RF_NUT_4_SUDHA

Duplicate

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	50	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			
Photato	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	-

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 & Jaggery						

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

HEALTH<NUTRITION AND AGRICULTURAL DEVELOPMENT

(an exploration focusing on Karnataka State)

This exploratory report, is the first step, towards the initiation of a participator dialogue, between researchers from various academic disciplines, health and development action initiators, non-formal educators and others in Karnataka state, on an area of increasing concern and importance, with a view, to identify areas of interactive and participator research, forcusing on agricultural workers and rural communities.

(The report forms part of a larger, sabbatical assignment undertaken by me at the London School of Hygiene and Tropical Medicine from October 1986 to September 1987. The assignment was an exploration of the relationships between Health and Agricultural Development. It included a review of the health effects of Agricultural development policies and the occupational health of Agricultural workers.)

Ravi Narayan
Community Health Cell
Centre for Non-formal and continuing Education
Bangalore
(August 1987)

HEALTH, NUTRITION AND AGRICULTURAL DEVELOPMENT

(an exploration focusing on Karnataka State)

CONTENTS

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11. HAZARDS OF SERICULTURE

The sericulture agro-industry is a rapidly expanding, high priority development programme which has seen a 300% increase in the context of land being brought under mulberry cultivation in the last 30 years. Mulberry leaves are eaten by the caterpillar Bombyx mori to form its cocoon of protein silk. The rearing and feeding of caterpillars, the supervision and 'sunning', important processes during cocoon, formation are family based rural cottage industries spread throughout the rain fed and irrigated Southern, interior Karnataka.

The cocoons are sold in special markets and the silk thread is removed in special reeling and spinning units which are also rurally based but not always home based.

The silk thread is then woven into silk of various grades with both traditional hand looms and electrically operated power looms which are also part of rural industry.

Studies undertaken by the Ross Unit of occupational health based at St. Johns Medical College, Bangalore, in Mallur and neighbouring villages of Kolar district established that many sericulture workers in both homes and reeling units, who handle the silk cocoons, have skin and respiratory ailments, an atopic/allergic reaction to certain antigenic products related to the silk protein. These were demonstrated in small pilot studies but larger surveys are required to establish the extent of this problem and magnitude or morbidity across the agro-industry.

The weaving units have been inadequately assessed from an occupational health point of view but the noise levels are in the hazardous range and noise induced deafness could well be a significant problem. The problem of child labour is however a more important problem in this aspect of the industry. This is partly because of the fact that weaving is a family based industry and all members of the family are inducted into service. However with the increase of power looms the situation is rapidly changing and workers other than family members need to be employed. These additional workers include children, often under very exploitative wage conditions and school dropout rates are usually high in villages with sericulture development especially weaving units. The health problems that these child workers face during their work in noisy, crowded, poorly lit loom sheds need immediate assessment.

With the rapid growth of sericulture, the magnitude of the above hazards especially in terms of population at risk, will increase greatly in the years to come. A larger issue of importance will be the increasing diversion of land, normally used for food and fodder, to an export oriented cash crop, which could have serious repercussions for the community. In many areas where sericulture development has taken place, there is additionally diversions of land for eucalyptus as well. Together, this diversion would mean decrease in local food grain production. There is already increasing evidence that this is taking place in some regions like Kolar district in Karnataka and the long term health and nutrition consequences are obvious.

NUT 2.2

NUTRITION — Practical II

Milk: It is an ideal food for infants and children and a good supplementary food for adults. It is nearly a complete food existing in nature. It contains all the nutrients.

Composition:

	Gms. per 100 gms		
	Cow's milk	Buffalo's milk	Human milk
Protein	3.2	4.3	1.1
Fat	4.1	8.8	3.4
Lactose	4.4	5.0	7.4
Calories	67	117	65

Rich: in calcium

Deficient: It is deficient in iron and vitamin C

Daily requirement:

Adults	10 oz or 284 gms (non-vegetarian requirement - 20 oz or 568 gms)
Children	20 oz
Expectant mothers	40 oz

Milk borne infections: from the animal - Bovine tuberculosis, (Brucellosis) anthrax, achinomycosis, Q. Fever

from the human handler & environment - typhoid, paratyphoid, dysentries, cholera, diphtheria, infective hepatitis.

Prevention: Pasteurization - if effectively done - phosphatase test will be negative
Boiling

Rice: Main cereal consumed in south India, cheapest source of energy and contributes 70-80% of calories. Main source of thiamine and nicotinic acid. By virtue of its quantity it provides nearly 50% of protein requirements. Proteins of rice is of better quality than wheat although the protein content of wheat is more.

Composition:

	Gms. per 100 gms			mgm	mgm
	Protein	CHO	Fat	Thiamine	Nicotinic
Raw rice(mld)	6.8	78.2	0.5	0.06	1.9
Parboiled rice (mld)	6.4	79.0	0.4	0.21	3.8

Parboiled rice is superior in nutritive value to raw rice as regards the thiamine and nicotinic acid are concerned.

Daily requirements: 14 ozs or 400 gms Ie milled raw rice it being consumed, it can be partially substituted by wheat, jowar or ragi. This improves the nutritive value of the diet (N.B. 100 gms or rice contains more proteins than in 100 gms of milk).

Wheat: Next to rice, wheat is the most important cereal

Daily requirements: 14 oz or 400 gms

Composition: (whole wheat)

	Per 100 gms
Protein	11.8 gms
Fat	1.5 gms
CHO	71.2 gms
Thiamine	0.45mgms
Niacin	5.50mgms

Though it has protein to the extent of 11.8% it lacks in lysine. It is a good source of thiamine and niacin.

Millets: Jowar and Ragi : - Jowar is deficient in lysine and has an excess of leucine. The consumption of jowar is occasionally found to be associated with pellagra.

Ragi is a popular millet in South India. It is very rich in calcium, and is a fair source of iron, phosphorous and thiamine.

Daily requirements: In combination with cereals daily requirement is 14 oz or 400 gms.

Composition:

	Gms. per 100 gms		
	Protein gm	CHO gm	Calcium gm
Jowar	10.4	72.6	25.0
Ragi	7.3	72.0	344.0

Pulses: Pulses are next in importance to cereals as an article of diet in India. The common pulses used are red gram, green gram, black gram dhal, Bengal gram, dry beans, and dried peas.

Pulses are rich in protein containing about 20-25 g of protein per 100 gms. In vegetarian diets, pulses are the main source of protein. Pulses are good sources of B group vitamins, especially thiamine and riboflavine. Sprouted pulses are good sources of vitamin C.

Daily requirements: 3 oz or 85 gms

	Mgm per 100 gms			
	Proteins %	mgm Thiamine	mgm Niacin	mgm Riboflavine	mgm Iron
Bengal gram	17.1	0.3	2.9	0.15	10.2
Black gram	24.0	0.42	2.0	0.37	9.1
Red gram	22.3	0.45	2.9	0.19	5.8
Green gram	24.0	0.47	2.1	0.29	7.3

Groundnuts: Groundnuts or Peanuts are extensively grown in India. It is rich in fat, protein is equal to pulses. It is also rich in nicotinic acid, thiamine and riboflavine.

Composition:

	Per 100 gms	
Protein	25.3%	Groundnuts after extraction of fat is a cheap and rich source of proteins
Fat	40.1%	
CHO	26.1%	
Thiamine	0.9 mgm	
Riboflavine	0.13 mgm	
Nicotinic acid	19.9 mgm	

Daily requirements: In combination with pulses 3 oz

Green leafy vegetables: Eg. spinach, amaranth, fenu greek, cabbage are cheapest protective foods. These are excellent source of carotene and vitamin C. They are also good sources of calcium, iron, riboflavine and folic acid. They provide cellulose which acts as roughage. It plays an important role in persons who go on diet to cut down calories.

Daily requirements: 4 oz or 114 gms.

Oil: Eg. groundnut oil, gingelly oil etc. vegetable fat. It is 100% fat, yields 900 calories per 100 gms. Contains no vitamin, contains more of polyunsaturated fatty acids. Lowers the serum cholestrol.

Daily requirements: 2 oz or 57 gms

Ghee: Animal. Except for little moisture it nearly cent per cent fat. Yields between 820 to 895 calories. Good source of vitamin A (200 i.u./100 gms) contains more of saturated fatty acid and hence tries to raise serum cholestrol.

Daily requirements: In combination with other fats like oil 2 oz (N.B. vegetable fats usually do not contain vitamin A)

Vanaspathi: Popular cooking media in our country. It is manufactured by hydrogenation of vegetable oils. On hydrogenation saturated fatty acid content increases. *Gives about 700 i.u. of A and 150 i.u. of 'D' per 100 gms. It is 100% fat and yields 900 calories.

Daily requirement: In combination with other fats 2 oz.

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* These are added by manufacturers according to government regulations

Sugar & Jaggery: These are carbohydrate foods. Sugar is a pure carbohydrate food and contains no proteins, fats or minerals. 400 cal./100 gm.

Jaggery: Is used in place of sugar. 383 cal./100 gms. It is also rich source of iron 11.4 mgm/100 g.

Daily requirement: Sugar/and/or jaggery - 2 oz or 5[illegible].

Milk: It is an important source of animal protein. It contains also the nutrients except CHO. It contains protein, fat, calcium, all the vitamins except C. It is a complete protein containing all essential amino acids.

Composition:

Protein	13.3%
Fat	13.5%
Minerals	1%
K Cals	143

Daily requirement: 1 egg (1½ oz)

Root and tubers: Generally used as vegetables.

Potatoes, tapioca, carrot, onion, raddish. These especially potatoes are rich in CHO. Poor source of fat and protein. Good source of calcium and phosphorous.

Carrot rich in carotene
Potatoes rich in vitamin C

Daily requirement: 3 ozs or 85 gms.

//[illegible]//

Assessment of Protein-energy Malnutrition (PEM)

a) Biochemical tests

Changes in the body's composition in malnutrition are most readily assessed in general terms by anthropometric techniques which measure the mass of tissue in the body or arm etc. Many biochemical tests are indirect measures of the processes which are in progress during the course of developing malnutrition. Biochemical tests may therefore be more sensitive to recent dietary experience and may revert rapidly towards normal when a malnourished child has only just started to recover.

Tests can be categorised into measurements on i) blood and ii) urine. Blood tests are not always acceptable in population studies but provide the opportunity for other useful tests eg. Hb.

Blood tests

1. Circulating proteins of liver origin
   a) Albumin: insensitive but important when low
   b) Transferrin: studied only in severe PEM
   c) Lipoproteins: no more sensitive than albumin
   d) Thyroxine binding pre-albumin: preliminary studies only
   e) Pseudocholinesterase and other liver enzymes: insensitive

Liver-produced proteins are particularly sensitive to a fall in the dietary protein intake but the concentration in the blood depends not just on the rate of synthesis but also on the breakdown rate of each protein. The breakdown rate of albumin adjusts as the synthesis rate falls thus minimising the effect of the reduced intake of protein. Transferrin does not show this phenomenon - nor probably does T.B.P.A. but little work on this protein so far. Both proteins may prove more sensitive than albumin which is often near normal in marasmus. Transferrin and T.B.P.A. show greater falls than albumin in kwashiorkor but their levels have not been reported in marasmus. Both tests are time consuming and expensive. Lipoproteins behave rather like albumin: although both are rather insensitive any fall is important. At albumin levels below 3.0 gm/100 ml a whole range of other disorders of hormonal and amino acid concentration are evident and reflect impaired hepatic function.

Albumin is the simplest and most useful blood test for PEM but is still of no value in demonstrating the extent of growth failure or wasting in marasmic children.

2. Indices of recent absorption: urea, cholesterol.

3. Amino acid levels a) valine reduced particularly in kwashiorkor
   b) alanine low in starvation states eg. marasmus but too variable. Tends to rise in protein deficiency.
   c) Ratio essential amino acids / Non-essential amino acids. Low in kwashiorkor, normal in marasmus. Likely to change within 2-3 days of altering the diet.

Urinary tests

1. Creatinine excretion. Creatinine is spontaneously formed by the cyclization of creatine phosphate (C.P.) present as a high-energy compound in muscle. Creatinine is excreted unchanged in the urine, the rate reflecting the mass of C.P. in the body. Since the concentration of C.P. is constant in muscle, its exclusive site, the excretion rate of creatinine reflects muscle mass. Creatinine excretion is, however, somewhat variable, and in field studies accurate urine collections for long times are impracticable. Three hour collections have been tried - coefficient of variation 25%; 24 hour collections - 10% coefficient. Most meaningful method is to express the creatinine in terms of the child's height in cm. since this will indicate the amount of muscle that a child has for his size. Muscle mass in Kg = creatinine excretion in mgm. ÷ 50. Creatinine is theoretically one of the best indices of malnutrition since it does reflect the extent of muscle atrophy - a key feature of the whole spectrum of PEM from kwashiorkor to marasmus. Creatinine excretion is increased for a short time during stress eg. trauma or infection.

2. Urinary tests indicating recent dietary intake.

   a) Total Urinary N

   b) $\frac{\text{Urea N}}{\text{N}}$ % falls on a low protein diet

   c) $\frac{\text{Urea N mg}}{\text{mg creatinine}}$ suitable for single urine but limited usefulness.

   d) Urinary SO_4/creatinine: ? reflects intake of S-amino acids. Limited usefulness.

3. a) Urinary Hydroxyproline 24 hr excretion: reflects the rate of growth and related to the turnover of collagen. Increased excretion in infection; not easy to measure.

   b) Hydroxyproline index $\frac{(\text{OHPs x body wt})}{\text{creatinine}}$

   Disadvantage of two variables each of which may affect index. Useful for single urine. Index age dependent and thought to reflect growth.

Significance of biochemical values

	Deficit	At risk	Acceptable
Serum albumin	< 2.8	2.8 - 3.5	> 3.5
Amino acid ratio	> 3.0	2.0 - 3.0	< 2.0
Other index	< 2	-	> 2
Urea N/creatinine	< 10		> 10

Serum albumin is the most commonly used biochemical index but it reflects the extent of liver synthesis which appears well maintained in starvation states and the index although simpler is less sensitive than the T.B.P.A. and transferrin blood concentrations. Urinary creatinine is the biochemical test of choice for showing the extent of the nutritional deficit but it is impracticable to obtain an accurate estimate of muscle mass by this technique.

W.P.T. James,
February, 1973

Anthropometric Assessment (Cont.)

Use Harpenden calipers. If other types of caliper are used the standards for these calipers must be used as calipers with different pressures and area of cross section at jaws give different results.

The standard measurements are:

1. Biceps: over the mid-point of the muscle belly with the arm resting supinated on the subject's thigh.

2. Triceps: over the mid-point of the muscle belly, mid-way between the olecranon and the tip of the acromion, with the upper arm hanging vertically (Edwards, Hammond, Healy, Tanner and Whitehouse, 1955 , Brit.J.Nutr. volume 9, p.133, 1955.)

3. Subscapular: just below the tip of the inferior angle of the scapula, at an angle of about 45° to the vertical.

4. Suprailiac: just above the iliac crest in the mid-axillary line.

At these four sites, the skinfold is pinched up firmly between the thumb and forefinger and pulled away slightly from the underlying tissues before applying the calipers for the measurement.

If only a single measurement is taken, the triceps skinfold is the most useful. If several measurements are made an estimate of total body fat can be made from the total of four skinfolds (Durnin and Rahaman. Br.J.Nutr. 1967, vol.21, p.681).

The differences in fat percentages become progressively smaller for each 5 cm. difference in skinfold as the skinfolds increase in size.

Percentages of fat corresponding to the total value of skinfolds at four sites (biceps, triceps, subscapular and suprailiac)

Total skinfold (mm)	Fat (% body weight) Men	Women	Boys	Girls
15	5.5	-	9.0	12.5
20	9.0	15.5	12.5	16.0
25	11.5	18.5	15.5	19.0
30	13.5	21.0	17.5	21.5
35	15.5	23.0	19.5	23.5
40	17.0	24.5	21.5	25.0
45	18.5	26.0	23.0	27.0
50	20.0	27.5	24.0	28.5
55	21.0	29.0	25.5	29.5
60	22.0	30.0	26.5	30.5
65	23.0	31.0	27.5	32.0
70	24.0	32.5	28.5	33.0
75	25.0	33.5	29.5	34.0
80	26.0	34.0	-	-
85	26.5	35.0	-	-
90	27.5	36.0	-	-
95	28.0	36.5	-	-

(Rounding off in the percentages of fat accounts for the differences between adjoining values not being uniform)

The following measurements of triceps skinfold thickness are those which can be considered as including the range of "normal" values for French-Canadian schoolchildren measured in 1970.

	Lower limit 3rd percentile		Upper limit 97th percentile	
	Boys	Girls	Boys	Girls
6	5.6	6.4	12.6	15.0
7	5.5	6.1	11.9	16.0
8	5.4	6.3	12.9	17.5
9	5.3	6.5	14.5	19.5
10	5.3	6.7	16.4	21.0
11	5.4	6.8	18.0	21.5
12	5.5	6.9	19.0	22.0
13	5.6	7.0	19.8	22.3
14	5.5	7.3	19.8	22.8
15	5.3	7.9	19.0	23.3
16	5.1	8.5	18.0	23.8

Read from grapsh of Jenicek and Demirjan, Amer. J. Clin. Nutr. 1972, 25, 576.

Robson et al (Amer. J. Clin. Nutr. 1971, 24, 864) have found that Black children in Dominica have much thinner triceps skinfolds than London White schoolchildren although the subscapular measurements of the two groups are the same. A racial difference in triceps skinfolds has therefore been suggested and would certainly explain the very high proportion of West Indian Black children with thin triceps values. However, American Black and White children show no differences in their response in triceps or subscapular skinfolds to changes in weight, and this suggests that the differences in West Indian children's subcutaneous layer of fat may be determined by environmental rather than ethnic factors.

Differences in other skinfolds have been found e.g. subscapular skin thickness is different in French-Canadian and London children but the triceps measurements are approximately equal.

Changes in skinfold thickness have been observed over the years e.g. secular changes in triceps measurements have been very marked in Canadian children with an increase from 6 to 10mm average in boys' values in the last 17 years. Nutritional factors rather than genetic control therefore may be more important.

Most London and Canadian children are weaned early onto diets containing very high quantities of protein and energy. This will produce faster growth rates with an increased likelihood of childhood obesity. Many young obese adults were obese in childhood and have an excessive number of fat cells in their bodies. This excess, which is probably determined in the first six to 24 months of life, "programmes" the body for life-long obesity and perhaps an earlier death. Present values for skinfold measurements although "normal" may not be "ideal", and we cannot be certain of the significance of thin triceps skinfold measurements in community surveys. Sequential changes in an individual's measurements will be significant, however, and the finding of a low percentage of body weight as fat means that a subject's energy reserves are limited.

W.P.T. James

NUT 4.5

VITAMIN AND MINERALS
Daily Requirement for an adult

		Deficiency
Vitamin A	3000 I.U.	1. Xeropthalmia. Blindness 2. Decrease Resistance to URTI 3. Inner Ear Deafness 4. Acne
Vitamin D	400 I.U.	1. Rickets in children 2. Osteomalacia in adults
Thiamine	1.5 mgms	1. Beri Beri 2. Neuritis
Riboflavine	1.5 mgms	. Angular Stomatitis . Photoph Glossitis
Nicotinic Acid	15 mgms	Pellegara
Cyanocobalamine	1 mcg.	Anaemia
Pathothemic Acid	3 mgms	1. Chick Pellagara 2. Hair growth
Choline - Parent substance acetylcholine and a constituent of Lecithin	2 gms	Deposition of fat in liver and Haemorrhagic degeneration of liver and kidney
Ascorbic acid	50 gms	1. Scurvy 2. Decrease resistance to infection
Folic acid	1.5 mgms.	Anaemia
Vitamin E & K	Not known	1. Vitamin E - sterility in male 2. Vitamin K - Hypoprothrombinaemia
Ca.	1 gm.	1. Borne defects 2. Hair 3. Blood disease
Iron	15 mgms.	Anaemia
Fluoride, Ion in water	1 - 2 ppm	Dental caries

Essential Fatty acids nutritionally important and necessary for growth. They are Linoleic, Linolenic and Arachidonic acids. They cannot be synthesised in the body and have to be supplied in the diet. Linoleic and Linoenic acid are of vegitable origin and present in cotton seed, groundnut and linsee oils while Arachidonic acid is of fish and animal origin. E.F.A. regulate cholesterol metabolism.

DAILY BALANCED DIET FOR AN ADULT

	Gms		Cals
Cereals (rice chiefly milled)	300	(340x3)	1020
Dhal (red gram)	100		35[illegible]
Green vegetable (cabbage)	100		2[illegible]
Potatoes	100		9[illegible]
Cauliflower	100		3[illegible]
Banana	150		15[illegible]
Oils & fats	50		45[illegible]
Sugar (in tea, coffee & sweets)	100		40[illegible]
Milk (cow)	100		6[illegible]
Mutton	200	(194x2)	38[illegible]
Egg	50		8[illegible]
Agathi	50		4[illegible]
			3114

Interface between the Socio-economic Status and the Health and Nutritional Status of Women and pre-School Children of the Rural and Urban Poor in Eastern India.

(A b s t r a c t)

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I. Introduction. This project sponsored by a number of U.N. Agencies such as the UN Research Institute for Social Development, Geneva, UN University, Tokyo, and the UNICEF, New Delhi, has grown out of a proposal before the UN System, mooted after the World Food Conference, for a global study of famine risk in the modern world. It was felt that the study of famine risk would be too narrow because of various definitional problems of identyfying famine. Famine Codes and Scarcity Manuals in different parts of the world use different definitions. Moreover, nothwithstanding the prevalence of the Famine Code in India, the Bengal famine of 1943 was never declared to be a famine, although perhaps three million people had died. It was also felt that famine risk is endemic in large parts of the Third World because of the extreme vulnerability of certain segments of the population, during certain seasons, almost every year, to conditions of food shortage percipitated by lack of purchasing power and employment. It was felt that such vulnerability exposing segments of the population to acute distress conditions even at the slightest fluctuation of food production, caused by drought or flood, is a consequence of an essentially multi-faceted structure of determination involving a large number of variables - ecological, physiographic, socio-economic, technological and cultural. It was consequently felt that a System Approach in the proper sense of the term would be the best methodological standpoint for the analysis of food systems and society in all their interaction. Famine, or acute distress, would then represent breakdown points of the system through which the system reproduces itself -- the breakdown points acting more like safety valves.

II. The Components. Food System and Society is then considered to be a generalised system like any other system. It would be composed of a set of sub-systems. Notionally, we think of the main sub-systems of the general system called "Food Systems and Society" envisaged in terms of information and output flows and feed-backs. The Sub-System, which is relatively stable over the relevant time -span, is the Ecological and Physiographic Sub-System, changes in which can be observed only over the relatively long run. The Ecological and Physiographic Sub-System can be represented and measured in terms of parameters such as those relating to the water regime(rain fall, sub-soil water, surface run off etc.), relief, forest-cover, basic soil properties etc. In some cases fluctuations, such as those in rainfall, can also be parametrised whereby short run changes can be impounded into long run parameters.

The Ecological - Physiographic Sub-System thus, represented by a set of parameters, provide, so to speak, the stage for the inter-play of socio-economic forces including property relations, quality and quantity of the labour force, technology and culture. It is through the interaction of the Ecological - Physiographic Sub-System and the Socio-economic Sub-System that specified configurations of the food system arise.

The Socio-economic Sub-System can be represented by a whole range of parameters such as pattern of land holdings, cropping pattern and intensities, incidence of Scheduled Castes and Scheduled Tribes, incidence of landless Agricultural Labour, interaction with the Urban Metropolitan centres, availability of controlled irrigation, technology, particularly agricultural technology, etc. A whole range of data is available to enable us to express these parameters in terms of suitable magnitudes on different scales. The Physiographic - Ecological Sub-System provides a range of information inputs into the Socio-economic Sub-System which digests these inputs generating a structure of production and distribution of food with different social forces exercising different degrees of control over access to food*. It is possible, then, to think of methods of subsuming the entire range of variables and parameters in a Composite Index of Food Insecurity to which specified segments of the population, such as, Scheduled Castes, and Scheduled Tribes or landless labourers, are exposed. The net output of the interaction of the first two sub-systems is, then, this composite index of food insecurity, which in turn becomes the information-input for the Nutritional and Health Sub-System. It is possible that the Ecological -- Physiographic Sub-System also provides certain direct information inputs of an epidemiological character to the Health and Nutritional Sub-System. For instance, data show that in eastern India incidence of Gastro-Enteritis has a certain seasonal profile, which may be the consequence of environmental hazards compounded with food insecurity.

The Nutritional and Health Sub-System can also be represented by a range of parameters relating to Nutritional levels, deficiency signs, morbidity and mortality profiles, access to Health Care delivery system of, particularly, the segments who suffer from Food Insecurity etc. There may be other associational factors such as Health Culture and Health Habits, Community Habits and Taboos, practices of pre-Natal and post-Natal care etc.

The purpose of the project being reported here is to identify the interaction among the three major sub-systems in terms of a whole range of parameters to arrive at a composite measure of the entire system of interactions

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* For instance, the interaction between the two sub-systems is such im Eastern India that tribals and semi-tribals have been driven to the low-productive, arid plateau regions.

among the variables, and, finally to arrive at a multifactor index of vulnerability. The idea is to use techniques of estimation of a Multi-Variate System model methods of cluster analysis, factor analysis etc. to arrive at a composite measure of vulnerability in regard to Food, Nutrition and Health. Such an index of vulnerability will, as far as can be envisaged at the present state of our research, be in the nature of a Mahalanobis Distance measure in multi-dimensional space. It can provide important guidelines for resource allocation between regions and communities, and a method of evaluation & monitoring.

III. The Survey . The foregoing analytical scheme, largely quantitative in nature, will be based on an extensive compilation of available secondary and primary data from various agencies in Eastern India, Governmental and otherwise. It is expected that the Multi-Variate analytical techniques used in course of arriving at the composite Distance Measure will also tell us quite a bit about the relative weights of the various components of the system represented by the whole range of parameters which we propose to estimate for each of the 46 districts in the three states of Eastern India, West Bengal, Bihar and Orissa. However, since there is no a priori general theoretical framework in the revived body of knowledge for identyfing the linkages among the variables and the sub systems, it is proposed to identify some of the linkages by examining the situation at the micro-level, in clusters of villages in a set of sample districts : four rural districts and two urban areas in each of the three states of West Bengal, Bihar and Orissa, including the Calcutta Metropolitan Development area. These micro-surveys are designed to capture the linkages among the three sub systems for specified communities, households and individuals, including women and pre-school children. The survey is purposive and is aimed at catching the typologies of vulnerability under different Ecological and Demographic contexts in the three states of Eastern India. It may be possible to evolve certain norms specific to given communities -- norms which are not based on studies on communities in the U.S.A. or such other Western countries. The physiology of the tribal man in, say, Phulbani in Orissa is not likely to be the same as that of a Texas peanut farmer, for example. The survey will also attempt diagnostic studies of disease profiles and access to health care delivery; it will not use any inputs such as drugs, pills, special feeding programmes etc. to elicit information from the community. Instead, an attempt will be made to report back to the community some of the more easily comprehensive findings through Audio-Visual techniques readily understood by indigent segments of the inhabitants in the target areas, so that the community gains a degree of understanding about its human predicament, and may think of doing something at its own initiative to rectify the perceived inadequacies.

IV. The Team. Inevitably, the team is composed of a wide range of disciplines -- Medical Scientists, Statisticians, Economists, Geographers, Anthropologists, Agricultural Scientists etc. At the moment we have a team of about 20 professionals engaged in this work, supported by a number of computing hands and investigators. Our main problem at the current phase of our research is the challenge of the massive compilation and processing of the secondary data, and the challenge of setting up the logistics of the survey which will begin in West Bengal and Orissa by the middle of this year.

Only service element of survey will be audiovisual feedback of findings – sharing with the people the details of the human predicament they are in

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Studies

Investment in Health/Education bolsters up social inequalities in a society

Eastern India study

1. SCs more on arid/plateau/slope region
2. Inaccessible to public expd – health/education

→ Translate findings to health cell of Panchayat system
– understand comprehensive profile of the community
– Panchayat then may be stimulated to start a health movement of their own!!!

↓

Can we make some input to stimulating a health movement based on sensitising people to their own predicament?

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INTEGRATION OF A NUTRITION PROGRAMME WITH HEALTH AND AGRICULTURE

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Introduction: In the Indian Social Institute Training Centre from which I come, we are trying to help full-timers in rural development from South East Asian countries to critically evaluate the work their organisation is doing. This requires first a critical understanding of their own society: What is the prevailing concept of under-development and development which is at the base of all development policies of their government? This sort of approach has made us all increasingly aware of the deeper causes which lay behind a process of change we call 'development', yet in reality is the development of certain strata in society only. In an unjust distribution of development gains we find the basic answer to the question: Why can the masses not be mobilised (blocking of motivation), why can the local resources not be tapped?

1. The issue of Justice

It is relevant to mention this in the introduction to our theme: Integration of a Nutrition Programme with Health and Agriculture. It is meaningful to link these three sectors together; but to be so more fully, these have to be placed into the totality of social reality of a country. I am very much impressed that this Seminar has been guided by a paper of high quality, indicating that those developing countries which have brought about a radical transformation of inegalitarian structures have been most successful in meeting the basic needs of the people despite scarcity of resources. Only in the context of this total transformation was it possible to create a new system of Agriculture and a new health system. An equitable distribution of increased food production and the priorities of the health-care-system eliminated basically the problem of malnutrition. The question is then raised: Where this re-structuring of society has not occurred: "Is it the fate of nutrition planners to be 'patient revolutionaries' biding his time with pilot projects and marginal influence". For us in India this question has a very realistic ring. What to say about the apparent new commitment of Governments to Nutrition Programmes which excludes however, the more decisive commitment to transforming unjust and oppressive social structures responsible for the constant widening gap between rich and poor? I'll tell you frankly my opinion: Within oppressive and unjust social structures creative participation of the people can never be what it should. The proof is the constantly increasing percentage of the people who are forced to live below the subsistance level.

In such a situation what real hope can integration of nutrition programmes with health and agriculture give? I believe the honest answer is in the saying: Better light a candle than curse the darkness. Symbolic islands can be created through this approach, provided it is based on a philosophy of immense trust in the

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capacity of the people. Where this real love of the people animates nutrition-programme-planners an approach which integrates nutrition with health and agriculture can make a great difference.

2. Example of a comprehensive rural health programme

I wish to give this example because it constitutes quite a sizeable island, covering a population of 40,000. It was initiated in 1970 by a doctor couple (Dr. Arole) in Jamked, Maharashtra, and covers about 30 villages. The project demonstrates it seems to me how best the Chinese model of comprehensive health-care can be implemented in a feudal society.

This comprehensive rural health project is guided by the three basic concepts of a) participation of the community
b) delegation of responsibility to lesser trained personnel
c) mobile health teams

Under Five Clinics are central to the activities of the project.. as one of the goals of the project is to reduce mortality rate of the under five by 50% within four years. Through these Clinics supplimentary feeding is carried out in most villages. The community takes the responsibility of providing fuel and utensils, they do the actual cooking. The stress of health education and the actual experience of improved health among the children has motivated the community to work for better water supply, and to set apart some land to grow food for this programme. The project is collaborating with agencies involved in agricultural development. But in comparison with another major project in this state, in Kanakapura Taluka, where the thrust has been in agricultural extension for small farmers, more than on nutritional programmes, the impact of increased agricultural production seemed to have remained small. Care of minor illnesses, health and nutrition education of the mothers, and immunisation programmes arranged by the villagers themselves, are other activities of these under Five Clinics. I do not think it necessary to give more details about the various other goals and activities of this project. Instead I wish to point out some of its characteristics which have impressed me most and which are relevant for our purpose.

a) Emphasis on the educational aspect of the programme

Not only the mothers but the whole community is exposed to continuous nutrition and health education. Not only the explanations given by health workers, but also the actual results of a programme in which many take an active part, achieve this result. I was much impressed by the villager, who has been trained as health educator, and wanders from village to village. He had a session in the village I visited. In a dramatic way he explained his charts to the villagers seated on the ground around him. Since I knew the local language, I myself got fascinated by his way of communicating, pointing out concrete examples of his reference among the audience. I understood that the best communicators are found among the people themselves.

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b) The people are made to understand that food-supply from outside was only meant as a starter. They would have to grow the food required for feeding programmes. Some members of the community did get motivated to donate some of their land.

c) The nutrition programme being part of a comprehensive health programme meeting the basic health needs of the people, supported by locall resources (primary health workers, collaborators and material supplies), has a very strong demonstration effect. As child mortality declined, motivation for planning the family became effective.

d) The educational impact of the programme is very much strengthened by the central role of the local permanent workers who are fully identified with the community. Much of the training of other health and nutrition workers is also given locally. They escape thus getting alienated from the people through a sophisticated training in a city. Experience has shown that team-members trained in city-conditions, tend to leave this rural areas soon again.

Evaluation: The Jamked project shows the possibility of creating health through a comprehensive approach in which community teams, inspired by dedicated animators (the Aroles) are able to bring to life the participation of the village communities. The remarkable success of the project and the spirit which animates it, has encouraged many other groups in India to launch similar ventures. Just now a new team of medical mission sisters is reaching out into the area bordering on Jamked. Dr. Arole told the sisters: "Do not imitate the Jamked project, you can do better; be creative." Provided success does not blind the groups involved to the fact that they are still up against formidable obstacles, rooted in the unjust structures of ownership of land and concentration of political power in the hands of a minority, they are doing a highly meaningful service to the people. Though they have to work within the constraints of the prevailing structures, reflected in the caste-system, they are instrumental in expanding the educational processes in a direction which will make people more critically aware of the still deep rooted elements of a highly inegalitarian society. It might be worthwhile to discuss whether or not such a comprehensive approach can and should evolve further into genuine conscientization leading ultimately to the emancipation of the masses.

3. Food for Work

I had the opportunity to listen to your first reports on programming concrete projects. In all of these food for work had an important place.

What is surprising about food for work programmes is that some look upon them as a curse, others as a great blessing. When visiting in Maharashtra, a massive food for work project, I was much impressed by hundreds of men and women constructing percolation tanks that would greatly increase the agricultural production. A few critical questions, however, brought out a

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a number of serious drawbacks of the programme. Nutrition education was totally absent; more serious: the land below the percolation tanks belonged to the richer farmers of the villages. And an accident of lorries with grain having been diverted to the market of a nearby township, still further darkened the picture.

As I wish to elicite discussion, on what the conditions for a good Food for Work Programme are, I cite another case. Over thousand men and women have been involved in a programme which lasted several years. It was greatly effective in increasing agricultural production in the area. A network of channels were dug which would bring the water from the main canal into the fields of the farmers: fields were levelled and bunded. All excellent on first inspection. But there were non-intended effects. The earning capacity of the farmers was increased permanently through the labour of this army of workers. These, however, after completion of the project were back where they were initially: in poverty, unemployment and helplessness. The inequality gap between them and the farmers had been widened as a result of the project. This case demonstrated how linking of Food for Work and agricultural development needs a good deal of political wisdom to be really contributing towards genuine development. The question as to what impact such programmes have on the social structures of society cannot be ignored. I am sure that many of you have been connected with such projects which really improved the productive capacity and the income of the beneficiaries themselves. I too, know many such projects.

A friend of mine visited recently some region of Andhra Pradesh. On his return he wrote to me: "I was shocked to see how priests and sisters have become corrupt in handling development projects. He was not referring explicitly to Food for Work Projects. But the problem is common to all development work. If our preoccupation is only in terms of efficiency, of effective programming etc., there will be a missing link. Development programmes, however well conceived, do not automatically bear fruits of justice, integrity and responsibility. It is strage that so many organisations which go under a spiritual name pay so little attention to this. I am including the organisation to which I belong. We expose a host of people to responsible work, supply them with lots of material inputs, and expect them to be good and honest without helping them to discover motives to be so. Exposed to a host of pressures it is not easy to swim against the stream, especially with the increasing shortage of food-stuffs and constantly rising prices. Food For Work programmes are to a high degree vulnerable and expose the persons handling them to the pressures mentioned, in an atmosphere of wide-spread corruption and of 'let me get up' philosophy.

4. The Educational Dimension

The linking of nutrition, health and agriculture has the advantage that all three sectors demand primary emphasis on educational processes if they have to build up new people with new ways of

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feeling, thinking and acting. You know much more about the nature and methods of extension education related to these three sectors than I do. But the best extension education can still miss the ultimate worthwhile goal of building a community, a horizontal solidarity, of helping a new spirit of collaboration and sharing to be born. Mere achievement motivation which results from successful experience in 'keeping my child health, producing more on my fields' risks to be infected with striving for egoistic social advance, which is the root-cause of underdevelopment understood in depth. Everywhere we see that the same processes which push up some, keep others down.

The following happened in North India: Under the guidance of a priest the Santals had transformed a jungle area into fertile fields. They had built, with Food For Work an earthen dam in a valley close to their settlement. The monsoon broke in. Heavy rains poured down incessantly. Suddenly in the middle of the night shouts resounded: "The dam is bursting", men and women ran out of their houses in the direction of the dam. They worked the whole night, filling bags with sand to strengthen the dam. The priest was with them and all got wet to their skin. In the morning the dam still stood. They had made it together. "During this night the community was born", commented the priest in narrating the story. How can such community experiences become educational processes within programmes of nutrition, health and agriculture? This seems to be a critical question if our long-term goal is the creation of a new society, in which dignity and equality and participation is deeply experienced within human organisations and institutions. It is my personal conviction that any organised intervention risks unconsciously to serve the interests of those who have control over societal institutions, unless it is clearly guided by long-term goals of a more just and more human society. Every intervention, however small it may be, affects the process of change in society. It either is supporting a process leading to increasing-inequality, or it belongs to the counter-forces inspired by counter-values, and which do have a relevance for a change towards greater social justice.

