ST. JOHN'S MEDICAL COLLEGE, BANGALORE

COMMUNITY HEALTH DEPT.
47/1, (First Floor) S.P. Market
BANGALORE - 560 001

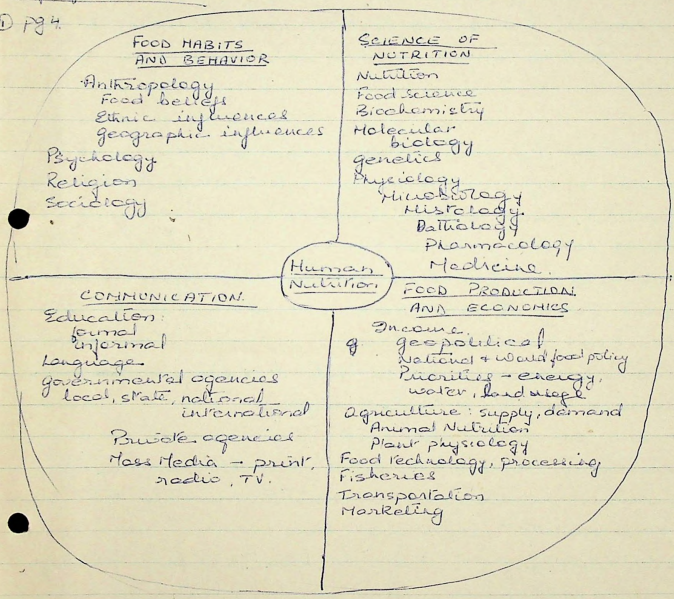
8.

Class | Roll No.
Semester | Subject
Examination | Date

NUTRITION

Ref. from (4)

① Pg 4



Human nutrition encompasses the study and application of many disciplines

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②. Pg 1 What does food mean to you? Food - menu - diet - hunger - nutrition - malnutrition. What images do these words bring to your mind? Are they oriented to your senses? To your social enjoyment? To your concerns about your own well-being? To your emotions? Do they raise questions about the quality of life for your fellow human beings?

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pg 1

③ Next to the air you breathe and the water you drink, food has been basic to your existence. In fact food has been the primary concern of man in his physical environment throughout all recorded history. By food, or its lack, the destinies of men are greatly influenced. Man must eat to live, and what he eats will affect in a high degree his ability to keep well, to work, to be happy, & to live long.

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④ pg 3

The achievement of good nutrition requires :-

i) Application of agricultural science & technology to produce sufficient amounts of plant & animal foods of high nutritive value.

ii) Processing of food for maximum retention of nutritive value

iii) Adequate storage, transportation & marketing facilities to make foods available at times & places where needed.

iv) Appropriate governmental controls to ensure wholesomeness & nutritive quality of the food supply.

v) Economic conditions that make it possible to procure the necessary foods at a cost within the reach of all

vi) Educational programmes in nutrition within the schools & at the community level.

vii) Efficient use of food within the home, public eating place & institution

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⑤ pg 11

Problems of nutrient excesses :- Some people consume diets that are excessively high in calories, saturated fat, cholesterol & sugars, & that are also excessively refined. All of these excesses are believed to increase the risk of chronic diseases. It must be remembered, however, that there are also other factors that relate to the incidence of chronic diseases.

1. Excessive caloric intake leads to obesity which is associated with chronic diseases such as diabetes

mellitus, gallbladder disease, gout, cardio-vascular diseases + others.

2. Excessive intake of fats + sugars that are practically devoid of minerals, vitamins + proteins may result in suboptimal intakes of these essential nutrients. This imbalance may also lead to deficiencies.

3. Excessive intakes of saturated fats + cholesterol are believed by many clinicians to be among the important risk factors in the incidence of cardiovascular + cerebrovascular diseases.

4. Excessive intake of salt has been associated with hypertension.

5. Excessive use of refined foods, on the basis of epidemiologic studies, is believed to increase the incidence of gastrointestinal disorders such as diverticulosis, irritable colon + possibly colon cancer.

6. Excessive intakes of Vit. A + D are known to be toxic.

⑥ Pg 11

Nutritional balance - A good diet must fulfill these criteria:

(i) It must furnish the appropriate levels of all nutrients to meet the physiologic + biochemical needs of the body at all stages of the life cycle +

(ii) it must avoid excesses of any nutrients that increase the risk of diet related diseases.

⑦ Pg 11

Global problems in Nutrition

Scope of malnutrition - Most of the worlds people today, as always, are engaged in a struggle for food. In relatively few countries, such as the United States, Canada + western European countries is food abundant + of great variety. More than half the worlds people are caught in a relentless sequence of ignorance, poverty, malnutrition, disease + early death. There are

no completely reliable statistics on either morbidity or mortality from malnutrition, but one estimate places the daily death toll from malnutrition at 10,000.

The worlds population increases by approximately 150 to 200 thousand persons each day, so that the expansion of food production to keep pace with, + one ahead of, this population growth must assume staggering proportions. The world production of food increases about 2.5% annually, just keeping ahead of the population increase of 2% annually. Moreover, much of the increase in food production occurs in the developed countries + not in the areas of greatest need

The energy crisis experienced throughout the world directly affects the food supply. Energy is required for the production of fertilizers, to run farm machinery, to transport foods + to process foods. Short supplies of energy together with high costs of energy have affected the poor countries most severely.

Protein - calorie malnutrition is the single greatest world problem in nutrition. In its severe forms, kwashiorkor + marasmus, it affects millions of pre-school children. In fact, in some countries, these children may be dead before the first one gets to school. Those children who do survive are physically + mentally retarded - perhaps irreversibly so.

Anemia (especially in mothers + young children), blindness resulting from Vit A deficiency, + riboflavin deficiency are especially frequent. Rickets, scurvy, pellagra, beri-beri + endemic goitre occur in severe forms in some parts of the world.

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(8) Pg. 12.

Responsibility for world nutrition :-

No thinking man or woman can afford to avoid the fact that so many of the worlds people simply do not have enough to eat, nor can he, even in his own self interest, evade the responsibility for alleviating hunger. In chronic starvation lie the frustration, tension + envy of masses of people who will ultimately resort to violence

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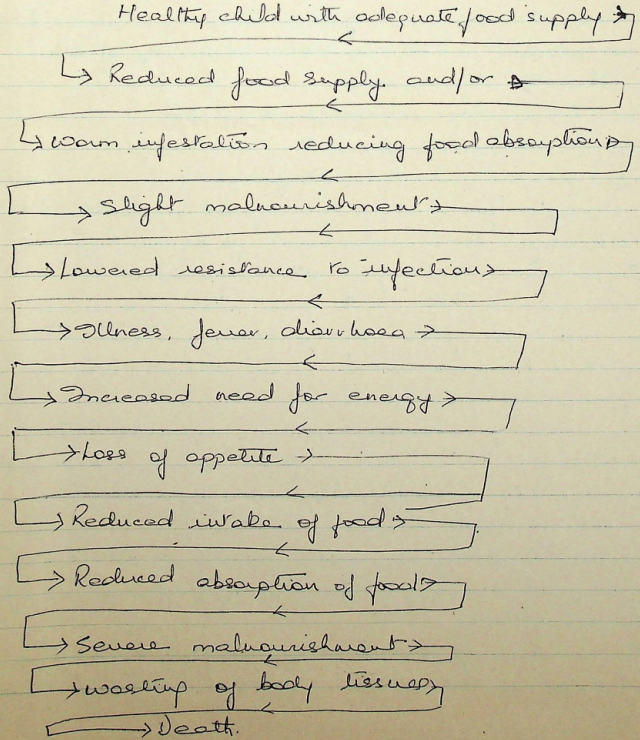
(9) Contact 45 Pg (2) Appr: Technologies for tackling malnourishment

The vicious spiral of illness + malnourishment



The 2 sources of the problem of malnourishment are (1) Inadequacy of the food supply, leading to malnourishment or incipient malnourishment + reduced resistance, or increased susceptibility, to infections + infestations

(2) an unhygienic environment which exposes the child to infections + infestations which can increase the demand for nutrients + simultaneously reduce assimilation of whatever nutrients are available

Technologies for tackling this must be

i) be capable of operating within the limited financial + material resources of low income communities

ii) be adapted to the available resources of skills within the community

iii) be socially + culturally acceptable

iv) be functionally efficient.

These fall into 3 main categories.

i) Technologies for making more food available at lower cost

ii) Technologies for improvement of home hygiene

iii) Supportive technologies which facilitate the application of those in the first two categories

Technologies for food availability include those related to conservation, food dehydration + appropriate food farming.

Technologies for home hygiene include those related to the structure of the home, improved availability of water, hygienic food handling + to excreta + waste disposal

Supportive technologies relate mainly to conservation of human energy + efficiency of performance of household tasks.

Elimination of post harvest spoilage + wastage of food crops could increase food availability by over

40% without cultivating a single additional acre or spending additional money on production

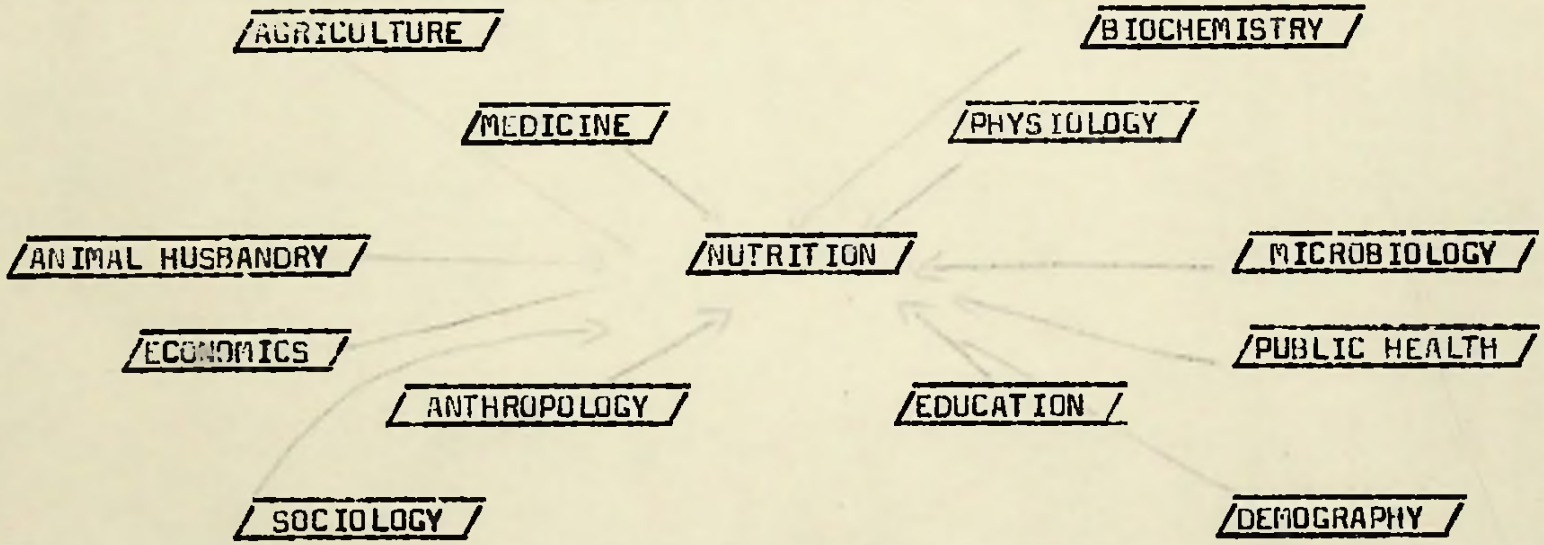
Food conservation involves 2 basic operations :-

i) Drying the crop to a low moisture content & (ii) storing it in a moisture proof & pest proof situation

(i) Solar drying in a simple enclosed dryer results in rapid drying (one day or less as compared to 3-7 days) & because of high temperatures (60-70°C) involved, also kills or drives off any insect infestation

ii) Fuel fired drying - consists of a "firebox/heater" in the form of a tunnel, made from oil drums placed at the bottom of a six foot deep pit fitted & a chimney to create a draught. Drying trays containing the crop are placed over the pit & the hot air rising from the firebox passes up through the crop, drying most grains to a safe moisture content in one day. It has a high demand for fuel. However agricultural waste like maize cobs, coconut husks etc reduces the prob.

THE DISCIPLINES CONCERNED WITH NUTRITION



(Courtesy: Basic Preventive Medicine by Deodhar Adranwala)

SOME OBJECTIVES IN THE STUDY OF NUTRITION

At the beginning of any study it is well for the student to set some specific objectives for himself. These will not be the same for all individuals because students begin the study with quite differing backgrounds of knowledge and experience, and because their professional interests are likely to vary widely. Moreover, it must be anticipated that these will, in fact, change as the study progresses and the student becomes more aware of the field. Worthwhile goals are not fully achieved within the space of a few months but should provide the basis for an ongoing lifetime program of education. The discussion that follows will give the student some background for setting up his own objectives with reference to personal and family nutrition, and toward a professional career in the health sciences.

Personal and family nutrition. Regardless of one's future professional career, the study of nutrition should first be directed to onself. Physical and mental health are essential assets to meet the exciting and sometimes arduous, requirements of one's life work. Those who expect to help other people achieve better health through nutrition must be enthusiastic and living examples of the benefits of the application of nutrition knowledge.

Nutrition education applied to the individual also reaches the family. This is especially important for young men and women as they establish their own families. Within the family the wife and mother is the principal decision maker for the family's food. She plans the menus, selects the foods, and prepares them. Although she makes every effort to please her husband, her influence also molds many of his habits. The food habits of children are formed by the prevailing attitudes and practices within the home.

Professional opportunities in nutrition. Professional people in any discipline related to health are engaged in activities related to education, prevention, and therapy.

Nutrition education in schools. Education of the population holds promise of long-range benefits to the greatest numbers. Teachers, nurses, nutritionists, dietitians, home economists, and physicians assume varying responsibilities for individual and group education.

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The elementary and secondary schools afford the single best opportunity for helping the child to establish attitudes and practices concerning food selection that will lead him to a more healthful, productive life. Nutrition education must begin in the kindergarten and continue through the twelfth grade if it is to achieve maximum effectiveness. It is the responsibility of the elementary teacher as well as teachers of home economics, health, and physical education.

Nutrition programs for the public. Voluntary and governmental agencies together with industry are accepting responsibility for nutrition programs. The researcher in nutrition and food sciences is equally at home in the laboratories of a food company, a university, a hospital, or in the public health field. Nutritionists, dietitians, and home economists, depending upon their education and particular interests, are the experts who interpret a product for a company; develop new uses for a food; advise mothers and children concerning their diets in a clinic; serve as consultants to a public health team; supervise food service in a college dormitory, industrial cafeteria, or hospital; assist individuals and groups in dietary selection; and teach in nursing schools, colleges, and universities.

Nutrition and health care. The concern of today's health worker is for the maintenance as well as the restoration of health. Traditionally, health care has been directed to the patient-that is, the horizontal individual. Today, health care includes the concept of continuity of care. The health worker soon learns that there must be concern for the patient who makes the transition from the hospital to his home. To implement continuity of care with respect to nutritional needs, the patient may require counseling in the proper choice of foods in the market, assistance in planning for the best use of his food money, and practical suggestions for food preparation with meager facilities, or in the face of physical handicaps.

PROBLEMS AND REVIEW

1. What is your understanding of the following terms: nutrition, malnutrition, foodstuff, nutrient, health, food, nutritional care, primary prevention?
2. Industrial and economic developments have been a powerful factor in the changing of our food habits. List several of these which have had an influence on our dietary habits within your lifetime.

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Objectives for the student. To achieve the personal and professional objectives the student should strive toward the following behavioral changes.

1. Shows the proper attitude and convictions relative to the importance of nutrition in regulating one's own health, that of the family, and that of individuals of the community.

2. Knows the kinds of health problems arising from poor nutrition that exist in his own community, the nation, and throughout the world.

3. Demonstrates knowledge concerning the science of nutrition:

   a. Functions, digestion, absorption, and metabolism of proteins, fats, carbohydrates, minerals, and vitamins.
   b. The interrelationship of nutrients.
   c. The nutritive requirements of individuals and the variations that may be imposed by activity, climate, stage of life cycle, and disease.

4. Appreciates and understands the meanings that food has for people and how these are related to economic, psychologic, and cultural factors.

5. Interprets the principles of nutrition in the selection of an adequate diet:

   a. By knowing the food sources of the nutrients.
   b. By applying consumer information to the planning of meals and the selection of food for quality and economy.

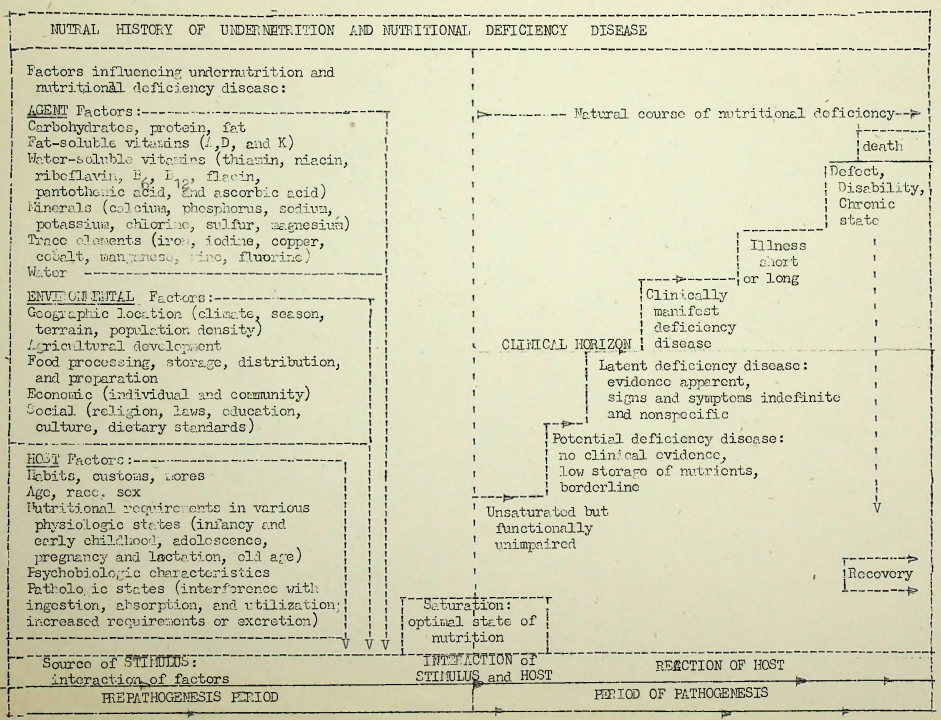
6. Uses opportunities for improving nutrition through the education of individuals.

7. Counsels people on an individual or group basis by adapting nutrition information to specific health, socio-economic, and cultural needs.

8. Knows where to look for reliable sources of information and how to evaluate publications on food and nutrition and the claims made through product advertising.

9. Becomes familiar with agencies concerned with nutrition and health in order to utilize their services and contribute to their functioning.

SOURCE: FUNDAMENTALS OF NORMAL NUTRITION



NUTRITION

Nutrition is a dynamic process in which food is consumed and utilised for growth and repair of the body.

Growth implies increases in physical measures.

Development implies increase of intellectual and emotional faculties.

Adequate nutrition which is vital for attaining optimum health is ensured by providing every individual with a balanced diet. This diet contains proteins, fats, carbohydrates, minerals, vitamins and water in proportionate amounts to provide adequate energy for growth and repair of tissues.

Proteins (derived from the Greek work "protos" meaning to come first), are complex organic nitrogenous substances containing carbon, hydrogen, oxygen, nitrogen and sulphur in varying amounts. Some proteins also contain phosphorus and iron, and occasionally other elements. Protein rich foods are milk, meat, fish and eggs from animal sources and pulses, nuts and beans from vegetable sources.

The recommended daily allowance for the Indian adult is one gram per kg. of body weight. This is increased in infancy, adolescence, pregnancy and lactation.

Lack of protein and vitamin A can cause serious and permanent defects in children especially. These range from impaired mental development and blindness to death.

The reasons for lack of protein in the Indian diet are numerous:

1. Lack of knowledge of the importance of proteins
2. Lack of utilisation of locally available proteins
3. Dietary restrictions
4. Superstitions and some traditionally harmful customs.
   (For example - In some rural areas pregnant women do not eat green leafy vegetables or drink milk).
5. Poverty

It was estimated that 10 - 15% of the people in the world, or roughly 20% of the people in the developing countries, did not meet their energy needs during the decade 1950 - 1960, (they were undernourished). The study was extended to estimate the incidence of protein deficiency as data became available; this estimate was placed at between 25 and 33% (Sukhatme 1966).

What has since become clear is that protein deficiency is for the most part the indirect result of inadequate energy intake. In other

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words, what diets lack is energy foods to avoid the body katabolizing the protein people do eat. (Gopalan 1968). This finding is the opposite of what has been reported in various studies of the subject, notably the study on Protein Gap by the U.N. Committee on Application of Science and Technology to Development (U.N. 1968) which has formed the basis for international action.

The finding that protein deficiency is indirectly caused by low calorie intake is gradually being confirmed by a number of workers and is also reflected in the recent writings of F.A.O. (1971).

Based on F.A.O. and W.H.O. Studies (1957 to 1965) and the recommendation of the I.C.M.R. (1968).

Recommended Levels of Nutrient Intake for the Pre-Social Child and Adult in India (Approximations only):

Age	Calories	Protein as Egg in G*	% Prot./Cal Concentration	% Protein/Cal Concentration when NPU relative to Eggs is 67
1 - 3 years	1,000	12.0	4.8	7.2
Adult Male	2,700	33.0	4.8	7.2

* Defined as average + 20%

Current evidence shows that if a diet has 5% of its calories from good quality protein, such as in egg or milk, the individual's needs for protein will be met regardless of whether he is a pre-school child or an adult man, provided he eats enough to meet his energy needs.

TABLE IV

Distribution of households surveyed in India (Maharashtra State) 1958 by calorie supplies per day per reference man.

CALORIES/per day/per reference man	% Frequency
Upto 1,300	6.8
1,300 - 1,700	9.7
1,700 - 2,100	14.7
2,100 - 2,500	16.3
2,500 - 2,900	16.6
2,900 - 3,300	12.9
3,300 - 3,700	9.0
3,700 - 4,100	5.5
4,100 - 4,500	3.5
4,500 - and over	5.0
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by National Sample Survey 862 households.

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"Since malnutrition (or the lack of a balanced diet) is the outcome of several factors - social, economic, cultural and psychological the problem can be solved only by taking action simultaneously at various levels - individual family, community, national and international levels. Other measures to ensure people adequate nutrition are:

1) Increasing food production
2) Price control
3) Prevention of food adulteration
4) Fortification and enrichment of foods
5) Food aditives
6) Inventing cheap supplementary foods (e.g. High Protein Foods)
7) Irradiated Food
8) Nutrition education, and
9) Population control

The Government of India is attempting to solve the problem of malnutrition by implementing the following programmes on a national scale:-

1) Applied Nutrition Programme
2) School, Mid-day Meal Programme
3) National Government Control Programme
4) Crash Programmes in Nutrition (For 0 - 3 years)
5) Vitamin A supplement to facilitate growth and prevent blindness.

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Studies from the United States and the developing countries reveal the not surprising fact that as family size increases, per capita spending for food goes down. As a result, corresponding diet inadequacies and nutritional deficits are common.

FOOD CONSUMPTION PATTERNS BY STUDIES OF F.A.O.

Major Parts of India

Rice, Millets and other Cereals	Moderately High
Pulses, Fats and Oils	Moderate
Milk	Low
Meat, Fish and Eggs	Very Low

India (Punjab) and Pakistan

Wheat, Rice	High
Milk and Pulses	Moderate
Meat, Fish and Eggs	Low

Cereals constitute upto 80% Calorie Supplies
and upto 70% Protein Supplies

Pulses constitute upto 10% Calorie Supplies
and upto 20% Protein Supplies

Food of Animal Origin constitute upto 4% Calorie Supplies
Meat, Fish and Milk - 10% Proteins

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Malnutrition, especially protein calorie malnutrition, is widespread and is to be feared not only because of its general debilitating effect but especially because of the irreversible brain damage that inadequate proteins cause. Data from 24 countries indicate that the prevalence of severe PCM (Protein Calorie Malnutrition) ranges from 0.5% to 5% and the prevalence of moderate PCM from 4% to 43%.

"The human brain reaches 90% of its normal structural development in the first four years of life. We now know that during the critical period of growth, the brain is highly vulnerable to nutritional deficiences, deficiencies that can cause as much as 25% impairment of normal mental ability. Even a deterioration of 10% in the diet is sufficient to cause a serious handicap to productive life. This is irreversible brain damage. What is particularly tragic in all of this is, that when such mentally deprived children reach adulthood, they are likely to repeat the whole depressing sequence in their own families. They perpetuate mental deficiency, not through genetic inheritance, but simply because as parents they are ill-equipped mentally to understand and hence to avoid the very nu ritional deprivation in their own children that they themselves suffered.

In low income countries the high mortality rates among children in large families and in families with close birth intervals, are in part due to malnutrition. The greater the sibling number, the greater the likelihood of malnutrition among poor families. Studies of pre-school children in Colombia, for example show that 52% of the children in families in which there were five or more pre-school children were seriously malnourished, whereas only 34% of children in families with only one pre-school child were malnourished.

In Thailand, of the children whose next youngest sibling was born within 24 months 70% were malnourished; of those in families without a younger sibling, only 37%.

Height and weight being affected directly by nutrition showed variation in children according to family size. Even in high income countries the children of the poorer families are larger at any given age when the number of children in the family is small. For example, of 2,169 London day-school students, 11.25 years old, children from one child families were about 3% taller and 17 - 18% heavier than children from families with five or more children.

The difference in physical growth between children of small and large families in Great Britain seems to affect mainly the poorer social classes. In the higher income classes boys in families with 3 or more children are taller at all ages than boys in small families; the reverse is true for girls. In the upper and lower manual working

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classes children in small families average 3 - 4% taller than those in large families at 7 and 11 years of age and 1.4 to 2.8% taller at 15 years.

Diet surveys carried out in India have shown that the average Indian diet is ill-balanced with an excess of Carbohydrates and very little protective foods like milk, meat, fish, eggs, fruit and leafy vegetables.

The Nutrition Advisory Committee has designed a diet from the resources available required to give a total caloric value of 2,400. Such a diet would cost, in 1960 Rs.35 per month per adult. Only 20% of our people in India can afford this.

Indian rural economy is not balanced, for while rural earnings give only Rs.16 per individual per month, the same individual spends Rs.20 in that month.

Only 70 crores of the total outlay of 361 crores of rupees is provided for rural hospitals and health care in our 4th Five Year Plan. The top priorities of the health tasks are not always properly chosen.

The Green Revolution in India has lulled many into a state of complacency. While it is true that great progress has been made in increasing food production, the increasing population has almost nullified this increase, so that the per capita availability of food is only 446 gms. (cereals and pulses) per day and a per capita availability of 120 ml. of milk per day.

Yet India has the largest cattle population in the world - most of the cattle being of poor quality, yielding little milk and serving no useful purpose, yet consuming much fodder. The economic advantages would be considerable if these animals were permitted to be slaughtered and much needed meat be made available for consumption and more leather for foreign trade. About 1/3 of the people have no objection to eating beef.

Whereas the proportion of staple cereals and starchy roots in the North American diet is estimated to be only 25%, and in the British diet only 31%, in Latin America it is 54%, in Africa 66%, in the Near East 71% and in the Far East over 73%. Conversely, while the proportion of animals products - milk, meat, eggs and fish - in the typical North American diet reaches the exceptionally high figure of 40% and in the British diet can be as high as 27%, the figure for Europe as a whole is estimated as 21%, for Latin America 17%, for Africa 11%, for the Near East 9% and for the Far East 5%.

In only a few regions of the world are there adequate food supplies. These are the United States and Canada, Australia, New Zealand, Western Europe, parts of Argentina and parts of South East Asia, These regions have already utilized the means of increasing agricultural

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productivity, but only ten centuries in the world today produce more food than they consume.

The "dhals" which have a high protein content (vegetarian meat!) take the place of animals foods in communities where it is consumed (though in insufficient amounts). However, the body utilises only 40 - 60% of the vegetable protein which forms the chief kind of protein (in contrast to animal protein) that is consumed. Certain essential amino acids like Lysine and Methionine are also present in insufficient amounts in this diet pulses.

According to a National Survey the average daily intake of calories in India was 1890 calories with a daily protein intake of 53 grams.

Pregnant women, nursing mothers and growing children, ie. a group constituting 60% of the population, lack adequate calories, proteins, vitamins and minerals. The result of this is seen in the high incidence of low birth weight babies, still-births and fairly high morbidity and mortality rates in children.

Health education for adequate nutrition and balanced diet needs to be given to all parents, teachers and health personnel. Many foods are freely available at reasonable prices and can be used to supplement the diet. These (greens and fruits especially) are often locally available or easily grown in the kitchen gardens, and found both in cities or in rural areas.

The C.F.T.R.I. has also developed multipurpose food - which is a blended flour of groundnuts and Bengal gram. It is cheap, extremely nutritious and can be used in a variety of ways. For children especially, C.F.T.R.I. has a prepared mixture of wheat, groundnuts, and soya bean or Bengal gram flour with skimmed milk powder.

More recently, using a machine, C.F.T.R.I. has extracted protein from leaves and grass. This process is still in the research stage.

It is interesting to note the view of Dr. P.V. Sukhatme - "An insufficient amount of protein in the diet is held to be at the heart of the problem of persistent and widespread malnutrition in the developing countries. However, when one examines the available data, the conclusion is clear that what diets lack is not protein but energy foods to enable the body to utilize the protein people actually do eat. There is no evidence that the quality and concentration of protein in cereal-legume diets normally eaten in the developing countries is inadequate to meet protein needs, provided energy intake is adequate. The protein problem is therefore essentially a socio-economic problem. Production of semi-conventional, cheap, protein-rich foods using modern technology and distribution of factory foods so produced through special feeding programmes as recommended

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by the international bodies, will be a costly and inefficient method of solving the problem".

Much can be continued to be said on the subject of nutrition, but at the present time given the familiar family situation of providing adequate nutrition two things must be emphasised:

1. The use of locally available foods like green leafy vegetables in the diet.
2. Early recognition of nutritional deficiencies and their remedy by sound dietary practices and use of food supplements prepared by C.F.T.R.I.

A recent report says "Nearly one million Indian toddlers die every year because they do not get enough to eat. Although these hapless toddlers constitute 16.5% of the population, they account for 40% of the total deaths. One-fifth of the babies born in India never live beyond the age of five years".

In a paper on Nutrition and Development, Gopalan points out that apart from the one million small children who annually fall victim to malnutrition, many more die of diseases they would have either escaped or survived if they had been better nourished. The children would stand a better chance if they were more sensibly fed from even the available foodstuffs.

In a countrywide survey, the severely undernourished pre-school children (17 - 18% of the number surveyed) were 40% lighter in weight than they should be for their age. About 14% were 10 - 23% lighter than normal and 65% were 26 - 40% lighter than they should be. Only 3% were the right weight for their age.

The question of wants also means that the use of resources may go far beyond what someone from another social background might consider quite adequate for survival or even for a good life. It has been calculated, for instance, that a child born in the United States is likely to consume in the course of a lifetime 28 times as much as a child in India.

TABLE

Estimated consumption per head in 1960 in various countries (U.K. = 100)

U.S.A.	140
Sweden	125
West Germany	86
Mexico	22
Taiwan	12
Ceylon	9
India	5

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Since nutrition is closely bound up with Agriculture, it is imperative that the problem of malnutrition which is so serious in India be confronted at "grass-roots" level. Three possible avenues are open:

1. The growing of food crops to be encouraged, expanded and given positive incentives.

2. The storage, distribution and allotment of food to priority groups (e.g. the vulnerable population) given due attention.

3. Increased research and exploration of food from a) the sea and use b) of the protein containing vegetable foods like groundnuts and soya bean.

The exact fishing potential of the ocean remains unknown. Indeed fish farming as a serious industry is still in its infancy in most parts of the world. The Northern Hemisphere are 61% water and provides 98% of the world's fish supplies. The Southern Hemisphere is 81% water but is supplies only 2% of the fish. The fisheries of the world could yield far more food - and of a particularly valuable type - being of good protein content.

It is of importance and interest to look to future trends in food cultivation for both the rich and the poor countries.

The rich countries, with no greater rate of growth in food production but most of it coming from increases in productivity and with only half the rate of growth in population compared to the developing countries, improved their per caput availability of food and were able to export increasing quantities.

As a consequence, trends in the food supplies of the developing countries have been somewhat more favourable than those in production but this has taken place at the expense of the trading pattern between the two groups of countries. The Far East and Near East, which were exporters of food before the War, are now importing 6 and 7% respectively of their supplies. Africa and Latin America are still exporting but on a much reduced scale. This unfavourable development has tended to increase balance of payment problems and to accentuate the difficulties resulting from the almost continuous decline since the Korean boom in world prices of primary commodities. The situation is illustrated by the example of cereals; the less developed countries (excluding Mainland China) which exported ten million tons of cereals before the War are now actually importing nearly 20 million tons, and this largely to maintain their current unsatisfactory level of diet. Judged by these trends, the prospects of stepping up the rates of growth to 3% in total foods and 3.5% in animal foods over the years 1965 - 2000 seem bleak indeed.

Sinc we cannot take comfort from the past trends, we should find out what are the possible sources of food supply, what resources we

have and how we can exploit them to meet our future food needs. Never before the planning of resources use and land use in particular has assumed so much importance as at present under the heavy pressure of demographic growth.

T A B L E

Rate of Growth (1958-63)

	Population Growth	Per Capita Gross Domestic Product
	(per cent per year compound)	
Developed Regions	1.3	3.4
Developing Regions	2.5	1.8

Gross National Product is the value of total annual production of goods and services supplied by all 'normally resident' individuals, firms and government bodies. If 'income' is restricted to income derived from participation in production GNP also equals the annual sum of their incomes, including net incomes from abroad.

Gross Domestic Product ..... Equals GNP minus net income from abroad.

COMMUNITY HEALTH CELL
47/1, (First Floor) St. Marks Road
BANGALORE - 560 001

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FOOTNOTES TO THE TABLE ON DAILY ALLOWANCES OF NUTRIENTS FOR INDIANS

(i.e. TABLE 1)

BMR + Diet induce thermogenesis + Cold induced thermogenesis + Activities of Daily Living + Work

1. Calories:
   a) Calorie allowance for heavy work does not include work under special conditions like high altitude.

2. Proteins:

   a) Adult allowance corresponds to 1 gm./kg. of dietary protein of N.P.U. 65.

   b) Infant allowance during 0-6 months is in terms of milk proteins. During 7-12 months, part of protein intake will be protein in the formof milk, and supplementary feeding will be derived from vegetable proteins. Total daily protein allowance is calculated from the ideal weight. Protein allowances during infancy will be:-

0-3 months	2-3gm-/kg.
3-6 months	1.2gm./kg.
6-9 months	1.3gm./kg.
9-12 months	1.5gm./kg.

   c) Allowances for children and adolescents have been computed using body-weights as obtained in the well-nourished group and assuming N.P.U. of 50for the dietary proteins.

3. Calcium: In the absence of precise information on calcium requirement of different groups, a range of allowance has been suggested.

   a) Calcium allowance for infants 0-6 months will be for artificially fed infants. Calcium intake from breast milk will, however, satisfy the needs of breast-fed infants up to 6 months.

4. Iron:

   a) This allowance of 30mg. iron is for adult woman during her premenopausal period. For the post-menopausal woman, iron allowance is the same as for man.

   b) This allowance for preganat woman will be throughout pregnancy.

   c) This allowance is for lactating woman who is not menstruating. If a woman is lactating and also menstruating, her iron allowance will be 35 mg./day.

5. Vitamin A:

   Dietary allowance for Vitamin A is given in terms of retinol (Vitamin A alcohol) and B-carotene. Either of these is used, depending upon the dietary source of vitamin. The factor to be used to convert B-carotene to retinol is:

   1 ug. of B-carotene = 0.25 ug. of retinol.

   If the diet contains both Vitamin A and B-carotenes, its content can be expressed as retinol, using the following formulae.

   i) Retinol content ug. = ug. retinol + ug. B-carotene x 0.25
   if the retinol and B-carotene content of foods are given as ug. in the food composition tables.

   ii) Retinol equivalent = Vitamin A (I.U.) x 0.3 + B-carotene

ii) Retinol content (ug.) = Vitamin A (I.U.) x 0.3 + B-carotene (I.U.) x 0.15 if the Vitamin A and carotene values are given in terms of International Units.

6,7,8. Thiamine, Riboflavin and Nicotinic acid:

The daily allowance of these three vitamins are related to calorie intake.
The basic allowances per 1000 calories are.

Thiamine = 0.5 mg., Riboflavin = 0.55 mg., abd Niacin = 6.6 mg. niacin equivalents.

Niacin allowance includes contribution from dietary tryptophan, 60 mg. tryptophan being equal to 1 mg. niacin.

Niacin equivalents in a diet are computed as follows:

$$\text{Niacin equivalents (mg.)} = \text{Niacin content (mg.)} + \frac{\text{tryptophan content (mg.)}}{60}$$

9. Folic Acid: Dietary allowance of folic acid will be in terms of free folic acid(L. casei activity) present in foods.

a) Folic acid requirements appears to be considerably increased during pregnancy. Since the exact requirement is not known, a range, rather than a single figure, has been suggested for the daily allowance of folic acid during pregnancy.

10. Vitamin B_{12} ;

Vitamin B_{12} is derived entirely from foods of animal origin.

11. Vitamin D :

Since the exact requirement of Vitamin D is not known, an arbitrary allowance of 200 I.U./day is made. This allowance is in addition to some amount of Vitamin D that might be derived form exposure to sunlight.

12. Fat:

Since human requirement of fat is not known. no specific allowance is recommended. A desirable range for fat in the diet is, however, indicated. Diet should contain at least 15 gm. fat derived from vegetable oils like sesame, safflower or groundnut. It is also desirable that calories derived from fat in the daily diet should not exceed 30% of total calories.

Daily Allowances of Nutrients for Indians

(Recommended by the Nutrition Expert group in 1968)

Group	Particulars	1 Net calories	2 Proteins (gm.)	3 Calcium (gm)	4 Iron (mg.)	5 Retinol (ug.) or β-carotene (ug.)	6 Thiamine (mg.)	7 Riboflavin (mg)	8 Nicotinic acid (mg.)	9 Ascorbic acid (mg.)	10 Folic acid (ug.)	11 Vitamin B12 (µg)	Vitamin D (I.U.)
Man	Sedentary work	2400					1.2	1.3	16				
	Moderate work	2800	55a	0.4-0.5	20	750 3000	1.4	1.5	19	50	100	1	200
	Heavy work	3900					2.0	2.2	26				
Woman	Sedentary work	1900					1.0	1.0	13				
	Moderate work	2200	45a	0.4-0.5	30[a]	750 3000	1.1	1.2	15	50	100	1	200
	Heavy work	3000					1.5	1.7	20				
	Pregnancy (second half of pregnancy)	+300	+10a	+1.0	40[b]	750 3000	+0.2	+0.2	+2	50	150-300a	1.5	200
	Lactation (upto 1 year)	+700	+20a		30[c]	1150 4600	+0.4	+0.4	+5	+20	150		200

Cereal/Pulse combination – Groundnuts – Milk/Eggs/Fish – Dhals/pulses/beans

Ragi, Bean, Sikaphal, Iron vessels

GLV, Jaggery

GLV, yellow coloured fruit/ vegs

Parboiled Rice / Atta Fermented Foods

Amla, Sprouted gram – Tamarind – Green chilly – Citrus – Potato

– Cooking of veg in closed vessels – Water used for cooking etc

		1	2	3	4	5 5 (Retinol)	B	6	7	8	9	10	11
Infants	0-6 months	120/kg	2.3-1.3/kg.[a]		1.0mg./kg	400	1200	—	—		30	25	0.2	
	7-12 "	100/kg.	1.8-1.5/kg	0.5-0.6		300	1200	—	—		30	25	0.2	200
Children	1 year		17											
	2 years	1200	18	0.4-0.5	15-20	250	1000	0.6	0.7	3				200
	3years		20											
	4-6 years	1500	22			300	1200	0.8	0.8	10				
	7-9years	1800	33			400	1600	0.9	0.9	12				200
	10-12years	2100	41			500	2400	1.0	1.2	14	30-50	50-100	0.5	
Adolescents	13-15yrs.boys	2500	55	0.6-0.7	25	750	3000	1.3	1.4	17				
	girls	2200	50		35			1.1	1.2	14				200
	16-18yrs.boys	3000	60	0.5-0.6	25	50	3000	1.5	1.7	21				
	girls	2200	50		35			1.1	1.2	14				200

ASSESSMENT OF GROWTH AND NUTRITIONAL STATUS IN INFANCY AND CHILDHOOD

Pattern of growth

In the normal, edequately nourished child, rapid growth takes place during the first year of life. In different parts of India the average birth weight is about 2,700 to 2,900g. Almost all babies lose weight during the first 3 to 4 days after birth and regain it by 7 to 10 days. After that, the weight increases by 25 to 30g a day for the first 3 months, and thereafter less rapidly (see table below). The widely accepted formula that a baby doubles its birth weight at 5 months and trebles it at I year does not apply to all babies, and may be misleading. Babies with a lower birth weight may double their weight at 3 to 4 months and may be four times their birth weight at 1 year of age. For example, a baby with a birth weight of 2, 300g may double that at 3 months and may weigh between 9 and 10kg at one year. It is better to be familiar with the weight gain pattern as shown in the table.

The length of a baby at birth is 48 to 50 cm and at 1 year of age becomes one and a half times as great. Thereafter it increases as shown in the table below. The values in the table are averages and each child will differ gfrom another to a certain extent, but as long as the trend of the growth curve is maintained there is no cause for concern.

Average weight and height increments during the first five years

Age	Weight increments per week
0-3 months	200g
4-6 months	150g
7-9 months	100g
9-12 months	50-75g
	per year
1-2 years	2.5kg
3-5 years	2.0kg

Age	Length increments per year
1st year	25cm
2nd year	12cm
3rd year	9cm
4th year	7cm
5th year	6cm

Several Indian studies have shown that the weight curves of many children are excellent for the first 3 to 4 months, with the birth weight doubling by this age, but after this the curves tend to flatten. This is because no, or insufficient, food is given to supplement the mother's breast milk, which by itself is inadequate forthe baby from about this age.

Assessment of malnutrition

It has to be remembered that a series of readings is more important than a single reading. Any weight taken has to be compared with some reference standard, and by common consent the Harvard growth curves are used as reference standards. The concept of centiles should be understood before growth can be evaluated and compared with a reference standard. It is easier to understand in relation to height.

If 100 children of the same age are lined up from the tallest to the shortest, the 50th will be in the middle and will represent the median or 50th percentile. The tenth from the left will represent the 10th percentile (90 children will be taller than him) and the 90th from the left, the 90th percentile (only 10 children will be taller than him). The lower the percentile, the more growth retardation there is likely to be.

The same criteria can be applied to weight, and this, too, can be represented as percentile curves. It is preferable that the reference standard for comparison should be from the same population, care being taken to ensure that these children do not suffer from nutritional constraints or suffer from infections. This, at the present time, can only be found in the higher socio-economic group children. Work is already being done on this in different parts of India and till such time as these norms are available and there is agreement on their use, it is better to use an accepted standard like the Harvard standard.

Measurement of Growth - Parameters used

1. Weight:

2. Height:

3. Mid-arm circumference: An easy and useful measurement. The middle of the upper arm is measured while it is hanging relaxed at the side of the body. Normally the arm circumference increases rapidly from birth to 1 year. Between the 1st and 5th birthdays, it remains fairly constant in well nourished children and can be used as an age independent method.

4. Head and chest measurements: At birth, the head circumference is about 2 cm more than the chest circumference. About 6-9 months the two measurements become equal, after which the chest circumference becomes more than the head circumference. The chest and head ratio is a good indication of the nutrition of the child.

5. Skin folds: Where skin fold calipers are available, measurement of skin fold thickness is a useful measure of nutritional status. The common sites for skin fold measurement are triceps, biceps, subscapular and suprailiac regions.

1. Weight / Height

2. Ponderal Index = $\frac{W}{H^2}$

VITAMIN A DEFICIENCY AND XEROPHTHALMIA

II - Treatment, Control and Prevention.

1. Treatment of xerophthalmia — A. Conjunctival lesions.
   B. Corneal lesions.
2. Prevention and Control. — Objectives i) Control blindness
   ii) improve Vit A status of target groups

A. Periodic Massive dose programme
   i) In Pregnancy and Lactation.
   ii) In Preschool children and school children.
B. Use of Locally available Carotene-rich Foods.
C. Fortification of Foods with Vitamin A.
D. Health Services.
E. Horticultural and related production activities
F. Educational Programme.

3. NATIONAL PROGRAMMES India and others.
4. EVALUATION OF PROGRAMMES.

References

1. WHO TRs 590.
2. World Review of Nutrition and Dietetics Vol 20 p 184-230
3. " " Vol 24 p 192-216
4. Am. J. Clin Nutri 29 (1) 110-5 Jan 1976
5. " 28 (10) 1189-93 Oct 1975
6. " 28 (12) 1436 Dec 1975
7. " 23(1)119. 1970
8. Lancet 1, 7969 1120-2 May 1976
9. Lancet 2 228-231 1973.
10. J. Trop Med & Hyg 78 : 114-115 1975.
11. Brit. J. Nutr 27: 294-304 1972.
12. Indian Pediatr. 9.: 307-310 1972.
13. Trop. Geog. Med 16. 271-315 (1964)
14. VHAI 240 - Nutritional Blindness and Vitamin A.
15. MCH Scheme - Prophylaxis against Blindness caused by Vit A Deficiency, Family Planning Programme IV Five Yr Plan Technical information. MCH No 2

SINGLE MASSIVE ORAL DOSE Studies in India (2)

The NIN Hyderabad was the first institute to actually initiate Field trials on the use of large doses as a possible method to minimise blindness resulting from Vit A Deficiency.

(1) Swaminathan et al (1970)

Large group of preschool children given 90,000 µgm of Vit A.

i) Water miscible preparation. → 25% developed Hypervitaminosis

ii) oil-soluble preparation → 4% "

(2) Vinodini Reddy (1971)

Single massive dose 60000µg of Vit A does not produce any significant lysosomal injury. Excretion of enzymes not increased

(3) Srikantia S.G (1970)

Water dispersed and oil soluble preprn to rats orally and IM.

- Best Hepatic storage of vit. A occurred when oil soluble vit. A given orally.

(4) Srikantia S.G. 1970 15 malnourished children ē Vit A serum levels of 8 ± 1.2 µg/100 ml given 90000µg. of oil soluble Vit A orally.

- Serum levels were adequate till 6 months and were still above pre-dose levels for 9-14 months.

(5) Pereira, S.M (1969)
Orphanage children in S. India administered 90,000 µgm of V.A orally as a single dose.
- Levels of serum V.A were above pre-treatment levels for periods upto 4 months

(6) Sivakumari B (1972)
5 children who received 60000µg of V.A palmitate (oral dose) with tracer dose of $^{1}H^{2}$ $^{3}H_{2}$ retinyl acetate.
68% of dose absorbed and 47% of dose retained.

(7). Swaminathan M.C (1970) Field Study
2500 preschool children received 90,000 mg of retinyl palmitate in oil orally once a year for a period of 5 years.
- Incidence of xerosis and Bitot's spots were found to be significantly reduced within 1 year and fell by about 75% of the expected incidence. No new cases of Keratomalacia were encountered during this period.

(8) Susheela. T.P (1969) In sub-sample of Field study children serum V.A levels high for 4 months but fell to slightly above pretreatment levels at the end of 12 months

Final Conclusion: 60,000µg of Vitamin A to be given once in 6 months.

TREATMENT (W.H.O)

The massive dose technique is particularly useful when a child is hospitalised with xerophthalmia. The following protocol is recommended.

Recommended Preparations of Vit. A	i) Water Miscible	Intramuscular	100,000 IU.
	ii) Oil solution (in combination with Vit E)	Oral	100,000 IU 200,000 IU

Treatment schedule

Immediately on Diagnosis		100000 I.U. / Water miscible / IM
Second day		100000 IU / oil solution / oral
Prior to discharge.	Under 1yr	100000 IU / oil solution / oral
	Over 1yr	200000 IU / " / oral.

Explanatory Notes:

1. Retinyl palmitate is the preferred active form of Vitamin A in water-miscible formulations for intramuscular injection.
2. Upon diagnosis, an oil solution of Vit. A (100000 IU) should be substituted only if an IM preparation is not available. Hospital in endemic areas should keep water-miscible preparations handy at all times

3. Oral water miscible preparations of Vitamin A may be substituted for oil solutions. Vit. A. acetate may be used in place of retinyl palmitate.

4. Oil solutions of Vit. A should never be injected IM because they are relatively ineffective, the vitamin being liberated extremely slowly, if at all, from the injection site.

Danger of omission of Vit A therapy while treatment of PCM - Xerophthalmia may be precipitated

Objectives: i) To halt active lesions.
ii) To replenish body stores.

Other Factors to be considered

1. Treatment should not be delayed. Delay for even one day at stages X2 or X3A when changes are reversible may make all the difference between sight and blindness.
2. Eye conditions failing to respond to antibiotics — underlying xerophthalmia should be considered esp if social circumstances are indicative
3. Water miscible prepr^n are especially important in cases of vomiting and diarrhoea.
4. Underlying conditions need vigorous Rx. PEM, Nutritional disorders, gastroenteritis dehydration, electrolyte imbalance, infections, infestations.

PREVENTION AND CONTROL (WHO)

CONTROL PROGRAMMES could have two main objectives depending on severity of problem, socio economic situation, availability of human and financial resources, technological means and political considerations.

