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REVIEW OF COMMON NUTRITIONAL PROBLEMS IN THE PRE-SCHOOL PERIOD

by

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The meeting on the health needs of the pre-school child held in Karachi (WHO/EMRO 1968) reported that one should define the pre-school child as "the child from his first to his fifth birthday". This definition reflects a statistical group of children rather than a developmental group. Pre-school children have a common denominator of physical, psychological and social features.

Features of the pre-school child

1. Physical features: The pre-school period is a phase of rapid growth and development. There is progressive gain in body weight and steady increase in body length. The growth of tissues and organs imposes specific nutrition requirements of various nutrients especially proteins of high biological value to supply the essential amino-acids. These physical features have been reported by Stuart and Stevenson (1959), Stilt (1960), Green and Richmond (1962), Harfouche (1966), Jelliffe (1968) and Abbassy et al (1972).

Physiologically the specific water metabolism of the pre-school child is a characteristic feature. He has a greater need for water than adults. The extra-cellular fluid shows a more rapid turn-over. The urinary concentrating power is less efficient. He is more liable to dehydration which is more serious and more difficult to be corrected.

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Immunologically the pre-school child has lost the transplacentally acquired maternal antibodies and he is trying to build his own active immunity. His small body mass makes him more susceptible to the effects of attacking agents and more liable to the lethal effects of environmental hazards.

2. Psychological features: The experience of weaning through which the child passes may explain the anxiety features sometimes observed; he is listless and liable to suffer from psychosomatic vomiting. He is hyperactive, inquisitive and explorative towards the environment around him. He is also resistant and negativistic. These features have been described by Kanner (1955), Kagan et al (1966) and Oomen (1968). They are important in determining his feeding habits.

3. Socialization: The pre-school age is the period of communal socialization. At about four years he starts to be acquainted with social circles outside the family. He develops community consciousness.

The Cultural Reactions to the Pre-school Child

After weaning, the methods of food preparation, the eating habits and the cultural food attitudes tend usually to treat the pre-school child as a miniature adult. Feeding practices are geared especially to the adult male to whom animal protein is given first; the child will get the more starchy and carbohydrate-rich staple food. Cultural barriers and taboos may delay or limit the introduction of available protein food for young children, as shown by Cassel (1955) and Jelliffe (1968).

The Nutritional Needs of the Pre-school Child

The nutritional needs of the pre-school child are determined by his growth rates as well as his activities. Jackson et al (1962) classified the factors which determine the nutrient requirements in childhood as follows:

(i) the growth rate of different tissues of the body

(ii) sex

(iii) body build

(iv) the capacity of the body to store certain nutrients.

Consequently, it may be calculated from the studies of Hansen (1959) and others that the pre-school child would need the following nutrients:

Calories	100 - 90 Calories per kg body wt.
Protein	2.5 gm/ g body wt
Fat and Carbohydrates - sufficient to meet calorie need	
Calcium	1.0 gm
Phosphorus	1.5 gm
Iron	8 mg
Iodine	Trace
Vitamin A	2 500 - 3 000 IU
Thiamine	0.6 - 0.8 mg
Riboflavine	0.9 - 1.2 mg
Niacine	8 - 10 mg
Ascorbic acid	40 - 50 mg
Vitamin D	400 IU

The child should be provided with these needs in a palatable way and in amounts and frequency suitable for his appetite and psychological features. Jelliffe (1966) recommended that the pre-school child should be served easily masticated and digestible food in frequent meals.

Common Nutritional Problems among Pre-school Children

1. Developmental: Impairment of physical, psychological or social growth and development. Obesity may be a manifestation of malnutrition during this period.

