

PREVENTION AND TREATMENT OF VITAMIN A DEFICIENCY



MINISTRY OF HEALTH & FAMILY WELFARE, GOVERNMENT OF INDIA

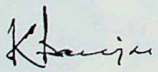


PREFACE

In recognition of the magnitude of the problem of vitamin A deficiency, India was the first country to launch a national programme for prevention of blindness in 1970. The overall strategy includes long and short term measures. The long term measures are designed to increase the availability and consumption of foods rich in vitamin A. The administration of concentrated dose supplement of vitamin A to children between the ages of 6 months to 5 years constitutes the short term measure to prevent blindness and offer relief from other debilitating effects of vitamin A deficiency.

The National Programme has been reviewed by the National Institute of Nutrition in 1978 and the findings indicate a need to improve the awareness of concerned health professionals and programme managers as well as elicit community participation in order to achieve the desired impact.

The Department of Health and Family Welfare set up a Task Force on Vitamin A in 1989 to formulate policies and streamline procedures for improving the implementation of the vitamin A programme. In this effort, a booklet for health professionals and programme managers has been developed to provide the requisite information and encourage interlinkages with other professionals particularly of the ICDS scheme. Professionals engaged in the National Prophylaxis Programme against Blindness due to Vitamin A Deficiency have an excellent opportunity and great responsibility in controlling easily preventable nutritional blindness.



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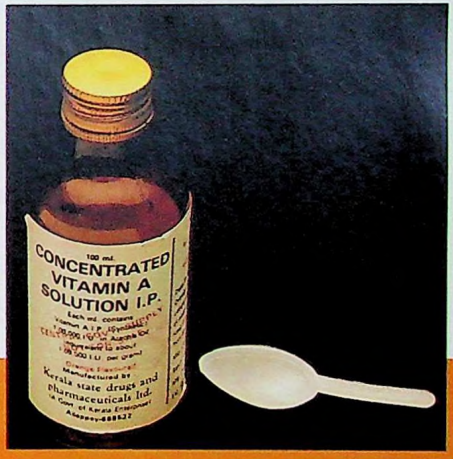
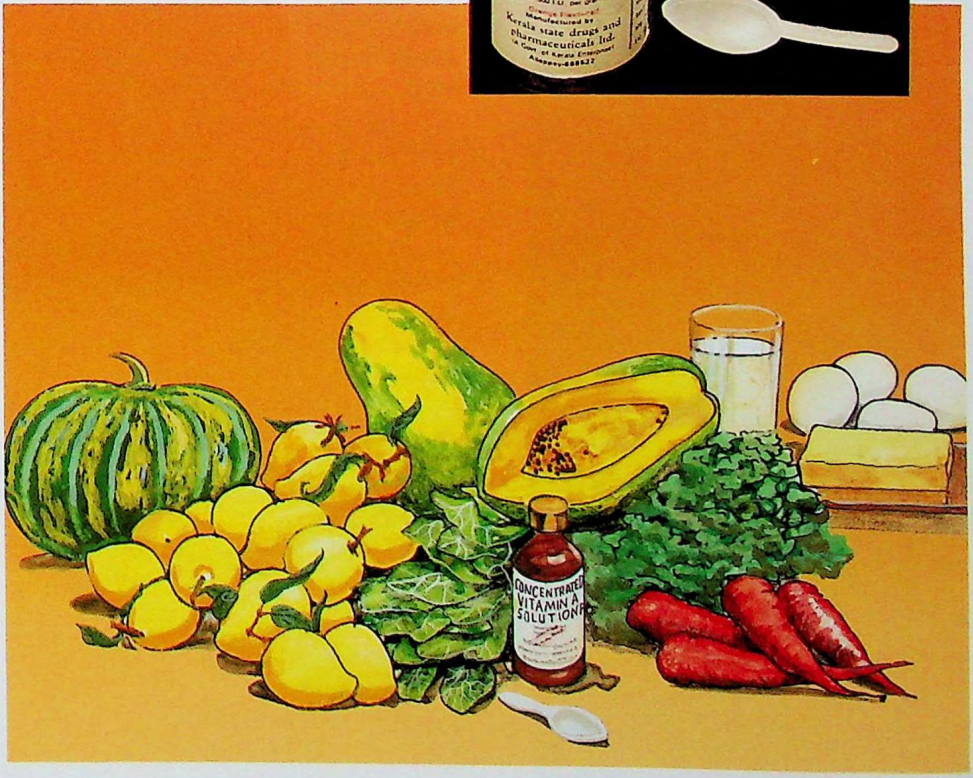
This booklet is addressed to:

- Medical Officers (PHC)
- Project Officers & Supervisors (ICDS)
- Health Administrators
- Programme Managers

engaged in the National Programme on "Prophylaxis against Blindness due to Vitamin A Deficiency".





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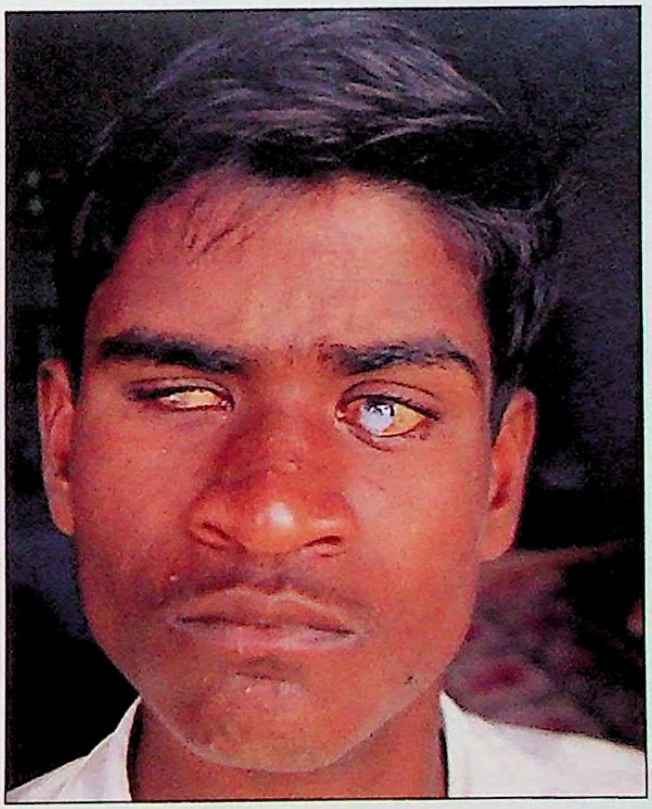


1 VITAMIN A DEFICIENCY IN INDIA

A. VITAMIN A DEFICIENCY PROBLEM

Vitamin A deficiency has been recognised as a major controllable nutritional problem in developing countries. The role of vitamin A in preventing nutritional blindness is well documented. According to rough estimates 30-40,000 children may lose their eye sight due to vitamin A deficiency in India (1). An adequate vitamin A status prevents nutritional blindness. Evidence is accumulating that it also contributes significantly to improved child health as well as reduced mortality. The mechanism by which it has this effect is unclear.

Vitamin A deficiency is a serious public health problem in India

Prevent Vitamin A deficiency. Prevent blindness, and reduce risk of disease and death.

In Indonesia, children with vitamin A deficiency have been shown to be two to three times more prone to develop diarrhoea and ARI (2). These two diseases account for nearly half the childhood deaths in India (3) (Figure 1).

Measles can severely deplete vitamin A stores, leaving a child more vulnerable to other diseases such as pneumonia, diarrhoea, and xerophthalmia. Every year, thousands of children die as a result of measles and its secondary complications. In addition, this can lead to a destruction of cornea and blindness.