Objective I - To control blindness causally related to Vit A. deficiency. Need criteria will be prevalence of blindness and corneal scars (XS) and occurrence of severe xerophthalmia X2, X3A and X3B during the high season for Vit. A. deficiency. (Also high proportion of extremely low Vit A values for plasma ($< 10 \mu g/100 ml$) and liver ($< 5 \mu gm/gm$)

Objective II - To improve the vitamin A status of target groups. Need criteria will be i) Frequency of the milder more prevalent clinical signs, ii) dietary intake data. iii) plasma and liver concentrations.

A- PERIODIC MASSIVE DOSE PROGRAMMES

In these programmes the generally recommended method is.

i) 100,000 IU of Vitamin A to children > 1yr
ii) 200,000 IU of Vitamin A (± Vit E.) to children 1-6yrs every 6 months

- through health delivery system (as far as possible as an integrated multipurpose worker
- Training - Medical and auxiliary personnel. about
  i) significance of programme
  ii) proceduves for administering.
  iii) Risk of overdosing.
- Cost - of Vit A preparation is relatively cheap.
- Community awareness and involvement should be ensured by education programme
- Evaluation i) Operational effectiveness
  ii) Biological "

B- FORTIFICATION A suitable food vehicle for Vit. A. fortification should have following characteristics:

1. Food widely/universally consumed by target population
2. Not much variation in per capita daily consumption
3. Food should show no organoleptic characteristics after Vit A addn.
4. Economic feasibility of Fortification on industrial scale.

1. Fortified Milk - Fortification ∑ A, D, E of defatted skimmed milk. All milk products supplied by US assistance programmes have been fortified since 1968.
2. Fortified Cereals - wheat Flour/maize meal/rice premixes /simulated rice grain kernels.
   Baked bread/chapaties and cooked rice retain the Vit. A.
3. Fortified Sugar - Project in Guatemala (1969)
4. Fortified Tea leaves/powder - Trials in Southern India
   Retention excellent even after tea boiled for 1 hour.
   Survey Maharashtra 87% Gujarat 84% families give tea to their children (esp low income groups) ?? ideal vehicle.
5. Fortification of Monosodium glutamate - pilot study in Cebu Phillipines. (consumed in diet by 95% of families)

C- Health Services

1. Need to detect presence and estimate prevalence.
2. Should be able to investigate epidemiology and devise prevention strategy
3. All Field workers must be trained. to identify esp 'at risks'
4. MCH Services must all have Vit A supplementation scheme
5. Anor conditions to be actively treated.

D- Horticultural - To increase consumption of Carotene rich Foods
- vegetable and fruit gardens to be popularised.
- Green leafy vegetables to be increased
- New high carotene varieties of seedlings to be develop

E- Education - Nutrition education using educational methods and mass media should be an integral part of the progr

Points
1. Local sources of Vit A / carotene
2. Production / Storage / preparation of these sources
3. Special nutritional needs of young children.

e.g. VHAI 240

VIT. A. RICH FOODS

Animal Sources µg/100 gm (Retinol)

Fish - 30-40 Egg 300-400. Butter - 720-1200 Liver oils 10-100000

Milk - 50-60 Ghee 600-700 Liver - 6-10000

Plant Sources Retinol equivalents

Spinach 600 Carrot - 217-434 Orange - 35

Amaranth - 266-1166 Pumpkin - 100-200 Ripe tomato - 32

Cabbage - 217 Mango - 500

Veg. sources - β Carotene From Green leaf sources

Amarath / Beet / Radish / Knolkhol / Spinach

Factors influencing absorption.

i) Fat in the diet ii) Large pieces / pureed.

Adult 4500µg β Carotene / day = 100gm greens

Child 1500-1800µg " = 30gm

USE OF MASSIVE DOSES OF VITAMIN A

In Pregnancy and Lactation.

One of the ways of preventing Keratomalacia in the young infant is to enhance or supplement the diet of the mother.

Pregnancy: Vit A level drops in 3rd Trimester.

i) Good dietary intake
ii) Vitamin supplements
iii) Vit A 100000 IU/Day

→ Enhance Feral liver stores.

Lactation Supplements effectively raise Vit A content of Breast milk. Supplement shd be well over physiological requirement.

600000 IU water dispersible Vit A at delivery increased colostrum content & breast milk level - 1 mth

NATIONAL PROGRAMME (INDIA) (13)

Serious Public Health Problem in India.

Estimates: 1 million cases of Blindness due to Vit A Def.
12000-14000 Keratomalacia cases/yr
30-50% of Preschool children (deficient)

Prevalence: Karnataka, Kerala, Tamilnadu, AP, Orissa.
West Bengal, Bihar. (SE India)

Approach Integration with MCH & FP Services

Method: 2 Lakh I.U of Vit A in oil orally/6mth

National Vitamin A Prophylaxis Programme for Prevention of Blindness in Children (1970)

1970-74 19 districts/7 states to 97 d/14 states
2·4 (1 m) — 4·25 m (3 m.

1974-79 - 12 million children

Selection of Areas - State Nutrition Officers

Agency For administration

Urban	Rural
Child Welfare Clinic of Urban F.P Centre	PHC / Subcentres
General Hospitals.	ANM / FP Health Asst.
Maternity Homes	LHV / PHN ?

- Specific months chosen for admn to prevent repeated admn.
- 2 lakh IU / 6 mths till 5 years.

(NB - Short shelf life of prepn - 15 mths).

Health Education: Nutrition education and Problems of Vit A Def + Adv. of prophylactic program

Evaluation - Baseline Surveys / Repeated Surveys

Records - Child Health Records Reports - Monthly

NATIONAL PROGRAMMES (OTHERS)

1. BANGLADESH - Govt. sponsored periodic massive dose programme - Jan 1973.
- All 0-6 yr children given 200,000 IU Vit A Capsule
- Distributed through NMEP staff.
- <5% of child population Reached.

2. INDONESIA - Periodic massive dose programme in 1973 (For 2 yrs). Capsules of 2 Lakh IU Vit A and 40 IU tocopheryl acetate - admn biannually by mouth 100,000 children 12-48 mths (3 provinces of Java) 70% covered. Def. signs markedly ↓↓

3. PHILIPPINES - CEBU 3 yr pilot project (1976

3 strategies of intervention.
i) 2 Lakh IU Vit A + Vit E every 6 mth to all under 6
ii) Public health and horticultural activities (16)
iii) Fortification of mono sodium glutamate.
Cost & Effectiveness of 3 strategies after 2 yrs.

4. EL SALVADOR - Study - 2 - (6 mthly) doses of Vit A given to all children 1-5 yrs during a mass measles vaccination programme. (54)
Each capsule 2 Lakh IU Vit A + 40 IU Vit E.
Hosp. Record Review used for evaluating programme (Active Vit A related corneal destruction)
i) Potential effectiveness was 40%.
ii) Programme Failed to influence xerophthalmia occurrence
iii) Programme was well timed - seasonally.
iv) Measles History more common than PCM in xerophthalmia cases - v) Measles ↓ No K.M ↓

NUTRITION REHABILITATION UNITS

G. Venkataswamy (42012 Presch children

Child Care Centres in 146 villages

Preralence of Vit A Deficiency signs

Conjunctival Xerosis - 22%

Bitot Spots - 4%.

Night Blindnes - 0.7%

Strategy i) Demonstration Feeding on a selective basis Grade III PCM / Grade II / Grade I & obvious Vit A def.

Food supplement consists 3000 IU of Beta. Carotene

50-65 paisa/day.

Nutrition Education / Mahalir Mandrams

VHW - [redacted]lserikas MCH & FW Services

(18)

Results

Effects of Feeding on Xerophthalmia.
analysis of 1465 children.

Classfn	on admission	on discharge
1. Night blindness	109	12
2. Conj. Xerosis	1049	421
3. Bitot's Spots	146	84

Ref: Lancet 1 7969 1120-2 May 76.

EVALUATION

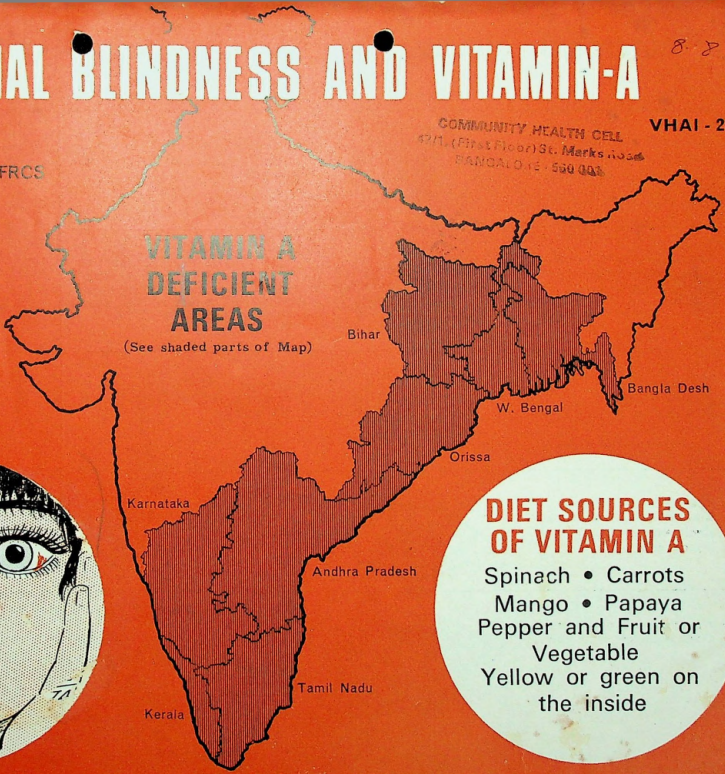
1. Base line Survey.
2. Criteria For determining whether significant Public health Problem.
3. Evaluation of
   i) Operational effectiveness.
   ii) Biological effectiveness - in reducing prevalence of xerophthalmia or Vit A deficiency
3A - Relative effectiveness of alternative strategies
4. Cost-effectiveness. / Cost-benefit
5 Regression coefficient method

Vijayaraghavan (1975)

NUTRITIONAL BLINDNESS AND VITAMIN-A

Helen Gideon MPH
Murray Laugesen FRCS

VHAI - 240



DIET SOURCES OF VITAMIN A

Spinach • Carrots
Mango • Papaya
Pepper and Fruit or Vegetable
Yellow or green on the inside

VOLUNTARY HEALTH ASSOCIATION OF INDIA C45 SOUTH EXTENSION PART 2 NEW DELHI-110049

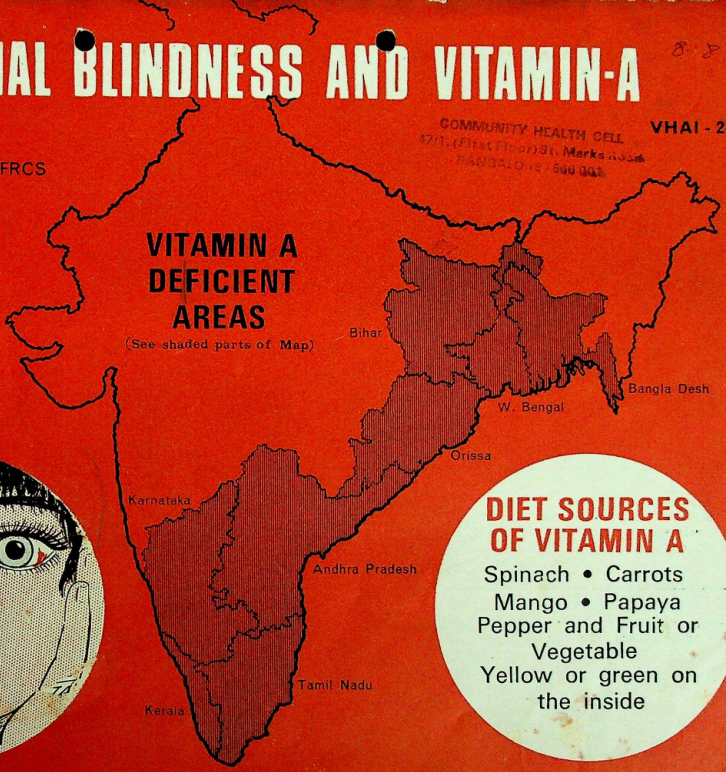
NUTRITIONAL BLINDNESS AND VITAMIN-A

Helen Gideon MPH
Murray Laugesen FRCS

VHAI - 240

VITAMIN A DEFICIENT AREAS

(See shaded parts of Map)



DIET SOURCES OF VITAMIN A

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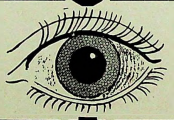
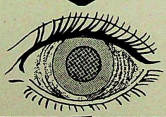
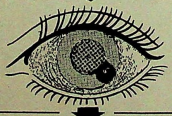
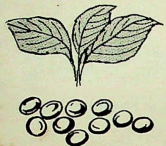
Yellow or green on the inside

VOLUNTARY HEALTH ASSOCIATION OF INDIA C45 SOUTH EXTENSION PART 2 NEW DELHI-110049

NUTRITIONAL BLINDNESS (Dry Eye or Xerophthalmia) IS PREVENTABLE

			TREATMENT
X-0	Night blindness : the child stumbles in the dark.	 Some brown pigmentation may be seen around the edge of the cornea.	Green leafy vegetables, eaten daily, and oral Vitamin A, 200,000 units in oil (as capsules or liquid) every 3-6 months prevent the disease. Newborns, until they are 5 Kg. or have doubled their birthweight, only need quarter of this dose. (1) (2) (3)
X-1	The white of the eye is dry. If in doubt, hold the eye open for half a minute.	 White triangular patches that look like milk powder or white paint may or may not be seen on the outer side of one or both eyes. (Bitot's spots)	
X-2	The cornea is dry. It looks hazy. It has lost its shine.	 Eyesight is now in danger. Both eyes are usually in danger at once.	For rapid effect, give Vitamin A in watery solution by intramuscular injection immediately. Also give some protein-rich food. (3)
X-3	The cornea ulcerates, the iris prolapses, or the whole cornea melts (Keratomalacia)	 TOO LATE Partial sight can be saved in only a few.	As well as treatment as for X-2 above apply local antibiotics by injection, atropine eye drops or ointment, pad and bandage.
X-4	White patches and scars cause permanent blindness.	 TOO LATE The child is left blind, totally or partly. Usually both eyes are affected.	NIL Only a few are suitable for corneal graft.

DOSE	SOURCE OF SUPPLY

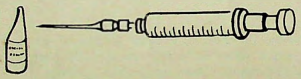


40 Gms or 2 large spoonfuls daily of spinach or green leafy vegetables.

'raton ki goli' containing Vitamin A 200,000 units by mouth, twice yearly, in oil, as high dose capsule or concentrated liquid, 2 ml teaspoon supplied = 200,000 units.

Seeds are obtainable locally, or by mail, from Pestonjee P Pocha, Seed Merchants, 1 A Middie Road, Pune, Maharashtra.

Concentrated liquid Vitamin A is obtainable free from the District Medical Officers in Bengal, Orissa, Bihar, Andhra Pradesh, Tamil Nadu, Karnataka and Kerala, and commercially from Anglo-Frehch Drug Co. Eastern Ltd. 28 Tardeo Road, Bombay 34 W8. High dose capsules are obtainable from Seamless Capsules Ltd. Box 2262 Bombay-400002.



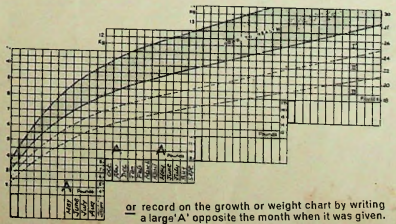
200,000 units of aqueous Vitamin A, by intramuscular injection, immediately, and not repeated for 3 to 6 months, except on doctor's order; combined with rice, dal and green vegetables daily.

Vitamin A aqueous injection (2 ampoules = 200,000 units) is available from U S Vitamin and Pharmaceutical Corporation India Ltd. 43 Dr V B Gandhi Marg, Bombay-400001.

RECORDING OF MASSIVE VITAMIN-A DOSES

Record as immunisation by writing the date given

DPT TRIPLE	3 10/74	4 12/74	3 1/75
Vitamin A	Nov 1973	May 1974	Nov 1974



or record on the growth or weight chart by writing a large 'A' opposite the month when it was given.

COMMON SITUATIONS LEADING TO NUTRITIONAL BLINDNESS

PROBLEM	POSSIBLE ACTION
Infection such as measles whooping cough diarrhoes tuberculosis typhoid	1. Treat the infection 2. Do not starve the child (except in early typhoid). Advise or give extra food. including green leafy vegetables daily. Explain why. 3. Protect the child for the next 3 to 6 months by giving him 200,000 units of Vitamin A by mouth, in oil. Explain why.
Green leafy vegetables are not available in the village.	1. Make seed packets available for starting a small garden of green leafy vegetables. Use waste water from the house, and protect the garden from goats and chickens. Start many such gardens. 2. Give 200,000 units of Vitamin A by mouth, in oil, to prevent dry eye in the meantime.
Green leafy vegetables are available. But they are not fed to the child.	1. An aide or another mother can demonstrate to mothers, how to feed green leafy vegetables, and how the children like them. Keep spinach for demonstration. 2. Teach all staff a simple slogan to teach mothers, such as 'eat greens every day' 3. Take help of school teachers, village doctors, leading men and women, and shopkeepers.

PROBLEM	POSSIBLE ACTION
Night blindness only, or conjunctival signs (the white of the eye only is dry) is present among some children in the community. Village people will be able to gather for inspection, those who complain of night blindness.	Vitamin A in oil (retinol palmitate) given by mouth, in a high does of 200,000 units has been found the most effective treatment. Village women and schoolteachers or dais can be trained to give all affected children the Vitamin A, and repeat it every 3 to 6 months. The oral route is best for slower absorption, and the oil aids absorption from the intestine. Absorption takes several days.
The central dark cornea is hazy and dry.	Vitamin A is urgently needed in a rapidly absorbed form. High dose aqueous injection of 200,000 units of Vitamin A is recommended by intramuscular injection. This will take effect in a few hours. Use antibiotic eye ointment to prevent ulceration.
Paramedical staff, village leaders village doctors and village parents do not, recognise the disease.	Use the eyes of children with night blindness to teach diagnosis and treatment and prevention. Use posters and coloured Pictures also.
High dose Vitamin A is not available	Use Vitamin A and D capsules each containing 10,000 units of Vitamin A, until high dose capsules or liquid can be obtained. These capsules are widely available in chemists shops throughout India. Also use liquid Paraffin eye drops to lubricate the eyes till the Vitamin A takes effect.

REFERENCES

(1) Gopalan C (1970) Am. J Clin Nutrition 23 p 35—51
(2) Pereira S et al (1971) Arch Dis Childhood 46 p 525—527
(3) Pereira S et al (1967) Am J Clin Nutrition 20 p 297—304
(4) Pereira S (1975) personal communication

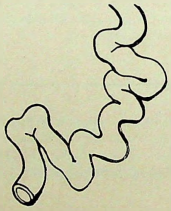
PHYSIOLOGY OF VITAMIN A

INTAKE

is from vegetables in the form of carotene, or from animal sources as retinol

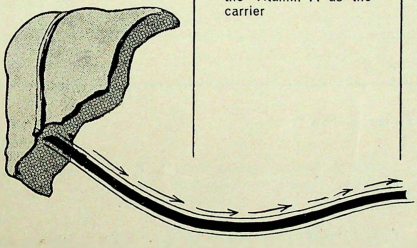
ABSORPTION

is with the help of fat or oil in the diet, and of the bile salts, in the small intestine



STORAGE

is in the liver for up to 6 months



TRANSPORT

Vitamin A is carried by the blood from the liver to the eye. Retinol binding protein links to the Vitamin A as the carrier

ACTION

Vitamin A acts on the goblet cells on the outer surface of the eye. Vitamin A aids the cells to secrete mucus which is the under layer of the tear film for lubricating the surface of the eye.

PATHOGENESIS OF VITAMIN A DEFICIENCY

POOR INTAKE

refugees
war
poverty
ignorance
dietary customs
famine
crop failure
infections
withholding food in illness
insufficient solid foods for weaning
feeding programmes relying on unskimmed milk containing no Vitamin A.

POOR ABSORPTION

diarrhoea
sprue
no fat in the diet
obstruction of the bile ducts

POOR STORAGE

inadequate stores built up in the liver, due to poor intake and absorption.
Severe liver cirrhosis

NO PROTEIN CARRIER

severe protein lack in the diet as in kwashiorkor or marasmus

DAMAGED EYE

when cornea is already damaged due to viruses of smallpox, measles, or other neglected infections.
When the eyelids can not close.

"Is your child blind in the dark ? Feed him more green leafy vegetables and give him Vitamin A twice yearly."

This poster is available at cost from Voluntary Health Association of India.

It is available in Hindi, Bengali, Oriya, Telugu, Tamil, Kannada and Malayalam.

It is printed on stiff paper, size 45 cms × 57 cms in 4 colours.

Copies of the above poster and of this brouchre on Vitamin A and Nutritional Blindness are available at cost plus postage from :

VHAI Community Health Programme.
VOLUNTARY HEALTH ASSOCIATION OF INDIA
C 45 South Extension Patt 2, New Delhi 110049.

Printed with the kind assistance of Christoffel Blindenmission, D614 Bensheim Schoenberg, Nibelungenstr 124, W. Germany.

PRESERVATION OF FOODS BY IRRADIATION

With ↑ rapidly ↑ pop: there is a need for not only augmenting food prod:, but also for preservation + max. utilisation of available food resources.

Most foods deteriorate on storage — spoilage + putrefaction. loss d/o action of micro-org + insects + biochem. + physio changes

Traditional methods - salting, smoking, pickling, fermentn:

Newer " - canning, drying + dehydn:

But, these may alter colour, taste, flavour, texture etc.

Then — refrigeration + freezing — not economically feasible.

Latest — irradiation (nuclear power)

"Irradiated food prod. have been temporarily cleared for human consump:" in Canada / Denmark / Israel / USA / USSR etc.

Sources: electromagnetic radiation — gamma rays from Cobalt 60, Caesium 137 + also fast electrons. Last not favoured : possibility of induced radioactivity. Co.60 - many adv, but half life 5½ yrs. Caesium-137 - more economical : long half life of 27 yrs, but low penetrating power. Sodium 24 - a possibility.

Adv. of irradiation

1) Germin: of root veg of potatoes, onions, carrots prevented.
2) Metn: controlled : delayed ripening of fruits / veg. flash foods
3) ↑ shelf life d/o suppression of org: like salmonella in eggs + other.
4) Sterilizn: of parasites like Tapeworm + trichinella in beef / pork.
5) Eradicn: of granary insects causing food spoilage + deterioran:
6) ↓ dependance on chem. preservatives + pesticides whose residues in the environ. + foodstuffs are causing concern.
7) Avoiding recontamination + reinfestn: of packed + sealed goods : irradn can be done 2nd disturbing the package.

Suitability for human consumption: Imp. points are.

a) Absence of induced radioactivity.
b) Nutritional adequacy of irradiated food.
c) Absence of toxic or cancer causing sub. that may be formed during irradiation.

a — as long as food is irradiated at 10 MeV energy levels, no detectable radioactivity could be measured even with extremely sensitive methods like gamma ray spectroscopy + electron counting ie no consumption hazard esp if food is stored for a short period prior to use.

b — does not alter nutritive value of major nutrients like prot + carbs. Loss of vit. comparable to those caused by conventional methods.

Better baking quality of wheat flour, better soyabean protein utilisation d/o inactivation of trypsin inhibitor + lipoxidase activity of starch observed after irradiation.

c) – FAO, WHO + International Atomic Energy Agency classed need for evaluation of mutagenic + cytotoxic potentials of irradiated foods.
i) genetic damage not reflected on viability of young ones to be born
ii) Damage to chromosomes
iii) Mutations in micro-org: grown in host fed irradiated food

Clearances rqd for all foods.
In addition – economic, legal + political consider:
Commercial application slow to dev.

EDIBLE OILS – problems + prospects.

- Fats provide palatability, flavour + texture.
- Av. Indian adult consumes – 13-14 gm fat/day acc to extensive surveys. 5-40 gm/day.
- Av. mthly income 200/pm – abt 6 gm/day.
  500/pm – 10-12 gm/day.
- current availability – 10 gm/head. Ghee, Veg. oils.
- estimated 25% pop: use hydrogenated veg. oils, rest use raw or refined oils.
- Veg. oils. also used for lighting + hair dressing.
- Abt 20% Total veg. oil prod in India. used for industrial purposes esp soap making + paints.
- est. 20-25% for manuf of hydrogen. fats

Prod: of oils – '67-'67 – 2 million tons. almost static since.
Main sources – groundnuts, mustard or rape seeds., sesame (til), copra (coconut), cottonseeds, niger seeds + safflower seeds
To a lesser extent – linseed, mahua seeds + sal seeds
Recently – sunflower + soyabean.
Oilseeds potential not fully exploited for extraction of oil.
minor % groundnut + sesame – direct consumption as seeds
1-2% groundnuts – exported.
cottonseed – directly as cattle feed (decoiled cake is good enough)
Use of conventional village plants instead of mechanisation + solvent extraction.

Possible to use non-edible oils from plant sources for industry
Groundnut oil has been main source of vanaspati. Dio shortage – cottonseed (sesame) soyabean. Addition of Vit A + D + ess. F.A. (in shape of sesame + safflower oils) obligatory.

Deoiled cakes useful source of pot. for livestock, poultry & humans. + good potential for export.

Measures – form. of Veg. oilseeds & Oil Corpon.

– Intensive Oilseeds Dev. Progr. [I.O.D.P] taking roots as Dist. level.

- Short dur. groundnut varieties & high yields in areas & irrig. facilities, to fit in multiple cropping sys.
- High yielding varieties in dry areas
- Sunflower pred. in South & Soyabean in North.
  Groundnut in irrigated & dry areas.

Other sources. Not fully explored & exploited.

eg rice bran – shd be of good quality & stabilised by steaming. to prevent rancidity & low yields.

- sal, mahua, neem, kusum, karanj, kokum, , rohar, wadi, chanta, papaya, cucurbita, cumin, moringa.
- Maize (corn) oil widely used in USA etc. (India – used for poultry feed, human consumption & starch industry)
- palm kernel.

—x— x —x—

FLASH CARDS:- postcard size for small grps (5-10).

– large ones (12" x 10") for large grps (20-30).

– for formal & informal teaching.

– sand paper cut in strips & stuck on the back will help fix them firmly onto a flannel graph.

– No captions necessary.

– Flannel graph – Take a thin piece of plywood. Cut. Use an old piece of flannel to cover the plywood. stick or pin it firmly. Use an ordinary door hinge to fix another rectangular piece of wood to the back of this plywood so that it rests like a photo frame on the table.

– lightly press each flash card on the flannel surf. & the sand paper strips facing it. It will hold unless manually removed.

Protein Calorie Malnutrition (PCM) or P.C. Deficiency (PCD)

- most common bet. 6 mths + 4 yrs
- severe cases often fatal.
- have a lowered res. to inf: Inf: may PP child into severe PCM.
- Resp. inf, Dh, TB, G.E, measles more likely to be fatal has
- growth failure, best measured by failure to gain wt or wt. loss - is a constant feature of all degrees of PCM
- Marasmus / Kwashi: easy to D. Mild PCM/undernutr: much more difficult.
- PCM maybe a direct or indirect cause of death.
- [redacted] does not kill it may leave the child both physically & mentally backward all its life. NVT 3.10
- D.D. - Nephritis + severe hookworm inf: edema but no other signs of malnut. + invest:
- start supplementary feeding at 4th mth so that by 6 mths when the child really needs the extra nutrients, it is used to supplementary foods.

- [Average Indian Calorie — 1,900 cals]

- Treatment-

- Explain to parents that illness is d/to inad. food.
- [redacted]pply what is lacking in the diet.
- prevent & Rx inf:'s & other diseases
- teach parents how to prevent a relapse.
- encourage mother to ↑ her own breast milk (if baby < 6 mths is malnourished) by eating prot. rich food & drinking a lot.
- Home visiting — to understand problems facing parents & to give practical advice.
- Severe PCM — Admit Diet: Casulan Reinforced Milk (dried skim milk/sugar/oil) electrolytes / vitamins.

½ strength Darrow's sol": in 2.5% glucose.

glucose (Dextrose BP)	— 125 g
sod. chloride BP	— 10 g.
pot chloride	— 6.5 g.
sod. lactate 70%	— 16 ml.
water	— to 5 litres.

- NIBIDEC - 0.3 ml O.D. or 0.6 ml on all days. A polyvit. prep" (Parke Davis & Co). Each 0.6 ml contains Vit A 5000 U, Vit D 1000 U, aneurine, riboflavine nicotinamide, ascorbic acid & pyridoxine
- Best fed c cup & spoon NOT bottle c is diff to clean.
- Antiemetic drip ce dyspnoea / heart failure d/j continuous or c syringe.
- Attention & care of mother also.
- Dangers of bottle feeding -
  - Diff to clean. Germs breed.
  - Lip. milk is a breeding ground ∴ don't use stale milk
  - Dirty water for reconstitution, dirty utensils, dirty hands.
  - expensive.
  - more work for mother.

- 1 DSP = 1 Dessertspoonful 10 ml
- A sick child has to be fed.
- When giving out dried milk make sure that they don't miss out on their rep feeds. Don't give dried milk to breast fed babies unless they are definately malnourished, as this encourages bottle feeding
- Nutritional & Hlth educ" - persuade leaders pri" conc. on children. If they are not convinced it is our fault.

Signs / Symptoms	P.C.M. Marasmus.	Kwashiorkor
1. Growth failure.	Marked. usually v. low wt-for-age	Marked, sometimes concealed by edema.
2. Muscle wasting.	Marked. best seen on fall on U. arm	quite marked, sometimes hidden by edema + fat. Better felt than seen.
3. Fat wasting	Marked, severe cases look like little old man.	Fat usually retained.
4. Oedema.	None	Most common in feet, L.L, + often on hands, lower back + face. Detected by pressing thumb on shin for 5 sec. to see if a dent is left.
5. Serum protein.	low in severe cases.	Always low.
6. Hair changes.	Sometimes soft + straight	usually soft, fair, straight + easily pulled out.
7. Skin.	often normal	Sometimes pale, most obvious on face. Sometime flaky paint rash.
8. Appetite + behaviour.	often hungry + alert + anxious looking.	usually poor appetite miserable, feable whining cry.
9. loose stools d/t poor dig^{n}.	Sometimes (may c/o constip^{n})	often.
10. Infective diarr. + dehydr^{n}.	Sometimes	often.
11. Moderate anemia.	Sometimes	Sometimes
12. Liver size	Normal	often enlarged d/t accumul^{n} of fat.
13. Vit. deficiencies	Sometimes present	usually present.

P.T.O.

Causes of P.C.M.

A The foll ↑ a childs rquts:-

(i) growth - after 5-6 mths outgrow supply of breast milk.

(ii) worms + other parasites

(iii) Infn / fever - commonly resp. infn, measles, malaria, g.e., whooping cough, TB.

B Reasons for inad. food :-

(i) child may not be given enough to eat becos of.

(a) food habits eg traditionally v. high carbo, restrict food when ill, certain foods considered harmful, abrupt withdrawl of breast milk c̄out ad. replacement.

(b) Lack of knowledge

(c) Poverty.

(d) Bad new ideas eg bottle feeding.

(ii) Child may not eat enough :

(a) no appetite d/o illness / unhappiness / upset / neglect / fed lazy

(b) gets filled c̄ starchy food

(c) Sore mouth d/o measles / thrush etc.

(iii) May not digest / absorb enough food it has eaten.

(a) food eaten is too hard.

(b) Diarrhoea

(c) Vomiting.

(d) febrile disease

(e) any illness interfering c̄ mete.

Protein Foods (22 diff a.a) - facts & fallacies

INT 3.11 8.11

Some of the common fallacies -

1) Gen. assumed that Indian diet is seriously lacking in prot.
2) Quantitative aspects of prot. intk. often not appreciated.
3) No distinction between is made bet. prot of widely diff. biolog. values
4) Ext. damage that prot. suffer in their nutritive value when baked at high temp. is not recognised.
5) Mistaken impression that prot. hydrolysates are better utilized than intact prot. when taken orally.
6) Wrongly believed that milkfed infants & children need supplements of lysine.

- Variation in nutritive value of prot. is d/t a.a. comp. & digestability.
- Nutritional value of a prot expressed as N.P.U or Net. Prot. Utilization & is the % of the ingested prot. N₂ that is digested, absorbed & retained in the body for tissue synth.

$$N.P.U = \frac{D \times B.V}{100}$$

D = Digestability - % of food N₂ digested & abs.
B.V = Biolog. value - % of abs. N₂ retained in the body

- Chemical score - amt. of the most limiting ess. a.a in food prot. expressed as % of its conc. in the 1957 FAO provisional pattern.

Foodstuff	Net. prot. utiliz.	Most limiting ess. a.a.	Chem. Score
Egg	100	—	100.
Fish.	83.	Tryptophan	70.
Beef muscle	80	S*	80.
Cows milk.	75	S	80.
Casein.	72	S	80.
Rice	57	lysine.	70.
Soya flour.	56	S	70.
Millet.	56	lysine.	70.
Wheat flour refined	52	"	50.
Groundnut flour	48	S	60.
French. beans	47	S	50.
Peas	44	S	60.

S* - Sulfur containing a.a, methionine + cystine.

- Hen's egg - "ideal reference prot" or prot of human milk for infants is they have an optimum ess. a.a. pattern & is completely utilized : easily digested & supplies all ess. a.a. in right proportions The tissues do not have the ability to store surp a.a. for later use. -: if a prot. is def. deficient in a part. ess. a.a. eg 50% the tissues can utilize only the conc. amt of all the other a.a. & the rest are wasted.
- Milk, pulses & oilseeds are most deficient in the S.a.a - methionine + cystine
- In cereals it is lysine & then - threonine.
- Mutual complementations bet. proteins by mixing - Recommend consumption of cereals (low in lysine, rich in methionine) & pulses (rich in lysine, low in methionine)
- Daily equiv - expressed in terms of 'ideal ref. prot.' but mixed dietary prot are of lower quality. Due allowance. shd be made for this factor in cal. prot. equiv.

Mainly cereals & pulses - NPU - 65, Entirely milk - NPU - 75-100,
Milk cereals & pulses - NPU - 65, Mostly cereals & pulses - NPU - 50

- When calorie needs of the body are not adequately met part of the dietary prot. is diverted to energy prods. ie waste of prot.
- prot. content of av. Indian diet ~~is~~ satisfactory, but the actual qty of food consumed by the majority is inadequate. However prot needs of weaned infants, pre-school children, preg & lactating mothers is higher & they need supplements.
- effect of heat:- under normal cond of cooking, digestability improved & as denaturation occurs. Some raw veg. eg pulses, beans contain trypsin inhibitors & lower digestability. Mild heating destroys these inhibitors. Prot. suffer serious damage in nutr. value when subjected to drastic cond. of heating esp. in presence of sugars & their carbo. in the dry state as in baking of biscuits.
- oral prot. hydrolysates + a.a. preps. — feeding trials proved that even in extreme starvation, peptic ulcer, ulcerative colitis, resp. enteritis, prot. dipes: & aa. abs:- are normal. Being unpalatable prot. dipests were often rejected & vomited by pts. a.a. mixtures cannot be utilized as efficiently as equivalent units of prot. Hair reason → extremely rapid abs:- of free a.a. & consequent flooding of tissues & Xs a.a. & cannot be utilized equally rapidly. & bac.: partially unaided. Abnormally high conc. of a.a. in intest may provoke diarrh: while elevated a.a. levels may cause nausea & vomiting.
Addition of lysine to NU & mineral preps has no rational basis. - it is rapidly abs:, but largely wasted as other ess. a.a. are not supplied simult.
- The most limiting ess. aa. in av mixed diets in our country maybe either methionine, threonine or tryptophan but not lysine
- ~~N~~ prot. needs of diabetics & the elderly.
Additional prot of 0.5 g/kg/day recomm. in diabetics as it has a more sustained effect in maintaining bld sugar than carbo. Prot. rich snack at bedtime as precaution against morning hypo- glycemia.

— x — x —

Medical Div:, Rapidos Brett + Co. Pvt. Ltd, B'bay.

NUTRITION.

- Girth (height) ceases by abt the 19th yr in ♀ & 17 yrs in ♂.
- Av. adult normal Indian male weighs bet 50-55 Kg & is 160-165 cms in height. In ♀ — 40-45 Kg. & 150-155 cms resp. of the country.
- Average birth wt of Indian infants - 2.8 Kg. - in diff reg.
  Av. length at birth — 50cm, ↑ to abt 75cm by 1st yr.
- Av. normal height/weights for school children

Age grp. (years)	Boys. Ht. cms	Boys. Wt. Kg	Girls. Ht. cms	Girls. Wt. Kg
5	118.5	19.3	112.2	18.7
6	118.9	22.1	117.7	21.6
7	123.3	24.5	122.7	24.5
8.	127.9	26.4	127.2	26.0
9.	133.6	30.0	133.1	27.8
10	138.5	32.4	139.0	33.6
11	143.4	35.3	145.0	37.2
12	148.9	38.8	151.0	43.0
13	154.9	42.9	153.4	44.5
14	161.7	48.3	155.0	46.7
15	165.3	52.2	158.0	45.5
16	168.4	55.5	156.0	47.8

MALNUTRITION

Malnutrition has been defined as "a Pathological state resulting from a relative or absolute deficiency or excess of one or more essential nutrients, this state being clinically manifested or detectable only by biochemical, anthropometric or physiological tests".

Four forms of malnutrition have been distinguished. (1) Undernutrition : This is the condition which results when insufficient food is eaten over an extended period of time. In extreme cases, it is called starvation. (2) Overnutrition : This is the pathological state resulting from the consumption of excessive quantity of food over an extended period of time. The high incidence of obesity, atherosclerosis and diabetes in western societies is attributed to overnutrition. (3) Imbalance : It is the pathological state resulting from a disproportion among essential nutrientswith or without the absolute deficiency of any nutrient. (4) Specific deficiency : It is the pathological state resulting from a relative or absolute lack of an individual nutrient.

Classification of Nutritional Diseases :

The WHO Expert Committees on Nutrition (1962, 1971) proposed the following classification of nutritional diseases :

Nutritional Diseases :
HYPOALIMENTATION :

1. Protein-calorie Malnutrition (PCM)
   - (a) Kwashiorkor
   - (b) Nutritional marasmus
   - (c) Severe PCM, unqualified
   - (d) Moderate PCM, unspecified
   - (e) Other PCM
   - (f) Malnutrition, unspecified
   - (g) Nutritional dwarfism

2. Mineral deficiency
   - (a) Iodine
   - (b) Fluorine
   - (c) Selenium
   - (d) Calcium
   - (e) Others

3. Vitamin deficiency
   - (a) Vitamin A deficiency
   - (b) Thiamine deficiency
   - (c) Niacin deficiency
   - (d) Ariboflavinosis
   - (e) Deficiency of other B complex vitamins
   - (f) Ascorbic acid deficiency
   - (g) Vitamin D deficiency
   - (h) Sprue
   - (i) Vitamin K deficiency
   - (j) Vitamin E deficiency

4. Other Nutritional deficiencies
   - (a) Essential fatty acid deficiency
   - (b) Individual amino acid deficiency
   - (c) Other states and unspecified

HYPERALIMENTATION :

- (a) Obesity
- (b) Hypervitaminosis A
- (c) Carotenaemia
- (d) Hypervitaminosis D
- (e) Fluorosis
- (f) Other

FOOD TOXICANTS :

- (a) Lathyrism
- (b) Epidemic dropsy
- (c) Aflatoxicosis

p. t. o.

Diseases of the Blood and Blood Organs :

PERNICIOUS ANAEMIA :

(a) Subacute combined degeneration

NUTRITIONAL DEFICIENCY ANAEMIA :

(a) Iron deficiency anaemias
(b) Other deficiency anaemias (folic acid, vitamin B_{12}, vitamin B_6, protein)

INDICATORS OF MALNUTRITION

It will be useful to bear in mind the following "indicators of mal-Nutrition" while assessing the nutritional status as well as evaluation of nutritional programmes in a community.

(1) Statistical:

(a) the mortality in the age-group under one year (especially 6-12 months).

(b) the mortality in the age group 1-4 years.

(c) the ratio of deaths of children less than 5 years of age to total deaths.

(2) Anthropometric :

(a) the weight of the newborn.
(b) the percentage of newborn weighing less than 2,500 grams
(c) the height and weight of children aged up to 5 years
(d) the average weight of 7-year old children entering school.
(e) The index weight/height is regarded as a simple and reliable indicator of the nutritional status of preschool children in a community. An index of 0.15 has been used as a dividing line between well-nourished and mal-nourished children.

(3) Clinical:

(a) the number of cases of mal-nutrition admitted annually in hospitals and health centres.
(b) diagnosis of individual nutritional deficiency diseases.
(c) the proportion of pregnant women with less than 10 g of haemoglobin per 100 ml of blood in the last trimester of pregnancy.

(4) Dietary Examination:

(a) Intake of calories, proteins and other nutrients :
(b) Studies of dietary habits.

Degrees of Malnutrition:

While studying malnutrition ininfancy and childhood with special reference to kwashiorkor, Gomez(1955) was able to draw up the following classification by assessing the percentage of underweight in relation to average .

(1) First Degree Malnutrition:

Weight between 85 and 75 per cent of the theoretical average for the age

(2) Second Degree Malnutrition:

Weight between 75 and 60 per cent of the theoretical average for the age

(3) Third Degree Malnutrition:

Weight below 60 per cent of the theoretical average for the age.

NUT 3.14

8.14

ST. JOHN'S MEDICAL COLLEGE, BANGALORE

Class | Roll No.

Semester | Subject

Examination | Date

Bulletin of the World Health Organization - 1979

I Complement (C_3), Nutrition + Infection - A study in Punjab - Navgaon [illegible]

Deleterious effects of undernutrition on complement levels were demonstrated sometime ago. This is to understand the nature of the inter-relationship.

Max. C_3 levels were reached at approx. 70-80% of the Harvard wt median, comes to 15th percentile on the Gomez scale. Below that level, serum C_3 conc. was extremely sensitive to nutritional fluctuations. Thus in the interval bet. 40 + 50% of the Harvard wt median, the mean C_3 conc. rose by approx. 60%, whereas bet. 70 + 80% of the Harvard median it rose by less than 10%. Use of Waterlow's classification of nutritional status further helped to identify wasted + stunted children as the ones with min. C_3 levels + most vulnerable to infection. The commonly observed excess mortality in this group is thus not surprising.

Here, C_3 was determined more by the current level of nutrition as measured by weight for age or weight for height than by measures of long term nutrition such as height. Surprisingly arm-muscle circumference, an accepted indicator of lean body muscle mass, showed a lower correlation with C_3 than weight for age. This is probably Punjabi children get relatively high amts of protein in their diet + even though total food intake may be low, specific protein deficiency was not the limiting factor in C_3 production.

A 4/10 purulent skin infection was associated with a significant reduction in C_3 conc. From our data it seems that both frequency + duration of skin infection episodes determine the extent of the reduction. Several mechanisms may explain these results - (a) complement levels do not return to normal even in disease free intervals in children with frequent skin infections suggesting that the time required for C_3 repletion is

longer than the mean dur'n of the dis. free interval (b) even tho' they showed no signs of overt inf'n, the majority of children ε a high prevalence of past skin inf's were suffering from subcl. inf's at the time of the survey, suggesting remission & exacerbation of a chr. cond'n rather than new inf's.

While it seems fairly clear from the results that the underweight child (< 70% of the Harvard weight median) ε a high prev. of skin inf's seems to have minimal C_3 reserves, the effects of inf'n on C_3 synth. at high levels of multi: seem unclear.

Complex statistical manipulations of relatively few samples is a less reliable & less satisfying method of identifying possible variable interactions than ex'n of contingency tables ε a large enough

NUTRITION AND PRIMARY HEALTH CARE

MRS. MANGALAM

IT is said that a man is what he eats. A diet sufficient in quantity and adequate in its nutrition content is the foundation of good health and well being. It is also an important factor in raising productivity. Therefore, nutrition cannot be separated from health and any nutrition programme will possess a health component. One might argue and say that nutrition will not take place in the absence of an adequate purchasing power for our people. True, but we cannot wait until a reasonable standard of living is achieved. This is because nutrition is the very basis for achieving an improved economic status. The objective of nutrition in any Primary Health Care Programme is not only to prevent malnutrition but also to promote positive health.

As correctly said by Dr. David Kerner, if we all took more care to eat well, to keep ourselves, our homes and our villages clean and to be sure that our children are vaccinated, we could stop most sicknesses before they start.

Malnutrition a Serious Public Health Problem

Malnutrition is the biggest problem affecting public health in any developing country. The findings of carefully conducted diet and nutrition surveys carried out under the auspices of the Indian Council of Medical Research and the studies undertaken at the National Institute of Nutrition have confirmed the existence of widespread malnutrition among the poorer sections of our population. Children and women in the productive period appear to be the worst sufferers. Over 15% of the population in India falls below the age of 5 years and it is estimated that about 40% of total deaths in India occurs in this group as compared to a figure of 3—8% in advanced countries. Apart from causing ill health, malnutrition imposes serious economic burden on the country due to child wastage and decreased productivity. On an overview of the determinants of nutritional status, it is clear that the extent to which a child is well nourished or malnourished depends directly upon :

(a) His food intake and

(b) The presence or absence of infectious disease.

These two in turn depend upon

(a) Nutritional content of food consumed

(b) Presence or absence of non-family feeding programmes

(c) Family's purchasing power

(d) Nutrition and health beliefs of mother

(e) Extent of health care and

(f) Environmental and social factors.

Mortality Rate in Various Age Groups

Age Group	Rate	Causes
Ist week	51/1000	(i) Low birth weight (ii) Starvation
P—4 weeks	21/1000	(i) Respiratory infection (ii) Low birth weight
1—6 months	27/1000	(i) Diarrhoea
6—24 months	34/1000	(i) Infection (ii) Diarrhoea and respiratory infection pneumonia (iii) Delayed supplementation
2—5 years	28/1000	(i) Malnutrition and infection forming a vicious cycle.

Expenditures to overcome or avoid diseases have commonly been regarded as a form of

consumption and consumption is often a negative factor in any national planning. As discussed above, if children will not live to realise their full development potential, the cost of child rearing, education and upbringing invested by society, if computed, would probably run into hundreds of crores of rupees.

Health in Relation to What People Eat

It has long been recognised that nutrition is but one of the several determinants of optimum health, though admittedly an important one. While poverty is an important factor for malnutrition, it is not all due to poverty. There is widespread ignorance about the common foods that supply the nutrients to promote positive health. The countrywide survey carried out by ICMR on 18,356 preschool children of six different regions of India has revealed that in the current dietaries of preschool children, the major bottleneck is Food Gap—INADEQUATE FOOD rather than a particular nutrient gap. Since the mother has to nurture the foetus her nutrition has a direct relationship to birth weight of the baby. The main cause of undernutrition in the mother is insufficient intake of food within the family. Most mothers feed their husbands and schoolgoing children and other family members first, and they eat whatever is left over.

The primary deficiency in children is "Chronic Starvation". The term "Marasmus" has been widely accepted to describe the energy malnutrition and "Kwashiorkor" to describe protein malnutrition. The problems of Marasmus and Kwashiorkor start when breast milk becomes insufficient and the baby is offered all kinds of diluted milk due to poor socioeconomic conditions and lack of knowledge of the infant's nutritional requirements.

There are several factors which contribute significantly to ENERGYPROTEIN Malnutrition, which include :—

1. Prolonged nursing at the breast and the late introduction of supplementary foods.
2. Inappropriate choice of weaning foods.
3. Unhygienic feeding habits which predispose a child to diarrhoea.
4. The practice of drastic medication and the withholding of foods in an attempt to take care of diarrhoea.

Energy—Protein deficiencies are always accompanied by a lack of minerals and Vitamins and result in a poor state of health and increased susceptibility to infection. Simple remedy to these problems is that the preschool children should be given more of Energy and Body Building Foods. Vitamin 'A' deficiency is frequently associated with Energy—Protein malnutrition and is another result of a generally poor diet. The most serious effect of the lack of Vitamin 'A' is the damage done to the eyes. Night blindness, the inability to see in dimlight, is an early indication of Vitamin 'A' deficiency. A diet lacking in green leafy vagetables can cause this deficiency. Therefore, a simple advice on eating more of greenleafy vegetables daily should be one of the first attempts in the primary health care programme.

A diet lacking in dark green leafy vegetables and other foods rich in iron can cause 'Anaemia' or make it worse. In children anaemia can come from not eating foods rich in iron. Therefore, a diet with dark green leafy vegetables, is the first step in preventing anaemia.

Acid indigestion and 'Heart Burn' often come from eating too much heavy or greasy food or from drinking too much alcohol. Constipation is often caused by a poor diet, especially, not eating enough fruits, green vegetables or fruits with natural fibre, or by lack of exercise. Drinking more water and eating more fruits and foods with natural fibre like roots and tubers and greens is better than using laxatives. A goitre is a swelling or large mass on the throat that results from abnormal growth of a gland called the thyroid. Most goiters are caused by lack of iodine in the diet. Also, lack of iodine in a pregnant women's diet sometimes causes babies to die, to be born mentally low and/or deaf. A simple treatment for goitre is use of iodized salt.

Most children die from diarrhoea because they do not have enough water in their bodies. With good hygiene and good food, most diarrhoea could be prevented. Headaches that keep coming back may be a sign of chronic illness or poor nutrition. Colds and flue are common virus infection that does not need any medicine. Getting enough sleep and eating well helps prevents colds.

Beri-Beri is common among people whose nourishment is obtained from highly milled rice. It is unfortunate, but true, that the introduction of small rice mills in villages has led to an increasing incidence of beri-beri among farming communities.

When money is limited it is important to use it wisely. Men in the rural areas spend often on alcohol and women buy sweets and other unhygenically prepared foods rather than buying or preparing nutritious food. Many mothers believe that some kinds of foods are hot and others are cold. Traditional beliefs in food habits are prevalent among a large majority of the population who are illiterate and ignorant regarding the nutritive value of foods. These beliefs profoundly influence foods eaten.