2. Morbidity:

2.1 Clinical nutritional diseases

2.1.1 Protein-Calorie-Malnutrition

2.1.2 Vitamin deficiencies such as xerophthalmia and rickets or overdose as hypervitaminosis D.

2.1.3 Mineral deficiencies as of iron and iodine.

2.2 Indirect features of malnutrition: low resistance and lower immunity leading to repeated infections.

3. Mortality: specific death rate in the age group 1-4 years is a reflection of malnutrition.

Retardation of Physical Growth and Development

Post-natal growth and development is the result of interaction between the genotype of the pre-school child and his environment. This environmental influence is mediated through dietary intake. Inadequate nutrition during this phase will result in growth and developmental retardation as reported by Jelliffe (1955), Dean (1958), Abramson (1959), Ashcroft (1965), Jackson (1966), Garn (1966), Gopalan (1968), Gokulanathan and Verghese (1969), Wray et al (1969), Hedayat et al (1969), Abbassy et al (1972), Adrianzen et al (1973) and Walker and Richardson (1973). These authors showed that undernutrition of the pre-school child is also associated with retardation of growth and its component features such as the centres of ossification and skeletal growth. There is definite slowing in height and weight gain. This had been shown in different communities in Africa, Asia, Central America and the Eastern Mediterranean Region.

Retardation of Mental Development

The lack of proper nutrition during infancy and early pre-school age period shows itself in different psychological forms which impede potential mental development. There is significant lowering of IQ among pre-school children who were underfed before eighteen months. These children are slower in learning. When reaching late pre-school age, their capacity to attend and sustain interest is limited. These pre-school children were shown to have a reduction in responsiveness. They are easily fatigued and unable to sustain prolonged physical or mental effort. These findings were demonstrated by Cravioto (1966), Both Antoun (1968), Berch (1972) and Martin (1973).

Protein Calorie Malnutrition

This term covers a spectrum of clinical pictures. It is the term used referring to malnutrition in young children. It includes the severe clinical forms known as marasmus and kwashiorkor as well as mild and moderate

forms which do not have frank clinical features but mainly retardation of growth and development and some biochemical changes as the only evidence of malnutrition. There is a spectrum of changes through which the child can pass and even shift from one peak clinical picture i.e. kwashiorkor to the other peak i.e. marasmus as stated by Jelliffe (1966).

As shown by Brock (1960), the deficiency of calorie intake is as important as the deficiency in protein intake, and the feeding of protein concentrates if not compensating the deficit of calorie intake will not correct the clinical or pathological changes, as emphasized by Gopalan (1973).

Bengoa (1974), analysing the recent nutritional surveys in developing countries, showed that 2.5 per cent of children less than five years of age had severe P.C.M. and almost 30 per cent had moderate conditions. This probably means that at least another 30 per cent had mild P.C.M., bringing the total incidence to approximately 65 per cent. This nearly matches with the statement of Rao (1974) that only 20-40 per cent of the pre-school children of lower income groups in the Eastern Mediterranean Region could be grouped as normal while the rest were found, in the different surveys, to be affected by malnutrition of some degree.

Kwashiorkor

This disease had been reported in the Eastern Mediterranean Region as early as 1947 when Hanafy (1947) described the sub-acute sub-nutritional syndrome in Alexandria. Consequent reports were given by Brock and Autret (1952), Jelliffe (1955), El Nabawy (1959) in Cairo, Pharoun (1960) in Jordan, Hassan (1960) in Sudan, Hedayat et al (1969) in Iran. Rao (1974) showed the distribution of the problem in the Eastern Mediterranean Region. A look at Table I which gives data on per capita protein availability and 1-4 age group mortality in the Region might suggest that PCM could be present in some of the communities where it has not yet been reported.

