Nutritional Evaluation of an Indigenous Low Cost Protein Food

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A study of supplementary feeding was conducted on children with a protein food (edible fish powder in the form of 'chutney') for 35 days and the effect assessed periodically. The most noticeable effect was gain in weight and mid arm circumference in children. 35 % children showed a weight gain of 1 kg, 27 % 0.5 kg, 21 % 1.5 kg and 2.5 % 2.5 kg. 48 % children registered an increase in their mid arm circumference by 0.5 cm, 16 % 1 cm and 2.5 % 1.5 cm. 10 % children did not gain weight. However, these children had intercurrent infections like measles, whooping cough and asthma.

Malnutrition, infection and infectious diseases are responsible for 95 % mortality in children below 6 years in the developing countries (Gupta, 1977). Malnutrition in a child during the first year has an adverse effect on subsequent learning and behaviour (FAO/WHO, 1967). The Joint FAO/WHO (1971) Expert Committee has recommended special protein foods and energy requirements for the vulnerable groups, adults and children suffering from malnutrition. Udani (1975) stressed the need for developing suitable feeds for infants and pre-school children.

The improvement in the nutritional status of the young pre-school children is mandatory and an increasing need is felt for the development of a food, rich in protein and other nutrients palatable to children, economically feasible, technically advisable and socially acceptable. The Indian peninsula is gifted by a very long coast line of 6100 km with an annual marine fish landings of 1.32 million metric tons. Of them, more than 30 % is composed of cheap miscellaneous fishes. However, these trash fish form a rich source of protein of high nutritional value. An attempt was made in this study to prepare a protein rich, cheap and palatable food for the pre-school children and feeding trials were conducted to find out the practical and nutritional implications.

Materials and Methods

The study was conducted at Vimalalayam, a social institute at Cochin, during November and December, 1977. The age of the children varied from 1 to 5 years. 950 children were examined and those suffering from serious illnesses and major congenital defects were excluded. Only 150 children who could attend this supplementary feeding programme regularly were chosen for the study and examined fully after recording the relevant clinical history. The children were fed with usual food at home, thereby assuring that the feeding was only supplementary and not substitutory. The feeding was between 3 and 4 p.m. every day.

The edible fish powder was prepared out of lean fish meat. The meat was cooked, pressed in canvass bags and dried in an electrical drier. The dried meat was powdered, sieved and packed 1 kg each in polythene bags, subjected to detailed bacteriological analysis and care was taken that every sample was free of all pathogens. Proximate composition (Table 1) of the fish powder was determined by the methods of AOAC (1960). Amino acid composition was determined micro-biologically (Kavanagh, 1963; Gopakumar, 1973). The fish powder 'chutney' was prepared by mixing the ingredients in the ratio as given in Table 3

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and grinding it to a paste in a mechanical grinder. Each child, irrespective of age, was fed with 40 g of 'chutney' (containing 20 g protein) with two slices of bread or a few pieces of cooked cassava.

Table 1. *Proximate composition of fish powder*

Protein %	80.5
Ash %	9.5
Moisture %	5.3
Fat %	4.7

Table 2. *Amino acid composition of fish powder*

Amino acids	g/100 g of fish powder
Lysine	7.10
Valine	6.56
Arginine	3.10
Methionine	3.24
Tryptophan	1.20
Isoleucine	5.52
Tyrosine	5.76
Cystine	0.28
Aspartic acid	7.06
Proline	7.70
Serine	6.40
Histidine	1.82
Leucine	6.00
Threonine	4.70
Phenylalanine	4.55
Glycine	1.15
Glutamic acid	13.50

Table 3. *Composition of 'chutney'*

Fish powder	1 kg
Onion	800 g
Coconut	400 g
Salt	to taste
Chilli	to taste
Ginger	to taste

Table 4. *Clinical signs on examination*

Open fontanelle	5%
Helminthic infestation	50%
Hair changes	20%
Stomatitis	5%
Oedema	2%
Pallor anaemia	57%

The nutritional status was assessed at 10, 20, 30 and 35th day of the study by recording the body weight and mid-arm circumference. Those children who were absent for more than two days in a week or those who failed to get 80% attendance were excluded. Children with massive helminthic infestation were dewormed. Positive results on deworming and any intercurrent illness or untoward symptoms of children were also recorded.

Results and Discussion

Only 75 children completed the programme with more than 80% attendance. The m jority of parents were very poor (64% had a monthly income of Rs. 100/- to 200/- and 6.7% Rs. 300/- or more). About 60% of the parents had primary school education (upto 5th standard). 8% of fathers and 4% of mothers had passed S.S.L.C. examination. The study revealed that 57.3% of children had pyoderma or eczema, mixed with scabies earlier and 25.35% had measles.