Health Facilities :

In India 80% of medical professionals have settled in cities to give medical care to only 19% of the country's population. Two-Thirds of the deaths in developing countries are not attended to by any medical presonnel and more than half of the world's people have no access to medical care. Generally most of the people who need health services are neither identified by health personnel nor do they voluntarily utilise the available services. Thus the utilisation of health services is poor in many developing countries. The medical need is/does/usually not present a complex problem. As discussed earlier many of the recognised threats to health like diarrhoea, respiratory tract infections, malnutrition and infections are preventable. Management and prevention of many of these ailments do not need the services of a highly qualified doctor.

A Package Program in Primary Health care through Community Participation :

It is generally agreed that the problem of malnutrition can only be solved by educating rural communities to effectively utilise inexpensive locally available foods within their economic reach. Any education in the field of health and nutrition should be practical and adapted to suit the socio-economic conditions, food habits and local food resources. For a satisfactory improvement in the overall health status of preschool children, we need to have a package program which includes safe drinking water, environmental sanitation and control of infection along with proper nurtrition.

Considering the fact that 40% of the total deaths occur in the firist six years of life and that 80% of such deaths are due to preventable illness related to malnutrition, the Government, the International and other Private Welfare Agencies have initiated supplementary feeding programs in order to improve the nutritional status of vulnerable groups.

These programs usually have the two-fold purpose of teaching better practices in the home production of highly nutritive foods and their use and providing some food for children of school going age and for preschool children and expecting and lactating mothers. In this connection the supplementary programmes sponsored by Catholic Relief Services of United States Catholic Conference in India deserve special mention here. Recognising that education in nutrition is vital for the success of efforts to improve the health and well-being of mothers and children, CRS assisted Maternal and Child Health (MCH) Programmes to serve as the nucleus for nutrition and health education in the field of primary health care. The untrained in India represent a potentially productive and greatly wasted resource. Through the MCH Programmes Catholic Relief Services attempts to stimulate a desire among the illiterate, especially, rural mothers to obtain at least a functional literacy which is related to their health food habits and environment and which can be demonstrated to them to be of practical. In view of the current high toddler mortality rate and in view of the well known long term implications of early childhood malnutrition, CRS has recently launched a nation-wide Nutrition Education Project in 400 selected MCH Centres. The main objective of this project is to equip the selected centres with trained personnel in the field of primary health care and nutrition and involve the local community in the implementation of the project at the grass roots level. The project is designed in such a way that it can carry out the following activities with the support of the existing Maternal and Child Health centres located in the selected areas.

(a) Train project personnel

(b) Train local women leaders

(c) Education of mothers

(d) Preventive, curative health care

(e) Provision of nourishing food.

The nutrition and health education training given in the training course will help the local mothers to appreciate the role of well balanced and at the same time inexpensive diets in promoting food growths and maintaining good health of infants, children and expectant and nursing mothers.

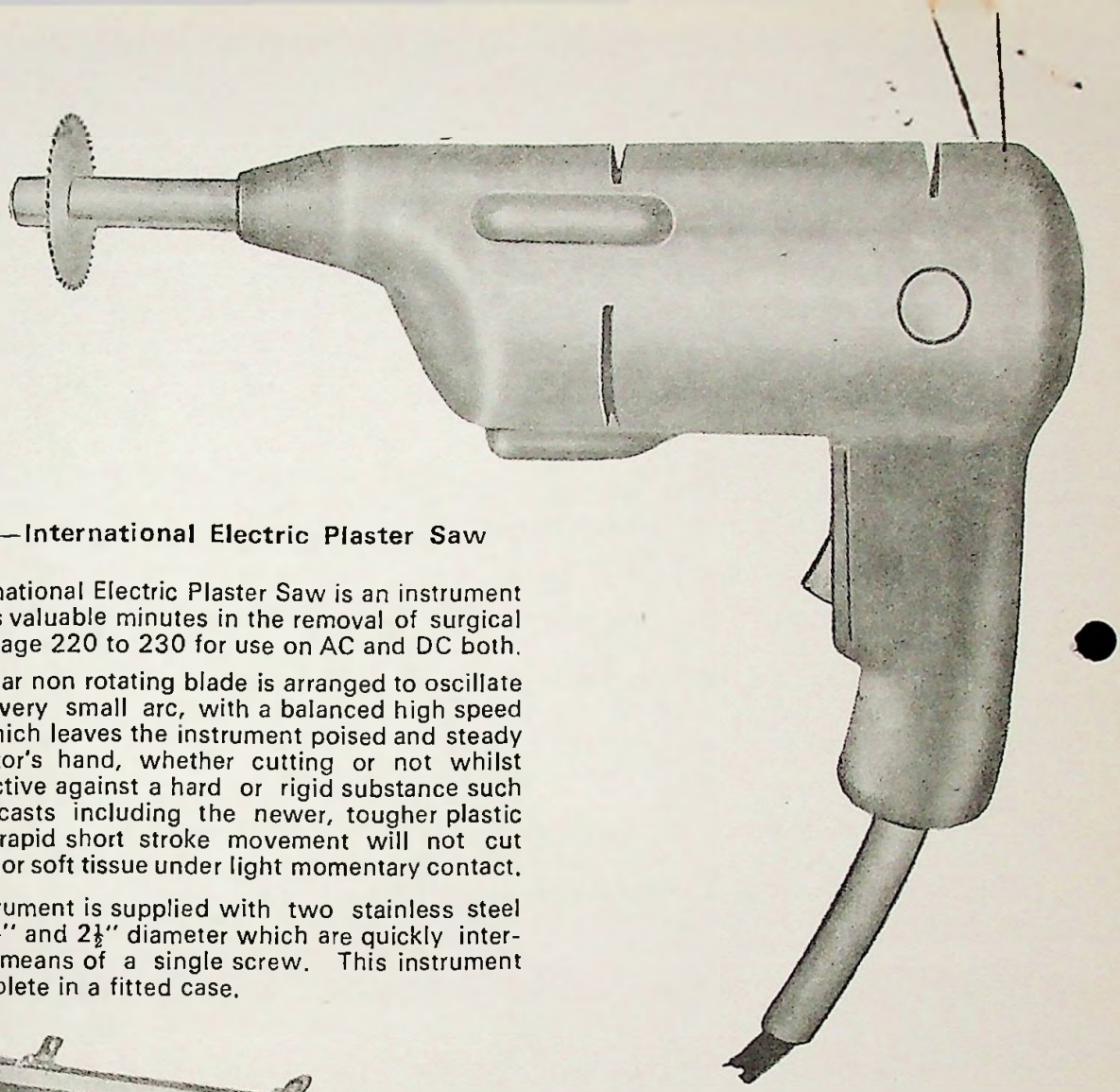
The experiences gained over the past years in executing the Maternal and Child Health Programmes have led to the making of following recommendations.

1. The participation of the community is essential for the success of any health program. It should be considered their programme rather than anything that a particular agency or the Government is doing for them.

2. The community should be stimulated to persuade the local dais to recieve the training in scientific methods of antenatal and confinement care. The large number of dais available in the villages should be better equipped for their skilful job.

3. It is absolutely necessary to form village health committees with whose cooperation and acceptance the community health worker is initiated into action and supported in his day-to-day activities and also watched. A system of cooperative health insurance or at least a monthly subscription from each family can be organised by the village committee for the maintenance of primary health care for the community.

Nutrition and Health Education is a process to renew and update women and to provide the necessary insight into today's health problems for speedier progress. Like all education, Nutrition and Health Education is a very slow process but hopefully it may contribute to a renewal and regeneration of women/family and society in the decades to come. □



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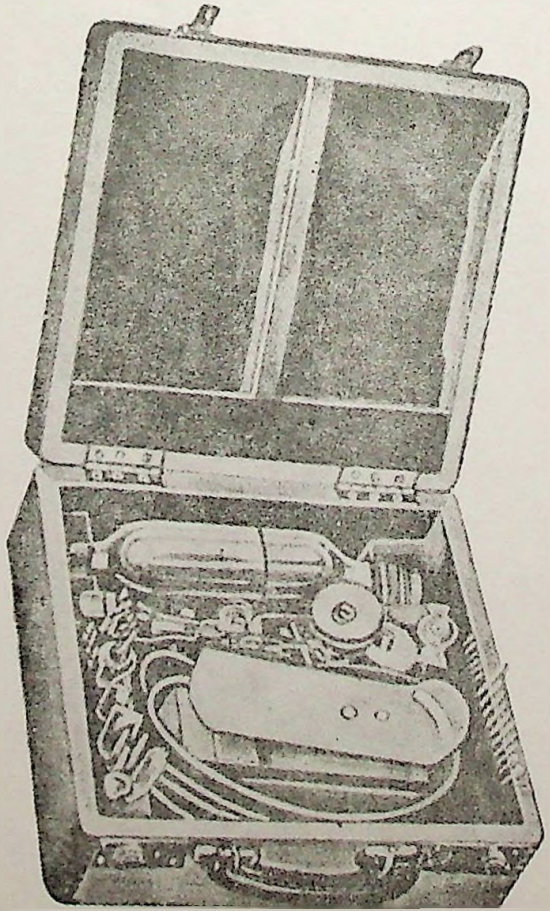

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Slides available in the Dept on Nutrition

NUT 3.16

8.16

1. Malnutrition in India - [III 6A 1-24]
2. Protein calorie Deficiency - [III 6B 1-24]
3. Vitamin deficiency - [III 6C 1-44]
4. Malnutrition in Hallur. - [IV 4B 1]
5. More about child care - Nutrition
   part 1 - Child care before birth
   " 2 - Diagnosis of undernutrition
   " 3 - Causes of undernutrition
   " 4 - Treatment of undernutrition
6. Management of Kwashiorkor.
7. The Desha weight chart.
8. Breast feeding - [III - 3A 27-50]
9. Feeding your baby - [III - 3B 1-31]
10. Goitre Survey - [VI 7A 1-24]
11. Food hygiene course - Safe food - [II 3C 1-39]
12. " - Food Handler - [VII - 7A 49-50]
13. " - Food poisoning - [VII 1B 1-23]
14. " - Hygiene [VII - 1B 44-50]
15. Xerophthalmia - [III - 4A 27-50]
16. Fibre in Human Diet - [III 6B 27-50]
17. Nutrition Rehabilitation - 24 slides & Dr R N
18. - Balanced diet for adults in India. 24 Filmstrip
19. Better diet at low cost 41 - Filmstrip.

Nutrition Problems in India

II MD MB 1st Sem
4/6/21
NUT 3.17
8.17

1. What does nutrition/malnutrition mean to you.
2. Objectives in the study of nutrition
3. Gen. introduction to malnutr°.
   a) Classific°. i) — under nutr° — Kwashi, Marasmus, wasting } PEM/PEM
   ii) — Specific — Vit deficiencies, Mineral deficiencies
   iii) — over nutr° — (iv) food borne - fatty liver, atherosclerosis, diabetes, obesity, dyslipidemia
   b) Iceberg phenomenon
   c) global distribution.
   d) other aspects — ill effects of transculturing: ie powdered milk / baby foods
   — use of vitamins / tonics
   — ignorance of health personnel.
4. Ill effects of undernutrition — direct - osteoporosis
   indirect.
   — morbidity - nutr° + inf°
   — mortality of diff age groups.
   — growth retardation - physical/mental
   — ↓ productivity + inability to attain potential.
5. Causes of undernutrition
   a) poor socio-economic conditions - low purchasing power; poor sanit°, poor housing
   b) Ignorance - inadequate food quantities, prejudices against foods
   c) Repeated infections (b) cultural factors - food habits, malpractices, beliefs, religion, cooking practices, child rearing practices
   d) Large families
   e) Closely spaced families
   f) low birth weight
6. PEM (studies (NHANI) on PEM)
   Marasmus - Kwashiorkor - Marasmic Kwashiorkor.
   Magnitude - 2-4% severe, 60-70% mild
   age groups
   signs + symptoms
   aetiology (PEM in the community)
7. Iron deficiency anemia
   a) Magnitude - children, women - pan India, geo'age
   b) aetiology - iron, folic A, B_{12}
   c) Health implications -
   d) cause
8. Problems of nutrient excesses + refined foods — Cxs calorie - obesity - coronary
   xs cholesterol/saturated fats - "
   xs salt
   xs Vit A + D

Objectives

1) Attitude & personal, family, community nutrition.
2) awareness of nutr. problems.
3) Sources of nutr.
4) Nutritive value
5) Balanced diet - local sources & specific diets
6) Nutr. assessment
7) Nutr. intervention -
   agencies involved in nutrition
8) socio-cultural factors in nutrition.

Objectives for the student. To achieve the personal and professional objectives the student should strive toward the following behavioral changes.

1. Shows the proper attitude and convictions relative to the importance of nutrition in regulating one's own health, that of the family, and that of individuals of the community.

2. Knows the kinds of health problems arising from poor nutrition that exist in his own community, the nation, and throughout the world.

3. Demonstrates knowledge concerning the science of nutrition:

   a. Functions, digestion, absorption, and metabolism of proteins, fats, carbohydrates, minerals, and vitamins.
   b. The interrelationship of nutrients.
   c. The nutritive requirements of individuals and the variations that may be imposed by activity, climate, stage of life cycle, and disease.

4. Appreciates and understands the meanings that food has for people and how these are related to economic, psychologic, and cultural factors.

5. Interprets the principles of nutrition in the selection of an adequate diet:

   a. By knowing the food sources of the nutrients.
   b. By applying consumer information to the planning of meals and the selection of food for quality and economy.

6. Uses opportunities for improving nutrition through the education of individuals.

7. Counsels people on an individual or group basis by adapting nutrition information to specific health, socio-economic, and cultural needs.

8. Knows where to look for reliable sources of information and how to evaluate publications on food and nutrition and the claims made through product advertising.

9. Becomes familiar with agencies concerned with nutrition and health in order to utilize their services and contribute to their functioning.

SOURCE: FUNDAMENTALS OF NORMAL NUTRITION

LICMR Bulletin - Aug '74

Nutrition + Infection

(1) Malnutrition increases susceptibility to infections + concurrent infections may alter dynamics of immune reaction + also the phagocytic * function of macrophages +

(2) Infections adversely affect the nutritional status

The triple-M syndrome -
Malnutrition - Morbidity - Mortality.

(* cell-mediated immunity may be impaired)

Nutrition + the brain

Growth retardation + Malnutrition

Shantighosh.

Marasmus

~~Aetiology~~ Magnitude - 2-4% of under 5's have marasmus or Kwashi. Marasmus commoner in India ∴ staple foods are cereals ∈ have calories & proteins. Kwashiorkor is more common in Africa. where staple foods are starches eg plantain, tubers etc

Aetiology (1) → inadequate breast milk ∴ feed on diluted goat, cow, or buffalo milk.
∴ frequent diarrhoea d/t poor hygiene
(2) late introduction of semi-solid foods.
(3) Repeated infections ∴ occurs in earlier age grp

Signs + Symptoms -
- below 60% of weight for age
- height deficit acc. to duration of malnutr.
- v little subcut. fat + muscle ie skin + bone
- head seems large with v little hair
- pigmented or peeling skin
- Most probably will have one or more infections
- child apathetic, whimp, irritable, not interested in environment
- facial pasty & fat lost in 90 - old man appearance
- usually moderate anaemia + other deficiencies
- early stages: appetite good - later on severe loss of appetite making it v. difficult.

PTO

Kwashiorkor — "the disease that occurs when the child is displaced from the breast by another child"

Magnitude - 2-4% of preschool kids

aetiology - weaning period
inadequate prot/cal

- dependant on child's response. Dif children respond differently to the same environ. stress - adaptable
- occurs late than marasmus, uncommon under 1yr of age

Signs & symp —
- weight usually less than 60% - depends on degree of oedema
- Height retardation even more pronounced
- Still some subcut. tissue present
muscles waste
- oedema
- lustreless hair
- apathy, moon face
- moderate anaemia + vit deficiencies
- loss of appetite
- fatty change in liver & it enlarged
- diarrhoea - undigested food flo malabs.
- intercurrent infections

- Same diet - different response of diff. children
- Marasmic Kwashiorkor
- early detection of PCM.
- Disadvantages pplm / complications PCM.

Iron deficiency anemia

ICMR Bulletin May '71

Nutritional anemia is a major public health problem in India. Though it is more frequently seen among the poorer sections of the community, affluent sections are not free from this disease. However, even among the poor sections of the community, not all are equally affected. Preschool children + pregnant women are the worst sufferers, while men are affected to a considerably lesser extent. Over 60% of rural children in the age-group of 1-3 yrs belonging to the poor income groups have anemia, while 40% of children between 3 + 5 years of age are anaemic. Severe degrees of anemia - of Hb% < 8 g/100 ml are encountered in as much as 12% of pre-school children. Older school children appear to suffer less frequently from anemia.

Anemia is one of the most frequent complications of pregnancy. Almost 50% of women have Hb levels below 10 gm% during the last trimester of pregnancy. The incidence of anemia increases with increasing gestational age + with increasing parity, particularly after 3 pregnancies.

Aetiology -

Iron deficiency is clearly the commonest cause of nutritional anemia, though in some instances, concomitant deficiency of folic acid is an additional cause. This is particularly true of pregnancy anemia. Though megaloblastic anemia due to deficiency of Vit B_{12} is seen, the real extent to which it contributes to the total problem does not appear to be very great.

The health implications of anemia are not inconsiderable. Almost 50% of maternal deaths that occur among women of the poor socio-economic groups in our country is believed to be attributable directly to anemia. Anemia is also believed to be a contributory factor in the increased incidence of genito-urinary infections during pregnancy, still births + premature births.

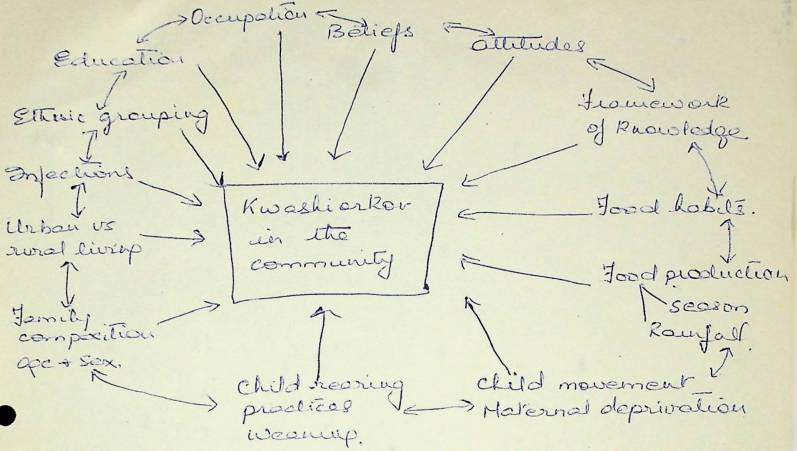
Puerperal sepsis has been found to be 3-4 times higher in severely anemic women as compared to those with milder degrees of anemia. In addition maternal anemia appears to be related to the birth weight of the infant. The mean birth weight of full-term infants born to severely anemic mothers has been found to be around 2 kg - a value considerably lower than the 2.8 kg of infants born to women without anemia. Perinatal mortality is known to rise steeply as the birth weight falls - 75% of deaths occurring in infants with weights below 2.5 kg. Added to this is the possible role of anemia in precipitating premature labour, with consequent low birth weight of the infant. Among poor income groups in India 45% of total infant deaths are accounted for by neonatal deaths + a great majority of them occur in infants with birth weights of 2 kg or less.

Consequences of anemia in children have not so far been fully studied. Indications are that iron deficiency may adversely affect host defence mechanisms against infections. Increased susceptibility + morbidity from infectious diseases have indeed been reported in anemic children.

Cause The single most important cause for the widespread iron deficiency anemia in the country is inadequate iron intake in the habitual diet, coupled with poor bio-availability of dietary iron. Iron absorption from cereal/millet/pulse based diets is less mainly because of the presence of phytates in the diet which inhibit intestinal absorption of iron. Low amounts of ascorbic acid + calcium in habitual diets are additional contributory factors. Repeated attacks of infection seem to be another reason, since infections interfere with absorption of iron.

Prevention + control

1) Diversify diet to provide iron in an absorbable form by changing food consumption patterns + improving purchasing power.
2) supplementation of medicinal iron to target groups viz pregnant women + preschool children.
3) Fortification of foods with iron.



Maurice King - Medical care in developing countries.

Nutrition Problem in India 8.17 (C

NUT 3-17

Gen. introduction - Great progress has been made in recent decades towards controlling many of the infectious diseases which have afflicted mankind since recorded history. The eradication of smallpox is a good example. It is hoped that other diseases which are preventable by vaccines already available. eg TB polio, tetanus, measles diphtheria & whooping cough will be possible

Malnutrition on the other hand presents a very different picture This is yet another of the age-old causes of human suffering yet very little progress if any has been made towards meeting the challenge it offers. It continues to be one of the most serious public health problems for the majority of the worlds pop:

What prevents us from controlling this scourge of today's world — a scourge which causes grief & suffering at the most basic human level & which inhibits the full flourishing of social development? Certainly it is not an insufficient knowledge of what human beings should eat, nor is it the worlds incapacity to produce the foods required by its present popul:

The causes are directly linked with poverty and its inevitable consequences of insufficient education and an inadequate sanitary environment.

It is therefore not a medical problem but a health & socio-economic problem. Health workers must be concerned with it. They cannot by working within the restricted traditional concepts of what the health sector's responsibilities are, solve the problem of malnutrition. But they can & they should, by operating as members of a team alongside the personnel of other social sectors & with the population concerned, succeed in improving the living conditions for millions of people now facing a subhuman life of misery, hunger and disease.

Malnutrition is both one of the consequences of social injustice and one of the factors contributing to its maintenance. It bears hardest on small children, contributing to the massive death toll among the young and together with other adverse environmental factors it interferes with the adequate growth & development of the survivors. It reduces their capacity to learn during childhood & to earn during adulthood. The inevitable result is a downward spiral in which poor malnourished parents produce poor malnourished children who in turn will become poor & malnourished parents. (Halfdan Mahler)

Malnutrition is a man-made disease. It is not the only one, but in terms of the number of people affected and of its consequences for human well being, it is the most serious and shameful of them all.

The causes of malnutrition are built into the very nature of society as it functions today; in the socio-economic & political structures, both nationally & internationally. It has been repeatedly said that scarcity of food is the main factor responsible. This may be true at the family level for those populations affected, but it is not true on a global basis, nor is it true for most of the countries where malnutrition is still a serious problem. It is rather a problem of uneven distribution between countries & within countries. Even in those countries which cannot produce enough food to feed their populations properly, the main problem is not a physical inability to do so, but the socio-economic structure which restricts the capacity of large sectors of the population to produce or to buy the food they need. Many countries suffer severely

from malnutrition, yet there are "surpluses" of foods on the market & some foodstuffs are even major items for export.

It is true that the present very rapid population increase is making it more difficult to produce the quantity of food required, but I am confident convinced that this is not yet due to a fundamental shortfall in natural resources, nor will it be in the near future.

It has also been said frequently that "ignorance" is in many cases the most important cause of malnutrition, particularly in the case of small children whose mothers do not know how to feed them properly. I believe that this is frequently either an exaggeration or a misinterpretation. In general, mothers know much more than they are given credit for, and most populations suffering from malnutrition would eat better & feed their children better if they had the right resources & facilities. To try to "educate" them without solving the real problems has been a frustrating experience for many well intentioned workers. This is of course particularly true for populations who still live within their own traditional culture. The situation is different for people who are obliged to live with or are heavily influenced by a foreign culture than they may

become lost, finding their traditional ways of life no longer applicable or socially acceptable, and mothers may fail to feed their children properly, because they adopt practices that they do not understand or are not prepared to follow closely. Not only children, but whole populations may suffer from this transculturization which is sometimes considered equivalent to "civilization".

Examples of this situation are early weaning and the adoption of bottle feeding, which has been proved disastrous for many populations influenced by so-called "western civilization", + the adoption of commercially produced refined foods which are more expensive + frequently less nutritious than the traditional ones they replace. In such cases, inadequate knowledge may be an important factor in causing malnutrition, but in general, when dealing with traditional practices + beliefs, we have to be careful not to interpret practices which differ from ours — many of them developed from centuries of adaptation to the ecology — as necessarily wrong. There are of course some undesirable traditional practices or beliefs whose origins have long since been forgotten; but we cannot

just assume that they are manifestations of ignorance.

Another important factor responsible for malnutrition as we see it today, particularly in small children, is the range of common infectious diseases resulting from an unsanitary environment among them diarrhoeal diseases, measles, whooping cough, malaria & tuberculosis. This problem is understood by health workers, but not sufficiently by officials at the policy making level. When these diseases are highly prevalent & this is the case for most of the areas where malnutrition is a problem, they interfere with the proper utilization of the diet & very significantly reduce the appetite & therefore the capacity for eating enough, even if the foods are available. This reduction of intake of the foods available in the home seems to be an important factor in small children. It partly explains why an insufficient diet (caloric deficit) rather than a very imbalanced diet is frequently found to be a cause of malnutrition in small children. Many instances may be observed of small children who have no limitation on the amount of foods available to them in their homes & yet who still do not eat enough. To satisfy their requirement

In conditions of poor environmental sanitation & personal hygiene, it has been shown that small children suffer from some infection for almost half of their first 3 years of life. Most of these infections may not be serious and the children are not even considered sick, but their nutritional status is affected.

It is now apparent that malnutrition is not a simple medical problem. We cannot dream of finding a drug to solve it, still less a vaccine to prevent it. No medical intervention can solve it. That does not mean that the health sector does not have an important role to play in the control of malnutrition. It does. But it can only be effective as a component of a more comprehensive programme of social development. The health sector can, if properly organized & given adequate resources, treat & rehabilitate cases of severe clinical malnutrition & can implement such measures as supplementary feeding for those at risk so as to prevent the appearance of these severe forms. It can counteract the effects of infections & other precipitating & aggravating factors, and it can to some extent influence food practices.

But all of these, even in the best of circumstances & assuming that the whole population & particularly those in greater need have adequate health services, will only provide palliative, partial or temporary solutions.

The real, permanent solution can only come from more fundamental measures that will combat the basic causes. This implies increasing the availability of foods both in quantity & quality as required, but — much more important — making sure that the people suffering from or at risk of malnutrition can obtain these foods. For this purpose, important changes in agricultural, economic & social policies & programmes maybe required, significant improvements will be called for in the overall living conditions of people where there are now very poor sanitary facilities, virtually no home hygiene, and very low standards of general education. In brief this means socio-economic development, but development oriented towards solving the problems of people and particularly of those with the greatest need.

In the past we have seen developmental efforts concentrated on strengthening & expanding the national economy, & unfortunately we have seen countries achieving the desired goals of

economic growth without significant changes in the living conditions, including the nutritional status of large sectors of the population. Development programmes which include improvements in the nutritional condition of the population as a direct objective are needed. There is evidence that nutritional improvement cannot be an indirect objective that will be achieved as a result of overall national economic growth. On the other hand significant improvements can be made even without great changes in economic growth if the efforts are properly oriented toward this specific direct objective. Thus food & nutrition planning must be a component of socio-economic development planning, and its resulting strategies & programmes must form a part of the overall socio-economic development programme. Initial efforts might have to be modest & it will be necessary to start with palliative measures. However, particular care is needed to ensure that the palliative, temporary measures do not interfere with or limit the actions of longer term solutions.

Health & particularly nutrition as a basic component of health should be the responsibility of all, including the people themselves & all sectors of society, & not a concern only of the health workers.

– Moisés Behar

The problem - Fragmentary evidence derived from consumer expenditure surveys, has led the FAO to conclude that there are about 460 million people - 15% of the worlds pop^n excluding China - who are undernourished. Nor surprisingly 2/3rds - about 300 million - live in South Asia where they constitute 1/5th of the pop^n.

It would take no more than 25 million tons of grain, or 2% of world grain production to bring these people up to a standard of about 2000 calories.

Clearly it is not a problem of limited natural resources. The world's food production potential is still greatly under-utilized. Even in the advanced countries average yields per hectare fall far short of the yields achieved by experimental stations or on best-managed farms. Estimates by FAO & the US Science Advisory committee indicate that only about half of the land that is available for crop production is now cultivated. Water is generally not a limiting factor. Nor is it a foregone conclusion that costs of production will rise, in real terms because of diminishing returns to land, water, fertilizer & other inputs. Thus far, this so-called "Ricardo-effect" has been more than offset by advances in technology & management. In fact

Some of the most spectacular improvements in productivity have come from technological breakthroughs that cost very little: the development of hybrid seeds is an example.

Projections for India indicate that to meet the food demand of a population of almost 1000 million in the year 2000 - allowing for a per capita real income about twice the present level, foodgrain production would have to increase from 115 million tons to about 275 million tons. This could be accomplished by

- a 10% increase in land under cultivation (small because most of the suitable land is already cultivated)
- an increase in double cropping from 20% to 45%.
- greatly increased irrigation (from 35 to 83 million gross hectares)
- a seven-fold increase in fertilizer consumption

Increases of these magnitudes are not impossible to achieve. They would require a moderate acceleration of the annual rate of growth of foodgrain production (3.5% as compared with 3% in the past 20 years) a corresponding speed-up in the development of irrigation + fertilizer use continuing to grow at approximately the present rate.

In fact, the projected levels of

food grain production are quite modest in relation to India's ultimate food production potential. Even in the year 2000, the projected cropping intensity would be less than that already achieved in China, Taiwan & Korea. Fertilizer consumption per gross cropped hectare would be only about one-fourth of current levels in Western Europe & Japan. Yields at 1.6 tons per hectare, would be less than half those achieved in Japan, Korea, Taiwan, Western Europe & USA

Finally there is increasing evidence that population growth is beginning to slow down in the developing countries as birth-rates continue to fall while mortality rates are levelling off. Here again, progress has been greatest in some of the more advanced developing countries, but there are indications that the pop: growth rate in India may also have passed its peak. — Fred H. Sanderson.

—

Problem in upper income gp

The problem of obesity may be regarded as unjust for the upper income group, yet this is, if not irrelevant, at least of less immediate concern for a middle income group. Similarly the vitamins & tonics & protein compounds which — whether needed or not — are widely advertised &

widely consumed among the middle classes are financially & even culturally irrelevant in the lower income groups.

— In India almost every programme of nutrition education is closely linked with education in the fields of health & sanitation - the 2 key factors demanding priority attention in rural & low income urban areas - Tara Gopalan.

8.17

PROPHYLAXIS AGAINST NUTRITIONAL ANAEMIA AMONG MOTHERS AND CHILDREN

FAMILY PLANNING PROGRAMME

FOURTH FIVE YEAR PLAN

MATERNAL AND CHILD HEALTH

Technical Information : MCH No. 1

MATERNAL AND CHILD HEALTH
THE CONCERN OF FAMILY PLANNING PROGRAMME

The family planning programme is vitally concerned with promoting the health of mothers and children. As it advises the couples to limit the size of their family to 2 or 3 children so it takes measures to promote the health of those few children. With this end in view FP programme has provided funds for schemes for prevention of diseases and promotion of health among mothers and children. One of them is a scheme for prophylaxis against nutritional anaemia among mothers and children.

1. NUTRITIONAL ANAEMIA AMONG MOTHERS AND CHILDREN— WIDELY PREVALENT

Anaemia is considered to be a major public health problem affecting women of child-bearing age and children in the country. Several research investigations carried out during the recent past under the auspices of the Indian Council of Medical Research have highlighted the problem. Nearly 60 per cent of 700 children over six months of age surveyed by the National Institute of Nutrition, Hyderabad, showed anaemia of some severity. Similarly, incidence of anaemia among women of child-bearing age was found to be 10 per cent, while nearly 50 per cent of pregnant women showed some degree of anaemia. It has also been reported that anaemic women have more complaints of vaginal bleeding after insertion of IUCD.

2. MATERNAL MORBIDITY AND MORTALITY

Anaemia is reported to be an important cause of maternal mortality; approximately 10 per cent of all maternal deaths are directly due to anaemia. Apart from direct contribution to maternal death, anaemia aggravates other complications and diseases incidental to pregnancy. The contribution of anaemia to maternal deaths due to other causes and to maternal morbidity in general is therefore considerable. Although, it is difficult to give a precise estimate of the

morbidity attributable to nutritional anaemia, broadly speaking, it is known that puerperal morbidity is 3-4 times greater in patients with Hb levels less than 6-5 g per cent. Genito-urinary infections are frequent complications of anaemia. Apart from this, when pre-eclampsia, eclampsia, ante-partum haemorrhage, obstructed or difficult labour occurs in an anaemic mother, the mortality and morbidity due to these complications are further enhanced.

3. PREMATURE BIRTHS AND PERINATAL MORTALITY

Maternal anaemia also affects the intra-uterine growth of the foetus. In one study, the average birth-weight of infants born at term in normal pregnancy of a series of 1,000 mothers with Hb levels of not less than 10.5 g per cent was 2.8 kg whereas in mothers with less than 6.5 g per cent of Hb, the average birth-weight at term was only 2.4 kg. Since 70 per cent of deaths in the perinatal period occur in infants weighing less than 2.5 kg at birth, the role of maternal anaemia in perinatal mortality and premature birth is very significant.

4. CAUSATIVE FACTOR MAINLY NUTRITIONAL

There is considerable evidence on the basis of haemotological studies, biochemical estimations, therapeutic and prophylactic trials, that iron deficiency is widespread in our community and the primary causative factor in the great majority of cases of nutritional anaemia. For example, one study has shown that nearly 95 per cent of all pregnant women have biochemical evidence of iron deficiency. There are also other studies showing the virtual absence of any significant iron stores in the Indian population.

There is evidence to suggest that folic acid deficiency also makes a significant contribution to the development of nutritional anaemia in pregnancy.

It should be emphasised that anaemia is a late manifestation of nutritional deficiency. Normal persons have reserves of iron, vitamin 'B' and folic acid which they can draw upon in time of deprivation or physiological stress such as pregnancy and rapid growth. When the intake of nutrients is inadequate to meet the daily requirements these stores are gradually used up. Biochemical abnormalities begin to appear even before there is detectable anaemia. The incidence of anaemia in a community is, therefore, a gross underestimate of the true magnitude of the problem of nutritional-deficiency. Hence, the importance of prophylactic measures like routine supplementation with iron and folic acid to prevent the development of overt anaemia.

PLAN OF OPERATION

1. PROCUREMENT AND SUPPLY OF DRUGS

A provision of Rs. 200 lakhs has been made in the Central sector for the programme. The drugs are procured by the Department of Family Planning and distributed to the States and Union Territories on the basis of annual plans. The cost of the drugs thus supplied will be adjusted as grants to the State Governments/Union Territories. The State FP Officer should place indents on the Government Medical Stores Depots, Bombay, who would send the supplies to the officers at the district level who are responsible for administering the programme.

2. BENEFICIARIES

Expectant and nursing mothers/acceptors of FP methods, like IUCD, salpingectomy and preschool-age children would receive the benefit of the scheme. Before enrolling them on the prophylaxis programme an estimate of the level of Hb should be done preferably by Sahlis' method. In situations like rural subcentres where this may not be possible at least an estimation by a Talqvest Hb Scale should be done. Women showing a Hb level less than 10g per cent and preschool-age children showing Hb level less than 8g per cent should be put on active anti-anaemic treatment straightway. Those women having a Hb level of 10g and above and children showing Hb level of 8g and above can be put on the prophylaxis programme. All institutions rendering family planning and MCH services like PH centres and their sub-centres, maternity and children hospitals, maternity homes, urban FWP centres should implement the programme.

3. DOSAGE

The daily recommended dosage is one tablet containing 0.1 mg folic acid with 60 mg of ferrous sulphate for children. Pregnant and nursing mothers and family planning acceptors should receive daily one tablet containing 0.5 mg of folic acid with 180 mg of ferrous sulphate. The daily administration of the tablets should be continued till the level of Hb attains and is maintained at a satisfactory level. It is necessary that the estimation of Hb is repeated at 3-4 month intervals. It is estimated that on an average each beneficiary may require administration of the tablets for a period of six months. The exact period will depend on the progress of the individual beneficiary.

For the sake of convenience the drugs may be issued for a fortnight or for a month at a time. The auxiliary nurse midwife/lady health visitor/FP health assistant should check on the actual use of the tablets by the mothers and children during their routine home visits.

Supply of Drugs

The tablets are supplied in two types and two packings, (i) orange coloured small tablet containing 0.1 mg folic acid with 60 mg of ferrous sulphate packed in tins of 1,000 tablets and 5,000 tablets, (ii) a larger grey coloured tablet containing 0.5 mg folic acid with 180 mg ferrous sulphate also packed in tins of 1,000 and 5,000 tablets. The tablets are sugar coated and therefore are to be preserved in a dry cool place to avoid absorption of moisture. Folic acid has a comparatively short shelf-life and care should be taken to use the tablets before the date of expiry indicated on the tins.

4. RECORDS

The regular records prescribed by the Health Department—the antenatal card, the child health card, the follow-up card prescribed for IUCD and sterilisation, should be maintained in respect of beneficiaries under the programme. These cards should show records of Hb estimation of the quantity of drugs issued to them. Registers showing the particulars of beneficiaries and the stock position of iron and folic acid tablets should also be maintained as per proforma given at *Appendix-I*.

5. REPORTS

Monthly reports on the number of beneficiaries and the stock position of the drugs should be sent to their supervising authority from the individual institutions. Consolidated monthly reports should be sent by the State FP Officer so as to reach the Department of Family Planning by the 15th of the succeeding month as per the proforma at *Appendix-II*.

APPENDIX-I

(A) REGISTER OF BENEFICIARIES UNDER THE NUTRITIONAL ANAEMIA PROPHYLAXIS PROGRAMME

Sl. No.	*Card No.*	*Date of enrol-ment*	*Name*	*Age*	*CATEGORY*			*Date of remo-val*	*Remarks*	*Initials*
					Mother	*Child*	*Contra-ceptor*			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)

(B) STOCK REGISTER OF IRON AND FOLIC ACID TABLETS

Date	*Receipt*	*Issue*	*Balance*	*Initials*
(1)	(2)	(3)	(4)	(5)

APPENDIX II

PROPHYLAXIS AGAINST NUTRITIONAL ANAEMIA AMONG MOTHERS AND CHILDREN

Report for the month ending.....197 .....for the State of.....

(A) STATEMENT OF BENEFICIARIES

Sl. No.	*Category of beneficiaries*	*No. on 1st day of the month*	*No. of cases enrolled during the month*	*No. of cases dropped during the month*	*No. of cases remaining at the end of the month*	*Progressive total for the year*	*Remarks*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1.	Mothers						
2.	FP Cases IUCD Tubectomy Others						
3.	Children (under 6 years of age)						
4.	Total						

(B) POSITION OF RECEIPT AND ISSUE OF THE DRUG

Opening balance on the first day of the month	*Receipts during the month*	*Issues during the month*	*On hand on the last day of the month*	*Remarks*
(1)	(2)	(3)	(4)	(5)

Place.....Date..... Signature.....Designation.....

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TREATMENT OF IRON DEFICIENCY ANAEMIA IN GYNAECOLOGICAL & OBSTETRICAL PATIENTS BY FERRUM HAUSMANN INTRAMUSCULAR

V. N. Shirodkar, *M.D., F.R.C.S., F.R.C.O.G.*,*
D. M. Amonkar, *M.D., F.R.C.S.*,** S. L. Shanbhag, *M.B.B.S., D.G.O.*,†
P. G. Samdani, *M.D., D.C.H.*‡

THE study aims at treatment of anaemia with a parenteral iron preparation, Ferrum Hausmann. Each ml. of its solution contains 50 mg. elemental iron in complex form (iron polymaltose in aqueous solution). The study was carried out on 36 patients of which 22 cases were treated with intravenous (I.V.) total dose infusion while the remaining 14 cases were treated with intramuscular (I.M.) doses.

In 1963 S. K. Basu, in England, described the technique of correcting iron deficiency anaemia by giving the required amount of iron as a single dose of iron dextran complex after diluting it with 5 per cent dextrose intravenously. Since then this technique is being used more and more all over the world.

Material and Method

The present study was conducted at St. George's Hospital, Bombay. Patients who had haemoglobin levels below 9.5 G. per cent were selected for the study. Age of the patients in the above study varied between 19 to 40 years. Sixteen patients out of 36 were gynaecological while 20 cases were obstetrical of which one case was in recent puerperium. Two patients were nulliparous, 5 patients primigravidae, 10 between 2nd and 4th gravidae and the remaining 19 were 5th or more gravidae.

Before starting iron therapy by I.V. or I.M. route, all the patients were thoroughly examined. The following investigations were carried out in all the patients in fasting state. (*a*) Haemoglobin estimation and R. B.C. count (*b*) Serum Iron (*c*) Reticulocyte count (*d*) P.C.V. and (*e*) Serum Proteins. Stools and urine were examined routinely. Haemoglobin estimation was repeated weekly and finally at the end of 3 weeks. In a few patients the haemoglobin was estimated at the end of 2 months also. Reticulocyte count was done before starting the therapy and on the 4th day thereafter.

If the total amount of drug required was less than 24 ml., 2 ml. was dissolved in a bottle containing 540 ml. of 5 per cent dextrose solution. Intravenous infusion was run at the rate of 40-50 drops per minute for 10 minutes and the rate was reduced then to 10 drops per minute for 5 minutes and the patient was watched. If no untoward reaction occurred, the rest of the Ferrum Hausmann solution was added to the drip and the rate of infusion increased gradually to 40-50 drops per minute. The amount in excess of 24 ml. was added in a separate bottle and the drip was continued. This was a necessary precaution to avoid reaction.

In the initial stages of the study, antazoline 25 mg. was added to the drip, but later on it was given intramuscularly before infusion was started.

Intramuscular injections were given as 2 ml. daily by the Z technique.

Observations

The *incidence of anaemia* in the different age groups is tabulated below :

Age	No.	Percentage
Between 12-20 years ..	1	2.77
21-30 years ..	25	69.25
31-40 years ..	10	27.7

* Hon. Prof. of Gynaecology and Obstetrics, St. George's Hospital and Hon. Gynaecologist and Obstetrician, Bombay Hospital.
** Hon. Gynaecologist and Obstetrician, St. George's Hospital, Bombay.
† Ex. Gynec. Registrar of St. George's Hospital, Bombay.
‡ Ex. Pediatric Registrar, St. George's Hospital, Bombay.

The incidence of anaemia was maximum in 2nd and 3rd decades.

Parity : Anaemia increased with parity as seen in the following table :

Parity	*No. of Cases*
Nulliparous ..	2
Primigravidae ..	5
2nd — 4th gravidae ..	10
5th and above gravidae ..	19

Duration of Pregnancy: Incidence of anaemia in relation to duration of pregnancy is tabulated below :

Trimester	*No. of Cases*	*Percentage*
1st ..	—	—
2nd ..	7	35
3rd ..	13	65

Anaemia is more evident in the 3rd trimester because average foetal requirement of iron is around 375 mg.

Aetiology : The commonest cause of anaemia was pregnancy in 30 cases, parasitic infestation in 14 cases, menorrhagia in 9 cases, retained products after abortion or normal delivery in 3 cases, *cancer* in 2 cases and unknown cause in 2 cases. The commonest parasitic infestation found was hook worms and round worms. In 2 patients E. hystolytica and E. coli were found.

Laboratory Findings : The main values of haemoglobin and serum iron, before and after 3 weeks of therapy in the intravenous and intramuscular group is shown in the following table :

Intravenous Group

	Hb.	Serum Iron
Before therapy	6.9 gm.%	51.9 ugm.%
1st week	8.1 gm.%	—
3rd week	10.7 gm.%	97 ugm.%
Percent rise	55%	86.9%

The average value of the reticulocyte in the beginning of therapy and on 4th day was 1.9 per cent and 4.9 per cent respectively.

Intramuscular Group

	Hb.	Serum Iron
Before therapy	8.2 gm%	74 ugm.%
1st week	9.3 gm.%	—
3rd week	11.3 gm.%	115 ugm.%
Percent rise	37.7%	55%

The reticulocyte count in the intramuscular group in the beginning of therapy and on the 4th day was .9 per cent and 4.5 per cent respectively.

From the above tables it is evident that in cases treated with intravenous iron, the rise in the haemoglobin level is 18 per cent per week and the serum iron rise is 86.9 per cent after 3 weeks. In cases treated with intramuscular iron the haemoglobin rise was 12.5 per cent per week. The serum iron was raised by 55 per cent after 3 weeks. This lower rise in the intramuscular group may be due to the fact that these cases had higher initial haemoglobin levels than those in the intravenous group. The initial haemoglobin level of the patients taken for intravenous therapy varied from 2 gms. per cent — 9 gms. per cent while in the series of cases treated with intramuscular therapy it varied from 6 gm. per cent to 9 gm. per cent.

The initial mean haemoglobin, reticulocyte count, serum iron, final haemoglobin, reticulocyte count and serum iron in both intravenous and intramuscular group is tabulated below along with percentage rises:

Intravenous Group

Range of Haemoglobin	Initial Hb.	Hb. after 3 weeks	Reticulocyte		Serum Iron	
			Before	After	Before	3 weeks later
2-6gm%	4.7gm%	9.4gm% (100%)	2.4%	8.2% (241%) increased	31.1ugm%	98.4ugm% (216%)
6.1-8gm%	7.6gm%	11.2gm% (47.3%)	1.9%	4.6% (142%) increased	60.2ugm%	91.5 (52.6%)
8.1-10gm%	9gm%	11.5gm% (27.7%)	.8%	3.9% (387%) increased	64.4ugm%	103 ugm% (61%)

Intramuscular Group

Range	Haemoglobin		Reticulocyte		Serum Iron	
	Before	After	Before	After 1 wk.	Before	After 3 weeks.
6-8gm%	7gm%	10.5gm% (50%)	.95%	6.3% (563.1%) increased	66.3ugm%	121.3ugm% (82.9%)
8.1-9gm%	8.9gm%	11.8gm% (32.4%)	.87%	4.1% (371.3%) increased	80ugm%	110ugm% (37.3%)

The analysis shows that the higher the initial haemoglobin the lower was the percentage rise in haemoglobin. The patient having initial haemoglobin between 2 gm. — 6 gm. per cent showed a rise of 100 per cent after 3 weeks, while those having initial haemoglobin between 8.1 gm. — 10 gm. per cent showed a rise of 27.7 per cent only.

The rise of the haemoglobin level in cases treated with intramuscular iron was nearly the same as in those treated with intravenous iron and with identical initial haemoglobin level. The overall weekly rise of haemoglobin in the intravenous group was 1.26 gm. per cent while in the intramuscular group it was 0.99 gm. per cent.

Side Effects

The side effects observed during the therapy are tabulated below :

Intravenous Group

Nature of side effects	No. of cases	Percentage
Immediate :— Irregular pulse, sweating, palpitations.	1	4.5
After 2-8 hrs. :— Puffiness of face, palpitation, rigors, ringing in ears.	1	4.5
After 24 hrs. :— Mild Joint pains and mild fever.	5	22.5

Seven out of 22 patients treated with intravenous iron had reactions. Two cases out of 7 had reactions of significance whereas 5 patients had mild joint pains and fever after 24 hours. Thus 9 per cent had immediate reactions and 22.5 per cent had reactions after 24 hours. In one case where immediate reaction occurred, the reason could not be ascertained and the drip was discontinued. The patient was comfortable after an antihistamine and hydrocortisone injection. The same patient was later treated by the intramuscular route without any reaction, which suggests that it could have been a pyrogen reaction. The second patient who developed puffiness of the face, ringing of ears and palpitation after 3 hours when almost half the solution had been administered, had an initial haemoglobin level of only 1.5 gm. The drip was discontinued and the patient was given packed cell transfusion. When the haemoglobin level came to 6 gm. the drug was given by intramuscular injection. This patient was pregnant, the duration being 34 weeks.

None of the Cases treated with intramuscular iron showed any reactions at all. A slight brownish discolouration was seen in a few cases which decreased after 3 weeks of therapy.

Discussion

The main aim of the present study was to know the effects and efficacy of intravenous iron polymaltose therapy and compare it with intramuscular therapy. The analysis of the results shows that total dose infusion increases the haemoglobin in all patients suffering from iron deficiency anaemia and the increase was 1.26 gm per cent per week. In the intramuscular group with similar haemoglobin levels the rise was nearly the same.

A 2 months follow-up could not be done in all the cases because the patients did not report after 2 months. However, 10 cases out of 22 who were treated by the intramuscular route showed haemoglobin rise to about 12 gm. per cent showing thereby that the maximum rise in haemo-

globin can be expected after 2 months and the treatment should be started earlier in antenatal care.

In hospital practice intravenous therapy should be favoured because the antenatal attendance of these patients is very poor and irregular. Hence the anaemia cannot be treated on O.P.D. basis by intramuscular iron. This method of intravenous therapy would prevent many complications at the time of labour in severe anaemic patients. Admission of the patient for anaemia and treatment with intramuscular iron will increase the cost to the hospital, reduce the number of beds for serious patients and cause inconvenience to the family. As against this, in the intravenous therapy, the treatment can be completed in a day or two with definite predictable and faster results at less cost.

Bonnar (1965) noted a weekly rise of 1.14 gm per cent of haemoglobin in pregnant women with an average of 0.16 gm. per cent of haemoglobin with iron-dextran. Basu claimed a daily rise of haemoglobin by 1.3 per cent with iron dextran. Motz et al (1967) observed a rise of .68 per cent per week in their study of 6 weeks by total dose infusion of iron dextran complex. Mehta et al (1968) showed a rise of 2.14 gm. per cent per week in the first 2 weeks in gynaec and obstetric patients by iron dextran total dose infusion.

In our study side effects occurred in 32 per cent out of which 9 per cent had immediate and severe reactions of significance which necessitated withdrawal of the treatment. The remaining 23 per cent had very mild reactions which did not require any additional specific treatment.

Mehta et al showed systemic reactions in 48.3 per cent of the cases treated by total dose infusion therapy with iron dextran. Kamath and Pai noted reactions in 62.69 per cent of the cases by intravenous total dose iron dextran therapy. Bhat et al observed systemic reactions in only 16 per cent of the cases by intravenous iron dextran therapy.