TABLE I

The Important Populational and Vital Statistical Features of Countries in EMR

	COUNTRY	Population Estimate (Latest) (1 000)	Average Annual Population Increase (1963-1971)	Crude Birth Rate	Crude Death Rate	Infant Mortality Rate	Proportionate Mortality under five %	Daily P.C. Calorie Supply	Daily P.C. Protein Supply (gm)
1	Afghanistan	17 878	2.3	50.5	26.5	190	...	2 060	65
2	Bahrain	229	3.4	24.4	3.9	146	...	...	...
3	Cyprus	647	1.0	23.3	7.8	28.3	5.4	2 460	78
4	Dem. Yemen	1 590	3.0	50.0	22.7	160	57.5	2 020	67
5	Egypt	35 300	2.5	34.1	14.4	120	42.3	2 770	80
6	Ethiopia	25 933	1.9	45.6	25.0	162	50.0	1 980	66
7	Iran	31 300	3.0	45.4	16.6	120	37.8	2 030	55
8	Iraq	10 412	3.3	49.3	15.5	104	14.9	2 050	58
9	Jordan	2 560	3.4	45.3	16.0	105	38.6	2 400	65
10	Kuwait	880	9.8	46.7	7.4	81.0	44.5	...	...
11	Lebanon	2 963	3.0	26.5	16.0	59.0	17.7	2 360	70
12	Libya	2 161	3.7	45.9	15.8	69.0	54	2 630	66
13	Oman	717	3.0	50	19	...	...	...	...
14	Pakistan	64 892	2.4	50.9	18.4	136	53.8	2 410	55
15	Qatar	90	4.8	30	3.2	27	...	...	...
16	Saudi Arabia	8 199	2.8	50.0	22.7	157	...	2 080	56
17	Somalia	3 000	2.3	45.9	24.0	200	...	1 770	57
18	Sudan	16 901	2.7	48.9	18.4	121	...	2 090	59
19	Syria	6 879	3.3	47.5	15.3	98	33.8	2 450	69
20	Tunisia	5 509	2.2	37.0	16.0	120	49.0	2 200	63
21	U.A. Emirates	203	3.0	50	19	119	...	...	...
22	Yemen	6 096	2.7	50.0	22.7	160	...	1 910	57

Based on data from Circular dated 6 March 1974 - Health Statistics Units WHO/EMRO

Jelliffe (1966) grouped the signs of kwashiorkor into:

1. Constant signs: oedema, growth retardation, muscle wasting with retention of some subcutaneous fat and psychomotor changes.
2. Usual signs: hair changes, diffuse dispigmentation of the skin, moon face and anaemia.
3. Occasional signs: Flaky-paint rash, hepatomegaly, indolent sores and fissures, moist groin rash, associated vitamin deficiency, associated conditioning infections.

Marasmus

This is a severe picture of chronic malnutrition due to a diet poor in both proteins and calories. Its signs could be classified into:

1. Constant signs: growth retardation and wasting of muscles and subcuteneous fat.
2. Occasional signs: hair changes such as sparse hair, associated vitamin deficiencies as angular stomatitis or keratomalacia. Associated conditioning diseases may be present.

Intermediate Severe Syndromes of P.C.M.

These are cases which are intermediate between kwashiorkor and marasmus. Changing circumstances may result in a transition from one clinical picture to another.

Mild-moderate P.C.M.

There is a multitude of clinical pictures. These may consist only of underweight of the child with normal growth and development in length. But a disproportionate growth and scattered loss of subcutaneous fat may show themselves, as the buttocks are flattened and the scapulae appear winged, the chest appears smaller than the distended belly.

Nutritional dwarfism

The child is underweight and under-sized but he has a relatively normal weight for height.

For practical assessment of different forms of P.C.M. it is better to use objective anthropometric data and some simple classification as proposed by Gomez, Jelliffe, etc.

Vitamin A deficiency

This is shown clinically as xerophthalmia and keratomalacia. In pre-school age, xerophthalmia is usually in association with P.C.M. Rao (1974) showed its distribution in the Eastern Mediterranean Region; it was a reportable condition in Jordan and Pakistan and it is reported to be less frequent in Ethiopia. More extensive studies may be indicated.

Rickets

Vitamin D deficiency is reported in Egypt, Ethiopia, Iran, Libya and Tunisia. It is relatively common in the mild form in Egypt. In rural as well as urban areas it reaches 30 per cent of the child population less than three years of age. It is observed that it corrects itself at the third year. The cause is not only lack of intake of vitamin D; the habits of clothing the children and refusal to expose them to sunshine, especially in winter, may be contributing factors for the occurrence of rickets in Egypt.

Iron deficiency

This is a common deficiency disease in pre-school age children. Finch (1966) showed that the critical period of iron store depletion which occurs during the first year needs rebalance which extends over the first 3-4 years. Rao (1974) showed that the prevalence of nutritional anaemia was studied in nine countries in the Eastern Mediterranean Region which are: Egypt, Ethiopia, Iran, Iraq, Jordan, Lebanon, Libya, Pakistan and Sudan. These studies showed that 20-25 per cent of pre-school children suffer from anaemia. Iron deficiency anaemia is the predominant type. This supports the previously shown findings of Chopra et al (1964) who suggested that anaemia in most cases was multifactorial inclusive of faulty diet, parasitism and elevated needs due to growth.