Of the total 75 children who completed the feeding programme, 38 (50.66%) were boys and the rest girls. The age and sex-wise distribution are presented in Fig. 1. 96% of children were born after full term pregnancy and the rest were born prematurely (15 days earlier). 14.66% children exhibited pica (eating mud, dirt and charcoal). Pallor, suggestive of a moderate degree of anaemia was present in 57.6%. Other clinical signs are given in Table 4. Intercurrent infections in the form of asthmatic episodes, scabies and measles were noted in a minority of cases.

The cost of production on pilot plant scale of the fish powder worked out to Rs. 7/kg. The protein efficiency ratio (P.E.R.) of fish is 3.55 compared to 3.9 for egg, 3.09 for cow's milk, 2.30 for beef, whereas, soya, corn, ground nut, wheat and rice all have lesser P.E.R. (Shenoy *et al.* 1976). The P.E.R. of fish power used was 3.1 compared to casein (2.46). The amino acid composition of the fish powder is presented in Table 2. The loss of lysine after heating was the least in fish when compared to milk, ground nut or wheat. The role of supplementary feeding and the acceptance of low cost local

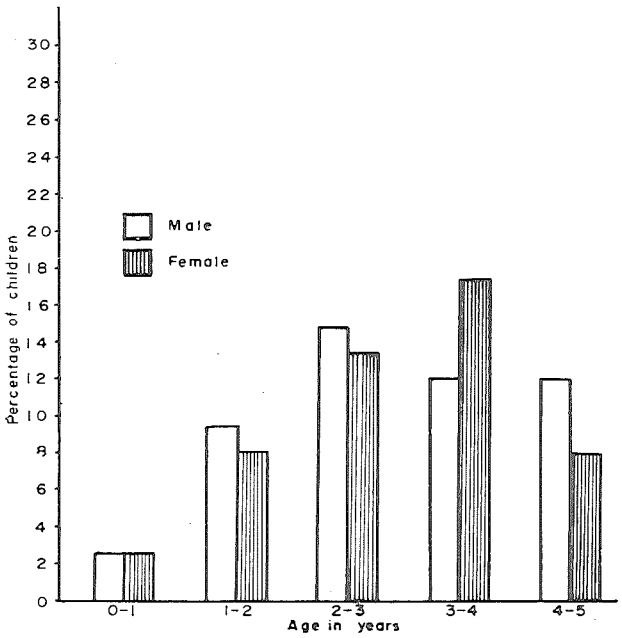

Fig. 1. Age and sexwise distribution of children

food served on the spot was also stressed by Kamaraj & Moorthy (1977).

The demonstrable improvement in the form of gain in weight and mid-arm circumference within a short period of 35 days, were quite impressive (Fig. 2). It was striking that no children developed diarrhoea,

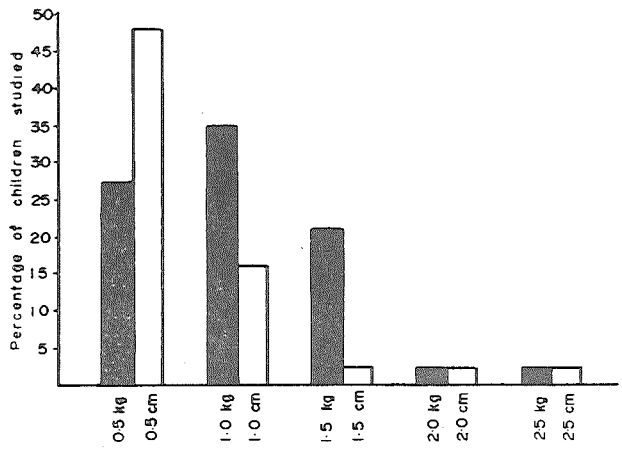

Fig. 2. Gain in body weight and mid-arm circumference

vomiting or any other gastro-intestinal disturbances, a clear testimony to the safe and hygienic nature of the preparation. The acceptability of the feed was excellent. Even children belonging to strict vegetarian families accepted the preparation without any inhibition. In the treatment of malnutrition and hypoproteinemia, this powder can be suitably modified and used according to regional food habits with promising results.

The authors express their deep sense of gratitude to Shri G.K. Kuriyan, Director and Shri M. R. Nair, Project Co-ordinator, Central Institute of Fisheries Technology, Cochin for making available the raw materials for the study, to Shri M. Arul James, Scientist, for the amino acid analysis and to the sisters and staff of Vimalalayam, Cochin for their help in the operation of this programme.

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