Conclusion

Total dose infusion therapy with Ferrum Hausmann intramuscular was found to be very effective, the average rise of haemoglobin being 1.26 gm. per cent per week. Side effects were noticed in 32 per cent of the cases. Of these, in 9 per cent they were so severe that the treatment by intravenous route had to be discontinued. The remaining 23 per cent had mild reactions which did not require any special treatment. Injection of antazoline given before institution of infusion is preferable as a propiylaxes. The concentration of the drug in infusion therapy should preferably be kept below 5 per cent. Thus intravenous therapy can be routinely adopted in hospital practice and is quite safe, economical and effective method of treatment.

In this series, Ferrum Hausmann intramuscular in total dose infusion therapy caused fewer bye-effects than reported by other workers with iron dextran. No side effects were observed when Ferrum Hausmann was administered intramuscularly.

REFERENCES

1. Basu, S. K., *Lancet*, 1963, I, 1430.
2. Bonnar, J., *Brit. Med. J.*, 1965, 2, 1030.
3. Bhatt, R. V., Joshi S. K., and Patel M. R. : Intravenous use of Iron-Dextran — Five Year experience — National Conference of Iron Deficiency Anaemia, 1968.
4. Kamat, G. R. and Pai, J. R. — Intravenous Iron — Dextran in Iron Deficiency Anaemia — Total Dose, diluted and undiluted — National Conference on Iron Deficiency Anaemia, 1968.
5. Mehta, B. C., Jheweri Kusum and Patel J. C. : Total Dose Iron Therapy — National Conference on Iron Deficiency Anaemia, 1968.
6. Seetamma, J. : Total Dose infusion in Gynaecological conditions — National Conference on Iron Deficiency Anaemia, 1968.

VOLUNTARY HEALTH ASSOCIATION OF INDIA
C-14, Community Centre, Safdarjung Development Area, New Delhi-110016
Phone : 652007, 652008 Telegrams : VOLHEALTH New Delhi-110016

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COMMUNITY HEALTH CELL
47/1,(First Floor)St. Marks Road
BANGALORE-560 001

8.20

ANAEMIA IN PREGNANCY

Anaemia in pregnancy is a major public health problem in developing countries. While anaemia is directly responsible for 20% of maternal deaths, in another 20% it is a contributing factor. (Menon, M.K.K. 1967). Besides it is also responsible for the high incidence of premature and low weight births, thus increasing the prenatal mortality and morbidity. Studies carried out at the National Institute of Nutrition, Hyderabad are highlighted below:

Haemoglobin Surveys:

Haemoglobin surveys carried out in different parts of the country indicate that while 15-20% of women are anaemic at the onset of pregnancy, the incidence of anaemia (Hb. levels less than 11g%) increases to 60-70% in the last trimester. A survey of 1810 women attending Niloufer Hospital, Hyderabad indicated that incidence of anaemia was closely related to parity (Table 1).

The incidence seen in the hospital may in fact be an underestimate, since the hospital patients come from a mixed socio-economic group. In rural population, the incidence of anaemia may be of a much higher order due to associated infestations and infections.

Etiology:

Anaemia of pregnancy seen in our population is mainly due to iron deficiency. However, associated folic acid and B12 deficiencies also exist.

1. Dietary factors.

The average Indian diet would appear to be adequate in iron content (20-22mg) for a non-pregnant adult woman. However, various factors inhibit iron absorption of which phytate is most important while an absorption of 10% is essential to meet the iron requirement of a normal adult. Studies using whole body counter-indicate that only 3-5% of dietary iron is absorbed in an apparently normal healthy individual. The diet is difficient in protein, calcium and vitamin C. The diet is also deficient in other haemopoietic factors like folic acid and B12.

The iron needed during pregnancy is of the order of 4-6 mgs of absorbed iron daily, which cannot be made available through dietary sources. Since most women do not receive any supplements during pregnancy, iron deficiency is a common feature.

2. Iron stores and Iron loss.

Most of the population in Asian Countries have very poor iron stores as indicated by poor bone marrow haemosiderin and low levels of liver iron. Besides, iron losses through menstruation, to the extend of 15-30mg every cycle, increases the iron requirement of adult women. Most women enter their first pregnancy with very little iron reserve.

3.

Demands of Pregnancy

The net iron loss during pregnancy in Indian women is around 350 mg. To meet this additional demand, a woman needs to absorb 2-3 mg of additional iron daily. Besides the increased demands during pregnancy, demands during lactation contribute to reduce iron stores and worsen the deficiency status. Since many women have repeated, closely spaced pregnancies with prolonged periods of lactation, there is progressive depletion of iron stores with increasing number of pregnancies. This results in high incidence of anaemia in women with higher parities.

4. Infections and Infestations.

Repeated and chronic infections prevent the utilization of iron and are additional contributory factors in causing anaemia. Hookworm infection in some areas aggravates the situation by increasing iron loss.

Absorption Studies

Iron absorption

Studies carried out on food iron absorption at the National Inst itute of Nutrition have indicated that during pregnancy, iron absorption from food increased from an average of 10% in the first trimester to 25-30% at term. In addition, iron absorption was of a much greater order in women in whom the transferrin saturation was less than 15%. On the basis of these data, iron requirement during pregnancy has been computed to be around 40 mg per day. However, the requirement is greater in women who have very poor iron stores and low haemoglobin levels at the onset of pregnancy.

Folic acid absorption

There is considerable controversy regarding absorption of folic acid in pregnancy. It is believed that folic acid deficiency seen in pregnancy is mainly due to impaired folic absorption and partly due to increased renal clearance of folate. Transfer of folate across the placenta to the foetus is also considered as an additional cause.

Studies carried out on folic acid absorption using tritiated folic acid in women undergoing therapeutic termination of pregnancy in the first and second trimester at the National Institute of Nutrition have indicated that there is no impairment in the absorption of crystallin folate during the first and second trimesters of pregnancy. However, whether this is true of food folate needs to be investigated. These studies also suggest that the folate status of the individual influenced the extent of absorption but this observation needs confirmation.

Serum levels of iron, folic acid and B12.

In spite of normal haemoglobin levels, about 50% of pregnant women have low levels of serum iron, it being less than 60ug/100ml in the last trimester. The percentage transferrin saturation is also low in these women.

Determination of serum folic acid and B12 levels have indicated that in about 60% of women, serum folate levels were less than 3ng/ml indicating folate deficiency and that in 25% levels of serum B12 were below 100ng/ml in the last trimester.

In a small number of women with severe anaemia, where haemoglobin levels were less than 8.5 gms, studies on bone marrow indicated that in 60% of them there was megablastic erythropoiesis. Folate levels in RBC in these women was below 80ng/ml. There was no stainable iron in the bone marrow in any of the subjects.

These observations suggest that while in mild and moderate degrees of anaemia in pregnancy iron deficiency was the major factor, in the severe forms folate deficiency is clearly present.

Effect of Maternal Anaemia on Foetus and Newborn

1. Foetal stores

The iron, folate and B12 stores in the levers of infants born to mothers of low socio-economic group was studied. It was observed that iron stores were only 60% of the reported figure from western countries. Similarly, liver stores of folic acid and B12 were far below the reported normal range for newborn in western countries. The implication of such low stores of these nutrients is obvious. An infant born with poor stores of iron, folate and B12 has greater risk of developing anaemia during very early infancy. Also, the high incidence of infections and infestations in early infancy tended to aggravate and hasten the onset of anaemia.

2. Infancy anaemia

In a recent study it was found that while at birth, haemoglobin levels of infants born to mothers [illegible] unsupplemented with iron during pregnancy were similar to those born to iron supplement mothers, at 3 and 6 months of age, the incidence of anaemia (Hb. less than 11 gms%) was 45% in infants born to unsupplemented mothers as against 25% in those born to supplemented mothers. This suggests that supplementation of iron during pregnancy not only benefited the mothers but also their infants.

3. Birth weights

As indicated earlier, the incidence of prematurity and low birth weight were much higher in infants born to anaemic mothers.

While investigating the iron and folate requirements of pregnant women, it was observed that infants born to mothers, given supplements of folic acid along with iron were heavier by 200 gms compared to infants born to mothers receiving iron supplements alone. Also the incidence of small-for-date births (weight less than 2500 gms) was 17% and 37% in infants born to folate supplemented and unsupplemented mothers respectively. That such an improvement in placental efficiency has been shown by increased weights of placentae in folate supplemented mothers, which also have a higher DNA and protein content.

Treatment and Prevention of Anaemia

(1) Blood transfusion

In cases of severe anaemia, during the last trimester of pregnancy, there is very little time to improve the haemoglobin and iron status with oral or parenteral iron. In addition, a greater majority of such women come in a state of anoxia and cardiac failure. In such cases, an initial transfusion of packed cells or exchange transfusion needs to be given, followed by supportive treatment to improve her nutritional status. With the advent of packed cells or exchange transfusion, maternal mortality rate has been brought down to a considerable extent.

(2) Parenteral iron therapy

In mild and moderate anaemia, in middle or early pregnancy, in cases where regularity of intake of oral iron cannot be ensured and in cases who have intolerance for all forms of iron, parenteral iron is the treatment of choice. However, parenteral iron does not have any greater benefit over the oral iron as far as the rate of haemoglobin regeneration is concerned.

(3) Orlal Iron supplements:

Oral iron supplements are useful not only for therapeutic purposes but also for the prevention of anaemia. Two studies conducted at National Institute of Nutrition, Hyderabad using 30 and 60 mgs of elemental iron given daily during the last 12-16 weeks of gestation have indicated that both these levels can, not only maintain but also bring about an increase in haemoglobin levels from the presupplement levels in about 90-92% of women. In 8-10% of the women, haemoglobin levels were still below 11 gms%. Addition of 200-500 µgs of folic acid to the iron supplement resulted in an improvement in RBC folate levels in both the mother and the newborn, but had little of any additional beneficial influence on haemoglobin levels. The same was true for added B_{12}.

However, as indicated earlier, 200-500 µgs of folic acid was found to have beneficial effect on the birth weights of infants to the extent of 200-300 gms and in reducing the incidence of small-for-date births. While 30 mgs of elemental iron as supplement daily is adequate to prevent anaemia in pregnancy in 90% of women, it has been recommended by a study group in Nutritional anaemia that 60 mgs of elemental iron with 500 µgs of folic acid should be given as a supplement daily in the last 12-16 weeks of pregnancy. This figure has been arrived at on the basis of (a) the estimated additional needs for iron during pregnancy and lactation, (b) the extremely poor iron stores, (c) the variability of the levels of absorption of ingested iron, (d) possible irregularities in supply and intake and (e) losses that may occur due to hookworm infestations.

Anaemia Prevention Programme

The Government of India has accepted an anaemia prevention programme and the proposal has been included in the Fifth Five Year Plan. Tablets containing iron and folic acid are distributed to different MCH and family planning centres to cover at least 50% of pregnant women in their last trimester of pregnancy.

Reference: Menon, M.K.K. Proc. Soc. India. 2, 1, 1967.

TABLE I

Incidence of anaemia in pregnancy (%)

*(Total No. investigated - 1810)

Gestational age (weeks)	Overall incidence (Hb/11.0 g%)	Parity			
		I-III		IV & above	
		/11.0 g%	/8.5 g%	/11.0 g%	/8.5 g%
/16	15.5 (265)	12.5 (140)	.....	20.0 (125)	2.0
16-28	29.2 (974)	23.0 (666)	2.2	32.5 (308)	6.0
28-40	41.0 (571)	37.0 (371)	3.2	48.5 (200)	8.5

* Sample size

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VOLUNTARY HEALTH ASSOCIATION OF INDIA
C-14, Community Centre, Safdarjung Development Area, New Delhi-110016
Phone : 652007, 652008 Telegrams : VOLHEALTH New Delhi-110016

M-3

COMMUNITY HEALTH CELL
47/1, (First Floor) St. Marks Road
BANGALORE - 560 001

NUTRITION IN PREGNANCY AND LACTATION

It has long been recognised that pregnancy and lactation constitute periods of physiological stress and that the requirements of most nutrients increase during these periods. From the nutritional standpoint, therefore, pregnant and lactating women constitute vulnerable segments of the population. During the last two decades considerable amount of research work has been carried out under the aegis of the Indian Council of Medical Research on the subject of nutrition in pregnancy and lactation. Most of these studies have been carried out at the National Institute of Nutrition, Hyderabad. These studies have related to increase nutrient requirements, the effects of maternal nutritional status on the course of pregnancy and its outcome, and also the inter-relationship between maternal nutritional status on the one hand and the nutritional status of the offspring on the other. They have also related to the nutritional status of nursing mothers and the composition of their breast-milk. The results of some of these studies are reviewed here.

Nutrient requirements during pregnancy and lactation:

Though it is well recognised that requirements of most nutrients increase during pregnancy and lactation, there is still some uncertainty regarding the quantum of increase. Studies carried out on Indian subjects have provided some data about the increased calorie and protein requirements during pregnancy and lactation. The Basal Metabolic Rate (BMR) of Indian pregnant women was found to be about 7% higher upto 24 weeks of pregnancy and 15% higher subsequently, as compared to BMR of normal non-pregnant women. Since many women of poor communities do not curtail their physical activity even during late stages of pregnancy, the additional daily energy requirement for Indian women has been assessed to be around 100 calories during the first trimester and about 300 calories during late stages of pregnancy.

Studies on the basal metabolism of lactating subjects had shown that during the first six months of lactation, the BMR is generally elevated by about 15% over the normal value. Data regarding milk yield of Indian women have shown that they secrete, on an average, milk which have a calorie content of about 490. On the basis of these data, it has been computed that the additional calorie needs of lactating Indian women is approximately 500 calories per day.

Nitrogen balance studies in Indian pregnant women have shown that with increasing levels of protein in the diet, they show a linear increase in retention. The requirements of protein, calculated on the basis of these studies, showed that they are about 20-40% higher than that of non-pregnant subjects. Most of these studies were carried out on undernourished subjects and it is, therefore, possible that these apparently high values may be due to their erstwhile poor nutritional status. In a recent study carried out at the National Institute of Nutrition, the influence of gestational period on nitrogen absorption and utilization were investigated.

It was observed that on an intake of 40g. of protein and 1800 calories per day, nitrogen retention progressively increased with increasing gestational period due mainly to decrease urinary excretion of nitrogen. These studies indicate that pregnant women utilize nitrogen more efficiently. Similar studies in lactating women indicated that they require around 60 g of protein per day to attain equilibrium. However, retention was found to increase with increasing intake of protein upto 100 g. per day. As in the case of pregnant women, these studies were also carried out on undernourished lactating women and this may have contributed to increase in nitrogen retention upto 100 g. of protein per day.

Longitudinal studies carried out in pregnant women regarding the absorption of iron and calcium showed that in pregnant women belonging to the low income groups, efficiency of absorption of both iron and calcium increased with advancing gestational period - an observation similar to that made with respect to protein. Calcium balance studies in lactating women, however, indicated that all women studies were in negative calcium balance during this period.

Nutrient intake during pregnancy and lactation:

Diet surveys carried out in different parts of our country have shown that the intake of most nutrients by pregnant and lactating women belonging to the poor socio-economic groups is far below recommended allowances. In many instances, intakes are even lower than the allowances recommended for non-pregnant subjects. The actual intakes of some of the nutrients have been indicated in Table.

MEAN NUTRIENT INTAKE OF INDIAN PREGNANT AND LACTATING WOMEN OF THE LOW INCOME GROUPS

Nutrient	Intake during pregnancy	Lactation	Recommended allowances Pregnancy	Lactation
Calories	1430	1860	2500	2900
Protein - g	49	49	55	65
Calcium - mg	269	300	1000	1000
Iron - mg	18	18	40	30
Vit A - µg	304	304	750	1150

As can be seen, the intakes of both proteins and calories are well below recommended allowances, the deficit in calories, however, being of a much greater magnitude than that in protein. The diets were found to be predominantly cereal-based and the protein mainly of vegetable origin. The diets were found to be deficient in several vitamins and minerals as well. The major reason for the low intakes has been found to be the poor purchasing capacity. But an important additional reason is the practice of food taboos and food fads which prevented the intake of certain nutritious foods both during pregnancy and lactation. The fear of difficult delivery consequent on a large infant also prevented some pregnant women from consuming adequate amounts of food.

As a result, a high proportion of pregnant women were found to suffer from signs of nutritional deficiency. Signs of B-complex deficiencies like angular stomatitis, glossitis, tingling and numbness were found in 30 - 40 percent of pregnant women, while almost 50 percent of women in the third trimester of pregnancy were found to have anaemia with levels of haemoglobin below 10 g/100 ml. With increasing parity, the incidence of both anaemia and B-complex deficiency signs were found to increase. Biochemical studies on pregnant women belonging to the poor income groups have shown activities of the two enzymes - transketolase and glutathione reductase in erythrocytes, as lowered, indicating sub-optimal nutritional status with respect to thiamine and riboflavin. Deficiency of pyridoxine is commonly seen in pregnant women and recent studies have shown that several cases of angular stomatitis which until now was considered pathognomonic of riboflavin deficiency, responded not to the administration of riboflavin, but to pyridoxine. The effects of this unsatisfactory dietary situation of the mother were felt not only on her but on her offspring as well.

Weight gain during pregnancy:

The mean gain in body weight during pregnancy in well-nourished women was found to be around 12 kg. This gain in weight is largely accounted for by the weight of the foetus, other products of conception and changes in body composition, particularly accumulation of body fat. In pregnant women of the low-socio-economic group, whose pre-pregnant weight is only around 40 kg., the net gain in body weight during pregnancy is associated with low birth weights of the offspring. Studies on the body composition of these women indicated that during pregnancy, they gain very little fat which probably accounts for the relatively low gain in body weight. Further, these studies have also suggested that many pregnant women belonging to the poor income groups actually lose body fat at the expense of fluid accumulation.

Effect on pregnancy wastage:

While in experimental animals, it has been well demonstrated that severe protein deficiency leads to foetal absorption, similar reliable data on human is scanty since it is not easy to establish the relationship between maternal nutritional status and pregnancy wastage. However, in studies both retrospective and prospective, it has been observed that 20 - 30 percent of pregnancies in women of low socio-economic group terminated in abortions. This may be an under-estimate of the real incidence since many abortions which may occur within the first few days after conception would be missed in such studies.

Birth weights:

Data on birth weights of large numbers of infants from different parts of the country have indicated that there is a socio-economic gradients with respect to birth weight. The mean birth weight of infants born to poor income groups has been found to be around 2.7 kg. as compared to 3.2 kg. among infants born to well-nourished women. The incidence of prematurity has been found to be around 19 percent, while the incidence of small-for-date births has been found to be 10-29 percent in different parts of the country. Studies on perinatal mortality have shown that the rates are considerably higher with small-for-date birth indicating that maternal malnutrition is an important factor which contributes to a high rate of neonatal mortality in our country.

Nutritional status of the newborn:

Assessment of the nutritional status of newborn to under-nourished mother has been carried out using biochemical parameters like concentration of albumin, vitamin A, folic acid in circulating as well as nutrient stores of the foetal liver. Foetuses born to mothers belonging to the low income groups have considerably lower amounts of iron, vitamin A, folic acid and vitamin B_{12} in their livers – the values being only about 50 percent of values found in foetuses born to well-nourished mothers. Also, studies on the body composition have indicated that at all gestational ages, they have lowered amounts of nitrogen and fat as well as reduced amounts of total body iron and body calcium.

Levels of serum, albumin, vitamin A and folic acid in the cord blood of infants born to under-nourished mothers have been found to be lower than that observed in the cord blood of infants born to well-nourished mothers.

Maternal nutritional status and placental function:

Since low birth weights are associated with poor maternal nutritional status, studies have been undertaken to assess the influence of maternal malnutrition of placental function. The mean weight of placentae in women belonging to the low socio-economic group has been found to be considerably lower than that of high income group, there being a difference of about 100 g. It has also been observed that placental weight bears a close correlation with birth weight. However, since efficiency of placental function and nutrient transfer need not always depend upon the size, studies have been carried out to determine placental function.

It has been established that estrogens and pregnanediol are elaborated by the placenta and excreted in the urine in increasing amounts as pregnancy advances. Studies carried out on the urinary excretion of these two hormones have shown that beyond 28 weeks of pregnancy, malnourished women excrete considerably lower amounts as compared to well-nourished subjects. That the lowered excretion was due to maternal malnutrition was confirmed by the observation that nutrient supplements given to mothers of the low income group brought about an increase in the excretion of estrogens to levels seen in well-nourished women. This was also associated with an increase in birth weights of their infants.

Recent studies on heat stable alkaline phosphatase - an enzyme elaborated by the placenta, have shown that their levels are significantly higher in women belonging to the low income groups as compared to well-nourished women. In addition, negative correlation was seen to exist between the concentration of the enzyme at term on the one hand, and at the birth weight of the infant on the other. The results of some studies have suggested that the higher levels of the enzyme in malnourished mothers may be due to pre-mature aging and hypoxia of placental cells releasing high amounts of enzyme into maternal circulation.

Studies on the chemical composition of placenta have shown that in placentae of infants with intrauterine growth retardation, the concentration of nitrogen was significantly lower as compared to placentae of normal infants, and there was a reduction in the total number of cells as indicated by the DNA content. Also, the cell size was reduced as shown by the protein DNA ratio. Levels of heat stable alkaline phosphatase were significantly lower. The concentration of glycogen in such placentae was significantly lower and the rate of glycogen breakdown significantly higher, indicating that there were biochemical differences between placenta of normal infants and those of infants with intrauterine growth retardation.

Anaemia in pregnancy:

As indicated earlier, nutritional anaemia is a major problem among pregnant women in our country and results of several surveys have shown that 10 - 20 percent of women start their pregnancy with haemoglobin levels less than 10 g. and that with advancing gestation, 50 percent and more of women have haemoglobin levels below 10 g. Severe anaemia with levels of haemoglobin below 8 g/100 ml are encountered in about 10 - 15 percent of pregnant women at term. There is also a direct relationship between incidence and severity of anaemia on the one hand and parity on the other. Though the precise contribution of the anaemia to maternal mortality is not known, it is believed that anaemia accounts for nearly 20 percent of all maternal deaths.

A number of studies have shown that iron deficiency is by far, the commonest cause of anaemia, though in many cases, there is concomitant deficiency of folic acid. Serum folic acid levels have been found to progressively fall with advancing pregnancy. About 60-70 percent of women have levels below 3 ng/ml levels considered to indicate difiency, during the third trimester of pregnancy. The concentration of folic acid in erythrocytes also fall as pregnancy advances. Supplements of 300 ug of folic acid daily to such pregnant women have been found to fully prevent the folate in red cells from falling, indicating that this may be the additional folic acid needs during pregnancy.

A number of controlled studies have indicated that daily supplements of 60 mg of iron and 500 µg of folic acid given during the last 100 days of pregnancy can effectively control and prevent pregnancy anaemia.

Effects of nutrient supplements on the outcome of pregnancy:

Since it is recognised that maternal malnutrition influences the birth weight of infants, studies have been undertaken to determine the effects of nutrient supplements given to undernourished pregnant women on the birth weights of their infants. Pregnant women were maintained on diets which provided about 2400 calories and either 60 or 80 g. of protein daily, during the last 4 - 6 weeks of pregnancy. This represented an increase of 500 - 600 C/day and 20 to 40 g. of protein, above that provided by their habitual home diets. Such women delivered babies whose birth weights were about 300 g. more than women who did not receive such food supplements. Also, concentrations of serum albumin both in the mother and in the infant were higher. Maternal weight gain showed an increase as compared to unsupplemented mothers. Since there were no differences between those that receive 60 g. protein and 80 g. protein a day, it was concluded that 60 g. of protein was adequate. That these effects were brought about by an improvement in placental function was supported by an increase in estrogen excretion in the supplemented mothers.

Iron and folic acid supplements:

During an investigation done to determine the amounts of iron and folic acid requirements of pregnant women, it was observed that the mean weights of infants whose mothers had received 300-500 mg. of folic acid daily during the last 100 days of pregnancy were significantly higher when compared to the birth weights of infants born to mothers who had received iron supplements alone. This suggested that folic acid supplements had a beneficial effect on birth weights. In a recent investigation, this observation was confirmed, the practical significance of which is obvious.

Studies on lactation:

The nutritional status of lactating women is particularly important in developing countries, since women breast feed their infants for prolonged period of time and from the infant's point of view, adequacy of milk secretion and the nutritional quality of the secreted milk acquires practical significance. As indicated earlier, lactation is a period of physiological stress and the requirement of most nutrients increase.

Dietary intake and nutritional status:

Results of several diet surveys have, however, shown that the dietary intakes of lactating women, belonging to the poor income groups are far from satisfactory. As in the case of pregnant women, intakes of most nutrients fall short of recommended allowances, the calorie intake being particularly low. Intakes of vitamins and minerals are also inadequate. This is reflected in a high incidence of frank nutritional deficiency signs - particularly of the vitamins of B complex group. In spite of these considerations, the lactation performance of these subjects seems satisfactory. This observation is somewhat intriguing, since these mothers do not show evidence of much loss in body weight. No significant differences have been found between mothers in the early stages of lactation and those in the later stages with respect to body weights; also body weights of lactating women with only one infant were found not to be different from those with several infants. Most mothers tended to have either a stationary body weight or at most lose about 1-2 kg. throughout the period of lactation, though they were secreting between 400-600 ml of milk daily. There has so far been no satisfactory explanation for this observation, through results of limited studies have suggested that some of the lactating women have increased body hydration. Further studies are obviously needed to determine whether this indicates an adaptation to low nutrient intakes, brought about through hormonal changes.

Milk output:

As mentioned earlier, in spite of seemingly inadequate dietary intakes, a great majority of women belonging to the poor income groups are able to breast feed their infants satisfactorily for long periods of time. Serial and cross sectional studies on breast milk output carried out in different parts of the country have indicated that milk output was about 600 ml daily during the rest of the first year and around 100-150 ml during second year. The use of various substances like garlic, cottonseed and tamarind commonly used by the rural population to increase the milk yield did not really have any effect as galactogogues. This may have partly been due to the fact that the mothers who were studied already had satisfactory levels of milk secretion. However, when such mothers were provided with diets containing 2900 calories and 60 g. of protein for a period of 10 days, the milk output did not show an increase, but the concentration of protein showed a considerable reduction, there being no net increase in the protein content.

Composition of human milk:

Extensive studies have been carried out on the chemical composition of breast milk secreted by undernourished Indian mothers from different parts of the country. The results of these studies have shown that while the concentrations of protein and lactose are very similar to those seen in milks of well-nourished mothers, the concentrations of fat and some vitamins are lower. It was observed that the lower concentrations of vitamins seen in the milk of undernourished mothers could be raised to normal levels by supplementing such women with the appropriate vitamin, indicating that the low concentrations were reflections of low dietary intakes by the mother. Concentrations of calcium and iron in breast milk were found to be within normal range. When mothers were given supplements of these two nutrients, the concentration of these minerals in breast milk showed a significant fall. The reason for this fall is, however, not clear.

It is not uncommon to see mothers who are still breast feeding, to become pregnant, but continues to nurse the baby. Studies on such women have indicated that with advancing pregnancy, there is marked reduction in the volume of milk, but that there is a considerable increase in the concentration of protein and vitamin A. That this is not due to a simple process of concentration has been shown by the observation that the other constituents in milk did not show much changes.

Studies on the effects of duration of lactation on chemical composition have revealed that the mean concentration of total solids, proteins, vitamin A, riboflavin and vitamin C were significantly higher in colostrum and early milk samples as compared to mature milk. Colostrum was also found to be a rich source of immunoglobulins, especially IgA. The concentration of all the constituents decreased in mature milk samples with the exception of thiamine and folic acid both of which tended to show an increase.

Lactation Amenorrhoea:

It has been observed that there is a striking difference with respect to the duration of lactation amenorrhoea between women belonging to the low income groups and those belonging to the well-do-do groups. While about 20% of mothers from well-do-do groups resume menstruation within three months after delivery, this figure is negligible for the low income group. By six months, 82 % of well-to-do and only 8% of poor mothers start their cycles. By 12 months, the corresponding figures are 100% and 45%. Though a variety of factors may be responsible for the resumption of menstruation, the delay in onset of menstruation in women of the poor income groups may have a nutritional basis and be the effect of poor dietary intakes. Alternatively, early cessation of lactation in the well-to-do mothers may be responsible for early resumption of menstruation.

The results of these studies clearly indicate that the dietary intakes and nutritional status of many women belonging to the poor income groups in our country during pregnancy and lactation are far from satisfactory. Many women enter pregnancy in an already undernourished state, and the continuing malnutrition during this period of physiological and nutritional stress has an adverse effect not only on her, but on her infant. The same

is true of lactating women too. In view of the recent findings that malnutrition during intrauterin growth of the foetus and during early infancy, may have long lasting effects on subsequent growth - priority should be accorded to programmes directed towards improvement of the nutritional status of these vulnerable segments of the population.

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For more copies write to:

Voluntary Health Association of India
C-14 Community Centre
Safdarjung Development Area
New Delhi 110 016

MATERNAL AND CHILD HEALTH
SCHEME FOR PROPHYLAXIS AGAINST BLINDNESS IN CHILDREN CAUSED BY VITAMIN 'A' DEFICIENCY

FAMILY PLANNING PROGRAMME

FOURTH FIVE YEAR PLAN

Technical Information : MCH No. 2

1. MATERNAL AND CHILD HEALTH— THE CONCERN OF FAMILY PLANNING PROGRAMME

The family planning programme is vitally concerned with promoting the health of mothers and children. While it advises the couples to limit the size of their family to 2 or 3 children it also takes measures to promote the health of those few children. With this end in view, family planning programme has provided funds for schemes for prevention of diseases and promotion of health among mothers and children. One of them is the scheme for controlling blindness among children caused by vitamin 'A' deficiency.

2. VITAMIN 'A' DEFICIENCY AMONG CHILDREN—A PROBLEM

Vitamin 'A' deficiency is widely prevalent in the country, specially amongst the pre-school-age children. Surveys carried in the southern and eastern parts of the country have revealed that at least 30 to 50 per cent of all children in the pre-school age-group have eye manifestation as a result of vitamin 'A' deficiency. The most severe form of vitamin 'A' deficiency - keratomalacia - causes softening and necrosis of the cornea of the eye leading to complete blindness. It has been estimated that not less than 12,000 to 14,000 children go blind in the country every year as a result of keratomalacia. The economics of such malnutrition is of great significance in view of the large amount of money which has to be invested in the rehabilitation of these handicapped children in later life.

3. TRADITIONAL MEASURES FOR CONTROL OF VITAMIN 'A' DEFICIENCY

In the past, the control of vitamin 'A' deficiency has been linked with the general improvement of the nutritional status of the population. Nutrition education of mothers to persuade them to include foods rich in vitamin 'A' like green leafy vegetables in the diet of young children has been of some benefit. However, the recent findings that protein malnutrition accentuates vitamin 'A' deficiency and that these two deficiencies exist hand in hand is another complicated problem. Both protein-caloric malnutrition and keratomalacia are found to be common in the southern and eastern parts of India.

Another measure implemented through the health agencies is the distribution of vitamin 'A' and 'D' capsules and codliver oil through the Child Welfare Clinics of medical and health institutions. For such supplementation to show results the child should be given at least one capsule of vitamin 'A' and 'D' twice a week. Our past experience has shown that it is difficult in the rural areas to ensure that the mothers administer these capsules regularly to their children to prevent the development of deficiency of the vitamin. As a result of these lacunae, no significant impact has been produced on the incidence of keratomalacia in the country.

4. A NEW APPROACH

Recent studies have shown that oral administration of a large dose of 2 lakh I. U. of vitamin 'A' in oil every six months can protect children from developing keratomalacia. The studies have shown that vitamin 'A' given by mouth is readily absorbed and stored in the liver from where it is gradually released for utilisation in the tissues. Unlike many of the vitamins, vitamin 'A' is not excreted in the urine and this is an advantage. No toxic manifestations have been observed in connection with the use of vitamin 'A' in the dosage mentioned above. In the shape of implementation this measure can be equated with prophylactic inoculations.

5. PLAN OF OPERATION

Rupees forty lakhs have been provided for the scheme in the Fourth Five Year Plan budget in the Central sector. Supplies of vitamin 'A' are procured by the Department of Family Planning and distributed to the State Health Departments, the cost of the drug being adjusted as a grant. The State Family Planning Officers who are responsible for the administration of the programme have to place indents on the Government Medical Stores Depot, Bombay, for obtaining their supplies. The Medical Stores Depot would send the supplies to the District Officers concerned.

6. SELECTION OF AREAS

The State Nutrition Officers would select the areas of maximum prevalence of keratomalacia based on the nutritional status surveys conducted by them. In view of the limited financial resources the programme for the present would be confined to such areas

identified for this purpose. As far as possible all the children in the age group 1-3 years should be covered during the first year of the programme. These children should get the benefit of the programme till they reach five years of age.

7. AGENCY FOR ADMINISTRATION

The existing maternal and child health and family planning organisations would be responsible for administration of the programme. In the urban areas the programme should be administered through the child welfare clinic of the urban family planning centres, general hospitals, maternity homes, etc. It has to be ensured that there should be no risk of repeated administration of the drug. Therefore, in such institutions the vitamin 'A' should be administered only through the child health clinic and not through the general out-door department of the institutions.

In the rural areas the programme would be implemented through the primary health centres and its sub-centres under the supervision of the medical officer. The auxiliary-nurse-midwife and the family planning health assistant working in the primary health centre would have the immediate responsibility for administering the drug to the children. The drug has to be put into the mouths of the children by the workers themselves.

As coverage of the entire age-group and avoidance of repeated administration of the drug are of great importance, it is desirable to fix a specified period for administering the programme. For example, the primary health centre/ urban MCH centre may decide to cover all the eligible children during the month of September 1970 and complete the administration of the drug during the period of one month; the administration of the next dose to these children as well as new children to be included, would then have to be done in the month of March 1971 only. Adoption of such a strategy would go towards effective implementation of the programme and lessen the load on the ANM/FP health assistant who are multipurpose workers with various other responsibilities. The children could be collected at the sub-centres or in other suitable places or contacted in the homes according to convenience.

8. DOSAGE AND MODE OF ADMINISTRATION

The vitamin 'A' preparation supplied has a strength of 1 lakh I.U. of vitamin 'A' per 1 ml. The recommended dose is 2 lakhs I.U. of vitamin 'A' or 2 ml. of this preparation to

be given by mouth. The administration should be repeated every six months till the child is five years of age.

Vitamin 'A' preparation has a relatively short-shelf life of about 15 months. Proper precaution should be taken about the storage and use of the drug before the date of expiry indicated on the lable.

9. HEALTH EDUCATION

The community should be prepared both through individual and group approach on the problem of vitamin 'A' deficiency and the advantages of the prophylactic programme envisaged.

10. EVALUATION

The base line survey at the commencement of the programme and repeated surveys at periodical intervals would be necessary. A small representative sub-sample from each State would have to be chosen for these surveys. The assistance of the National Institute of Nutrition, Hyderabad, could be taken in conducting these surveys.

11. RECORDS

Child health records as prescribed by the State Health Department should be maintained in respect of the children covered under the programme and the dates of administration of vitamin 'A' noted thereon. In addition, a register showing the particulars of the children covered and the receipt and issue of vitamin 'A' supplied should be maintained in the proforma at *Appendix-I*.

12. REPORTS

Monthly reports on the number of children covered and the position regarding the receipt and issue of the drugs should be furnished by the individual institutions to their supervising authority. Consolidated monthly reports should be sent by the State Family Planning Officers so as to reach the Department of Family Planning by the 15th of next month in the proforma at *Appendix-II*.

APPENDIX I

(A) REGISTER OF BENEFICIARIES UNDER THE VITAMIN 'A' DEFICIENCY PROPHYLAXIS PROGRAMME

Sl. No.	*Date of Registration*	*Child Card No.*	*Name*	*Address*	*Age*	*Date of Administration*	*Remarks*	*Initials of the Worker*
(1)	(2)	(3)	(4)	(5)	(6)	1 | 2 | 3 | 4 , 5 | 6 | 7 , 8 | 9 | 10 (7)	(8)	(9)

(B) STOCK REGISTER OF RECEIPTS AND ISSUES OF VITAMIN 'A' LIQUID

Date	*Receipt*	*Issue*	*Balance*	*Remarks*	*Initials*
(1)	(2)	(3)	(4)	(5)	(6)

APPENDIX-II

PROPHYLAXIS AGAINST BLINDNESS IN CHILDREN CAUSED BY VITAMIN 'A' DEFICIENCY

Report for the month ending.....197 .....for the State of.....

(A) STATEMENT OF BENEFICIARIES

Category	*Age of children (year)*	*No. covered during the month*	*Progressive total for the year*	*Remarks*
1) Children given 1st dose	1—2 2—3 3—4 4 - 5			
	(Total 1-5 years)			
2) Children given 2nd dose	1—2 2—3 3—4 4—5			
	(Total 1-5 years)			

(B) POSITION REGARDING THE RECEIPT AND ISSUE OF THE DRUG

Opening balance on the 1st day of the month in millilitres	*Receipt during the month in millilitres*	*Issued during the month in millilitres*	*On hand on the last day of the month in millilitres*	*Remarks*
(1)	(2)	(3)	(4)	(5)

Age break-up of children may be given. If the break-up is not available then the total children in 1-5 years age group should be given,

Place.....Date..... Signature.....Designation.....

VOLUNTARY HEALTH ASSOCIATION OF INDIA
C-14, Community Centre, Safdarjung Development Area, New Delhi-110016
Phone : 652007, 652008 Telegrams : VOLHEALTH New Delhi-110016

B-41

COMMUNITY HEALTH CELL
47/1, (First Floor) St. Marks Road
BANGALORE - 560 001

VITAMIN A DEFICIENCY

Kamala S. Jayarao*

Vitamin A deficiency in pre-school children is yet one more nutritional disorder of public health importance in many developing countries. It – contributes to a significant proportion of preventable blindness, a self-explanatory tragic situation. Some ophthalmologists in India – believe that the problem of blindness due to cataract is seen in a a greater proportion and hence demands greater attention than vitamin A deficiency. However, in my opinion, such problems should not be viewed with a statistician's mind. Cataract is a disorder of adulthood whereas hypovitaminosis A has its peak between 1 and 10 years of age. Thus young children become blind before they can see anything of the world and become a socio-economic burden. It is hence that vitamin A deficiency should be looked upon as a public health problem.

Vitamin A deficiency, like other nutritional disorders of childhood, is seen mainly in the poorer classes and is mostly due to inadequate intake of foods rich in vitamin A. As in the case of PCM (Protein Calorie Malnutrition), the foundations for vitamin A deficiency may be said to be laid down during foetal life itself. The intake of vitamin A by pregnant mothers of the poorer classes is very low and their serum vitamin A levels are also low[1, 2]. They may therefore be expected to transfer smaller amounts of the vitamin to the foetus. The breast milk of such mothers also has low concentrations of vitamin A. The levels being not more than 200 /ug per 24 hours[3]. The infant thus is not only born with low stores of vitamin A but receives low quantities of it during the immediate post-natal life. In spite of this, however, ocular signs of vitamin A deficiency are rarely seen in the first 6 months of life. One may hence believe that this amount of vitamin A is probably adequate during infancy. I say this because as yet there are no techniques by which vitamin A requirements can be reliably assessed.

Beyond 6 months of age the vitamin A intake drastically falls because

(1) the breast milk output diminishes

(2) the infant does not receive any extra milk (either animal or formula made)

(3) the weaning foods being largely based on cereals contain virtually no retinol and only small amounts of B-carotene.

As you are all aware retinol is found in high concentrations only in animal foods. Plant foods contain only carotenes, of which B-carotene is nutritionally the most important. The absorption of B-carotene is not as good as that of retinol and its biological availability is also poor. Hence 1 /ug B-carotene is equivalent to only 0.25 /ug retinol. Diet surveys have showed that pre-school children in South India receive only 300-500 I.U. vitamin A daily,

* National Institute of Nutrition, Hyderabad-500 007

mostly as β-carotene, through their diets[4,5]. In pre-school children the incidence of ocular signs of vitamin A deficiency is quite high. In children of school-going age, the incidence is higher but the lesions are mainly Bitot's spots and conjunctival xerosis. Below 5 years, corneal xerosis and keratomalacia are more frequent and hence the condition is of more serious concern in this age period. The reason for this age pattern is not known; this may include factors like the severity of the deficiency, requirements for growth, influence of infections and presence of PCM etc. The incidence of vitamin A deficiency in children with kwashiorkor and marasmus is higher than in children with milder degrees of PCM.

Ocular manifestations of vitamin A deficiency.

The first functional evidence of vitamin A deficiency is night blindness. Being subjective, it is difficult to establish its presence in children, but in most cases the mother do notice that the children do not see well at dusk. The conjunctival lesions include xerosis and Bitot's spot. In adults and adolescents, Bitot's spots do not always respond to Vitamin A therapy and hence their association with vitamin A deficiency has been questioned. But in pre-school children they do disappear with therapy and are generally indicative of vitamin A deficiency. The conjunctival lesions do not interfere with vision but may be considered as red signals, indicating the presence of vitamin A deficiency of sufficiently high degree.

Blindness due to vitamin A deficiency is due to corneal involvement - corneal xerosis (the dry, hazy cornea) leading to keratomalacia (necrosis of cornea), the irreversible stage.

Therapy

1. Conjunctival xerosis and Bitot's spots may be treated with oral preparations of vitamin A. Therapy for at least 4 weeks will ensure fair storage of the vitamin in the body.

2. Corneal xerosis can progress rapidly to keratomalacia and must be treated immediately. Since it is necessary fo raise the serum vitamin A levels rapidly, it is not advisable to start the treatment with oral prepararions. Recent studies show that the rise in serum vitamin A levels is delayed when oily preparations are injected[6]. Hence it is advocated that children with corneal xerosis and children with kwashiorkor and vitamin A deficiency be given an intramuscular injection of a water-miscible preparation of vitamin A, immediately on diagnosis and again, 48-72 hours later. This may be followed up with oral therapy; oral therapy should be with oily preparations. Repeated parenteral administration is not recommended for fear of inducing acute hypervitaminosis A.

Prevention

1. The ideal way to control and prevent vitamin A deficiency wouldbe to provide the children with foods rich in preformed vitamin A like eggs, liver, milk and milk products, butter, ghee, etc. However, this being the ideal method, it may not be expected to take shape in the near future.

2. In the present economic circumstances, the next method would be to ensure adequate intakes of β-carotene (1200-1600 /ug daily for children, 3000 /ug for adults and 4500 /ug for pregnant and lactating women). This

entails intake of good amounts of green leaves (beetroot leaves, carrot leaves, arwi ka sag, methi, hara dhaniya, sarson, rajagira, palak, muli ka sag etc.) and fruits (jack fruit, mango, orange, papita, tomatoes, etc). This need vigorous nutrition education to the community. In certain communities, this may call for change in food habits and correction of wrong notions like believing that fruits cause cough and colds or greens cause diarrhoea, etc.

In view of the serious nature of the deficiency, it is necessary that some public health measures be taken for prevention rather than rely on the above two idealistic approaches. McLaren[7] suggested that since the human liver has a large capacity to store vitamin A, massive prophylactic doses of vitamin A may be given to control vitamin A deficiency. Following on this suggestion, the National Institute of Nutrition at Hyderabad had carried out field trials and concluded that oral administration of 200,000 I.U. of vitamin A (as palmitate) every six months during the first 5 years of life, will considerably reduce the incidence of ocular signs of vitamin A deficiency[8]. It was found during this study that 75-90% of the children are protected from developing any sign of vitamin A deficiency and also, no new case of keratomalacia occurred during this period. Following the recommendation of the Institute, 7 States in India had accepted in principle to implement this programme. These States are Andhra Pradesh, Bihar, Karnataka, Kerala, Orissa, Tamil Nadu and West Bengal (these cover the southern and eastern regions where vitamin A deficiency is rampant). The early stages of the trials at Karnataka were followed up by this Institute and the results confirmed the earlier observations[9].

The programme has now been taken up in Indonesia and Philippines, also. I may, however, mention here that not everyone is willing to accept the efficacy of this programme. Dr. Pereira from Vellore (Tamil Nadu) has some reservations regarding this programme [10, 11]. However, a group from West Bengal[12] have conducted a similar study and observed total elimination of night blindness and no new cases of Bitot's spot. In those who already had the latter, the lesion disappeared in only some children. It must be remembered here that in older children and adults, Bitot's spot may not disappear despite vigorous vitamin A therapy. More importantly it must also be remembered that this programme is mainly intended to prevent the development of serious eye lesions which could lead to permanent blindness; this regime may not totally eliminate vitamin A deficiency.

The aqueous preparation of massive-dose vitamin A is made available by the Family Planning Units of the Union Ministry of Health and of the States where the programme is running. It is also supplied by the Anglo-French Drug Company (Pardon me! I have no vested interest; I am only giving you information).

Those of you who are concerned with vitamin A deficiency may also be interested to know that there is an organisation called the Xerophthalmia Club (supported by the Royal Commonwealth Society for the Blind, U.K.). They bring out bulletins which give information on various programmes the world over, aimed at prevention of vitamin A deficiency blindness. The Voluntary Health Association of India has brought out some pamphlets on this subject, in English as well as regional languages, which will be helpful to the paramedical workers. Those interested may write to the following

addresses:

Xerophthalmia Club
Nuffield Lab of Ophthalmology
Oxford, U.K.

Voluntary Health Association of India
C14, Community Centre
Safdarjung Development Area
New Delhi-110016.

The World Health Chronicle (30: 117, 1976) has an article which touches on some of the points discussed here.

References

1. Shankar, K. (1962). Ind J. Med. Res. 50:113.

2. Venkatachalam, P.S. Belavady, B. and Gopalan, C. (1962), J. Pediat. 61: 262.

3. Belavady, B. and Gopalan, C, (1969). Ind J. Med. Res. 47:234.

4. Sunderaraj, R., Begum, A., Jesudian, C., and Pereira, S.M., (1969). Ind. J. Med. Res. 57:375.

5. Rao, N.P., Singh, D. and Swaminathan, M.C. (1969). Ind. J. Med Res. 57: 2132.

6. Srikantia, S.G. (1976). World Review of Nutrition and Dietetics. Vol. 20 (Karger, S., Basle), pp. 185-230.

7. McLaren, D.S. (1964). Nutr.Rev. 22: 289.

8. Swaminathan, M.C., Susheela, T.P. and Thimmayamma, B.V.S. (1970), Amer. J. Clin. Nutr. 23 : 119.

9. Annual Report (Jan 1872 - Dec. 1972). National Institute, Hyderabad, 1973, p.102.

10. Pereira, S.M. and Begum, A. (1969). Amer. J. Clin. Nutr. 22: 858.

11. Pereira, S.M. and Begum A. (1971). Arch. Childh. 46:525.

12. Sinha, DP., and Bang, F.B. (1976). Amer. J. Clin. Nutr. 29: 110.

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Nutrition and Diet (by Dr. V. Gopal, Addl HO BCC)

I Nutrition

II Food - Proximate
- Protein
  - Animal
  - Vegetable
- Carbohydrates
- Fats

III Accessory Foods - Tea, Coffee, Condiments, etc.

IV Supplementary foods - Minerals, Vitamins.

Roughage

Balanced diet
- Age
- Sex
- Work

Pregnancy
Lactation
Sickness

Average Daily requirements

ಮಾತುಬಲ್ಲವನಿಗೆ ಜಗಳವಿಲ್ಲ
ಊಟಬಲ್ಲವನಿಗೆ ರೋಗವಿಲ್ಲ

DIET

D : Dosage (How much to eat)
I : Items (What to eat)
E : Eating habits (How to eat)
T : Timing (How many times)

Protein - Fat 3:1

"Greater the waist line - shorter the life span"

"Not live to eat but eat to live" Napoleon.

Boiling - loss of 14.85% of food value.

ಒಂದು ಹೊತ್ತು ಉಂಡವ ಯೋಗಿ (Saint)
ಎರಡು " " ಭೋಗಿ (Luxury)
ಮೂರು " " ರೋಗಿ (Patient)
ನಾಲ್ಕು " " ಹೊತ್ತುಕೊಂಡು ಹೋಗಿ (death)

Prevention of Protein - Calorie malnutrition.

Measures of Prevention

National measures

1. Improving food supply → Fertilisers
   → Technology
2. Improving economic level
   (More purchasing Power)
3. Improving General Edn.
   (So that people may understand the value of what they are taught)
4. Improving medical facilities especially those Concerned with preventive medicine

e.g:- maternal and Child health Programmes
- under fives' Clinics
- Proper immunisation
- School Health programmes.

Local measures

1. Nutrition & Health Edn. by every Health Worker taking every measure to - Co-operate with Colleagues in edn, agriculture and community development.
2. Focus first on - Community Leaders - School Children
   - Parents of malnourished children during treatment Period.

2. Improvement of preventive health services: e.g.,
   - Immunisations
   - Control of worms
   - Pest Control
   - maternal Child health (MCH) Care

P.T.O

3. Distribution of Protein Rich Foods to malnourished Children (under Supervision)

e.g. Protein-rich foods from Govt Agencies, Charitable organisations, etc, to be distributed to vulnerable groups, with adequate Supervision, e.g. - Medical check-up and weight-height records at suitable intervals to watch progress

Some Causes of Protein-Calorie malnutrition (PCM)

PCM occurs when amounts of nutrients eaten are not sufficient to satisfy the Child's nutritional requirements.

If there is an inadequate Consumption of mainly Protein, Kwashiorkor results

Reasons of PCM: (Any of the following or Combination of reasons)

A. Increased demand.

due to growth
- Parasitic infestation
- fever

B. Inadequate Intake.

- Wrong or poor feeding habits
e.g. more Starch and inadequate vegetable Proteins.

Rice + dal + (watery)

Wrong cycle of food Causes

- no eggs, no fish.

Poverty

ignorance ⟷ Poverty ⟷ Poor Crops.