Iodine deficiency

Iodine deficiency has been recorded in many countries of the Eastern Mediterranean Region as shown by Rao (1974). This iodine deficiency, whether due to soil factors or feeding habits shows itself as goitrous changes in the thyroid gland and their sequelae. Follis (1966) stated that in goitrous areas

the weight of the gland is markedly increased at birth, decreases a little during infancy then begins to increase at a much greater rate in the pre-school age period than in non-goitrous areas. Diwany et al (1960) showed that in Cairo among children aged 2-5 years only eighteen out of fifty-six, i.e. 28 per cent had a normally functioning thyroid. From the already existing but limited information it is likely that the problem of iodine malnutrition in the pre-school age period might be a considerable one.

The Malnutrition-Infection Synergism

There is an association of malnutrition and infection observed by different authors in communities where pre-school malnutrition is common. This synergism between infection and malnutrition has been explained by Scrimshaw (1966) on the basis of the intermediation of the metabolic processes controlled by the pituitary/supra-renal actions.

Malnutrition interferes with the antibody formation and the phagocytic activity of the leucocytes.

Proper nutrition is important for the integrity of the integument, whether skin or mucous membranes. Deficiency of some elements such as vitamin A would interfere with the proper health of this integument, giving more chances for infection to take place: Hegsted (1972) and Gopalan et al (1973) pointed out that synergism between infection and malnutrition will accentuate already poor nutritional conditions, which will lower the resistance inviting more infection. This combination is most apparent in the pre-school age.

Obesity and Hypervitaminosis

Pre-school child obesity is beginning to be apparent in affluent communities, as shown by Forbes (1957) and among mother-dominated families even in the poor communities. The mother, eager to give her child the best care, overfeeds him and protects him against too much activity. The net result is obesity. Maternal dominance also interferes with the proper psychological development of the child, which will be reflected in his physical growth.

Hypervitaminosis occurs in the pre-school age as a result of overdosage of vitamins A or D or both. This is seen among children of sophisticated mothers who want to be sure that the child receives his need of vitamins. But for self-assurance she overdoes this nutritional care.

Pre-school Age Mortality

Nutritional deficiency is a background for the killing diseases during pre-school age. Wills and Waterlow (1958) suggested that the crude death rate between 1-4 in the age period could be used as an index of malnutrition, even though malnutrition as such may hardly figure in the listed causes of death. The synergism between malnutrition, infection and parasitism may lead to death of the pre-school child. The use of death rate 1-4 years has been accepted by Williams (1966), Jelliffe (1966) and Gordon et al (1967) as an index to the level of pre-school malnutrition in a community. This is supported by the findings of Tharburn and Hayes (1968) and Cook (1969).

The Ecology of Malnutrition in Pre-school Age

Ecological factors play a very important role in the causation as well as in the subsequent progress of nutritional disease. This subject is reviewed in relation to the host, agent and environmental factors.

1. Agent: Food deficiency or over-indulgence can both lead to disease as exemplified above. Deprivation of the needed nutrients is a more common operating factor than overfeeding, especially in developing countries.

2. The Host: A pre-school child suffering from malnutrition may be one of two types:

(a) A child who has passed infancy and reaches the pre-school age in a balanced nutritional condition, who then begins to suffer during early childhood.

(b) A child who has reached pre-school age suffering from undernutrition, whether concealed or frank. Thus the pre-school age malnourished picture is an extension with or without amelioration or aggravation of his antecedental nutritional status.

2.1 Age : P.C.M. may occur in any part of the pre-school period of the child's life

2.2 Sex · usually there is not much significant sex difference but Hassan (1960) showed that in the Sudan kwashiorkor affected males more than females. Cook and Hanslip (1964) reported that in the "Greater Syrian Region" which covers Syria, Lebanon, Jordan and Palestine (the Arab population) the apparent malnutrition and higher mortality were greater among girls compared to boys in age 0-4 years. They explained this in terms of cultural values in sex discrimination. Similar observation of the sex difference has also been reported by Wray and Aguirre (1969) where girls were affected by P.C.M. more than boys in Central America. They stated that there was no cultural pattern strongly favouring boys.