You may remember the passage from Solzhenitsyn's novel 'The Inner Circle'.... about the sheep producing more wool because of being better fed. In explicit terms it means: mere extension education, however important it is, not accompanied by 'political education' gained by people organising themselves, establishing their own institutions, e.g., for credit, marketing, etc.,(reflecting on the causes of their having little say in policy formulation of political bodies at various levels), risks to support the existing power structure. Social workers are easily 'used' by politicians. And the greatest illusion would be to think that Nutrition Programmes are neutral, having no political consequences. Politicians may be interested in Nutrition Programmes (nationally and internationally) for "political reasons".. which in plain language means: for the purpose of "feeding" rather than for the purpose of emancipation and liberation, which really would serve the interests of the people.

* * *

WHO Chronicle, 31: 143-149 (1977)

KEEPING FOOD SAFE FROM HARMFUL GERMS

The health of people depends to a large extent on the food they eat. Keeping food safe from harmful germs and their toxic products is therefore an important problem, which over the years has engaged the attention of various WHO expert committees concerned with different aspects of food hygiene. The latest report of the WHO Expert Committee on microbiological aspects of food hygiene, which met in Geneva in March 1976 (with the participation of FAO), has recently been published[1] and it describes the microbiological agents of food-borne disease and the microbiological hazards in relation to foods. The article below, which is adapted from the second part of the report, describes the microbiological hazards related to food processing, handling and storage, population movements, tourism, etc., as well as the measures available to control them.

Hazards related to food preparation

The largest proportion of food-borne disease is probably caused not by commercially processed foods but by food prepared at home, in institutions, or in food catering establishments. Food-processing plants were implicated in 6% of food-borne disease outbreaks in the USA during the period 1968-73 and in nearly 25% of outbreaks in Denmark during 1954-63. The commonest causes of disease resulting from food prepared in kitchens of private homes or institutions in the USA are unexpected contamination of the raw food material and faulty preparation techniques. One study of disease outbreaks that could be attributed to food processing plants suggested that most of the outbreaks were due to contaminated raw materials (for products not given a terminal heat process) and to faulty applications of processing and packaging techniques.

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Common faults in the handling and processing of food in homes, restaurants, and other food catering establishments, which led to disease outbreaks, are given in Table 1. In some cases several faults were found without the possibility of identifying the importance of each one. Several outbreaks of food poisoning, usually caused by salmonellae, were found to be due to the transfer of organisms from contaminated raw food to cooked food by hands, utensils, and unclean surfaces.

Table-1. Factors contributing to 493 outbreaks of disease caused by foods processed in homes or in food catering establishments[a]

Factor	No. of outbreaks
Inadequate refrigeration	336
Food preparation far in advance of serving	156
Infected persons and poor personal hygiene	151
Inadequate cooking or heating	140
Food kept "warm" at a wrong temperature	114
Contaminated raw materials in uncooked foods	84
Inadequate reheating	66
Cross-contamination	58
Inadequate cleaning of equipment	52
Other conditions	160

[a] Adapted from BRYAN, F.L. Microbiological food hazards today-based on epidemiological information. Food technology, 28(9): 52(1974)

Hazards related to storage

Hazards related to the storage of food are determined by various combinations of factors-length of storage, type of food, methods of processing and preservation, types and relative proportions of organisms present, PH, water activity, and temperature.

1 WHO Technical Report Series, No.598, 1976 (Microbiological aspects of food hygiene). Report of a WHO Expert Committee with the participation of FAO), 103 pages, Price; Sw. fr. 9.-.

Temperature control is of major importance in reducing hazards from pathogenic bacteria, limiting spoilage, and keeping food safe. In countries where refrigeration facilities are available perishable foods should be stored at temperatures that inhibit the growth of pathogenic bacteria, i.e., less than 4°C (or alternatively above 60°C). The low temperatures must be achieved quickly after processing in order to obtain the greatest benefit from refrigeration. Slow cooling may allow heat-injured spores to recover and subsequently to grow before the temperature reaches an inhibiting level.

At low temperatures, particularly under chilled storage, changes may occur in food usually as a result of the growth of psychrophilic bacteria such as Pseudomonas, Achromobacter, Flavobacterium, and Alcaligenes and certain yeasts and moulds.

Hazards related to food habits

Food habits vary from one country to another and even within a country, but these habits are subject to change. In countries where environmental sanitary conditions are poor, gastroenteric diseases are one of the most important causes of morbidity and mortality. Food and water are important channels of transmission of these diseases.

The following factors tend to increase food-borne diseases:

(1) Intensive production of livestock and the use of contaminated feeds.

(2) Consumption of raw or undercooked meat or poultry. This increases the risk of parasitic diseases and bacterial infections and intoxications, e.g., salmonellosis, toxoplasmosis, human linguatulosis, Taenia saginata and T. solium infestations, and trichinosis. Even in countries where meat is thoroughly inspected to prevent transmission, mild infections of carcases can still be missed. The habit of cooking large cuts of meats into which heat cannot adequately penetrate may sometimes be responsible for these infections.

(3) Consumption of raw milk, either from choice or for economic reasons.

(4) Consumption of raw or undercooked fish. Infections due to Vibrio parahaemolyticus, Diphyllobothrium latum or other cestodes, trematodes, and nematodes may result.

(5) Consumption of wild animal meat. Out-breaks of trichinosis have occurred through consumption of wild boar and bear meat.

(6) Improper home canning of foods. In the USA the majority of outbreaks of botulism occur as a result of home canning of vegetables and fruits where adequate processing has not been carried out.

(7) Preparation of ready-to-eat foods in bulk and mass feeding, where under certain conditions normal habits of food hygiene are relaxed.

(8) Consumption of traditional food delicacies. Utijak, an Eskimo delicacy prepared by keeping seal flippers soaking in oil until rotten, has been responsible for whole families dying from botulism.

Hazards related to population movements and travel

With improvements in the speed and safety of travel, more and more people now visit other countries; in the case of "package" tours, organized to attract tourists, a considerable number of people are exposed to environmental hazards which they would not experience in their own countries or homes.

Outbreaks of food-borne disease due to Staphylococcus aureus, Clostridium perfringens, salmonellae, V. parahaemolyticus, cholera and non-cholera international air travel. Strict control of food hygiene in flight kitchens as well as on board aircraft is essential.

Numerous outbreaks of enteric infection have been recorded on passenger ships; several of these have been reported on cruise ships. Replenishment of ships' water supplies during a voyage has always presented a particular hazard since many opportunities exist for contamination of water between ship and shore. An additional hazard is cross contamination of drinking-water with bilge or waste water. Several outbreaks of V. parahaemolyticus gastroenteritis were reported on cruise ships sailing from ports in the USA in 1975. In one of these outbreaks V. parahaemolyticus serotype $O_3{:}K_{22}$ was isolated

from sick passengers and seafood cocktail was implicated. It was thought that the food was contaminated with polluted sea water. In another investigation of the incidence of gastroenteritis on a passenger ship, Escherichia coli O27 was the predominant organism isolated from patients with diarrhoea.

In addition to the specific hazards of well-known enteric infections and intoxications, travellers and holiday-makers are exposed to other infections usually classed as "travellers' diarrhoea"; such infections are of limited duration. There is evidence that travellers' diarrhoea is associated with strains of enterotoxigenic E. coli new to the individual and acquired through the medium of food and water. Amoebiasis and giardiasis may also be involved in tourists' gastroenteritis originating from food and water.

Owing to the influx of large numbers of people to sites of pilgrimages and refugee camps, the threat of cholera and other enteric diseases in these places is very real. Camping and caravan sites, fairs, and festivals can also present hazards of food-borne disease outbreaks if the sanitary arrangements are not satisfactory.

Hazards related to imported foods

Large quantities of foods for human consumption and for feeding animals are transported from one country, or from one part of the world, to another. The exporting country may have no knowledge of the ways in which their products are used in importing countries, and foods that are considered safe in the country of origin may provoke disease in the importing country as a consequence of different food habits. The importing country, on the other hand, often has insufficient knowledge about the production and processing of the food, and public health authorities are concerned about the unknown risks. This has led to the setting up of control systems or requests for guarantees on wholesomeness, absence of pathogens, etc., which information many exporting countries are generally unable to give. Import control based only on sampling and testing of lots is often ineffective and has not been able to prevent several outbreaks of disease due to imported foods in various countries.

Eliminating harmful germs

Different processing methods, e.g., heat treatment, refrigeration; etc., are available for combating food-borne disease agents such as bacteria, parasites, and viruses. The effects of such treatment on these agents or on toxins produced by them are summarized below.

Effect of heat processing

(1) Non-spore-forming bacteria. Officially approved heat treatment of moist foods for the purpose of eliminating non-spore-forming bacteria, notably salmonellae, ranges from 3.5 minutes at 61.1°C for liquid whole egg to 1 second at 132.2°C or over for ultra-high temperature treatment of milk. Foods with low water activity or high fat content require more intense heat treatment than foods with high water activity or low fat content. Such treatment can be expected to effectively eliminate salmonellae, staphylococci, pathogenic streptococci, brucellae, etc. Studies of the heat resistance of V. parahaemolyticus have shown that this organism is killed as easily as other non-spore-forming bacteria.

(2) Spore-forming bacteria. The heat resistance of spores of C.botulinum type A has been the basis for calculating minimum heat processes for low-acid canned food for half a century. Spores of C. botulinum types B and F may have a heat resistance approaching that of type A; spores of most type E strains are destroyed at temperatures below 100°C and strains C and D barely survive heating to 100°C. The spores of type G seem to be as resistant as types C and D.

The heat resistance of C. perfringens type A spores may approach that of C. botulinum type A, which means that they are not killed by normal cooking (boiling) of food. The resistance of spores of non-haemolytic strains is generally higher than that of B-haemolytic strains. Heat-shocked C. perfringens spores, when ingested, germinate in the intestine. Later sporulation of these vegetative forms gives a greater yield of spores and therefore more toxin.

(3) Parasites. Trichina and several other parasites are killed by exposure to a temperature of 58°C and all food-borne parasites seem to be destroyed by boiling (100°C) for a short time.

(4) Viruses. Oncogenic viruses in ice-cream mixes were effectively destroyed by standard pasteurization (68.3°C for 30 minutes or 79.4°C for 25 seconds). Pasteurization of liquid whole egg at 60°C for 3.5 minutes resulted in a million-fold or tenthousand-fold decrease in poliovirus and echoviruses, respectively. Studies of survival of poliovirus and Coxsackie viruses during broiling of hamburgers showed that 4 minutes at u71°C and 76.7°C respectively were required for 90% reduction. For complete destruction of some viruses it may be necessary to boil the food.

(5) Microbial toxins. Most fungal toxins, including the aflatoxins, are not destroyed by boiling or autoclaving. Staphylococcal enterotoxins are also very heat-resistant; more than 9 minutes at 121.1°C may be required for 90% destruction. Boiling readily destroys botulinal toxins as well as C.perfringens toxin, but the latter is never or only rarely present in foods.

(6) Microwave heating. Microwave heating of food has become widespread in recent years. Frequencies of 915 or 1450 MHz are most often used. Microwaves generate heat in foods and it has been suggested that their effect is solely due to the generated heat. There are indications of additional modes of action when vegetative cells are killed by microwave. However, microwaves do not effectively kill spores at temperatures below 100°C.

Effects of irradiation

Resistance of food-borne pathogens to ionizing radiation might be a problem in irradidation preservation of foods. Low doses of irradiation have been suggested as a means of prolonging the shelf-life of food and eliminating radiation-sensitive disease agents such as salmonellae. Large doses (4.8×10^4 Gy (gray) 4.8 megarad) or more) have been recommended for sterilizing canned foods.

(1) Non-spore-forming bacteria. Irradiation of food with doses of up to 1×10^4 Gy(1 megarad) will effectively eliminate bacteria such as salmonellae, staphylococci, vibrio, and others.

(2) Spores. Spores of C. botulinum are among the most radiation-resistant microbial forms. The dose required to destroy 90% of spores is a little more than 3×10^3 Gy (0.3 megarad) for the most resistant strains of types A and B and more than 6×10^3 Gy (0.6 megarad) for proteolytic type F. In the USA, 4.8×10^4 Gy (4.8 megarad) has become the accepted sterilizing dose for food.

(3) Parasites, viruses, toxins. Parasites are rather sensitive to irradiation. Larvae of Trichinella spiralis may survive as much as 1×10^4 Gy (1 megarad) but 1×10^2 Gy (0.01 megarad) suffices to sterilize the female larvae and thus interrupt the infection cycle. Viruses are quite resistant but it is believed that a sterilizing dose (4.8×10^4 Gy or 4.8 megarad) will inactive viruses naturally present in food. Toxins in food cannot be inactivated by irradiation.

Refrigeration:

(1) Non-spore-forming bacteria. The growth of salmonellae is arrested at temperatures below 5.2°C and above 44-47°C. Whether they will actually grow at these temperature extremes depends on other factors; low pH or water activity narrows the range of growth. Staphylococci can grow at temperatures between 6.7°C and 45.4°C and enterotoxin production can occur at temperatures ranging from 10°C to 46°C. The lowest reported temperature permitting growth of V. parahaemolyticus is 3°C and the maximum 44°C.

(2) Spore-forming bacteria. While the growth of proteolytic strains of C. botulinum is arrested at temperatures below 10°C it has repeatedly been confirmed that non-proteolytic B and F strains grow and produce toxins at temperatures down to 3.3°C. The minimum growth temperature for C. perfringens is 6.5°C but growth is slowed down considerably at temperatures below 20°C. No clostridia have been found to multiply at temperatures higher than 50°C. Bacillus cereus can multiply in the temperature range 7-49°C. Pathogenic bacteria may remain viable, but without growth, for a long time in refrigerated foods.

(3) Parasites, viruses, toxins. These agents do not multiply in foods but may remain active indefinitely at refrigeration temperatures.

(4) Moulds. The majority of fungal toxins may be produced in food kept at temperatures between 4°C and 40°C, but fungi that produce alimentary toxic aleukia can grow and produce toxin in the range of -2°C to - 10°C with an optimum temperature for toxin production of 1.5-4°C.

Freezing

(1) Non-spore-forming bacteria. Freezing not only results in arrest of growth but also in destruction of some cells. However, like salmonellae and staphylococci, V. parahaemolyticus shows better survival at low freezing temperatures. At - 30°C, they may survive for longer than 4 months.

(2) Spore-forming bacteria. While the vegetative cells of bacilli and clostridia are not much more resistant to freezing than non-spore-forming organisms, their spores are highly resistant.

(3) Parasites. Protozoa are generally destroyed by freezing. Trichinella spiralis, Anisakis, and Toxoplasma cysts can be killed by exposure to freezing temperatures for long enough periods of time. The same is true for intermediate stages of Taenia and Diphyllobothrium latum in fish.

(4) Viruses, toxins, moulds. These agents are generally very resistant to freezing.

Water activity, pH, and other factors

Different types of microorganism have characteristic ranges of growth with respect to the water activity in foods. The latter is reduced by increasing the concentration of solutes, which can be accomplished by drying and/or the addition of agents such as sodium chloride, sucrose, glucose, glycerol, and propylene glycol. The type of agent used influences the response of microorganisms to variations in water activity. Values that are inhibitory to the growth of microorganisms do not necessarily destroy them or viruses or toxins. However, trichina and possibly other parasites die in heavily salted foods. Minimum and optimum levels of water activity that favour the growth of different bacteria and moulds may be found in the report on which this article is based.

The effect of the acidity (or pH) of food on the growth of different organisms, etc., may be summarized as follows:

(1) Non-spore-forming bacteria. Staphylococci can grow under aerobic conditions in food within the pH range 4.3-9.0 or higher, but enterotoxin production (with the possible exception of type C enterotoxin) does not occur at pH values below 4.5. The limiting acidity for anaerobic enterotoxin production is pH 5.3.

Salmonellae can grow in the pH range 4.1-8.0 and V.parahaemolyticus in the range pH 4.8-11.0. Values below pH 4 are lethal to most vegetative cells of pathogenic food-borne bacteria. The lethal effect and the growth inhibitory effect depend on temperature, pH, and on the acids used.

(2) Spore-forming bacteria. Growth of C. botulinum in foods does not occur at pH values below 4.6. At this pH value the growth of C. perfringens and B. cereus is also inhibited although the latter may grow slowly at pH 4.4. in certain types of food. Bacterial spores die out slowly in foods with pH levels too low to permit growth.

(3) Parasites, viruses, toxins. Little or no information seems to be available about the effect of acids on parasites in foods. Some viruses are sensitive to acids but others are very resistant. Most toxins are quite resistant.

(4) Moulds. Aflatoxins can be produced in grapefruit juice (pH 3.3) and at even lower pH values in laboratory media. The fungi neutralize (metabolize) the organic acids during growth.

Fermentation, often combined with other means (especially salt), is used for preserving many types of food. The main preserving effect of fermentation is due to acid production, but other compounds inhibitory to food-borne pathogens may be formed by fermenting organisms. The growth of pathogens may be inhibited through competition for essential nutrients. The only effect of fermentation that can fairly accurately be predicted is the one based on acidity; the other effects are still not well understood.

Other factors in food processing or preservation, e.g., oxidation/reduction potential or the presence of carbon dioxide, exert small but important effects on pathogenic organisms in foods. The widespread use of plastic materials (with low oxygen permeability) for packaging has been discussed in recent years. Vacuum packaging prolongs the shelf-life of various products but does not offer protection against growth of all food-borne pathogens.

Combined effect of preservation methods

The preserving effect of high and low temperatures, low pH, low water activity, irradiation, and curing salts is increased when these act together, as is very often the case in food preservation. The combined effect may be additive or there may be interaction producing a greater than additive total effect. These combined effects are difficult to predict quantitatively because of the complexity of the required experiments. Even in the case of cured meats where the combined effect of different treatments (each used at a subinhibitory level) is crucial, it is not possible to predict accurately the minimum changes required to ensure safety if any part of the treatment is reduced.

Influence of food habits

Microbiological hazards tend to be reduced by certain food habits, such as:

(1) Pasteurization or boiling of milk. In many tropical and subtropical countries, milk is boiled before consumption, thus reducing the risk of milk-borne disease. Where pasteurization can be enforced, the effectiveness of the treatment must be carefully and continuously controlled. For small and rural communities, vat pasteurization is recommended in the initial stages. Modern methods of pasteurization (HTST, high temperature, short time; and UHT, ultra-high temperature) should be used in urban areas.

(2) Use of fermented milk. Fermented milk is a common food in certain parts of Asia and in central and southern Europe. The concentration of lactic acid in fermented milks is sufficiently high to kill or inhibit the growth of salmonellae, shigellae, and other food-poisoning organisms.

(3) Prolonged cooking of foods. Except when a heat-stable toxin is present, food that is adequately cooked and eaten while hot is safe. After cooking, prolonged storage without refrigeration must be avoided because heat-activated spores of C. perfringens and B. cereus may germinate and multiply.

(4) Vegetarianism. As meat, meat products, fish, and eggs are important media for food-poisoning organisms, the omission of these products from diets diminishes the risk of food-borne disease. However, the risk of infection with shigellae, E. coli, parasites, and other intestinal pathogens originating from vegetable foods remains.

Importance of health education in food hygiene

Preventive measures in all countries should include health education to discourage unhygienic food habits. Health education should start in the schools. Adult education may be provided in maternal and child health centres and teacher training colleges, as well as by mobile teams, radio and television broadcasting, and other means of mass communication.

Travellers, particularly those going to countries with a low standard of hygiene, should be given information on the precautions to be taken. The inclusion of such information in travel brochures and similar literature, as is done by some travel agencies, should be standard practice; this information could be combined with details about vaccination requirements. This matter is discussed with special reference to air travel in the second edition of Guide to hygiene and sanitation in aviation.[2]

General measures for controlling food-borne microbiological hazards include the sanitary production of raw materials, cleaning and disinfection of food processing plants, and hygienic practices by personnel, especially when handling food. These measures are described in most reference works on food hygiene and in the Joint FAO/WHO Food Standards Programme code of practice in food hygiene, which is now under revision.[3]

2BAILEY, J. Guide to hygiene and sanitation in aviation. Second edition. Geneva, World Health Organization (in press).

3CODEX ALIMENTARIUS COMMISSION. Recommended international code of practice: General principles of food hygine. Rome, FAO and WHO, 1969 (Ref. No. CAC/RCP 1-1969).

FOOD HYGIENE

NUT 4.10 18-5

(1) Definition :-
Hygiene in the production, handling, distribution and serving of all types of food'

(2) Food borne diseases

A- Food borne infections

a) Bacterial
Typhoid, Paratyphoid.
Streptococcal
Bacillary. dys.
Brucellosis
Bovine TB.

b) Viral
Infective Hepatitis.
Poliomyelitis.
Gastro enteritis

c) Protozoal
Amoebiasis
Balantidiasis.

d) Helminthic
Taenia.
Cysticercus
Trichinella.
Fasciola.
Rnd + HW + WW

B- Food poisonings and intoxications

a) Bacterial
Salmonella
Staphylococcal
Clostridium

b) Chemical
Arsenic
Lead, zinc.
Cadmium
Cyanide.
Fluoride
Antimony
Insecticides.

c) Plants + Animals
Lathyrism.
Epidemic dropsy
Aflatoxicosis
Anti enzyme factor.
Goitrogens
Cyanogenetic glycosides
Seafood poisons

d) Allergies
Milk
Egg.
Fish
Prawns.

(3) SOURCES

1. Food handlers — Hands, Hair, Habits.
2. Vectors - Housefly, cockroach.
3. Vermin - rats
4. Environment - water, air.

Factors — Warmth, moisture, food

(4) Food Hygiene principles should be practiced at all these Sites: a) House b) Canteens c) Restaurants + Hotels d) Food shops e) food manufacturing industries.

(5) Principles

1. Personal Hygiene and clean personal habits.
2. Food storage.
3. Washing up of soiled crockery.
4. Legislation - ex: Skin of manufacture
   handling.
   packing
5. Regular medical inspection

(6) Food handlers - Typhoid, Diptheria, Amoebic Dys., TB. — Otitis media, wounds, skin infections — all not allowed work

FOOD HYGIENE

(1) Hygiene in the production, handling, distribution and serving of all types of food.

A Food borne diseases
- i) Bacterial - Typhoid, Cholera, Brucellosis
- ii) Viral - Inf Hep, Polio, gastroenteritis
- iii) Protozoal - Amoebiasis, Giardia, Balantidium
- iv) Helminthic - RW, HW, TW, TS, FH

B - Food poisoning / intoxications
- i) Bacterial - Salmonella, Staphylococcal, Clostridium.
- ii) Chemical - Arsenic, Lead, Zinc, Cadmium, Cyanide, Fluoride, Pesticide residues, Antimony.
- iii) Plant toxins - Lathyrism, Aflatoxin, Goitrogens, Epidemic dropsy, Anti enzyme factor, Cyanogenetic glycosides, Seafood poisoning

C - Food allergies (proteins)
- Milk
- Egg
- Fish
- Prawns
- Pulses
- Groundnuts

(2) Sources of contamination
- i) Environment - Water, Air, sewage
- ii) Food handlers - Hands, hair, habits
- iii) Vectors - Housefly - cockroaches
- iv) Vermin - rats

(3) Factors
- i) warmth
- ii) moisture
- iii) food - poor quality
- iv) poor storage.

(4) Where should principles of Food hygiene be practiced
- i) Storage areas
- ii) During transport
- iii) Food industry - processing, canning/bottling, packing
- iv) Food shops.
- v) Canteens, restaurants, hotels.
- vi) Food vendors - mobile.
- vii) Homes

⑤ Principles

i) Clean areas of work.

ii) Proper storage – air tight (moisture proof)
vector + vermin proof
Proper temperatures

iii) Clean food processing
- boards
- implements
- containers

ix) Clean water supply

x) Health Education of all Staff./Public

iv) Washing up (regularly) of all soiled containers knives Crockery

v) Food handlers
a) Personal hygiene
b) Clean personal habits.
c) regular inspection
d) understanding of hygiene (education)

Thru courses discussions posters

vi) Medical inspection of handlers/carriers/contacts

vii) Public Health inspections

viii) Legislation re hygiene standards

Special problems of Developing countries

1. Climate – Hot + Moist.
2. ↓ Economic Resources
3. Insufficient/Irregular supplies of water/electricity
4. Illiterate populations.
5. Special local customs.
6. Illegal slaughtering / use of other animal meats difficulty of licensing / inspection / controls.
7. Poor ~~or~~ inadequate legislation

MEAT - HYGIENE

① Handling of animals on the farm
- i) Ry of diseased animals
- ii) Close attention → to use of
- iii) use of herbicides / plant protection + treatment of animals ē insecticide

antibiotics, fungicides, coccidiostatics, tranquillisers, food additives, anthelmintics

② Handling of animals in transit
- i) Reducing risk of injury.

③ Slaughter House / Abattoir
- i) Site - raised, good water supply, + facility for disposal of effluent
- ii) Size - adequate to prevent congestion
- iii) Type of building depending on climate.
- iv) Design - separation of 'clean' and unclean' operations
- v) Drainage - for ready cleansing and draining of effluvia
- vi) Slaughtering operation - unopened git removed by sanitary means
- vii) Bleeding + blood collection - hygienic depending on intended use
- viii) Washing / Dressing of carcasses
- ix) Storage / cooling / refrigeration
- x) Washing and sanitary facilities for staff
- xi) Vector - Vermin + animal proofing of Abattoir
- xii) Disposal of condemned products / wastes etc
  - by a) incineration
  - b) Steam treatment
  - c) chemical denaturation — crude carbolic acid, kerosene, phenolic disinfection
- xiii) Meat inspection
  - a) Ante mortem
  - b) Post mortem

Rejection
- i) Diseased
- ii) contaminated
- iii) decomposed.

11. Meat borne diseases - 1. T. Solium
2. T. Saginata
3. Cysticercosis
4. Trichinella spiralis

Fish borne diseases - Fish tape worm.
Clonorchis
Paragonimus
Capillariasis

Food Preservation

Problem: Temperature in tropical countries favours fermentation or decomposition of food

Preservation attempts at i) keeping food fresh / wholesome
ii) retain its nutritive value

Methods

1. **Heating** kills bio – can be re contaminated
2. **Canning** – food sterilised, sealed ē vacuum.
   inner surface of can may be lacquered
   destroys vitamin C only
3. **Drying** – Milk (loss of Vit C) Egg Fish
   Fruits Meat (dried in vacuum)
- **Smoking** – Meat + fish after preliminary salting.
  – Articles become dry and impregnated with pyroligneous compounds ē exert germicidal effect
  – only outer portions affected.
5. **Salting / Pickling** – Meat + Fish + vegetables salt / vinegar
   – brine checks bacterial growth but causes hardening of fibres
   – prolonged pickling can kill Krichinal / bacteria
6. **Jams / Jellies** ē Sugar syrup (same action as salt)
   — Fruits
- **Cooling / Refrigeration** – prevents growth / multiplication of bacteria
  – most animal parasites die in cold storage
  – meat / egg / fish / fruits / milk
  – cold imparts no new taste / does not interfere with natural flavour / temporary measure only
8. **Glazing** – used for preserving eggs – Sod. silicate soln
9. **Oils** – used ē salt to preserve veg / fish / fruit
10. **Chemicals** (antiseptics)
    Benzoic acid / benzoates
    boric acid / borax
    formaldehyde
    Salicylic acid
    Sulphites, hydrogen peroxide
    Sod. bicarbonate

fruit pulp < benzoate / SO_2

Sausages – SO_2

* – Legislation

Food additives

Chemicals used in food industries as

i) food colours
ii) anti-microbials. (lecithin)
iii) anti-oxidants (ascorbic acid)
iv) emulsifiers (tocopherol) } for oils, fats
v) stabilizers
vi) bleaching agents (not allowed for milk cream)
vii) maturing agents

Technical purposes:

i) maintenance of nutritional quality of food
ii) enhancement of keeping quality
iii) " of stability & resulting reduction in food wastage
iv) making food attractive to the consumer
v) essential aids for food processing

Shd not be used

i) To disguise the use of faulty processing or handling techniques
ii) when their use will result in substantial reduction of the nutritive value of food
iii) when the desired effect can be obtained by food manufacturing practices that are economically feasible.
iv) when any doubt about safety of the additive

Many countries have brought in legislation re use of additives

Flavouring agents - Prohibited — coumarin
— dihydrocoumarin
— diethylene glycol mono ethyl ether.

Preservatives

Defn - substance which added to food for inhibiting retarding, arresting process of fermentation, acidification and decomposition of food

Class I - Salt, sugar, dextrose, glucose, wood smoke, spices, vinegar, honey, hops, commercial saltpetre
Alcohol, spirits
Any proportion / Unrestricted

Class II. Benzoic acid - salt
Sulphurous " - salt
Nitrites of sod. & potassium

/ use of more than one prohibited
/ use in specified foods
/ use in specific

FOOD HYGIENE

Sites
1. House.
2. Shop.
3. Restaurant
4. Food manufacturers.

Type
1. Chemical
2. Fungal
3. Bacterial → Toxin
   → Organisms

Sources
1. Food handlers ⟶ Hair
   Face
   Bowels.
   grain
   hands - boils, cuts etc
2. Vectors.
3. Vermin
4. Environment
   water

Factors for growth of organism.
1. Warmth
2. Moisture
3. Food

Keep clean
Eyes open
Your responsibility

Control or Prevention

(1.) **Personal Hygiene**
- Bath.
- covering of hair
- cuts - waterproof dressing
- sneezing or coughing into paper towels followed by washing

(2.) **Toilet use**
- seat
- flush handle
- door handle
- crevices in wash basin

(3) **Soiled Tables**
" equipment
Broken cups

(4.) **Food**
- cooked
- refrigerated.
- covered.
- discarded if contamination suspected.

⑤ Legislation re: Food manufacture, packing and handling.

MEAT HYGIENE - MEASURES

PRE-ABATTOIR

① Handling of animal on the farm.

Require close attention

i) Treatment of diseased animals prior to slaughter. (Change rules for emergency)

ii) Use of antibiotics, coccidiostatics, "tranquillisers" and anthelmintics as feed additives → shd not be used

iii) The use of "tranquillisers" and preventive chemotherapeutic agents during 1pr to abattoir → shd be abolished

iv) Use of oestrogenic hormones in food animals

v) Use of herbicides in plant protection and treatment of animals & insecticides

② Handling of animal in transit

i) Reduce risk of injury & prevent unnecessary suffering.
Good ventilation etc.

③ ABATTOIR

i) Site - good water supply, facilities for disposal of effluent

ii) Size - prevent congestion

iii) Type of building depending on climate

iv) Design - seperation of clean and unclean operations

v) Drainages for ready cleaning and drainage

vi) Slaughtering & dressing operations
unopened stomachs & intestines should be removed by sanitary means to seperate room for cleaning.

vii) Bleeding & collection of blood - method depends on intended use.

viii) Dressing of carcases — No dirty wiping cloths.

ix) Washing of "

x) Cooling & refrigeration.

xi) Sanitary facilities, plumbing & waste disposal — cleaning operations

xii) Condemned products, sterilization and by-products. - proper facilities

xiii) Abattoir environs - elimination of dust, refuse and trespassing animals.
- also fly & vermin - Prod.

④ Meat Inspection

1) Ante mortem – i) selection of suspected animals (fever / septicemia)
ii) If systemic infn – then killed in Special unit or at end of days kill

2. Post mortem i) Evisceration at time of inspection
ii) Condemnation or Passing of carcass

Disease
- Tuberculosis, Leukosis complex, Septicemic, Special diseases } Penalty
- Inflammatory process, Tumors, Parasites, Bruises

Cadavers (death due to other cause.

- Contamination – by chemicals, oils, paints etc.
- Overscalded carcasses
- Decomposed "

⑤ Disposal

a) Steam treatment
b) Incineration
c) Chemical denaturing ← crude carbolic acid, Kerosene & fuel oil, phenolic disinfectant

⑥ Storage and refrigeration

Parasitic diseases transmitted by meat

i) Cysticercosis & Taeniasis
ii) Trichinosis

Cysticercosis – i) Meat inspection however meticulous cannot give complete assurance of safe meat (masseter, cardiac muscle, diaphragm, shoulder cuts).
ii) Infested beef or pork should be frozen, heated or salted. 15°F for 10 days | 140°F throughout
iii) Research into irradiation of cysts

Trichinosis i) Meat inspection
ii) Use of heat or cold for sterilization of cysts
- 137°F (all parts)
- 40°F 20-30 days – at 15°F
iii) Various curing procedures
iv) Heating of garbage before feeding to swine
v) Irradiation of cysts → worms produced cannot produce offspring – Costly procedure

- Pig, Arctic – Eskimo
- Bush pig, Wart hog
- Fox, wolf, dog, Rat – Leopard

Health Education – Adequate cooking of meat at home

① Classification of Food Borne Infections for reporting outbreaks (1962)

A- Food borne

① Bacterial - Typhoid, Paratyphoid, Other salmonellae. Diphtheria, Shigellosis, Anthrax, Brucellosis Tuberculosis, Tularaemia.

② Viral & Rickettsial - Infectious hepatitis, Foot & mouth disease

③ Protozoal - Amoebiasis, Sparganosis

④ Helmintic (Zoo parasitical)

Taeniasis, Diphyllobothriasis, Trichinosis, Oxyuriasis Ascariasis, Fascidiasis and opisthorchiasis, Hydatidosis

B- Food borne intoxication - Botulism & Staphylococcal

C - Food " - heavy contamination - Clostridium perfringens B. cereus Streptococci.

D- " uncertain aetiology - Escherichia, Proteus, Pseudomonas

E " undetermined "

F " chemical poisons.

Outbreak

1. Notification of health authorities
2. Reporting of circumstances, size, food concerned form, sources of contamination and specific agent if detected by lab. examination (Must be atleast done at end of investigation)
3. Epidemiological investigations
   i) Extent of outbreak - No. involved.
   ii) Characteristics of cases - Name, age, sex. address, occupation, previous meals, substances taken - if suspect meal then list beverages and foods served and tick what case took.

date & hour of meal, onset of illness (date & hour)

iii) Clinical features and I.P for each patient.
Nature of earliest and most characteristic symptoms

iv) Suspected food – obtain left overs, samples or specimens

v) Specimens for laboratory examination in addition to (iv)
- specimens of vomitus & faeces
- If post mortem – liver, spleen, blood & intestine
- specimens from utensils, preparation tables etc
- specimens from ingredients from which food prepared

vi) Food Handlers – Complete list
H/o both recent & remote illness.
Evidence of sores, scratches, pyogenic infections and recently healed cuts.
- Specimens from – hands, finger nails, nose, cuts & sores.
If ? Salmonellosis then specimen of feces
If ? Typhoid or paralyphoid " " blood

vii) If evidence of infestation ē rats & mice
- trap laid & specimens obtd for examination
- If illness in animals including pets – samples obtained from them.

viii) In difficult cases – helpful to repeat process of cooking incriminated food to obtain evidence by sample exams at which stage contamination occurred.

All specimens sent to lab immediately but where delay expected, must be refrigerated.

ix) Report as in ② must include
Description of outbreak
Food History.
Canned Food? – Manufacture
History of food handlers
Epidemiological conclusions
Summary of case histories

General points

1. Vehicles of Infn — Meat, Vegetables, Diary products, Sweet meats, Fish

Never incriminated: Butter, oils, Pickles, Jams, Honey, Syrups.

2. Importance of carriers esp. Symptomless among Food handlers

3. Capillariasis, Intestinal — C. philippinensis (round worm)
   meat borne (fish)
   cooking - preventive measure

4. D. latum - Fish Tapeworm.
   man acquires by raw or inadequately cooked meat
   Prevention - cooking or freezing (-10°C) for 24 Hr

5. Sparganosis — raw flesh of frogs, snakes & mammals

6. Fish - Clonorchis. s., opisthorchiasis
   Crab - Paragonimus. w.

7. Lebanon & Armenia - habit of eating raw sheep or goat livers causes halzoun which is result of lodgement of adult worms on pharyngeal mucosa.

8. Examination of Food
   1. General - colour, smell, pH (6.4-6.6), water & blood content
   2. Bacterial counts - staph, salmonella, clostridia
   3. Pressures in Tins & leakages etc

Trichinosis	Taenia. saginata	Taenia. solium
Pig	Cattle	Pig.
Arctic Form	Sheep	Dog & cat — not source but infected
African Form	Reindeer	Man.
	Giraffe	
	Buffalo	

(2) AMOEBIASIS - Affects 10% of world's population.

i) Definitions - Amoebiasis - harbouring E.h. E or E cut clinical manifn

ii) Classification of disease

Asymptomatic:

Symptomatic:

Intestinal

Dysentery ← Acute / chronic

Non " colitis

Amoeboma.

Amoebic appendicitis

Compln: Perforation, Peritonitis, Stricture, Haemorrhage, Intussuception.