↓

C. Child may not eat enough

due to
- anorexia - due to illness
- unhappiness
- jealous of new baby
- deprived of mother
- neglect
- infrequent bulky Starchy meals
- Soreness of mouth in eg. - thrush
- measles
- Vit. deficiency

Code N-2

Teaching Nutrition to Mothers

Helen Laugesen

Summary

When planning nutrition education consideration should be given to the audience or the people who are to be taught. The correct material, presentation and illustrations can only be prepared when there is knowledge of the people who will listen to and respond to the teaching. Attention has to be given to the message which is to be given to the audience. The content of the message is only decided after the audience is studied. It is largely determined by the needs of the audience and by the resources of the audience. Finally the medium to be used for teaching is important. The best medium for teaching nutrition is the one most likely to convince people. One of the most successful ways of convincing people that certain food would be good to eat is to give a feeding demonstration.

1. *The audience*

1.1 *Study who are the people to be taught*

Questions such as these below should be asked so that there is good understanding of the people who are to be taught:

Where do they live?
How much do they earn?
How much can they afford to spend on food?
Is their diet good or bad?
What changes if any should they make in their diet?
What are their food customs - things such as hot and cold

food, special diet given to pregnant women and nursing mothers?

Can they afford to make any changes which we consider necessary?

1.2. *Study which people most need nutrition education.*

Ask who are the people most often malnourished, and who most often die of malnutrition. These are the children under five years. One third of children under five suffer from malnutrition (1) At least one third of the children who die under five are malnourished before they die. (2)

1.3. *Study the nutrition problems of children under five.*

When a baby is five or six months old his mother's milk no longer provides enough food.

Many mothers do not give soft foods by the time the child is six months old. (3)

About half of children under 5 are anaemic. (4)

Increasing numbers of mothers bottle feed their babies. Bottle fed babies often get diarrhoea and they sometimes die. (5)

When children are ill many mothers stop giving food and water.

2. *The message.*

2.1. *It should be directd at the problems*

Teach the remedies for the problems which cause malnutrition in children under 5. For example, children start to grow less well at the age of 4 or 5 months. This is because mother's milk no longer provides enough food for the child. The remedy is to teach parents that soft foods should be given to the child from four months of age. As well as this breast feeding should continue for as long as possible.

2.2. *The teaching should be appropriate and relevant*

People in low income groups cannot afford expensive food. Foods which are not expensive and are high in calories are recommended. It is not relevant to advise these mothers to start giving orange juice when the child is four months old. It is relevant to tell mother to roast some ragi or maize or wheat and grind it, then cook it with water and a little gur, and feed this porridge to the child.

2.3. *The message must be clear and easily understood.*

It is confusing to tell the mother to give her child 60 grams of rice a day. It is clear if we tell the mother to give her child one katori of rice everyday.

It is better to advise normal household foods as much as possible, and avoid special recipes.

2.4. *Some basic messages which should be taught.*

Rules for child care.

1. Breast feed your child for as long as possible.
2. Start to feed your young child soft food when he is four months old.
3. Feed your young child five or six times a day.
4. Continue to feed your child when he is ill.
5. Give your child extra water when he is ill, especially if he has diarrhoea.
6. Seek help from the nearest health centre quickly when your child is ill.
7. Get your child immunised.
8. Keep flies off food.
9. Wash your own and your child's hands before feeding him.
10. Give your child clean water to drink.,
11. Give your child dark green leafy vegetables to eat daily (6).

Rules for pregnant women

1. Eat your normal diet but eat more than usual.
2. Eat dark green leafy vegetables every day (6).

3. Visit the health centre in the last three months of pregnancy.
4. Protect yourself from tetanus by getting injections of tetanus toxid.
5. Prevent anaemia by taking daily iron tablets during pregnancy.
6. At the time of delivery have the help of a trained dai or ANM who washes her hands before she does an internal examination.
7. For delivery have a helper who cuts the cord with an instrument which has been washed and help in a flame.

Rules for mothers

1. Feed your baby breast milk from the first day. Don't throw away the first milk.
2. While breast feeding your child eat your normal diet but eat more food than usual.
3. While breast feeding your child eat dark green leafy vegetables daily (6).
4. Have no more than two or three children.
5. Have two or three years space between children.

3. *The medium—how the message is taught*

3.1. *Demonstration—feeding a child*

This is an excellent way of teaching mothers that small babies really can eat soft foods. Cereal porridge should be prepared in the clinic and a number of babies fed this food. This helps to convince the more sceptical mothers. It is not sufficient to give a cooking demonstration. Mothers need to see small babies accepting food.

3.2 *Flash card, flip charts or flannel graphs*

These are used to repeat the teaching which is given in the feeding demonstration. Local people can be trained to this work. It is not necessary for the busy ANM to do this. In some places illiterate volunteers have been trained to do this very well.

3.3. *The weight chart and weighing scale.*

The worker weighs the child and writes the weight on

the graph of the weight chart. Both the worker and the mother can see if the child is healthy or if he is malnurished by studying the weight chart. The worker talks to the mother about what the child is eating. She advises an improved diet. This is a good opportunity for nutrition education.

4. *Nutrition Rules for health workers.*

1. Ensure that staff talk to mothers with respect.
2. Teach the Rules for child care to every mother.
3. Have a little soft food ready for giving feeding demonstration in every clinic. A local volunteer can be trained to assist with this.
4. Register and care for every malnourished child in your area, not just the ones who come to clinic.
5. Educate community leaders as well as mothers.
6. Weigh every child and tell his mother how the chiid is doing.
7 Give every mother a child growth chart and chart the child's weight.
8. If weighing is impossible measure the upper arm circumference. It should be more than 13.5 centimetres (or 5-1/4 inches).
9. Always look at the lips for anaemia. Explain what is seen to the mother.
10. Ensure that iron tablets are always available at low cost.
11. Ensure that DPT vaccine is available at lowest possible cost.
12. Do not advise mothers to stop breast feeding.
13. Do not advise medicines and foods which mothers cannot afford.

References

1. Shah, P.M., 1973 Progress report of WHO Aided Project on "Domiciliary Treatment of Protein Calorie Malnutrition" at Palgar, page 3.
2. Shah, P.M. and Udani, P.M., 1969 Ind. Patd. Vol. 6;762.
3. Studies on Weaning and Supplementary Foods, 1974; page 14, Indian Council of Medical Research (ICMR).
4. Gopalan, C. and Raghavan. K.V., 1971 Nurition Atlas of India, page 71, ICMR.
5. Ghosh, Shanti, 1976. The Feeding and Care of Infants and Young Children, page 37. UNICEF.
6. Ibid, see page 37, many dark green leafy vegetables have high quantities of calcium, iron, Vitamin A and Vitamin C.

Relevant Health and Nutrition Education*

by J.P. Greaves, Sr.Programme Officer, UNICEF
and
G. Donoso, Regional Nutrition Adviser, WHO

The first point to make about education - any kind of education - is that it occurs always in a context. The context with which this paper is concerned is that of rural India, and the slums of the big cities. In other words, with over four fifths of the population. But the general content of the paper is applicable to most developing countries. The emphasis is on the poorer sections of the community, and on women and children. Why? Because this is where the need for health and nutrition education is greatest, where it is most urgent, and where success can bring largest returns in terms of improved health and wellbeing.

The second point to make about education is that it must be relevant - relevant to the context in which it is given. It is necessary to examine the context a little more closely. India still has one of the highest infant and child mortality rates in the world: comparative estimates are, for infants below 12 months, 100 to 130 per 1000 live births; for children aged 1 to 4, 45 per 1000 children in the age group; corresponding figures for Western Europe or North America are 15 and 1 respectively.

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* Based on a paper prepared for a Workshop on the Role of Home Science Colleges in Group Feeding Programmes, New Delhi India; April 1976.

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The reasons for this are well known: ignorance, often compounded with superstition about the nature and amounts of foods to be given to young children, coupled with an unsanitary environment in which infectious diseases flourish, both nurtured by poverty. This leads to a mutually exacerbating syndrome of malnutrition and disease, especially diarrhoea and respiratory infections, which commonly ends in death. Large families, and especially closely spaced families, further aggravate the problem.

Health and nutrition education must be relevant to this context. It must therefore be concerned with the nature and amounts of foods to be given to young children, both in sickness and in health; with simple means of preventing and coping with infectious disease, and with the principles and practice of personal and environmental hygiene. Above all, it must be directed at correcting an attitude, a behavioural pattern, which is known to be of decisive importance in the genesis of malnutrition and associated infections. Education in this context should not be concerned to impart "knowledge" for its own sake; should not relate to "nutrition" generally; should not be directed to marginal or non-existent problems (for example, undue emphasis on fruit juices where there is no scurvy). Rather, it should be aimed to effect change in attitude and behaviour in areas known to be crucial to the development of malnutrition in the context in which it occurs. The messages to be imparted must be based on a sound knowledge of the local human ecology.

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A vital point to apprehend is that, for the first two years of life, which is by far the most vulnerable period, the child is totally dependent on others - usually its mother - for what it is given to eat and drink. This point is so obvious that it deserves to be stressed. There is a natural tendency to overlook the importance of a fact so simple. But this fact is the reason why the problem of malnutrition in this age group is unique. There is no way of circumventing the need - the essential need - to improve the understanding and practice of mothers in this regard. Older sisters, cousins, aunts are important too; nor should one forget the father. Perhaps the person with the greatest influence is the grandmother.

There are some who believe that economic progress alone will improve this situation. They are wrong. One does not have to point to the nutritional problems - of a very different kind - of affluent societies to substantiate the statement that they are wrong. There is evidence from Indian studies that the incidence of malnutrition in children under 2 is largely independent of the income of the family. Some argue, in the jargon of economics, that improvement in income is a necessary and sufficient condition for the elimination of malnutrition. But whatever real improvements an increase in income may make to the diet of the family as a whole, it will have little effect on the child below 2 unless the mother's understanding of the child's needs is also improved. Nor is an increase in income always necessary: a redistribution of the family's available food so that the child below 2 gets an amount approaching its physiological need may make the difference between life and death to him, but only a marginal difference to the other family members.

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To illustrate the relevance of context, one could turn to a situation in many respects the opposite of the one with which this paper deals: Britain in the seventies. An article discussing what would be appropriate nutrition education for the mass of people in Britain today, where the major manifestation of malnutrition is obesity (especially disturbing in the young), concludes as follows: "... sensible eating for many people in Britain today implies an increase in consumption of fruits and vegetables and of bread (especially wholemeal bread); little change in consumption of milk, cheese and meat (but avoidance of their fat), and perhaps increased consumption of fish; and reduced consumption of fats and oils (except those rich in poly-unsaturated fatty acids which might even be increased), of sugar and sugar-containing foods (such as cakes, biscuits and pre-eminently sweets), and of alcoholic drinks. But above all, sensible eating implies moderate eating: restraint in the quantity, though not in the variety, of foods consumed."

Advice similar to this may indeed be appropriate for affluent India, but the number of people for whom it would be relevant, while in absolute terms far from negligible, represents in fact a relatively small proportion of the total population. For the mass of the people - the subject of this paper - quite different messages have to be conveyed.

Bearing in mind what has been said above about the preponderant Indian context, the following six groups of messages have a universal validity:

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Health and Nutrition Education: the Six Universal Groups of Messages

1. Breast feed your child always and as long as possible. Remember, however, that from 4 months of age onwards he must receive extra food at least 4 times a day. Keep in mind that the child depends on you to get the food he needs.

2. Feed your child only clean food and clean water, given with clean hands from clean utensils. Keep flies away from food.

3. Should your child fall ill, seek immediate help from available services. If diarrhoea (with or without vomiting) sets in, give your child immediately and repeatedly sugared water or weak tea. Diarrhoea can kill your baby because he loses more water than you give him. Try your best not to reduce his food intake.

4. Get your child immunized. Get your child weighed. Remember that an immunized child, who is growing well, is a healthy child.

5. If you are expecting or nursing a child you should eat more, at least 4 times a day, with plenty of dark green or yellow vegetables. You need more food to produce a healthy baby or enough milk.

6. Two or three healthy children are enough. Space your children for your own and for their sake at intervals of 2 to 3 years. Remember that today you can have your children when you want.

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The justification for these messages is briefly as follows:

Message 1 (a) Breast feeding is virtually universal in the rural setting but is starting to decline in the slum areas of the big cities. The breast feeding component of this message will have to be emphasised or not according to the rural/urban environment. Recent work has confirmed that breast feeding does reduce the chances of conception: this in itself is an important reason for prolonging it.

(b) A low total calorie intake is at the very root of child malnutrition. Inadequately fed nursing mothers do not produce enough milk to fulfill the child's requirements for calories and protein from the 4th month onwards. There is much evidence to show that poor rates in growth, that eventually lead to malnutrition, become evident in a considerable number of children from the 3rd or 4th month of life. Supplementary feeding is essential, and should be done regularly in increasing amounts from the 4th month onwards. The extra amount of food needed cannot be got into the child in one or two meals: four times a day is probably adequate under village conditions.

(c) The young child is dependent on its mother for feeding, as emphasised above.

Message 2 Faecal contamination of food and consequent diarrhoea are nearly always associated with malnutrition. This message aims at preventing such contamination.

Message 3 (a) Health services offer only limited coverage in India. However, even if the services are available,

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people may not readily make use of them. The idea of making use of whatever health services are available should be a component of nutrition and health education.

(b) Diarrhoea is inextricably tied to malnutrition in children under 2 or 3 years of life. The treatment and prevention of diarrhoea is very poorly understood by mothers and very inadequately handled through traditional practices and beliefs that emphasise prolonged restriction of both water and food. This wrong emphasis enhances the production of dehydration which is the main killer of the malnourished baby. Early oral rehydration can be a most effective tool in the control of dehydration due to diarrhoea in the malnourished child. Prolonged food restriction is in itself a mechanism in the production of malnutrition and all efforts should be made for an early normalization of the diet in the child that is suffering from diarrhoea.

Message 4 (a) Infectious diseases such as tuberculosis, whooping cough, diphtheria and measles are very important contributory factors in malnutrition. By promoting immunization, we are in fact promoting better nutrition.

(b) By getting the child weighed at periodic intervals an early warning that the child is not progressing adequately, or that his nutritional condition is deteriorating, can be obtained and remedial action initiated.

Message 5 (a) Poorly nourished mothers will produce small babies of lower vitality and insufficient breast milk. Both factors conspire against good nutrition in the child. The

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number of meals per day is critical to the total amount of food intake of mothers, needed to fulfill their calorie requirements, and four meals per day should be considered a minimum for the nursing and expectant mother.

(b) Yellow and green vegetables in the diet of mothers are especially important where there is a problem of xerophthalmia. In such areas the diet of children up to 5 years of age should also contain a supply of these vegetables.

Message 6 The more children in the family, the less food available per head. This can become critical for children under 2 or 3 years of age in families that have 4 or more children. The last-born is prone to malnutrition not only as a result of an insufficient diet after birth, but also through his mother during his intra-uterine development and growth. Spacing the children will promote a better nutritional status of the mother which will reflect persistently on that of the child she bears and nurses.

It is worth noting that none of the nutritional components of these messages - or, for that matter, of the ones considered relevant for Britain - makes specific mention of nutrients as such. There is no need to talk to people about protein, riboflavin or carotene; but there may be every need to encourage them to consume, for example, more dal, curd and drum-stick leaves, and to feed these, appropriately prepared, to their young children. It is absurd to talk about milligrams of this or that vitamin; sensible to talk about homely measures of this or that food. It is

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doubtful if it is very useful to talk in terms of groups of foods, as is conventionally done in a number of "systems": foods have been classified in 3, 4, 5 or as many as 9 different "groups", with exhortations about including examples from every group in each meal. More useful to start by observing habitual practice; note what is good in this, and emphasise it; and then suggest practical and quite specific ways in which practice can be improved - for example, about age at which semi-solids and solid foods are introduced, about ways in which foods are prepared, about frequency of feeding, and about particular foods that are (or could become) readily available and could be used to supplement the diet. No point in lauding the virtues of eggs if these are beyond the economic means of those one is attempting to help! No point in demonstrating how vegetables and fruits may be conserved with the aid of a pressure cooker and Kilner jars if these represent wealth beyond the dreams of avarice! (These and other examples in this paper, of inappropriate - i.e. irrelevant - education are not figments of the imagination: all have been observed in the field).

What is being advocated is simply the translation of the six universal groups of messages into practical and quite specific advice, relevant to each situation. "Extra food", and "dark green or yellow vegetables", means something different in South India to what it does in North India. Or in Africa. What is the local cereal? What are the pulses or oilseeds locally available? How can these best be prepared for young children? How much, and how often, can they be fed? Which green or yellow vegetables are already available, or could be grown in so-called kitchen or community gardens?

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How should they be prepared and included in the diet? What are the unusual but often nutritionally valuable food supplements that commonly feature in the diets of tribals, and consumption of which should be encouraged - and perhaps introduced in larger quantities, at an earlier age than tradition dictates? What is the local source of water, and how can it be made more "clean" for drinking? Given the economic circumstances of the people, the local availability and price of foods, the nature of food supplements that may be available (for example, from a food-for-work programme), what is the wisest pattern of food expenditure?

The answers to such questions clearly call for homework on the part of the would-be health and nutrition educators - or, to give it a more pompous term, research. Research has been defined as, firstly, the identification of a problem, and secondly, the search for a solution. Relevant problems can only be identified by studying the life of the people, not the literature of fellow-workers. Colleges of Home Science, amongst other institutions, are in principle well equipped for such research. Research of this kind is just as intellectually demanding as the more academic kind, and often very much more useful. It requires a certain humility on the part of the workers - they should not project their own problems (for example with respect to hang-ups about breast feeding), but enter sympathetically into those - recognised or not - of the people. Such research must recognise that solutions to problems, if they are to be effective, must be simple - and simplicity to the pseudo-sophisticated is suspect. It must be concerned not only with the messages to be conveyed, but equally with the

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means by which they are to be communicated. It requires persistent monitoring - or follow-up - to ensure that relevance is maintained. And finally it requires a constant concern for application of its results, and the recognition that this can be only fully achieved at second-hand: that success can only be realised if local community workers are trained to deliver the messages, with the Home Science College or other Training Institutions acting as an authoritative resource, stimulus and guide.

All those involved should constantly remember that their objective should be to promote relevant changes in behaviour, and that success, if it is to endure, will depend on a conviction by the people that they "have done it themselves". Lao-tzu, a Chinese philosopher, wrote thus about leadership more than 2500 years ago:

"Of the best leaders
the people only know that they exist:
The next best they love and praise;
the next they fear;
And the next they revile,
When they do not command the people's trust,
Some will lose faith in them,
And then they resort to recriminations!
But of the best, when their task is accomplished,
their work done,
The people all remark, 'We have done it Ourselves!'"

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What is a nutrient–requirement ? The requirement for a specific nutrient is defined as the smallest amount of that nutrient that will ensure a good state of health. This will however, vary from person to person. Therefore, nutrient requirements are set down as recommended dietary allowances (RDA). These levels are believed to 'meet the known nutritional needs of almost every healthy person.' By experimental procedures, the highest requirements in a population are assessed, some further allowances are added and the RDA for each nutrient is fixed. Thus for many individuals the RDA will be higher than their actual requirement. No person need take more than the suggested RDA. The RDA for various nutrients have been fixed by international organizarions like the FAO and WHO[3] and by various national bodies including the Indian Council of Medical Research[4].

I was interested to know how some of the commonly available vitamin preparations fare when compared to the RDA suggested by the ICMR. *Table I* shows the RDA for some nutrients, for various physiological groups. For specific reasons, I have not taken the RDA for infants and children but in absolute terms these values will be less than those for adults. In *Table II*, I have presented the quantities of various vitamins purported to be present in each commercial preparation. It is however not the complete formula of the preparation. I have taken only some important vitamins into consideratoin. The list is by no means exhaustive. I culled them from some recent issues of the Journal of the Indian Medical Association. They are marketed by leading pharmaceutical companies.

In the process of this search, I came across an interesting or disturbing feature, depending on how you wish to perceive it. Many advertisements do not say what ingredients the preparation contains, leave alone their quantities. Many inform you that the preparation is a unique formulation of **generous** amounts of vitamins or that it is a vitalizer with **balanced** amounts of vitamin (Incidentally, IDPL is one of them). The advertisement merely proclaims the efficacy of their product in specified condition. There is one advertisement by a leading company, which reveals nothing about the formula but claims that it is good for memory ! It contains nothing but vitamins B_1, B_6 and B_{12}. The companies are probably cocksure that the physician will rely more on their advice than on his own judgement (and they are dead right).

This lack of needed information is one of the reasons why *Table II* does not have more preparations listed. But this is ample for what I have to say. There is also no reason to believe that those which escaped inclusion would be any different.

The RDA for any nutrient is the amount which if taken regularly will ensure that a deficiency state of that nutrient will not develop. For example if a sedentary, house–wife takes 1.0 mg riboflavin daily, she is expected not to develop riboflavin deficiency. As I said earlier, 1.0 is the highest level and most can afford to live on lesser amounts. The situations which are under discussion now, are considered to be defieiency states of mild or moderate degree. The individual might have depleted levels of the nutrient and **may need** higher amounts than the RDA. What

Table–I **Recommended Daily Allowances***

	Thiamine (B_1) mg	Riboflavin (B_2) mg	Nicotinic acid mg	Pyridoxine† (B_6) mg	Folic acid mg	Vitamin B_{12} mcg
Man :						
Sedentary	1.2	1.3	16	—	0.1	1
Moderate	1.4	1.5	19	1.4	0.1	1
Heavy work	2.0	2.2	26	—	0.1	1
Woman :						
Sedentary	1.0	1.0	13	—	0.1	1
Moderate	1.1	1.2	15	2.0	0.1	1
Heavy work	1.5	1.7	20	—	0.1	1
Adolescents :						
13–15 yrs	1.1–1.3	1.2–1.4	14–17	1.6	0.1	0.5–1
16–18 yrs	1.1–1.5	1.2–1.7	14–21	1.8	0.1	0.5–1
Pregnancy (Second half)	1.2–1.7	1.2–1.9	17–22	2.5	0.15–0.3	1.5
Lactation	1.4–1.9	1.4–2.1	18–25	2.5	0.15	1.5

* Taken from reference 4

† Taken from RDA of Food and Nutrition Board, U.S.A. 1968.

should this higher level be ? For acute and severe states like beri-beri or keratomalacia text-books prescribe doses, empirically arrived at and found to bring quick relief. These are usually much higher than what would be required even for that degree of amelioration. *Table III* shows the prescribed therapeutic doses, as obtained from various standard books on nutrition and medicine.

For chronic, moderate deficiency states or for situations where vitamins are prescribed empirically, we may assume that levels much lower than the therapeutic doses and slightly higher than the RDA should be enough. Let us be generous and double the RDA, remembering that the patient does receive a certain amount from his diet too. With this information I would like you to critically compare *Table II* with *Tables I* and *III*.

Much of the time drugs are not prescribed according to any therapeutic schedule. They are usually prescribed as ' 1 dose or 1 tablet, three times a day '. Items No. 1-4 in *Table II* are close to the RDA with respect to vitamins B_1 and B_2. Given as per the above mentioned schedule they supply 2-4 times the RDA, and it was argued above that double the RDA should be enough in moderate or doubtful deficiency states. We must also remember that when a diet is considered to be low in a nutrient, it is not totally lacking in that nutrient. The average diets of the low socio-economic groups provide 0.5 to 0.8 mg each of B_1 and B_2. Items 7-9 provide about 5-25 times the RDA in a single dose. If even such preparations are prescribed thrice a day, the intake would be 15-75 times the RDA. Item 8 in a single dose supplies thiamine in a quantity prescribed for the whole day in beri-beri ? Moreover in beri-beri it is not necessary to prescribe very large amounts of other vitamins. Thus preparations like 8 and 9 are not necessary at all.

An argument may be put forward that since water-soluble vitamins are harmless compounds there is no necessity to raise a hue and cry about the dosages prescribed. This is no doubt true but, ' such practice is economically wasteful and in some instances, causes financial hardship '[1].

Table-II Composition of some multivitamin and haematinic preparations available in India.

	1 Capsule	2 Cap.	3 5 ml.	4 5 ml.	5 Cap.	6 Cap.	7 Cap.	8 Cap.	9 Cap.
Vitamin B_1 mg	1	2	1.0	1.6	3.0	5	10	50	20
Vitamin B_2 mg	0.5	2	0.75	0.8	1.0	2	10	25	5
Vitamin B_6 mg	0.6	1	0.15	0.8	0.5	1	5	10	2.5
Niacin mg	4	..	7	4.0	30.0	10	100	100	100
Vitamin B_{12} mcg	2	..	0.45	2.5	5.0	5	5	5	5
Folic acid mg	2	..	...	..	..	1	...	0.5	1.0
Vitamin C mg	..	50	..	..	..	50	200	300	100
Iron	..	Sulp.	F.A.C	Gluco.		Sulp.	Sulp.		
(Type of salt) mg		150 timed release	185	35		200	41		
Vit. A. I.U.	..		250				25000		10000
Vitamin D. I.U.	..	..	90				1000		1000

Table-II (Contd)

	10 5 ml	11 Cap.	12 Cap.	13 Cap.	14 5 ml.	15 5 ml.	16 Cap.	17 3. ml I.M.	18 5ml. I.M
Vitamin B_1 mg				..				100	100
Vitamin B_2 mg				..				..	..
Vitamin B_6 mg				10				27.5	25
Niacin mg				..				..	..
Vitamin B_{12} mcg	25	25	15	50	7	15	25	1000	500
Folic acid mg	2.5	2.0	2	2.5	1.75	2	2.5		
Vitamin C mg	..	200	150	100	..	..	..		
Iron (Type of salt) mg	Colloidal oxide 100	Fuma-rate 350	Fuma-rate 350	Fuma-rate 300	Colloi-dal ox. 500	Fuma-rate 125	Fuma-rate 250		
Vitamin A									
Vitamin D									

It must also be remembered that water-soluble vitamins cannot be stored in large amounts unlike the fat-soluble ones. This of course is one of the factors underlying their low toxicity. 'In prescribing thiamine it should be remembered that the healthy human body contains only about 25 mg of the vitamin. Furthermore, it has no means of storing any excess taken in the diet; the excess is **lost rapidly in the urine.** The human body is certainly an effective machine for dissolving thiamine pills and transferring the solution to the urinal'[5]. Moreover it has been shown, atleast for riboflavin that intestinal absorption is limited by saturability and that higher the dose, smaller the fraction absorbed. This is no case in favour of parenteral administration either, because higher the amount in circulation greater the excretion in urine.

Thus, most of the 'high-potency' or 'Forte' preparations of multivitamins are a sheer economic waste. It is a drain on the patients' purse and the onus is on the doctor because he is making the patient buy a specific preparation. If bought by goverment or public sector dispensaries, it is a national waste. If preparations with smaller and yet adequate quantities were bought, for the same money more tablets could be purchased and a greater number of patients benefitted. Manufacture of such 'high-potency' preparations must also use up an unnecessary amount of the scarce foreign exchange resources, since quite a few, and probably all vitamins (raw materials) are imported.

Thus it is not proper if one merely prescribes B-complex tablets and avoids brand name because he is a 'conscientious objector' to brand names. As long as there is no uniformity in the dosage employed in various preparations, it is necessary to know which brand supplies or claims to supply requisite quantities of vitamins. Also, there is no need to blindly follow the 'one t.d.s.' schedule. How much and how frequently, should be decided on the merits of the case.

Table-III

Suggested doses of vitamins for single, acute and severe deficiency

Condition	Vitamin	Dose (Oral)
Beri-Beri	B_1	10-25 mg bid or tds
Riboflavin deficiency	B_2	5-10 mg
Megaloblastic anaemia	Folic acid	5-10 mg
	B_{12}	5-10 mg
Megaloblastic anaemia of pregnancy	Folic acid	10 mg
Corneal xerosis	Vitamin A	5000-10,000 I.U
Bitot's spots	Vitamin A	5000-10,000 I.U
Rickets	Vitamin D	1000-5000 I.U.

I also wish to draw your attention to one or two additional points. There is a widely held belief that a combination of vitamins B_1 B_6 and B_{12} is good for neuropathies and other nervous disorders. I don't think this is based on any solid therapeutic evidence. The reason the three are combined, I think is because each one has been shown to be effective in a specific disorder of the nervous system. Hence the triad is used as a short-gun therapy, indiscriminately. In fact, the brand names of certain such preparations incorporate Greek terms like 'encephalo', 'neuro' etc. The manufacturers of one preparation even claimi ts efficacy in improving memory.

'It (thiamine) may be given, though **without expectation of dramatic results,** in cases of nutritional neuropathy. There is no reliable evidence that it is useful in any other disorder of the nervous system. The prescription of synthetic thiamine, **either alone or in combination with other vitamins, as a general tonic or appetiser,** is supported by no scientific evidence and is now discredited.'[5]

'Vitamin therapy is often given to patients with polyneuropathy, although it is clear that polyneuropathy is not due to deficiency of vitamin B_1, B^{12} or any other known vitamin. Such treatment has a placebo value and probably no other, but is not to be decried....'[6].

For reasons mentioned right at the beginning I too do not decry the use of the combination as I do the dosage in such preparations. Items 17 and 18 in Table-II are two classical examples. Both are meant for parenteral use, another characteristic of this triple combination, probably because of the presence of vitamin B_{12}. The conventional prescription by physicians for parenteral B-complex is '2 ml I.M. once a day or once on alternate days'. Assuming the patient receives 6 ml in a week, he is given 600 mcg to 2 mg of vitamin B_{12}! What a collossal waste considering that vitamin B_{12} is an expensive substance. The prescribed dose even for pernicious anaemia is 2 mg weekly. even those who may argue that unlike the other B-complex vitamins, vitamin B_{12} is stored to a certain extent in the body may note that with each 1 ml goes 20-33 mg thiamine.

Many of the oral preparation too contain unnecessarily high amounts of B_{12}. The RDA for this vitamin is 1.0 mcg and in pregnancy and lactation, 1.5 mcg. Even conceding that a majority of the population cannot afford animal foods and hence many may suffer from vitamin B_{12} deficiency, I see no

reason why any preparation should contain more than 2 mcg. and at the most 5 mcg vitamin B_{12}. This criteria is met by only 7 of the 16 oral preparations listed. If the preparations are haematinics combined with iron, they have to be prescribed three times a day. In which case the preparation should not contain more than 2 mcg B_{12}. Items 10–13, 15 and 16 must be very expensive and those who really suffer from B_{12} deficiency can ill–afford then. I also wish you to note that mixed haemanitics–iron preparation containing vitamins and minerals, are condemed by authorities in the field of anaemia. " Recovery of the patient with uncomplicated iron–deficiency anaemia is not helped by vitamin supplements or minerals"[7]. In our experience vitamin B_{12} and folic acid are not needed till haemoglobin levels come upto 11 gms. % or more.

Let us now consider the vitamin A content of these preparations. The prescribed dose of vitamin A for corneal xerosis and Bitot's spots is 1500–3000 μg (5000–10,000 I.U) daily[8,9]. The RDA during lactation, the maximum suggested for any group, is 3500 I.U. Notice the vitamin A content of items 7 and 9. Who needs **25,000** I.U. vitamin A daily ? Severe cases of deficiency like keratomalacia are not to be treated with oral preparations[9,10]. Those who really develop xerosis can never afford a pharmaceutical like 7 or 9, whose price is further raised due to presence of other nutrients. Imagine to what extent the price can be reduced simply by bringing down the vitamin A content, even to 5000 I.U., which itself is a high amount.

Then, there is the practice of adding glycerophosphates to liquid, multivitamin preparations. I do not know of what therapeutic value these compounds are. They are not mentioned in any standard text–book of pharmacology and therapeutics. As far as I know (see any pharmacopoea) they only form basic ingredients of syrups, possibly for flavour. However, a widespread misunderstanding is that they are ' energy givers ' or ' tonics '. Some brand names carry a prefix or suffix of 'phospho' and the advertisement says 'energy givers', ' vitalizer ' etc. This in my opinion is a fraud perpetuated by the drug companies and worse still, an unpardonable ignorance on the part of the doctor. The vitamins atleast, despite the excess and the wastage, do some good. I see no nutritive or therapeutic value for the glycerophosphates. Their presence is needed for syrup preparation but its name should not be included in the brand name and no claims should be made for its therapeutic efficacies.

One of the nutrients commonly added to multivitamin preparations is iron. Witness that out of the 16 listed items, only 4 do not contain iron. It is well-known that ferrous compounds are better absorbed than the ferric, and it is heartening to note that most are ferrous salts. A preplexing form is the colloidal iron oxide (items 10 and 14) which finds no mention in any book on pharmacology or iron metabolism. Since it is a colloidal preparation I doubt if the iron in it is easily available to the body.

Of the various ferrous salts, ferrous sulphate is the least expensive and should be the treatment of choice, yet only 3 preparatrons contain it. It is said that contrary to popular thinking and claims, gastrointestinal intolerance to iron preparations depends on the **total amount of elemental iron** in the gut and on psychological factors; it is **not a function of the form in which iron** is administered.[1,7] Thus claims made for compounds other than ferrous sulphate, of increased tolerance or decreased toxicity, are not genuine. Also, sustained – release (timed–release) compounds (no. 2) take the compound beyond the duodenum and proximal jejunum and thus reduce iron absorption. Therefore it is wasteful to prescribe such preparations.

The RDA for iron ranges from 20–40 mg per day depending on age, sex, physiological state etc. This of course is for food iron and for free inorganic salts would be less. The therapeutic dose, on the other hand, is 60 mg elemental iron, thrice a day. Ferrous sulphate, fumarate and gluconate contain 20%. 33% and 12% elemental iron respectively. Items 11–13 and 16 are probably meant for iron deficiency anaemia. Prescribed twice a day they supply 250–350 mg elemental iron which is higher than the therapeutic dose. Thus taken, 13 supplies 150 mcg vitamin B_{12}. On the other hand, no. 7 supplies only 8 mg elemental iron per capsule. One may argue that this may be used as for prophylaxis and not treatment. Have a second look and tell me the situation where in an individual is **grossly deficient** in every vitamin one can think of and is yet not deficient in iron ? This is a pure commercial gimmick to claim haematinic value for the preparation. As early as 1936 Strauss said " shot–gun therapy is to be deplored for a number of reasons. Most mixtures of substances **fail to contain enough of any one ingredient to give maximal effects.** The patient must pay not only for the material he needs but also for the non–essentials " (cited from ref. 1).

One can go on endlessly in this manner. My intention in writing this is to bring to the notice of MFC members the fact that all multivitamin and haematinic preparations are not same.

1. There is no uniformity in dosage employed.
2. There is no authority to lay down criteria for
3. There is no authority to check whether the claimed doses are actually present.
4. Doctors prescribe these preparations with total ignorance of or indifference to principles of nutrition and therapeutics.
5. High-potency preparations should be available separately for single vitamins. Multivitamins need not contain amounts much higher than RDA. They are economically wasteful.
6. The false claims made for improvement of unspecified and unproven conditions are perpetuated due to the ignorance or compliance of the doctors.
7. Most of the companies have foreign collaboration. Most of the raw ingredients are to be imported. Could this be one of the reasons for the high dosages employed ?

I am sure you will find asking yourself many more such questions.

References

1. The Pharmacological Basis of Therapeutics. (L. S. Goodman and A. Gilman, eds.). Fourth edn. MacMillan Co., London. 1970.
2. Nutrition Atlas of India (C. Gopalan and K. V. Raghavan eds.) National Institute of Nutrition. Hyderabad, 1971.
3. Energy and Protein Requirements. WHO Tech. Rep. ser. No. 522. 1973; Requirements of vitamin A, Thiamine, Riboflavine and Niacin. WHO Tech. Rep. ser. No. 362, 1967, WHO Geneva.
4. Dietary Allowances for Indians (C. Gopalan, B. S. N. Rao) Indian Council of Med. Research, Spl. Rep. Ser. No. 60, 1968.
5. D. Davidson, R. Passmore, J. F. Brock and A. S. Truswell. (1975). Human Nutrition and Dietetics, Sixth edn. Churchill Livingstone. Edinburg and London.
6. W. G. Bradley (1975). The treatment of polyneuropathy. Practitioner 215: 452.
7. T. H. Bothwell and C. A. Finch (1962) Iron Metabolism. Little, Brown Co., Boston.
8. S. G. Srikantia (1975) Human vitamin A defieiency. Wld. Rev. Nutr. Diet. 20: 184.
9. Reddy, V. (1969) vitamin A defieiency in children. Indian J. Med. Res. Suppl. to vol. 57, p. 54.
10. M. F. C. Bulletin 8, August, 1976.

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FORTIFICATION OF FOODS

IN INDIA THERE is still a basic shortage of food among several population groups which live merely on subsistence rations. As a result, even the energy needs of such population groups are not met with, let alone the requirements of other nutrients like proteins, Vitamins and minerals. A tremendous effort has to be made to meet the quantitative and qualitative requirements of food.

ON THE AGRICULTURAL front, the development of the high yielding varieties of cereal crops have justifiably raised our hopes. Along with this "agricultural revolution" efforts have to be made to make the best possible use of available food resources. Concurrently efforts must be also made to augment the supplies of protective foods such as milk, eggs, pulses, vegetables and fruits. These efforts will no doubt take time. However, the qualitative deficiencies in an average Indian diet needs to be rectified as quickly as possible. It is here that 'fortification' offers an approach worth the trial.

CEREALS, WHICH FORM the staple food in India and constitute nearly 80-90% of the diet are deficient in several nutrients and can be improved in nutritional quality by fortification. Other foods like hydrogenated oils, infant foods, canned fruits and vegetables, supplementary protein concentrates made from oilseeds meals have to undergo commercial processing before reaching the consumer. Nutrients which are present in unprocessed foods might get destroyed during processing. Therefore, these nutrients have to be added back to the foods in a synthetic form. Thus 'fortification' and 'enrichment' of foods can be an effective approach for providing a more wholesome and balanced diet.

'FORTIFICATION AND ENRICHMENT' OF FOODS

THE FOOD FORTIFICATION committee of the Indian Council of Medical Research has given the following definition of 'fortification' and 'enrichment'.

"FORTIFICATION OF A foodstuff denotes the addition to a food of one or more dietary essentials in amounts which make the total content greater than that found in that particular food in its natural state. By fortification also meant the addition of one or more dietary essential to a food which the latter does not contain in its natural state.

ON THE OTHER hand the term ENRICHMENT is used to signify the addition of dietary essentials to afford to restore the total content of the former to the levels obtaining in the food in its natural (unprocessed) State'.

FORTIFICATION OF FOODS IN PRACTICE

RICE

WHEN RAW RICE is milled to get polished white rice, most of the nutrients present in the germ and the outer layer of the grain, especially the B-Vitamin, Thiamine, are removed along with the husk. A process was developed in the united states whereby rice grains were enriched by soaking them in a solution rich in thiamine coat. The latter prevents loss of vitamins during the subsequent washing of rice. This enriched rice 'premix' was mixed with ordinary polished rice so that the vitamins were present in the final mixture in amounts equal to what was present in the original unpolished rice. This 'enriched' rice was used in the philippines in 1947-50, and the incidence of beri-beri a disease caused by the deficiency of thiamine was reported to have decreased significantly as a result.

THE INTRODUCTION OF 'premix' in our country, however, involves many problems, The mixing of 'premix' with unfortified rice would have to be done at certain centralized places from where distribution of the enriched rice will have to be carried out. Most farmers produce the crop and consume it right off the fields. Thus enrichment of rice involves many logistic problems and additional difficulties and therefore, may not be feasible at present in our country.

ON THE OTHER hand, Parboiling of rice is a traditional practice in India. The paddy is steeped in water, steamed, dried and then dehusked. The nutrients which are present mainly in the rice germ and the outer layer of the grain get diffused inside the grain during parboiling. In this parboiled rice even if milled later, loss of nutrients is prevented to a considerable extent. However, parboiling as is done by the trade way often impart an unpleasant odour,

flavour and appearance to the rice due to fermentation occurring during parboiling. Therefore, the raw polished rice, which is mechanically superior though nutritionally inferior to the parboiled rice, is often preferred. Attempts have, however, been made by the central Food Technological Research Institute in Mysore and Jadavapur University, Calcutta to develop an improved method of parboiling of rice. This improved method appears to be commercially increasingly popular with many mill owners. Thus the processing of providing parboiled rice with consumer acceptability or quality is not. The Government of India have placed restrictions on the extent of polishing and to a certain extent this prevents the complete removal of nutrients from the rice. For the present, parboiling seems to be a more practicable solution than production of an enriched premix in India, at least with regard to rice.

WHEAT (ATTA) MAIDA (refined flour) and Bread

DURING THE SECOND world war the United Kingdom undertook to fortify and enrich several foodstuffs. All flour was milled to 85 percent extraction only, which left enough thiamine (vitamin B_1) in the flour and the addition of synthetic thiamine was unnecessary. Since wheat flour is deficient in calcium, calcium carbonate (Chalk) was added at the rate of 392 g. of calcium carbonate to 280 lbs. of wheat flour. The practice of enriching wheat flour with vitamins and minerals has continued in the post war years also.

THE UNITED STATES have strict legislation on fortification and enrichment of foods. Rigorous standards have been laid down for the levels of nutrients to be added to various foodstuffs. Almost all refined flour in America is fortified with thiamine, riboflavin, niacin, iron and sometimes with calcium also.

IN INDIA, WHEAT is consumed mainly as whole wheat flour (almost 100% extraction) which has adequate amounts of the B-vitamins. However, it is lacking in calcium and therefore the sub-committee on Food Fortification of the Indian Council of Medical Research recommended in 1953 that wheat flour can be enriched with calcium carbonate.

THERE IS AN increasing trend towards consumption of bread in urban communities in India today. Bread is made from maida or refined flour which is poor in the B-Vitamins compared to the wheat flour. Thus there is a necessity for a judicious enrichment of the flour used in the bread industry. The establishment of several modern bakeries is a first step towards improving the nutritional quality of bread. These bakeries have been set up at Bombay, Calcutta, Delhi Hyderabad, Madras, Ahmedabad and Cochin with the help of many friendly foreign governments. The bread prepared in these bakeries is fortified with vitamin A, B-complex, iron and the amino acid lysine, nutrients in which refined wheat flour is usually poor.

IN FEBRUARY 1970, the government of India launched a programme in Bombay for fortification of atta with vitamines and minerals and for increasing the protein content by admixtured with edible groundnut flour. A concentrated vitamin-mineral mixture containing vitamin A, Riboflavin, niacin, thiamine, calcium and iron salts is prepared in a pharmaceutical factory and mixed in a selected flour mill with edible groundnut flour containing 45-50% protein. This "master premix" is distributed to other flour mills in the city for blending with atta at a level of 5 percent. This programme is planned to be extended to the metropolitian areas of Delhi and Calcutta at a later date.

HYDROGENATED FATS AND oils: Fortification of margarine with vitamins A and D is compulsory in several countries (the U.S. and Europe) Consumption of "Vanaspati" (hydrogenated fat) is becoming popular in India and vanaspati is replacing ghee (clarified butter) and vegetable oils in many preparations. Fortification of vanaspati with vitamin A has been made compulsory (700 International Units of Vitamin A per ounce of vanaspati) by the government and many manufacturers add vitamin D in addition.

M I L K

SEVERAL COUNTRIES IN the west are enriching milk with vitamin D. This is essential because of paucity of sunlight in these countries during the long winter month. In India a substantial amount of vitamin D is synthesized in our skin when sunlight direct or reflected falls on it. The reforo milk does not appear to require to be fortified with vitamin D in our country.

SKIMMED MILK POWDER is used in the feeding of children and pregnant and nursing women in many countries. Since skimmed milk powder is poor in vitamin A which is badly needed by these segments of the population many manufacturers fortify skimmed milk powder with synthetic vitamin A.

SEVERAL PROPRIETARY INFANT foods based on milk are fortified with vitamin A, D, B_6, C and iron and some with vitamin B_{12} also. Spray dried milk powders are deficient in vitamin B_6 (pyridoxine) which is lost during the processing, and addition of pyridoxine to spray dried milk powders is carried out as a routine procedure.

COMMON SALT: IN the Sub-himalayan regions of India, goitre & disorders caused by insufficient intake of iodine is very widespread. The incidence of goitre has been reduced to a great extent in the United States and Latin American countries by the distribution of iodized salt to the populations in the goitre regions. In India a pilot project for distribution of iodized salt has been undertaken in the endemic areas. The salt consumed in India is usually not the free flowing table salt but the crystalline, impure variety. Potassium iodate has been found to be more stable than potassium iodide and is added to the salt supplied in these areas. Carefully controlled studies carried out so far have shown that the consumption of iodized salt in these goitrous areas has brought down the incidence of goitre.

PROBLEMS ENCOUNTERED IN FOOD FORTIFICATION

FOR ANY FOOD fortification programme launched on a nationwide scale, or even at a regional level, to be successful several factors need to be considered.

*THERE HAS TO be a centralized agency which takes care of the technology involved in the fortification.

*THE VEHICLE OR the food item which is fortified must be such that it reaches the maximum number of consumers. Salt tea and bread are instances in point.

*THE NUTRIENT ADDED must be in stable form to withstand subsequent loss due to storage under varying conditions of humidity and temperature.

*THE FORTIFIED FOOD must not be radically different in appearance shape, colour and taste to the food people are used to. This is very important from the view point of gaining popular response from the average consumer.

*LAST BUT NOT least the cost of the fortified article of food should not be any different from the unfortified food.

JUDGED BY ALL these criteria, fortification of salt and bread appears to have caught up. Recently, the National Institute of Nutrition has carried out extensive researches on the possibility of fortifying common salt with calcium and iron. The results have been encouraging and based on these investigations, fortification of salt with calcium and iron will be taken up on a national scale in the near future.

IN ACCEPTING FORTIFICATION as a national policy certain other considerations should not be lost sight of undeveloping countries with expanding populations, the reliance has perforce to be placed mainly on an adequate supply, especially of protective foods, to meet the nutritional needs of the population. Also in considering the quantities and kinds of nutrients to be used in fortifying different foodstuffs, it is useful to take into account the nutritional deficiencies of the total diet of the population ratherm than of any single foodstuff alone. Fortification should not also be indiscriminate, as use of nutrients in quantities more than what is needed will only be a waste and may add to the cost of the final product which a population subsisting on marginal income can ill afford to bear.

by Dr. [illegible]

30/6/81

Nutrition Intervention (Individual case)

Specific problem	Medical Management	Nutrition education Explain cause + stress	Prophylaxis
1. PCM (Marasmus/ Kwashiorkor)	1. Assessment (Hospitaliz: if necessary) 2. Invest: for intercurrent inf: / infestations + Rx (worms / diarrhoea etc) 3. High protein diet 4. Rx of assoc. deficiencies 5. Role of Tonics / high protein isolates	1. B.F. as long as possible. 2. Start solid foods at 4 mths. 3. Frequent feeds 4. Locally available cheap foods (balanced diet) 5. Mixed recipes 6. Feed during illness 7. Clean water & environ:	1. Nutr: educ: of mother. 2. Nutr: surveillance (RH chart) 3. Under 5 clinic service Immuniz: / Health care / F.W. / Nutrition 4. Nutr: supplementation through govt. programmes
2. Vit. A deficiency	1. Assessment - signs 2. Injectable high doses/capsules 3. Secondary Infection - Rx 4 Rx of assoc: PCM.	1. Foods rich in Vit A (GLV / yellow veg / fruit) 2. ~~Prevention of deficiency~~ Methods of cooking 1) ~~Hookworm~~ 2) ~~Rpted pregnancies~~	1. 200000 I.U. of Retinyl palmitate in oil 1/6 mths to pre-school children.
3. Anemia	1. Assessment / ? Aetiology 2. High dose iron / Bid. ? 3. Rx of Hookworm 4. High protein diet	1. Foods rich in iron GLV / Ragi / Jaggery 2. Prevention of aetiological causes. i) Hookworm ii) Rpted pregnancy.	1. Iron + Folic Acid to children / mothers 2. Iron in salt.
4. Goitre	1. Assessment 2. Rule out other causes 3. Lugols Iodine etc	—	1. Iodised salt.

① a family consisting of an adult male (55kg) + an adult female (45 kg) + a child of 5 years weighing 15 kg. On a diet survey of the family it was observed that the consumption per day in terms of the proximate principles + nutrients are as follows -

protein	- 150 gm	
carbo	- 2000 ~~Calorie~~ gm	Suggest improvements confining your attention to the above nutrients only.
Fats	- 100 gm	
Vit A	- 1000 I.U.	
Vit B	- 10 mgm	
Vit C	- 150 mgm.	

The coefficient of consumption for the family is

$1 + 0.8 + 0.5 = 2.3$ units

∴ the calorie requirement $= 2.3 \times 2,400 = 5,520$ Cals

protein requirement $= 45 + 55 + (15 \times 1.66) = 124.9$ g
(24.90)

comments -

① calorie content of the above diet -

$(150 \times 4) + (100 \times 9) + (200 \times 4) = 9,500$ Cals.
(600) (900) (800) (9500 − 5520)

∴ The calories provided exceed the RDA by 3,980 Cals.

② The protein content of the diet is in excess by 25.1 g (150 − 124.9)

③ Carbohydrates are in excess
Normally they should provide 60% of the calories here 83%.

④ Fats are inadequate
They should provide 15 - 25% of the calories. Here 9.5%

⑤ Vit A is grossly deficient — doesn't suffice for even1 member. (~~RDA - 5000~~ RDA per person - 3000 IU/day

⑥ Vit B ? — is given as a whole + is inadequate for the entire family.

⑦ Vit C is adequate (Require 50 mg/day adult
30-50 " " - children)

No mention has been made of other essentials of a balanced diet viz Vit D, Ca, Iron, minerals

Nutrition Problems

NUT 3.30 8.30

2. On analysis it was found that a diet of an adult male doing moderate work contained the foll. nutrients.

a) CHO 250 gm
b) Fat 30 gm.
c) Protein 25 gm.
d) Vit A 4000 I.U.
e) Thiamine — 0.5 mg.
f) Vit C — 25 mg.
g) Calcium — 0.5 mg.
h) Iron — 10 mg.

Comment on the quantity & quality of the diet.