2.3 Previous weaning experience : Children who suffered from abrupt weaning were more liable to develop malnutrition, as abrupt weaning has a traumatizing effect on the child. It deprives the child of food and maternal contact both of which are needed to give him the sense of security and belonging. This habit of abrupt weaning has been illustrated by Jelliffe (1955) (1960) (1968), Foll (1958) El Golmy (1960) and El Sherbini (1967). Consequent to the sudden deprivation of maternal emotional touch, besides the well tolerated feed, the child develops a state of anorexia and psychological depression which will inhibit his desire to eat.

2.4 History of infectious disease A major proportion of those who suffer from kwashiorkor in the pre-school age have a history of infectious disease. Diarrhoea has been reported by Nabawy (1959) as well as measles, TB and other infectious diseases.

2.5 Birth order : Malnutrition is found more among the high birth order children especially if above the fourth child in the family. This fact has been recorded by Wray and Aguirre (1964).

3. The environmental factors

3.1 Sanitation : Bad sanitation has been used to explain the findings in the malnutrition infection syndrome. Its role is indirect, as

through bad sanitation infection is able to take place. Hegsted (1972) states that since the physical environment is unsatisfactory, the child suffers from repeated and often continuous bouts of infection. Elbualy (1970) explains the decline of nutritional problems before chemotherapy in USA by better housing and sanitation.

3.2 The social environment : The contemporary habits of child feeding are the result of a variety of social determinants. These feeding habits are reflected in terms of :

(a) The quality and quantity of the pre-school child's diet.

(b) The way in which the food is prepared.

(c) The method and frequency of presentation.

(d) The method of preservation from contamination and degeneration.

(e) The priority of the pre-school child in intra-family food distribution.

Feeding habits are determined by the interaction of the different social customs which build the network of the social system around the family. These are influenced by the history of the community, the prevailing religion, the education, the economy, the social control and the child-rearing practices.

The most important social structural units through which the pre-school child feeding habits can be influenced are the family, the surrounding community and the day care centres.

The role of the family in pre-school child malnutrition

1. The family size : Wray and Aguirre (1969) found that among families who have four children or less, the rates of malnutrition among pre-school children are lower than the community average. With five or more they are higher and increase with the increase in number.

2. The pre-school children in the family : The increase in number of pre-school children is associated with increase of rates of protein calorie malnutrition in the family.

3. Interval between children : An interval of at least three years between two consecutive children protects the older child from malnutrition.

4. Maternal age : The highest rates of malnutrition were in children born to mothers of thirty-five years or older. This might be due to exhaustion of maternal resources of nutrient as she had given birth to multiple children during her long maternal life.

5. Education of the parents : This is a barrier against pre-school child malnutrition. This has been shown by Willbourne (1959) and Wray and Aguirre (1969).

6. Family economy : There is less malnutrition among pre-school children of high income as stated by Peterson and Lightwood (1956). The occurrence of malnutrition is influenced by the way the family income is spent on food. The frequency of malnutrition rises as the per capita food expenditure decreases.

7. Family integrity : Malnutrition of pre-school children was reported by Willbourne to be found more in broken families than among intact families.

8. Mother-child relationship : A well established mother-child relationship promotes normal nutrition, even with poor diet and with the poor environmental conditions of slums. Hegsted (1972) shows the importance of this relation and states that a poorly functioning maternal-child relationship negates the advantages of adequate nutrient intake to the vulnerable, rapidly growing child.

9. Child feeding : Improper weaning is a common denominator for pre-school children suffering from malnutrition. Lewis (1959) shows that limitations of maternal resources determine the quality and quantity of diet given to the child. The type of food consumed is partly determined by customs and poor knowledge about the important foods necessary for the promotion of health. Mainly carbohydrates form the bulk of the diet of pre-school children whatever the income. This is supported by the statement of Hegsted (1972) that because of poverty, tradition or lack of parental understanding, the quantity and quality of food available to the child is either marginal or limited.