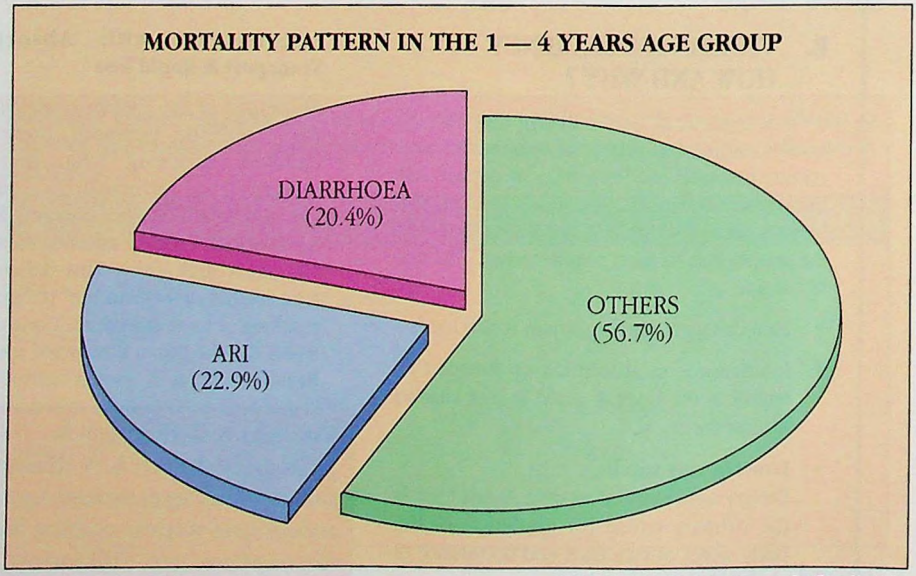


Figure - 1 **SOURCE : Registrar General of India (3)**



B. VITAMIN A DEFICIENCY HOW AND WHY ?

Vitamin A deficiency results in xerophthalmia i.e. drying of conjunctiva and cornea followed by destruction of cornea and blindness. Xerophthalmia occurs when the body stores of vitamin A are exhausted and the supply fails to meet requirements. This can occur due to :

- Low dietary intake of vitamin A rich foods
- Interference in absorption or transport of retinol in the body & rapid loss of vitamin A from the body
- **Low Dietary Intake**
  Dietary deficiency of vitamin A rich food is the primary cause for depletion of the body stores of vitamin A and occurrence of xerophthalmia.
- **Interference with Absorption, Transport & Rapid loss**
  Absorption of the vitamin is impaired and the metabolic demands increase in children suffering from diarrhoea, respiratory infections, measles, gastroenteritis and other diseases. This sets up a vicious cycle of infections leading to vitamin A deficiency. This deficiency in turn reduces resistance to infection resulting in more infections. Consequently, it sets the child on a downward spiral of ill health.

Vitamin A deficiency is primarily due to low dietary intake. It is aggravated by infections which reduce its absorption and utilization.

2 DIAGNOSTIC CRITERIA FOR VITAMIN A DEFICIENCY

A. OCULAR SIGNS AND SYMPTOMS

Although vitamin A deficiency affects many tissues in the body, it is most detrimental in its effects on the eye resulting in blindness. The surface of the cornea becomes dry and rough, and may ultimately break down partially or completely. This may lead to ulceration, which causes permanent scarring or irreversible damage and loss of sight.

The ocular signs are considered the most reliable criteria for identifying vitamin A deficiency . Severe forms of the disease can appear quickly without preceding milder signs and symptoms appearing in sequential progression.

A classification of the disease according to eye symptoms and prevalence levels above which it is considered a public health problem is shown in Table 1 & 2.

Classification of Xerophthalmia by eye (ocular) signs	
Night blindness	(XN)
Conjunctival xerosis	(X1A)
Bitot's spots	(X1B)
Corneal xerosis	(X2)
Corneal ulceration/keratomalacia < 1/3 corneal surface	(X3A)
Corneal ulceration/keratomalacia ≥ 1/3 corneal surface	(X3B)
Corneal scar	(XS)
Xerophthalmic fundus	(XF)

Table - 1 **SOURCE : WHO (4)**

Prevalence criteria (in percentage of preschool-age population, 6 months to 6 years old, at risk) for determining the public health significance of xerophthalmia and vitamin A deficiency.	
CRITERIA	
Night blindness (XN)	in > 1.0 %
Bitot's spots (X1B)	in > 0.5 %
Corneal xerosis / Corneal ulceration/keratomalacia (X2/X3A/X3B)	in > 0.01 %
Corneal scar (XS)	in > 0.05 %
Plasma vitamin A of <0.35 µmol/l (10µg/dl)	in > 5.0 %

Table - 2 **SOURCE : WHO (4)**

B. RECOGNITION OF THE SIGNS AND SYMPTOMS OF XEROPHTHALMIA:



Night blindness –
The first symptom of xerophthalmia. A child cannot see to get around after dark or in a dark room.