4. As a M.O. of a PHC what would you do if you came across V.A. deficiency conditions among many members of a family.

5. Put up a balanced diet for a family consisting of a father, a lactating mother & a boy aged 12 yrs.

6. In your practice as a family physician you encounter nutritional deficiency cases in a family. What investigations would you conduct to determine that it is due to lack of proper diet? Give the composition with quantity of a balanced diet in a family consisting of a father 40 yrs, mother 35 yrs, one son 15 yrs, 2 daughters 10 yrs & 6 yrs respectively.

7. Describe how you would conduct a diet & nutrition survey in a boarding hostel having 100 students in the primary school age group. & suggest measures to improve the nutritional status of these students

8.31

GOVERNMENT OF KARNATAKA

DIRECTORATE OF HEALTH AND FAMILY WELFARE SERVICES, BANGALORE

HEALTH AND FAMILY WELFARE COMPONENTS AVAILABLE FREE FOR HEALTH CARE DELIVERY THROUGH VOLUNTARY ORGANISATIONS

Sl. No.	Programmes	Beneficiaries	Methodology	Objective	Role of the voluntary organisations	Remarks
1	2	3	4	5	6	7
	NUTRITION PROPHYLAXIS PROGRAMMES					
1.	Iron and Folic acid tablets for mothers (Iron-60mg; Folic acid 0.5 mg.)	Expectant and Nursing mothers, women Family Welfare acceptors.	1 tablet to each of these women daily for 100 days.	Prophylaxis against Nutritional Anaemia	Voluntary organisations can distribute these drugs to the beneficiaries.	1. Monthly quota to be distributed once in a month. List of beneficiaries to be maintained in prescribed, form. 2. To be obtained from D.H. & F.W.O./ P.H.C./Sub-centre.
2.	Iron and Folic acid tablets for children (Iron-20 mg Folic acid 0.1 mg)	Children below 12 years of age School going and pre-school.	1 tablet daily for 100 days	do	do	do
3.	Vitamin 'A' concentrated Sol.2 lakhs units strenght.	All children from 1 to 4 years.	Once in 6 months in the form of capsule or liquid.	For preventions of night blindness, Keratomalacia and other complications due to Vitamin 'A' deficiency.	do	1. This programme is taken up in the rural area at present. 2. To be obtained from P.H.C. or sub-centre.

..Contd/2-

1	2	3	4	5	6	7
IMMUNISATION PROGRAMMES						
1.	D.P.T.	All children from 3 months to 3 years.	Start at 3rd month and 3 doses at an interval of 4 to 8 weeks with a booster dose 18 to 24 months later.	Prevention of Diphtheria, Tetanus, pertussis (whooping cough)	Completion of 3 doses. Voluntary organisations can organise immunisation campaign in the rural area and slums in the urban areas and carry out the immunisations.	1. Vaccine to be stored in refrigerator at t of 4°c to 10°c. 2. To be obtained f D.H.& F.W.O./P.
2.	D & T	All children between 3-8 years.	Two doses at an interval of 4 to 8 weeks (Primary Vaccination i.e. no DPT previously given) Booster dose in case of previous DPT after an interval of one year.	Prevention of Diphtheria and Tetanus.	Completion of 2 doses or one booster dose Voluntary Oranisations can organise immunisation campaigns in the rural areas and slums in urban areas and carry out the immunisations.	do
3.	T.T.	Antenatal cases	In case of antenatals 3 doses-starting 1st dose at 16-20 weeks, 2nd dose at 20-24 weeks & 3rd dose at 36-38 weeks.	Prevention of Tetanus	Voluntary organisations can take up as a part of MCH Service and immunise anatenatals.	do
4.	B.C.G. Vaccination	3 months to 19 years	Earliest at the age of 3 months	Prevention of Tuberculosis	Voluntary organisations can arrange mass immunisation programmes with the assistance of Dist. T.B. Centres.	1. Vaccine to be s in regrigerator. 2. Vaccine availabl Dist. T.B. Centr

...Contd/3-

1	2	3	4	5	6	7
5.	Smallpox Vaccine	Primary only	At the age of 3-9 months	To prevent smallpox	Voluntary oranisations can take up as part of MCH services and conduct Primary Vaccinations.	1. Vaccine to be stored in refrigeration. 2. Vaccine available at the PHC
6.	Polio Oral Vaccine	All children 3 to 9 months	Start at 3rd month and 3 doses at an interval of 4 to 8 weeks with a booster dose at 18 to 24 months.	To prevent Polio myelitis	do	1. Vaccine to be stored at - 20°c. Likely to be available during next financial year.

FAMILY WELFARE PROGRAMMES

1.	Sterilisation	Couples with two children and above	Vasectomy, Tubectomy	Permanent method for limiting the family.	1. Voluntary Organisations can organise sterilisation camps with the assistance of local Primary Health Centre/Urban Family Welfare Centre.
2.	Loop	Couples with one or two children.	Loop insertion	For spacing the children Temporary method of Family Planning.	2. Motivate eligible couples for undergoing sterilisation, IUD insertion at the nearest Primary Health Centre or hospital. They can act as depot holderns for distribution of contraceptives. They can ensure follow up services by the staff by closely associating with Primary Health Centre/ Urban Centres and the Community.
3.	Nirodh	Newly married couples, and couples with one child.	6pieces or more at a time depending on usage. Distribution once a month.	For spacing the children Temporary method of Family planning.	3. They can establish Urban Family Welfare Centres in areas left uncovered by Government institutions after approval by Government. 100% assistance will be provided by Govt.

....Contd/4-

2	3	4	5	6	7
Oral Pills	Couples with one or two children.	Oral pills-first 3 cycles to be distributed directly under the supervision of doctor and when there is no untoward effect, pills may be distributed by non-medical personelle. Beneficiaries to be examined by a doctor once in 6 months or earlier whenever indicated.	For spacing the children-Temporary method of Family Planning.	4. Volutary organisations having their own hospital, approved by Government for conducting tubectomy operation can maintain sterilisation beds for which bed maintainence charges will be paid by Government as per rules.	
Medical Termination of Pregnancy.	Pregnant woman upto 20 weeks where pregnancy is unwanted.	Medical institutions (Private or Government) recognised under M.T.P. Act can taken up this programme.	To safeguard the health of the beneficiaries as a welfare measure.	5. Private Practitioners recommended by Local Indian Medical Association and approved by Government can take up vasectomy operations and IUD insertions. The beneficiaries eligible for compensation amount. The Private Practitioners are eligible for service charges at the prescribed rate fixed by Government provided the services are rendered free to the community. They can also take up distribution of contraceptives including oral pills.	
				6. Nursing homes run by private practitioners and voluntary organisations, satisfying all the conditions as per M.T.P. Act and recognised by Government can take up M.T.P. Services.	

NOTE: (1) Iron Folic acid tablets, D.P.T. Vaccine, Diptheria and Tetanus, Vaccine, Tetanus Toxoid, B.C.G. Vaccine, Small-pox Vaccine, B.C.G. Vaccine Contraceptives are available free:

(i) depending on the availability of stock with Government.
(ii) depending on refrigerator facilities available with the organisation.
and (iii) provided the services are rendered free to community.

.....Contd/5-

(2) All the supplies made have to be accounted. Subsequent supplies will be made, after the previous supply is properly accounted.

(3) List of beneficiaries under nutritional prophylaxis, immunisation programme, family welfare programme have to be maintained in the prescribed registers and forms.

(4) Monthly statistical data in the prescribed forms have to be furnished to the concerned Primary Health Centres/Urban Family Welfare Centres within the due dates.

(5) Apart from the assistance already approved by State and Central Government, no other monetary assistance will be be given to the honorary staff/organisation.

(6) For further details the nearest Primary Health Centre/Urban Family Welfare Centre/the District Health and Family Welfare Officer/City Family Welfare Bureaux may kindly be contacted.

Dr. J.S. Saksena
Director

Directorate of Health & Family Welfare Services
Ananda Rao Circle
Bangalore - 560009.

FOOD POISONING

Injurious effect of food may be due to different causes and gives use to symptoms of Acute Gastro-Enteritis.

I. Chemical :

a) Antimony in Enamel ware in contact with fruits/acids dissolves out
b) Zinc from galvanised articles.
c) As from harmful colouring matter.
d) Pb (lead) from soldered vessels
e) Insecticides in food grains
f) Commercial acids used in manufacture of Bees.

II. Parasites or their Cysts like Tape-worm Cysts

III. Bacteria : 1. Salmonella Group causing Salmonellosis or Acute Gastro Enteritis e.g. a) Enteritidis } from
b) S. Typhimurium } Ducks, eggs & partially cooked meats e.g. Sausages.

These organism are nonsporing and Thermolabile. The symptoms appear after about 8 hours as severe pain, vomiting, diarrhoea and collapse.

2. B. Morgani and Proteus
3. Bact. Flexneri
4. B. Coli
5. Staphylococcus which may contaminate Food, Milk, Milk Products Cakes, etc., due to Staphylococci from the skin, nose or throat or from the cow's udder if some lesion is present. This is usually due to an Exotoxin which multiplies in the food/milk before ingestion and sometimes known as Toxin Type. or poisoning.
6. Cl. Botulinum giving rise to Botulism. It produces a potent toxin and contaminates, fruits and vegetables. Canned and pickled foods are sometimes the source as Cl. Botulinum is an anaerobic sporing organism. Symptoms mat be immediate or delayed after 12-24 hours and are very serious like nervous disorders or vision and dysphagia to be differentiated from Belladonna poisoning. Paralytic ileus may occur and then failure of the heart and respiration.

IV. Food poisoning may be also caused by poisonous fungi e.g. toadstools mistaken for mushrooms.

Investigations to be carried out in an outbreak of food poisoning.

1. Source of infection. Food, milk, cakes etc. to be determined. Food sample, of suspected food to be taken and examined bacteriologically also aerobic and anaerobic cultures to be made and examined. Stop further consumption of suspected food and sale of the same food/milk.
2. Note time interval. When F.P. is caused by living Infective Bacilli the incubation period is longer since time for the Bacilli to multiply and cause sign. If symptoms appear rapidly, it is due to be preformed Toxin the food e.g., tinned foods.
3. Agglutination tests may be positive with known culture.
4. Examination of Vomit/Faeces in the acute stage for Bacteria.

Prevention of Food Poisoning

1. Prompt refrigeration of sliced meats, pastries, custards and cream fillings to prevent any staphylocci from multiplying.
2. Exclusion from food handling of persons suffering from pyogenic infections of the hand or skin.
3. Education of food handlers, cook etc, in hygienic standards in preparation and storage.
4. Extermination of Rodents from kitchens and stores.
5. Prevention of human carriers e.g. in Salmonella infections.
6. Food should be covered. Left overs avoided.
7. Proper canning and Preservative methods of food.

FOOD-BORNE DISEASES

1. Diarrhoea
2. Dysentry
3. Typhoid
4. Paratyphoid
5. Cholera
6. Food poisoning
7. Tuberculosis
8. Brucellosis
9. Undulant fever
10. Worm infestations, eg. round worms, thread worms, trichandua spiralis etc.
11. Leptospira haemorrhagica .
12. Poliomyelitis
13. Lathyrism
14. Epidemic dropsy
15. Ergotism

Food allergy : occurs among some persons due to acquired or inherent, dissynchrasy. Usually the allergic manifestations eg. gastrointestinal upset, urticaria or asthma are due to protein in the food and therefore foodstuffs which cause allergy are mostly fish, eggs, prawn, milk, cheese etc.

Food sanitation : food may serve as a vehicle in transmission of diseases.

1. Milk - excellent food and ideal culture medium. Dirty milk a major health hazard.

Warm surrounding favour : growth of Bacteria. In Urban areas, where the milk is pooled from various sources before distribution. Contaminated milk samples from a single source may contaminate the complete stock of milk.

Milk borne diseases are :-

1. Those due to salmonellae organism
2. Those due to shigellae organism
3. Those due to staphylocci organism
4. Those due to streptocci eg. sore-throat, scarlet fever.
5. Diphtheria
6. Tuberculosis
7. Poliomyelitis
8. Undulant fever.

Sources of milk borne diseases :-

Dirty udders of cow
Dirty fingers of milker
Dirty utensils and bottles
Flies
Droplet infection from Milkman etc.

Milk sanitation :-

1. Animal should be clean and healthy as certified by veterinary doctor.
2. Dairy farm to be clean. 3. Milker - free from illness eg. open T.B., typhoid, sorethroad or staphylococci eg. boils and abscesses + clothing, personal cleanliness and maild. 4. Utensils - for storage and transportation clean + sterilized. 5. Pasteurization - destroys most organisms. Does not destroy spore forming organisms.

Meat and fish - uncovered and left meat. Growth of

1. gangrene causing organisms
2. worm infestations
3. Oysters - typhoid
4. Infection due to fingers and flies

Sanitation :- 1. Animals
2. Inspection of cut meat & fish
3. Rapid transportation
4. Proper storage
5. Correct preservation
6. Adequate cooking

Fruits and vegetables :- If eaten raw - poor culture media

1. Choebic dysentry; 2. Worm infestations - round worms + thread worms. proper washing preferably in the $KMNO_4$. Steaming if necessary. Droppings of rats and mice - leptospire haemorrhagica.

Prevention of dietary infections :-

1. Choice of food -fresh, free from infestations
2. Storeage and transport + Preservation, cool dry place protected from rodents.
3. Kitchen staff - strict hygienic practices free from illness and infections.
4. Water - Boiled
5. Sanitary conditions, work place + utensils.
6. Health education
7. Use of effective pesticides.
8. How to use only approved chemicals for preserving or as additives.

DEPT OF PREVENTIVE AND SOCIAL MEDICINE, ST JOHN'S MEDICAL COLLEGE, BANGALORE

SCHEDULE FOR DIET SURVEY

Date:

Village:

Name of Head of family:

Family No.:

Address:

GENERAL INFORMATION :

Type of Family: Single/Joint

List of Family Members :

No.	Name	Relationship	Age	Education	Occupation
1.					
2.					
3.					
4.					
5.					

Caste :

Religion :

Total Monthly Income :

Monthly Expenditure on:

(a) Milk

(b) Fruits

(c) Groceries

(d) Rent

(e) Others

EATING HABITS :

Vegetarian or Non-vegetarian :

What do you eat ?

Morning

Noon

After-noon

Night

Other times

What foods do you specially like? dislike? why?

How often do you consume the following foods?

p.t.o.

Food	Everyday	Occasionally	Never
Milk			
Fruits			
Leafy vegetables			
Eggs			
Meat/Fish			

Any food modifications for certain groups within the family ?

(a) Infants, pre-school children

(b) Elderly

(c) Pregnancy

(d) Illness

FOODS CONSUMED :

Item	Items in Ozs./games (days) 1	2	3	4	5	6	7	Average daily Intake: Per Family	Per Consumption unit
Cereals :									
Wheat									
Rice									
Jowar									
Bajra									
Other(state)									
Pulses :									
Arhar									
Urad									
Moong									
Masur									
Other (state)									
Milk and its Products :									
Milk									
Dahi									
Other									
Fats and oils									
Ghee									
Dalda									
Oils									
Others									

...3

Vegetables:

Leafy : (Names)

1. .....
2. .....
3. .....

Root : (names)

1. .....
2. .....
3. .....

Other (names):

1. .....
2. .....
3. .....

Fruits: (names)

1. .....
2. .....
3. .....

Meat .....

Fish .....

Eggs .....

Sugar/Gur .....

Beverages

1. Tea .....
2. Coffee .....
3. Others .....

Miscellaneous

1. Betel nuts .....
2. Betel leaves .....
3. Tobacco .....

Others .....

METHODS OF COOKING :

1. Rice .....
2. Roti .....
3. Dhal .....
4. Vegetables .....

Do you have :

1. Vegetable garden .....
2. Fruit trees .....
3. Chicken .....
4. Cattle .....

Investigator

8.34

COMMUNITY HEALTH CELL
47/1, (First Floor) St. Marks Road
BANGALORE-560 001

NUTRITIONAL ASSESSMENT OF UNDER FIVES

NUT 3-34

Child's Name:

Mother's Name:
Occupation:

Father's Name:
Occupation:

Address:

Date:
Age:

Birth order:

IMMUNISATION

B.C.G.
Smallpox
Polio
D.P.T.
T.A.B.
Mx test & result

Standing ht.
Sitting ht.
Weight
Birth wt.
Bicristal dia.
Head
Chest
Arm

Petichiae,
pellagrous dermatitis
Pigmentation of
knuckles, fingers
toes
Mosaic dermatitis, flaky paint
Scrotal and vulval dermatitis

Musculoskeletal

Muscle wasting

Craniotabes,
bossing F & P bones
Epiphyseal enlargement
Beading of ribs
Persistence anterior
fontanelles
Bow legs, deformities

C.N.S.

Tingling extremities
Burning feet
Tender calf muscles
Glove, stocking
anaesthesia
Loss of ankle/knee jerks

FACE Pale conjunctiva
Bitot's
Xerosis conjunctive
cornea
muddy wrinkled conjunctiva
keratomalacia
angular palpebritis
night blindness
photophobia
skin fold over triceps

LIPS angular stomatitis
angular scars
cheilosis

TONGUE red and raw
oedema
magenta
atrophy papillae

TEETH mottled enamel
caries

GUMS spongy - bleeding

GLANDS thyroid
parotid

SKIN xerosis
phrynoderma

NAILS koilonchia - fingers/toes

HAIR sparse, thin
lack of lustre
dyspigmentation
flag sign
easy pluckability

G.I.T. liver
S(soft) F(firm)
H(hard) (mid. clav.
line below costal
margin)

spleen

C.V.S.

Cardiomegaly
Tachycardia

ANY OTHERS

INVESTIGATIONS - Hb%

GENERAL DIET SURVEY

Food Available	Daily consumption Av.amount/member	Any special consideration for under 5
Rice		
Wheat		
Ragi		
Maize		
Proteins		
Fats		
Veg.		
Oils		
Butter		
Ghee		
Milk		
Dhal		
Meat		
Eggs		
Fish		
Fruits		
Coconut		

NUT 3-35 2.35

SOURCES OF THE FOLLOWING:-

① Protein
- pulses
  - Red gram. — 22 g/100 gm (protein content)
  - green gram — 20-22 "
  - Black gram — 24 "
  - Bengal gram — 17 "

average 20-25 g/100 g in pulses.

Soyabean is the richest source ▷ 43 g/100 gm.

- Other sources
  - Meat, Fish, Egg, Milk.

② Carbohydrates. — Cereals. viz Millets

(a) Rice (Parboiled + milled) — carbo content 78.2 g%
also contain Vit B - 0.4 mg%.
protein - 7.7 g%
Niacin - 3.5 mg%.
Milled rice contains less of Vit B - 0.1 mg%
+ protein - 7 g%.

(b) Wheat — carbo. content 70 g%.
protein 11 g%.
Vit B 0.1 mg%.

(c) Maize — carbo 66 gm%.
protein 11 g%
Vit B 1.1 mg%.

(d) Ragi. — Carbo - 72 g%.
protein - 7 g%.
Rich in calcium 344 mg%/100 g,
& iron 17 mg%/100 g.

~~④ Fats~~ ← ~~animal sources~~ ~~Vegetable sources~~

~~③ Vitamins~~

③ Vit A
Sources
- Animal sources - liver, fish, milk, eggs, butter, cheese
- Vegetables " - Amaranth, carrots, cabbage.
  200 - 600 mg. of Vit/100 g
- Fruits - ~~Ban~~ Papaya, Orange, Mango (ripe) Tomato

(4) Vitamin D. - animal - Milk, fresh, eggs, butter.
" - ? cod liver oil!

(5). Thiamine - Vit B_1, vegetables = groundnut, wheat, Rice.
animal — milk, egg, mutton, liver, fish.

(6). Riboflavine - Vit. B_2.
Animal - liver, milk, egg, meat.
Vegetable - green leafy vegetables

(7) Niacin - animal - Liver, Milk, egg, meat, liver, fish
- Vegetable — groundnut, cereals, pulses, maize.

(8) Pyridoxine - (Vit B_6)
animal - liver, meat, fish, egg
vegetable - cereals.

(9) Folic acid - animal - liver, eggs
vegetable - green, leafy veg.

(10) Cyanocobalamin - Vit B_{12} animal - liver, fish, egg, milk
~~vegetable~~ —
NO VEGTABLE SOURCE.

II ~~MINERALS~~

(11) Vit C - ~~DAILY VEGETABLE ORIGIN~~
Fruits - amla - richest source
— guava, orange, lime.
Vegetables — root & tuber ie potatoes, carrot.
germinating pulses.
animal sources - contain very small amounts

IV MINERALS

① Calcium — animal — Milk and milk products / Fish

vegetable — Radish, beetroot, curryleaves, Tamarind

Fruits — Sitaphal (Custard apple), melons, source

Dates, dried fruits.

cereals — Ragi — a rich source. 344 mg/100 gm.

② Iron —

animal — liver, meat, eggs, fish,

vegetable — Jaggery, green leafy veg cereals & pulses to a lesser amount

Ragi - 17mg/100g,

③

AGRICULTURAL LABOURER'S BASIC MEAL.

PREPARED BY

MISS.T.PADMASINI ASURI.

MISS.TARA IYYAKKU.

OFFICE OF THE REGIONAL HOME ECONOMIST, BANGALORE

I N T R O D U C T I O N

The Agricultural Labourers normally get their wages, either by daily or weekly payment. This inhibits their bulk purchases and invariably they do not manage their money in order that they may have adequate food essential for their maintenance of health, throughout the month. These agricultural labourers whose money income is low, have to learn to use cheaper substitutes and millets in their diet. The Menu suggested is only a model one, as it depends upon the taste and food habit of the people. However, an attempt has been made to plan a basic diet for the landless labourers who could get the essential nutrients even though the diet may not be so balanced as per the ICMR standards. The money being a constraint these labourers and their families should be educated to use different millets and not try for cereals like rice or wheat which are of prohibitive prices. This is an attempt to see that the nutrients are made available at a lower cost for landless labouers.

MENU No.1(For Lunch & Dinner)

Jowar Roti
Horsegram Curry
Amaranthus - groundnut dry vegetable

Ingredients	Quantity	Protein	Calories	Carotene	Cost
Jowar	400 g				
Horsegram	50 g	58.6g	2000	4106 ug	Rs.1.46
Groundnut	10 g				
Leafy vegetables	70 g				
Onion	50 g				
Oil	30 g				
Jaggery	20 g				
Seasonings					

NOTE: In place of field beans, any other whole gram can be used

2

MENU II (For Lunch and Dinner)

Jowar Roti
Fieldbean - amaranthus curry
Groundnut - Onion chutney

Ingredients	Quantity	Protein	Calories	Carotene
Jowar	400 g			
Fieldbean	30 g	57.0g	2000	4010 µg
Groundnuts	20 g			
Leafy vegetables	70 g			
Onion	50 g			
Oil	30 g	Cost		
Jaggery	20 g			
Seasonings		Rs. 1.40		

MENU III

Lunch	Dinner
Jowar Roti	Bajra Roti
Bengalgram boiled	Leafy vegetables with potato.
Onion-tamarind sauce	Onion-tamarind sauce.

Ingredients	Quantity	Protein	Calories	Caortene
Bajra	200 g	50.7 g	2110	4287 ug
Jowar	200 g			
Bengalgram	50 g			
Groundnut	10 g			
Leafy vegetables	70 g	Cost		
Oil	30 g			
Jaggory	20 g	Rs. 1.44		
Potato	50 g			
Seasonings				

MENU No. IV(For Lunch & Dinner)

Jowar Roti
Fieldbean onion curry
Leafy vegetable - Bengalgramdhal pugath

Ingredients	Quantity	Protein	Calroes	Carotene
Jowar	400 g	57.7 g	2010	4070 ug
Fieldbean	30 g			
Groundnuts	20 g			
Leafy vegetables	70 g			
Onion	50 g			
Oil	30 g	Cost	-	
Jaggery	20 g			
Seasonings		Rs. 1.45		

MENU NO.V (For Lunch & Dinner)

Wheat Roti
Leafy-vegetable horsegram curry
Potato-onion vegetable with groundnuts.

Ingredients	Quantity	Protein	Calories	Carotene
Wheat	400 g			
Horsegram	50 g	65.4 g	1950	4034 µg
Groundnuts	10 g			
Leafy vegetables	70 g			
[illegible]	30 g			
Jaggery	20 g			
Onion/Egg	50 g			
Seasonings		Cost		
		Rs. 1.40		

MENU No. VI

Lunch	Dinner
Wheat chapathy Groundnut curry	Jowar Roti Fieldbean - leafy vegetable dry vegetable.

Ingredients	Quantity	Protein	Calories	Carotene
Wheat	200 g	64.5 g	2000	4000 µg
Jowar	200 g			
Fieldbean	30 g			
Groundnuts	20 g			
Leafy vegetables	70 g	Cost		
Onion	50 g			
Oil	30 g	Rs. 1.41		
Jaggery	20 g			
Seasonings				

MENU NO. VII

Lunch	Dinner
Wheat Roti	Bajra Roti
Leafy vegetable)	Horsegram chutney
Fieldbean curry)	

Ingredients	Quantity	Protein	Calories	Carotene
Wheat	200 g			
Bajra	200 g	61.0 g	1950	4012 µg
Fieldbean	30 g			
Horsegram	20 g			
Leafy vegetables	70 g			
Onion	50 g	Cost		
Oil	30 g			
Jaggery	20 g	Rs.1.40		
Seasorings				

MENU VIII

Lunch

Ragi balls
Horsegram leafy vegetables
Curry

Dinner

Jowar Roti
Groundnut onion chutney

Ingredients	Quantity	Protein	Calories	Carotene
Ragi	200 g	50.0g	2018	4063 µg
Jowar	200 g			
Horsegram	30 g			
Groundnuts	20 g			
Leafy vegetables	70 g			
Onion	50 g	Cost		
Oil	30 g			
Jaggery	20 g	Rs.1.44		
Seasonings				

MENU NO. IX(For Lunch & Dinner)

Ragi balls
Fieldbean - onion curry
Amaranth - groundnuts dry vegetable

Ingredients	Quantity	Protein	Calories	Carotene
Ragi	400 g	47.1 g	1981	4032 µg
Fieldbeans	50 g			
Groundnuts	10 g			
Leafy vegetables	70 g			
Onion	50 g	Cost		
Oil	30 g			
Jaggery	20 g	Rs.1.48		
Seasonings				

1. Amaranth-groundnut dry vegetable

Ingredients	Quantity
Amaranthus	70g/1 cup chopped
Groundnuts	20g/6 std.sp.
Oil	10g/3 std.sp.
Onion	half of a medium sized one/50 g
Curry leaves	a sprig
Mustard	½ std.sp.
Blackgram dhal	¼ std.sp.
Water	6 std.sp./30 ml.

Method

1. Clean & chop amaranthus
2. Roast groundnuts, remove skin and grind coarsely (a peanut grinder can be used)
3. Chop onion and green chillies.
4. Prepare seasonings with oninon, green chillies, blackgramdhal and mustard and curry leaves.
5. Add chopped amaranthus, water and cook till done.
6. Add salt and stir.
7. Add groundnut powder and mix well.

Volume of the product - 2/5 std.cup
Number of serving -

Nutritive value and cost per serving:

Protein (g)	Calories	Calcium (mg)	Iron (mg)	Carotene (ug)	Vit.B1 (mg)	Vit.B2 (mg)	Vit.C (mg)	Cost (Rs)
8.0	254	312	19	3872	0.24	0.24	72	33

2. Amaranth-gram dry vegetable

Ingredients	Quantity	Method
Amaranthus	70g/1 cup chopped	1. Soak field beans overnight and cook in double the volume of water (including the soaking water) This takes about 20-30 minutes.
Field beans	30g/¼ std.sp.	
Onion	50g/½ of a medium sized one	
Curry leaves	a sprig	2. Clean and cut amaranthus.
Blackgram dhal	½ std.sp.	3. Prepare seasonings with onion, green chillies, blackgram dhal, mustard and curry leaves.
Green chillies	2	
Salt	½ std.sp.	4. To this add the chopped amaranthus and the remaining water and cook for approximately 10 minutes.
Water	1/5 std.cup	
Oil	10g/3 std.sp.	5. Add the cooked gram to this and continue cooking till the preparation is dry.

Volume of the preparation - 4/5 cup
Number of servings - One

Nutritive value and cost per serving:

Protein (g)	Calories	Calcium (mg)	Iron (mg)	Carotene (ug)	Vit.B1 (mg)	Vit.B2 (mg)	Vit.C (mg)	Cost (Ps)
10.0	361	294	18.0	3864	0.1	0.22		72

3. Groundnut Onion Chutney

Ingredients	Quantity	Method
Groundnuts	20g	1. Roast groundnuts
Onion	30g/½ of a small	2. Chop onion and green chillies
Green chillies	4	3. Grind all the ingredients, except oil to a fine paste
Salt	¼ std.sp.	4. Add oil to the ground paste and mix well.
Tamarind	5 g	
Jaggery	5 g	
Oil	1½ st.sp./5g	
Water	15ml/3 std.sp.	

Volume of the product - 1/5 std.cup
Number of servings - one

Nutritive value and cost per serving:

Protein (g)	Calories	Calcium (mg)	Iron (mg)	Carotene (µg)	Vit.B1 (mg)	Vit.B2 (mg)	Vit.C (mg)	Cost (ps)
5.2	174	30	-	-	0.22	0.04	-	26

4. Wholegram - Onion Curry

Ingredients	Quantity
Field beans	50g
Onion	½ of a small sized onion/30g
Red chillies	5 g
Coriander seeds	10g/5 std.sp.
Fenugreek seeds	2g/¼ std.sp.
Bengalgram dhal	10g/2 std.sp.
Tamarind	10g/one amla size
Oil	20g
Water	750 ml.

Method

1. Soak fieldbeans overnight in thrice its volume of water.
2. Cook it till soft (approximately 20-30 minutes)
3. Roast bengalgram dhal, coriander seeds, fenugreek and red chillies
4. Grind this masala using 100 ml. of water to fine paste.
5. Soak tamarind in 100 ml. of water and prepare tamarind extract.
6. Slice onion
7. Prepare seasonings using onion and mustard in oil
8. Add tamarind extract to them and allow to boil for a few more minutes.
9. To this add the ground masala, cooked field beans and salt and allowed to boil for 10-15 minutes
10. Removed from the fire.

Total volume - 2-2/5 std.cup
Number of serving - one

Nutritive value and cost per serving

Protein (g)	Calories	Calcium (mg)	Iron (mg)	Carotene (mcg)	Vit.B1 (mg)	Vit.B2 (mg)	Vit.C (mg)	Cost (ps)
12.5	368	44	1.6	-	0.33	0.09	3	33

5. Amaranthus - Onion Curry

Ingredients	Quantity	Method
Amararanthus	70g/1 cup (chopped)	1. Clean and chop amaranthus
Onion	½ of a small onion 30g	2. Slice onion
Tamarind	5 g	3. Soak tamarind in 50 ml. of water
Chillie powder	½ std.sp.	4. Prepare seasonings using mustard and curry leaves
Mustard	½ std.sp.	5. To this, add the cut amaranthus, onion and water and boil for approximately 10minutes.
Blackgramdhal	½ std.sp.	
Oil	10g/3 std.sp.	
Jaggery	5 g	
Water	150 ml./3/5 std.cup	6. Add tamarind juice, salt and chillie powder and bring it to boil for few minutes.
Salt	1 std.sp.	7. Add jaggery powder to this and remove from the fire. (This is optional)

Total volume of the product - one std.cup
Number of servings - one

Nutritive value and cost per serving:

Protein	Calories	Calcium	Iron	Carotene	Vit.B1	Vit.B2	Vit.C	Cost
g		mg	mg	µg	mg	mg	mg	P.
2.8	152	288	18.56	3864	0.04	0.20	72	30

6. Wholegram - Usali

Ingredients	Quantity
Field beans	30 g
Onion	20 g
Green chillies	1
Oil	5 g
Water	150 ml.
Salt	½ std.sp.

Method

1. Soak field beans overnight in thrice the volume of water
2. Cook it till soft.
3. Add salt and mix
4. Prepare seasonings with onion and green chillies in oil.g
5. Add the cooked grams to the seasonings and mix well.

Total volume of the product - 2/5 std.cup
Number of servings - One

Nutritive value and cost per serving:

Protein (g)	Calories	Calcium (mg)	Iron (mg)	Carotene (ug)	Vit.B1 (mg)	Vit.B2 (mg)	VictC (mg)	Cost (Ps)
7.5	194	18	0.8	-	0.16	0.05	-	18

NOTE: In place of fieldbeans either bengalgram or horsegram can be used.

7. Amaranth - Gram - Curry

Ingredients	Quantity
Amaranthus	70 g
Fieldbeans	30 g
Green chillies	2-3
Mustard	¼ std.sp.
Blackgram dhal	4 sprig
Curry leaves	2 sprig
Oil	1½ tsp/¼ std.cup
Salt	½ std.sp.
Water	1 std.cup

Method

1. Soak field beans overnight and cook in thrice the volume of water (including the soaking water) This takes about 20-30 minutes.
2. Mash the cooked gram and keep aside
3. Prepare seasonings with green chillies, blackgram dhal, mustard and curry leaves in oil.
4. Add the cut amaranthus, salt and any remaining water and till done.
5. Add the mashed gram and stir well.
6. Allow to simmer for a few minutes and remove from the fire.

Volume of the product - 1½ std.cup
Number of serving - one

Nutritive value and cost per serving:

Protein (g)	Calories	Calcium (mg)	Iron (mg)	Carotene (µg)	Vit.B1 (mg)	Vit.B2 (mg.)	Vit.C (mg)	Cost (ps)
10.3	361	296	18.7	3864	0.18	0.25	69	30

HORSEGRAM - GREENS CURRY

Ingredients	Quantity
Horsegram	30 g
Leafy vegetables	70 g
Tamarind	5 g
Coriander seeds	2 std.sp.
Red chillies	2
Blackgram dhal	1 std.sp.
Mustard	¼ std.sp.
Curry leaves	a sprig
Oil	10 g/15 ml.
Salt	1 std.sp.
Water	1 std.cup

Method

1. Soak horsegram overnight in thrice the volume of water and cook till soft in the soaking water
2. Soak tamarind in 50 ml. of water and extract the juice.
3. Fry coriander seeds, red chillies and black gram dhal in ¼ std.spoon of oil and grind them to a fine paste.
4. Cut leafy vegetables and add this to the frying pan with the seasonings.
5. Cook the leafy vegetables a little longer.
6. Add the tamarind juice and bring it to boil and add salt to this.
7. To this add ground masala and cooked gram.
8. Boil for 5-7 minutes.

Total volume of the product - 4/5 std.cup

Nutritive value and cost per serving

Protein	Calories	Calcium	Iron	Carotene	Vit.B1	Vit.B2	Vit.C	Cost
g		mg	mg	µg	mg	mg	mg	P.
9.4	218	371	20.3	3885	0.15	0.26	69	30

NOTE:- In placeof horsegram other whole grams can also be used.

HORSEGRAM - Curry

Ingredients	Quantity
Horsegram	50 g
Tamarind	3 g
Coriander seeds	2 std.sp.
Red chillies	2
Mustard	¼ std.sp.
Blackgramdhal	½ std.sp.
Curry leaves	a sprig
Oil	10 g/15 ml.
Salt	¾ std.sp.
Water	1 std.cup

Method

1. Soak horsegram overnight and cook in thrice the volume of water (including the soaking water.
2. Soak tamarind in 50 ml. of water and prepare tamarind juice.
3. Fry coriander seeds and chillies in ¼ std.spoon of oil and grind them to a fine paste.
4. Prepare seasonings with blackgram dhal, mustard and curry leaves.
5. Add tamarind juice, bring it to boil and add salt.
6. To this add ground masala and cooked gram.
7. Boil for 5-7 minutes.

Total volume of the product - 3/5 std.cup

Nutritive value and cost per serving:

Protein	Calories	Calcium	Iron	Carotene	Cost
6.6 g	187	9.3 mg	2.3 mg	21 ug	20 ps.

NOTE: In place of horsegrams, other wholegrams can also be used.

ONION CURRY

Ingredients	Quantity
Onion	50 g
Tamarind	3 g
Coriander seeds	2 std.sp.
Red chillies	2
Mustard	¼ std.sp.
Blackgramdhal	½ std.sp.
Curry leaves	a sprig
Oil	10g/15 ml.
Salt	¼ std.sp.
Water	1 std.cup

Method

1. Soak tamarind in 50 ml. of water and prepare tamarind juice.
2. Fry coriander seeds and chillies in ¼ std.sp. of oil and grind them to a fine paste.
3. Chop onion and fry till golden brown.
4. Add blackgram dhal, mustard and curry leaves and prepare seasonings.
5. To this add the tamarind juice bring it to boil and add salt.
6. Add ground masala to this.
7. Boil for 5-7 minutes.

Total volume of the product - 2/5 std.cup

Nutritive value and cost per serving

Protein	Calories	Cost
-	115	20

II. BALANCED DIETS IN TERMS OF STANDARD CUPS AND SPOONS

The balanced diets for different categories of people are given in terms of standard cups and spoons in the following table:

Table-1: Balanced Diet for Adult Man(Moderate worker)

Food Stuff	Qty (g)	Approximate volume in std. cup and std. spoon.	Number
I. CEREALS			
1. Rice	335	1-3/5	
2. Wheat flour	140	1	
II. PULSES			
1. Redgram dhal	30	1/5	
2. Blackgram dhal	30	6 std. sp.	
III. GREEN LEAFY VEGETABLE			
1. Amaranthus	125	1-4/5	3 bundles
IV. Roots and Tubers			
Potato	100	3/5	2 medium sized ones
V. OTHER VEGETABLES			
Beans	75	1/2	12-15 or a handful
VI. FRUIT			
Orange	30	-	3 segments.
VII. Milk	200	4/5	-
VIII. Fats and oils	40	2/5	-
IX. Sugar & Jaggery	40	1/5	-

... 2

Table-II: Balanced Diet for an Adult Women (Moderate Worker)

(1)	(2)	(3)	(4)
I. CEREAL			
1. Rice	230	1	
2. Wheat	120	-4/5	
II. PULSES			
1. Redgram dhal	45	-1/5	
2. Blackgram dhal	25	5 std. sp.	-
III. GREEN LEAFY VEGETABLE			
Amaranth	125	1-4/5	3 bundles.
IV. ROOTS AND TUBERS			
Potato	75	1/2	1
V. OTHER VEGETABLES - Beans	75	1/2	12-15 or a handful.
VI. FRUITS - Orange	30	-	3 segments or a quarter fruit.
VII. Milk	200	4/5	-
VIII. Fats and Oils	35	1/5	-
IX. Sugar and Jaggery	30	6 Std. sp.	-

Table-III: Additional Allowance for Pregnancy and Lactation

Food Stuff	Pregnancy			Lactation		
	Qty (g)	Appx.Vol. in std.cup.	No.	Qty (g)	Appx.Vol. in std.cup	No.
I. CEREALS:						
Rice	50	1/5	-	40	1/5	-
Wheat				60	2/5	-
II. PULSES:						
Redgram dhal				20	2 std.sp.	-
III. GREEN LEAFY VEGETABLE	25	2/5	3/4 bundles	25	2/5	3/4bundles
VI. Milk	125	½	-	125	1/2	-
V. Fats & Oils				15	4 std.sp.	
VI. Sugar & Ja-						

Table - IV: Balanced Diet for a Child between the Age 3-6 years (Ref. - 6 years old child)

Food Stuff	Qty (g)	Appx. Vol. in std. cup	No.
(1)	(2)	(3)	(4)
I. CEREALS			
1. Rice	140	3/5	-
2. Wheat flour	60	2/5	-
II. PULSES			
1. Redgram dhal	30	6 std. sp.	
2. Blackgram dhal	15	3 "	
3. Other grams	15	3 "	
III. GREEN LEAFY VEGETABLE:			
Amaranth	75	1-1/5 std.cup	1-½ bundles
IV. ROOTS AND TUBERS			
Potato	50	2/5 "	1 medium size
V. OTHER VEGETABLES			
Beans	50	2/5 std.sp.	8-10 in no.
VI. FRUITS			
Orange	50	2/5 std.cup.	5 segments.
VII. Milk	250	1 "	
VIII. Fats and Oils	25	7 std.sp.	
IX. Sugar and Jaggery	40	8 std. sp.	

... 4

Table - V : Balanced Diet for a Child Between the Age 1-3 years
(Ref: 3 year old child)

(1)	(2)	(3)	(4)
I. CEREALS			
1. Rice	90	2/5	-
2. Wheat	60	2/5	-
II. PULSES			
1. Redgram dhal	25	5 std.sp.	-
2. Blackgram dhal	10	2 std.sp.	-
3. Greengram dhal	15	3 std.sp.	-
III. GREEN LEAFY VEGETABLES:			
Amaranth	50	4/5 cup	1 bundle
IV. ROOTS AND TUBERS			
Potato	30	2/5 cup	1 small
V. OTHER VEGETABLES			
Beans -	30	2/5 cup	5-7 in no.
VI. FRUITS - Orange	50		5 segments
VII. Milk	300	1-1/5	-
VIII. Fats and Oils	20	6 std.sp.	
IX. Sugar and Jaggery	30	6 std. sp.	

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D I E T S

A balanced diet is one that contains the nutrients necessary to maintain good health in the right proportions.

In planning a diet the following points must be taken into consideration.

1) Total calorie value
2) Proportion of P.F. CHO. Min, Vit and H_2O

   Calories must provide the energy to maintain B.M: plus extra energy required varies

3) Age
4) Sex
5) Occupation & condition

   a) pregnancy
   b) sickness
   c) convalescent

Average adult - 72 C/hr.

72 x 24 = 1728/Day

Sedentary 800 - 900 C

Light work (Prof. Business) 900 - 1400 C

Modorate work (Mechanic) 14 - 1800 C

Heavy labourers/Athelotes 1800 C

Diet P - varies

$\frac{1}{2}$ Veg. P $\frac{1}{2}$ animal

Fat $\frac{1}{4}$ - 1/3 calories (45 - 50 gms)

CHO Bulk. (Normal adult 400 - 500 gms)

ICMR recommends the daily allowance of Protein as follows:

			P/Ams
Men 55 kg./120 lbs.	Light or sedentary work	2400	55
	Moderate work	2800	55
	Very hard work	3600	55
Women 45 kg./100 lbs	Sedentary work	2000	45
	Moderate work	2300	45
	Very hard work	300	45
	Pregnancy		100
	Lactation		110

ITEMS	Proteins gms	Fats gms	Cho gms	Calsvalue	Ca	P	Fe	Vit. A I.U.	Thiamine mgs	Riboflavin mgs	Nicotinic acid	Vit.C mgs
RICE (milled)	6.8	.5	78.2	345	10	160	3.1	0	.09	.03	1.9	0
RICE (parboiled)	6.4	.4	79	348	.9	143	4	0	.21	.09	3.8	0
RAGI	7.3	1.3	72	328	344	283	17.4	70	.42	.1	1.1	0
MAIZE	11.1	3.6	66.2	342	10	328	2	1502	.42	.1	1.4	0
WHEAT	11.8	1.5	71.2	346	41	306	4.9	108	.45	.12	5	0
WHEAT FLOUR	12.1	1.7	69.4	341	48	423	11.5	49	.49	.29	4.3	0
RED GRAM	22.3	1.7	57.6	355	73	304	5.8	220	.45	.51	2.6	0
BENGAL GRAM	20.8	5.6	59.8	372	56	331	9.1	216	.48	.18	2.4	1
BLACK GRAM	24	1.4	59.6	347	154	385	9.1	64	.42	.37	2	0
GREEN GRAM	24.5	1.2	59.9	351	75	405	8.5	83	.72	.15	2.4	0
AGATHI	8.4	1.4	7.8	93	1130	80	3.9	9000	.21	.09	1.2	169
BEANS	4	.5	6.3	46	397	83	25.5	9200	.03	.1	1	99
CABBAGE	1.8	.1	4.6	27	39	44	.8	2000	.06	.03	.4	124
CORIANDER	3.3	.6	7.5	48	184	62	18.5	11530	.05	.06	.8	135
BEETROOT	1.7	.1	8.8	43	200	55	1	0	.04	.09	.4	88
CARROTS	.9	.2	10.6	47	80	30	212	3.50	.04	.02	.6	3
ONIONS	1.2	0	11	49	180	50	.7	0	.08	.01	.4	11
POTATO	1.6	.1	22.6	97	10	40	.7	40	.1	.01	1.2	17
RADDISH	.7	.1	3.4	17	50	22	.4	5	.06	.02	.5	15
SWEET POTATO	1.2	.3	28.2	120	20	50	.8	10	.08	.04	.7	24
YAM	1.4	.1	26	111	60	20	1.3	130	.07	0	.7	0
DOUBLE BEANS	8.3	.3	12.3	85	40	140	2.3	220	0	0	0	22
BRINJALS	1.4	.3	4	24	18	47	.9	124	.04	.11	.9	12
CAULIFLOWER	2.6	.4	4	30	33	57	1.5	51	.04	.1	1	56
CUCUMBER	.4	.1	2.5	13	10	25	1.5	0	.03	.01	.2	7
DRUMSTICKS	2.5	.1	3.7	26	30	110	5.3	184	.05	.07	.2	120
KNOL-KOL	1.1	.2	3.8	27	20	35	.4	36	.05	.09	.5	85
GOOSE-BERRIES	0.5	.1	13.7	58	50	20	1.2	15	5.3	.01	.02	600
TOMATOES	1.9	.1	3.6	23	20	36	1.8	320	.07	.01	.4	31
COCONUTS	6.8	62.3	80.4	661	400	210	2.7	0	.08	.06	.6	7
GROUNDNUTS	26.7	40.1	20.3	549	50	390	1.6	63	.9	.3	14.1	0
BANANA	1.1	.1	24.7	104	10	30	.25	124	.04	.17	.3	6
LIME	1.5	1	10.9	69	90	20	.3	0	0	0	0	26
EGG	13.3	13.3	0	173	60	220	2.1	1200	1000	.1	.1	0
MUTTON	18.5	13.3	0	194	115	150	-	31	.18	.27	6.8	0
SHARK	21.6	.4	0	90	143	175	1.3	0	0	0	2.5	0
BUTTER	0	81	0	729	0	0	0	2500	0	0	0	0
OIL	0	100	0	900	0	0	0	0	0	0	0	0
COWS MILK	3.2	4.1	4.4	67	149	96	.2	150	15	.05	.18	.1
BUFFALO MILK	4.3	8.8	5.1	118	210	130	.2	160	.04	.1	.1	3
BREAD	7.8	.7	51.9	245	11	0	1.1	0	.07	0	.7	0
GHEE	0	100	0	900	0	0	900	900	900	0	0	0
SUGAR	0	0	100	398	0	0	0	0	0	0	0	0
JAGGARY	.4	.1	95	383	.08	.04	11.4	280	.02	0	1	0
BUTTERMILK	4.3	8.8	5.1	118	210	0	.2	160	0	0	.1	3

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BALANCED DIETS FOR ADULT MAN

	Sedendary work		Moderate work		Heavy work	
	Vegetarian (gm)	Nonvegetarian (gm)	Vegetarian (gm)	Nonvegetarian (gm)	Vegetarian (gm)	Nonvegetarian (gm)
Cereals	400	400	475	475	650	650
Pulses	70	55	80	65	80	65
Green leafy vegetables	100	100	125	125	125	125
Other vegetables	75	75	75	75	100	100
Roots and tubers	75	75	100	100	100	100
Fruits	30	30	30	30	30	30
Milk	200	100	200	100	200	100
Fats and oils	35	40	40	40	50	50
Meat and fish	-	30	-	30	-	30
Egg	-	30	-	30	-	30
Sugar and jaggery	30	30	40	40	55	55
Groundnuts	-	-	-	-	50*	50*

*An additional 30 gm. of fats and oils can be included in the diet in place of groundnuts.

BALANCED DIETS FOR ADULT WOMEN

	Sedentary work		Moderate work		Heavy work		Additional allowances during	
	Vegetarian (gm)	Non-vegetarian (gm)	Vegetarian (gm)	Non-vegetarian (gm)	Vegetarian (gm)	Non-vegetarian (gm)	Pregnancy (gm)	Lactation (gm)
Cereals	300	300	350	350	475	475	50	100
Pulses	60	45	70	55	70	55	-	10
Green leafy vegetables	125	125	125	125	125	125	25	25
Other vegetables	75	75	75	75	100	100	-	-
Roots and tubers	50	50	75	75	100	100	-	-
Fruits	30	30	30	30	30	30	-	-
Milk	200	100	200	100	200	100	125	125
Fats and oils	30	35	35	40	40	45	-	15
Sugar and jaggery	30	30	30	30	40	40	10	20
Meat and fish	-	30	-	30	-	30	-	-
Eggs	-	30	-	30	-	30	-	-
Ground nuts	-	-	-	-	40*	40*	-	-

*An additional 25 gm. of fats and oils can be included in the diet in place of groundnuts

BALANCED DIETS FOR CHILDREN

	Pre-school Children				School children			
	1-3 years		4-6 years		7-9 years		10-12 years	
	Vegetarian (gm)	Non-vegetarian (gm)	Vegetarian (gm)	Non-vegetarian (gm)	Vegetarian (gm)	Non-vegetarian (gm)	Vegetarian (gm)	Non-vegetarian (gm)
Cereals	150	150	200	200	250	250	320	320
Pulses	50	40	60	50	70	60	70	60
Green leafy vegetables	50	50	75	75	75	75	100	100
Other vegetables / Roots and tubers	30	30	50	50	50	50	75	75
Fruits	50	50	50	50	50	50	50	50
Milk	300	200	250	200	250	200	250	200
Fats and oils	20	20	25	25	30	30	35	35
Meat and fish / Eggs	-	30	-	30	-	30	-	30
Sugar and jaggery	30	30	40	40	50	50	50	50

BALANCED DIETS FOR ADOLESCENT BOYS AND GIRLS

	BOYS				GIRLS	
	13-15 years		16-18 years		13-18 years	
	Vegetarian (gm)	Non-vegetarian (gm)	Vegetarian (gm)	Nonvegetarian (gm)	Vegetarian (gm)	Nonvegetarian (gm)
Cereals	430	430	450	350	350	350
Pulses	70	50	70	50	70	50
Green leafy vegetables	100	100	100	100	150	150
Other vegetables	75	75	75	75	75	75
Roots and tubers	75	75	100	100	75	75
Fruits	30	30	30	30	30	30
Milk	250	150	250	150	250	150
Fats and oils	35	40	45	50	35	40
Meat and fish	-	30	-	30	-	30
Eggs	-	30	-	30	-	30
Sugar and jaggery	30	30	40	40	30	30
Groundnuts	-	-	50*	50*	-	-

*An additional 30 gm of fats and oils can be included in the diet in place of groundnuts.