Diff Δ
1. Shigellosis
2. Appendicitis
3. Ulc. colitis
4. Balantidiasis
5. Giardiasis

Extra Intestinal

Hepatic - Acute non-suppurative → Compln
Liver Abcess

Cutaneous

Involvement of other organs - Lungs, Spleen, Brain

iii) Amoebae of Man - All 7 species selective - live in the colon except E. gingivalis (mouth). - E.h, E. hartmanni, E. coli, Endolimax nana, Iodamoeba buetschlii, Dientamoeba fragilis

- Only E.h pathogenic - may live as harmless commensal
- Free living amoeba reported as facultative parasites of man are Acanthamoeba, Hartmanella & Naegleria (34 cases)

Invasion through nasal mucosa, open lesions of skin after pls swum in fresh water lakes and pools.

Distinguishing features: i) Size ii) No. and structure of nuclei iii) Shape of cytoplasmic inclusions.

Morphology

E.h. 3 Stages
i) Trophozoite 20-40μ - pseudopodia, active, RBCs,
ii) Precystic 10-20μ - single blunt pseudopodia no RBCs.
iii) Cystic 12-15μ - Glycogen mass, chromatoid bars.

Multiplication (trophozoite form) Excystation, Encystation.
↓ Requires normal intestinal transit

Animal Reservoirs? i) Monkeys
ii) Domestic pig.
iii) Rats, mice
iv) Dogs & cats
v) Reptiles

No infn of man directly - ever reported

T a B L E I.

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 B-carotene (ug)	6 Thiamine (mg)	7 Riboflavin (mg)	8 Nicotinic acid (mg)	8 Ascorbic acid (mg)	9 Folic acid (ug)	10 Vitamin B12 (ug)	11 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	
	Heavy work	3900a					2.0	2.2	28				
Woman	Sedentary work	1900					1.0	1.0	13				
	Moderate work.	2200	45a	0.4-0.5	30g	750 3000	1.1	1.2	15	50	100	1	
	Heavy work	3000					1.5	1.7	20				
	Pregnancy (Second half of pregnancy)	+300	+10a		40p	1.0 750 3000	+0.2	+0.2	+2	50	150-300a		200 1.5
	Lactation (up to 1 year)	+700	+ 20a		30c	1150 4600	+04	+0.4	+5	80	150		
Infants.	0-6 months	120/kg.	2.3-1.8/kg	b	1.0mg/400 kg	-							
	7-12 months	100/kg	1.8 1.5kg	0.5 0.6a	300	1200				30	25	0.2	
Child-ren.	1 year	1200	17		0.4 *								
	2 years		18		0.5	250 1000	0.6	0.7	8				
	3 years		20		*15-20								
	4-6 years		22			300 1200	0.8	0.8	10				
	7-9 years		33			400 1600	0.9	1.0	12				
	10-12 years		41			600 2400	1.0	1.2	14				
Adole-scents	13-15 yrs Boys	2500	25	0.6-0.7	25.	700 3000	1.3	1.4	17				
	Girls	2200	30	0.6-0.7	35		1.1	1.2	14				
	15-18 yrs Boys	3000	60	0.5-0.6	25	750 3000	1.5	1.7	21				
	Girls	2200	50		35		1.1	1.2	14				

...2.

Footnotes to the Table on Daily Allowances of Nutrients for Indians (i.e. Table I)

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 1gm/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 in the form of 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	2.3 gm./kg.
3 - 6 months	1.8 gm/kg.
6 - 9 months	1.8 gm./kg.
9 - 12 months	1.5 gm./kg.

(c) Allowances for children and adolescents have been computed using body weights as obtained in the well-nourished groups and assuming N.P.U. of 50 for 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 30 mg. 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 pregnant 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 35mg./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 µg. of B-Carotene + 0.25 µg. of retinol.

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If the diet contains both Vitamin A and B-carotene, 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 content (ug.) + vitamin A(I.U) x 0.3 + B-carotene (IU) 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 allowances of these three vitamins are related to calorie intake.
The basic allowances per 1000 calories are:

Thiamine + 0.5mg., Riboflavin + 0.55 mg., and Niacin + 6.6mg. niacin equivalents.

Niacin allowance includes contribution from dietary tryptophan, 60 mg. tryptophan being equal to 1 mg. of niacin.
Niacin equivalents in a diet are computed as follows:
Niacin equivalents (mg.) + Niacin content (mg.) + Tryptophan content (mg.)

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 requirement 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.

(b) Vitamin B12:

Vitamin B12 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 from 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.

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TABLE 2.

Balanced Diets for Adult Man.

	Sedentary work		Moderate work		Heavy work	
	Vege-tarian (gm)	Non-veg-tarian (gm)	Vege-tarian (gm)	Non-vege-tarian. (gm)	Vege-tarian (gm)	Non-vege-tarian (gm)
Cereals	400	400	475	475	550	550
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.

* * * * * * * * * * * * *

TABLE 3.

Balanced Diets for Adult Woman.

	Sedentary work		Moderate work		Heavy work		Addl. Allowance during	
	Vege-tarian (gm)	Non-veg-etarian. (gm)	Vege-tarian (gm)	Non-Vege-tarian (gm)	Vege-tarian (gm)	Non-Vege-tarian (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 & 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 & Jaggery	30	30	30	30	40	40	10	20
Meat & fish	-	30	-	30	-	30	-	-
Eggs	-	30	-	30	-	30	-	-
Groundnuts	-	-	-	-	40*	40*	-	-

* An additional 25 gm. of fats and oils can be included in the diet in place of groundnuts.

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TABLE 4.
Balanced Diets for Children

	Pre-school children				School children			
	1-3 years		4-6 years		7-9 years		10-12yrs	
	Vege-tarian. (gm)	Non-vege-tarian. (gm)	Vege-tarian (gm)	Non-vege-tarian. (gm)	Vege-tarian. (gm)	Non-vege-tarian. (gm)	Vege-tarian (gm)	Non-vege-tarian (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 & fish & Eggs.	-	30	-	30	-	30	-	30
Sugar & Jaggery	30	30	40	40	50	50	50	50

TABLE 5.
Balanced Diets for Adolescent Boys & Girls

	Boys				Girls	
	13-15 years		16-18 years		13-18 years	
	Vege-tarian (gm)	Non-Vege-tarian (gm)	Vege-tarian (gm)	Non-Vege-tarian. (gm)	Vege-tarian (gm)	Non-vege-tarian (gm)
Cereals.	430	430	450	450	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 & tubers	75	75	100	100	75	75
Fruits	30	30	30	30	30	30
Milk	250	150	250	150	250	150
Fats & Oils	35	40	45	50	35	40
Meat and fish	-	30	-	30	-	30
Eggs	-	30	-	30	-	30
Sugar & 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.

MC

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
	100

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.

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 deficiencos, 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

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

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 is 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 population 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.

S No	Title / Name of Article / Handout / Notes	Author
25	List of References - Work of NIN Hyderabad	—
26	Kwashiorkor - Causes & measures in prevention	Dr Rani Narayan
27	Malnutrition in India	Sunday Standard 17th Jan 1971
28	Food for Babies & Toddlers (WHO Day - paper) 1974	Dr E.M. DeMaeyer.
29	The importance of Breast Feeding (WHO Day Paper) 1974	Dr Omoloh
30	Population and Food	Dr. M.M. Mascarenhas
31	Sharing some thoughts on Food	"
32	Food Adulteration	Hummar 28/9/73
33	Food Adulteration	" 10/1/75
34	Nutrition Programmes for Children	Govt. of India
35	Applied Nutrition Programme	DHFP Handout.
36	Integration of Nutrition programmes with Health and Agriculture	Fr Volken
37	Nutrition Education Unit - Project Report 70-71	Dr. W. Cutting
38	Exercises in Nutrition and Dietetics (Practical I)	Dept Handout
39	Exam questions (Theory) in Nutrition	"

VITAMIN AND MINERALS

Daily Requirement for an adult

		Deficiency
Vitamin A	3000 I.U.	1. Xeroptbalmia. Blindness 2. Decrease Resistance to URTI 3. Inner Ear Deafness 4. Acne
Vitamin D	400 I.U.	1. Rickets in children 2. Osteomalacia in adults
Thiamine	1.5 mgms	1. Beri Beri 2. Neuritis
Riboflavine	1.5 mgms	Angular Stomatitis Photonh o b l a Glossitis
Nicotinic Acid	15 mgms	Pellegara
Cyanocobalamine	1 mcg.	Anaemia
Pathothemic Acid	3 mgms	1. Chick Pellagara 2. Hair growth
Choline - Parent substance acetylcholine and a constituent of Lecithin	2 gms	Deposition of fat in liver and Haemorrhagic degeneration of liver and kidney
Ascorbic acid	50mgms	1. Scurvy 2. Decrease resistance to infection
Folic acid	1.5 mgms.	Anaemia
Vitamin E & K	Not known	1. Vitamin E - sterility in male 2. Vitamin K - Hypoprothrombinaemia
Ca.	1 gm.	1. Bone defects 2. Hair 3. Blood disease
Iron	15 mgms.	Anaemia
Fluoride, Ion in water	1 - 2 ppm	Dental caries

Essential Fatty acids nutritionally important and necessary for growth. They are Linoleic, Linolenic and Arachidonic acids. They cannot be synthesised in the body and have to be supplied in the diet. Linoleic and Linoenic acid are of vegitable origin and present in cotton seed, groundnut and linseed oils while Arachidonic acid is of fish and animal origin. E.F.A. regulate cholesterol metabolism.

DAILY BALANCED DIET FOR AN ADULT

	Gms	Cals
Cereals (rice chiefly milled)	300	(340x3) 1020
Dhal (red gram)	100	355
Green vegetable (cabbage)	100	27
Potatoes	100	97
Cauliflower	100	30
Banana	150	150
Oils & fats	50	450
Sugar (in tea, coffee & sweets)	100	400
Milk (cow)	100	67
Mutton	200	(194x2) 388
Egg	50	85
Agathi	50	45
		3114

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VITAMIN AND MINERALS

Daily Requirement for an adult

		Deficiency
Vitamin A	3000 I.U.	1. Xeroptbalmia. Blindness 2. Decrease Resistance to URTI 3. Inner Ear Deafness 4. Acne
Vitamin D	400 I.U.	1. Rickets in children 2. Osteomalacia in adults
Thiamine	1.5 mgms	1. Beri Beri 2. Neuritis
Riboflavine	1.5 mgms	1. Angular Stomatitis Photophobia Glossitis
Nicotinic Acid	15 mgms	Pellegara
Cyanocobalamine	1 mcg.	Anaemia
Pathothenic Acid	3 mgms	1. Chick Pellagara 2. Hair growth
Choline - Parent substance acetylcholine and a constituent of Lecithin	2 gms	Deposition of fat in liver and Haemorrhagic degeneration of liver and kidney
Ascorbic acid	50mgms	1. Scurvy 2. Decrease resistance to infection
Folic acid	1.5 mgms.	Anaemia
Vitamin E & K	Not known	1. Vitamin E - sterility in male 2. Vitamin K - Hypoprothrombinaemia
Ca.	1 gm.	1. Bone defects 2. Milk 3. Blood disease
Iron	15 mgms.	Anaemia
Fluoride, Ion in water	1 - 2 ppm	Dental caries

Essential Fatty acids nutritionally important and necessary for growth. They are Linoleic, Linolenic and Arachidonic acids. They cannot be synthesised in the body and have to be supplied in the diet. Linoleic and Linoenic acid are of vegitable origin and present in cotton seed, groundnut and linseed oils while Arachidonic acid is of fish and animal origin. E.F.A. regulate cholesterol metabolism.

DAILY BALANCED DIET FOR AN ADULT

	Gms		Cals
Cereals (rice chiefly milled)	300	(340x3)	1020
Dhal (red gram)	100		355
Green vegetable (cabbage)	100		27
Potatoes	100		97
Cauliflower	100		30
Banana	150		150
Oils & fats	50		450
Sugar (in tea, coffee & sweets)	100		400
Milk (cow)	100		67
Mutton	200	(194x2)	388
Egg	50		85
Agathi	50		45
			3114

FRIDAY

Breakfast	Calorie Value
1 Puri	50x4 = 200
Potato Palleiyam	25
Bread - 1 slice ½" thick	45x4 = 180
Egg - 1 med.	50
1 pat butter	54x4 = 216
1 cup coffee - jaggery	16
Milk 15 gms	10
Total Calorie Value =	697

Lunch	
Fried Fish & Fish curry	108
Rice	414
Butter milk	25
Plantain	150
Total Calorie Value =	697

Tea	
Kesari bath	200
Tea	26
Total Calorie Value =	226

Dinner	
Fish	108
Puli Kulambu	25
Payesam	200
Total Calorie Value =	333

Total Calorie Value for Friday: 1934

SUNDAY

Breakfast	Calorie Value
2 sausages	400
1 egg	50
5 slices bread & butter	495
Coffee	28
Total Calorie Value =	973

Lunch	
Mutton Biriyani	630
Salad	25
Pudding	120
Chicken	21
Total Calorie Value =	796

Tea	
Sweet-Jangri	150
1 cup tea	26
Total Calorie Value =	176

Dinner	
Beef roast	216
Rice	414
Plantain	150
Sambar Veg.	25
Curd	67
Total Calorie Value =	872

Total Calorie Value for Sunday = 2815

DIETS

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1) Total caloric 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

Moderate work (Mechanic) 14 - 1800C

Heavy labourers/Athletes 1800C

Diet P - varies

1/2 Veg. P 1/2 Animal

Fat 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	3000	45
	Pregnancy	3366	100
	Lactation	3700	110

Co-ebbiecent Index

Index	Calories
1 =	2600 - 2600
.9 <	210
.8 <	2000
.7 =	1800
.6 <	1600
.5 <	1300
.4 =	1000

1 Adult male

1 Adult female

Children 9-12 yrs

7-9 "

5-7 "

3-5 "

1-2 "

ITEMS	Protein gms	Fats gms	Cho gms	Cals value	Ca mgs	P mg mgs	Fe mgs	Vit.A I.U.	Thiamine γ mgs	Ribo-Flavin mgs	Nico-tinic Acid	Vit.C mgs.
/00 Gms												
RICE (milled)	6.8	.5	78.2	345	10	160	3.1	0	.09	.03	1.9	0
RICE (par-boiled)	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	40	.49	.29	4.3	0
RED GRAM (Dhal)	22.3	1.7	57.6	355	73	304	5.8	220	.45	.51	2.6	0
BENGAL GRAM (Dhal)	20.8	5.6	59.8	372	56	331	9.1	216	.48	.18	2.4	1
BLACK GRAM (Dhal)	24	1.4	59.6	347	154	385	9.1	64	.42	.37	2	0
GREEN GRAM (Dhal)	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	3.5	.6	7.5	48	184	62	18.5	11530	.05	.06	.8	135
BEETROOT	1.7	.1	8.3	45	208	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	.06	.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	5
DOUBLE BEANS	8.3	.3	12.3	85	40	148	2.3	220	0	0	0	22
BRINJALS	1.4	.3	4	24	18	47	.9	124	.04	.11	.5	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	21	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	145	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	6.8	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
Ayapana	1.8	0.1	6.6	47		39	.8	2000	0.06	0.03	0.6	124

ITEMS/ 100 gm	Protein gms	Fats gms	Cho gms	Cals value	Rich in:
RICE (milled)	6.8	.5	78.2	345	Phosphorus
RICE (parboiled)	6.4	.4	79.0	349	Thiamine
RAGI	7.3	1.3	72.0	328	Phosphorus, iron, Thiamine, Calcium, Riboflavine,
MAIZE	11.1	3.6	66.2	342	Phosphorus, Thiamine, Vit.A
WHEAT	11.8	1.5	71.2	346	Phosphorus, thiamine Nicotine
RED GRAM	22.3	1.7	57.6	335	Phosphorus, Thiamine Riboflavine Nicotine.
BENGAL GRAM	20.8	5.6	59.8	360	Phosphorus, Thiamine, Iron, Nicotine
BLACK GRAM	24.0	1.4	59.6	347	Phosphorus, Thiamine, Iron Riboflavine
GREEN GRAM	24.5	1.2	59.9	348	Phosphorus, Thiamine, Nicotine
AGATHI	8.4	1.4	11.8	93	Calcium, Vitamin A & C
BEANS	4.0	.5	6.3	46	Vitamin A
CABBAGE	1.8	.1	4.6	27	Vitamin C
CORRIANDER	3.3	.6	6.3	44	Vitamin A & C
CARROTS	.9	.2	10.6	47	Iron
GOOSE BERRIES	0.5	.1	13.7	58	Vitamin C, Thiamine
COCONUTS	6.8	62.3	80.4	661	Phosphorus, Calcium
GROUND NUT	26.7	40.1	20.3	549	Phosphorus, [illegible]
EGG	13.3	13.3	0	173	Phosphorus, Thiamine, Vit.A
MUTTON	18.5	13.3	0	194	Nicotine
SHARK	21.6	.4	0	90	Phosphorus
BUTTER	0	81.0	0	729	Vitamin A
GHEE	0	100.0	0	900	Thiamine, Vitamin A, Iron
AMARANTH	4	0.5	6.3	47	Vit. C, Vit. A

DIETS

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   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
Moderate work (Mechanic) 14 - 1800C
Heavy labourers/Athaletes 1800C

Diet P - varies
1/2 Veg. P 1/2 Animal
Fat 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	3600	45
	Pregnancy	3300	100
	Lactation	3700	110

Coefficient Index

	Index	Calories
Adult Male	1	2400 - 2600
Adult Female	.9	2160
Children	9-12 yrs .8	2000
	7-9 " .7	1800
	5-7 " .6	1600
	3-5 " .5	1300
	1-3 " .4	1000

ITEMS	Proteins gms	Fats gms	Cho gms	Cals value	Ca mgs	P mg	Fe mgs	Vit.A I.U.	Thiamine mgs	Riboflavin mgs	Nicotinic Acid mgs	Vit.C mgs.
100 Grms												
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	106	.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 (Dhal)	22.3	1.7	57.6	355	73	304	5.8	220	.45	.51	2.6	0
BENGAL GRAM (Dhal)	20.8	5.6	59.8	372	56	331	9.1	216	.48	.18	2.4	1
BLACK GRAM (Dhal)	24	1.4	59.6	347	154	385	9.1	84	.42	.37	2	0
GREEN GRAM (Dhal)	24.5	1.2	59.9	351	75	405	8.5	82	.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	9	.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	100	50	.7	0	.06	.01	.4	11
POTATO	1.6	.1	22.6	97	10	48	.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	142	2.3	220	0	0	0	22
BRINJALS	1.4	.3	4	24	18	47	.9	124	.04	.11	.5	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	.06	.06	.3	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	.28	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
Averages	1.8	0.1	6.6	44		39	.8	2000	0.06	0.03	0.4	12.4

D I E T S

A balanced diet is one that contains the nutrients necessary to maintain good health in the right proportions.

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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

Moderate work (Mechanic) 14 - 1800 C

Heavy labourers/Athletes 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
Woman 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	66
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	164	.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

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

Moderate work (Mechanic) 14 - 1800 C

Heavy labourers/Athelotes 1800 C

Diet P - varies

½ Veg. P ½ animal

Fat ¼ - 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	3000	45
	Pregnancy	3300	100
	Lactation	3700	110

Coefficient index

		Calories
Adult Male	1	2400-2600
Adult Female	.9	2100
Children 9-12	.8	2000
7-9	.7	1800
5-7	.6	1600
3-6	.5	1300
1-3	.4	1000

ITEMS (per 100gms)	Protein gms	Fats gms	Cho gms	Cals value	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	.03	.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
Amaranth	1.8	0.1	6.6	47	39	18	3	2000	0.04	0.03	0.4	124

LONDON SCHOOL OF HYGIENE AND TROPICAL MEDICINE

Lectures on Nutrition

to

Diploma in Tropical Public Health
Diploma in Tropical Medicine and Hygiene
Diploma in Clinical Medicine of the Tropics

GENERAL OUTLINE

The subject of nutrition has a wide range and cannot be dealt with in detail in 12 hours of lectures. Inevitably those with special interests, e.g. in clinical medicine, paediatrics, public health, child and maternal health, food production, economic and social conditions, etc., will find the lectures inadequate from their point of view. A reading list is provided which may do something to fill these gaps.

A further difficulty is that nutritional conditions are not the same in all parts of the world, and they obviously differ in urban and rural communities. There are similarities, but there are also differences. We can only teach general principles, which each student must apply for himself in his own particular situation.

Both courses are oriented towards the problems of developing countries. Since in these countries some 50% of the population are children under the age of 15, and since children from a nutritional point of view are more vulnerable than adults (except for pregnant and lactating women), it is logical that this set of lectures should be closely related to those by Dr David Morley on child health.

A list follows of the lectures proposed. We have tried to choose the subjects which are most important and interesting.

J.C. Waterlow
February 1973

LONDON SCHOOL OF HYGIENE AND TROPICAL MEDICINE

1973 SESSION

Lectures on nutrition to DTPH, DTM & H and DCTM Courses

(All lectures start at 2.00 p.m.)

1.	27 February	Introductory lecture	Professor J.C. Waterlow
2.	27 February	Assessment of nutritional status (1)	Professor J.C. Waterlow
3.	1 March	Marasmus and kwashiorkor: history, classification and clinical features.	Professor J.C. Waterlow
4.	2 March	Marasmus and kwashiorkor: pathology and biochemistry	Dr W.P.T. James
5.	6 March	Vitamin A: requirements, biochemistry, effects of deficiency	Dr D.I. Thurnham
6.	8 March	Iron absorption and iron requirements	Professor J.C. Waterlow
7.	9 March	Protein and energy requirements	Professor J.C. Waterlow
8.	13 March	Long-term effects of malnutrition	Professor J.C. Waterlow
9.	16 March	Assessment of nutritional status (2)	Dr W.P.T. James
10.	16 March (3.00 p.m.)	Dietary surveys	Mrs J. Doughty
11.) 12.)	20 March	(Prevention of malnutrition (Panel discussion	Professor J.C. Waterlow Dr T.P. Eddy Dr W.P.T. James Mr P.R. Payne

A N A E M I A

Def: A state in which the R.B. Cell values are less than normal.

Normal Blood Values:

	M	F
RBC'S	5	4.5/cu mm
Hb.	15	14.5 gms/100 cc
PCV	47	42 %

RBC life - 120 days.

Classification.

I Principally caused by Impaired production.

A Deficiency of substances essential for Erythropoiesis

1. Iron
2. Vit. B_{12} and Vit C.
3. Folic Acid
4. Protein

B Endocrine Deficiency

C Physical / Chemical / Other

Injury to Bone Marrow - eg. Benzol, Radiation, as in Leukaemias.

D Infections

E Failure of Bone marrow

II Loss of blood - Haemorrhage. A serious infestation of Hookworm can rob its victim of half a pint of blood, one Day Haemorroids.

III Excessive Destruction of RBC

1. Fe D.R. 20-30 mg. Adult. 10-30 mgs. Children. 30 mgms as $FeSO_4$ for approx. 8 mg. of elemental iron.

Source Meat, B-rinjals, tomatoes, green veg. dried fruits, (milk is poor in Fe). The iron of vegetables is more easily absorbed than the Fe. of meat. Fe may be provided adequately but may not be absorbed and therefore Utilised.

Deficiency Typical Microcytic Hypochromic Anaemia.

2. Vit. B_{12} or Cyanocobalamin - necessary for maturation of RBC is known as Extrinsic Factor interacts with Intrinsic Factor found in Gastric fundus. When I.F. is deficient result is Pernicious Anaemia.

D.R. 1 mcg / day.

Source Liver, beef, milk, rice.

E.F. + I.F. Anti Pernicious A Factor

Def: results in Macrocytic anaemia.

3. Folic Acid D.R. 1.5 mg/day

Source green leafy vegetable, liver, kidney, milk.

Deficiency of Vit B_{12} & Folic Acid together cause Megaloblastic Anaemia.

4. Vit. C or Ascorbic Acid.

Use discovered by Sir Richard Hawkins in 1593.

D.R. 25-50 mg, Increased in Infection - 2,000 mg. Excess to be stored.

Source Fresh fruit, vegetables, and potatoes, Guavas Amla

Deficiency - Nutritional anaemia, helps in folic acid metabolism.

Vitamin C. ctd. Synthetically manufactured and known as Ascorbic Acid. Destroyed by prolonged heat and in process of fruit canning.

Essential for 1) capillary Integrity, 2) Formation of Intercellular substance and 3) R.B.C. Maturation.

Deficiency leads to scurvy, anaemia, halitosis, spongy gums and delayed healing of wounds and haemorrhages.

Vitamin P occ-urs with Vit. C. in fresh fruits especially lemons. Helps in preventing capillary permeability.

Deffency leads to purpura and capillary Haemorrhages.

5. Traces of Cu, Co and Nicotimamide as Catalysts for Hb synthesis.

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ANAEMIA IN MEDICAL STUDENTS

DR. MARIE M. MASCARENHAS M.B.B.S.(Bombay)
F.R.I.P.H. D.P.H(London)

INTRODUCTION

Medical students in the city of Bombay represent a cross section of population of varied habits and nutrition, belonging to the middle class and touching the upper strata of society. This would lead one to believe that anaemia would be very uncommon, if not rare, amongst such a class of people, whose profession will later demand guidance of the masses in respect of their health.

But is this really the true state of affairs? Can one safely think of a medical student as a young and healthy individual consuming an average nourishing diet?

MATERIAL AND METHODS

A Student Health Service was started by the Department of Preventive and Social Medicine of the Grant Medical College, Bombay, in 1961, when students in the first and third year of their medical course were examined.

In 1962, most of the students volunteered to donate blood for the national emergency. A fair number were rejected for having haemoglobin(Hb) levels below the acceptable limit. This experience, together with the findings of Dr.R.S.Sharma who in his survey of 592 University students found a high percentage of anaemia, pointed out the necessity of including haemoglobin estimation in the routine examination of medical students at the Student Health Centre.

From July to December 1963, 175 medical students have been examined at the Student Health Centre. Blood was obtained by the finger prick method and the haemoglobin level estimated by Sahli's method.

Based on the results of Parekh et al.[2] and R.S.Sharma,[3] those students whose haemoglobin level was 12 Gm.% or more were considered as normal. Those whose haemoglobin level was below 12 Gm.% were further investigated at the Haematology Clinic and a full blood count, stool examination and details of their diet were also done. Anaemic students were treated and followed at the Student Health Centre and their haemoglobin level at the end of 3 months' treatment was recorded.

FINDINGS

Out of 175 students examined since July 1963, 98 were males and 77 were females. Their age group was from 17 to 25 years. Out of 98 male students, 80 had a Hb.level above 12 gm.% and 18 were below 12 Gm%. In females, however, out of 77 students, 37 had a Hb. level below 12 Gm% and 40 above 12 Gm%.

These figures are comparable with those of Greendyke[1] and R.S. Sharma[3]. The latter found that 47.6% out of 592 students had a Hb. level below 12 Gm%. A simpler clinical survey held in Gujerat University, found 3.5% of University students anaemic as judged by "pallor" (personal communication).

Thus anaemia is much more common in females (48.05%) than in males (18.17%). The reason for this seems to be the menstrual loss and greater demand not supplied by an inadequate diet. More than two-thirds of the female students were vegetarian, whose diet was insufficient to supply necessary calories and hematinic factors (see Table 3), besides being inadequate in proteins. In short their diet falls very short of a good and balanced diet, adequate in calories, proteins and hematinic factors (see Table 4).

TABLE 4 - A suggested balanced diet

	Ozs.	Total calorific Value
Cereals ...	14	1372
Pulses ...	3	288
Green Veg. ...	4	40
Roots & Tubers ...	3	66
Other Veg. ...	3	30
Fruits ...	3	30
Sugar & Gur ...	2	220
Oils & Fats ...	2	460
Milk ...	10	250
Groundnuts ...	1	122
	Total Veg.	2876
	Non. Veg.	120
	Misc.	100
	Total Non. Veg.	3096

That poor nutrition was the main cause of anaemia is corrab-orated by the fact that haemogram studies showed hypochromic micro-cytic anaemia which in almost all cases responded to correction in the diet and iron by mouth. A vegetarian diet per se should not be the cause of anaemia, but an ill-balanced diet such as that taken by the females in this study group especially when associated

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Enquiry into the diet of these students revealled that those students whose haemoglobin level was less than 12 Gm.% were taking inadequate calories (ranging from 2000 to 2200 cals), insufficient in proteins. Two-thirds of these were vegeturians whose diet composition was not enough to maintain their health (see Table 3).

Those students whose haemoglobin was below 12 Gm.% were given iron sulphate and instructions about their diet. They were followed up and all except three responded to this treatment, their haemoglobin level rising to about 12 Gm.% in three months.

DISCUSSION

A survey of the Hb.estimation in 175 medical students shows that their Hb.level on an average is far from satisfactory. 30.18% of these students had a Hb.level less than 12 Gm.% which would perhaps go undetected by a check-up which did not include the Hb.estimation.

with increased menstrual loss can certainly lead to hypocromic microcytic anaemia.

This preliminary study conducted at the Student Health Centre has pointed out the need for a continued check-up on the health of all University students. A simple haemoglobin estimation included in the routine examination, entails very little extra effort and brings the important fact of anaemia into the limelight. No effort should be spared to establish such centres in all the colleges and instruct the students about their diet which should maintain their Hb. level high and keep them fit for their ardous duties.

SUMMARY

At the Student Health Centre run by the Department of Preventive and Social Medicine of the Grant Medical College, 175 medical students were examined from July to December 1963 and their haemoglobin level estimated.

30.18% of these students had a Hb. level than 12 Gm%; of these, the majority were females.

The main causative factor of this anaemia was probably an inadequate and ill-balanced diet, especially in vegetarians.

Treatment of anaemic students with a corrected diet and iron sulphate yielded good results.

ACKNOWLEDGEMENTS

My thanks are due to the Dean, Grant Medical College and J.J. Group of Hospitals, Bombay, for permission to publish this paper and to Dr.A.F.Heredia, Hon. Lecturer, Department of Preventive and Social Medicine, for his valuable help and guidance.

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3. Sharma, R.S.: Status of University students as blood donors, J.J. Hospital Journal. 8 : 4, 1963.

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18.14

Vitamin E also called antisterility vitamin.

Deficiency in rats causes irreparable damage in germinal epithelium of male rats while in female rats full term pregnancy is impossible resulting into resorption of factus. In case of female rats, changes are reversible.

Characteristics:-

Vitamin E is chemically related to sex hormones. It is stable to heat, acid, alkalies, but oxidation takes place in presence of lead and iron salts and also in rancid fats and ultra violet rays. Vit. E activity is exhibitedl by four or more compounds of related chemical structure, namely ultra violet rays, beta, rand of tocopherol.

Measurement:-

Activity is expressed in mgms where alpha tocopherol is used standard to prevent resorption or factus in pregnant rats under standard conditions.

Physiology:-

Vitamin E, unlike other fat soluble vitamins is not stored in liver.

Fatty tissues store small amounts.

Defective absorption of fats also decreases tissue level of vit. E.

Functions:-

In human beings are not yet established.

1. As an antioxidant i.e., by acce oxygen it is able to minimize oxidation of carotene. Therefore synergizes effect of vit. A.
2. It has ability to protect R.B.C.S. from haemolysis by such agents as H_2O_2.
3. In rats, vitamin E promotes efficiency of linoleic acid and even cure E.F.A. deficiency.
4. In cows, liberal intake of alpha and tocopherol leads to increased milk and butter fat production.
5. It is necessary for utilisation of sex hormones, cholesterol and vitamin D.

Daily allowances:-

[illegible],

...2

Daily allowances:-

Is not known for human beings. Consumption is about 14 mgms/day.

Sources:-

Wheat germ oil, oil of cotton seed and rice germ, germs of other seeds. Green leafy vegetables, nuts, legumes, egg and meat.

Deficiency:-

Is not known in man.

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LONDON SCHOOL OF HYGIENE AND TROPICAL MEDICINE

DTTH, DVM & H and DPHT COURSES

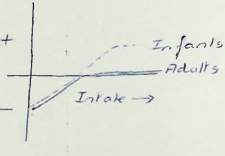
NUTRITION LECTURES

Protein and Calorie Requirements

A. Protein requirements

1. Protein needed for maintenance and growth.

   Growth includes weight gain in childhood
   formation of foetus and adnexa in pregnancy
   production of milk in lactation



100mg N/kg ± 15

2. Maintenance requirement determined in two ways:
   (a) from sum of obligatory losses (FAO/WHO 1965)
   (b) from minimum amount of good quality protein needed to maintain N balance (FAO/WHO 1971)

   Growth requirements calculated from amounts of protein laid down in new tissue or secreted in milk.

3. Except in young infants and lactating women, requirement for maintenance greatly overshadows that for growth.

   In infants the safest method of estimating requirements is from observed intakes of breast-fed children growing normally. See Table I.

4. In other age groups, requirement calculated in three stages:
   (a) add minimum requirements for maintenance and growth as in para 2.
   (b) the experimentally determined results are averages. Individuals vary with SD 10% of mean. Mean + 2SD will cover 95% of individuals. Therefore add 20% to for individual variation. Results shown in Table II.
   (c) Above results are in terms of top quality protein, assumed to be 100% utilized. Correct for lower protein quality (NPU) in actual foods. In UK diet, NPU ≈ 70. In poor tropical diets NPU 50-60.

Protein requirement
0·8 gm/kgm

TABLE I.
Protein requirements of infants estimated from observed intakes which maintain normal growth (g/kg/day)

Age (months)	Human milk	Cows' milk*
0 - 3	2.6	2.2
3 - 6	1.9	1.8
6 - 9	1.5	1.5
9 - 12	-	1.25

Values are averages + 2SD

*Cows' milk formula with protein content similar to human milk

(Data from: Fomon(1966); Fomon and Ray(1958); Chen and Waterlow(1966))

Protein content of Milk

1. Cow's 3 gm/100 ml
2. Human 1.2 gm/ "

Table II - Safe level of protein in terms of diets of protein qualities of 60, 70 and 80% relative to milk or eggs

Age group	Body weight kg a	Safe level of egg or milk protein: g protein /kg/day b	Safe level of egg or milk protein: g protein /person/day a x b	Safe level of food proteins g/person/day: Score* 80 e.g. Meat	Score 70 Cereal	Score 60 Cassava
Infants						
6 - 12 months	9.0	1.53	14	17	20	23
Children						
1 - 4 years	13.4	1.19	16	20	23	27
4 - 7 "	20.2	1.01	20	26	29	34
7 - 10 "	28.1	0.88	25	31	35	41
Male adolescents						
10 - 13 years	36.9	0.81	30	37	3	50
13 - 16 "	51.3	0.72	37	46	53	62
16 - 20 "	62.9	0.60	38	47	54	63
Female adolescents						
10 - 13 years	38.0	0.76	29	36	41	48
13 - 16 "	49.9	0.63	31	39	45	52
16 - 20 "	54.4	0.55	30	37	43	50
Adult man	65.0	0.57	37	46**	53**	62
Adult woman	55.0	0.52	29	36**	41**	48
Pregnant woman, latter half			add 9	add 11	add 13	add 15
Lactating woman, first six months			add 17	add 21	add 24	add 28

*Scores are estimates of the quality of the protein usually consumed relative to that of egg or milk. The safe level of protein intake is adjusted by multiplying the intake of egg or milk protein by 100/score. For example, 100/60 = 1.67 and for a child of 1-4 years the safe level of protein intake would be 16 x 1.67 or 27 g of protein having a relative quality of 60.

**The correction may over-estimate adult protein requirements

B. Energy requirements

1. New units: 1000 kilocalories (kcals) C

= 2.4 megajoules (MJ)

2. For energy, requirement estimated as average intake of healthy people. There is very wide variation between individuals. Some will need less energy for the same level of activity, others more. By contrast, for other nutrients, e.g. protein, the 'requirement' or safe allowance is the average + a safety margin.

Why the difference?
With other nutrients, if an individual gets more than his requirement, it does no harm; with energy an excess intake causes obesity.

3. In principle, energy requirement made up of two components - maintenance and physical activity (+ growth in children). In practice separation not possible because of difficulty of measuring expenditure on activity over 24 hours.

Maintenance requirement = about 1.5 x basal metabolic rate
(Minimal activity)

Except in very active people, it makes up the major part of energy needs. Average needs at different levels of activity shown in Table III.

4. Other factors:

i) Age Energy needs per kg decrease from infancy to old age (Table IV)

ii) Body weight Small people need less energy than large ones. Therefore, for people in normal nutritional state, requirement should be calculated per kg body weight.
But for undernourished or overnourished (weight for height too low or high) requirement should be related to ideal weight.

iii) It used to be recommended that energy needs reduced in hot climates. Latest FAO/WHO Expert Group abandoned this idea.