Bitot's spots –
Although Bitot's spots differ somewhat in size, location, and shape, they have a similar appearance. They are accumulations of foamy cheesy material on the conjunctiva, often in association with other signs of xerophthalmia such as night blindness.



Corneal xerosis/ulceration –
The cornea becomes dry (xerosis). If the disease is not treated, the xerosis can progress within hours to an ulcer of the cornea.



Keratomalacia –
If the disease is not treated, a corneal ulcer can lead to "melting" or "wasting" of the cornea (keratomalacia).



Corneal scar –
Keratomalacia can lead to perforation of the cornea. At this stage, a corneal scar will remain in the eye. The sooner the disease is treated, the smaller the ulcer and the smaller the scar which will remain forever. If treated early, corneal scars and blindness can be prevented.

3 THE NATIONAL PROGRAMME

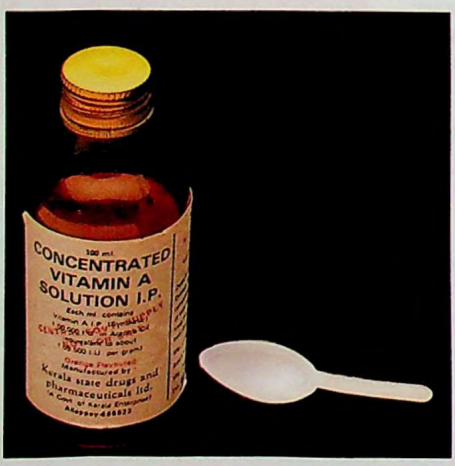
India was the first country in the world to implement a National level Programme for prevention of Vitamin A Deficiency in children under five years of age.

The "National Prophylaxis Programme against Blindness due to Vitamin A Deficiency" was started in 1970, initially in seven states where the incidence of the problem was higher. By 1975, it was extended to other regions of the country as a national programme.

The Programme today covers 30 million children under five years of age and utilizes two major strategies:

A. Short-term : Administration of megadose of vitamin A solution periodically to children under five years.

B. Long-term : Promotion of dietary intake of vitamin A.



Effective intervention can save the sight of millions of children in our country.

A. SHORT TERM STRATEGY

The short term strategy focuses on periodical provision of a massive dose of vitamin A solution to children under five years. This approach is based on the property of vitamin A that it can be stored in liver and utilised slowly over time.

Children under five years are at the highest risk of blindness due to vitamin A deficiency. In the past, pre-school children (1-5 years) were covered under the Programme. The National Programme is now being extended to cover children 6-11 months and a priority is being proposed for children 6 months to 3 years.

Vitamin A supplementation, administered periodically, is effective and safe. When vitamin A is administered in doses as recommended, there are rarely any adverse effects. Side effects such as headache and vomiting may occur sometimes, but these are rare, mild and transitory and do not require any treatment.

Prevention of blindness due to vitamin A deficiency

The recommended oral dose is :

Children 6 -11 months	one dose of 100 000 IU of vitamin A orally. (Measles immunisation is a good time to give a routine dose.)
Children 1-5 years	one dose of 200 000 IU of vitamin A orally every six months.

Treatment of vitamin A deficient cases

All children suffering from vitamin A deficiency must be administered a single oral dose of 200 000 IU of vitamin A immediately

on diagnosis. This should be followed by another dose of 200 000 IU of vitamin A one to four weeks later. Regular consumption of vitamin A rich foods such as dark green leafy vegetables and yellow vegetables and fruits (carrots, pumpkin, sweet potato, papaya, mango) must be encouraged to prevent recurrence.