ADULTRATION OF FOODS

Adulteration of foods consists of a large number of practices - mixing, substitution, abstraction, concealing the quality, putting up decomposed foods for sale, misbranding or giving false labels and addition of poisons. Some forms of adulteration are injurious to health, e.g. adulteration of mustard oil with argemone oil. But for the most part, food adulteration has an economic rather than a sanitary significance, e.g. addition of water to milk.

Food adulteration practices vary from one part of the country to another, and from time to time. Our knowledge about the current practices of food adulteration is meagre. The types of adulteration commonly found in various foodstuffs in India are as follows:

(1) Milk: Perhaps no other food is subjected to such frequent adulteration as milk. Addition of water, removal of cream, and addition of starch, paper pulp and skim-milk powder are the common types of milk adulteration

(2) Ghee: Ghee is adulterated with vanaspathi and animal fats such as pig's fat. In order to improve the flavour of adulterated ghee, tributyrin is added. The Government of India have not succeeded in enforcing the colouring of vegetable ghee.

(3) Cereals: Rice and wheat are mixed with stones, sand, grit and mud to increase bulk

(4) Flours: Wheat flour is mixed with soap stone (talc) powder and chalk powder. Bengal gram (Besan) flour is adulterated with lathyrus flour. Maida is adulterated with sinchada flour.

(5) Pulses: Pulses are adulterated with lathyrus. Chemical substances such as metanil yellow are added to old stocks of pulses to improve the colour and appearance.

(6) Edible oils: Admixture of cheaper oils and mineral oils is commonly practised. Dyes are also added to improve the appearance. Argemone oil is another intentional adulterant. (

(7) Tea and Coffee: Tea leaves are adulterated with exhausted old tea leaves and dust, black gram husk, saw dust and cashew husk. Coffee powder is adulterated with roasted dates, tamarind seeds, husk powder, added colour and chicory without declaration.

(8) Honey: Honey is adulterated with sugar or jaggery and boiled with empty beehives. The list is endless

Food Standards:

(1) Codex Alimentarius: This is a collection of international food standards prepared by the Codex Alimentarius Commission, which is the principal organ of the Joint FAO/WHO Food Standards Programme. The food standards in India are based on the international codex alimentarius (2) PFA Standards: Under the prevention of Food Adulteration Act (1954) rules have been framed. These are revised from time to time by an expert body called the "Central Committee for Food Standards". Any food that does not confirm to the minimum standards is said to be adulterated.

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The use of food additives is subjected to government regulation throughout the world. In India, two regulations, viz. the Prevention of Food Adulteration Act and the Fruit Products Order govern the rules and regulations of food additives. Any food that contains food additives that are not permitted is considered adulterated; if the permissible limit exceeds, then also the food is considered adulterated. The nature and quantity of the additive shall be clearly printed on the lable to be affixed to the container. Whenever, any extraneous colouring matter has been added to any article of food, the words 'Artificially Coloured' shall be written on the label. At the international level, food standards are fixed by the codex alimentarius commission.

FOOD FORTIFICATION

The 8th Joint FAO/WHO Expert Committee on Nutrition (1971) defined fortification as "the process whereby nutrients are added to foods to maintain or improve the quality of the diet of a group, a community or a population". On the other hand, the word enrichment is used to signify the addition of dietary essentials to a food to restore the total content of the former. The following are some examples: (1) Milk: Milk is fortified by the addition of vitamins A and D (2) Wheat flour: In February 1970, the Government of India launched a programme in Bombay for fortification of atta with vitamins and minerals, and for increasing the protein content by admixture with edible groundnut flour. This programme is planned to be extended to other cities at a later date. (3) Edible oils: Fortification of "vanaspathi" (hydrogenated fat) with vitamin A has been made compulsory (2,500 i.u. of vitamin A and 175 i.u. vitamin D per 100 g of vanaspathi) by the Government of India. (4) Common salt: Common salt is fortified with potassium iodate and supplied in areas where goitre is endemic. Fortification of common salt with calcium and iron is being considered to be taken up on a national scale in India. (5) Synthetic amino acids: Addition of synthetic amino acids to foods offers great possibilities for the future, e.g., lysine to wheat flour. (6) Sugar: fortified with vitamin A is being used in some countries for the prevention of nutritional blindness. Fortification and enrichment have made tremendous contributions to the public health in improving the nutritional standards of the people and in correcting specific deficiency states.

SOURCE: PREVENTIVE & SOCIAL MEDICINE

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NUT 3-40 R-12

COMMUNITY HEALTH CELL
47/1, (First Floor) St. Marks Road
BANGALORE - 560 001

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THE PREVENTION OF FOOD ADULTERATION ACT, 1954

(Act 37 of 1954)

This Act to make provision for the prevention of adulteration of food was enacted by the Indian Parliament in 1954. It extends to the whole of India except the State of Jammu & Kashmir and supersedes all Food Laws that were passed by individual States in their own territories. It came into force in May, 1955.

An attempt has been made under this Act to make the provisions uniform, broadbased and more deterrant and to remove some of the lacunae that were found in the existing Food Laws and Bye-laws of the different States and local bodies.

Some of the important Sections are summarised below :

Section 2. Definitions

(1) "Adulterated"- an article of food shall be deemed to be adulterated -

(a) if the article sold by a vendor is not of the nature, substance or quality demanded by the purchaser and is to his prejudice, or is not of the nature, substance or quality which it purports or is represented to be;

(b) if the article contains any other substance which affects, or if the article is so processed as to affect injuriously the nature, substance or quality thereof;

(c) if any inferior or cheaper substance has been substituted wholly or in part for the article so as to affect injuriously the nature, substance or quality thereof;

(d) if any constituent of the article has been substituted wholly or in part abstracted so as to affect injuriously the nature, substance or quality thereof;

(e) if the article had been prepared, packed or kept under insanitary conditions whereby it has become contaminated or injurious to health;

(f) if the article consists wholly or in part of any filthy putrid, disgusting, rotten, decomposed or diseased animal or vegetable substance or is infested or is otherwise unfit for human consumption;

(g) if the article is obtained from a diseased animal;

(h) if the article contains any poisonous or other ingredient which renders it injurious to health;

(i) if the container of the article is composed, whether wholly or in part, of any poisonous or deleterious substance which renders its contents injurious to health;

(j) if any colouring matter other than that prescribed in respect thereof and in amounts not within the prescribed limits of variability is present in the article;

(k) if the article contains any prohibited preservative or permitted preservative in excess of the prescribed limits;

(l) if the quality or purity of the article falls below the prescribed standard or its constituents are present in quantities which are in excess of the prescribed limits of variability.

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(V) "Food" means any article used as food or drink for human consumption other than drugs and water and includes;

(a) any article which ordinarily enters into, or is used in the composition or preparation of human food, and

(b) any flavouring matter or condiments.

(IX) "Misbranded"- an article of food shall be deemed to be misbranded -

(a) if it is an imitation of, or is a substitute for, or resembles in a manner likely to deceive, another article of food under the name of which it is sold, and is not plainly and conspicuously labelled so as to indicate its true character;

(b) if it is falsely stated to be the product of any place or country;

(c) if it is sold by a name which belongs to another article of food;

(d) if it is so coloured, flavoured or coated, powdered or polished that the fact that the article is damaged is concealed or if the article is made to appear better or of greater value than it really is;

(e) ifalse claims are made for it upon the label or other;

(f) if, when sold in packages which have been sealed or prepared by or at the instance of the manufacturer or producer and which bear his name and address, the contents of each package are not conspicuously and correctly stated on the outside thereof within the limits of variability prescribed under this Act;

(g) if the package containing it, or the label on the package bears any statement, design or device regarding the ingredients or the substances contained therein, which is false or misleading in any material particular; or if the package is otherwise deceptive with respect to its contents;

(h) if the package containing it or the label on the package bear the name of a fictitious individual or company as the manufacturer or producer of the article;

(i) if it purports to be, or is represented as being, for special dietary uses, unless its label bears such information as may be prescribed concerning its vitamin, mineral, or other dietary properties in order sufficiently to inform its purchaser as to its value for such uses;

(j) if it contains any artificial flavouring, artificial colouring or chemical preservative, without a declaratory label stating that fact, or in contravention of the requirements of this Act or rules made thereunder.

(k) if it is not labelled in accordance with the requirements of this Act or rules made thereunder.

Section 3. The Central Govt. to constitute a Central Committee for Food Standards with D.G.H.S. ex-officio as Chairman and Director of Central Food Laboratory, ex-officio member and the following members nominated by the Central Government-two experts, one representative each of the Central Ministries of Food and Agriculture, Commerce and Industry, Railways and Defence, two representatives from Union Territories, two representatives of industry and commerce. Besides these, each State nominates one representative and the Indian Council of Medical Research nominates a representative of the medical profession.

Section 4. The Central Govt. to establish a Central Food Laboratory, and after consultation with the Central Committee make rules regarding the functions of the Central Food Laboratory. The object of these two sections is to bring about uniformity of Food Standards throughout the country and to maintain a satisfactory standard of laboratory practices in the different States.

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Section 5. Prohibition of certain articles of food into India.

(i) any adulterated food ;
(ii) any misbranded food :
(iii) any article of food for the import of which a licence is prescribed, except in accordance with the conditions of the licence; and
(iv) any article of food in contravention of any other provision of this Act or of any rule made thereunder.

Section 7. Prohibition of manufacture, sale, etc., of certain articles of food. No person shall himself or by any person on his behalf manufacture for sale, or store, sell or distribute -

(i) any adulterated food ;
(ii) any misbranded food ;
(iii) any article of food for the sale of which a licence is prescribed, except in accordance with the conditions of the licence ;
(iv) any article of food the sale of which is for the time being prohibited by the Food (Health) Authority in the interest of public health ; or
(v) any article of food in contravention of any other provision of this this Act or any rule made thereunder.

Section 8. The Central or State Govt. to appoint Public Analysis and define their jurisdiction.

Section 9. The Central or State Govt. to appoint Food Inspectors who shall be deemed to be public servants within the meaning of the section 21 I.P.C. thereby having definite rights and responsibilities.

Section 10. (1) A food inspector shall have power

(a) to take samples of any article of food.
(b) to send such sample for analysis to the public analysts.
(c) with the previous approval of the health officer having jurisdiction in the local area concerned, or with the previous approval of the Food (Health) Authority, to prohibit the sale of any article of food in the interest of public health.

(2) Any food inspector may enter and inspect any place where any article of food is manufactured, stored or exposed for sale and take samples of such articles of food for analysis.

(4) A food inspector may seize and carry away or keep in safe custody of the vendor with a bond, if any article intended for food appears to be adulterated or misbranded.

(6) Any material apparently of a kind which may be employed for purpose of adulteration may be seized by the food inspector and if necessary, a sample submitted for analysis to a public analyst.

(7) Where the food inspector takes any action under clause (a) of sub-section 1), sub-section (2), sub-section (4) or sub-section (6), he shall call one or more persons to be present at the time when such action is taken and take his or their signatures.

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Section 11. (1) When a food inspector takes a sample of food for analysis, he shall

(a) give notice in writing then and there of his intention to have it so analysed to the person from whom he has taken the sample :

(b) except in special cases provided by rules under this Act separate the sample then and there into three parts and mark and seal or fasten up each part in such a manner as its nature permits ; and

(c) (i) deliver one of the parts to the person from whom the sample was taken;
(ii) send another part for analysis to thepublic analyst; and
(iii) retain the third part for production in case any legal proceedings are taken or for analysis by the Director of the Central Food Laboratory under sub-section (2) of section 13, as the case may be.

Section 12. A purchaser may have food analysed by giving notice to the vendor of his intention to have the same analysed; if, on analysis, the article is found to be adulterated, the fee paid by him for analysis will be refunded to him and the vendor will be dealt with according to law.

Section 15. The Central Government or the State Govt. may, by notification in the Official Gazette, require medical practitioners carrying on their profession in any local area specified in the notification to report all occurences of food poisoning coming within their cognizance to such officer as may be specified in the notification.

Section 16 to 20. Penalties : If any person whether by himself or by any other person on his behalf (a) contravenes Sec. 5 or 7, or (b) prevents a food inspector from taking samples for analysis or (c) obstructs the food inspector in the discharge of his duties or (d) being a manufacturer has any material that can be used for adulteration in his possession or in one of his premises, or e) uses any report or certificate of a test issued by the Director of Central Food Laboratory for advertising or (f) gives a false warranty to the purchaser in, writing in respect of any food sold by him, he shall be punishable.

He shall, in addition to the penalty to which he may be liable under the provisions of section 5, be punishable with imprisonment for a term which shall not be less than six months but which may extend to six years, and with fine which shall not be less than one thousand rupees. There are other provisions also.

If any person convicted of an offence under this Act commits a like offence afterwards, it shall be lawful for the court before which the second or subsequent conviction takes place to cancel the licence and to cause the offender's name and place of residence, the offence and the penalty imposed to be published at the offender's expense in such newspapers or in such other manner as the court may direct. The expenses of such publication shall be deemed to be part of the cost attending the conviction and shall be recoverable on the same manner as a fine.

No court inferior to that of a Presidency Magistrate or a Magistrate of the first class shall try any offence under the Act.

Section 23. The Central Govt., may after consultation with the Committee and subject to the conditions of previous publication, make rules:

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(a) specifying the articles of food or classes of food for the import of which a licence is required and prescribing the form and conditions of such licence the authority empowered to issue the same and the fees payable therefor;

(b) defining the standards of quality for, and fixing the limits of variability permissible in respect of any article of food ;

(c) laying down special provision for imposing rigorous control over the production, distribution and sale of any article or class of articles of food and other rules for proper implementation of the Act.

Section 24. The State Government may also make rules in the same way as above in matters not falling within the purview of section 23.

3. THE PREVENTION OF FOOD ADULTERATION RULES, 1955

In exercise of the powers conferred under the Act, the Central Government after consultation with the Central Committee of the Food Standards have made the following rules.

These cover the definitions and standards of quality of various articles of food as also definite directives regarding the Central Food Laboratories, Public Analysts and Food Inspectors, packing, sealing and despatch of samples, conditions for sale and licence, colouring matter and preservatives, anti-oxidants, emulsifying, stabilising and flavouring agents.

Standards of Quality of food - The standards of some food items are given below:

A.08 Coffee -

A.0801 (1) Coffee (green, raw or unroasted) means the seed of coffea arabica, Coffea liberica, or Coffea robusta, freed from all but a small portion of its pericarp by decortication.

(2) Roasted Coffee means the properly cleaned green coffee which has been roasted to a brown colour and has developed its characteristic aroma.

(3) Ground coffee means the powdered product obtained from 'roasted coffee' only and shall be free from husk.

(4) Coffee (green, raw or unroasted), 'roasted coffee' and 'ground coffee' shall be free from any artificial colouring, flavouring, facing, extraneous matter or glazing substance and shall be in sound, dry and fresh condition free from rancid or obnoxious flavour.

(5) Coffee (green, raw or unroasted), 'roasted coffee' and 'ground coffee' shall conform to the following analytical standards -

(i) Total ash (determined on the sample dried to constant weight at 100°C), shall be feathery white or bluish white in colour and shall be not less than 3.5 per cent and not more than 5.0 per cent by weight of which not less than 65 per cent shall be soluble in boiling distilled water. The ash insoluble in hot dilute HCl shall be not more than 0.1 per cent.

(ii) The alkalinity of the soluble ash per gram of dried coffee shall be equivalent to not less than 3.4 ml. and not more than 4.4 of N/10 acid.

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(iii) The caffeine content as obtained by standard methods, shall be not less than 1.0 per cent.

(iv) The aqueous extract determined by extraction of 2 grams of the sample direct to constant weight at 100°C with 100 ml. of boiling distilled water for one hour under reflux shall be not less than 25 per cent and not more than 32 per cent.

A.11 Milk and Milk Products.

A.11.01 Milk means the normal clean and fresh secretion obtained by complete milking of the udder of a healthy cow, buffalo, goat or sheep during the period following at least 72 hours after calving or until colostrum free whether such secretion has been processed or not.

The standards prescribed for milk shall apply for boiled milk also.

A.11.01.01 Cow milk shall contain not less than 3.5 per cent of milk fat, except in Orissa, where it shall be not less than 3 per cent and in Punjab and PEPSU where it shall be not less than 4.0 per cent. The milk solids other than milk fat, shall be not less than 8.5 per cent.

A.11.01.02 Buffalo milk shall contain not less than 5.0 per cent of milk fat except in Delhi, Punjab, PEPSU, Uttar Pradesh, Bihar, West Bengal, Assam, Bombay and Saurashtra where it shall not be less than 6 per cent. The milk solids other than milk fat, shall be not less than 9 per cent.

A.11.01.03 Goat or Sheep milk shall contain not less than 3.0 per cent of milk fat except in Madhya Pradesh, Punjab, PEPSU, Bombay, Uttar Pradesh, and Travancore-Cochin where it shall be not less than 3.5 per cent. The milk solids other than milk fat, shall be not less than 9 per cent.

Where milk, other than skimmed milk, is sold or offered for sale without any indication as to whether it is derived from cow, buffalo, goat, or sheep the standard prescribed for buffalo milk shall apply.

A.11.02 Skimmed milk, either fresh or reconstituted means milk from which all or most of the milk fat has been removed by mechanical or any other process and includes "separated milk" or "machine skimmed milk". The milk solids other than milk fat shall be not less than 8.5 per cent.

A.11.03 Butter-milk means the product obtained after removal of butter from curds by churning or otherwise.

A.11.04 Toned milk means the product prepared by blending milk with fresh separated milk or with separated milk reconstituted from spray dried skim milk powder or by partial abstraction of fat through skimming or separation of milk.

It shall contain not less than 3.0 per cent of milk fat and 8.5 percent of milk solids other than milk fat.

A.11.04.01 Double Toned Milk means the product prepared by blending milk with

(a) fresh separated milk ; or

(b) separated milk reconstituted from spray dried skim milk powder; or

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(c) by partial abstraction of fat through skimming or separation of milk; and containing not less than 1.5 per cent of milk fat and 10 per cent of milk solids other than milk fat.

A.11.06. Dahi or curd - (a) Whole milk dahi or curd means the product obtained from fresh whole milk either of cow or buffalo by souring. It shall not contain any ingredient not found in milk except sucrose and/or gur.

The standard of purity of dahi or curd shall be the same as prescribed for the milk from which it is derived.

A.11.11 Ice-cream shall contain not less than 36 per cent by weight of solids and 10 per cent by weight of milk fat except that when the ice-cream contains fruits or nuts or both, the content of milk fat may be proportionately reduced but not less than 8.0 per cent by weight. Ice-cream prepared from skimmed milk shall not contain less than 8.5 per cent of milk solids other than milk-fat.

Mixed Ice Cream should have the same fat content and total solid contents as prescribed for Ice cream.

A .11.14 Ghee means the pure clarified fat derived solely from milk or from curd or from deshi (cooking) butter or from cream to which no colouring matter or preservative has been added. The standard of quality of ghee produced in a State or Union territory shall conform to the standards as laid down for that area. Although the maximum limits of the percentage of (1) free fatty acid (as oleic acid) and (2) moistre have been uniformly specified, the standards for minimum Reichert value and Butyro-refractometer reading at 40°C varies from region to region.

A.14 Tea means tea derived exclusively from the leaves, buds and tender stems of plants of the Camellia genus and thea species. It shall conform to the following specifications:

(a) Total ash determined on tea dried to constant weight at 100°C - 5.0. to 8.0 per cent

(b) Total ash soluble in boiling Distilled Water - Not less than 40.0 per cent of total ash.

(c) Ash insoluble in HCl-Not more than 1.0 per cent.

(d) Extract obtained by boiling dry tea (dried at constant weight at 100°C) with 100 parts of distilled water for one hour under reflux - Not less than 1.3 per cent.

(e) Alkalinity of soluble ash - Not less than 1.3 per cent and not more than 2 per cent expressed as K_2O

(f) Crude fibre-Not more than 15 per cent. It shall not contain any added colouring matter.

A.17.06 Mustard oil (Sarson-ka-tel) means the oil expressed from clean and sound mustard seeds, belonging to the compestris, juncea or napus varieties of Brassica. It shall be clear, free from rancidity, suspended or foreign matter, separated water, added colouring or flavouring substances or mineral oil. It shall conform to the following standards:

(a) Butyro-refactometer reading at 40°C -58.0 to 60.5

(b) Saponification value - 168 to 175

(c) Iodine value - 96 to 108

(d) Unsaponifiable matter - Not more than 1.2 per cent

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(e) Free fatty acid as Oleic acid - Not more than 3.0 per cent.

(f) Bellier (Turbidity test) by Ewar's method (Acetic Acid) - Not more than 26.5°C.

The test for argemone oil should be negative.

A.17.11 Til Oil (Gingelly or sesame oil) means the oil expressed from clean and sound seeds of Til (Sesamum indicum) black, brown, white, or mixed. It shall be clear, free from rancidity, suspended or other foreign matter, separated water, added colouring or flavouring substances, or mineral oil. It shall conform to the following standards:

(a) Butyro-refractometer reading at 40°C-58.0 to 61.0

(b) Saponification value-188 to 198

(c) Iodine value-105 to 115.

(d) Unsaponifiable matter - Not more than 1.5 per cent.

(e) Free fatty acid as Oleic acid-Not more than 3.0 per cent.

(f) Bellier Test (turbidity temperature - Acetic acid method) - Not more than 22°C.

A.19. Vanaspati means any refined edible vegetable oil or oils, subjected to a process of hydrogenation from groundnut oil, cotton seed oil and sesame oil or mixtures thereof or any other harmless vegetable oils allowed by the Government for the purpose. It shall conform to the standards specified below:

(i) It shall not contain any harmful colouring, flavouring or any other matter deleterious to health.

(ii) No colour shall be added to hydrogenated vegetable oil unless so authorised by Government, but in no event any colour resembling the colour of ghee shall be added.

(iii) If any flavour is used, it shall be distinct from that of ghee in accordance with a list of permissible flavours and in such quantities as may be prescribed by Government.

Provided that diacetyl to the extent of not more than 4.0 p.p.m. may be added to Vanaspati exclusively meant for consumption by the Armed Forces.

(iv) It shall not have moisture exceeding 0.25 per cent.

(v) The melting point as determined by the capillary slip method shall be from 31°C to 37°C both inclusive.

(vi) The Butyro-refractometer reading at 40°C, shall not be less than 48.

(vii) It shall not have unsaponifiable matter exceeding 1.25 per cent.

(viii) It shall not have free fatty acids (calculated as Oleic acid) exceeding 0.25 per cent.

(ix) The product on melting shall be clear in appearance and shall be free from staleness or rancidity, and pleasant to taste and smell.

(x) It shall contain raw or refined sesame (til) oil not less than 5 per cent by weight, but sufficient so that when the vanaspati is mixed with refined groundnut oil in the proportion of 20:80, the red colour produced by the Baudouin test shall not be lighter than 2.0 units in a 1 cm. cell on a lovibond scale.

(xi) It shall contain not less than 25 I.U. of synthetic Vitamin 'A' per gram.

(xii) No anti-oxidant, synergist, emulsifier or any other such substance shall be added to it except with the prior sanction of the Government.

PART X

PRESERVATIVES

Preservative has been defined as a substance which when added to food, is capable of inhibiting, retarding or arresting the process of fermentation, acidification or other decomposition of food. Preservatives have been divided into two classes:

(i) Class I preservatives comprise of : Common Salt, Sugar, Dextrose, Glucose, Wood smoke, spices, Vinegar or acetic acid, Honey, Hops, Commercial salt petre, and Alcohol or potable spirits. Addition of Class I preservatives in any food in any proportion is not restricted.

(ii) Class II Preservatives are : Benzonic acid including salts thereof, Sulphurous acid including salts thereof, and Nitrites of Sodium or Potassium in respect of food like ham, pickled meat. Use of more than one Class II Preservative in or upon a food is prohibited. Their use has been restricted to the specified group of foods in concentration not exceeding the proportions fixed against each. These foods comprise of Sausage and Sausage meat, Fruits and fruit juices, Cooked picked meat, Alcoholic and non-alcoholic wines, Syrups, Sherbets, Dehydrated vegetables, etc.

PART XII

ANTI-OXIDANTS, EMULSIFYING AND STABILISING AGENTS

'Anti-oxidant' means a substance which when added to food retards or prevent oxidative deterioration of food and does not include sugar, cereal oils, flours, herbs and spices. No anti-oxidant, other than lecithin, ascorbic acid and tocopherol shall be added to any food, but a number of anti-oxidants have been specified which may be added to edible oils and fatss

"Emulsifying agents" and "Stabilising agents" mean substances which when added to food are capable of facilitating a uniform dispersion of oils and fats in aqueous media, vice versa, and or stabilising such emulsions and do not include the following, namely -

Agar, alginic acid, calcium and sodium alginates, carrageen, edible gums, dextrin, sorbitol, pectin, sodium and calcium pectate, sodium citrate, sodium phosphate, sodium tartrate, calcium lactate, lecithin, gelatin, quillaia, modified starches and hydrolysed protein.

Except in milk and cream, a number of specified emulsifying or stabilising agents are permitted to be used in foods.

Container of an article of food to which any emulsifying and stabilising agent has been added shall bear a statement of the chemical nature of such emulsifying and stabilising agents in addition to any trade name.

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PART XIII

FLAVOURING AGENTS

The use of coumarin and dihydrocoumarin as flavouring agents in any article of food is prohibited. Use of Diethylene Glycol monoethyl ether as a solvent in flavours has been prohibited.

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AN ARTICLE: On Food Adulteration and Poisons

CONQUEST OF DEATH, INDIAN STYLE

Author: Sumanta Banerjee
Magazine: "Perspective" (National Monthly published in Delhi)
Issue: March 1978
Editor: Bhabani Sen Gupta

Getting used to hygienic living, like drinking unpolluted water or having unadulterated food, may have its hazards, especially in a country like India.

The other day, we took along a friend of ours who has been living in Europe for the last 10 years, to dine out in a restaurant. While we woke up quite hale and hearty the next morning, this friend from abroad could not get up from his bed because of what turned out to be, after a medical examination, a case of foodpoisoning! One man's food is indeed another man's poison. After years of daily consumption of poison in small doses in the shape of cereals mixed with a variety of items like wood shavings and stone pebbles and cooked in adulterated oil, we Indians have developed a strong stomach that can digest what in scientific terms is known as "unedible for human beings." But even a single dose of such stuff could be fatal for an alien uninitiated to the secrets of modern Indian cooking.

In a sense, therefore, we can claim to be conquering death in stages. At least in this respect we score a point over the developed nations of the West. Our food can be the bane of the rich nations, who have grown soft and flabby all these years on nutritous food preserved carefully from any pollution, its ingredients sterilized and checked and re-checked by sanitary experts. We do not need the dreaded bomb to wipe them away, if there is any war in the future. A taste of our food would be enough to scare them away.

The benefits of immunity through poisoning in doses were known to Indians long before Hahnemann discovered the principles of homoepathy. If you inoculate a man with a small quantity of a disease he becomes immune to a large quantity. Our traders have taken this lesson to their hearts and are doing their best to immunize us against all diseases of the world. Go to any eating place and name any germ and you are sure to pick it up. May be the first time, you may get a bout of amoebic dysentery or gastro-enteritis which may unnerve you. But do not worry. You will soon get used to it. It will become part of your daily life. Soon, even larger doses of amoebic germs will fail to upset you. Thus a time may come when medical experts will have to revise their definitions of terms like "fatal".

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If this seems to be an idle speculation, let us have a look at the facts. A recent study by the Institute of Science, Bombay, revealed that an urban Indian every day is consuming unwittingly along with vegetables fairly sizeable amounts of pesticides like DDT, Landane, Dieldrin and Endrine. Potatoes and french beans showed an incidence of residual pesticides of over 70 % and carrots over 30%. Incidentally, 42 of the 63 polluted samples of vegetables examined by the institute showed that the amount of pollution was much above the recommended human tolerance limits (HTL) as specified by the World Health Organisation and the Food and Agricultural Organisation. Since even after the consumption of these highly polluted foodstuff we are not only living but kicking away, we are clearly on our way to conquer death.

The capital of India - New Delhi - takes the cake in this respect. The morning milk for which the Delhiwalla faithfully queues up before government booths has been found to be contaminated (or shall we say "flavoured" since the presence of the extraneous element apparently does not seem to have any destructive effect, but on the contrary by increasing our immunity can be said to be beneficial!) to the tune of over 4% by DDT residues. DDT is also found in mustard, sesame and coconut oils. A Punjab Agricultural University entomologist is of the view that the level of DDT in human fat in people from the Delhi region could well be the highest in the world.

Incidentally, DDT appears to have emerged into a favourite food for both mosquitoes and human beings, judging by recent Indian habits. Originally meant to destroy mosquitoes, instead of disappearing, they are thriving under DDT spray. The long-departed friend of our rural homes - malaria - has come back. And this time, it is going to stay put. Scientists have discovered a DDT-resistant strain among the new breed of mosquitoes, who, like human beings, have also developed immunity.

I can well imagine the displeasure of some of the readers who may feel that I am being facetious about a serious matter. They may point out that some years ago in West Bengal about 300 men, women and children developed paralysis of the lower limbs after having consumed mustard oil adulterated with a colourless toxic liquid used in the plastic industry. They may add that Argemone, which is popularly known as yellow poppy, is added to mustard seeds and when consumed, causes epidemic dropsy. Old dal is polished with metanil yellow, a cheap soluble colouring substance that makes dals deceptively brighter and freshlooking, but causes cancer.

But than, one should look at it from the point of our leaders who are running the country. There are too many people and too few jobs to go. In such a situation if some are rendered disabled through paralysis or dropsy, isn't it a relief for the overburdened employment market? While adulterated foods have played their part in crippling healthy people, the police in the former regime have made an even more decisive contribution by killing off a sizeable portion of the able-bodied youth who otherwise would have clamoured for jobs or changes and become a thorn in the flesh of our administrators.

Besides, those chicken-hearted people who get upset over food adulteration should also pause to remember how many people, in these days of shrinking employment opportunities, will be thrown out in the streets if adulteration is put an end to. A number of small-scale and cottage-industry workshops are in operation in different parts of the country engaged in producing their speciality - artificial adulterants. It is not a simple job. Colours have to be matched. The exact sizes have to be fixed so that they blend properly with the original. Tastes have to be determined so that the consumer cannot make out the difference. It is an all-embracing affair taking care of all human senses. Isn't this a challenge to human ingenuity?

An entirely new technology has emerged in response to the needs. We heard some years ago about a sophisticated machine somewhere in North India which could chop wood into any size to produce a variety of "dals" to be mixed with the real stuff. In a corner of West Bengal there is reported to be a factory which manufactures stones cut in various shapes to be mixed with cereals.

Such being the case, our leaders, instead of pretending to penalize the adulterators (in the decade between the 'sixties and the 'seventies on an average 4,000 cases anually resulted in short terms of imprisonment - a sort of ritualistic holiday for the accused traders who usually come back to business with renewed vigour after the short interval), should, in fact, encourage them.

According to one estimate, out of about 5,000 cases of food-poisoning in one year, nearly 700 proved fatal!

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LEAGUE FOR INTERNATIONAL FOOD EDUCATION

NEWSLETTER

April 1978

L.I.F.E. NEWSLETTER

EDITOR
HUGH J. ROBERTS, PH.D.

ASSOCIATE EDITOR
ANN L. DYER

FOR
FURTHER INFORMATION

DR. HUGH J. ROBERTS
EXECUTIVE DIRECTOR
LEAGUE FOR INTERNATIONAL
FOOD EDUCATION
1126 SIXTEENTH STREET, N.W.
WASHINGTON, D.C. 20036 U.S.A.
TELEPHONE (202) 331-1658

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UNDERUTILIZED SPECIES OF FISH: A NEW FOOD SOURCE

Robert C. Baker, Ph.D.
Professor of Food Science
Cornell University
Ithaca, New York 14853 USA

Did you know that each year we waste or "underutilize" millions of tons of fish? It is estimated that as much as 70% of the fish in the oceans are underutilized. According to fishermen, there are many areas in the oceans where only underutilized species of fish exist. In lakes, it is estimated that more than 70% are underutilized. Known to the fishing industry as "trash" fish, these fish are frequently netted, killed, and returned to the water as a pollutant.

Why are these fish underutilized? Some have tiny, needle-like bones which make them difficult to eat. Others have unfortunate names, like sucker, crappie, or cancer fish. Still others are considered too small to be worth the effort to prepare them. But all of these problems can be overcome. And on the plus side, these fish contain a high level of good quality protein. And they are extremely low in fat (1-3%). And what is more, the fat is unsaturated which is another plus.

With high quality protein running short in the world, we cannot afford this kind of waste. Along with others, we at Cornell have been looking for solutions to this problem of underutilized fish. One answer is to debone these fish mechanically. We remove the head and entrails, wash the carcass, and place the cleaned fish between a heavy plastic belt and a large cyclinder which contains many small holes. The pressure from the belt forces the flesh, but not the skin, bones, and fins, through the holes in the cylinder. This process can also be used on the fish frames which remain after a larger fish is filleted. From this dressed fish, we obtain yields of 50 to 75% depending upon how well the job of filleting was done.

The deboner that we use is made in Japan and may be too expensive for people in some developing countries. An alternative to the machine process would be to clean the fish, removing the fins, tail, and scales, and then grind the rest of the carcass through a manual grinder. Since fish bones are soft, they disperse well in the ground product and are not particularly objectionable; moreover they are a good source of calcium.

Most species of fish have a mild flavor and are not fishy in taste. The deboned or minced fish looks very much like coarse ground hamburger except that it is much lighter in color. The product has a variety of uses. It can be substituted for hamburger or used in such traditional dishes as spaghetti and meat sauce, Swedish meat balls, sweet and sour fish, lasagna, chili, and tacos. Gourmet chefs can also use the product for such dishes as Newburg or quenelles. They have told us they find the product excellent and especially appreciate the fact that it saves them time by not having to grind fillets.

We have just finished market testing two seafood chowders: Manhattan (tomato-based) and New England (milk-based). In each case, the seafood used in the chowder contained 65% of seafood products that previously have been wasted. Sales were excellent.

We have also market tested one-pound frozen blocks of minced fish. It was packaged in a cardboard box with a heavy waxed paper overwrap. The label served a dual purpose. It opened up into a recipe book with fifteen different recipes for the use of the minced fish. The product sold well at 89 cents per pound.

What does all this mean? I hope it means that in the near future there will not be such a thing as underutilized fish. We just cannot afford to waste this perfectly good food.

INTERNATIONAL NUTRITION: PROBLEMS, POLICIES, AND STRATEGIES

Problems affecting world food supply and nutritional status, and the impact thereon of population growth, particularly in third world countries, are now at the center stage of world concern. Over the past twenty-five years, numerous policies, plans, and programs have been developed and implemented by third world countries to deal with these challenges, frequently with inputs from multinational and bilateral assistance agencies. This summer program, to be held at Cambridge Massachusetts, July 17-July 21, 1978, will be of special value to individuals involved in policy formulation and in program planning and administration in developing countries, and to others in academic, governmental, and commercial institutions concerned with international and third world problems.

For further information, please write to: Max Milner, Associate Director; International Nutrition Policy and Planning Program; Massachusetts Institute of Technology; Cambridge, Massachusetts 02139 USA

THE 4-H TRAINING CENTER IN BELIZE

(The following is adapted from "People-Oriented Projects Making Progress in Belize" by John Dieterly. The article appeared in the Winter 1977 issue of Sharing Life, published by Heifer Project International (HPI).)

Agricultural development in Belize has as much to do with developing new attitudes and getting farmer acceptances of new practices as it does with developing new practices. For various historical reasons, farming is not seen as an attractive vocation. Young people usually move to the towns to seek employment; many emigrate to other countries. With 60% of the population under 21, any agricultural program needs to focus heavily on the young people.

With the School Farm pilot project, HPI can introduce children to the idea that farming can be enjoyable. If they like some phase of it, they can pursue that interest through 4-H, which is active in most schools. Then they can take the three month course at the 4-H Training Center. At present four to six boys can live at the Center at a time, but a new dormitory is under construction which will house 20 students, both male and female. Here young people come for three months to get practical training with rabbits, broilers, layers, milk goats, and bees, as well as experience in the growing of vegetables and a basic understanding of the simple mechanics of a small tractor.

The primary purpose of the Center is to prepare young people for opportunities in agriculture. We do not lecture much. Learning is by doing. Young people learn about rabbit diseases by treating sick rabbits. They learn how to slaughter chickens by slaughtering chickens. Each trainee, when completing the course, should be capable of starting in any of the farming projects we have at the Center, on the basis of experiences they have had, not on the basis of notes taken during a lecture.

We cannot train at the Center all the young people who want to come, so we teach the trainees to teach others. When visitors come to the Center, we encourage the trainees to show them around. In this way they learn not only about chickens, but also about how to tell others about chickens. In turn, when they return to their villages, they are able to tell others what they have learned, and the impact of the training program is multiplied. This has already been illustrated in several instances. A Training Center graduate may return home, start a broiler project, and soon with his help two or three other 4-H'ers in the village also start broiler projects.

Another value of the Center is that it is a place 4-H'ers can call their own. Many were involved in building it and have since watched it grow. They use its services to get started with agricultural projects, and they take pride when it is on display to visitors, notably the 10,000 people who come each year to the National Agricultural Show on which grounds the Center is located. Since the Center is also on the main highway only a mile from Belmopan, it is visible to all who come to the capitol. The attitudinal impact this makes on youth and adults alike is most significant.

L.I.F.E. Lines

In response to "Hens and Eggs, Parts I and II" (October and November 1977) these remarks from Richard Forsythe, Campbell Institute for Food Research, Camden, New Jersey:

> ...While I am sure it is just an oversight, one important element seems to be missing -- namely, the male birds. Obviously one will not have fertile eggs to set from an all pullet flock. Depending on the types of birds, one male should be supplied for every 15-20 light breed females and for every 10-15 heavier type females.

And from Wilmer Dagen, World Neighbors, an offer of additional information:

> ...Eggs are definitely a good source of protein, if the motivation to sell the eggs for badly needed cash is not too great. World Neighbors produced a filmstrip that has had good reception and is excellent for starting a discussion on the subject.

Editor's note: "Who Should Eat the Egg" is available in both Philippine and Guatemalan versions. Both are in English, have a horizontal format, come in color, consist of 21 frames, and are available at US $4.00 each from: World Neighbors; 5116 North Portland Avenue; Oklahoma City, Oklahoma 73112 USA

* *

A year ago we started the L.I.F.E. Lines section of the Newsletter. It appears whenever we receive comments, questions, or additional information from you, the Newsletter readers. We have been pleased with your response thus far and we hope you will continue to write us. Letters can be sent to: L.I.F.E. Lines; 1126 Sixteenth Street NW; Washington, DC 20036 USA

LETTER FROM THE EDITOR

On this my last day as Executive Director of L.I.F.E. and Editor of the Newsletter, I want to take a few moments to express my gratitude to you, L.I.F.E.'s readers and friends. Thank you for taking time to write about something you read in the Newsletter; for providing helpful and overwhelmingly favorable input to AID's evaluation of L.I.F.E.'s services; for responding to L.I.F.E.'s requests for help. Through the communication links between us, I have derived a sense of partnership with you in the struggle to alleviate malnutrition.

In my acceptance of the position of Technical Director of the Meals for Millions Foundation in Santa Monica, California, I am not withdrawing from the battle. Meals for Millions also encourages and supports the poor, the hungry, and the malnourished in their efforts to improve their own well-being. I look forward to continuing to work with you for development that honors the dignity of the individual and enhances self-respect.

Hugh J. Roberts
Washington, DC
April 14, 1978

L.I.F.E.

LEAGUE FOR INTERNATIONAL FOOD EDUCATION

FOR
FURTHER INFORMATION

EXECUTIVE DIRECTOR
LEAGUE FOR INTERNATIONAL FOOD EDUCATION
1126 SIXTEENTH STREET, N.W.
WASHINGTON, D.C. 20036 U.S.A.
TELEPHONE (202) 331-1658

NEWSLETTER

May 1978

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LEAF PROTEIN GAINS RESPECTABILITY

N. W. Pirie
Rothamsted Experimental Station
Harpenden
Herts, England AL5 2JQ

Recent increases in the cost of energy and of protein-rich foods and fodders have combined to awaken interest in leaf protein (LP). The pressed leaf residue after extraction contains two to three times as much dry matter as the original crop so that much less energy is consumed in drying it to produce winter fodder. The annual yield of LP in Britain can be 2t/ha; in India, it can be 3 t/ha. It may not be economically realistic to strive for such yields, nevertheless, in similar conditions, a leaf crop that is photosynthetically active during most of the year should always outyield a seed crop that becomes inactive while ripening. This long overdue interest in LP has not yet stimulated a corresponding interest in the design of efficient extraction equipment.

Method of preparation

LP can be coagulated with acid: it is usually coagulated by sudden heating to 70-80°. The coagulum is filtered off, washed, and pressed to a hard, moist cake which can be preserved with the usual bacteriostatic agents. For prolonged conservation it is usually dried. It is at this stage that LP is most often damaged; most of the differences in nutritional value that have been observed between preparations from crops of differing age, and between species, are probably in reality the result of differing conditions of drying in the rather unsystematic work that has been done so far. If dried in air, or in an oven, LP becomes hard and nearly black. The product is more attractive if it is partly dried and then ground finely before the drying is completed. However it is dried, there is risk of damage through Maillard reactions if the filter cake is not washed to remove most of the sugars present in the original leaf extract. Carotene

and xanthophyll are valuable components of LP whether it is used as a human or an animal food. As is well known, they are less rapidly destroyed during storage if the material is made slightly alkaline and is protected from light and air. Drying should be avoided whenever possible.

Nutritional Value

Experiments on rats, mice, chickens, and pigs show, as would be expected from the amino acid analyses, that LP is a satisfactory substitute for fishmeal and is a little better than groundnut or soybean meal. The limiting amino acid appears to be methionine. There is some evidence that part of the methionine in LP is unavailable; more work on the extent to which this is the result of complex formation during separation and drying is urgently needed.

Trials in Nigeria and India confirm earlier work in Jamaica on the value of LP in infant feeding. Particular emphasis was laid in Nigeria on increased alertness as well as the improvement in the physical condition of malnourished children. In the Indian trial, in six villages, near Coimbatore, preliminary results show that LP is superior to the usual legume seeds, and nearly equal to milk.

Composition

When made carefully, for human consumption, from suitable species, LP contains 9 to 11% N (nitrogen), i.e., 56 to 68% protein. When made for use as animal feed it seldom contains more than 50% because the fiber is usually less carefully removed by straining the initial extract, and surface dust is less completely removed from the crop before it is extracted. Most of the non-protein material is lipid (20 to 25%) and this is highly unsaturated. Because of the value of the lipid both as an energy source and as a source of essential fatty acids, it would be unwise to remove chlorophyll and its breakdown products by solvent extraction. If pheophorbide formation is prevented, they appear to be harmless. The amount of nucleic acid depends on the interval between extraction and heat coagulation; there is little if leaf ribonuclease is given time to act, but 1 or 2% if an extract from very young leaves is coagulated after a few minutes.

Commercial production

There is work on LP in research institutes in at least 16 countries. There is commercial interest in five or six but it is difficult to get reliable information. Material produced commercially in France and Britain is suitable for animal feeding only.

* *

Three earlier issues of the L.I.F.E. Newsletter have also featured articles on leaf protein:

May 1973	Leaf Protein: A New Protein Source for the Management of Protein-Calorie Malnutrition in Nigeria
February 1974	Leaf Protein: Update
March 1975	Leaf Protein Child Feeding Trial

We still have a few copies of each of these issues in stock. If you are interested in receiving any of them, please send your requests to L.I.F.E.

UNCSTED and The Lund Letter

UNCSTED, the United Nations Conference on Science and Technology for Development, will take place in 1979. It has three major goals:
--Implementing strategies for the successful use of knowledge and technology to meet the basic needs of the world's poor.
--Strengthening the technological autonomy of the developing countries.
--Harnessing the potential of science and technology for the solution of global problems.

The Lund Letter is trying to provide a forum where independent views on the progress of UNCSTED can be expressed. In the words of its editor,

...We believe that the following can be important means by which to improve the results of the Conference:
--An active preparation process, especially in the least developed countries, aiming at identifying those social needs in fulfillment of which science and technology play a vital role.
--Involvement of broad circles in the preparatory process, not only government officials and the established scientific community but also individual scientists and planners.
--A broadening of the classical definition of science and technology to embrace the entire process of knowledge production and information dissemination.

If you are interested in receiving the Lund Letter, please write to: Research Policy Program; University of Lund; Solvegatan 8; S-223 62 Lund Sweden

XI INTERNATIONAL CONGRESS OF NUTRITION

The XI International Congress of Nutrition will be held in Rio de Janeiro, Brazil, August 27-September 1, 1978. Promoted by the International Union of Nutritional Sciences, the Congress has as its main objective to discuss "The practical utilization of available multisectorial technical and scientific knowledge to solve food and nutritional problems."

In addition to the plenary sessions, case studies, symposia, workshops, poster sessions, and short courses are also scheduled. Discussions will be conducted on a multi-disciplinary basis, covering specific problems of basic and applied nutrition as well as their socio-economic, cultural, and political implications.

A number of parallel meetings are also scheduled, including those of the International Society of Parenteral Nutrition, the Latin American Nutrition Society, the Federation of Asian Nutrition Societies, the International Vitamin A Consultative Group the International Nutritional Anemias Consultative Group the Nutrition Programmers Forum, and the International Dietetic Committee.

For further information, please write to: XI International Congress of Nutrition; Sociedade Brasileira de Nutricao; Av. Churchill, 94-6° andar; 20.000 Rio de Janeiro, RJ, Brazil

L.I.F.E. Lines

On "Whose Milk Shall We Market" (September 1977), we received two letters. The first from Mushtaq Ahmad, Federal Chemical and Ceramics Corporation, Karachi, Pakistan:

> ...Another vital aspect which has not been given any thought is the rate of incidence of breast and uterine cancer among the women who are breast-feeding their babies as compared to those who have adopted the method of bottle feeding. It may be worthwhile to explore and collect statistical data and find if possible any link between the diseases like breast and uterine cancer arising out of not feeding the baby on breast milk. Certainly with the advancement of medical science and the fine techniques of diagnosis and compiling the relative statistical data for these two maladies one may find some clue of a basic vital link which may appeal to the mothers to resort to breastfeeding to avoid contracting such maladies.

and the second, a case history, from Jorge O. Casale, Instituto Nacional de Tecnologia Industrial, Buenos Aires, Argentina:

> ...In August 1973, during a visit to the Department of Technical Guidance, Coordination of Integral Technical Assistance (C.A.T.I.), the Director of the Zootechnical Division, Dr. Jorge Adibi Roston, told me of their experience in mass media transference of technical information to farmers.
>
> The usual leaflets were found inadequate. Much more useful were the radio and T.V. spot messages. But their best tool was the inclusion of disguised technical messages into the plot of the popular radio and T.V. "serial" theater plays. These continuing serial programs are extremely popular. (In your Newsletter the Nicaraguan "Pancho Madrigal" program is mentioned.) Instead of using "spots" among other commercials (people tend to pay less attention to commercials rather than to the actual play), they convinced the radio and T.V. operators to include disguised messages into the plot. People tend to imitate what they see or hear through the mass media, and this proved to be an excellent asset for C.A.T.I. I thought it to be a very clever use of the mass media to reach subliminally the target population.

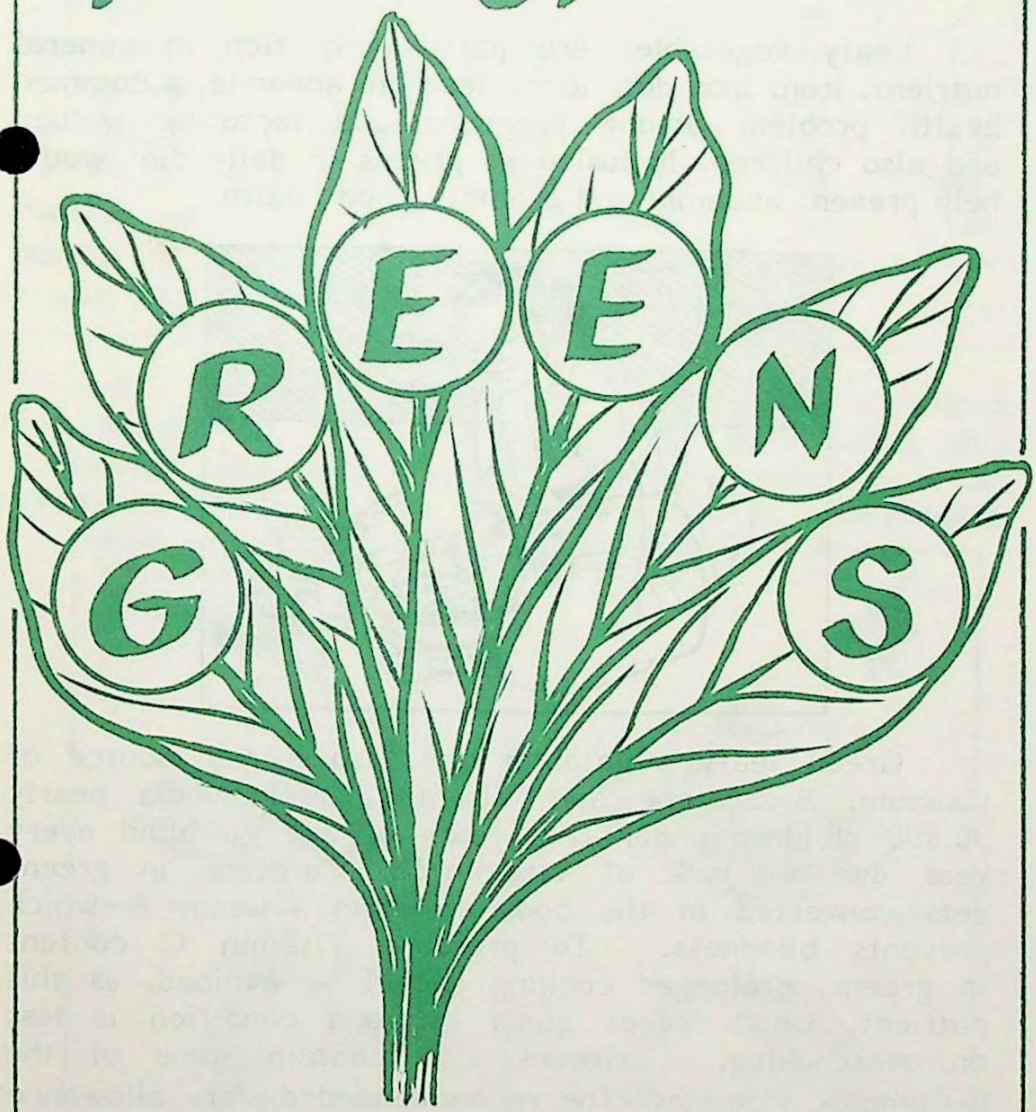
In response to the inclusion of The YFC Intensive Unit in "Recent Publications of Interest" (December 1977), Dudley Hall, Rhodesian YFC Association, Salisbury, Rhodesia, writes:

> ...We have been overjoyed at the response to the publicity you have given YFC and our leaflet. ... People have tried to pay us with an American check for US$.31. Such checks cannot be accepted here and if they were, the cost of processing to get payment would be much more than the 31 cents! Moreover, air mail postage is as much as $3.00 on our booklet. Hence we are having to post by surface mail which takes weeks to reach its destination.