5. Pregnancy

Add 150 kcal/day in 1st trimester

350 kcal/day in 2nd and 3rd trimester

Lactation

Add 500 kcal/day

TABLE III

Energy needs of average man (65 kg) or woman (55 kg) according to activity (kcals/day)

	Man	Woman
Maintenance	2600	1900
Light activity	2700	2000
Moderate	3000	2200
High	3500	2600
Very high	4000	2950

Types of activity

Light: office and shop workers, professional men, housewives (mechanized)

Moderate: light industry, many farm workers, housewives (unmechanized)

High: Some farm workers, forestry, mines, steel, dancers, athletes

Very high: lumberjacks, blacksmiths, rickshaw pullers

TABLE IV

Energy needs at different ages (moderate activity)

Age	Weight kg	kcals/kg	kcals/head
0-3/12	4.6	120	750
3-6/12	6.6	115	760
6-9/12	8.3	110	910
9-12/12	9.6	105	1000
Average 1st year		112	850
1-4 years	13.4	101	1350
4-7 "	20	91	1830
7-10 "	28	78	2190
MAN			
10-13 years	37	71	2600
13-16 "	51	57	2900
16-20 "	63	49	3070
Adult	65	46	3000
WOMAN			
10-13 years	38	62	2350
13-16 "	50	50	2490
16-20 "	54	43	2310
Adult	55	40	2200

UK + UN Reference

J.C. Waterlow

LONDON SCHOOL OF HYGIENE AND TROPICAL MEDICINE

DTPH, DTM & H and DCMT COURSES

NUTRITION - Introductory lecture

General view of world nutritional problems

1. Nutritional problems divided into four categories:

A. The major, almost world-wide, problems:

protein-calorie malnutrition in children — Most serious disease problem in the world.
inadequate energy intakes in adults
Estimated 1 million cases of blindness (India) — vitamin A deficiency
nutritional anaemias — Mainly iron deficiency.

B. The classical avitaminoses - more localized, less common:

beri-beri — very uncommon
pellagra
scurvy — more a problem of developed countries
rickets — present in Middle East, North Africa, North India — also immigrants in U.K.

C. Conditions which may have a nutritional cause, in part or whole:

endemic goitre and cretinism — Iodine deficiency
In Africa, cyanides ingested in cassava. — peripheral neuropathy — Goitrogens in Food.
stenosing pyloric ulcer — South India more in N. India
bladder stones — Rwanda-Burundi
In N E Thailand esp. in children resided to 1) electrolyte imbalance ii) some kind of rice? — ?certain forms of cancer. e.g Ca Liver — Mozambique Ca oesophagus — Iran. Union of a nutritional S. Africa basis
Often difficult to separate deficiencies from effects of toxins, e.g. lathyrism — Thought to have
Aflatoxin in groundnuts — has produced liver Ca in rats.

D. Regional differences in distribution of disease,

e.g. ischaemic heart disease — rare in developing countries.
In Developed countries
1. Calories + +
2. Saturated Fats + +
3. Sugar +
4. Fibre ↓ ↓
5. Lack of exercise.

2. A look-back at the past:

If protein-calorie malnutrition is one of the commonest diseases in the world, why was it not recognized until 40 years ago?

Possible reasons, from which lessons may be drawn:

A. Preoccupation with infectious diseases in the tropics (Epidemic and Endemic

B. Scientific fashion: preoccupation with vitamins and their biochemistry

C. Preoccupation with problems of developed countries

3. Complicating factors:

Malnutrition usually associated with poverty, bad hygiene, infections, social deprivation, etc.

In considering the end results - inertia, retarded physical and mental development, premature death - difficult, if not impossible, to separate these factors. Therefore nutrition should not be regarded as a separate subject, but as an integral part of public health.

4. Measures of nutritional state of a country:

A. Vital statistics, e.g. 1-4 year mortality rate.
Though malnutrition may not be primary cause, it is usually an associated cause at this age.
Defects of present classification of causes of death.

B. Growth of infants and children. Ht + wt etc
This raises problems: genetic versus environmental factors;
the question of appropriate standards.
Harvard Standards"

C. Clinical and biochemical surveys.

D. Dietary surveys

5. What can medicine and public health do?

If the problem is shortage of food, the solution lies with agriculture, economics, transport, education, etc.

The contribution of medicine:

A. Treatment and rehabilitation of individuals

B. Defining the extent of the problem - nature of deficiency, groups affected, prevalence. - what where how who

C. Advice on best method of breaking the vicious circle, e.g. more food versus better water supply Urban slums

D. Maintaining awareness of the problem, so that account is taken of nutritional needs by all relevant branches of government and other agencies.

J.C. Waterlow
February 1973

LONDON SCHOOL OF HYGIENE AND TROPICAL MEDICINE

Department of Human Nutrition

List of Books for Reading and Reference

Recommendations for Courses for DTPH, DTM & H and DCMT

GENERAL NUTRITION

HUMAN NUTRITION AND DIETETICS

Davidson, Sir Stanley and Passmore, R. 597pp.1972. £6.00
5th edition. E, & S. Livingstone.

'This is one of the most important books to be reviewed in these columns for some time, and must be regarded as a major addition to textbooks of medical science. It is beautifully written. It is not only a book of great scholarship but it is extremely readable and it contains some apt quotations.' - British Medical Journal

'This textbook needs no recommendation to the specialist worker in nutrition or dietetics, but it is not a book written exclusively for the specialist: it would be of the greatest interest and value to doctors engaged in any form of clinical practice or to anybody who has a responsibility for the feeding and nutrition of a group of people.' - Tropical Diseases Bulletin

THE ASSESSMENT OF THE NUTRITIONAL STATUS OF THE COMMUNITY (with special reference to field surveys in developing regions in the world)

Jelliffe, D.B. WHO Monograph Series No. 53. 271 pp. 1966 £1.80

The standard guide for the planning and conduct of nutrition surveys and their interpretation. 'This textbook will be an indispensable guide to nutrition work in developing countries whilst much of the information in it, particularly that concerning the interpretation of clinical signs, biological tests and standard anthropometric methods should also be useful to medical officers in Great Britain.' - Public Health

FOOD FOR MAN

Aykroyd, W.R. Pergamon Press, London 93pp. 1964 45p

A straightforward non-technical account of nutrients and deficiency diseases aimed at the intelligent layman with some scientific background.

CONQUEST OF DEFICIENCY DISEASES - Achievements and Prospects

Aykroyd, W.R. Freedom from Hunger Campaign Basic Study No. 24. 98 pp. 1970 90p

This book describes the advances that have been made in the last 60 years in elucidating the epidemiology of deficiency diseases and the considerable progress that has been made towards the elimination of some of them.

HUMAN NUTRITION IN TROPICAL AFRICA

Latham, M.C. FAO, Rome 268 pp. 1965 £1.00

'A textbook for health workers with special reference to community health problems in East Africa.' A book at the elementary level, very well produced, with excellent photographs.

/Cont'd. . . 2

GENERAL NUTRITION (cont'd)

JOINT FAO/WHO EXPERT COMMITTEE ON NUTRITION
Eighth Report. FAO Nutrition Meetings Report Series No. 49 (also WHO Technical Report Series No. 477) 80 pp. 1971 40p

This is a report on the latest meeting of the Joint FAO/WHO Expert Committee on Nutrition held in November 1970. The meeting concentrated on two main subjects of international importance - food fortification and protein-calorie malnutrition.

SPECIAL ASPECTS OF NUTRITION

Experimental malnutrition:

MAMMALIAN PROTEIN METABOLISM Vol. II. ed. H.N. Munro and J.B. Allison. Academic Press, New York and London 642 pp. 1964 £7.50

Chapter 21: Experimental protein-calorie deficiency
Platt, B.S., Heard, C.R.C. and Stewart, R.J.C.

This chapter describes, in detail, the results obtained in animals by feeding deficient diets and the methods of measuring protein values.

Economics:

ECONOMICS OF SUBSISTENCE AGRICULTURE
Clark, C and Haswell, M. MacMillan Students Edition 250 pp. 1964 £1.25

This is a useful book for anyone interested in the problems of economics related to food production, unemployment and poverty.

Food hygiene:

FOOD POISONING AND FOOD HYGIENE
Hobbs, B. 2nd Edition. Arnold, London. 252 pp. 1968 £2.50

A simple account of the subject, useful for anyone interested in institutional feeding or needing to draw up regulations about food handling, etc.

Infection:

INTERACTIONS OF NUTRITION AND INFECTION Scrimshaw, N.S., Taylor, C.E. and Gordon, J.E. WHO Monograph Series No. 57. Geneva. 329 pp. 1968 £2.70

Prepared in consultation with seventeen specialists in various countries.

Pregnancy:

NUTRITION IN PREGNANCY AND LACTATION

WHO Technical Report Series No. 302. 54 pp. 1965 30p

A report of a WHO Expert Committee.

SPECIAL ASPECTS OF NUTRITION (cont'd)

Infant nutrition:

INFANT NUTRITION IN THE SUB-TROPICS AND TROPICS
Jeliffe, D.B. WHO Monograph Series No. 29. 2nd Edition. Geneva. 335 pp. 1968 £2.70

A standard work on child nutrition in the developing countries.

Protein-calorie malnutrition:

ADVANCES IN PROTEIN CHEMISTRY
Volume 25. 1971. ed. C.B. Anfinsen, J.T. Edsall and F.M. Richards

Chapter: Protein malnutrition in children

Advances in knowledge in the last ten years
Waterlow, J.C. and Alleyne, G.A.O. p. 117-241

Psychological and social aspects:

DISADVANTAGED CHILDREN Health, Nutrition and School Failure
Birch, H.G. and Gussow, J.D.
Grune and Stratton Inc. 322 pp. 1970 £4.30

A scientific assessment of the effect of poverty on the intellectual potential of children.

REQUIREMENTS

CALORIE REQUIREMENTS
Report of the Second Committee on Calorie requirements
FAO Nutritional Studies No. 15. Rome. 64 pp. 1957 30p

PROTEIN REQUIRSMENTS
Report of a Joint FAO/WHO Expert Group. FAO Nutrition Meetings Report Series No. 37. Rome. (also WHO Technical Report Series No. 301) 71 pp. 1965 50p

REQUIREMENTS OF VITAMIN A, THIAMINE, RIBOFLAVINE AND NIACIN
Report of a Joint FAO/WHO Expert Group. FAO Nutrition Meetings Report Series No. 41. Rome. (also WHO Technical Report Series No. 362) 86 pp. 1967 40p

REQUIREMENTS OF ASCORBIC ACID, VITAMIN D, VITAMIN B12, FOLATE AND IRON
Report of a Joint FAO/WHO Expert Group. FAO Nutrition Meetings Report Series No. 47. Rome. (also WHO Technical Report Series No. 452) 75 pp. 1970 40p

FOOD COMPOSITION TABLES

TABLES OF REPRESENTATIVE VALUES OF FOODS COMMONLY USED IN TROPICAL COUNTRIES
Platt, B.S. H.M.S.O. Medical Research Council
Special Report Series No. 302. 46 pp. 1962 70p

LONDON SCHOOL OF HYGIENE AND TROPICAL MEDICINE

Professor J.C. Waterlow
February, 1973

Protein-energy malnutrition of children

1. General

Two forms of PEM can be distinguished - marasmus and kwashiorkor

Marasmus: (M) growth failure, gross loss of fat and muscle } i.e. semi-starvation

Kwashiorkor: (K) growth failure, beginning after weaning
less severe loss of fat than in M
oedema
enlarged fatty liver
changes in hair, mucous membranes, skin.
Reddish, sparse, thin
post-mortem

These are the extreme forms. Intermediate forms (marasmic kwashiorkor - MK -) are common.

2. History

M has always been known, although different names have been given to it, e.g. dystrophy. Frequently accompanies gastro-enteritis.

A condition very like K described in Central Europe in the last century under the name 'flour-feeding injury'.

Other descriptions in the 1920s, especially from Latin America (distrofia pluricarencial).

The name kwashiorkor introduced by C.D. Williams in Ghana, 1933.

Controversy then about cause -

?thiamine deficiency, because of oedema
?infantile pellagra, because of skin lesions
Riboflavin deficiency — mucosal lesions

By 1945 accepted that the main cause of K is protein deficiency, although there may be associated vitamin deficiencies.

Brock produced 'initiation of cure' (loss of oedema) by treatment with pure amino acids.

Because most of the early descriptions came from Africa and Central America, Trowell (1945) suggested that K was a disease of people of African stock. This soon shown to be untrue. In the late 1940s K described in Chile, Brazil, Mexico, India, Indonesia. Also in Greece and Italy after World War II.

Now recognized that K occurs in almost all developing countries. The rather dramatic features of K - oedema, red hair, etc - have tended, until recently, to obscure the less dramatic condition marasmus. The balance is now being redressed.

3. Nomenclature

Since M and K grade into each other, we need an umbrella name to cover the whole spectrum. It is accepted that in both the underlying deficiencies are of protein and energy, and not of vitamins. Hence the name protein-calorie malnutrition - PCM - now changed to PEM since the abolition of the calorie.

Note that K and M are descriptive names, whereas PEM is a causal name.

c.f. distinction between beri-beri and thiamine deficiency.

For public health purposes, PEM is the more useful name. From a clinical point of view K and M are still useful because they distinguish different clinical pictures.

4. Causes

(i) The classical theory

M = combined, more or less uniform, deficiency of energy and protein. i.e. quality adequate, quantity inadequate
e.g. 7% protein cals, 50 kcals/kg

K = specific deficiency of protein:
quality inadequate, quantity adequate
e.g. 3% protein cals, 100 kcals/kg

MK = intermediate
e.g. 4% protein cals, 70 kcals/kg.

Evidence: in animal experiments, especially pigs, diets such as those above do produce different conditions resembling M and K.

in man, the preservation of body fat in K but not in M shows that there must have been a higher energy intake.

However, dietary studies in man have never shown clearly the expected difference in energy intake.

(ii) The Gopalan theory

Prospective dietary studies in India showed no difference (quantitative or qualitative) in intakes of children who developed K or M. Therefore suggested that the difference lies in the child, not in the food. M represents an adaptation, K a failure of adaptation.

Other factors which may affect the outcome:

Infection may precipitate K
Individual differences in energy requirements.

5. Classification

Accounts from different countries suggest that in some the most frequent form of PEM is kwashiorkor, in others marasmus, in others mixed forms. If accurate comparisons are to be made, there has to be some accepted system of classification. A number of different features have been proposed as essential parts of the kwashiorkor syndrome without which the diagnosis should not be made,

e.g. dyspigmented hair (Brock and Autret)
skin lesions (Trowell)
fatty liver (Waterlow).

However, the importance of these varies from one country to another, and none of them can be accepted as essential features of kwashiorkor.

The one feature which is regarded by all workers as essential is oedema. This is the basis of the very simple Wellcome classification of severe PEM.

	Oedema 0	Oedema +
Weight 80-60%	Under-nutrition	Kwashiorkor
Weight less than 60% of standard weight for age (Harvard)	Marasmus	Marasmic kwashiorkor

Notes: (i) Body weight expressed as % of standard weight for age (Harvard 50th percentile)

(ii) This classification is only intended for severe PEM, e.g. as in hospitals. For less severe PEM, as in community studies, we have to use a different system. Therefore a limit has to be set, at which the classification begins. A child is not classified at all unless body weight is less than 80% of standard weight for age.

(iii) The fact that only one clinical feature - oedema - is included does not mean that others are neglected. Once cases have been divided according to the classification, it becomes easier to analyze and compare other features, e.g. tabulate as follows:

Clinical

Age, months

% frequency of:

hair changes
skin changes
etc

Biochemical

Hb, g/l
Total protein
g/l
etc

Anthropometric

% Weight for age
% Height for age
etc.

(iv) When comparisons are made in this way, it is usually found that cases of M are more severely retarded in height than cases of K. This suggests a more recent onset for K.

(v) If it is true that the different clinical pictures of K and M reflect different dietary backgrounds (see para 4), then proper classification is important for diagnosing the prevailing deficiency, and hence for prevention.

(vi) It is often said that M occurs at an earlier age than K, and that M is becoming more frequent. Both these statements are probably true, but there is at present (1972) no hard evidence to support them. A proper classification will make it much easier to substantiate statements of this kind.

Further lectures will deal with:

Nature and cause of the specific features of kwashiorkor (listed in para 1)

Classification of mild-moderate PEM in prevalence studies

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LONDON SCHOOL OF HYGIENE AND TROPICAL MEDICINE

MSc and Diploma in Human Nutrition

Professor J.C.Waterlow
January 1973

Pathological and biochemical characteristics of kwashiorkor (PEM)

1. Superficial signs

Hair changes - Hair is dyspigmented, sparse, thin and brittle.
In people of African stock, hair is often reddish.
In the East and Latin America it is often white.
In straight hair a white band may indicate the period of malnutrition.

Mechanism of the dyspigmentation is not known. S-amino-acid deficiency has been suggested.
Severe K can occur without any dyspigmentation.

The other changes are due to atrophy of the hair follicles (see Bradfield).
The hair follicles are part of the epidermal layer of the skin, which is also atrophic and thinned.

Biochemistry
Vasantha et al (1976) Amer. J. of Clin. Nutr Vol 23, No1 p75-82

Skin of children with Kwashiorkor has lower levels of
i) total nitrogen
ii) dermal "
iii) collagen " compared with normal children
↓
Also dermis
i) Hydroxyproline ↓
ii) tyrosine ↓
iii) proline ↓
iv) glycine =

Skin lesions - The typical skin lesion in kwashiorkor has been called 'crazy pavement dermatosis' and has some resemblance to the skin lesions of pellagra. My impression is that it is commoner in countries where maize is the staple. It heals on treatment with protein, without additional nicotinic acid. ?Role of tryptophan deficiency

Many cases of kwashiorkor have no skin lesions.

Mucosal lesions - Glossitis, cheilosis, angular stomatitis. These are common, but not always present. They are probably caused by associated riboflavin deficiency.

N.B. Kwashiorkor may be associated with other vitamin deficiencies, notably of vitamin A and of folic acid

2. Oedema

This is the hall-mark of kwashiorkor. It is accompanied by low concentrations of total protein and albumin in plasma (albumin 1-2 g%, compared with normal about 4 g%).

Total body water is increased; the excess fluid is mainly extracellular, but in some cases there may also be an increase in intracellular water as well (not proven).

Note that the clinical test of oedema (pitting on pressure) is not easily elicited unless some subcutaneous fat is present (Frenk, Mexico). In marasmus there may be some increase in total body water (Hansen), but because there is less subcutaneous fat oedema is less apparent.

Causes of oedema

-i Low plasma albumin (Starling's hypothesis); but no strict correlation between severity of oedema and extent of reduction of albumin.

-ii Increased levels of anti-diuretic hormone (ADH) because of failure of the liver to inactivate the hormone (theory of the Hyderabad School). Unlikely, because ADH+ should cause hypertonic urine, whereas urine always hypotonic.

-iii Impaired renal excretion of water and sodium, caused by decreased glomerular filtration rate, which in turn is caused by a reduction in cardiac output (theory of Alleyne).

-iv Potassium deficiency, experimentally, causes oedema by a mechanism which is not entirely clear : probably by increasing the reabsorption of sodium in the renal tubule. K deficiency is very common in kwashiorkor (see below).

It is possible that all these factors may play some part.

3. Fatty liver

Fatty liver rather variable in different parts of the world, but comparative figures not available.

Amount of fat may be up to 50% of wet weight - far more than in any experimental models of PEM.

Very high fat content may cause liver failure (bilirubin+, transaminases+); increases mortality rate.

Cause Decreased synthesis of the protein part of the lipoprotein which transports triglycerides from liver to fat depots, i.e. failure of removal of fat from the liver.

4. Anaemia

In PEM anaemia characteristically not severe, e.g. Hb 9g/100ml.

It is doubtful if there is truly an anaemia caused by protein deficiency.

More severe degrees of anaemia caused by deficiency of Fe or folic acid.

The claim made for vitamin E deficiency as cause of anaemia has not been substantiated.

5. Potassium deficiency

Very common in severe PEM. Caused mainly by diarrhoea and loss of K in stool.

K deficiency probably contributes to apathy and weakness, low cardiac output, oedema.

Serum K level is a poor guide to existence or degree of K deficiency.

Diagnosis can only be made by whole body counting, muscle biopsy or K balance. All difficult and possible only in best conditions. Therefore in general, assume that patients K deficient. The same applies to magnesium. (see treatment)

Treatment of severe PEM

A. Acute stage:

1. Correction of disturbances of water and electrolyte balance. If dehydration, i.v. fluids. N.B. Danger of giving too much: cardiac failure, pulmonary oedema, death.

   Not more than 140 ml/kg/day - 5% glucose in $^{1}/_{5}$ isotonic NaCl + K + bicarbonate if acidosis.

2. Antibiotics: controversy about whether these should be given routinely, even when no overt infection.

3. Folic acid 1 mg 3 x daily

4. Oral feeds: at first weak milk mixtures, in small amounts at frequent intervals. Nasogastric tube may be necessary. Work gradually up to stronger mixtures. If lactose intolerance, use a soya preparation.

(Treatment of severe PEM)

B. Recovery stage:

If possible, child should not be discharged until it has reached expected weight for height (2-3 months). This reduces recurrence rate.

The quicker the weight gain (provided it is not fat) and the shorter the stay in hospital, the better.

Weight gain is more likely to be limited by intake of energy than of protein. Aim at 150-175 kcals and 3-4 g protein/kg. This calorie content can only be achieved by adding fat, usually as vegetable oil.

Typical formula shown in table.

Vitamins A and D, organge juice, ferrous sulphate.

TABLE

	milk	sugar	oil	water	milk	sugar	oil	water
	oz	oz	fl.oz	fl.oz	g	g	ml	ml
Dried skimmed milk	2	1½	1½	16	100	90	85	1000
Evaporated milk	8	½	1	7	500	30	70	500
Half cream milk	2½	1	1	16	120	50	80	1000
Full cream milk	3½	-	1	16	190	-	60	1000

One should aim to provide at least 75 calories/lb body weight/day (165 calories/kg body weight/day). For any of the formulae in the above table, this is approximately equivalent to 2 oz feed/lb body weight/day (125 ml/kg body weight/day).

LONDON SCHOOL OF HYGIENE AND TROPICAL MEDICINE

DTPH, DTM & H and DCMT COURSES

NUTRITION LECTURES

Professor J.C.Waterlow
March 1973

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

Assessment of nutritional state (PEM) (1)

In community surveys severe PEM (kwashiorkor or marasmus) found in only 1-4% of children. Mild or moderate PEM much more common, and the problem is to assess incidence and severity.

1. Mortality data

-i 1-4 mortality rate considered a better indicator of malnutrition than infant mortality rate

	e.g. Infant mortality per 1000 live births	1-4 mortality per 1000 in age group
UK	19	0.8
Jamaica	35	4.7
Guatemala	91	29.5

-ii In study of causes of death below 5 years in 18 areas of Latin America, in more than 50% of cases malnutrition was an underlying or associated cause (Pan American Health Organization) 16% Primary cause
36% Secondary causes

2. Clinical examination

This is necessary to rule out vitamin deficiencies, infection, parasitism, etc, but is of relatively little value for quantitative estimates of prevalence or severity of moderate PEM.

Hair changes (dyspigmentation, thinning) and skin changes (dry, atrophic, glazed appearance) are common, and perhaps reflect reduced availability of protein for rapidly turning over epidermal cells.

Quantitatively: hair diameter reduced - measured microscopically; increased frequency of atrophic hair bulbs.
(see Nammacher et al. Am.J.Clin.Nutr. 25, 871, 1972
Bradfield, Lancet 2, 1169, 1968)

The practical value of these measurements remains to be determined.

Comparing nutritional status methods in a Guatemalan Survey.

Mark. A. Nammacher et al

Amer. J. Clin. Nutrition 25 No9 p871 (sept 72)

Summary: Biochemical, Hair-tissue and anthropometric methods used for the early recognition of malnutrition were compared simultaneously in 179 preschool children living in the Guatemalan highlands. Decrease in hair root diameter (measured by ocular micrometer and a dissecting microscope) and urinary urea/creatinine ratio (urine and venous blood specimen in the morning under thirsting and fasting conditions) were consistently related as early indicators of inadequate protein intake. Increase hair root atrophy (expressed as percentage of hair bulbs in the growing or anagen phase) was consistently related to increase in the ratio of non-essential to essential amino acids in serum and also to depressed weight for height and weight for age as later indicators of PCM. Hair-root measurements are useful in determining nutritional status of population

3. Anthropometry

This is the major tool for community surveys. The basic data on age, weight, height. Subsidiary data are arm, chest and head circumference, and skin-fold.

It is convenient to express results as per cent of a reference standard. The most widely used standards are the 'Harvard Standards' of Stuart and Stevenson (see Jelliffe, 1966 - WHO monograph)

-i Weight for age (weight of child as per cent of weight of standard child of same age)

The earliest classification was that of Gomez (Mexico) based on Harvard Standards:

90-75% = grade 1 PEM 'Mild

75-60% = grade 2 PEM K

< 60% = grade 3 PEM. MK or M

-ii Height for age (height of child as per cent of height of standard child of same age)

A malnourished child can lose weight, but it cannot lose height. A low height/age (retardation) may be regarded as evidence of past malnutrition, leading to growth failure.

Retardation in height is accompanied by retardation in ossification, and by reduced head circumference.

-iii Weight for height (weight of child as per cent of weight of standard child of same height)

A low weight/height is evidence of present malnutrition, in children as in adults.

Note that the Gomez classification (weight/age) does not distinguish between two quite different situations:

	A	B
Age	1 year	1 year
Weight, kg	7	7
Standard weight, kg	10	10
Weight/age %	70	70
Height, cms	75	64.5
Standard height, cms	75	75
Height/age, %	100	92
Weight/height %	70	100
Malnutrition:	Present	Past

Physiologically these two children are probably quite different. Naturally there will be many children who show both present and past malnutrition.

Arm circumference is a measure of thinness or fatness. Arm-circumference/head circumference, as suggested by Kanawati and McLaren (Nature, 226, 573, 1970) gives essentially the same information as weight/height, but probably less accurately.

Skin-folds and biochemical measurements will be considered in the second lecture on assessment.

Nutritional Status in a Community

(1) Direct nutritional assessment of human groups
- i) Clinical Study.
- ii) Nutritional Anthropometry
- iii) Biochemical
- iv) Biophysical

i) Clinical Study
- Hair
- Eyes
- Mouth.
- Thyroid
- Skin
- Skeleton
- Odema

ii) Anthropometry
- Age
- Wt
- Ht.
- Skin fold thickness < biceps, Tricep, sub scapula, Supra iliac
- Arm circumfern
- Hd. circumference

iii) Biochemistry. Blood < Albumin, Total P_r, TBPA, Hb etc
Urine - creatinine etc.

iv) Biophysical
- a) Radiography < Rickets, osteomalacea, Advanced pulmonary Scurvy
- b) Tests of phys. function.

(2) Indirect indicators – Vital statistics
- i) Age specific death rate
- ii) 1-4 age group.
- iii) Cause specific < mortality, morbidity data

(3) Ecological factors
1. Food production factor < Climate, Soil, Crop
2. Infections in community
3. Food consumption - distribution
4. Cultural factors - practices, feeding habits, taboos
5. Socio economic factors
6. Food production
7. Health & education services

(4) Food surveys
- i) National Food balance sheet.

Treatment of Malnutrition

Treatment involves both public health measures as well as standard medical therapy of the acutely ill child or adult:
A few facts must always be remembered:

1. Age distribution of population. About 25% of the population is under 5 and 50% under 15. Child health is a major problem.

2. Susceptibility to malnutrition: particularly the under 5s and pregnant women because of the extra food needs for growth of the foetus or child.

3. "Malnutrition is the iceberg disease". If 1% of children under 5 have classical kwashiorkor or marasmus, it is probable that 40 - 60% of the child population is underweight and malnourished.

4. Malnutrition is part of a vicious circle. Economic and social factors are important factors in the development of malnutrition which itself leads to apathy and inability to work. Malnourished mothers produce smaller babies who may be permanently affected mentally despite adequate postnatal care.

5. In many countries energy deficiency is the major deficit - not protein deficiency, eg. Ethiopian adults exist on diets which seem barely adequate for the known basal metabolic rates. Marasmus is the great problem in Asian, South American and Ethiopian children - not kwashiorkor.

   In East Africa protein deficiency is important although children with kwashiorkor seem to ingest too few calories also.

6. Vitamin A deficiency and, in Asia, Thiamine deficiency, are important deficiencies which arise mainly because of social customs and taboos on particular foods eg. vegetables. Despite the low calcium intakes in many countries rickets occurs mainly in areas where skin exposure to sunlight is limited by social customs.

Treatment must be based on a knowledge of an individual's needs (requirements), his normal food habits and the nutritional value of individual foods. All treatment must be simple and practical with a strong educational element.

Individual's needs or requirement

A person's requirement for protein or energy is a definite figure. Allowances given in books refer to expert committees' agreed amounts which are useful when thinking in community terms and take into account the variability in requirements from person to person.

Table 1 gives the allowances at different ages for a series of nutrients: the protein value is increased to take into account the relative deficiency of some essential amino acids in vegetable proteins and assumes that only the equivalent of 70% of the protein ingested can be used efficiently. Thus, for example, a year old child should be allowed 30 grams of protein which is over 2 grams per kilo when the requirement for growth is only 1.2 grams/kilo of "perfect protein".

Foods

It is simplest to think of the main foods in three categories:

a) the staple foods - cereals, b) the staple roots, tubers and fruits and c) legumes. Animal protein is not an important constituent of many communities' diets; it is not worth encouraging its consumption since it is too expensive. Cereals are important sources of protein as well as energy. Table 2 shows the nutrient content of a variety of cereals. The protein is not completely used because of a relative deficiency of lysine but this can be counteracted either by eating pulses also, or just eating more staple and using the extra amino acids for energy. Encouraging the fortification of cereals with amino acids is a waste of money and irrelevant to the needs of a community.

The cereals are usually milled and used as flour or grain and are prepared as bread and porridges, or eaten in the grain form. The quantities listed in Table 2 are for uncooked cereals: cooking leads to a great increase in the water content of foods eg. maize. A child cannot eat enough in only two meals/day to satisfy his energy needs because his stomach is not big enough. If enough cereal can be eaten to satisfy the energy requirements then his protein requirements will automatically be met.

Roots and tubers:

In many countries especially in Africa root crops are consumed largely as staple foods. It is very easy to grow these foods without much effort. In contrast to the cereal group, the protein content of roots is very low. When cooked in their fresh state, they contain a large percentage of water and cellulose. In concentrated flour form, the energy value improves. In comparison to cereals and legumes the nutrient value of roots and tubers is poor.

Average protein calorie and other nutrient value of roots per 100 gm. (uncooked)

Food	Protein gm.	Calories	Ca. mgm.	Fe. mgm.	Vit. A I.U.	Thian. mgm.	Ribofn. mgm.	Nico-tinic mgm.	Vit.C mgm.
Cassava (fresh)	0.7	153	20.0	1.5	-	0.07	0.03	0.7	30
Cassava (flour)	1.5	342	55	2.0	-	0.04	0.04	0.8	0
Ensete	1.5	190	140	5.0	-	0.02	0.05	0.2	0
Bread-fruit	1.5	113	25	1.0	-	0.10	0.06	1.2	20
Plantain	1.0	128	7	0.5	100	0.05	0.05	0.7	20
Sweet Potato	1.5	114	25	1.0	100	0.01	0.00	0.2	0
Irish Potato	2.0	75	10	0.7	-	0.10	0.03	1.5	15
Taro	2.0	113	25	1.0	-	0.10	0.03	1.0	5
Yam (fresh)	2.0	104	10	1.2	20	0.10	0.03	0.4	10
Yam (flour)	3.5	317	20	10.0	-	0.15	0.10	1.0	-

The Nutrient Value of Legumes

Food	Prot. gm.	Calories	Ca mgm.	Fe. mgm.	Vit. A I.U.	Thiam mgm.	Ribofl. mgm.	Niac. mgm.	Vit. C mgm.
Groundnut (Fresh)	15.0	332	30	1.5	-	0.5	0.1	10.0	10
Groundnut (dry)	27.0	579	50	2.5	-	0.9	0.15	17.0	-
Pea	25.0	337	70	5.0	100	0.8	0.2	2.5	-
Pigeon Pea	20.0	328	100	5.0	50	0.5	0.15	2.3	-
Lima Bean	20.0	326	90	6.0	-	0.5	0.14	1.5	-
Soya Bean	35.0	382	200	7.0	-	1.1	0.30	2.0	-
Soya Bean milk	3.4	32	12	0.6	-	0.09	0.04	0.2	-
Cow Pea	22.0	340	90	5.0	20	0.90	0.15	2.0	-
Pumpkin Seed	30.0	610	40	10.0	30	0.20	0.20	2.0	-

Note that the above foods contain very little Vitamin A - this is best obtained from eating green vegetables or yellow fruits and vegetables eg. mangoes, carrots and other greens which contain carotene.

Despite the reasonable iron content of many foods, iron from vegetable foods is poorly absorbed and anaemia is very common. Fortification has not answered the problem.

Practical problems:-

Therapy of the acutely ill malnourished subject:-

The immediate problems are infection, dehydration and diarrhoea.

In malnourished children dehydration is difficult to assess. For general treatment of gastroenteritis see J. Biddulph, Tropical Doctor July 1972 2 p. 114 and M. A. Church (same issue) p. 119. A child is better with oral fluids if he can take them than I.V. There is a danger of overhydration if staff problems exist. Glucose in oral fluids encourages absorption of fluid. Lactose intolerance is exceptionally common in most countries. Feed early and frequently in small amounts. Most children with gastroenteritis are malnourished - therefore treating dehydration without rehabilitation is a waste of time. Organise rehabilitation with mothers fully involved and treating each other - avoid emphasis on drips and drugs as cures. Use local foods encouraging

the use of pulses and cereals for protein content: more meals per day, and special priorities for children in family ration to get in energy.

Community problems

Avoid glamorous projects connected with animal proteins. Go for good storage conditions for food - 25% of food may be lost by deterioration and pests. If roots are staples encourage legume consumption. If cereals are staples encourage more frequent meals and higher intakes for infants and pregnant and lactating mothers. Vegetable consumption needed in areas with Vitamin A deficiency.

Under-five-clinics very useful with cards for each child - kept by mother at home and understood as a record of health. Use acute medicine as introduction to prevention and community efforts.

Malnutrition occurs particularly in the weanling period; after 5-6 months, breast feeding alone is not enough. Infection, poor hygiene and inadequate food lead to weanling diarrhoea. Treatment must include the encouragement of suitable foods for infants. Prolonged breast feeding on its own may be as harmful as early weaning onto advertised commercial milk preparations.

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P. T. James

TABLE 1

Recommended Daily Intakes of Energy and Nutrients

Age Range	Average Body Weight kg	Energy (Kcal)	Protein (gm)	Thiamine mg	Riboflavine mg	Nicotinic Acid mg equivalents	Ascorbic Acid mg	Vit. A µg retinol equivalents	Vit. D µg cholecalciferol	Calcium mg	Fe mg
Infants 0-1	7.3	800	20	0.3	0.4	5	15	450	10	600	6
1-2	11.4	1200	30	0.5	0.6	7	20	300	10	500	7
3-5	16.5	1600	40	0.6	0.8	9	20	300	10	500	8
5-9	22.8	1950	49	0.7	1.0	10	20	350	2.5	500	10
Boys 9-18	31-61	2800	63-75	1.1	1.4	14-19	25-30	725	2.5	700	13-15
Girls 9-18	33-56	2300	58	0.9	1.4	16	25	725	2.5	700	13-15
Men	65	3000	75	1.2	1.7	18	30	750	2.5	500	10
Women	55	2500	63	1.0	1.3	15	30	750	2.5	500	12
2nd & 3rd trimester pregnancy		2400	60	1.0	1.6	18	60	750	10.0	1200	15
Lactation		2700	68	1.1	1.8	21	60	1200	10.0	1200	15

Based on Recommended Intakes of Nutrients for UK. Department of Health & Social Security. Report No. 120. HMSO.

Table 2

Average protein calorie and other nutrient content of cereals per 100 gm. grain (uncooked)

Food	Protein	Calories	Ca mgm.	Fe gm.	Vit. A I.U.	Thiamine mgm.	Riboflavin mgm.	Nicotinamide mgm.	Vit. C mgm.
Wheat	13.1	353	13.1	2.27	-	0.30	0.08	2.0	0
Rice	6.2	361	3.7	0.45	-	0.06	0.03	1.0	0
Maize	8.0	354	9.0	2.0	-	0.05	0.03	0.6	0
Millet	6.0	332	350	5.0	-	0.30	0.10	1.4	0
Sorghum	10.4	355	32.0	4.5	-	0.50	0.12	3.5	0
Oats	12.0	388	60.0	5.0	-	0.50	0.15	1.0	0
Barley	12.0	339	35.0	4.0	-	0.50	0.20	7.0	0
Rye	8.0	350	25.0	3.5	-	0.27	0.10	1.2	0
Teff	8.5	345	110.0	90.0	-	0.50	0.10	2.0	0

BETTER FOOD FOR A HEALTHIER WORLD

WORLD HEALTH DAY, 7 APRIL 1974

THE IMPORTANCE OF BREAST-FEEDING

by

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Just a few months ago, a mother from a village was sent to my clinic because her child was not growing as it should. The child was two months old but weighed only 2 kilos (5-1/2 lbs). It was tiny, wrinkled, only skin and bones, and screaming all the time. The mother said that the child was bigger at birth but had been losing weight for the past month. I felt that he was not getting enough to eat and so examined her breasts - they were full of milk. She told me that the child was not being fed from the breast but with a bottle, but could not tell me the type of artificial milk product she used.

I then saw the husband and asked him what type of milk he bought for his child. He informed me that the child had been doing well and gaining weight on breast milk but that, on his wife's insistence, he had bought the feeding-bottle the previous month with all the money he had and was now saving up to buy a tin of powdered milk. Thus, the child had had nothing but water from the feeding-bottle for a month, while the mother's breast milk had been expressed and thrown away! Luckily, the child had no infection and we were able to get him back on breast milk.