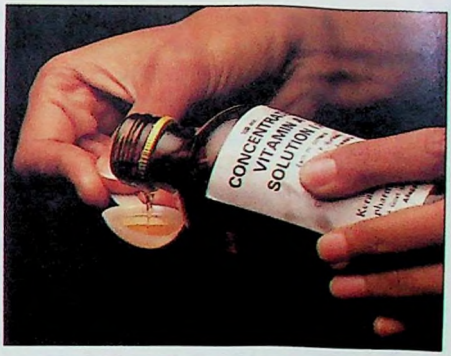
Children who suffer from diarrhoea, acute respiratory infections and measles should be monitored carefully and given usual prophylactic doses of Vitamin A.

Vitamin A Concentrate

Vitamin A solution for the National Programme is supplied as a flavoured syrup in 100 ml bottles with a concentration of 100 000 IU vitamin A/ml. A spoon measure of 2 ml solution is supplied with each bottle. A spoon of syrup to the marked level provides the recommended dose of 200 000 IU vitamin A. Vitamin A does not require any special storage measures such as a cold chain. However, it should be stored in a cool dark room protected from direct sunlight.

The bottle once opened must be utilised within 6-8 weeks. The shelf life of a sealed bottle of vitamin A solution stored in cool dark place is about one year

The price of the syrup is around Rs. 25.00 per bottle of 100 ml or 50 paise per dose of 200 000 IU vitamin A. The solution is provided free of cost to the community through primary health centres (PHCs).



A single spoon measure (2 ml) of 200 000 IU of Vitamin A.

Keep Vitamin A solution away from sunlight. A sealed bottle can be kept at room temperature for one year. However, a bottle once opened must be utilised within 6-8 weeks.

Additionally, fixed dose vitamin A capsules (100 000 IU), are also being supplied for infants. The content of the capsule should be squeezed gently and completely into the mouth of the infant after snipping an end of the capsule with a pair of scissors or a clean razor blade.

Oral Dose -Vitamin A

One dose of 100 000 IU to infants (6-11 months).
Six monthly doses of 200 000 IU to children 1-5 years of age.

Procurement and Distribution

The Ministry of Health and Family Welfare, supplies the vitamin A syrup. The indent of supplies should be made by the medical officer of the PHC on the basis of expected number of beneficiaries i.e. children 6 months to 5 years of age.

i) Department of Health and Family Welfare

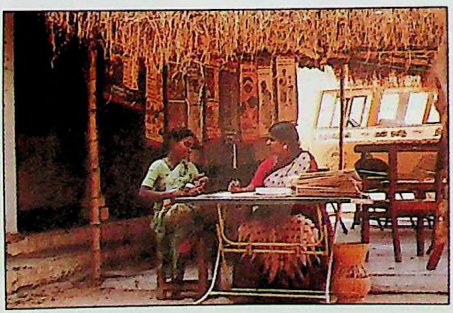


The Maternal & Child Health (MCH) Division, Department of Health and Family Welfare is the nodal department responsible for the overall administration of the Programme. In rural areas the Programme is implemented through the Primary Health Centre (PHC) and its sub-centres, under the supervision of the Medical Officers. The medical officer of PHC is in-charge of indenting of supplies of vitamin A, coverage of beneficiaries and monitoring of the programme.

The Auxiliary Nurse Midwife and other paramedicals at PHCs are responsible for administering vitamin A solution to children.

The Universal Immunisation Programme offers opportunity to reach infants. The contact with children between the ages of 9-12 months for measles vaccination provides an excellent opportunity for administering the first dose of vitamin A solution, 100 000 IU for infants.

ii) Department of Women and Child Development



The Integrated Child Development Services (ICDS) Programme provides an opportunity to distribute vitamin A to children six months to five years. In places where ICDS is functioning, the Anganwadi workers should participate not only in the identification of children but also assist in the administration of vitamin A and in imparting nutrition education.

Monitoring

A child should receive a total of 9 oral doses of vitamin A by the fifth birthday.