* *

Do you have a comment on or a question about something you have read in the Newsletter? Take a moment to let us all know what it is. Please write to: L.I.F.E. Lines; 1126 16th Street NW; Washington, DC 20036 USA.

THE GOODNESS OF GREENS



NATIONAL INSTITUTE OF NUTRITION
Indian Council of Medical Research
HYDERABAD - 500 007 : INDIA

Green leafy vegetables are vital for growth and good health as they contain all important nutrients. In India a wide range of greens are consumed, the more popular ones being Spinach (Palakura), Amaranth (Thotakura), Gogu (Gongura), Fenugreek (Methi), Drumstick leaves, Mint (Pudina) etc.,

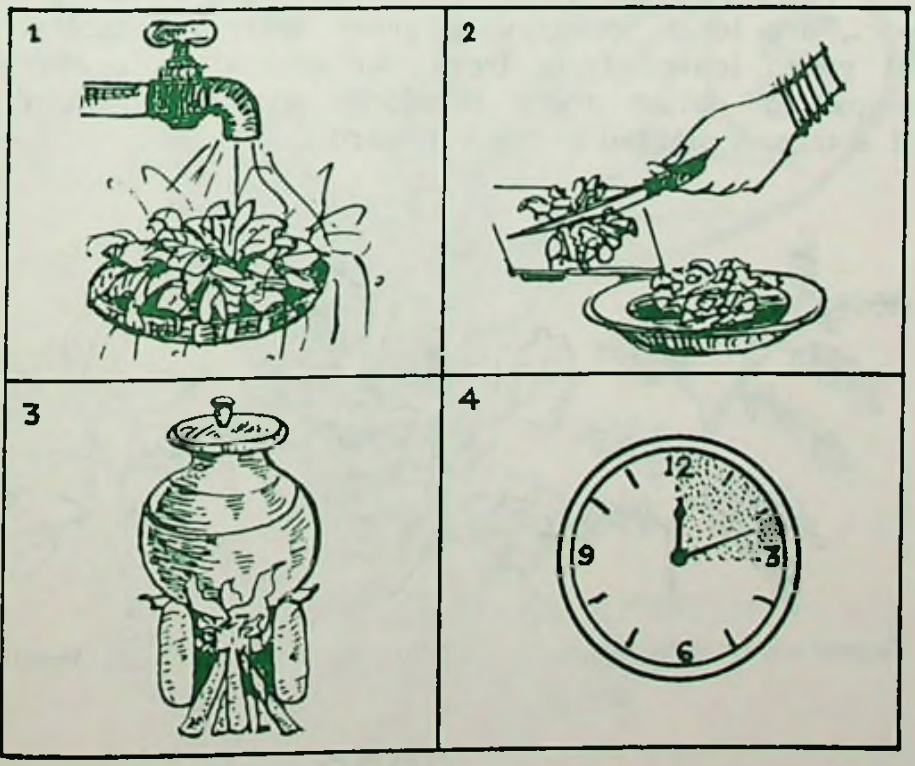
Leafy vegetables are particularly rich in mineral nutrient, iron. Iron deficiency leads to anaemia, a common health problem among pregnant and lactating women and also children. Inclusion of greens in daily diet would help prevent anaemia and promote good health.

Green leafy vegetables are also a rich source of Calcium, B-carotene and Vitamin C. In India nearly 30,000 children under five years of age go blind every year due to lack of Vitamin A. Carotene in greens gets converted in the body to form Vitamin A which prevents blindness. To preserve Vitamin C content in greens, prolonged cooking should be avoided, as this nutrient, which keeps gums in good condition is lost on overcooking. Greens also contain some of the B-Complex Vitamins. The recommended dietary allowance of green leafy vegetables for an adult women is 100g/day, adult man 40 g/day, preschool children (1-3 yrs) 40g/day, preschool children (4-6 yrs) 50g/day. And for boys and girls beyond 10 yrs of age it is 50g/day.

NUTRITIVE VALUE OF SOME OF THE COMMONLY EATEN GREENS
(100 g. of edible portion)

Nutrients	Mint	Amaranth	Spinach	Drumstick leaves	Coriander leaves	Gogu
Calories	48	45	26	92	44	56
Protein (g)	4.8	4.0	2.0	6.7	3.3	1.7
Calcium (mg)	200	397	73	440	184	1720
Iron (mg)	15.6	25.5	10.9	7.0	18.5	2.28
Carotene (μg)	1620	5520	5580	6780	6918	2898
Thiamine (mg)	0.05	0.03	0.03	0.06	0.05	0.07
Riboflavin (mg)	0.26	0.30	0.26	0.06	0.06	0.39
Vitamin C (mg)	27.0	99	28	220	135	20.0

It is generally believed that greens cause diarrhoea in children. So most mothers abstain from giving this nutritious food stuff to their children. Several bacteria/ germs/insects and other extraneous matter contaminate



greens through water and soil. And if not washed properly, they may cause diarrhoea on consumption. All greens must be washed thoroughly under running water to eradicate such contaminants and prevent diarrhoea.

Infants should be served greens only after they have been cooked, mashed and seived so as to remove the fibrous part. To retain the nutritive value of greens, excessive or overcooking must be avoided; also the water obtained from the greens on cooking must not be thrown away. Always ensure the vessel in which greens are cooked is covered with a lid. Do not dry the leaves in the sun as carotene will be lost. Avoid frying greens.

The nutritive value of greens should not be judged by its cost which most people wrongly do and discard them as inferior foodstuff. For although inexpensive, greens are highly nutritious and required by all.

Cultivation of green leafy vegetables should be encouraged so that they may be available all through the year. Kitchen gardens, roof gardens, school gardens etc., are ideal for growing green leafy vegetables. Use of green leaves from trees like drumstick, agathi etc. helps to obtain them regularly without much effort if a tree is planted in the backyard.

Drumstick Leaves Mint Amaranth

OOOO

Original Article Indian J Pediatr 1998; 65 : 565-572

Tamil Nadu Nutritional Survey Comparing Children Aged 0-3 Years with the NCHS/CDC Reference Population

Rajaratnam Abel and V. Sampathkumar

RUHSA Department, Christian Medical College and Hospital, Tamil Nadu

Abstract : A cross-sectional nutritional survey of children belonging to Tamil Nadu State of India, aged 0-3 years was conducted on a representative sample of 2039 children. The collected data was analysed using the recommended indices of height-for-age and weight-for-height based on standard deviation (SD scores) and cross-classified using the SD scores. The nutritional status of these children was compared with the NCHS standard. Prevalence of stunting (27.6%), wasting (9.9%) and simultaneous wasting and stunting (10.7%) was high among the children studied: **(Indian J Pediatr 1998; 65 : 565-572)**

Key Words : *Nutritional status; Stunting; Wasting.*

Protein-energy-malnutrition (PEM) still remains a major public health problem in most of the developing countries, India being one with a high prevalence of PEM.[1] PEM among children is known to cause permanent stunting besides affecting their mental performance.[2]

PEM prevails among populations with poor socio-economic conditions (poverty). These populations are characterised by low levels of income, inadequate diets, poor levels of education, poor environmental sanitation and housing conditions, large family size and high prevalence of morbidity and clinical signs of undernutrition. In 1979 WHO had launched its strategy and campaign of health for all by the year 2000.[3] One of the indicators identified by them to gauge the health progress was the nutritional status of pre-school children.

Reprint requests : Dr. Rajaratnam Abel, RUHSA Department Christian Medical College and Hospital, RUHSA Campus P.O. 632 209, North Arcot Ambedkar District, Tamil Nadu, India.

Previously prevalence of malnutrition among pre-school children was assessed using weight-for-age as criteria. However, use of weight-for-age criteria alone cannot distinguish acute from chronic malnutrition. In 1976, a Joint FAO/UNICEF/WHO Expert Committee recommended the use of height-for-age and weight-for-height as primary indicators of nutritional status of children.[4] Besides, Waterlow *et al* suggested a method of nutritional classification that facilitated comparison of results of surveys carried out in different regions or at different times and recommended the use of height-for-age (as an indicator of past malnutrition) and weight-for-height (as an indicator of the present status).[5] They also recommended that nutritional data from the National Centre for Health Statistics/ Centres for Disease Control (NCHS/CDC) reference population[6] would be most appropriate for making international comparisons. This was subsequently endorsed by WHO.[7]

The present study was carried out to assess the nutritional status of children aged 0-3 years in the entire rural Tamilnadu.

MATERIALS AND METHODS

Tamil Nadu (TN) lies in the southern most part of India. There are 21 districts. The state is largely dependent on rainfall for replenishing its sources of water and therefore the onset or failure of the monsoon plays a key role in its economic well being. The state has a population of 55.6 millions according to the 1991 census. The sex ratio is lower with 972 females per 1000 males. The literacy rate of the state is 63.7%. The infant mortality rate in 1989 was 68 for the state as a whole while it was 80 for rural Tamilnadu.[8]

Studies of the nutritional status of preschool children in Tamilnadu done in the past may be of limited use for any present planning. In 1976 the prevalence of wasting (< 80 per cent weight-for-height) and stunting (< 90 per cent height-for-age) was 15.1 per cent and 47.6% respectively.[9] In another study conducted in a drought prone district of Tamilnadu in 1983, the prevalence of underweight was 44.6%, of stunting 41.4%, of wasting 11.1% and of simultaneous wasting and stunting 9.6%.[10]

In TN, nutrition intervention is being carried out by the Tamilnadu Integrated Nutrition Programme (TINP). This was started in the year 1980 on a pilot basis and subsequently, in 1982 it was implemented in 10 districts. More recently the programme has been extended to all the districts. While the emphasis in the first two phases was on direct nutrition intervention with food supplementation and nutrition education, in the third phase it is moving on to a sustainable level through effective community participation and food security through income generation schemes especially for women.

It is in the above setting that a cross-sectional survey was carried out in 20 districts of rural Tamilnadu. A multi-stage sampling technique was used to select families from the districts. Initially, one block from each district was selected using the simple random method. In the second stage one revenue village was picked randomly from each of the selected blocks. A second revenue village was randomly selected from each block to keep as stand-by in case of inadequate sample size from the first village.

All children under three years of age from the selected villages were surveyed. The formula used for calculating the samples size was $2\sqrt{\frac{PQ}{n}}$ = 20% of P. P is 50% which is based on a previous survey. The sample size obtained was 100 per district. This gave a total sample size of 2039 for 20 districts. Madras district was excluded from this study as it was predominantly urban in nature.

The survey was carried out in two phases by four trained field workers with sufficient experience in anthropometric surveys. The first phase included survey in 10 districts from May-June 1992. In the second phase the remaining 10 districts were surveyed from December 1992 to January 1993. The two teams were supervised throughout the survey by one of the authors. The children were measured for weight, height, length and mid-upper arm circumference (MUAC). Weights were measured to the nearest 0.1 kg using Salter Spring Balance Scales. The recumbent length of children < 2 years of age was measured to the nearest centimetre using a portable scale locally manufactured as per

the WHO standards. The standing height of older children was measured to the nearest centimetre. MUAC was measured with the help of the Zerfas insertion tape to the nearest millimetre. Measurement techniques were standardized according to the UN manual, "How to weigh and measure children".[11] It was decided that clinical manifestation would not be studied in this survey as the total survey was to be completed within a short stipulated period. As part of quality control the first author visited one of the surveyed districts and visited the houses of sampled children and examined for clinical signs of malnutrition. The survey team had identified one child suspected with clinical form of severe malnutrition. This was confirmed by the author. Socio-economic information was obtained by interviewing the mothers through a structured interview schedule.

Data was analysed on an IBM Compatible PC. A total of 2039 children were surveyed. Complete data was available for 2010 children. In the remaining 29 children data was either incomplete or the height and weight fell outside the reference standard-6 standard deviations and therefore excluded from further analysis.

The anthropometric standard utilized in this study was the NCHS standard. Different classifications used to define malnutrition are based on various cut-offs. There are two main methods that are usually used to analyse anthropometric data.

(a) Calculating the percentage of the median standard represented by a certain weight-for-age (W/A), height-for-age (H/A) or weight-for-height (W/H), and choosing the point under which malnutrition may be regarded as present. A disadvantage with the percentage of the median method is that the cut-off points chosen to define malnutrition are not similar for WA, HA and HW.

(b) Choose as cut-off point, 2 standard deviation (SD) units below the median of reference population. Children who fall below this cut-off of W/A, H/A and W/H are considered to be malnourished for having some degree of functional disnormality.

The advantage of SD measure is that it is based on a statistical principle and is the same for all anthropometric parameters. For this reason SD measures were used in this analysis. MUAC was also analysed for children. Anthropometric analysis was done with the help of NCHS/CDC anthropometric package.[12]

RESULTS

Complete data was available for 2010 children out of which 1040 were males and 970 were females. The overall level of non response was less than 1%.

The percentage distribution in the sample population of the main characteristics surveyed are outlined below. Majority of the children belonged to the backward caste (72.7%) and they were followed by schedule caste (22.4%) and forward caste (4.5%). The proportion of tribal children was low with 0.4%. Educational status of mothers was low with 55.6% of them having no education, 19.8% with 1-5 years of schooling, 22.5% with 6-10 years of schooling and 2.1% with college education.

The occupational pattern of mothers was as follows : agricultural manual work 40.9%, household work 49.5%, family occupation (weaving, pot making, rope making) 3.5%, white collared 0.3% and other occupations (beedi making, petty business, blue collared) 5.8%. The occupational pattern of fathers was as follows : farming

25.4%, agricultural manual work 46.9%, family occupation (weaving, pot making, rope making, tailoring, fishing) 8.3%, white collared 5.4%, blue collared 4.0%, petty business 5.6% and others (beedi making, money lender) 4.7%. Regarding size of family 39.8% of the families surveyed had four members, 39.5% had five to six members and 20.7% of them had more than seven members.

Over 58.8% of the children were fully immunized while 25.3% were in the process of immunization. These children were below the age of one year and in different stages of immunization. Only 3% of the children were not immunised and 12.4% were partially immunized. There were 16.9% child deaths among the families of the children surveyed. Similarly, 1.9% of the mothers surveyed had delivered still birth babies and 3.3% of the mothers had experienced at least one abortion.

Only 27.0% of mothers had given colostrum to the children surveyed. Majority of the mothers had given sugar water (64.1%) as the first feed and others (8.9%) had given honey and donkey's milk. Children who were given supplementary food by 4th month constituted 11.3%, 13.7% were given in 5th month, 17.1% in 6th month, 14.2% in 7th month and 28.1% after 8 months. Around 15.5% of the mothers had not started supplementary feeding to their children. Out of these 7.1% of the children were below the age of 4 months and 8.4% of the children were above the age of 4 months.

Waterlow's cross-classification of height-for-age and weight-for-height provides a complete classification of malnutrition among children in any population. According to this classification four groups of children can be obtained (Table 1).

The proportion of children who were normal (H/A, > - 2SD and W/H >-2SD) was 51.8%, that of stunting (H/A <-2SD and W/H >2SD) was 27.6%, that of wasting (H/A > 2SD and W/H < - 2SD) 9.9% and that of simultaneous wasting and stunting (H/A <- 2SD and W/H <- 2SD) 10.7%. Female children were found to have lower prevalances than male children but it was significant for only wasting ($p < 0.05$).

Prevalences of stunting, wasting and underweight by age group are shown in Table 2. Prevalences of severe stunting (5.1%) and severe underweight (3.0%) were observed in the sample children studied.

TABLE 1. Distribution of Children According to Normal, Stunted, Wasted and Simultaneously Wasted and Stunted Based on Waterlow's Cross-classification of Height-for-Age and Weight-for-Height

	Male		Female		Total	
	No.	%	No.	%	No.	%
Normal	521	50.1	520	53.6	1041	51.8
Stunted	286	27.5	268	27.6	554	27.6
Wasted	118	11.4	81	8.3	199	9.9
Wasted and stunted	114	11.0	102	10.5	216	10.7
Total	1039	100.0	971	100.0	2010	100.0

However, there were no children with severe wasting. Prevalences of stunting, wasting and underweight were at their lowest among children below six months but steadily increased reaching the peak between 18-23 months and there on declined.

In Table 3 prevalence of malnutrition based on MUAC is presented. According to this 6.5% of the children were found to suf-

TABLE 2. Distribution of Number of Children by SD Scores for Height-for-Age, Weight-for-Height and Weight-for-Age for the Sample of Tamilnadu Children

	Age group						
	0-5 months	6-11 months	12-17 months	18-23 months	24-29 months	30-35 months	Total
Height-for-Age (SD Score)							
-2.00 or more	278	267	221	153	190	139	1248
	(90.5)	(72.0)	(59.4)	(43.9)	(55.1)	(52.2)	(62.1)
-2.00 to -2.99	20	80	94	109	86	74	463
	(6.5)	(21.5)	(25.3)	(31.2)	(24.9)	(27.8)	(23.0)
-3.00 to -3.99	8	14	38	53	50	33	196
	(2.6)	(3.8)	(10.2)	(15.2)	(14.5)	(12.4)	(9.8)
-4.00 or less	1	10	19	34	19	20	103
	(0.4)	(2.7)	(5.1)	(9.7)	(5.5)	(7.6)	5.1)
Weight-for-Height (SD score)							
-2.00 or more	290	320	268	220	271	230	1599
	(94.5)	(86.3)	(72.0)	(63.0)	(78.5)	(86.5)	(79.6)
-2.00 to -2.99	15	48	95	115	71	34	378
	(4.9)	(12.9)	(25.5)	(33.0)	(20.6)	(12.8)	(18.8)
-3.00 to -3.99	2	3	9	14	3	2	33
	(0.6)	(0.8)	(2.5)	(4.0)	(0.9)	(0.7)	(1.6)
-4.00 or less	0	0	0	0	0	0	0
	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
Weight-for-age (SD score)							
-2.00 or more	281	202	160	109	120	96	968
	(91.5)	(54.4)	(43.0)	(31.2)	(34.8)	(36.1)	(48.2)
-2.00 to -2.99	22	118	122	148	130	120	660
	(7.2)	(31.8)	(32.8)	(42.4)	(37.7)	(45.1)	(32.8)
-3.00 to -3.99	4	42	77	80	77	42	322
	(1.3)	(11.3)	(20.7)	(22.9)	(22.3)	(15.8)	(16.0)
-4.00 or less	0	9	13	12	18	8	60
	(0.0)	(2.5)	(3.5)	(3.5)	(5.2)	(3.0)	(3.0)
Total	307	371	372	349	345	266	2010

*Figures in parentheses are percentages

TABLE 3. Distribution of Children According to MUAC

	Male		Female		Total	
	No.	%	No.	%	No.	%
< 12.5	63	6.1	68	7.0	131	6.5
12.5 - 13.5	120	11.5	141	14.5	261	13.0
> 13.5	856	82.4	762	78.5	1618	80.5
Total	1039	100.0	971	100.0	2010	100.0

fer from severe muscle wasting and 13.0% were suffering from moderate muscle wasting. A higher percentage of female children were suffering from muscle wasting when compared to male children and this was statistically significant ($p < 0.05$).

DISCUSSION

This study was carried out in rural Tamilnadu. Tamilnadu stands second to Kerala with respect to some of the health indicators. Birth rate and infant mortality rate is low when compared to other states in India. Female literacy has increased considerably over the years.[8] This could have increased the utilization of health services particulary immunization of children which has a high coverage in the state.

The survey methodology was well executed. Data on 2039 children was collected, out of which 29 were excluded. The proportion of males to females did not differ from that estimated for the study population.

The percentage distribution of socio-demographic factors such as caste, educational qualification of mothers, immunization coverage, number of child deaths, number of still births and number of abortions of the sample surveyed by us were similar to the National Family Health Survey carried out in 1992.[13] According to the National Family Health Survey the percentage of Schedule caste children was 23.2% (22.4% in the present survey) and tribal children 0.4% (0.4% in the present survey). Similarily, 54.9% of the mothers had no education while in our study it was 55.6%. The proportion of fully immunized children reported by the National Family Health Survey was 50.5% while it was 58.8% in the present survey.

According to National Family Health Survey, the proportion of child deaths was 17.7% and that of still births 2.8%. In the present survey the proportion of child deaths was 16.9% and that of still births 1.9%. Mothers who gave colostrum constituted 21.8% in their survey while it was 27.0% in the present survey. Similar findings obtained in both the studies indicate that the sample chosen for this study was representative of rural Tamilnadu.

The prevalences of stunting, wasting and simultaneous stunting and wasting found using the cross-classification of height-for-age and weight-for-height recommended by Waterlow *et al*[5] were higher when compared to the reference population. Female children were found to have significantly higher weight-for-height

when compared to male children. This is surprising as Tamil Nadu has lower sex ratio and female infanticide is practiced in some parts of Tamil Nadu.[14]

Prevalence of stunting and wasting among children has decreased considerably when compared to the prevalences reported by earlier studies conducted in the years 1976[9] and 1983[10] from the same region. This could be attributed to the WHO compaign of health for all by the year 2000 which underlines improvement of nutritional status among children as one of its goals. Agewise trends indicated a higher prevalence of stunting, wasting and underweight among children between the age group of 18-23 months.

A striking feature was the absence of severe wasting (below-4SD) in the sample of children studied. On the contrary the sampled children were found to suffer from severe stunting and severe underweight. This suggests that the present state of nutrition (as reflected by the values of weight-for-height) is strikingly better than the past nutrition (as measured by height-for-age). Besides weight-for-height responds faster to intervention programmes than height-for-age which takes a longer period for the interventions to get translated. The National Health Survey[13] reported a prevalence of 46.6% under weight (< - 2SD) while it was 51.8% (Table 3) in the present study.

Although clinical forms of protein-energy-malnutrition were not studied, the field investigators were on the look out for children with marasmus and kwashiorkar. Out of 2039 children the number of cases with clinical signs of malnutrition was less than 10 (0.5%). Of these only one was kwashiorkar and the remaining were marasmus. This is an indication that the clinical forms of malnutrition are no more a major problem in this part of India.

Conclusion

Stunting remains a problem among children of Tamil Nadu. The problem of stunting among children can be addressed by ensuring food security, good health care services, better sanitation and also by increasing the awareness among mothers on health and nutritional aspects.

Acknowledgements

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REFERENCES

1. Administrative Committee on Coordination-Sub Committee on Nutrition. Overview of trends in malnutrition. *Second Report on the World Nutrition Situation.* Global and regional results, Vol. 1. ACC/SCN, Geneva, 1992; 11.
2. Gopalan C. Stunting significance and implications for public health policy. In : Waterlow JC, ed. *Linear Growth Retardation in Less Developed Countries.* Nestle Nutrition Workshop Series. Vol. 14, New York; Raven Press 1988; 256-284.
3. World Health Organisation. Global strategy for health for all by the year 2000. *Health for All Series,* No. 3 WHO, Geneva, 1981; 15-18.
4. WHO Technical report Series. Methodol-

ogy of nutritional surveillance : report of a joint FAO/UNICEF/WHO Expert Committee, No. 593. WHO, Geneva, 1976; 36.

5. Waterlow JC, Buzina R, Keller W, Lane JM, Nichaman MZ, Tanner JM. The presentation and use of height and weight data for comparing the nutritional status of group of children under the age of 10 years. *Bull WHO* 1977; 55 : 489-498.
6. Food and Nutrition Board. National Academy of Sciences - National Research Council. Comparison of body weights and lengths and heights of groups of children. *Nut Rev* 1974; 32 : 284-288.
7. World Health Organisation. Measuring change in nutritional status. *Guidelines for assessing the nutritional impact of supplementary feeding programmes for vulnerable groups*. WHO Geneva, 1983; 21.
8. Bose A. Population of India. *1991 Census results and methodology*. Delhi : B.R. Publishing Corporation, 1991; 54.
9. Anderson MA. Comparison of anthropometric measures of nutritional status in preschool children in five developing countries. *Am J Clin Nutr* 1979; 32 : 2339-2345.
10. Steinhoff MC, Hilder AS, Srilatha VL, Mukarji D. Prevalence of malnutrition in Indian Preschool age children : a survey of wasting and stunting in rural Tamilnadu. *Bull WHO* 1986; 64 : 457-463.
11. *National Households survey capability programme. How to weigh and measure children*. New York : United Nations Department of Technical Cooperation for Development and Statistical Office, 1986; 14-59.
12. Jordan MD. The CDC anthropometric software package. Atlanta, GA : Centres for Disease Control, 1986; 136.
13. *National Family Health Survey*. Population Research Centre. The Gandhigram Institute of Rural Health and Family Welfare Trust. Ambathurai R.S. Tamilnadu and International Institute for Population sciences, Bombay, 1994; 174-177.
14. George S, Abel R, Miller BD. Female infanticide in rural South India. *Economic and Political Weekly* 1992; 27 : 1153-1156.
15. Administrative Committee on Coordiantion - Sub-Commitee on Nutrition. Women's Nutritional Status. *Second report on the World Nutrtion Situation*.Global and regional results, Vol. 1. ACC/SCN, Geneva, 1992; 51-57.

nutrition program file

BANGLADESH INTEGRATED NUTRITION PROGRAMME

Ministry of Health and Family Welfare

Government of the People's Republic of Bangladesh

Monitoring Report, June 1999

Monitoring report for the month of June 1999 presents data on the status of the monitoring indicators of Community Based Nutrition Component (CBNC) in the programme thanas as of June 30, 1999. This report was prepared in three sections to show the status of indicators separately for group of first, second and third phase thanas where CBNC is being implemented in phased manner. Data were collected through the Monthly Performance Reports (MPR) prepared at the Community Nutrition Centres (CNC) by the Community Nutrition Promoters (CNP). Information collected in CNCs were compiled to produce summarized unionwise and thanawise report by CNOs and thana level officials like ATFPO and Managers of partner NGOs. The report contains information on the status of routine activities at CNC level like GMP coverage, malnutrition rate among children under two years of age, weighing of women, supplementary feeding of pregnant and lactating women, Anti-Natal Care (ANC) of pregnant women, birth weight, nutrition management committee meetings, status of training and use of iodized salt postpartum Vitamin A supplementation and Iron supplementation. Status of some key monitoring indicators during last six months in first phase program thanas are presented in table-1.

Table1: Comparative Status of Some Selected Monitoring Indicators During Last Six Months (First Phase 6 Thanas)

Some Selected Monitoring Indicators of CBNC Activities	Comparative Status During Last 6 Months (%)						
	January'99	February	March	April	May	June '99	Average
GMP Coverage (<2 Children)	90.76	90.51	90.94	91.25	89.30	89.91	90.45
Severe Malnutrition (<2 Children)	2.43	2.15	2.00	1.80	1.93	1.75	2.01
Weighing of Pregnant Women	92.13	92.6	92.55	92.11	92.07	92.28	92.29
Coverage by ANC	36.86	42.68	47.93	50.64	50.98	52.85	46.99
Coverage by SF (Sev. & GF <2 Children)	90.34	90.29	91.41	90.08	87.86	85.70	89.28
Coverage by SF (Preg. & Lac Women)	94.68	93.58	93.23	93.91	92.87	92.28	93.43
Households using Iodized Salt	84.88	81.95	73.8	75.98	74.25	74.30	77.53
CNP Refresher Training	96.10	73.96	80	93.84	93.99	93.58	88.58
Women Received Vitamin A Capsule	87.01	90.5	87.33	87.77	88.13	89.37	88.35
Women Received Iron Tablet	77.44	79.53	78.59	78.54	76.44	73.86	77.40
Coverage of VNMC Meeting	90.06	90.06	92.97	88.55	90.11	88.68	90.07

GMP is considered as one of the key indicators of the successful CBNC. It appears from the above table that the average GMP coverage was 90.4 % during the last six months. Percentage of severely malnurished children is also gradually reducing. It may be mentioned here that the percentage of severe malnutrition was 13.8% at the begining of the implementation of CBNC in April 1997. Improvement by 16% in the coverage of ANC of pregnant women was observed during last 6 months.

Status of Monitoring Indicators in Second Phase 17 Thanas:

CBNC activities were supposed to start from early 1998 but the implementation was delayed for more than six months for different reasons like flood and delay in disbursement of funds. Training and other preparatory activities were completed in March 1998 and opening of the Community Nutrition Centrs started in April 1998 but all community level activities were disrupted in most of the thanas due to flood during August-September 1998. Reorganization in the CNCs and to bring

the situation in normal shape took about three months after the flood. From February 1999 the CBNC activities again started in full swing with the active cooperation of the 6 partner NGOs. Name of second phase CBNC thanas and some vital statistics along with the names of the partner NGOs working in those thanas are presented in table-2.

Table- 2 : Some Selected Statistics of Second Phase 17 Thanas

Name of Thana	Partner NGO	Estimated Population	Household	No. of CNO	CNP/ CNC	Under 2 Children	Severe Mal-nourished	Pregnant Women	Lactation Women
Norshingdhi Sadar	CARE	498,554	86368	34	328	21874	1565	5887	5353
Barisal Sadar	Proshika	457,624	52719	22	198	12860	713	2573	2894
Chandpur Sadar	BRAC	468,393	61460	31	312	19173	1893	4108	3314
Fatikchari	CARE	428,608	77402	39	359	22607	2819	5342	6063
Kulaura	BRAC	375210	65711	31	340	20334	1010	3745	4068
Madaripur Sadar	CARE	340027	57917	24	216	17008	2357	4594	4211
Goplalgonj Sadar	Proshika	321896	46291	26	240	14484	996	3371	2597
Dumuria	W. Vison	283339	52520	19	189	11109	301	2310	2835
Shibpur	BRAC	262067	52638	18	174	14272	441	3435	2904
Bhanga	Proshika	237164	41856	24	195	10789	758	3850	2568
Bhedergonj	CARE	228942	44137	21	177	12907	1463	2441	4426
Adamdhighi	BRAC	188145	33213	13	129	6119	67	1476	1833
Teknaf	SHED	168517	27563	22	166	11934	699	3199	3712
Sreepur	BRAC	159586	26987	11	109	6739	81	1509	2198
Dacobe	W.Vishon	158105	27558	18	151	6459	275	1500	1977
Tarail	SARD	152977	29371	16	138	9531	375	2351	1938
Tetulia	CARE	95836	22044	8	74	5525	97	1070	1619
Total		48,24990	805755	377	3495	223724	15910	52761	54510

Monitoring activities at CNC, Union and thana levels were established systematically in second phase 17 thanas in September 1998. Complete Monthly Performance Reports (MPR) are received by the central office regularly from November '98. Status of monitoring indicators are stated below:

Weighing Coverage of <2 Children and Pregnant Women:

About 250,000 children below two years of age and 52,000 pregnant women in 17 programme thanas were brought under regular monthly weighing. Overall coverage of Growth Monitoring and Promotion (GMP) June 1999 was 82.27 per cent which appears to be highest during the last six months started from January 1999. While looking at the GMP data by thana, the highest coverage (97.43%) was reported in Gopalgonj Sadar thana while the lowest coverage (64.58%) was reported in Narsingdi Sadar thana. Weighing of pregnant women is one of the important activity at the CNC to monitor weight gain during pregnancy. About 86 per cent of the pregnant women were brought under weighing in the month of June 1999 which is also highest coverage over a period of last six months. Highest per cent (95.13) of pregnant women was in Gopalgonj Sadar thana and lowest per cent(77.56) were weighed in Chandpur Sadar thana in June 1999. Weighing coverage of <2 children and pregnant women over a period of last six month from January 1999 is presented in Fig.-1.

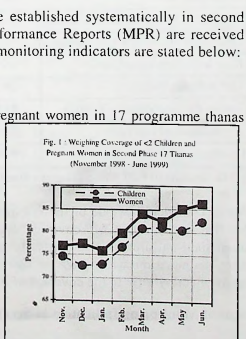
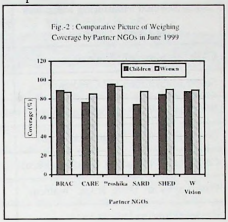


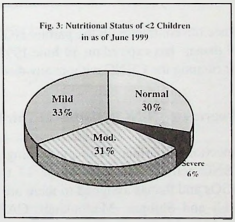
Fig. 1 : Weighing Coverage of <2 Children and Pregnant Women in Second Phase 17 Thanas (November 1998 - June 1999)

Since weighing of <2 children and pregnant women are the most important indicators considered for effective CBNC activities at community level, coverage of weighing of <2 children and pregnant women was reviewed in case of all partner NGOs. While looking at weighing data by NGO, it appears that highest coverage exists in the thanas where Proshika is working. On the other hand lowest coverage observed in Narsingdi thana where CARE is working. However the difference in terms of weighing coverage is not very big. Average GMP coverage of partner NGOs in the month of June 1999 are BRAC 88.92%, CARE 75.14%, PROSHIKA 95.62%, SARD 73.91%, SHED 84.42% and World Vision 87.42%. Regarding weighing of pregnant women the highest average coverage (93.19 %) was found in the thanas where Proshika is working and the lowest coverage was (87.62 %) in Teknaf thana where SHED is working.



Nutritional Status of <2 Children

On the basis of the information obtained through monthly performance reports it was found that the severe malnutrition among children under two years of age was 11.96 per cent in second phase 17 thanas in the month of November 1998 and it came down to 5.68 per cent in June 1999. The percentage of moderate malnurished children was 35.91 in November 1998 and also decreased by 5.16 per cent over a period of eight months upto June 1999.



However the percentage of children in the category of mild malnutrition has increased from 23.12 per cent to 33.99 per cent over a period of last eight months. Probable reason for increase in the proportion of mild malnutrition is shifting of the severely and moderately malnourished children to the mild and normal group. Percentage of children falling in normal group has also increased by 6 per cent during the above mentioned reference period. Highest per cent of severe malnutrition (13. %) exists in Madaripur Sadar thana and lowest ie only 1.0% in Sreepur thana under Magura District.

Status of Supplementary Feeding

In June 1999, 83.79 per cent of the Severely malnourished/growth faltered children (detected through GMP) were brought under supplementary feeding in 17 second phase thanas.. Nearly 93 per cent of the targeted children were brought under supplementary feeding at Tetulia thana which is the highest coverage of supplementary feeding among all of the thanas in June 1999. The lowest supplementary feeding coverage (69.50%) was reported at Bhadergonj thana.

Regarding feeding of malnourished pregnant and lactating women, the average coverage rate was 84.19 per cent in June 1999. Highest feeding coverage (96.48%) of malnourished PLW was reported in Tetulia and lowest coverage (69.50%) was reported in Bhadergonj thana. Average feeding coverage in case of malnurished PLW over a period of last eight months starting from November 1998 was 86.26 in third phase 17 thanas. Coverage of other important indicators in second phase 17 thanas over a period of last 8 months is shown in table-3.

Table-3 : Comparative Status of Some Selected Monitoring Indicators During Last Six Months in Second Phase 17 Thanas

Some Selected Monitoring Indicators of CBNC Activities	Comparative Status During Last 6 Months (%)						
	January'99	February	March	April	May	June '99	Average
GMP Coverage (<2 Children)	72.87	76.61	80.72	81.04	80.41	82.27	78.99
Severe Malnutrition (<2 Children)	11.25	9.28	7.19	6.74	6.56	5.68	7.78
Weighing of Women (Pregnant Women)	75.8	79.68	83.94	82.33	85.05	86.26	82.18
Coverage by ANC (Pregnant Women)	20.01	22.53	27.82	27.11	31.72	32.55	26.96
Coverage by SF (Sev. & GF <2 Children)	82.15	86.09	86.68	85.2	87.07	83.79	85.16
Coverage by SF (Preg. & Lac Women)	81.82	87.73	87.87	86.04	86.31	84.19	85.66
Households using Iodized Salt	57.97	59.38	68.88	70.2	72.37	67.25	66.01
CNP Refresher Training	82.05	86.24	96.5	93.7	99.14	86.91	90.76
Women Received Vitamin A Capsul	65.05	63.84	66.78	73.3	75.71	69.49	69.03
Women Received Iron Tablet	42.96	57.04	67.03	60.78	69.73	68.87	61.07
Coverage of VNMC Meeting	92.84	90.96	88.66	90.82	87.85	94.38	90.92

Since the contract with the partner NGOs assisting GOB in implementation of CBNC in second phase 17 thanas has expired on 30 June 1999 immediate follow up action is needed to renew the contracts for running the CBNC without any discontinuation.

Progress of CBNC activities in Third Phase 17 Thanas:

Selection of partner NGO and signing contract with them for assisting Government in implementing CBNC activities in third phase 17 thanas were completed on March 01,1999. Name of partner NGOs and thanas assigned to them are : BRAC for Matlab, Sariakandi, Jamalpur Sadar, Srimongal, Nikli and Shibpur, Madhukhali. CARE for Damudia, Amtoli, Gaurnadi, Monohordi and Bada. World Vishion for Batiaghata and Rupsha . Proshika for Tungipara. SHED for Chokoria and TMSS for Sherpur.

Orientation and Training of Core Training Team (CTT) and Thana Trainng Team (TTT) were completed in May 1999. Ist and 2nd installment of funds to the NGOs were disbursed. Local committees like Thana Nutrition Management Committee (TNMC), Union Nutrition Management Committee (UNMC) and Village Nutrition Management Committee (VNMC) were formed. CNO/CNP selection by involving local committees and through social mobilization by NGOs are going on. Training of CNO and CNPs were started in phased manner where selection procedure has been completed. All registrars, forms and equipment were supplied to the NGOs for starting CBNC in their respective thanas. Some NGOs have already started household profile survey in each household to collect baseline information and preliminary selection of target beneficiaries.

Report prepared by : Md. Yeakub Patwary, Consultant (Programme & MIS) and Dr. Rowshan Jahan, Deputy Director (Programme &MIS)
Edited by : Mohammad Ayub, Line Director, 7A Paribagh, Dhaka-1000, Phone-862033

Fiona Plus

A BI-MONTHLY BULLETIN ON PRIMARY HEALTH CARE IN COMMUNITY HEALTH

Issue 19th August 1991

NUTRITION CHECK BY QUAC STICK

In *Fiona Plus* issue 4 we published a weight–for–length chart for infants and small children up to 100 cm in height. This is reproduced in this issue for continuity in checking nutrition.

Weight–for–Length Chart

Length	Mimimum Weight	Length	Minimum Weight
55 cm	3.5 kg	78 cm	9.0 kg
56	3.7	79	9.2
57	3.9	80	9.4
58	4.1	81	9.6
59	4.4	82	9.8
60	4.6	83	9.9
61	4.9	84	10.1
62	5.2	85	10.2
63	5.4	86	10.4
64	5.6	87	10.6
65	6.0	88	10.8
66	6.2	89	11.0
67	6.4	90	11.2
68	6.7	91	11.4
69	7.0	92	11.6
70	7.2	93	11.8
71	7.5	94	12.0
72	7.8	95	12.2
73	8.0	96	12.5
74	8.2	97	12.8
75	8.4	98	13.0
76	8.6	99	13.2
77	8.8	100	13.5

Issue 19th August 1991 Fiona Plus

Fiona Plus Focus

STANDING ORDERS FOR PRIMARY HEALTH CARE

Signs & Symptoms	Medicines	Baby below 1 year	Small child 1-3 years	Older Child 4-13 Years	Adult	Suggestions
Abdominal pain without	Belladonna tab	Carry baby in	1/4 tab 3 × /day × 2 days	1/2 tab 3 × /day × 2 days	1/2 tab 4 × /day × 2 days	Hot Water Bottle to abdomin. Send to dr. after 2 days
vomiting	Antacid tab	upright position	1/4 tab 3 × /day × 2 days	1/2 tab 3 × /day × 2 days	1/2 tab 4 × /day × 2 days	
Abscess of skin	Warm salt water	Compress 4 × /day	same	Same	Same	Open pus with sterile needle
Anaemia and weakness	Iron with folic acid tab	1/4 tab 2 × /day × 30 days	1/2 tab 2 × /day × 30 days	1/2 tab 2 × /day × 30 days	1 tab 3 × /day × 30 days	Nourishing food. Look for bleeding
Asthma, short of breath	Aminophyllin tab	1/4 tab 3 × /day × 2 days	1/2 tab 3 × /day × 2 days	1/2 tab 3 × /day × 2 days	1 tab 4 × /day × 2 days	Send to doctor after 2 days.
Bleeding after delivery	Ergotamine				1 tab 3 × /day × 2 days	Send to doctor if serious.
Burns	Gentian violet 1%	Apply to possible infected areas.	Same	Same	Same	Send to doctor if serious.
Constipation	Ispaghule (Isapgol)	1/2 tsp 1 × /day	1/2 tab 2 × /day	1/2 tsp 3 × /day	1 tsp 3 × /day	Drink plenty of water.
Cough only	Cough sedative tab	1/4 tab (crushed) 4 × /day	1/2 tab (crushed) 4 × /day	1 tab (sucked) 3 × /day	1 tab (sucked) 4 × /day	Send for Xray after 15 days.
Cough and sputum	Trimethoprim tab	1/4 tab 2 × /day × 5 days	1/2 tab 2 × /day × 5 da[illegible]	1 tab [illegible]/day × 5 days	2 tab 2 × /day × 5 days	Send for Xray if blood in sputum.
Cracked heels	Vaseline				Rub with soft stone	Apply after soaking in soapy water.
Cracked lips	B complex tab	1/2 tab daily	1/2 tab 2 × /day	1 tab 2 × /day	1 tab 3 × /day	Nourishing food best.
Cracks between toes	Fungicidal ointment	Keep feet clean	Apply daily	Same	Same	Apply after soaking in soapy water.
Diarrhoea, mild	Furazolidone	1/4 tab (crushed) 3 × /day × 2 dats	1/2 tab (crushed) 3 × day × days	1 tab (crushed) 3 × /day × 2 days	1 tab 4 × /day × 2 days	Report to doctor if stools bloody
Diarrhoea, severe	Rehydration (ORS) fluid	Give frequently after each motion	Give often to stop thirst	Give 1 cup after each motion	May need 3-4 litres/day	Give until diarrhoea stops.
Ear infection	Tetracycline eye/ear ointment	2 drops into infected ear	Same	Same	Same	Warm ointment before putting in, then lie on other side 20 minutes.
Eye infection	Tetracycline eye/ear ointment	1 drop in infected eye 1 drop in each eye at birth	Same	Same	Same	Warm ointment before putting in.
Fever only	Paracetomal	1/4 tab (crushed) 2 × /day × 2 days	1/2 tab (crushed) 2 × day × 2 days	1 tab 3 × /day × 2 days	2 tab 3 × /day × 2 days	Send to doctor if drowsy.
Fever and chills	Chloroquine tab	1/2 tab (crushed) daily × 3 days	1 tab daily × 3 days	2 tab daily × 3 days	3 tab daily × 5 days	Take malaria blood slide first.
Headache	Paracetomal	1/4 tab (crushed) 2 × /day × 2 days	1/2 tab (crushed) 2 × day × 2 days	1 tab 3 × /day × 2 days	Aspirin 2 tab 3 × /day	Take aspirin with food.
Haemorrhoids (piles)	Haemorrhoid ointment	Apply as needed after motion	Same	Same	Same	Replace haemorrhoids first. Sit 15 minutes in hot water.
Night blindness	Vitamin A tab		1 tab daily × 8 days	1 tab daily × 8 days	2 tab daily × 8 days	Repeat after 1 month if necessary.
Pain in body	Paracetomal		1/2 tab (crushed) 2 × day × 2 days	1 tab 3 × /day × 2 days	Aspirin 2 tab 3 × /day	Take aspirin with food.
Pain in joints	Aspirin		1/4 tab 3 × /day × 2 days	1/2 tab 3 × /day × 2 days	2 tab 3 × /day × 2 days	Menthol balm on joints useful. Hot water compresses 2 × /day.
Poisoning	Charcoal and milk	Give as much as possible	Same	Same	Same	Send to doctor immediately.
Pregnancy	Iron/folic acid tab				1 tab 3 × /day × 30 days	Tetanus toxoid injections. Repeat medicines monthly
	Calcium tab				1 tab 2 × /day × 30 days	
Round worms	Piperazine tab	2 tab (crushed) at one time	1 tab 2 × /day × 3 days	2 tab 2 × /day × 3 days	2 tab 2 × /day × 4 days	Drink plenty of water.
Scabies	Benzyl Benzoate	Apply 1 × daily × 3 days	Same	Same	Same	Wash first with soap and water.
Skin, infected	Gentian violet 1%	Apply to infected area	Same	Same	Same	Wash first with soap and water.
Skin, itching	Chlorpheniramine	1/4 tab 2 × /day × 2 days	1/2 tab 2 × /day × 2 days	1/2 tab 3 × /day × 2 days	1 tab 3 × /day × 2 days	Send to doctor if severe.
Skin, rash, dry	Sulphur ointment 10%	Apply 2 × /day to rash	Same	Same	Same	Cover with bandage.
Skin, rash, wet	Calamine lotion	Apply 2 × /day	Same	Same	Same	Leave skin uncovered to dry.
Toothache	Aspirin	1/4 tab as needed	1/4 tab 3 × /day × 2 days	1/2 tab 3 × /day × 2 days	2 tab 3 × /day × 2 days	Consult dentist. Brush teeth after each meal.
	Oil of cloves	Apply to tooth 3 × /day	Same	Same	Same	
Urinary burning	Trimethoprim tab	1/4 tab 2 × /day × 5 days	1/2 tab 2 × /day × 5 days	1 tab 2 × /day × 5 days	2 tab 2 × /day × 5 days	Take plenty of water.
Vomiting	Avomine	1/8 tab only as needed	1/4 tab only as needed	1/2 tab as needed	1 tab as needed	Send to doctor if pain in abdomen.
Wounds, fresh, deep	Soap and water	Wash thoroughly. Control bleeding. Pressure dressing. Treat shock.		Treat shock. Give T.T. and send for stitching.		

The QUAC (Quaker Arm Cirumference) stick as described in the *Current Medicine Scan* of the Christian Medical and Dental Society (May 1990) is a very useful way to determine whether an older child is malnourished or not. It measures whether the arm circumference of a child is as great as it should be for a child of a particular height.

The QUAC stick is made from a flat piece of wood 1 cm thick 4cm wide and 140 cm long, painted white and marked at the appropriate places with a black ball–point pen. A coat of clear varnish protects the markings.

The arm circumference tape is made of paper. A pattern of 10 tapes with centimeter markings is drawn on a sheet of standard type writer paper. The pattern is photo copied and cut into strips 2 cm wide and 28 cm long. These paper tapes will be as accruate as the pattern. They provide a check from being drawn too tight during the measuring procedure because they tear easily. Replacement cost is practically nothing. It is efficient to measure children ranging from 5-10 years of age and children taller than 133cm are not included 200 children can be checked in each hour.

An assistant measures the arm circumference at the mid-point of the left upper arm of each child. Another assistant writes this measurement on a small piece of paper and gives the paper to the child. The child then goes to the QUAC stick some distance away and hands its paper to a 3rd assistant there.

See Table:-

Table – Markings for QUAC Stick

Heights (cm)	Arm Circumferences (cm)
133	16.5
129	16.0
125	15.5
121	15.0
118.5	14.75
116	14.5
113.5	14.25
110	14.0
106.5	13.75
103	13.5
97.5	13.25
90	13.0

A.4 Assistant stands the child agains. The QUAC stick and calls out the marking at his height. This figures is written on the paper slip underneath the arm circumference figure. After the measuring session the two figures on each slip are compared. 18 the first figures (the child's arm circumference) is less than the second figure the child is counted as "malnourished".

The percentage of malnourished children can thus be recorded and compared from time to time.

Fiona Plus is a free bi-monthly bulletin on primary health care in community health, being brought out by the Christian Medical Association of India, the official health agency of the Protestant and Orthodox churches in India, a related ageny of the National Council of Churches and concerned with the promotion and maintenance of health of all people, irrespective of caste, colour, creed or community.

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Editor
Dr. Sukant Singh
Head, Dept. of Community Health, CMAI.

Managing Editor
Ms. L.M. Singha
Communications Officer, CMAI.

Consultant
Dr R. Seaton
Dept. of Community Health

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All correspondence may be directed to:
Christian Medical Association of India, Plot No. 2, A-3, Local Shopping Centre, Janakpuri,
New Delhi-110 058 Tel:5552046 Telex:76288 CMAI IN Fax:011-5598150