Before we blame this mother for nearly killing her child, let me say that before she came to the clinic she was sure she was doing the best thing for him. She had heard over the radio that powdered milk was the best food for infants. She had learnt that educated and "upper-class" women used feeding-bottles. She had seen posters and advertisements at health centres and on hoardings in town showing big bouncing babies being fed with bottles. She too wanted the best for her child. Thus, though the child was growing well and was satisfied with her breast milk, she forced her poor husband to spend all his money on a feeding-bottle. She had no idea that it was not the feeding-bottle but what you put in it that makes the child grow.

Mothers all over the world want the best for their children - whether they be in Colombia, Kenya or Japan. It is unfortunate that they do not all know that breast milk is the best food for infants. Over millions of years, the composition of breast milk has been modified and adapted by nature so that it is fully digested by the baby and gives a good rate of growth. Cow's milk is, at best, an expensive substitute.

It is true that manufacturers have tried to modify cow's milk by sterilization, dilution and supplementation so as to give it a similar composition to human milk. However, modified cow's milk as sold in tins - whether powdered or fluid - is only a substitute for the real thing. "Humanized" or homogenized cow's milk cannot be so completely digested and absorbed by the baby as breast milk - thus, children have to be fed a lot more of these modified cow's milks to grow well.

In developed countries, where mothers generally feed their infants on modified cow's milk rather than their own breast milk, it has become common practice for writers to compare breast milk with cow's milk. Perhaps it is a form of unconscious justification. The facts should, however, always be stated - breast milk is food for infants; cow's milk is food for calves. If we use cow's milk to feed human infants, we are using a substitute. The ideal is breast feeding; only those who cannot attain this ideal should fall back on cow's milk.

Within the past ten years educated women in developed countries have realized that by using cow's milk they are giving their children a "second best". In most universities in America, Britain and Europe, wives of teachers

and professors as well as women graduates have gone back to breast-feeding. Clubs, like the La Leche League, have sprung up in many countries and towns, formed by highly educated women. Their main aim has been to convince and educate other women about the importance of breast-feeding.

The medical profession has confirmed that breast milk, apart from being fully digested and absorbed by the baby, transfers to him some of the immune bodies of the mother and makes him less liable to infection. Breast-fed children get fewer attacks of diarrhoea, vomiting and stomach upsets than bottle-fed children.

Mothers who breast-feed develop a closer attachment to and love for their children. The children too are more relaxed, contented and happier. There is some evidence that this closeness may have far-reaching effects on the future of the child.

There is also a statistical relationship between cancer of the breast and women who do not breast-feed. Breast cancer was found to be more frequent among women who do not breast-feed. But the interpretation of this relationship is not as simple as it may seem because other factors have been shown to play a role.

In developed countries, where the standard of living is high, where money is available, where health services are well developed and where social services like water and sewerage are taken for granted, mothers may be allowed to choose the second best in feeding their infants. In most developing countries of the world, choosing not to breast-feed will have many repercussions not only on the baby but also on the family and the country.

There are many factors in developed countries that help mothers who decide to use the feeding-bottle. Clear, good water is always available - all they have to do is turn on a tap. Most homes have storage facilities and refrigerators where foods and milk can be kept. These mothers can read and follow the directions about mixing milk powders written on the tins and bottles. The concept of germs causing infection is well understood, and cleaning and sterilization of feeding-bottles are willingly performed.

Mothers in developing countries are not so well provided for. In most rural areas in these countries, where over 80% of the population live, water is available only from streams and springs. Women may have to walk five to 10 kilometres to get a bucket of muddy water for use in the house. This precious water, full of germs and particles, is usually the only liquid available for mixing baby's food. To boil and filter it is not easy - fuel has to be collected and this may mean another journey into the forest.

The huts in which most of the rural population live have no storage facilities - no cupboards, refrigerators or shelves. Foods and tins of milk have to be kept on the floors and under the roofs. Being without the advantage of formal education, most women cannot read or understand the directions for mixing the milk powders or diluting the fluid milk. Baby scales and nurses may be available at the clinics and health centres, but these may be 10 kilometres or more away!

The concept of germs causing illness is very difficult to grasp for people who have been brought up to believe that illness and death are caused be evil-doers, anger of the gods, witch-doctors and the "evil eye". After being taught how to sterilize feeding-bottles at welfare clinics, mothers arrive home and sterilize the bottle and mixtures as they have been taught at the clinic, then put the bottles in handbags or wrap them up in their head-ties! They often believe that once the bottles have been sterilized, they will remain sterile and fit for use whatever is done to them.

The result is that bottle-fed children in the developing countries get frequent attacks of gastroenteritis with vomiting, diarrhoea and dehydration. Doctors and nurses in hospitals spend a lot of their time putting water back into these babies and most hospitals have special wards for rehydration. In areas where these facilities do not exist or where babies are not brought to the hospitals early enough, many of them die. Doctors in developing countries often believe that putting a child on artificial feeding is like sentencing him to death.

The cost of the powdered milk takes a large percentage of the family's earnings in most developing countries. The example given at the beginning of this article, where the father had to save for a month to buy a tin of powdered

milk for the baby, is very common. In most developing countries, the price of a tin of powdered milk may be more than the father's wages for a full day's work. In the rural areas, he has to sell some of his produce or a farm animal.

The effect of this relatively high cost of baby's food is that the tin of milk is made to last for as long as possible. The child, instead of receiving a proper formula, is given a highly diluted milk which is mostly water and cannot support growth. He cries all the time from hunger. The family has no rest and the parents become worried, since they cannot understand this situation in which they are striving to give the best to their child and the child is not happy and contented.

Very few developing countries have dairy herds to supply cow's milk. Milk powders and evaporated milk have to be imported from developed countries with foreign currency. As the number of mothers who stop breast-feeding increases in these countries, so their governments will have to find more and more foreign currency to import milk for the children. The governments of developing countries therefore have an obligation to their people to support the dissemination of the truth - that the ideal food for babies is breast milk and that cow's milk is only a second best. Every facility must be given to mothers to breast-feed their children for as long as possible.

The factors that make more and more women start giving cow's milk instead of breast milk are many. They include:

the increasing tendency for women to go out to work in offices and shops;

the effect of high-powered salesmanship by the baby-food firms;

the tendency to think of bottle-feeding as part of "western civilization", which must be "better" than the local breast-feeding. This belief is strengthened when illiterate rural mothers see sophisticated, educated "elite" women giving up breast-feeding for bottle-feeding.

If no concerted action is taken, the time will soon come when the female breast will lose its function of feeding the young and become only a sex symbol.

BETTER FOOD FOR A HEALTHIER WORLD

WORLD HEALTH DAY, 7 APRIL 1974

FOODS FOR BABIES AND TODDLERS

by

Dr E. M. DeMaeyer

Mother's milk is the best food for babies, and meets all their requirements for the first few months of their lives if they have enough of it.

Breast-feeding is traditionally practised in most countries, but is steadily becoming less common. In all countries there is already a significant difference in the frequency of breast-feeding among rural and urban populations. For example, in Guatemala, 98% of babies in rural areas are breast-fed, until the twelfth month, whereas in the towns this applies to only 57%. In Taiwan, 97% of babies of six months are breast-fed against 61% in the towns. And in certain rural communities of Mexico there has been in 10 years a reduction of 20% in the number of breast-fed infants of under six months. In industrialized countries with high living standards, relatively few mothers breast-feed their babies, but the disadvantages of artificial feeding from birth are few in such conditions, as is demonstrated by the low infant mortality.

The duration of breast-feeding varies from a few weeks to several months, and may even be prolonged to two or three years, according to circumstances and accepted customs in particular countries. The secretion of milk is usually abundant during the first year, but tends to diminish afterwards. Nevertheless, it provides even then a precious source of high-quality proteins for the baby. This is of particular importance in countries where infant diets are very monotonous, usually consisting of a single cereal or tuber - such as manioc - supplemented by small quantities of other foodstuffs. As a consequence, the content of protein, vitamins and minerals in the diet is inadequate. In view of the high cellulose content of some of these foods, the diet, while satisfying the child's hunger, has little nutritional value and does not provide enough calories. If the meals are not evenly spaced and frequent, i.e. five to six a day, it is likely that the dietary intake of the child will be deficient in terms of calories and other essential nutrients.

Let us now look at the problem of dietetic foods for babies and toddlers.

Babies of less than six months

If for some reason - such as a breast abcess or an infectious disease - the mother cannot nurse her baby, or if her supply of milk is insufficient, the child must have an adequate substitute for mother's milk for the first six months or so of his life. The most usual substitute is cow's milk in one form or another. It may be fresh or in powdered form - either whole, skimmed or partly skimmed, acidified, or "humanized". Preparations of soya milk are also used. If given in sufficient quantities and according to the instructions of the manufacturers, these breast milk substitutes are usually adequate as long as they are given with due regard to hygiene. While in countries with clean abundant water supplies the problem of hygiene can be managed easily enough, it is very serious in countries where such a supply is not readily available and mothers are likely to have only rudimentary notions of hygiene.

However, in many countries it has been shown by growth-curves and mortality rates of artificially fed infants that it is perfectly possible to obtain excellent results by the use of these substitutes.

Babies of more than six months

Mother's milk or its substitutes meet all the needs of the baby for its first four to six months of life, although some paediatricians believe that "mixed feeding" - in the form of fruit or vegetable juices and mashed fruits or vegetables, or even small quantities of egg or meat - should begin before this age. But after six months, such supplementary feeding becomes essential. The mother can either prepare supplementary foods herself from fresh produce or, depending on circumstances, make use of preserved purées of vegetables and meat or baby foods made of cereals, industrially processed and commercialized on a large scale. The latter usually contain flour from one or several cereals, sugar, and a vitamin and mineral mixture, and they are intended to be prepared with milk. For this reason they do not need to contain protein either in significant quantities or of high quality, for the milk provides all the first-class proteins necessary to assure the baby's adequate nutrition.

Often, however, the mother does not know how to feed her baby adequately with the foodstuffs at her disposal. Nutritional education can remedy this situation, and many formulas of very adequate nutritive quality, based on locally available foods, have been developed. A combination of a cereal, a leguminous seed (peas, beans, lentils), a green vegetable and - in some cases - meat, eggs, or milk provides a mixture that is perfect from the nutritive point of view. On the other hand, it is unfortunately often the case that traditional foods, if not

properly processed, are ill suited to the needs of babies because of their low calorie value. As a result, and because the child is usually not fed more than twice a day, his nutritional needs are not met. Were he to be fed often enough, say six times daily, his nutritional needs might perhaps be satisfied, but such a solution is rarely feasible or adopted.

In developing countries, the baby foods based on cereals of the type used in industrialized countries are usually imported and costly. Moreover, the milk with which they have to be mixed often has to be imported too, and is therefore also costly. As a result, these products are often mixed with water and provide a diet that is unbalanced because of its deficiency in protein. A classic example is to be found in certain Latin American countries, where maize is the staple food and where a practically pure maize starch, containing no protein, is mixed with water to form a gruel which is the food commonly used for weaning infants. In other regions, rice or wheat starch may be used, with equally disastrous results for the health of the child.

What can international aid do to provide babies and toddlers with the nutrients they need? The international action programme hinges on two measures: the development of milk production and the development of weaning foods.

Development of milk production on a national scale

The development of the dairying industry is a relatively slow process, as has been shown by the experience of the United Nations Food and Agriculture Organization (FAO) and the United Nations Children's Fund (UNICEF) during the past 20 years. Moreover, ecologic and climatic conditions are not always favourable for the raising of cattle. Thus, even in countries where it has been possible to develop a dairying industry, milk remains an expensive food, the price of which is beyond the reach of members of the less privileged social classes. The paradoxical result is that some countries in which the internal demand is fully saturated from the economic point of view have become exporters of milk, although their real needs expressed in nutritional terms are only fractionally covered. Nevertheless, in certain regions of the world the development of the dairying industry has without any doubt contributed to the improvement of the nutritional status of children.

Development of weaning foods

As has already been indicated, baby foods based on cereals, whether imported or locally produced, are in general unsuitable when consumed alone because of their low protein content. It is only by mixing them with milk that it is possible to obtain a food of good nutritive value. The solution is to produce and market locally highly nutritive weaning foods that do not require the addition of milk but meet protein and energy requirements and are designed to supplement

the traditional diet of infants and young children. Such products should be attractively presented and marketed at as low a price as possible.

This is the policy that FAO, WHO, and UNICEF have applied with growing success during the past 15 years in developing an international programme of weaning foods. The first product of this kind, which was not originally developed as a weaning food but as a beverage to supplement the diet both of adults and children, was Incaparina, placed on the market with varying degrees of success in the 1960s in Guatemala and other Central American countries. Its ingredients included maize flour and a cottonseed protein concentrate. In Colombia a modified formula of Incaparina incorporating maize and defatted soya has been introduced with a view to producing a more adequate weaning food. Incaparina and two similar products are now competing in Colombia with various imported or locally produced weaning foods, and their introduction has been facilitated by the tax exemptions that the government has accorded within the framework of its social policy.

In the last five years other weaning foods have been developed in Algeria (Superamine), Tunisia, Morocco, Egypt (Superamine), Turkey (Sekmama) and in Iran (Shadamin), and are already marketed commercially in some of these countries. Typically, they contain a cereal, a mixture of pulses (chick-peas, lentils), with the addition in certain cases of soya, sugar, and sometimes a small percentage of skimmed milk, a vitamin and mineral mixture, and a flavouring agent. These food mixtures are in the form of white or slightly yellowish flours; they are in some instances partially pre-cooked, in which case the time required to cook them before feeding is reduced to three or four minutes. This short cooking time is advantageous by comparison with instant foods when the quality of the water used in the preparation is doubtful. In other cases the flour is of the instant type and can be used at once after mixture with warm water without any additional cooking. For such preparations enzymes (amylase) are added during the industrial processing, or an extrusion process is used. In both cases, good digestibility without further cooking is ensured by the transformation of starch into dextrin. Both these processes are slightly more costly and are intended to meet the needs of sophisticated customers. Packaging varies according to the market but should in principle be as simple as possible, in the form of polythene bags, for example, containing 300 grams of the product. This amount is sufficient to supplement the ration of a young child for three days. The polythene may be re-inforced by aluminium foil to offer greater protection against deterioration and also a better presentation. In Egypt, plastic containers are used. What is important is to keep the price as low as possible.

It should not be overlooked that packaging not only can increase the commercial appeal of a product but also protect its quality. And the public should be educated to understand that a locally produced weaning food, although inexpensive, is not an inferior substitute but can be a product of high quality.

Experience shows that in the industrial manufacture of weaning foods the cost of raw materials usually represents less than half the retail price. The rest is accounted for by manufacturing cost, packaging, amortization of equipment, marketing costs (including advertising), and the retailer's commission.

The retail price of weaning foods that have been developed within the framework of the FAO/WHO/UNICEF programme varies from one country to another, but is substantially less than that of comparable imported products. Nevertheless, this price is beyond the means of the less privileged classes of the population, who can only benefit from such foods if the social policy of the government is such as to allow them to be sold at an artificially low price or distributed free of charge. The main objective, however, remains the introduction into the normal commercial channels of distribution of a highly nutritive weaning food, which is at the same time fully adequate for the infant's needs, produced from locally available resources, and sold at a low price. This objective seems about to be achieved in certain countries such as Guatemala, Colombia, Algeria, Egypt, Tunisia, Turkey, Morocco, and Ethiopia. It is as yet too early to make a final judgement, but there are many reasons for believing that this international programme represents an important contribution to the improvement of the nutritional state and health of the world's children.

The Sunday Standard

MAGAZINE SECTION

JANUARY 17, 1971

Malnutrition in India

Needless human Tragedy

by Trevor Drieberg

INDIA'S foremost social problem is lack of proper nutrition for millions of people.

This is the greatest challenge to the nation's scientists and administrators in the 1970s, says Dr. C. Gopalan, Director of the National Institute of Nutrition, Hyderabad.

Nutritional deficiency diseases account for a large number of hospital cases throughout the country.

Sample surveys show that many infants and school children suffer from disorders caused by an unbalanced diet, some of them so serious as to inflict permanent damage on body and mind.

The most important and widespread nutritional problem is the inadequate intake of calories and proteins.

Nearly two per cent of all children between one and five years show unmistakable signs of this deficiency.

But this is a great underestimate of the serious ill effects of an inadequate diet, says Dr. Goplan.

The chief deficiency diseases seen in India, kwashiorkor and marasmus, account for only a small fraction of the damage caused to the growing child.

Kwashiorkor, the result of a diet with very little protein, is evidenced by swelling of the body, potbelly and changes in the colour of one's skin.

Anaemia

Marasmus is a gradual loss of flesh and strength. It occurs mainly in infants.

The most widespread deficiency disease of both children and adults is anaemia caused by lack of iron.

This is common among pregnant women, and the cause of many deaths at childbirth.

Lack of vitamins is also a potent destroyer of young lives. Nearly 10 per cent of school children from poor families do not get enough vitamin A.

But pre-school children between one and three suffer even more from this lack, which impairs sight and ultimately brings on total blindness.

Rickets, another scourge of the infant, softens the bones. Its cause is a shortage of vitamin D or calcium, and may result in deformity.

Pain in the joints and paralysis of hands and feet, swelling or wasting away are the symptoms of beri beri, a nervous disease caused by a poor intake of vitamin B.

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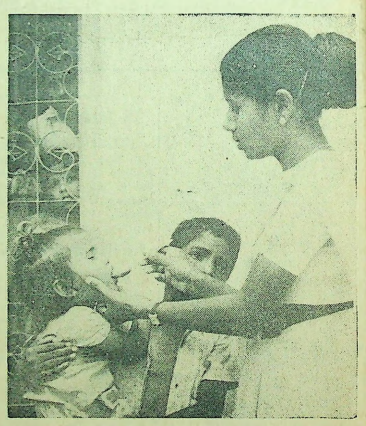

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A little dal is added to this proteinless, low-calorie diet once or twice a week.

Most of the children participating in this and other experiments belong to families of landless labourers, whose constant companion is hunger.

Their diet comprises reconstituted skim milk, bread, bananas and sugar.

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With this supplementary diet the weight of babies at birth is found to increase by 300 grams. At the same time the mother's health and production of milk and the infant's production of serum improve.

According to a survey made by the Indian Council of Medical Research in 1968, a woman's needs of calories in pregnancy are: sedentary worker 1,900; moderate worker 2,200; and heavy worker 3,000.

In the second half of pregnancy this intake should increase by 300 calories, and for breast-feeding up to one year the extra calorie need is 700.

The daily intake of proteins should be 45 grams, with an additional 10 grams for the second half of pregnancy and 20 grams for the period of lactation.

The main need of pregnant women is calories. These should be ideally available from early pregnancy, but this is not practicable for most families because of their low earnings.

But special feeding in the last six to eight weeks can make a significant difference, although babies will still not reach Western standards in height and weight.

Giving mothers additional protein without carbohydrates to increase the consumption of calories is a waste. Calories and proteins must go together, and if folic acid iron are added they "will do wonders."

Better nutrition ensures a healthier more vigorous and therefore more productive nation. This goal is within our grasp if only we can educate people on the need to change their eating habits.

Cheap vegetable foods which are readily available in the village, or which can be cultivated easily, can provide all the calories, proteins, vitamins and other protective elements the human body needs.

What is lacking is a campaign of mass education to carry the message of better nutrition to those in most need of it. Malnutrition is a problem of public health and must be overcome through the joint efforts of researchers and administrators.

The time for doing it is right now.

Miss Thimmayamma, a researcher of the National Institute of Nutrition, Hyderabad, and Mr. Achari, the village schoolmaster, with products of the school garden at Kuntloor.

Malnutrition in India

Needless human Tragedy

by Trevor Bricberg

INDIA'S foremost social problem is lack of proper nutrition for millions of people.

This is the greatest challenge to the nation's scientists and administrators in the 1970s, says Dr. C. Gopalan, Director of the National Institute of Nutrition, Hyderabad.

Nutritional deficiency diseases account for a large number of hospital cases throughout the country.

Sample surveys show that many infants and school children suffer from disorders caused by an unbalanced diet, some of them so serious as to inflict permanent damage on body and mind.

The most important and widespread nutritional problem is the inadequate intake of calories and proteins.

Nearly two per cent of all children between one and five years show unmistakable signs of this deficiency.

But this is a great underestimate of the serious ill effects of an inadequate diet, says Dr. Gopalan.

The chief deficiency diseases seen in India, kwashiorkor and marasmus, account for only a small fraction of the damage caused to the growing child.

Kwashiorkor, the result of a diet with very little protein, is evidenced by swelling of the body, potbelly and changes in the colour of one's skin.

Anaemia

Marasmus is a gradual loss of flesh and strength. It occurs mainly in infants.

The most widespread deficiency disease of both children and adults is anaemia caused by lack of iron.

This is common among pregnant women, and the cause of many deaths at childbirth.

Lack of vitamins is also a potent destroyer of young lives. Nearly 10 per cent of school children from poor families do not get enough vitamin A.

But pre-school children between one and three suffer even more from this lack, which impairs sight and ultimately brings on total blindness.

Rickets, another scourge of the infant, softens the bones. Its cause is a shortage of vitamin D or calcium, and may result in deformity.

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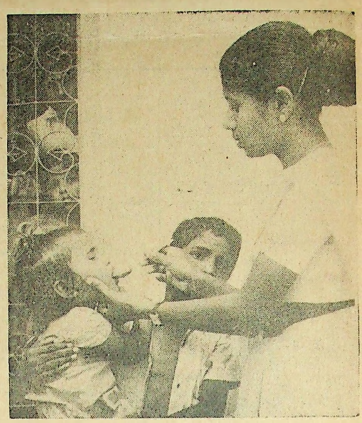

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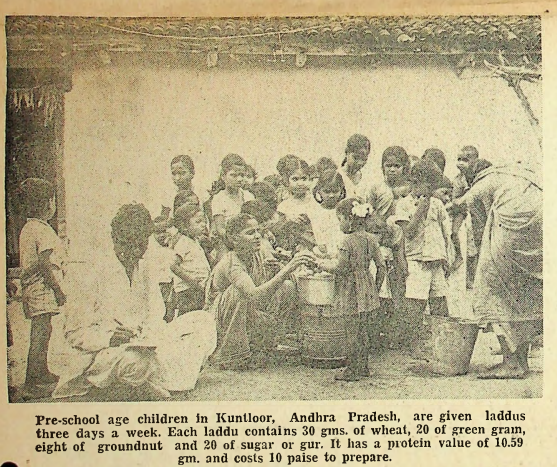
A little dal is added to this proteinless, low-calorie diet once or twice a week.

Most of the children participating in this and other experiments belong to families of landless labourers, whose constant companions are hunger and undernourishment.

Getting parents to send their children for treatment is a big problem. There are many dropouts, and when children fall sick their parents blame the feeding programme.



Pre-school age children in Kuntloor, Andhra Pradesh, are given laddus three days a week. Each laddu contains 30 gms. of wheat, 20 of green gram, eight of groundnut and 20 of sugar or gur. It has a protein value of 10.59 gm. and costs 10 paise to prepare.

Garden

At the villages of Kuntloor and Kohada nutrition is provided to children of pre-school age in the form of laddus three days a week. Each laddu contains 30 grams of wheat, 20 of green gram, eight of groundnut and 20 of sugar or gur.

Its protein value is 10.59 grams. It gives 300 calories of energy and costs 10 paise.

These nutrients are also turned into biscuits, a "prestigious" form of food in the village, but this is more difficult to prepare.

A keen supporter of the improved nutrition programme is Ramalinga Achari, the village schoolmaster.

The school has a large, well-tended garden, watered by an open well with an electric pump. The 75-foot-deep well cost Rs. 45,000 to dig and cement.

Mr. Achari grows a variety of crops, and his poultry yield eggs which he sells in Kuntloor and the neighbouring villages.

The institute manages a children's nutrition ward at Princess Niloufer Hospital for Women and Children in Hyderabad. It has a dozen beds.

Dr. Vinodini Reddy, the researcher in charge of the ward, told me the commonest ailment among children brought to her for treatment was edemas of kwashiorkor. Next came keratomalacia, rickets and anemias.

Ailment

A two-year-old patient from a distant village was blind and showed signs of edema. Her parents had taken her to a local vaid when she developed eye trouble, and this quack's "treatment" had worsened her plight.

One eye was completely lost, Dr. Reddy said, as the cornea was damaged beyond repair, but the other could be partially cured.

If the child had come two days later she would have lost even this eye, Dr. Reddy added.

Daily, one case of severe deficiency came to the hospital's out patient department, and it generally turned out to be the child of a landless peasant.

The diet given in the ward to victims of kwashiorkor is high in proteins and calories and comprises reconstituted skim milk, bread, bananas and sugar.

These nutrients are given as liquids at first. Later, rice and chapatis and other normal articles of diet are substituted.

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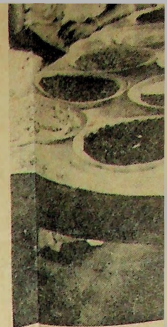

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KWASHIORKOR

NUT 4.31

Below is presented a figure which attempts to describe the relation of Kwashiorkor in a community to some of the factors which are responsible for it and to give some idea of their intricate relation to one another.

Fig. I:

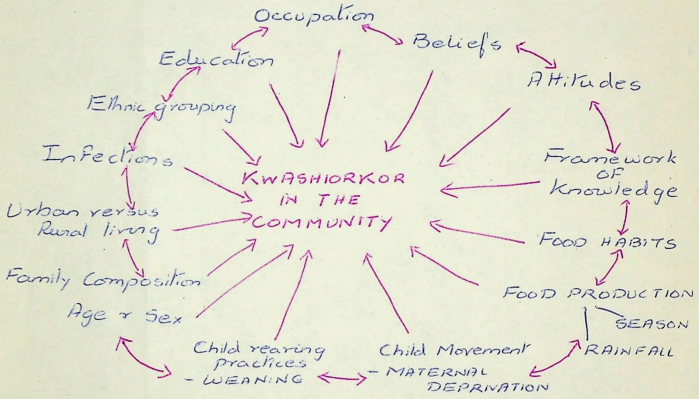
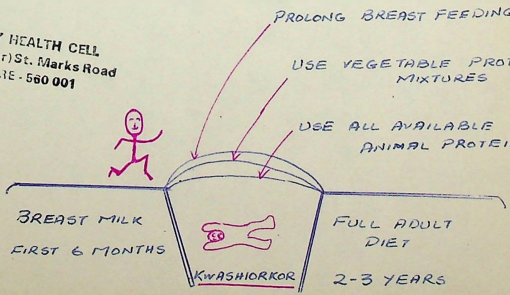


Fig. II:

THREE PLANK PROTEIN BRIDGE



... 2/

FIG II

If the child is not to fall into the river of Kwashiorkor in its second or third year, it must cross from breast feeding alone to a full diet on the three planks of prolonged breast feeding animal protein and zarg vegetable protein. To make the discussion more complete I would like to briefly mention the causes and the measures of prevention of Protein calorie Malnutrition in India.

Causes: PCM is mainly due to inadequate intake of proteins though it can also be due to many pathological states leading to defective absorption, defective digestion, defective utilization or loss of proteins from the body.

Inadequate intake is due to:

1) Economic Limitation: Due to poverty most families in India cannot afford protein rich foods which are relatively more expensive.

2) Ignorance of the Nutritional needs of the Child: Children are weaned from breast or bottle milk to starchy solids like rice and plantains.

3) Maternal malnutrition: All too often the childs malnutrition begins in the womb with the mothers own anemia and a protein calorie defficiency. These lead to birth of low birth weight and premature babies who are more susceptible to PCM.

4) Cultural Factors: There are number of taboos and superstitions attached to food in India. A large majority of the population are vegetarians and therefore eggs and meat are not eaten. Also though pulses (Dal) is high in protein value, it is rarely fed to the weaning infant because of the unfounded fears that it will cause digestive problems and eventual death.

... 3 /

5) Social factors: The classical example of social factor affecting the diet is that the shift with greater income, from rough rice to aesthetically more pleasing but nutritionally less valuable polished rice.

Another factor is the recent acceptance of powdered milk as a prestige of status symbol. The modern media of advertising have overplayed the value of milk powder. The successful use of bottle feeding by the well to do make the underprivileged feel that they are being denied the rights of modern living if they too cannot follow suit.

This leads to -

i) Early weaning of babies from breast to bottle feeds.

ii) Since commercial milk powders are relatively more costly for a lower middle class budget, mothers have a tendency to stretch a tin to last for longer than the required time. Thus the children get diluted milk. In the hospital on questioning it was found that some were giving their children upto 1/16th dilution.

iii) The lower middle class mother has neighter the money, the education, nor the kitchen facilities to prepare a safe sterile bottle feeds. The children therefore receive a dilute, contaminated mixture, low in nutrients and teeming with bacteria. The resulting triad of infective diarrhoea, nutritional marasmus and oral monilliasis is often fatal.

MEASURES IN PREVENTION:

I 1) Educational programmes in Nutrition at every level.

1) Antenatal clinics
2) Maternal and Child welfare centres
3) School teachers
4) Health centres
5) Community development centres
6) Agricultural agencies
7) Social workers, health visitors and public health nurses.

... 4 /

II Introduction of improved farming methods so that the food production is good and the protein requirements of the population are more easily met.

III Development of food Industries whereby protective foods may be made available at a reasonable sum cost to consumers - from local crops. A good example of such a product is MPF (Multipurpose food) a protein rich powder introduced by the CFTRI (Mysore) which consists of groundnut, flour and roasted Bengal gram.

IV Popularization of use of other foodstuffs rich in protein content like groundnuts, ragi and soyabeans.

V Mass screening for early detection of cases of PCM so that adequate nutrition and treatment may be started early and a complete follow up done.

VI Provision of Government sponsored mid-day meals in all educational institutions, orphanages, hospitals, which would supplement the home diet and provide other nutrients usually lacking in it.

VII Family Planning would be another indirect step in the prevention of PCM. Smaller families and better spacing would ensure a regular and good protein supply to each child without any strain on the family budget.

VIII Research work in the discovery of better and more easily available sources of protein food - especially for use in the underdeveloped countries.

LONDON SCHOOL OF HYGIENE AND TROPICAL MEDICINE

Department of Human Nutrition

NUTRITION LECTURES

Iron metabolism and requirements

1. Amounts of Fe in body

Normal adult male: (typical figures)	Haemoglobin	2400 mg
	Tissue Fe	350 mg
	Reserve Fe (ferritin and haemosiderin)	750 mg
		3500 mg

+ Plasma Fe carried (transferrin)

= about 50 mg/kg

Infant at birth	Total Fe content	300 mg

= about 80 mg/kg

Growth requires 25-50 mg/kg weight gain

2. Losses

Measured directly or by tracer methods

Normal adult: Male	(1mg/m)	0.9 mg/day (12% per year) (faeces 0.6, skin 0.2, urine 0.1) From cells of intestinal mucosa
Child	(0.5mg/m)	0.5 mg/day
Menstruation (~ 60 mgm per menstruation)		2.8 mg/day (averaged over the month)
Pregnancy, 1st half	(4 mg/m)	0.8 mg/day
2nd half		3.0 mg/day
Lactation		2.4 mg/day

3. Absorption of Fe:

Depends on

a) iron status of subject. Anaemic subjects absorb more. Subjects with iron overload less.
b) nature of food
c) infection reduces absorption

Factors in food which affect absorption:

Haem Fe (in animal foods) better absorbed than non-haem Fe (in vegetable foods) (10-20% absorbed, 5-10% absorbed) ∴ absorption enhanced by reducing substances viz. Glutathione

Inorganic Fe only absorbed in reduced form (Ferrous)

Inorganic Fe may form insoluble compounds, e.g. phytates (6 Poly groups which bind iron)

Requires acid medium. In Achlorhydria Iron deficiency occurs

Phytates - Found in cereal & husk. Brown bread and chappatis

However Yeast used in baking of bread breaks up phytic acid. This is not the case if chapattis. Hence Indo-Pak immigrants in U.K. have greater incidence of Anemia and osteomalacea

Protein enhances absorption of Fe, probably through binding with S-amino acids

In general, therefore, absorption better with a 'good' diet.

	Animal protein in diet % of calories	Efficiency of Fe absorption	
A	< 10%	10%	e.g. Vegetarian Diet of S. India.
B	10 - 25%	15%	Intermediate
C	> 25%	20%	Diet of developed country.

4. Requirements calculated by combining figures in paragraphs 2 and 3.

e.g. adult male on type A diet needs

$$0.9 \times 10 = 9 \text{ mg/day}$$

References:

WHO Technical Report Series no.405 (1968)
Nutritional Anaemias

WHO Technical Report Series no.452 (1970)
Requirements of ascorbic acid, vitamin D, B12, folate and iron

Iron Absorption in Infections of GIT.

Experimentally - i) Feed orally radioactive iron (Fe Ascorbate)
ii) Foods grown in " " (i.e. labelled)

Infections reduce efficiency of iron absorption

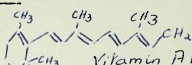
Copper - Studies in Peru - by Johns Hopkins Team.
Anemia in some children resistant to iron but respond to copper administration.

J.C. Waterlow

LONDON SCHOOL OF HYGIENE AND TROPICAL MEDICINE

DTPH, DTM & H and DCMT COURSES

NUTRITION LECTURES



Vitamin A

Vitamin A is the name used to include all biologically active forms of the vitamin.

Sources

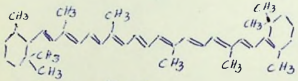
Retinol, vitamin A_1, is found in animal tissues.
Dehydroretinol, vitamin A_2, is found mainly in the livers of freshwater fish; it is much less common than retinol and less efficiently utilised.
β-Carotene is a yellow pigment occurring in green leafy vegetables and some fruits. It is an important dietary source of vitamin A, particularly amongst lower socio-economic groups in developing countries. 1/3 absorbed 1/2 of that utilised. Availability of carotene from vegetable foods is 50% or more.

Retinol equivalents

1 µg 'retinol equivalent' is equal to 1 µg retinol in the diet

OR 6 µg β-Carotene in the diet

OR 12 µg other biologically active carotenoids in the diet.



1 µg retinol is equivalent to 3.33 international units of retinol

OR 10 i.u. β-carotene.

Recommended Intakes (WHO tech. rep. ser. no. 362, 1967)

Age	Recommended Intake µg retinol per day
0 - 6 months	Breast milk of well-nourished mother (450 µg)
6 - 12 months	300
1 - 3 years	250
4 - 6 years	300
7 - 9 years	400
10 - 12 years	575
12 - 15 years	725
16 - 19 years	750
Adults (incl. pregnant women)	750
Lactation	1200

Absorption of Vitamin A

Retinol and esters (ie organic salts) of retinol are the most efficiently absorbed in healthy persons with normal fat absorption. Carotenes are water soluble and poorly absorbed. Raw, finely divided preparations and the presence of fat in the diet favour a better absorption of β-carotene. They need Bile salts. ©

Retinol → esterified → GIT → Absorbed as Retinol
→ re-esterified – then stored in Liver

Vit. A Requirements

Sheffield Study – Dietary regimen on 'conscientious objectors'

Retinol 390 μgm/Day could prevent night blindness
750 μgm/Day necessary to maintain plasma levels constant

β Carotene 1500 μgm/Day.
Maintain adequate plasma levels even though by accepted studies it is known that only 250 μgm/day of retinol would be available from the above quantity of β carotene.
– probably there is a compensatory mechanism which comes into action in these individuals

750 μgm/day – would also provide the foetus with its requirements when given to pregnant women.

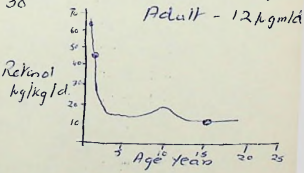
During Lactation – Breast milk contains 60 μgm/100 ml.
Normal output = 800-900 ml ∴ Daily loss of Vit A is about 400-450 μgm.
∴ Requirement during Lactation is 1200 μgm/Day

Estimated intake of Retinol in Breast-fed babies

WHO	End of 3 mths	End of 5 mths
Wt (kg)	5.7	7.3
Intake (μg/d)	420	420
Intake (μg/kg)	66	52

WHO Recommended Values
3 mths – 66 μgm/d
5 mths 58 μgm/d
Adult – 12 μgm/d

Indian		
wt. kg/d	4.7	6.1
	187	187
μg/kg	40	30



Effect of cooking

1. More finely chopped or 'pureed' the food better the absorption of Vit A.
2. Not much loss of Vit A even normal cooking time

Metabolic function of vitamin A

1. Vision (Beaton & McHenry, 1964) The aldehyde form of retinol is bound to the protein opsin forming rhodopsin in the rods in the eye. Light splits the combination, possibly exposing sulphydryl groups which may stimulate visual excitation.

2. Control of cell differentiation (Amer.J.clin.Nutr. 22 (1969) 1081) Vitamin A may control cell differentiation, possibly by regulation of protein synthesis, particularly (1) in those tissues where a rapid turnover of cell numbers occurs, and (2) those tissues involved in the synthesis of mucopolysaccharides.