The Mother -Infant Immunisation Cards should be used to record and monitor the vitamin A doses administered to children under two years.



All children under six years are being monitored for their growth under the ICDS Programme. The usage of Growth Monitoring Card is a practical method for recording and monitoring administration of vitamin A solution till the age of five years.

Under the MCH services and the ICDS Programme, a list of under-fives is maintained by the health and anganwadi workers. In addition to immunisation and growth cards, such records are recommended to be used for identifying as well as monitoring children for administration of all 9 doses of Vitamin A. A sample format for vitamin A monitoring is given in Table 3.

B. LONG TERM STRATEGY

1. Consideration of Causes

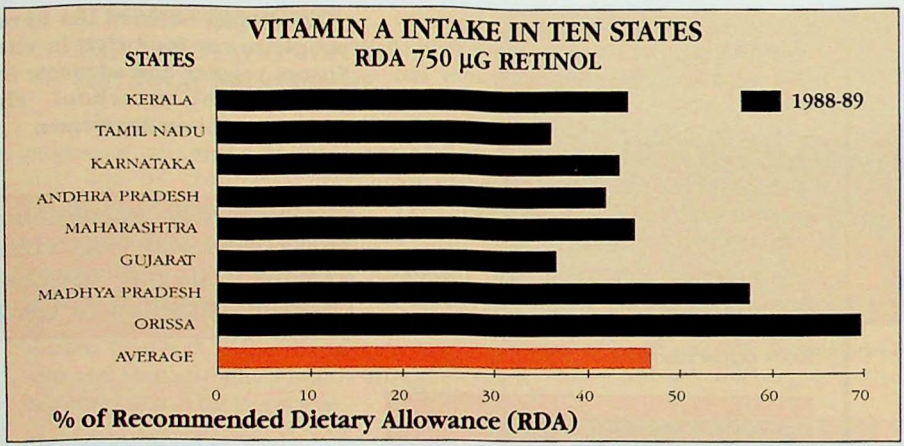
Dietary deficiency is the primary cause for depletion of body stores of vitamin A and occurrence of xerophthalmia.The dietary intake of vitamin A has been reported to be much below the recommended daily allowance (Figure-2) in all the ten states surveyed by NNMB (6).

The vitamin A and carotene (vitamin A precursor) deficient diet of the preschool children, who comprise the 'at risk group' is of particular concern. Their intake is reported to be well below half the recommended allowances of 400 µg of retinol or 1600 µg ß-carotene per day (7-9).

Absorption of the vitamin is reduced in children suffering from diarrhoea, respiratory infections, gastroenteritis, measles and other diseases. The prevention and control of infection & malnutrition by immunisation, proper nutrition, oral rehydration and timely medical care contribute towards the prevention of vitamin A deficiency.

Name of the child	Mother's name	Date of Birth	Sex	Address	Dates of Administration of vitamin A 1	2
1. *Sonu*	*Mangala*	*17.1.88*	*F*	*Katpara*	*17.10.88*	*17.4.89*
2. Pratap	*Krishna*	*29.1.88*	*M*	*Katpara*	*29.10.88*	*29.4.89*

Table - 3 **A sample format for Vitamin A monitoring**



SOURCE : NNMB (6).

2. Ultimate Solution

The ultimate solution for the prevention of vitamin A deficiency is regular consumption of vitamin A rich foods which are cheap and locally available. Vitamin A consumption must be ensured from birth itself. Breast feeding, including feeding of colostrum, will protect children from vitamin A deficiency during the first six months. From the age of four to six months, it is crucial to introduce complementary (semisolids) food containing rich sources of vitamin A such as dark green leafy vegetables and yellow vegetables and fruits (carrots, capsicum, yam, pumpkin, papaya, mango). Most leafy vegetables contain more than the recommended dietary allowance (RDA) of vitamin A for Indian children in about 100g edible portion. This quantity, on cooking, is reduced to two tablespoons. A child can easily consume this amount with other food items, thereby meeting its total daily requirement (10).