Meat or meat products and eggs are not usually given to pre-school children in various cultures. This has been shown by Jelliffe (1968). Hassan (1960) shows that plant proteins used in Egypt to feed children, although individually of less value than animal protein, are quite useful in combination;

rice protein is superior to that of wheat or maize. Its value is undermined by the method of preparation, as the uncontrolled liberal use of rice water as a substitute for milk leads to malnutrition. The same has been shown by Sabry (1960) i.e. that the major source of protein in pre-school child feeding is of plant origin. Contrary to the common idea that protein deficiency is the problem, Gopalan et al (1973) shows that by direct assessment of dietary intake of pre-school children, the major problem is the deficiency of calories and not proteins and, if the calorie need is met, then the protein need would also have been met.

The role of the community in pre-school child malnutrition

1. The degree of urbanization The usual location of cases of P.C.M. is the suburban areas to which new migrants from rural areas shift on their way to urban settlement. In these communities there is a process of adjustment to the new urban life. The pre-school child bears the brunt of adjustment, as stated by McLaren and Pellette (1970).

2. The degree of retention of cultural values : The shift from rural to urban culture will expose the population to the impact of a new pattern of life. The same applies to the impact of new technological changes when introduced in villages. This will induce social changes and a reactionary social repercussion to maintain the ingroup balance and socio-cultural haemostasis. Gokulanathan and Varghese (1969) state that among these reactions is the disturbance of pre-school child feeding. This is due to the shift to the new wage economy, the break of extended family ties and the shift to new types of medical care emphasizing supportive vitamin therapy.

3. The effect of mass media information · The utilization of mass media to propagate the use of certain foods for children, without teaching the proper use and precautions, may lead to malnutrition.

4. Engagement of the mother in work outside the home : The pattern of work of mothers, which is time-scheduled, may have repercussions in the nutrition of pre-school children. The separation of the child from the continuous care and supervision of his mother and his being kept in the care of some other person such as a neighbour, may expose the child to undernourishment.

The role of day care centres in prevention of pre-school child malnutrition

Nurseries and day care centres for children in the pre-school age can be used to initiate preventive measures against malnutrition, among these children. The cost of care in these centres might be a barrier for their extensive use, as shown by El Sherbini et al (1971) and Kamel et al. (1972).

The social pathogenesis of pre-school child malnutrition

1. The child of a big family, coming after repeated pregnancies, is often till his mother becomes pregnant again before he has completed his first year of life.
2. Abrupt weaning, due to the prevailing idea that the breast milk of the pregnant mother is not healthy for the child. This abruptly weaned child is given some rice water or decoctions.
3. After the birth of the new child the mother is occupied in caring for this new born and the older one is left with the older sisters and brothers. He is exposed to environmental infections while his immunological reactions are poor and not well developed.
4. Under the stress of separation from the mother as well as of under-feeding and infection the child becomes non-responsive and apathetic. He develops anorexia and eats the least amount of the carbohydrate food presented to him. This is the trigger-point for a chain of reactions.
5. The habits of food distribution in the family, together with low income and low food expenditure per capita, result in the child being presented by high carbohydrate food of limited quantity. This will aggravate his under-nutrition.
6. Exposure to the environment outside the home with the supervision of his brothers and sisters and bad environmental sanitation will result in infection which will strain his nutritional balance, leading to conversion of concealed into overt malnutrition.
7. The undernutrition-infection cycle is further perpetuated by referring the child to some traditional medical care which dictates the administration of a very inadequate diet.

8. As the child is ill and kept at home for a large part of the time, he is not exposed to play and reaction with his peers and consequently he has little opportunity to learn through play. He is also reared in an environment which is poor in intellectual stimuli.

9. If he is not fully rehabilitated, he is likely to suffer from physical and developmental handicaps.

10. If conditions deteriorate further they will lead to failure of the adaptive mechanisms of the body, ending in death.

11. Death of the pre-school child will stimulate the parents to try to get another child at the expense of the mother, exhausted physically and mentally.

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