Assessment of vitamin A status

1. Serum measurements

serum vitamin A:	deficient	<10 µg/100 ml	Keratomalacia
	low	10 - 20	Bitot spots
	acceptable	20 - 50	Studies in India
β-carotene:	deficient	<20 µg/100 ml	
	low	20 - 40	
	acceptable	40 - 100	

These parameters are applicable to all age groups but

(i) they are affected by dietary intake

(ii) they do not indicate the size of the liver reserves of vitamin A (90% in healthy person). No direct relation

(iii) serum vitamin A may be affected by impaired blood transport of the vitamin. — involvement of protein carriers

2. Dietary enquiry

Should be carried out where avitaminosis A is suspected.

Suggested Reading

Symposium 'Metabolic Function of vitamin A' Amer. J. clin. Nutr. 22 (1969) 975-1135.

Nutrition Vol. II Vitamins, nutrient requirements and food selection (1964). Eds. G.H. Beaton & E.W. McHenry. Acad. Press, London.

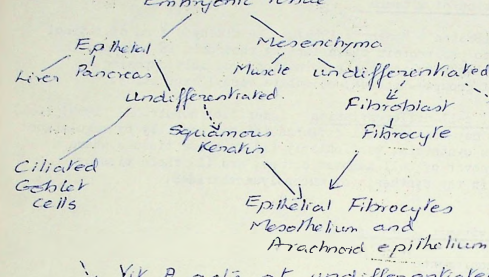
Nutrition Reviews (1971), 29(1), 3.

Deficiency of Vitamin A

1. Loss of Appetite.
2. Increased susceptibility to infections.

- Large doses of Vit A act not only as a nutrient but also as a pharmacological agent.
- Therefore effects of deficiency are not only reversed but other changes also occur.

① Hypothesis - Vit A control of cell differentiation



∴ Vit A acts at undifferentiated to basal stages and "squamous stage".

② Control of steroid synthesis.

Vit A for own development of Clast stages

CLINICAL SIGNS

Predominantly ocular - Night Blindness
Conjunctival Xerosis (subject to observer bias)
Bitot spots - commonly used as sign of deficiency in pre school children
Corneal xerosis
Keratomalacea

PROPHYLAXIS

1. Increase availability of green and yellow vegetables and fruits
   - requires other diet changes and ! social changes SLOW
2. Food fortification e.g Margarine
   EXPENSIVE
3. Administration of a single massive dose once or twice a year.

Amer. J. Clin Nutr. Vol 23 No 1 Jan 1970 p119-122 Sivakumaran MK et al

Indian studies began 1965.
Initially 8% of pre school ♀ deficiency signs.
Water soluble preparation 300,000 IU
Produce 25% ♀ side effects
Fever, irritability, - anorexia, vomiting
24 Hrs subsides.
Damages personal relations in community (not desired)

INTEGRATION OF A NUTRITION PROGRAMME WITH HEALTH AND AGRICULTURE

H. Volken

Introduction: In the Indian Social Institute Training Centre from which I come, we are trying to help full-timers in rural development from South East Asian countries to critically evaluate the work their organisation is doing. This requires first a critical understanding of their own society: What is the prevailing concept of under-development and development which is at the base of all development policies of their government? This sort of approach has made us all increasingly aware of the deeper causes which lay behind a process of change we call 'development', yet in reality is the development of certain strata in society only. In an unjust distribution of development gains we find the basic answer to the question: Why can the masses not be mobilised (blocking of motivation), why can the local resources not be tapped?

1. The issue of Justice

It is relevant to mention this in the introduction to our theme: Integration of a Nutrition Programme with Health and Agriculture. It is meaningful to link these three sectors together; but to be so more fully, these have to be placed into the totality of social reality of a country. I am very much impressed that this Seminar has been guided by a paper of high quality, indicating that those developing countries which have brought about a radical transformation of inegalitarian structures have been most successful in meeting the basic needs of the people despite scarcity of resources. Only in the context of this total transformation was it possible to create a new system of Agriculture and a new health system. An equitable distribution of increased food production and the priorities of the health-care-system eliminated basically the problem of malnutrition. The question is then raised: Where this re-structuring of society has not occurred: "Is it the fate of nutrition planners to be 'patient revolutionaries' biding his time with pilot projects and marginal influence". For us in India this question has a very realistic ring. What to say about the apparent new commitment of Governments to Nutrition Programmes which excludes however, the more decisive commitment to transforming unjust and oppressive social structures responsible for the constant widening gap between rich and poor? I'll tell you frankly my opinion: Within oppressive and unjust social structures creative participation of the people can never be what it should. The proof is the constantly increasing percentage of the people who are forced to live below the subsistance level.

In such a situation what real hope can integration of nutrition programmes with health and agriculture give? I believe the honest answer is in the saying: Better light a candle than curse the darkness. Symbolic islands can be created through this approach, provided it is based on a philosophy of immense trust in the

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capacity of the people. Where this real love of the people animates nutrition-programme-planners an approach which integrates nutrition with health and agriculture can make a great difference.

2. Example of a comprehensive rural health programme

I wish to give this example because it constitutes quite a sizeable island, covering a population of 40,000. It was initiated in 1970 by a doctor couple (Dr. Arole) in Jamked, Maharashtra, and covers about 30 villages. The project demonstrates it seems to me how best the Chinese model of comprehensive health-care can be implemented in a feudal society.

This comprehensive rural health project is guided by the three basic concepts of a) participation of the community
b) delegation of responsibility to lesser trained personnel
c) mobile health teams

Under Five Clinics are central to the activities of the project.. as one of the goals of the project is to reduce mortality rate of the under five by 50% within four years. Through these Clinics supplimentary feeding is carried out in most villages. The community takes the responsibility of providing fuel and utensils, they do the actual cooking. The stress of health education and the actual experience of improved health among the children has motivated the community to work for better water supply, and to set apart some land to grow food for this programme. The project is collaborating with agencies involved in agricultural development. But in comparison with another major project in this state, in Kanakapura Taluka, where the thrust has been in agricultural extension for small farmers, more than on nutritional programmes, the impact of increased agricultural production seemed to have remained small. Care of minor illnesses, health and nutrition education of the mothers, and immunisation programmes arranged by the villagers themselves, are other activities of these under Five Clinics. I do not think it necessary to give more details about the various other goals and activities of this project. Instead I wish to point out some of its characteristics which have impressed me most and which are relevant for our purpose.

a) Emphasis on the educational aspect of the programme

Not only the mothers but the whole community is exposed to continuous nutrition and health education. Not only the explanations given by health workers, but also the actual results of a programme in which many take an active part, achieve this result. I was much impressed by the villager, who has been trained as health educator, and wanders from village to village. He had a session in the village I visited. In a dramatic way he explained his charts to the villagers seated on the ground around him. Since I knew the local language, I myself got fascinated by his way of communicating, pointing out concrete examples of his reference among the audience. I understood that the best communicators are found among the people themselves.

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b) The people are made to understand that food-supply from outside was only meant as a starter. They would have to grow the food required for feeding programmes. Some members of the community did get motivated to donate some of their land.

c) The nutrition programme being part of a comprehensive health programme meeting the basic health needs of the people, supported by local resources (primary health workers, collaborators and material supplies), has a very strong demonstration effect. As child mortality declined, motivation for planning the family became effective.

d) The educational impact of the programme is very much strengthened by the central role of the local permanent workers who are fully identified with the community. Much of the training of other health and nutrition workers is also given locally. They escape thus getting alienated from the people through a sophisticated training in a city. Experience has shown that team-members trained in city-conditions, tend to leave this rural areas soon again.

Evaluation: The Jamked project shows the possibility of creating health through a comprehensive approach in which community teams, inspired by dedicated animators (the Aroles) are able to bring to life the participation of the village communities. The remarkable success of the project and the spirit which animates it, has encouraged many other groups in India to launch similar ventures. Just now a new team of medical mission sisters is reaching out into the area bordering on Jamked. Dr. Arole told the sisters: "Do not imitate the Jamked project, you can do better; be creative." Provided success does not blind the groups involved to the fact that they are still up against formidable obstacles, rooted in the unjust structures of ownership of land and concentration of political power in the hands of a minority, they are doing a highly meaningful service to the people. Though they have to work within the constraints of the prevailing structures, reflected in the caste-system, they are instrumental in expanding the educational processes in a direction which will make people more critically aware of the still deep rooted elements of a highly inegalitarian society. It might be worthwhile to discuss whether or not such a comprehensive approach can and should evolve further into genuine conscientization leading ultimately to the emancipation of the masses.

3. Food for Work

I had the opportunity to listen to your first reports on programming concrete projects. In all of these food for work had an important place.

What is surprising about food for work programmes is that some look upon them as a curse, others as a great blessing. When visiting in Maharashtra, a massive food for work project, I was much impressed by hundreds of men and women constructing percolation tanks that would greatly increase the agricultural production. A few critical questions, however, brought out a

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a number of serious drawbacks of the programme. Nutrition education was totally absent; more serious: the land below the percolation tanks belonged to the richer farmers of the villages. And an accident of lorries with grain having been diverted to the market of a nearby township, still further darkened the picture.

As I wish to elicite discussion, on what the conditions for a good Food for Work Programme are, I cite another case. Over thousand men and women have been involved in a programme which lasted several years. It was greatly effective in increasing agricultural production in the area. A network of channels were dug which would bring the water from the main canal into the fields of the farmers: fields were levelled and bunded. All excellent on first inspection. But there were non-intended effects. The earning capacity of the farmers was increased permanently through the labour of this army of workers. These, however, after completion of the project were back where they were initially: in poverty, unemployment and helplessness. The inequality gap between them and the farmers had been widened as a result of the project. This case demonstrated how linking of Food for Work and agricultural development needs a good deal of political wisdom to be really contributing towards genuine development. The question as to what impact such programmes have on the social structures of society cannot be ignored. I am sure that many of you have been connected with such projects which really improved the productive capacity and the income of the beneficiaries themselves. I too, know many such projects.

A friend of mine visited recently some region of Andhra Pradesh. On his return he wrote to me: "I was shocked to see how priests and sisters have become corrupt in handling development projects. He was not referring explicitly to Food for Work Projects. But the problem is common to all development work. If our preoccupation is only in terms of efficiency, of effective programming etc., there will be a missing link. Development programmes, however well conceived, do not automatically bear fruits of justice, integrity and responsibility. It is strage that so many organisations which go under a spiritual name pay so little attention to this. I am including the organisation to which I belong. We expose a host of people to responsible work, supply them with lots of material inputs, and expect them to be good and honest without helping them to discover motives to be so. Exposed to a host of pressures it is not easy to swim against the stream, especially with the increasing shortage of food-stuffs and constantly rising prices. Food For Work programmes are to a high degree vulnerable and expose the persons handling them to the pressures mentioned, in an atmosphere of wide-spread corruption and of 'let me get up' philosophy.

4. The Educational Dimension

The linking of nutrition, health and agriculture has the advantage that all three sectors demand primary emphasis on educational processes if they have to build up new people with new ways of

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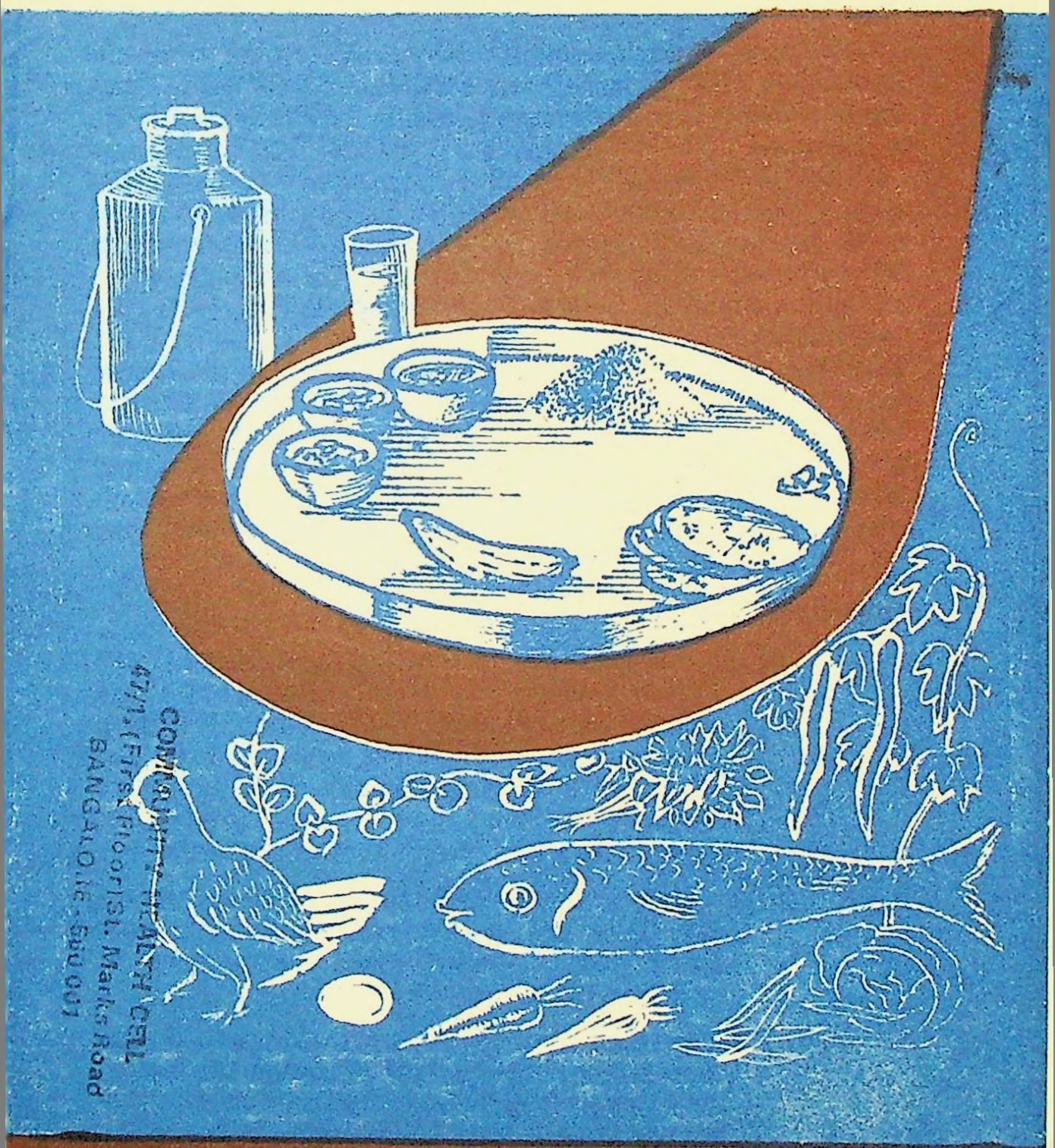
feeling, thinking and acting. You know much more about the nature and methods of extension education related to these three sectors than I do. But the best extension education can still miss the ultimate worthwhile goal of building a community, a horizontal solidarity, of helping a new spirit of collaboration and sharing to be born. Mere achievement motivation which results from successful experience in 'keeping my child health, producing more on my fields' risks to be infected with striving for egoistic social advance, which is the root-cause of underdevelopment understood in depth. Everywhere we see that the same processes which push up some, keep others down.

The following happened in North India: Under the guidance of a priest the Santals had transformed a jungle area into fertile fields. They had built, with Food For Work an earthen dam in a valley close to their settlement. The monsoon broke in. Heavy rains poured down incessantly. Suddenly in the middle of the night shouts resounded: "The dam is bursting", men and women ran out of their houses in the direction of the dam. They worked the whole night, filling bags with sand to strengthen the dam. The priest was with them and all got wet to their skin. In the morning the dam still stood. They had made it together. "During this night the community was born", commented the priest in narrating the story. How can such community experiences become educational processes within programmes of nutrition, health and agriculture? This seems to be a critical question if our long-term goal is the creation of a new society, in which dignity and equality and participation is deeply experienced within human organisations and institutions. It is my personal conviction that any organised intervention risks unconsciously to serve the interests of those who have control over societal institutions, unless it is clearly guided by long-term goals of a more just and more human society. Every intervention, however small it may be, affects the process of change in society. It either is supporting a process leading to increasing-inequality, or it belongs to the counter-forces inspired by counter-values, and which do have a relevance for a change towards greater social justice.

You may remember the passage from Solzhenitsyn's novel 'The Inner Circle'.... about the sheep producing more wool because of being better fed. In explicit terms it means: mere extension education, however important it is, not accompanied by 'political education' gained by people organising themselves, establishing their own institutions, e.g., for credit, marketing, etc.,(reflecting on the causes of their having little say in policy formulation of political bodies at various levels), risks to support the existing power structure. Social workers are easily 'used' by politicians. And the greatest illusion would be to think that Nutrition Programmes are neutral, having no political consequences. Politicians may be interested in Nutrition Programmes (nationally and internationally) for "political reasons".. which in plain language means: for the purpose of "feeding" rather than for the purpose of emancipation and liberation, which really would serve the interests of the people.

* * *

APPLIED NUTRITION PROGRAMME



COMMUNITY HEALTH CELL
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HIGH WAY TO HEALTH

APPLIED NUTRITION PROGRAMME

It is time we bestow a little attention on Scientific knowledge that is now available about "FOOD" with fresh concepts and applications, and if only this knowledge is 'applied', it is certain that 'MALNUTRITION' and 'UNDERNUTRITION' shall be things of the past. The right types of highly nutritious—and cheap foods have got to be produced, preserved and consumed—more especially by children, pregnant and nursing mothers, which should ultimately become everlasting habits with the individuals in particular and the community in general. In a broad sense, it is just this that the much used term "Applied Nutrition Programme" envisages, and with the effective implementation of this programme almost all over the nation, such serious effects of malnutrition and undernutrition like blindness amongst children, permanent crippling and other preventable tragedies could turn out to be only unpleasant memories of the past.

Objectives :

(i) To develop progressively a co-ordinated and comprehensive National Programme of Education and Training in Applied Nutrition Programme and related subjects with the object of stabilizing effective field service to improve the local diet through production, preservation and use of protective foods,

(ii) To ensure effective utilization of these protective foods by the vulnerable group of population like, pregnant and nursing mothers and pre-school children,

(iii) To promote through demonstration and education among the village communities sound and hygienic practices for production, preservation and use of protective foods, and

(iv) To provide facilities for training in Nutrition of various personnel involved in the implementation of the programme.

At this stage it would be necessary to know at least in brief, the various consequences of nutritional deficiencies to appreciate better the various aspects of ' Applied Nutrition Programme '.

DEFICIENCY DISEASES
MALNUTRITION AND UNDER-NUTRITION

Lack of foods	*Deficiency*	*Disease conditions*
Milk, Pulses (Grams) Egg, Fish and Meat.	Proteins	' Kwashiorkor ', - growth failure - oedema- anemia. Skin and hair disorders and liver diseases.
Green leafy vegetables like amaranth, drumstick leaves, etc., Fruits like Gauva, pappaya, Milk and its products.	Vitamin 'A'	Eye disorders - Night blindness - ultimately even total blindness tooth troubles - Skin diseases, etc.,
Un - polished Rice, Vegetables, Meat products, pulses, etc.	Vitamin 'B' complex	Beri Beri - stomach and intestinal upsets sore mouth — Diarrhoea — impaired digestion, etc.
Fruits like Oranges, Tomato, Amla, Guava, etc.	Vitamin 'C'	Bleeding Gums, Scurvy, extreme weakness, lassitude, anaemia, etc.
Milk, Eggs, Cod liver oil, Butter, etc.	Vitamin 'D'	Bone Diseases - specially in children, and pregnant mothers (Rickets and Osteomalacia, Tooth troubles, etc)
Milk, Green leafy Vegetables and other Vegetables.	Minerals like Calcium & Iron.	Poor formation of Bones and Teeth, anaemia, General weakness.

The diseases mentioned above are few of the main important conditions and for every frank nutritional deficiency, there will be many more who will be suffering from other minor ailments due to undernutrition and malnutrition. Accordingly the Applied Nutrition Programme will enable every concerned village community to appreciate the needs of various types of nutritious foods—particularly for the vulnerable group like children, pregnant and nursing mothers, and how best to produce and consume each one of them locally.

HOW THEY HAVE DEVELOPED

The various activities under the 'Applied Nutrition Programme' are being started under a phased programme in many parts of the country specially in selected community Development Blocks involving hundreds of villages and lakhs of people and Mysore State has been no exception to this ; already the various activities have reached definite stages and are progressing well in a total of 24 C. D. Blocks, selected till now in Mysore State for all types of activities like poultry, fisheries, school gardens, community orchards, etc., apart from establishing supplementary feeding Centres. The programme is also assisted by UNICEF, WHO and FAO.

The Taluk Board will be responsible for carrying out the programme and the Block Development Officer through his technical staff will be responsible to provide technical advice and assistance to the village Communities associated with this programme and will be responsible for implementing this programme in all its stages. The staff of the Primary Health Centres and M.C.H. centres in various blocks will help to identify the important Nutritional deficiencies, advise on Nutrition and Diet problems, and take part in training programmes.

I. Food Production :

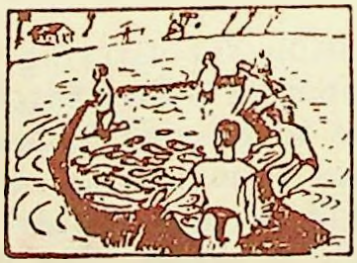
Vegetables and fruit production are through the establishment of School gardens, community gardens and Orchards, home or kitchen gardens in villages. The above will get assistance from the Government in the form of seeds, etc., till they become self contained. The produce will be used for supplementary feeds in Feeding Centres.

Poultry and Egg Production :

The Villages are assisted to start poultry units with advanced poultry farming practices--(1) 60 hens and 6 cocks are supplied initially by the Governmental agency. (2) Subsidies for specially built Poultry houses in the Village Panchayat and Taluk Board. (3) Free balanced rations to feed these birds for one year are also given by Government.

A portion of the eggs produced will have to be used for supplementary feeding in the local Mahila Mandal or Balawadi Feeding Centre and the rest can be sold with the ultimate object of being self contained.

Fish Production :



Village Fish ponds are established with the Governmental assistance in the form of cash loans, fingerlings, and technical guidance to the Panchayat. In addition, the UNICEF' is providing 'Nylon Webbing' and other supplies with equipment. The village panchayats should use a certain quantity of fish for supplementary feeds to children, pregnant and nursing mothers and the balance may be sold to reimburse the finances of the Village Panchayat.

Milk Production :

For purposes of increased Milk Production by the farmers themselves in each village, establishment of intensive pilot projects under 'Applied Nutrition Programme' are envisaged. At present UNICEF have been supplying Milk Powder to be used in feeding Centres with Eggs, Fish, Vegetables and Fruits.

II Consumption :

Consumption of the foods produced above in the Mid-day meals, in feeding Centres of Mahila Mandals and Balawadies in different villages thus becomes a practical possibility with the ultimate aim of educating the community at large.

III Training :

The training camps are arranged on Applied Nutrition Programme for all categories of personnel (both official and non-official) who are involved at different levels-State, District, Taluka and village level.

IV Education :

All methods and media are used for Nutrition education. Printed Educational materials are to be sent to various agencies with a view to educate both staff and the community at large, as to the varicus aspects of 'Nutrition'.

Such a co-ordinated. comprehensive National programme needs a close liaison between various Departments.

The 'Applied Nutrition Programme' is the peoples, programme and with their co-operation its object will be achieved for promoting health, happiness and prosperity of the individual, family, community, village and the country as a whole with Mal-nutrition and undernutrition turning out to be things of the 'PAST'.

WD P4599—GPB—25,000—23-11-67

NUTRITION PROGRAMME FOR CHILDREN.

Introduction:

Malnutrition and under-nutrition constitute serious hazards to the growth and Development of children in our country, particularly infants and pre-school age children. Recent surveys indicate that nearly two thirds of expectant mothers and pre-school age children belonging to poor sections of the community residing in backward areas suffer from serious malnutrition. Along with the unsatisfactory conditions of hygiene, environmental sanitation and control of communicable diseases, malnutrition and under nutrition rank as major secondary causes of the high mortality and morbidity which still continue to prevail among children. The Government of India have, therefore, decided to give high priority to the problem of nutrition among children in the Fourth plan. This considered as is basic to the programme of welfare for children.

2. Infants and pre-school children are, from the point of view of nutritional deficiencies, the most vulnerable segments of our population. During this period in an individual's life, the foundations of health for the adult age are laid and, therefore, any serious damage sustained during this period quite often produces irrevocable effects. Unfortunately, malnutrition is widely prevalent among the vulnerable sections of the population in the country, specially among the age group 1-5 years. The mortality and mordbidity rates among this section are exceedingly high. Mortality in this age group is 40 percent of total mortality in the country as against 6 to 8 percent in development countries.

3. Besides the problem of under-nutrition among children belonging to the lower socio-economic groups of families, the problem of malnutrition manifests itself in the form of proteincalorie malnutrition, anaemia and Vitamin A deficiencies. Recent Surveys carried out in different parts of the country under the auspices of the Indian Council of Medical Research and the State Nutrition Divisions indicate that out of about 100 million children in the age group of 1-5 years, about 50 percent suffer from protein-calorie malnutrition in one form or other. Blindness caused by Vitamin 'A' deficiency is also common in the southern and eastern parts of the country. The social cost of such malnutrition is heavy because the State has to incur large expenditures for the rehabilitation of the handicapped children in later life. It is therefore necessary to have a supplementary feeding programme for pre-school children, especially whose belonging to the vulnerable sections of the population.

The Fourth Plan:

4. The Fourth Plan provides for an integrated nutrition programme. Where so many are under nourished, more food is the first step towards better nutrition. The nation wide endeavour to develop agriculture along with animal husbandry and fisheries should be regarded as the base of all effort in nutrition. While this is so, the important problem remains of widerspread malnutrition among certain vulnerable categories of the population specially children in the pre-school ages and among school children. This problem needs to be specifically tackled.

5. The Fourth Plan includes the following schemes under different Ministries/ Departments, for promoting nutrition among children.

Programme	Out lay (Rs. Crores)	Beneficiaries (In Lakhs)
i) Nutrition programme for pre-school children (Department of social welfare.)	6.00	21.5
ii) School feeding programmes Ministry of Education & Youth Services)	19.18	150
(a) Prophylaxis against nutritional aneamia in mothers and children.	4.05	40
(b) Control of blindness in children caused by Vitamin A Deficiency (Department of Health & Family Planning)	1.02	160
iv)(a) Applied Nutrition	10.00	(To cover 450 CD.Blocks)
(b) Composite programme for Women and children (Department of Community Development)	6.00	(To cover 1200 CD.Blocks)

iv) (a) Production of Balahar & low-cost protein food.	7.70	(2.5 to 3 lakh tonnes)
(b) Production of weaning food	0.20	
(c) Pilot plan for protein isolate toned milk (dept. of food.)	0.40	
Total..	53.55	

1970-71 Budget:

6. The year 1970-71 will mark an important begining in providing nutritional services to pre-school children belonging to the vulnerable groups of families in the country. In addition to the Fourth Five Year Plan Programmes for nutrition, a special programme of nutrition to cover 20 lakh children in the age group 0-3 years in tribal blocks- and in slum areas of cities will be intiated in the 1970-71 budget.

The Special Programme:

7. It has been decided to introduce a special programme to cover 10 lakh children in tribal areas and 10 lakh children in the slum areas of metropolitan cities. There are 489 tribal development blocks in the country, besides a number of concernrated pockets of tribal population in very backward rural areas. The Maternity Child Health Centres and Family Planning Welfare centres situated in these areas will be made use of for supplying the nutrition to children. Similarly ten lakh children in the age group 0. to 3, residing in the slum areas of metropolitan cities, who are in most urgent need of supplementary nutrition to ensure normal growth and development, will be supplied with nutritive food.

8. As children in the age 0-3 years require different types of food as well as different levels of nutrition, it is proposed to provide the following by way of supplement to the food they get in their homes.

For children between 0 to 1 year.	Twelve of skimmed milk powder re-constituted, providing 120 calories and 12 grams of protein per day for 250 days in a year.
For children between 1 to 2 years.	One unit of skimmed milk powder reconstituted, plus one unit of processed or prepared food, giving 300 calories and 12 grams of protein per day, for 250 days in a year.
For children between 2 to 3 years.	One unit of processed or prepared food giving 300 calories and 13 grams of protein per day, for 250 days in a year.

9. It is sestimated that one unit of nutritious food given in different forms per child per day would cost Rs. 40 per year (of 250) days per child including administrative and transport costs. It would require Rs.4 crores to cover 10 lakhs children in tribal areas and another Rs.4 crores to cover 10 lakhs in urban slums. As it will take some time for the expenditures to come up to this level in 1970-71 an anitial provisions of Rs. 4 crores has been included in the budget.

Nutrition programmes for children in the age group 3 to 5 years through Balwadis:

10. The Programme of Nutrition for children in the age group 3 to 5 years, which has already been included in the Fourth Plan, is being initiated during 1970-71 with the help of existing Balwadis run by voluntary organisations as well as by Tribal Welfare and Harijan Welfare Departments in different States. The nutritional contents of the Programme would provide 300 calories and 15 grams of protein per day per child for 250 days in a year. On an average the contents of food would have two ounces of cereals and one ounce of pulses costing 15 paise per day per child. Supervision costs will amount to 1 paise per child per day. Whereever local food is available efforts will be made to encourage local voluntary organisations to look after the preparation and supply of food to children. In areas where local food is not easily available, it is proposed to supply processed food in the form of Balahar; the raw material for preparation of Balahar is likely to be supplied free of charge of CARE with the cost of preparation and administrative charges being met from the budget.

11. It has been decided to provide Rs. 20 lakhs for this programme in 1970-71 by way of a beginning. This provision will benefit about 68,600 children in the age group 3 to 5. The existing Balwadis in Family and child welfare projects and those run by voluntary social welfare organisations receiving grants from the Central Social Welfare Board and those promoted in tribal Welfare and Harijan Welfare, will be made use of in supplying nutritional services to children.

12. School feeding programme:

The programme of mid-day school feeding programme to provide free meals to children in the elementary stage of education was initiated in 1962-63 as a Centrally sponsored programme by the Ministry of Education. The programme was initially started in five states, viz., Andhra Pradesh, Kerala, Tamil Nadu, Punjab and Rajastan. By now all States except Jamu & Kashmir and Nagaland are operating this programme. In the Fourth plan these programmes are being implemented in the State sector and Central assistance to the States for the purpose is included in the plan assistance for developmental purposes. It is estimated that 98.7 lakh school children in the age group 5 to 11 years and 21-3 lakh children in the age group 3 to 5 years received the benefit of mid-day meals at Primary Schools during 1969-70. The State-wise distribution of children covered in this programme is furnished below for 1969-70.

(In lakhs)

State.	School children.	Pre-school children.	Total.
1. Tamil Nadu	16.00	1.00	17.00
2. Kerala	16.00	3.00	19.00
3. Andhra Pradesh	6.00	0.05	6.05
4. Mysore	8.00	4.00	12.00
5. Orissa	5.95	0.02	5.97
6. Madhya Pradesh	2.25	4.50	6.75
7. Uttar Pradesh	6.50	..	6.50
8. Rajasthan	3.50	0.050	4.00
9. Punjab	3.00	0.75	3.75
10. Gujarat	2.40	0.95	3.35
11. Bihar	5.00	-	5.00
12. Maharashtra	6.00	0.75	6.75
13. West Bengal	15.60	5.00	20.60
14. Haryana	2.50	0.75	3.25
Total...	98-70	21.27	119.97

The Programme will be continued in the Fourth plan.

Nutrition Programme for children under the Ministry of Health, Family Planning & Urban Development:

13. The Programme of nutrition for children under the Ministry of Health, Family Planning and Urban Development covers three major schemes viz (a) Skimmed milk feeding through Maternity and Child Health Centres, (b) Prophylaxix against Nutritional Anaemia and (c) Prophylaxis against Blindness through Vitamin 'A' Deficiency. The details of the services provided in these schemes are the following:

a) Skin milk feeding programme through health agencies:

In the last 15 years, UNICEF has been supplying skim milk powder for supplementary feeding programme of infants, children, pregnant and lactating mothers through health agencies. The States bear the expenses for transport and distribution. At the present time about 5,000 tonnes of skim milk powder are distributed annually to about 5 lakh beneficiaries, through primary health centres. Care is expected to continue this assistance with the withdrawal of UNICEF.

During the year 1970-71, 5 lakh children in the age group 0.3 years will continue to get the benefit of this service.

b) Prophylaxis against Nutritional Anaemia for Mothers and Children:

The scheme seeks to provide preventive measures against nutritional anaemia in mothers and children by administering ferrous sulphate (Iron) and folic acid through maternity and child Health and Family Planning centres.

During the year 1970-71 it is proposed to provide Rs. 40 lakhs to cover 30 lakh children with this service.

c) Prophylaxis against blindness in children caused by Vitamin 'A' Deficiency:

A scheme for controlling blindness in children caused by Vitamin 'A' Deficiency is being implemented by the Department of Family Planning Ministry of Health during the foruth Five year plan. During the 1969-70 16 lakh children are proposed to be covered by this scheme. Vitamin 'A' capsules of high dosage would be administered to the children through M.C.H. and F.P. Centres. The Plan outlay for the scheme is Rs. 40 lakhs.

During 1970-71 Rs. 8 lakhs will be provided to cover 16 lakh children with concentrated doses of vitamin 'A' in the form of capsules.

Programmes for the production of Nutritive Foods under Foods under the Department of Food.

14. Balahar:

a) In the Balahar programme the Wheat required for the manufacture of Balahar is supplied by Carc while the cost of edible groundnut flour and an equivalent quantity of milo or other food grains is met by USAID. The Govt. of India incur the expenditure on progessing the raw matterials and the cost of vitamins and minerals and flavouring agents.

The fourth plan includes a provision of Rs. 6.7 crores to produce 2.5 to 3 lakh tonnes of Balahar to benefit 17 million children. The 1970-71 budget includes a provision of Rs.50/- lakhs for this programme.

Weaning Food:

b) The weaning food is comparable to Balshar in nutritional qualities but has the advantage that it is pre-cooked and has a long storage life. It will fill the need for low cost protein rich food for commercial marketing. One suit has been developed in collaboration with Kaira District Milk Procedure co-operative Union Anand with the assistance of UNICEF and USAID for the production of nutritious low cost pre-cooked weaning food utilising largely vegetable protein foods. The production of this food has started recently on a piolt scale and the marketability of this product has been assessed and it is found that it has great potentiality.

Protein Isolated Toned Milk:

c) The object of this project is to encourage the use of oil-seed protein isolate in toning milk thereby significantly stretching the country's milk supply and lowering the cost of milk to the consumer. The Department of Food have already taken up two piolt projects at Bangalore and Madras Dairies with the co-operation of CFTRI, Mysore, rospective State Governments and the United Nations Children fund. The two units are producing 1000 litres of vegetable toned milk per day which are mainly used in the school feeding programme.

Conclusion:

15. To sum up, the Nutrition Programme for children, under different heads, will have the following coverage in 1970-71.

1. Special programme of nutrition under Department of Social Welfare.	Rs. 40 laksh.	20 lakh children in the age 0 to 3 years.
2. Nutrition programme for pre-School children under Department of Social Welfare.	Rs.20 laksh.	68,600 children in the age of 3 to 5 years.

School feeding under the Ministry of Education.	Rs. 297 lakh .	21, 27,000 children in the age of 4 to 5 years.
4. Skim Milk feeding Programme under the Department of food.		5 lakh children in the age of 0 to 3 years.
5. Prophylaxis under nutritional anaemia under the Ministry of Health.	Rs. 40 lakhs.	30 lakh children.
6. Prophylaxis against blindness caused by Vitamin A Deficiency in children under the Ministry of Health.	8 laksh.	16 lakh children.

16. The Nutrition Programme will thus cover 20 lakh children in the age group 0 to 3 years. 21.94 lakh children in the age group 3 to 5 years and 98.7 lakh children in the age group 6 to 12 years during 1970-71. This will provide a sound foundation covering a sizable population of children on which an extensive programme of nutrition could be built up in the remaining years of the Fourth plan.

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HIMMAT investigates

FOOD ADULTERATION

YOU ARE BEING slowly POISONED

HIMMAT investigates

You are being slowly poisoned

Report by Najmi A. Ajmerwala

TOGETHER with smuggling, hoarding and the like, food adulteration is a flourishing, illegal business in India. With a small investment, the food adulterator makes huge profits. For example, if an oil merchant uses even one per cent of argemone oil to adulterate edible oil, his yearly profits could be nearly Rs 50,000. In India, food adulterators reap a yearly profit of over Rs 500 crores.

A third of all the food marketed in India is adulterated, says a Health Ministry survey. It could be even more.

Art of adulteration

With the growth of knowledge and advancement of science, adulteration, which is as old as commerce itself, has developed from a crude form into almost a branch of applied science. The adulterator is no longer the simple milk seller adding water to milk (or vice versa). The modern adulterator has at his command a vast variety of adulterants with which to adulterate innumerable foodstuffs; and he uses them with such skill and finesse that adulteration has almost become a fine art too—a very profitable one at that.

Prohibited dyes, poisonous substances like argemone oil and white oil in edible oil, washing soda in powdered sugar and prohibited artificial sweeteners in soft drinks are but a few of the dangerous adulterants used by unscrupulous traders out to make a fast buck.

Spices and masalas are among the foodstuffs most commonly found adulterated. The list of adulterants ranges from comparatively harmless powdered husk in coriander powder to lethal lead chromate in turmeric (type of ginger). Sometimes metanil yellow and other prohibited dyes, suspected to cause cancer, are used to colour turmeric and chilli-powder. Besan, which is used extensively in cooking, is often adulterated with kesaridal which contains toxic matter that can cause paralysis of the limbs.