In addition to green leafy vegetables as far as possible, incorporation of other vitamin A rich foods such as dairy products (milk, cheese, curd , butter,)liver, eggs, oil and fat should be encouraged in the daily diet of preschool children who are prone to develop vitamin A deficiency. Such food practices will prevent vitamin A deficiency.



Breast feeding protects against vitamin A deficiency during first 6 months of infancy. Colostrum is rich in vitamin A.

Daily consumption of dark green leafy vegetables and other vitamin A rich food is also recommended during pregnancy and lactation. Mother's vitamin A status influences the vitamin A content of mothers milk and the health status of her children. Adequate intake of vitamin A rich food during pregnancy and lactation will prevent vitamin A deficiency both in mother and child.

Nutrition education, an integral component of Primary Health Care and ICDS Programmes, must emphasise on promotion of foods rich in vitamin A.

Foods rich in Vitamin A

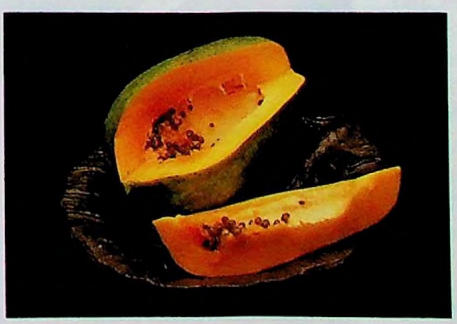
- **Green leafy vegetables**
- **Yellow fruits and vegetables (Papaya, Mango, Pumpkin, Chillies, Carrots)**
- **Milk , Cheese, Curd, Butter, Eggs**
- **Liver, fishes**
- **Red palm oil**

The ultimate solution lies in educating people to eat food rich in vitamin A. Ensure regular and adequate intake of vitamin A by preschool children, pregnant and lactating women.

Promote daily consumption of dark green leafy vegetables and yellow fruits and vegetables to prevent vitamin A deficiency.



Dark green leafy vegetables and Yellow/Orange vegetables



Yellow fruits



Dairy Products & Eggs

C. TOWARDS EFFECTIVE IMPLEMENTATION OF THE NATIONAL PROGRAMME

The effective implementation of the programme can only be achieved with trained staff and by creating a high level of community awareness.

The training should be imparted to the entire health delivery team and to functionaries of Integrated Child Development Services (ICDS) Programme. This will help the workers from both sectors in executing their role and responsibility towards effective implementation of the Programme.

The training should focus on :

- Effect of vitamin A deficiency.
- Recording signs and symptoms of vitamin A deficiency.
- Identifying beneficiaries.
- Prevention and Treatment with massive dose of vitamin A including indent of supplies.
- Prevention of vitamin A deficiency by promoting consumption of locally available vitamin A rich foods. Specific messages and effective methods of communication.
- Encouraging community participation.
- Recording system and reporting procedures.



Training of health and ICDS functionaries on prevention of vitamin A deficiency.



Community education on prevention of vitamin A deficiency.

4 SUMMARY



Vitamin A deficiency is a major public health problem among pre-school children in India. According to rough estimates, every year thirty to forty thousand children may become victims of preventable blindness. Vitamin A deficiency increases the susceptibility of children to infections and possibly influences morbidity and mortality.

The benefits of vitamin A supplementation makes the "National Prophylaxis Programme against Blindness due to Vitamin A Deficiency" extremely cost effective.

The health and ICDS administrators and programme managers can form an effective partnership in saving the sight and improving lives of millions of children.

The National Prophylaxis Programme against Blindness due to Vitamin A Deficiency today covers 30 million children under five years of age and utilities two major strategies — short term and long term strategy. The former entails mass distribution of a megadose of vitamin A to children between 6 months to 5 years of age. The latter emphasises the improvement of dietary intake of vitamin A through regular consumption of vitamin A rich foods such as dark green leafy vegetables, yellow vegetables & fruits, dairy products and the promotion of breast feeding. Educating the people and increasing regular consumption of vitamin A rich foods which are cheap and locally available is encouraged since this is the ultimate solution for the prevention of vitamin A deficiency.

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