Other common adulterants in use are: ground stone particles in food-grains, vanaspati in ghee, iron filings in rawa, chicory in coffee and metanil yellow in sweetmeats.

The list of adulterated foodstuffs is endless; be they in the form of whole grains, powdered spices or liquids such as milk, juices and squashes. In fact, nothing is spared.

This tribe of adulterators is certainly an ingenious lot. Rumour has it that there is a factory in South India which produces pebbles especially designed to resemble rice grains. Such ingenuity can be, and is, applied to other articles also. For example, papaya seeds are often mixed with pepper corns, which they resemble in shape, size and colour. Only a minute scrutiny can detect such deception.

Even if the adulterants used are harmless, they still serve to lower the nutritional value of the food consumed to a level far below that required for normal health. The health of the masses, already rendered poor by nutritional deficiencies, is thereby further harmed by the cumulative effect of adulterated food. Also, the consumer pays prices which are out of proportion to the production costs and to the weights and measures he receives.

When the adulterants used are harmful (as they often are), they can cause serious diseases and even death. In 1969, adulteration of edible oil with argemone oil resulted in the deaths of two people in Poona besides making 60 seriously ill. In 1972, in a district near Calcutta, nearly 400 people were afflicted with paralysis after consuming mustard oil adulterated with white engine oil.

Drive for more prosecutions in Maharashtra

	1972	1973	1974 (up to Sept.)
No of food sample analysed	24,540	20,006	17,625
No of food samples found adulterated	4032	4693	2376
Percentage of adulteration	16%	23.46%	13.55%
No of prosecutions launched	2530	1918	2049
No of convictions	1164	304	982
Fines realised	—	Rs 153,251	Rs 573,728

Source: Food and Drugs Administration, Maharashtra

HELP the Food and Drug Authority in checking food adulteration. The FDA acts swiftly on consumers' complaints. Readers in Greater Bombay who suspect food adulteration can just drop a line to the FDA office at Griha Nirman Bhavan, Opposite Kala Nagar, Bandra, Bombay 400 051, or dial 536321 and lodge a telephone complaint. You need not give your name. Let your charges be genuine and addresses of the shops complete.

Loopholes in Law

As long ago as 1954, the Prevention of Food Adulteration Act was enacted in Parliament with the hope that the Act would deter adulterators. But it was not to be so. The loopholes in the Act are so wide that they have often enabled guilty offenders to go scot-free. To this day no punishment has been meted out to those responsible for the Poona tragedy. As a matter of fact, the maximum sentence of six years rigorous imprisonment with a fine is not known to have been given even once.

In Maharashtra, a bill was introduced recently in the state Legislative Council which proposes to change over administration of the Act itself from the local authorities to the Food and Drug Administration (FDA).

At present, the FDA has 200 food inspectors on its rolls. They go around the state inspecting shops and collecting samples from manufacturers, wholesalers and retailers. Samples are also being taken from inter-district check-posts, hospitals, schools and other institutions. The Assistant Commissioner of the FDA, Bombay Circle, told me that the emphasis of the FDA is on the manufacturers and the wholesalers rather than on the retailers. The FDA maintains seven other circles in Maharashtra. It works in close collaboration with social service organisations, notably the Consumer Guidance Society of India.

The Act gives wide powers to the food inspectors. They can enter any shop to inspect any food articles suspected to be adulterated or wrongly branded. They may even exercise the powers of a police officer in ascertaining details. But all these powers are of no avail when they are expected to produce witnesses to prove their case. Prosecutions launched often fail because of the lack of reliable witnesses whose evidence will carry conviction in court. Often the food inspectors are themselves not careful enough in preparing the prosecution case. In a recent case, the Supreme Court set free an alleged offender just because the inspector did not send the stipulated quantities of samples for testing to the public analyst.

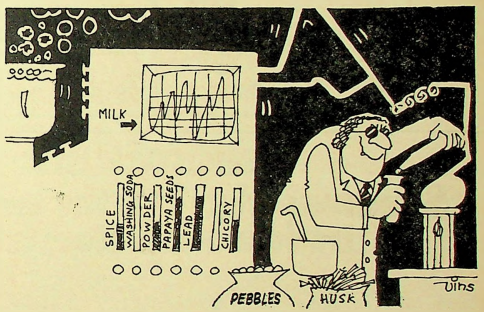
Delaying procedure

Before prosecuting a defaulter an elaborate procedure has to be observed.

On raiding a shop, the food inspector has to divide the article of food into three separate portions in the presence of at least one independent witness. One portion is given to the shopkeeper, another is sent to the public analyst and the third is retained by the inspector. The public analyst is obliged to send his report within sixty days of the receipt of the sample. Once this report is received, the food inspector files the case in court.

During this procedure delays occur at the various stages involved.

Delays occur when the food samples are sent to the laboratories for analysis because the laboratories are short of staff and equipment. For example, the laboratory in Bombay which examines around 12,000 to 13,000 cases every month has only 27 analysts, while it needs at least 15 more. Furthermore, the laboratories lack even basic equipment. For example, the one in Bombay needs a short and long-wave ultra-violet lamp which can detect a wide range of adulterants like colours and sweetening agents.



The modern adulterator

In the absence of more district-level laboratories, the six city-level laboratories in Maharashtra have to analyse samples from all over the state. Samples picked up at Nasik, Sangli, Kolhapur and Thana are sent to Poona. Each laboratory is thus so overloaded with work that it is not able to deal with cases as speedily as it should.

Delays also occur while filing a case. As the PFA Act, 1954, does not provide a time limit for filing a case, complaints are filed as much as a year after the sample is taken. The resulting delay also affects the prosecution case in favour of the accused.

In one case regarding adulterated butter, the interval between the date when the sample of butter was taken and the date of filing of the complaint was six months. But butter remains in a condition fit for analysis for three to four months at the most. Consequently the Bombay High Court held that the accused could not be penalised since the sample of butter had gone bad by the time the complaint was filed.

Besides the PFA Act, 1954, the Prevention of Food Adulteration Rules, 1955 (Central), and various state rules have been framed to arm the Government with adequate power to check food adulteration. In accordance with the PFA Act and the related rules, samples are being drawn and analysed and offenders hauled into court.

In Maharashtra alone, 17,652 samples were taken from various places in the first nine months of 1974. Of these, 2376 samples (13.55 per cent) were found to be adulterated. All over the state, 2049 prosecutions were launched, but more than 50 per cent of the accused were acquitted. Of the 982 convicted, 899 were awarded

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FOOD ADULTERATION — from page 13

punishments and fines amounting to Rs 573,728 were realised.

The figure of the fines realised in the first nine months of 1974 in comparison to those of the years from 1966 onwards shows that of late there is a distinct trend in the judiciary not to treat offences lightly.

Statistically, the percentage of food adulteration in Maharashtra has come down from 30 per cent in 1966 to 13.55 per cent up to the last quarter of 1974. This position is very much better than that obtaining in other states like Bihar, Orissa, Himachal Pradesh and Madhya Pradesh, where more than 60 per cent of the food samples tested by official inspection agencies were found to have been adulterated.

This disparity indicates the lack of uniformity in enforcing the PFA Act throughout the country. Some states do try to be sincere about the whole affair of adulteration, while others tend to be lukewarm. And even within a state, anti-adulteration efforts are by no means uniform.

The administration of justice also needs to be speeded up. Thousands of cases are pending with the courts all over India — some of them for years. From 1968 to 1971 only about 2600 cases were disposed of out of more than 25,000 pending against food adulterators at the beginning of 1968. In Mahrashtra alone, at the end of 1972, 8669 food adulteration cases were pending with the courts. These figures underline the need for setting up special courts to deal with food adulteration cases.

The Union Government is proposing to amend the PFA Act, 1954, to increase the sentences on food adulterators. The technical committee of Parliament is presently studying the amendments.

However, as a former Chief Justice of India pointed out in a recent seminar on food adulteration, "very severe sentences did not always prevent breaches of the law." What was required, he said, was honest and rigorous administration, continuous inspection of factories producing food, warehouses storing it, and other places from where food was distributed. And, finally, what was most important was greater public cooperation with the authorities to check this criminal business of food adulteration.

To sum up, certain essential steps must be taken to check the spread of food adulteration :

1) The Central Government and the Maharashtra Government are giving grants for setting up new laboratories for food testing. The laboratories should be equipped with modern equipment, the tests should be modernised and done as micro-tests to save time and money and should be uniform all over the country.

2) Training of personnel should be immediately taken in hand and a central institute for training public analysts should be set up.

3) To dispose quickly of milk adulteration cases, a mobile court fitted with milk testing equipment should be set up and in all cases of food adulteration it is essential that separate courts should be established to speed up the judicial process.

(Shortly HIMMAT investigates Bombay hospitals.)

HIMMAT

WEEKLY 35p

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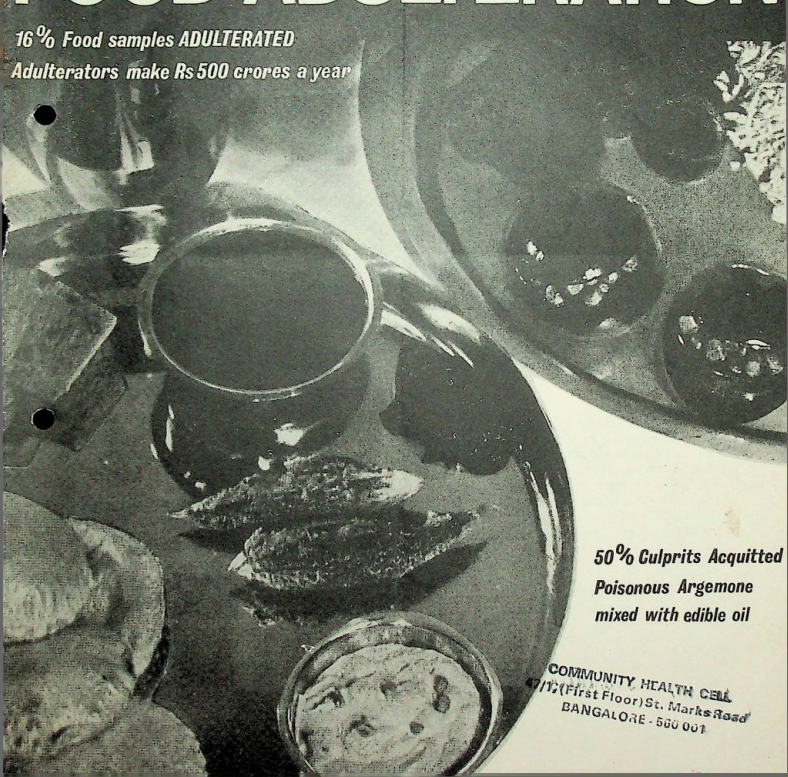
FOOD ADULTERATION

16% Food samples ADULTERATED

Adulterators make Rs 500 crores a year



50% Culprits Acquitted

Poisonous Argemone mixed with edible oil

HIMMAT investigates

FOOD ADULTERATION

Adulterators make Rs 500 crs. every year

WHILE there is frequent uproar in the Indian Parliament caused by the extent of food adulteration, the actual machinery of bringing to book the food adulterators is moving more slowly than before.

In Maharashtra alone, one of the best administered states, 16 per cent of food samples taken were found adulterated. Of those charged, 50 per cent were acquitted often on flimsy grounds and the rest were given ridiculously low sentences or charged small fines. HIMMAT's investigation reveals that if the Government is serious about dealing with adulteration, both the public, the law courts and the legislators will have to think again.

by Bhojan Krishnan

ONE-THIRD of all food marketed in India is adulterated, says a Health Ministry survey. It could be more.

With the growth of knowledge and advance of science, adulteration, which is as old as commerce itself, has developed from a crude form into almost a branch of applied science. The adulterator is no more the simple milk seller adding water to milk (or vice versa). The modern adulterator breaks ice cubes into pieces and drops them into milk-cans as a "preservative". He has at his command innumerable prohibited colouring materials and sweeteners to work out combinations that would baffle the smartest of housewives.

What is worse, greedy to make quick money, he does not hesitate to adulterate food articles with foreign materials of proven ill-effects. In India, where the adulterators reap a profit of over Rs 500 crores every year, highly poisonous argemone oil which causes epidemic dropsy (accumulation of watery fluid in any part of the body) is freely mixed with edible oil. Mineral oils which can wash away the intestinal layers are added to coconut oil.

Non-permitted dyes such as metanil yellow (used for dyeing cloth) are added to edible oils. Besan, which is used extensively in cooking, is often adulterated with kesari dal which contains toxic matter that can cause paralysis of the limbs. Prohibited artificial sweeteners such as dulcin, cyclamate and saccharine, which are suspected to cause cancer, are indiscriminately made use of in the preparation of supari.

Other common adulterants in use are: ground stone particles in foodgrains, vanaspati in ghee, iron filings in rawa, talcum powder in cardamom, chicory in coffee, and corn and beans in chicory.

Some of these adulterants are slow and poisons; some have proved to be lethal instantaneously. In 1969, adulteration of edible oil resulted in the death of two people in Poona besides making 60 severely ill. Even when not poisonous, being foreign materials, most adulterants are bound to create health problems in the long run. Worse still, the half-fed people of this country are deprived of the small amount of nutrients that they so badly need. They are forced to live without even knowing the real taste of food. In children, the deprivation of nutrients may lead to diseases and stunted growth.

As long ago as 1954, the Prevention of Food Adulteration Act was enacted in Parliament with the hope that the Act would deter adulterators. But it was not to be so. The loopholes in the Act were so wide and the punishments to be imposed so light (a fine of less than Rs 1000 and/or imprisonment for less than six months) that the Act, if anything, boosted the morale of fraudulent traders and encouraged them to practise their craft even more advantageously.

"There's a limit to adulteration, here's a cross-breed between beetroot and nails."

All the same, samples are being drawn and analysed for possible adulteration. Shops are being raided. Goods are seized and suits are filed almost as a routine. They bring to book a few adulterators here and there, while the rest, who are innumerable, go scot free.

In Maharashtra, where the Prevention of Food Adulteration Act is being enforced fairly strictly, the Food and Drug Authority's 200 food inspectors go around the state inspecting shops. They draw samples from wholesalers, manufacturers and retailers. Samples are also being taken at inter-district check-posts, hospitals, schools and other institutions. Besides the food inspectors of the Food and Drug Authority, the local bodies, too, have their own food inspectors.

Loopholes in the Law

The PFA Act, 1954, gives wide powers to the food inspectors. They can enter any shop to inspect any food articles suspected to be adulterated or wrongly branded. They may even exercise the powers of a police officer in ascertaining details. But all these powers are of no avail when the food inspectors are expected to produce witnesses to prove their case. Unwilling to get involved in court affairs, very few people come forward to sign as witnesses. When some of them do, they try to please the inspectors and traders equally by furnishing false names and addresses.

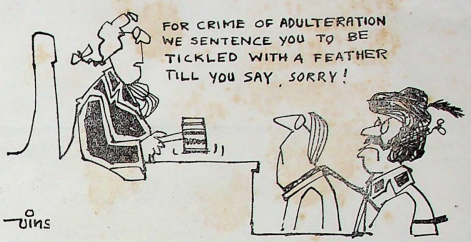
Besides the PFA Act, 1954, the Prevention of Food Adulteration Rules, 1955 (Central), and various State rules have been framed to arm the Government with adequate power to check food adulteration. In accordance with the PFA Act and the related rules, samples are being drawn and analysed and food offenders hauled into court.

Fewer culprits punished

In Maharashtra alone, 24,540 samples were taken from various places in 1972. Of these, 4032 samples (16.43 per cent) were found to be adulterated. Milk tops the list of adulterated items. All over the state, 2530 prosecutions were launched in 1972, but about 50 per cent of the accused were acquitted. Of the 887 convicted 600 were sentenced to jail, and fines amounting to Rs 2,37,862 were extracted from the offenders.

Compared with the figures of five years ago, that is of 1967, when 4907 prosecutions were launched, last year only 2530 prosecutions were launched. As against 1959 imprisoned that year, only 600 were jailed in 1972. The fines realised also came down from Rs 5,29,474 in 1967 to Rs 2,37,862 in 1972.

Statistically, the percentage of adulteration found in Maharashtra has come down from 30 per cent in 1966 to 16.43 per cent in 1972. But these statistics prove nothing, for the samples which are taken at random are by no means representative. FDA officials admit that the action taken has been so sporadic that for every adulterator caught there must be half a dozen more who are making a fortune by mixing adulterants with food articles.



The courts in India are overwhelmed with food adulteration cases. Unlike drugs, where the source of adulteration can easily be traced to the manufacturer or certain spurious firms, food articles can be adulterated at many points, and fixing the responsibility becomes much more difficult. The retailers are always prone to blame the wholesalers for any adulteration found, and the latter the former. In foodgrains, there is scope for adulteration right at the procurement stage.

In many cases, however, food adulteration is not deliberate. The lack of scientific storage systems, proper containers and packaging often causes bacterial growth and insect infestation. The Government considers spoiled food articles or insect-infested items, too, as adulterated. But the shopkeeper is helpless. One wonders how far the shopkeepers can be held responsible for such adulteration. Stocks with the retailers last for only a few days, and if in those few days the food articles deteriorate, it means that no proper care has been taken earlier at the godowns of the Food Corporation of India or of the State Trading Corporation or of the wholesalers.

The retailer is not qualified to spray insecticides or to fumigate the stock. Indiscriminate use of such sprays can endanger life. At best, such articles can be salvaged as far as possible and the portion unfit for human consumption disposed of. There are instances where the Government agencies are involved in distributing adulterated food articles to the retailers, as in the recent case of datura seeds found in American milo. Hundreds of women had to be employed to handpick datura seeds, thereby preventing possible food poisoning.

Over 8000 cases pending

A good many cases are pending with the courts all over India. Some of them have been pending for years. At the end of December 1972, in Maharashtra alone, 8669 food adulteration cases were pending with the courts. This has been a point of regret for the Food and Drug officials as well as the Municipal Corporations, who complain that delays in the courts hamper their work of enforcing the Food Adulteration Act. The Bombay Municipal Corporation and the Food and Drug Authority are contemplating the need for special courts to deal with food adulteration cases.

Profiteering doubtless is the main objective of the adulterators. Social

CONTINUED ON PAGE 15

Implementation of the Prevention of Food Adulteration Act in Maharashtra State

	1966	1967	1968	1969	1970	1971	1972
No. of food samples analysed	21,023	20,099	19,659	16,610	19,354	20,250	24,540
No. of food samples found adulterated	7,623	5,412	4,754	2,852	2,869	3,789	4,032
Percentage of adulteration	30	27	24	17.17	14.82	20	16
No. of prosecutions launched	4,924	4,907	4,399	2,595	1,021	2,062	2,530
No. of persons convicted	4,560	3,511	3,007	1,385	2,063	1,135	1,164
No. of persons sentenced to jail	1,759	1,959	1,365	1,078	781	(not available)	600
Fines realised (in Rs)	4,09,628	5,29,474	5,03,603	5,44,254	3,08,419	do	2,37,862

Source: Food and Drugs Administration, Maharashtra State.

FOOD ADULTERATION — from page 13

scientists may put forth many more reasons, such as ignorance of the traders about the harmful characteristics of certain adulterants, ignorance of the standards prescribed by the Government, and a general lack of knowledge of what does and does not constitute adulteration.

The lack of uniformity in enforcing the Prevention of Food Adulteration Act throughout the country has also been abetting the spread of adulteration. Some states do try to be sincere about the whole affair of food adulteration, while others tend to be lukewarm. And even within a state, anti-adulteration efforts are by no means uniform.

Some of the local bodies enforce the Act vigorously, while others, for want of funds (they can always raise enough funds by way of licensing food establishments and by realisation of fines) ignore the Act altogether. Those states and districts which are seriously engaged in curbing food adulteration are at a disadvantage. When food articles are imported from other states or districts, there is always a chance of adulterated food articles being bought for which the importing state or district has to bear the brunt of public wrath. All that a sufferer state can do is to draw samples at the check-posts and send them for analysis. By the time the results are known, the consignment has probably been consumed.

Mandate Laboratories

Want of adequate laboratory facilities perhaps cause no less delay in the analysis of food articles. In Maharashtra, there are only six moderately equipped laboratories to carry out tests on food samples — four Government public health laboratories, one each at Poona, Nagpur, Amravati and Aurangabad, and two municipal laboratories at Bombay and Nagpur.

More laboratories alone will not solve the problem. Facilities for research are essential, too, for finding out new ways of detecting adulteration. For example, in the case of adulteration of colophony in hing (compounded asafoetida) and artificial sugar in honey, there is no scientific way of ascertaining the adulteration. Research is also needed to improve the standards of food articles.

Greater effort is needed in detecting adulteration in hotels and restaurants as also at pavement stalls. All over the country, adulterated illicit liquor has been taking a toll of valuable human lives almost every year. Treating the adulterators as they are being treated now in India (see left) is no answer to the problem. Only stringent punishment and more public co-operation can help reduce this nefarious practice.

RING 536321 FOR ADULTERATION COMPLAINTS

Help the Food and Drug Authority in checking food adulteration. The FDA acts swiftly on consumers' complaints. Readers in Greater Bombay who suspect food adulteration can just drop a line to the FDA office at Griha Nirman Bhavan, Opposite Kala Nagar, Bandra (East), Bombay-400 051, or dial 536321 and lodge a telephone complaint. You need not give your name. Let your charges be genuine, and addresses of the shops complete.

In Biebrich, on the Rhine, a wine falsifier was condemned to drink six quarts of his own wine: from this he died. That was in 1482, but it is by no means the earliest known instance of punishment meted out to food adulterators.

In 1390, an Augsburg wine seller was sentenced to be led out of the city with his hands bound and a rope round his neck. In Frankfurt, casks in which false wine had been found were placed with a red flag on the knacker's cart. "The jailer marched before, the rabble after, and when they came to the river they broke the casks and tumbled the stuff into the stream."

But here in India, the food adulterator or illicit liquor-brewer has always been treated kindly. Despite our MPs' demand that this species of trader be sentenced to death, the Government and courts continue to have a soft spot for the adulterator — a fine which seldom exceeds Rs 100 and/or a jail term of one day.

In Bombay, a milk seller, who was charged with stockpiling blotting paper with the intent of mixing it with milk products, was acquitted on the ground that the adulterant was no health hazard!

In many cases, the adulterators are let off with a warning, or a jail term which lasts till the rising of the court!

"SHARING SOME THOUGHTS ON FOOD"

"The most widely shared concern about the present growth of world population is the fear that it will outrun the growth of food supplies and bring the world, or at least the more unfortunate in the developing countries closer to starvation".

GORAN OHLIN

Throughout human history starvation has seldom been far away for some large part of humankind. Even when western man was most bemused by the wonders of science and technology and constantly rising productivity, hunger was abroad in other parts of the planet.

The inherent and practical limits that soil and fresh water resources particularly place upon the world's ability to feed its growing populations are now compounded by energy and fertilizer supply problems, and by inflation which has put prices of even minimal sustainance beyond the reach of untold millions. The practical prospects for increasing world food production in the short term may be in dispute. But there are some very basic conditions which are not in dispute.

1. Arable and accessible land for additional cultivation of food by existing methods and known technology is physically limited and economically expensive to exploit.

2. The use of tractors over a continued period and even the use of fertilizers is now being found detrimental to the soil in which fragile monocultures exist.

3. A very large part of the world's potential pasture land is now already in use.

4. Most of the world's river systems readily available for irrigation have been tapped.

5. Lastly underground water is becoming scarce in many regions. Water shortages are expected to prevail in about 60 countries within another decade.

Since time immemorial there has always been a food problem in India, but it was ignored. It is only in the last 2 decades that serious attempts have been made to tackle this problem and put the spotlight on food.

A food problem is also present in many other Asian and Latin American countries but India's is the most urgent and biggest.

Not only does she not grow enough food for herself, but she also cannot afford to buy food for herself.

The average Indian has 2.25 acres of land (per capita basis). But of the arable land there is only 0.6 acre. Whereas it is estimated that even to meet his own food needs the minimum acreage a farmer should have is 1.8 acres.

40% of the total land is cultivated and of the cultivated land only 1/7 is irrigated. Large areas of land are not cultivated and some must be reserved for pasture.

Fertilizer consumption is 0.5 kg. per hectare. This should increase by 33%. But fertilizer costs are prohibitive to the average farmer.

Coming to the effect on diet and calorie supply, it was estimated that 10-15% of the people in the world, or roughly 20% of the people in the developming world did not meet their energy requirements in the decade 1950-60.

The estimate of protein deficiency was between 25-33%.

Diets lack energy foods and the body then catabolizes the protein (Gopalan 68). This finding of protein defieiency indirectly caused by low calorie intake, though opposite of the protein gap theory of U.N. is confirmed by the F.A.O. (1971).

If a diet has ONLY 5% of its calories from good quality protein such as in egg, milk the individuals need for protein will be met regardless of whether he is a pre-school child or adult man provided he eats enough to meet his energy needs.

When we know further that the human brain reaches 90% of its normal structural development in the first 4 years of life and that even a deterioration of 10% in the diet can cause a serious handicap to productivity it is imperative that food items in the early years supply the maximum utilisable protein.

This brings us to certain facts of Indian dietary habits which are responsible in a great extent to the degree of malnutrition found. Cereals which constitute upto 80% of calorie supplies and 70% proteins in India can be reduced and if pulses which constitute only 10% calories and 20% protein can be increased a great leap in nutritional status can be registered.

It is not practical in view of the costs to increase to any great extent the food of animal origin though efforts to promote eating of beef to which 1/3 of the Indian people have no objection should be made. Also fish products from fresh waters is particularly low.

Milk of which the per capita availability is only 6 ozs should be increased. Ghee production and the use of milk for sweets should be controlled. It is estimated that approx. 60% of milk produced in India goes for the making of these 2 items which only a fraction of Indians can afford.

The average Indian gets 1890 calories per day (Ideal is 2400 cals) and 53 gms protein of which a large portion cannot be utilised and so 1 million malnourished children exist. Toddlers who account for 16.5% population but contribute to 40% of all deaths and when millions of mentally deprived children reach adulthood, and are likely to repeat the whole depressing sequence in their own families, we know that concrete and practical steps must be immediately taken and these can be summed up in Health Education and Education in Nutrition and a change in food habits.

Thoug wheat is the staple diet of Gujarat, Rajasthan and Panjab, rice is the staple diet of 2/3 of the population. The rice crop which depends largely on the monsoon rains is an expensive commodity throughout the world.

Therefore, more and more people starting with children must be educated into eating wheat and othercereals like ragi and millets which are less expensive to cultivate and more nutritious to eat.

A change in food habits a breaking down of centuries old tradition and the education of the positive bad effects of certain dietary supersitions and beliefs can do much more good than trying to improve methods of cultivation and production.

The use of egg which has a high ratio of net protein utilised and which in its unfertilized vegetarian form is acceptable to the most orthodox vegetarian must be popularised.

An egg a day keeps sickness away is a slogan that CRS can spread so that with energy CRS aided meal one egg is contributed by the family themselves to provide the protective food so necessary to a growing child.

It is imperative in my opinion that any programme of nutritional aid like that of your reputed organization be linked with a programme of progressive health and nutrition education of the families and children who actually receive your foods.

The existenoec of the balanced diet which is an entirely new concept to rural Indians, the use of locally available foods in providing one's major needs. The use of pulses or dhals for children esuecially, the popularization of kitchen gardens and community markets the keeping of poultry and the rearing of goats are subjects which demand our urgent attention. Goats rearing is extremely profitable. Goats subsist on minimal fodder and provide milk, hair for weaving by the womenfolk into rugs and blankets and ultimately meat for eating. Fish breeding and eating must be popularized. All waste water must be utilised in maintaining fruit and vegetable trees. Only multiple efforts on a small scale that amount to a gigantic effort can change the picture of malnutrition in India. It is said give a man a fish and you feed him for a day. Teach a man to fish and he will feed himself for a lifetime.

The villagers problems cannot be attacked piecemeal. He cannot have higher production without education to know how to get it and health to do the necessary work.

In India high ideals and responsibility as in the west are lacking but morals and sacrifice are traditionally present. For the welfare of their children parents are prepared to go to great lengths of sacrifice. We should capitalise on this attitude and enlist the active participation of teachers, parents and elders into our programmes of aid. This will increase their self pride and dignity and this motivation towards a better life is half the battle won.

I conclude with the words of THOMAS JEFFERSON, who said, "I know no safe depositing of the ultimate power of society but the people themselves; and if we think them not enlightened enough to exercise their control with a wholesome discretion, the remedy is not to take it from them, but to inform their discretion by education"

THANK YOU

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POPULATION AND FOOD

"The most widely shared concern about the present growth of world population is the fear that it will outrun the growth of food supplies and bring the world, or at least the more unfortunate of the under-developed countries, closer to starvation".

Goran Ohlin

It was Malthus, an English parson born in 1766 and known for his essay on the "Principles of Population" who sounded the first warning between growing populations and food production.

With an estimated population of 5 million in England in 1700 and the First Census of 1801 giving a figure of 9.2 million, there was a relative worsening of the nutritional situation for which the enclosure of the land for pasture (instead of for crops) was chiefly responsible.

Malthus began by pointing out the disparity between the possible growth of the population on the one hand and the means of subsistence on the other: the population may grow by geometrical progression whereas the means of subsistence can grow only by arithmetical progression.

However, as Don Arthur in his book "Survival" says, "The inadequacy of food and natural resources has not proved to be limiting in the determination of the size of either populations or of families. Indeed, the reverse appears to be often true. In such countries as India, near famine conditions do not control numbers and frequently it is the unskilled and the underfed who have the largest families.

On a world scale, the inadequacy of food is not related to its decreasing production, for although it was reduced much more than population during the II World War, production per head had overtaken pre-war rates by 1952/53.

From 1950 to 1968 world cereal production was increased by 70%.

Subsequently, world production of food has increased by 3% while the average population has increased by 1.7%.

And, Gunning argues that -

"To many the doubling of world population as predicted for the year 2000, will seem an unsurvivable disaster. Some experts, however, see it as one necessary condition for the development of world economics because, in their view, a similar demographic explositon will be the only sufficiently strong incentive to force humanity into action. We have seen the draining of the Dutch Zuiderzee as the result of a strong demographic pressure. One can look at a great desert like the Sahara, a huge economic barrier for the development of Africa. No attempt at

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cultivating this desert will be made as long as the present "lack of world population" continues.

In Khartoum I was told by a Government Official that his ministry has ready plans for the irrigation of the whole Sudan, for which only 10% of the Nile water appeared to be needed. (Part of these plans I have actually seen realised!) There were only two great obstacles. One, lack of money, could certainly be overcome, but the second, lack of population seemed hopeless because in order to cultivate the soil made available by the plan, a population of 150 million would be the minimum required. The Sudan has no more than 15 million inhabitants.

With a stagnant and intermittently diminishing population for many decades, India in 1921 was unspeakably poor compared to India in 1961. For quite 40 years before 1921, India's population did not grow at all. If anything, it was decimated by pestilence, and even more by recurrent famines. But between 1921 and 1961, the annual rate of growth of India's population accelerated to 2.3% per year. In 1959, India was even richer than she was in 1961, despite a still higher annual growth of around 2.5%. A small population alone is no guarantee of prosperity. On the other hand, history has proved that a rapidly increasing population at certain crucial stages - either by migration or natural increase, has been a pre-condition of prosperity. We do not have to travel beyond India for proof. Ample proof is available in Assam, Rajasthan, Haryana, Malnad and Dandakaranya.

A steady rate of economic and cultural growth is more vital for a nation's prosperity than a small or diminishing rate of population growth. The ideal is reached when the two trend lines begin to diverge away from each other, particularly when the economic growth line continues to show a comfortably steady upward trend, while the population growth line shown first a steeply descending followed by an almost level trend.

George Hanar, 36 stated, "I personally haven't the remotest doubt that if we could mobilize our technology, our man-power, our efforts, provide the back-up and accelerators that are necessary, we can gradually "invade" the tropics, convert the better agricultural areas initially to usefullness in the production of plant materials or the production of animal materials. It would be no problem, in my judgement, to double or triple world food supplies in terms of the potentials which exist. The problem is not in terms of potential. People just haven't really been able to bring together the consortium of effort which is necessary".

About agriculture, Colin Clark says, "We must bear in mind two very different concepts, namely the amount of land per head required by a farming community to keep itself fed, and the quite different concept

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of the amount of land required to keep itself fully occupied. These are based on the two very different concepts of subsistence farming and commercial farming. Neither of these terms is precise or absolute. Clark has classified the cultivable land in several categories according to climatological factors (temperature and rainfall).

One square kilometer in Europe (moderate temperature, sufficient rainfall - one crop a year) is called one unit of "standard land".

Expressed in units of "standard land", the potentially cultivable surface of the world is 76.8 million km^2, according to the most narrow estimate, and 107 km^2 according to a more optimistic calculation.

The cultivable surface of the world can feed and clothe, according to European standards 34.57 billion people (narrow estimate) or 47 billion (more optimistic estimate). According to Japanese standards where the subsistence unit per person per year is much lower, these figures are 110 billion and 157 billion.

Fritz Baade (Director of the Institute for World Economics, Kiel Germany) reports that 11% of the world's surface that is now used for agriculture could produce more than 10 times the present output with the help of modern techniques and feed 40 billion people.

The area which an average Indian has is 2.25 acres of land (per capita basis), as compared to 13.45 acres available to the world citizen. Moreover, the per capita arable land for an average Indian is only 0.6 acres. It is estimated that an individual required 1.8 acres of arable land as the minimum for serving his food needs.

Charles Kellog, an American authority on soil problems, has demonstrated that if we brought into use only 20% of the unused area in the tropical zone we would add over one billion acres, or 40% of the total to the world's cultivable land.

Land for grazing, economically productive forestry and for grass cropping could be developed without much expense.

India has an area of 1,262,275 square miles or 808 m. acres and an average density of 370 people per square mile.

Total geographical area in 1,000 acres	807,856	
Net area, according to village returns	720,970	
Forests	126,099	
Net area irrigated	55,682	
Net area sown	322,460	cultivated
Fallow lands	58,490	cultivated
Not available for cultivation	166,201	uncultivated
Other uncultivated land (Including permanent pasture, grazing)	97,720	uncultivated

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That is, about 40% land is cultivated of which 1/7 is irrigated. Hence, the demands on these lands for crops is very great. Several ways may be adopted for improving the quantity and quality of food.

I. Increasing the land under cultivation

It is important that land should be brought under cultivation, and that wherever possible the farmer has a land holding that is productive enough to meet his own needs first, and then gain him profit which is put back into purchasing hybrid seeds, and amenities to improve the farm's yields.

Agricultural land should be safeguarded by law. Moreover, reclamation of land from marshes or swamps, and deserts undertaken.

The cultivation of sorghun, a cereal rich in lysine, and needing minimal water, should be encouraged in drier areas.

McCormack says, "It is true that large-scale reclamation often intolves large investment, and it may well be judged that it is more economic to use other methods of food production. But the fact that opportunities exist for extending the area of cultivation should offset a certain amount of pessimism, especially as concerns the longer term."

In a speech to scientists from all over Europe in 1968, Pope Paul VI said, "It is perhaps unnecessary to point out that the most terrible calamities, capable of destroying all the inhabited earth, come from precisely the best equipped laboratories of modern physical science. May you have the courage to renounce these things. Rather make the earth,fertile, make it produce bread for all; fight against the sterility of desert zones, intensify farm production everywhere, make possible victory, your art, your mission and your glory."

In the same vein N.M. Zhavoronkov summed up the view of technological optimists with the words that "as long as the sun shone and people were capable of creative thinking, they had no need to fear the future".

It is still disputed whether there is a possibility of cultivating the vast areas of humid tropical forest around the equator in these continents. If more research were undertaken into the problems of tropical agriculture, however, it would seem that tropical food crops (on which little research has so far been expanded) could at least approach the success of cash crops such as cocoa and sugar and other tropical products on which a great deal of research has been done so that crop-yields have been greatly increased.

Because of the inter-dependence that exists among food needs, food demands, overall income, agricultural product, total output Gross National Product (G.N.P.) or Gross Domestic Product (G.D.P.) it is meaningless to consider a nation's demand and supply of foodstuffs independently from

overall economic progress". Perhaps now that men have landed on the moon, by investing billions of dollars and using a huge reservoir of scientific brainpower, it would not seem too extravegant to turn to the development of some of the earth's possibilities for feeding its people; the relative cost would be very much less."

Small holdings are not productive enough and more and more farmers are forced to become labourers on other holdings or become landless.

In "India and Pakistan cultivation is carried on mainly by means of ox-ploughs. It is possible to make reasonable estimates of the amount of land required to keep the plough team fully occupied during the cultivating season, but not to over-strain its capacity. A method devised in 1945 by Tarlok Singh can still be regarded as satisfactory. For most regions of India this gave a result of 3-5 hectares per adult man as the amount of land required for full employment during the cultivating season.

It is indeed the shortness of the monsoon which makes draught animals necessary in India and Pakistan, even when farmers are so poor that they have great difficulty in feeding them. Where rainfall is more abundant in India hand cultivation may be preferable, particularly for some of the higher value crops such as jute and pepper and the amount of land required to keep a man fully occupied is lower.

In Japan where hand cultivation still prevails (though supplemented by abundant use of fertilisers, insecticides etc.) careful planning and diversification of crops make possible the full employment of 2.8 man equivalents of labour on a farm of only 1.9 hectares".

II. Irrigation

The rice production, even though inadequate, needs much water and though the new strains of rice do not need more water they benefit from more water.

Nearly seventyfive percent of Indian farming is dry farming. Therefore irrigation projects and methods to utilise water of rivers, lakes, tanks and wells should take high priority.

Gunning asserts that the actual irrigated surface (13% of the total agricultural surface of the world) produces 25% of the total food output. Even so at least 3/5 of this surface is not irrigated in the best possible way.

Expanding the irrigated land even on a world-wide basis is important. It is estimated that not yet 5% of the world's river water is used for irrigation. By sprinkling instead of flooding almost twice the surface can be irrigated. Moreover, the newly cultivated land does not have to be flattened and less salt loss results.

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Ancient gravity methods are used to draw water requiring animal or manpower and thus increasing the economic burden on the farmer.

However, increased irrigation also brings problems of malaria and schistosomiasis by providing the vector or carriers of these diseases with suitable conditions for breeding and development and this must be kept in mind. The provision of pump sets to farmers is also of prime importance.

III. Regeneration of the land by the use of Fertilisers

Multiple cropping and lack of appreciation of the "rape of the land" has made imperative that fertilisers be provided and used increasingly in India.

Incomplete nitrogen cycle due to non-return of faecal products as sanitary facilities increase and sewage is disposed of and therefore lost to the land, make it necessary to let the land lie fallow for one or two years before a new crop can be produced. Soil erosion is a matter for serious concern as land can be lost for cultivation.

McCormack says, "It seems reasonable to assume that through research ways can be found to make the infertile but otherwise favourable tropical soils acceptably productive. It was through research that the infertile sandy soils of Florida and, for that matter, many soils in the South Eastern United States, were made productive. Fifty years ago they were as low in fertility as many of the soils of the humid tropics.

The Belgians, for example, before suspending their research in the Congo, had developed an oil palm which when properly grown yielded about 4,000 kilograms of palm kernels per hectare whereas the ordinarly palm yielded approximately 500 kgs. per hectare.

Fertilizer

Of the actual irrigated surface, three quarters receives an insufficient amount of fertilizer, i.e. an average of 2 kg. nitrogen per hectare per year instead of an "optimum" average of 50 kg. per hectare.(6) Experiments of the FAO in Ghana gave a tripling of the output per hectare when sufficient fertilizer was used: 1070 kg per hectare without, 3486 kg. rice using 40 kg. nitrogen, potassium and phosphorus per hectare, giving an increase of net income from $ 47 per acre to $ 172 per acre.(7)

To give a few figures for comparison:

India in 1950 had an average fertilizer consumption of 0.5 kg. per hectare and an average cereal production of 0.65 ton per hectare. In 1960 these figures were 2.5 kg. fertilizer per hectare and 0.83 tons of cereal per hectare, i.e. an increase of 180 kg. cereal per hectare.

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Japan increased her average fertilizer consumption between 1950 and 1960 from 153 kg. per hectare to 304 kg. per hectare. Her cereal yield went up from 2.9 tons per hectare to 4.1 tons per hectare, i.e. an increase of 1200 kg. per hectare.

Holland in 1960 used an average of 456 kg. fertilizer per hectare.

Dr. Pauley of the FAO has estimated that in
i) the years immediately ahead India and Pakistan would need to increase their consumption of fertilizer at the fantastic rate of 33% per year.

Also improved strains of rice and wheat now increasingly used in India, respond more to heavier doses of fertilizers than ordinary strains.

Indian yields for crops other than wheat are quite low by international standards.

"It has been argued that with better varieties, pest control and application of fertiliser on the Japanese scale, Indian rice yields could be raised to almost 2½ times their present levels".

"Domestic Production as a percentage of the total supply of food in selected countries

Country	Wheat & Rye	Rice	Potatoes	Sugar	Meat
Australia	536%	319	102	353	145
India	56	97	100	106	100
U.K.	46	-	95	37	65

Inspite of massive investiments since 1950 in the urban and Industrial sectors and inspite of the massive absolute increase in the urban and industrial population which has broken away from agriculture, the proportions of populations dependent on agriculture, has stood almost constant, around 70%, significantly, inspite of the rising share of industries in the Gross Domestic Product, the percentage share of agriculture in the G.D.P. in India has also stood fairly constant, around 47%."

IV Food supplies from the sea-inland waters

Land is limited in supply. The largest section of the population live in countries in which the scope for the extension of arable land is extremely small. At the same time, practically the entire supplies of food care, raised from lands, either directly or indirectly.

For the world as a whole, 87% of the total supplies of calories and 70% of total proteins are derived from "arable lands". If we include foods of animal origin excluding fish, we find that the world draws 99% of calories and 96% of proteins from lands in general. With fish as a food acceptable to large sections of the population, and its vast coastline, it is surprising that fish farming has not been undertaken more extensively in India.

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The foods of sea and inland water origin consist mainly of fish; seaweeds and other plants growing in water are eaten in negligible quantities.

Fishery makes very little claim on lands and marine fishery none at all. Of the total catch of 53.3 million tons estimated for 1965, 7.6 millions were from fresh waters. Though relatively a less important source for the world as a whole, fresh water fish contribute a third of the total catch in the Far East. In this region, which is, as we have seen, so poorly endowed with land resources to feed adequately its large population, the development of inland fisheries is of particular importance. The region has large water surfaces. There are, it is roughly estimated, 37 million hectares of cultivable inland waters in the Indo-Pacific region.

By far the larger supply of fish, as said before, comes from the seas and oceans, and the total catch from this source has been increased at 7% a year. Inspite of their larger population and vast accessibility to the seas, the present annual catch of marine fish of the developing countries together is a fifth less than that of the developed regions. In fact the latter draw practically their entire supply of fish from marine sources. In the far East, Japan alone lands 6.6 million tons a year while the rest of the region only 9.3 million tons. More remarkable however is the achievement of Peru: annual catch has been expanding by 40% a year. This fantastic growth, which has put Peru in the lead among fishing nations of the world, is largely due to the growing demand for fish meal in North America. Other developing countries may not find such favourable conditions. On the contrary, they would confront considerable difficulties, largely because of their technological backwardness.

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NUTRITION

1. How would you conduct a nutrition survey in a boarding school of 100 students between 5 - 8 years of age. Suggest measures to improve the nutritional status of these students.

2. As a medical officer of a Primary Health Centre what would you do in the following circumstances - Vitamin A deficiency conditions among many members of a family.

3. 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 years, mother 35 years, one sone 15 years, 2 daughters of 10 and 6 years respectively.

4. What is kwashiorkor? What are the causes? By what measures can the prevalence of kwashiokor be reduced in a community.

5. How would you investigate an outbreak of food poisoning.

6. Discuss the nutrition value of milk. Write notes on (i) Composition of a balanced diet (ii) Role and requirement of Iron and Calcium in the diet (iii) Diseases associated with faulty diet.

7. Vijay an 18 year old employed in heavy labour has the following daily diet. Point out the omissions and defects in quality and quantity and suggest a balanced diet for him. Rice 8 oz. Pulses 1Oz Milk 1 oz Groundnuts 1 oz Vegetables 2 Oz. Hydrocarbons ½ oz.

8. What are the various causes of malnutrition in India? What are the measures you would recommend to overcome them?

9. Describe the role of proteins in thehuman diet. State how the requirement of protein are satisfied in the South Indian diet. Explain how the methods of cooking and preparation of food may affect the value of food articles.

10. Explain the role of proteins in the human diet.

11. What is an adequate diet. Mention the food articles (with quantities of each) which will constitute an adequate diet for a day for a medical student who weighs 60 kg. and plays tennis for an hour a day.

12. Describe the diseases that may be conveyed to man through meat. Describe the life cycle of T. solium.

13. Discuss the important of green leafy vegetables in himan diet.

14. What is a nutritional survey? State the specific points to which you will pay attention mentioning the uses you will make of the data gathered, with a view to prevention and correction of dietary defects.

15. Protein deficiency is one of the major public health problems in India. Discuss this statement.

16. Discuss the value of milk as an article of food. Name the diseases that may be conveyed through milk.

17. What is meant by Balanced diet. What are the nutritional deficiency diseases encountered by our people. Discuss the role of vitamin C in the diet. Comment on its source in a South Indian diet.

18. Discuss the role of vitamin C in the human diet. What are the sources of vitamin C available for people belonging to the low income group.

19. Discuss the importance of nutrition in the maintenance of promotion of health.

20. Short notes on :- Protein calorie malnutrition ; Pasteurization of milk ; Minimum standards for a good slaughter house ; Boiling of milk ; Meat borne diseases ; Essential unsaturated fatty acids ; Protective foods ; Hens egg ; Diet survey ; Kwashiokor ; Measly beef ; Rickets ; Essential amino acids ; Nutritional antropometry ; Botulism ; Relative merits of mothers milk and artificial feeding for infants ; Pellagra in India ; Fortified foods ;

21. Rice contains greater % of equal proteins than milk (Yes) (No)
2. Ghee is richer in fat than groundnut oil (Yes) (No)
3. Proximate principles are vegetables, fruits and milk (Yes) (No)
4. Kwashiokor is a - Syndrome
5. Vegetable oils are better than animal fats for old people (Yes) (No)

Correct figures wherever necessary :-

Daily requirement of	Vitamin A is	1000 I.U.
" " "	" D is	2000 I.U.
" " "	Thiamine	20 mgm.
" " "	Riboflavine	1.5 mgm.
" " "	Nicotinic acid	2 mgm.
" " "	Cyanocoblamine	1 mcg.
" " "	Ascorbic acid	80 mgm.
" " "	Calcium	5 gms.
" " "	Iron	10 mgm.
" " "	Floride ion	1 - 2 ppm.

22. What is kwashiokor? What are the causes? By what measures can the prevalence of kwashiokor be reduced in a community?

23/ Prescribe a balanced daily menu for a family of 5 members, the father, mother and 3 children aged 16, 9, and 3 years. The family income is Rs. 150/- a month and the father is a stenographer.

24. What are the deficiencies in the South Indian diet? What steps would you suggest to remedy these defects ?

25. What is an adequate diet? Give an example. Explain how the diet taken bymost of the people in Mysore State differ from this diet. How can the defects if any, be rectified?

26. What type of daily diet would you recommend for a labourer weighing 65 kg.?

27. What is meant by a 'Diet survey' and 'Nutrition survey'. Describe in detail how you would conduct a nutrition survey in a school of 200 pupils of low income group.

28. What is the difference between ghee and groundnut oil and their relationship to health and disease.

29. Discuss the advantages and disadvantages of vegetable proteins, over animal proteins. Describe a balanced diet.

30. What is an adequate diet. Prescribe an adequate diet for a moderately active male medical student weighing 65 kg.

31. Write short notes on :-

Mutual supplementation of dietary proteins
Essential unsaturated fatty acids.
Deficiency of Iron in the diet.

NUTRITION

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I Comment on the following:

a) Milk is an ideal food for adult

b) Vit B_1 requirement depends upon the calories supplied by the carbohydrates in the diet.

c) Mixed cereals is desirable than a single cereal in our diet.

d) Phosphatase test protein in a sample of milk states to have been pasteurised.

e) Ghee is good for health as it is rich in the saturated fatty acids

f) Louis Pasteur discovered pasteurising method for milk.

II Each person in a central prison is given the following daily dietary allowance:

Rice - 300 G
Pulses 500 G
Hydrogenated vegitable oils 25 g
Green leafy vegitables 25 g.

Comment on the quality of the above diet.

III. As a Medical Officer in a Health Centre, what would you do if you come across Vit. A deficiency among many members of the family?

IV. Comment on the following daily diet.

Rat rice (polished)	16 oz
Pulses	1 oz
Green leafy Vegitables	½ oz
Bringals	½ oz
Butter milk	4 oz
Sugar	½ oz

Suggest improvements without increasing the cost of the diet very much.

V Describe a balanced diet for a family with an income of Rs.200 per month consisting of 5 members - one male 45 years; 1 female (pregnant) 35 years; and 3 children aged 10 & 6 respectively.

VI. A family consisting

a) 1 adult male weighing 55 kgs
b) 1 adult female weighing 45 kgs
c) 1 adolescent boy weighing 45 kgs
d) 1 adolescent girl weighing 35 kgs

Calculate the daily requirement of protein for the family.

VII. On analysis of daily diet taken by a family consisting of

1 adult male (sedentary) 55 kg
1 adult female (") 45 kg
2 children of 3 years 12 kg
8 years 20 kg

It was found to contain the following nutrients. Comment on the quality & quantity of the diet.

Protein	100 G
Carbohydrates	1000 G
Fats	55 G
Vit. A	3000 IU (900 mcg of Retinonol)
Vit. B	5 mg
Vitc C	1000 mg
Vit. D	2000 IU
Fe	35 mg
Ca	2.5 G

How will you improve?

VIII What type of daily diet would you recommend for a labourer weighing 65 kg?

IX Explain in detail the dietary requirements of the following:

a) Pregnant mother
b) Labourer (adult male)
c) child aged 8 years

X. Write short notes on:

a) First class proteins
b) Measly pork/beef
c) Food preservation
d) Phosphatase test
e) Milk borne infections

XII. A family consists of the following members:

a) Old lady of 60 years (40 kg)
b) An adult male going to office (55 kg)
c) An adult female (45 kg)
d) Two sons and two daughters of 15, 13, 11 and 7 years of age

Give a schedule of balanced diet for this family in germs of rice, pulses, green leafy vegetables, root vegetables, other vegetables, milk sugar, fish, meat, egg and oil.

...3

XIII A family consists of an adult mele (55 kg) and adult female (45 kg) and a child of 5 years weighing 15 kgs. On a diet survey of this family, it was observed that the consumption per day in terms of the proximate principles and nutrients was as follows:

Proteins	..	150 gms.	Vit. A	1000 IU
CHO	..	2000 gms	Vit. B	10 mgm
Fats	..	100 gms	Vit. C	150 mgm

a) Comment on the quantity and quality of the diet.
b) Suggest improvements confining your attention to the above nutrients only.

XIV A mother with an infant of 6 months old wants to start her child with artificial feeding with buffalo's milk. What is the quantity of the buffalo's milk and the number of feeds per day that you would advise? What other advise you would like to give to the mother about the feeding with the Buffalo's milk? Considering the deficiencies in the milk, what supplements would you advise?

NUT 4 4 3

DEPARTMENT OF PREVENTIVE & SOCIAL MEDICINE
ST. JOHN'S MEDICAL COLLEGE, BANGALORE 560034

18-41

EXERCISES IN NUTRITION AND DIETETICS

Q - I. A family consists of the following members:

a) Old lady of 60 years (40 kg.)
b) An adult male going to office (55 kg.)
c) An adult female (45 kg)
d) Two sons and two daughters of 15, 13, 11 and 7 years of age.

Give a schedule of balanced diet for this family in terms of Rice, Pulses, Greenleafy vegetables, Root vegetables, other vegetables, milk, sugar, fish, meat, egg and oil.

ANSWER: Coefficient value of the family:

a) Old lady	..	0.9
b) Adult male	..	1.0
c) Adult female	..	0.9
d) Son, 15 years	..	1.0
e) Son, 13 years	..	1.0
f) Daughter, 11 years	..	0.8
g) Daughter, 7 years	..	0.7
Total		6.3

Requirement of Balanced Diet for the family =

		gms			gms	Oz.		
1.	Rice	400 x 6.3	=	2520	gms	14	..	80.2 Oz.
2.	Pulses	85 x 6.3	=	535.5	gms	3	..	18.9 oz.
3.	G.L. Vegetables	114 x 6.3	=	718.2	gms	4	..	25.2 oz.
4.	Root vegetables	85 x 6.3	=	535.5	gms	3	..	18.9 oz.
5.	Other vegetables	85 x 6.3	=	535.5	gms	3	..	18.9 oz.
6.	Fruits	85 x 6.3	=	535.5	gms	3	..	18.9 oz.
7.	Milk	284 x 6.3	=	1789.2	gms	10	..	63.0 oz.
8.	Sugar	57 x 6.3	=	359.1	gms	2	..	12.6 oz.
9.	Fish & meat	85 x 6.3	=	535.5	gms	3	..	18.9 oz.
10.	Eggs	7 eggs				1	..	7 eggs
11.	Oil	57 x 6.3	=	359.1	gms	2	..	12.6 oz.

We require for the above family 2400 x 6.3 = 15,120 calories. The above diet yields approximately 3000 x 6.3 calories. Hence, it is sufficient for the family.

Q - II. A family consists of an adult male (55 kg.), and adult female (45 kg.) and a child of 5 years weighing 15 kgs. On a diet survey of this family, it was observed that the consumption per day in terms of the proximate principles and nutrients was as follows:-

Proteins	..	150 gms.	Vit. A.	1000 I.U.
CHO	..	2000 gms.	Vit. B.	10 mgm.
Fats	..	100 gms.	Vit. C.	150 mgm.

a) Comment on the quantityt and quality of the diet.

b) Suggest improvements confining your attention to the above nutrients only.

....?

ANSWER:-

Requirements	Male		Female		Child		
1. Proteins	55 gm.	+	45 gms.	+	52.5 gms.	=	152.5 gm.
2. CHO	450 gm.	+	450 gms.	+	180.0 gms.	=	1080.0 gm.
3. Fats	60 gm.	+	40 gms.	+	40.0 gms.	=	160.0 gms.
4. Vit. 'A'	3500 IU	+	3500 IU	+	3500.0 IU	=	10,500.00 IU

In terms of Retinol and daily requirement will be 750 micrograms for the adult and for the child of 5 years 300 micrograms. It comes to 750 + 750 + 300 = 1800 micrograms. One I.U. of Vit. 'A' = 0.3 mg. So, 10,500 I.U. will be 3,150 micrograms.

5. Vit. 'B' (Thiamine) .. 2 + 2 + 1 = 5 gms.

6. Vit. 'C' .. .. 50 + 50 + 40 = 140 mgm

i. COMMENTS: Quantity: Calories requirement 1 + 0.9 + 0.5 = 2.4 coefficient = 5,760 calories.

The above diet will provide	Proteins	150 x 4	= 600 calories
	CHO	2000 x 4	= 8000 -do-
	Fats	100 x 9	= 900 -do-
	Total		= 9400 calories

It is more than ample.

ii. QUALITY :- Proteins : Just short: CHO - more than ample
Fats : Short Vit. A - very much short
Vit. B : Sufficient: Vit. C - sufficient.

iii. IMPROVEMENT: Cut out CHO (Cereals) and increase the pulses, milk or include egg. Fat requirement can be met by increasing oil or ghee (60 gms). Vit.A or Retinol is very much short of requirements and leafy vegetables like amaranath, drum stick leaves and other vegetables like carrot, fruits like papaya should be included in the diet. Vit. B & C are sufficient.

Q - III. A mother with an infant of 6 months old wants to start her child with artificial feeding with buffalo's milk. What is the quantity of the buffalo's milk and the number of feeds per day that you would advise? What other advise you would like to give to the mother about the feeding with the buffalo's milk? Considering the deficiencies in the milk, what supplements would you advise?

ANSWER: Buffalo milk yields 118 calories/100 gms. A child of 6 months (normal), weighing 6.7 kg. will require 600 calories. The child therefore, requires 600/118 = 5 or 500 gms. of milk or 16 to 17 oz. of milk. This milk must be diluted with water to reduce the fact concent and sugar must be added to increase the CHO content.

Composition: Buffalo milk = Fat 8.8 sugar 5.1
Human milk = Fat 3.4 sugar 7.4

i.e. the milk must be humanised.

Thus, 16 to 17 ozs. of diluted milk must be given in 4 feeds (8 hrs. once) during day and one feed before going to bed. Milk is deficient in Iron and Vit. C. Hence, fruit juices and green leafy vegetables mashed should be given as supplements.

Nutrition Education Unit

AND

Community Health Project

SUPPORTED BY OXFAM

Project Report

OCTOBER 1970 — SEPTEMBER 1971

C. S. I. Campbell Hospital

JAMMALAMADUGU

Cuddapah District, A. P.

SOUTH INDIA.

1. Introduction - Community Health Care.

"Many people are writing symphonies about Community Health Care, but who is playing the music ?" In Jammalamadugu we have a small amateur orchestra and there is music of a sort. Sometimes we are confused by different scores, and at others we are uncertain that the audience appreciates the tune. This report is a record of discord as well as melody - the Jammalamadugu sound" !

1.1. A Clinical Approach.

"Community Health Care" has become a cliche. Initially it may only mean a concern on the part of medical and nursing personnel for the important extra-institutional factors related to health and disease. At its best it implies the involvement of the community in improving its own health.

In an under-privileged society where the dominating factor is poverty, the majority are so involved in the struggle for survival, that the response to any "felt need" survey is circumscribed, and the community involvement in health care can only be rudimentary. In our situation the community health work is really at the initial stage of the definition given above, and we are conscious that education of the community to its health needs and possibilities is a primary task.

Most people in the villages around here only appear to appreciate health by its absence. Consequently it is important to utilise the management of disease as a fertile opportunity for teaching about health. When one member is ill, the family is a captive, attentive and often receptive audience. This clinical or disease-orientated approach carries the dangers of over involvement in therapeutic care, but it has the distinct advantage of being related to the immediate needs of the people. A health talk about immunisation

or clean delivery may not provoke much interest, but it is strikingly relevant in a ward where there are children with neo-natal tetanus. It is not uncommon in a single clinic to find two pregnant mothers each with a younger child suffering from gross malnutrition of the Kwashkorkor type. In this context a talk about the relation between family planning and nutrition is immediately obvious to all.

1.2. Components in the Programme.

The different elements in our clinical approach to community health include; analysis, pilot schemes, service, teaching and evaluation. There is a considerable overlap of these facets in the programme.

1. Analysis - assessment of the health status of the community and the problems with which people present at clinic and hospital.

2. Pilot Schemes - testing out what methods are acceptable and effective in stimulating the public and providing health care.

3. Service - the promotion of health with the prevention and treatment of disease.

4. Teaching and training - an essential part of health care and integrated with the service component. It includes teaching patients and their relatives, and training members of staff.

5. Evaluation - i an attempt to answer the questions "how effective and how economic is any part of the service in providing health care for the individual and the community ii an opportunity to feed-back information to modify the various aspects of the work.

In this report there are examples of these various components as they overlap and complement each other in our community health programme.

1.3. Co-ordination in the Hospital Services.

Those of us associated with the OXFAM project at Jammalamadugu would like to see the community health work more closely integrated with that of the hospital. This would mean several things; the increasing acceptance on the part of all hospital staff of a concern for the health of our community beyond the confines of the institution, and a closer physical and financial link between the hospital and the project. Already there has been a fruitful co-operation; a number of the staff financed by OXFAM perform part of their work within the hospital, for example the Public Health Tutor besides supervising various aspects of the community health work, draws on this experience in training the student nurses. In various ways members of the hospital staff assist with different aspects of the project. The Nutrition Unit can only function because parents bring their sick children to the hospital for help, yet the hospital would not be able to give these children the care they most need if there was no Nutrition Unit.

The dilemma before this and other Christian hospitals is on the one hand, the need for the institutions to remain as financially independent as possible, and the challenge on the other hand to pioneer in new ways of community health care which are essentially unremunerative. We have made a useful start in some aspects of community health care, but continued progress will depend on :-

1. Simplication of techniques to bring sown basic costs to a minimum

2. Acceptance on the part of the hospital that it has some financial responsibility for community health care.

3. Continuing help from OXFAM for much of the outreach work, especially the rehabilitation of the malnourished who are usually very poor.

4. Training programmes in which to will share our experience and help us to maintain high standards of care.

5. Co-operation with the government wherever possible. Besides orienting our efforts to the national health planning at, our programme should be benefited by a supply of free vaccines and remuneration for family planning services.

1.4. Co-operation with the Government.

The hospital is fortunate to have quite good rapport with the government on account of the fine record of family planning work. In January 1971 the State Health Minister opened the new 20-bed tubectomy ward, which is probably the largest granted to any Christian institution. In two consecutive years the hospital has been awarded the shield for the best family planning effort by a voluntary institution in the state.

The community health project has a happy relationship with the state Maternal and Child Health (MCH) Department, and the Director, Dr. B. Vigg, visited the work here in November 1971. We are now receiving Triple, Polio and Tetanus Toxoid vaccines directly from this department.

At the District level, we are receiving B.C.G. vaccine regularly from the District Tuberculosis Officer, and a member of the local health department visits the hospital every week and vaccinates all the newborn babies in the maternity and tubectomy wards.aganist smallpox.

We are grateful to the Director, Dr. C. Gopalan, and Assistant Director, Dr. S.G. Srikantia, of the National Institute of Nutrition in Hyderabad for their help. One of our staff was sent there for training in I.Q. testing as we plan to try to correlate the intelligence of the mothers along with other factors when we evaluate the progress of children. With the help of the artists at the N.I.N., we have developed a number of village picture sequences that will be valuable when testing the rural mothers in this are.

1.5. Training.

This project which started as a service, is beginning to have an important training function. All the project team have learnt a great deal during the development of the work and attempts have been made to try and share this experience with the rest of the hospital staff.

All the student nurses have the opportunity of working in the different parts of the project. This gives some realism to the community health nursing that is integrated in their course.

The Director of the Christian Medical Association of India's Family Planning Project (CMAI,FPP) has asked us to run a months training programme for nurses from 4 hospitals in different parts of South India who will be taking part in a Family Health Assurance Plan. The scheme is to develop the concept of the "small family norm" by improving basic health services with an emphasis on children under 5, and, having demonstrated the survival effect, encouraging planned conception. Although this hospital did not opt to join thier plan, the CMAI,FPP feel that we have practical experience in many matters directly relevant to the scheme, and requested

Dr. Ratnaraj, the Medical Superintendent, to let them site the training here. We hope the course will be a practical joint effort of those working in the CMAI, FPP, the hospital and the OXFAM project. Inevitably a major burden will fall on the community health project team, but we expect to learn a great deal and accept this as a milestone in our development.

1.6. Child Weight Cards.

The benefits of home-based health record systems are now recognised. The Under-Fives Weight Card developed by Dr. David Morley was a pioneer in this field. Our Telugu card is now used for children in one Government and many Christian hospitals, and we hope that the technique will be increasingly accepted in the coming years. Already the Andhra Pradesh state Government has produced a card based on the Morley pattern, even though they have not been bold enough yet to give it to the parents to keep. We have already stressed the value of the cards when counselling parents about contraception, and believe the section on Family Planning is a particularly valuable addition to the card for India.

We are developing a new card which will bear a basic weight-for-age graph and figures, and on this it should be possible to print other information locally in the regional language. A further modification included is the addition of two more growth curve lines. Reference to these lines will make it possible to classify any child immediately according to the degrees of malnutrition defined by the Nutrition Sub-committee of the Indian Academy of Pediatrics. We hope that these features will make the card more widely acceptable thoughout India.

1.7. Staff.

W.A.M. Cutting. M.B., M.R.C.P., D.C.H., D.Obst. R.C.O.G.
Mrs. Margot Cutting. M.B., Ch.B. (Part-time, Honorary).
Miss. Nirmala Paul. M.Sc. (Nutritionist).
Mrs. M. Margaret Prasad. R.N., R.M., S.T. (Tutor).
Miss. V. Karuna John. R.N., R.M., Public Health Certificate.
Miss. L.S. Deevanamma. R.N., R.M.
Mrs. Surya Bai. R.N., R.M.
Mrs. Alice Pushparaj. (Family Planning Nurse).
Mr. K. John Kumar. (Higher Grade Typist and Clerk).
Miss. M. Sarala. (Clerk).
Mrs. V. Sugunamma. (Health Demonstrator).
Mrs. B. Rajamma. (Health Demonstrator).

During 1971 Miss. Karunamma successfully completed her Public Health training at the Lady Reading Health School in New Delhi, and we were very glad to welcome her back. Dr. G. Arthur Samuel has commenced his specialist pediatric training at the Christian Medical College, Vellore, and he will return in 1973. The Medical Superintendent has approved the appointment of a part-time Administrator for the project from April 1972, and we hope OXFAM will also support us in this. Her functions will be partly to handle the correspondence and finances, and generally supervise and co-ordinate with the hospital and other services and also help plan training programmes. Thus, the foundations are laid for the continuation of the project after the gradual withdrawal of Dr. and Mrs. Cutting.

The five nurses are accepted as full members of the hospital staff in terms of confirmation of service and provident fund. The others on the project team would naturally like these privileges, but they have not yet been

accepted by the Medical Superintendent. The legal and financial implications are being studied, and if they cannot be accepted as actual hospital staff, it is hoped that some award in lieu of provident fund, and some security of tenure can be offered to these hard-working people.

1.8. Thanks and Acknowledgements.

Without the help, support and encouragement of many people this work would not go on. In particular we wish to thank OXFAM. Dr. John Staley and Mrs. Ausma Ackworth, the South India Secretaries, have always been ready with help, and their faith in what we are trying to do has been a real encouragement. The Area Secretaries Mrs. Reid and Mrs. Davie, from London and Glasgow, have written to us often after their visit to Jammalamadugu. Though they have a rather rosy picture of our work, we try to live up to their expectations ! We wish to thank Dr. Ratnaraj, the Medical Superintendent, who has given us wise counsel and permitted the development of the work in association with the hospital. We are grateful to many members of the public, and patients, young and old, from whom we have learnt much about the beliefs concerning health and disease which are essential when trying to run a community health project. The cover picture is by Sandoz Limited, India.

Last but not least, I would personally like to thank all the members of the staff. Often their efforts to help others have been difficult, and sometimes rudely rejected. They usually work long and sometimes irregular hours. They have accepted their delegated responsibilities and are a cheerful group of people with whom it has been a pleasure to work.

William A.M. Cutting.

Nutrition

I - W. Hobson - Nutr. + public health - G.R. Wadsworth 1944.

- Knowledge of practical rather than theoretical issues important
- rel. bet. diet + states of health / ill health
- Health authorities have the responsibility of ensuring that all members of the community can get that food necessary for maintenance of health + as free as possible from harmful substances.
- Scope of nutr. in public health includes - a knowledge of what people eat, main reasons for use of particular diets, main components of foods, poisonous substances in foods, amounts + kinds of foods for optimal health, methods to control diet of the whole community + of different classes of individuals in it.

NUTRITION — References NUT 445

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2. Contact 32 — Self-reliance & nutrition.
3. Food & Nutrition Strategies in National Development — WHO — TRS 584.
4. Fundamentals of normal nutrition — Corinne H. Robinson
5. Contact 50 — The Nutrition of mother & children.
6. Child Nutrition — UNICEF News. Issue 101/1979/3
7. World Health Nov '76 — Eating Better.
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9. ICMR Bulletins
   - i) Vol 6 No 5 May '76 — Iron def. Anemia & fortific of common salt.
   - ii) Vol 5 No 7 Nov '75 — Anaemia in Pregnancy.
   - iii) Vol 4 No 8 Aug '74 — Nutr & inf.
   - iv) Vol 5 No 8 Aug '75 — Nutr & the brain.
   - v) Vol 6 No 3 March '76 — Functional significance of gastrectomy d/o malnutr
   - vi) Vol 4 No 7 July '74 — Hazards of food toxins.
   - vii) Vol 4 No 6 June '74 — Nutr in pregnancy & lact.
   - viii) Vol 5 No. 5 May '75 — National Nutrition Monitoring Bureau.
   - ix) Vol 5 No 10 Oct '75 — Research in Blindness.
10. Food & Health — NIN public. 1973.
11. Nutritive Value of Indian Foods.
12. Diet Atlas of India — NIN.
13. Nutrition — Jan 1975 — NIN
14. " — Oct 1974 — "
15. " — July 1975 — "
16. " — July 1974 — "

18 44

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Factors affecting breast feeding + weaning practices in an urban elite / urban slum + rural area in an around B'lore - (200 kids)

- Take mothers who have children bet. 10 mths - 3 yrs
- How long breast fed.
- Any supplt. food - what, type / consistency
  How many times, How much
- Educational level of mother - nature / graduate / illiterate of or below
- sex of child / age
- Religion
- Veg / non veg.
- Taboos
- Occup.
- Socio ec.
- No of siblings
- Any deaths.

ST. JOHN'S MEDICAL COLLEGE, BANGALORE

Class | Roll No.

Semester | Subject

Examination | Date

Nutrition II - Vitamins.

Ref:-

1) WHO TRS No 362 (1967).

2) Swasth Hind 1974, 28, 110 - Govt of India 1974.

3) Essentials of food & nutr. - Swaminathan M (1974) Ganesh & Co - Madras 17.

4) ICMR Annual report 1974 - N.I.N. Hyderabad.

5) WHO - TRS No 452.

6) WHO Chronicle (1973) 27, 31.

7) WHO (1974) Handbook of human nutritional requirement

8) Hazards of the human environment - Geneva

9) Nutrition Vol. 3, No 3, p.10. (1969) - NIN Hyderabad.

19/12/80

MCH revision

III rd MB 1st Sem

- Aims of MCH — MCH problems in India.
- A.N. care — routine, objectives & MCH package investr, manag^{n}.
- Intranatal care — TBA 'dai' trg + domiciliary care
- P.N care — breastfeeding
- Child care — at risk concept
  - Birth wt — LBW (SFD)
  - feeding of infants — breast / artificial
  - weaning
  - gth + Dev^{n} — WT/HT/Head chest / Milestones
  - Road to health card
  - Underfive clinic
  - Immunic^{n} schedule EPI scheme
  - IYC / PNC
  - ICDS.
- organiz^{n} of MCH/FP services — ANM/LHV

Indicators of MCHcare — M.MR
- IMR < neonatal MR / post neonatal MR
- perinatal M.R.
- 1-4 yr M.R.

- School Hlth Service — Objectives/aspects
- Child Guidance clinic.
- Child welfare agencies.
- NFP.
- Year of the disabled

IIIrd HB 1st Sem REVISION. — CHILD CARE & UNDER FIVES

1. Reasons for special care for underfives.
large nos.
groth + dev.
High mortality
Preventable morbidity.
Inaccessability
2. Groth + devt. + their determinants viz — Genetic, Nutr., age, Sex, Physical surroundings, psychological factors, inf. + parasitoses, economic factors, birth order, spacing, birth wt., multiple pregnancies, educn. of parents, fam. size
3. Groth :— weight. Height. head + chest ⊙.
4. Developmental milestones — new skills + actions
5. Low birth weight — imp. causes, prevn. — < 2.5 kg / 37 wks (wat, social, social) } Birth wts.
6. Small for date babies causes.
Socioeconomic birth wt quotient (SBQ)
7. Infant mortality rate :— causes [Indicators of MCH care], MMR.
i) Medical reasons/ postn. Biologic, Economic, Cultural & Social.
Neonatal M.R.
Post "
Perinatal M.R
1–4 yr. Mortality Rate
Birth wt., age of mother, birth order, spacing, fam. size, high fertility, multiple pregnancies
cultural — breast feeding, religion & caste, illiteracy, ignorance of child care, sex, broken fam., illegitimacy, habits + customs, indigenous dai, lack of trained personnel,
Basic current. said to
(8). The Road to health card — wide basis, lines, at a glance, earliest indicn. of malnut, other factors where available, UNICEF, HE, thick paper, kept by mother, regional language
(9) Under five clinic
(10) The At risk concept
(11) School health — objectives
promotion, prevn. early Δ, Rx + follow up
awakening health consciousness.
providing healthy environment.
Components
1. Hlth appraisal of school children & school personnel
2. Rx + follow-up.
3. Prevn. of comm. dis
4. Healthy school environ.
5. Nutritional services.
6. 1st Aid & emergency care
7. Mental health.
8. Dental health.
9. Eye health
10. HE
11. Educn. for handicapped.
12. School health records.
(12) MC / EPI / ICDS scheme.
(15) Principles of MCH
(14) Delivery of MCH services
Triple M syndrome
(13) Child needs — Nutr, Immunizn. sickness care Security, Stimulation

DEPARTMENT OF PREVENTIVE & SOCIAL MEDICINE

S Y L L A B U S

Subject : Preventive & Social Pediatrics

Session I - Child Growth and Development

i) Why knowledge needed

ii) Place of children in Indian Society

iii) Methods of study

iv) Principles of Development.

Session II - Genetics and Health & Genetics Counselling

Session III - i) Preventive Pediatrics - Divisions

ii) Antenatal Pediatrics

iii) Prenatal development factors

iv) Neonatal period & Infancis - Delivery, Registeration, postnatal care, feeding naming, supplementary feeding and weaning bathing, clothes, sleep, teething, milestones, emotional and social development.

Session IV - Milestones in growth and development

i) Weight & Height

ii) Head measurements/fontanelles

iii) Dentition

iv) Mental, Physical, Social development.

Well baby clinic - Why? and functions.

Session V - Visit to well baby clinic

Session VI - Toddlerhood, Preschool Child Physical Development, Play, Feeding, Toilet training, Sleep

Health Protection - care of ear, nose, throat, worms - prevention of ill health and accidents.

Motor development, handedness.

Session VII - Intellectual/Emotional/Social Development of the Preschool child Nursery School as a Laboratory

Session VIII - Social pediatrics

- Behaviour problems
- Jurenile Delinquency
- Handicapped children
- Mental Retardation
- Maternal deprivation
- Battered baby syndrome
- Child Guidance Clinic
- Social Legislation.

Session IX - Visit to Child Guidance Centre

Session X - Mortality in children, Rates, causes, preventive and Social measures.