EVALUATION OF THE PRE-SCHOOL FEEDING PROGRAMME IN SELECTED SLUMAREAS AROUND COIMBATORE

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I. INTRODUCTION

"The worth of life is man's good fortune
His jewels are his good children".

- Thiruvalluvar.

Children are not only the jewels of the family but also the society. They are the most cherished possession of a society and they as a mirror reflect the progress of the country. A nation realises its potentialities through its children and is judged by what it does for children (Devadas, 1976). What the child will be as an adult depends much on the experiences he gains with objects and materials during these plastic and mouldable years of life (Nash, 1976).

Children between one year and 5 years of age are called pre-school children. About 15 percent of Indian population are in this age group. According to 1971 enumeration 41 per cent of Indian population (228 million) are children.

In 1971 there were 5.99 million children below four years of age in Tamilnadu and this number is expected to increase to 6.87 million by 1986. In India some 36 million children living in villages and 10 million in cities and towns are estimated to be below the poverty line (Samson, 1976).

The primary needs of pre-school children are whole some food, healthy environment and happy years of schooling which stimulate and satisfy the needs of his widening horizon (Gopalan, 1975). Hence it is very imperative that the needs of todays children are taken care of.

Childhood is the period of rapid physical and mental growth and development. Their nutritional requirements are higher than those of adults. Good nutrition is essential for children to stimulate and maintain their growth and well being. However inspite of the importance given to children in our literature and society they remain as the most neglected group in our population with regard to nutrition, health and education.

A number of nutrition and diet surveys carried out among the population groups in different parts of the country have confirmed the existence of wide spread malnutrition among the poor sections of our population. It has been estimated in a survey conducted by the National Nutrition Monitoring Bureau that three fourths of the pre-school children have body weights below 75 percent of the normal weights for their age indicating calorie under nutrition. Of these, 23 per cent suffer from severe degrees of malnutrition, 10 to 15 per cent of the children of the same age group suffer from deficiency of Vitamin A, running the risk of possible blindness. (Social Welfare, 1979).

As one of the measures to control malnutrition the government of India and the different States including Tamil Nadu have given high priority to the nutritional improvement of children and mothers and have sponsored several nutrition intervention programme. Since nearly 70 percent of the pre-school children live in rural areas, the development programmes should have a strong rural bias (Devadas, 1972). According to Murthy (1972) the current nutritional programmes of the Government are not adequate to meet the existing requirements.

According to Devadas (1972) nutritional feeding programmes should comprise of nutrition and health education, feeding the target groups and proper evaluation of the programme. Devadas (1979) stresses that the pre-school feeding programmes should of local foods, local participation, good organisation and integration with health services. The expected results aiming at the improvement of nutritional status of the children and nutrition education to ensure desirable changes in food, behaviour and habits.

Balwadi feeding programme is an effective tool to reach nutrition. It helps to develop food habits, social living and harmony. The balwadi feeding programme not only looks after the inadequacies in the diet but also the deficiencies in the personal behaviour and character formation of children on a collective basis. The balwadi feeding programme offers a unique opportunity and numerous socio-economic and cultural

factors towards the development of children. Pandey (1972) pointed out that one of the main objective of the balwadi is to give more attention to health and nutrition.

Feeding programme in pre-school has been in operation in the rural areas since 1972. It is implemented in collaboration with CARE by the State Department of Rural development and local administration and Social welfare department. This programme covers 88,200 beneficiaries through 1000 Anthandaigal Kendrams in 92 Blocks. Even though a large number of the pre-school children participated in this feeding programme the evaluation studies on these feeding programme is very limited. The systematic evaluation of the feeding programmes alone can reveal the beneficial effects of the programme, existing lacuna and suggestions for the further improvement of the programmes. Hence the present investigation is an effort in that direction. It aimed at evaluating the supplementary feeding programme in ten selected balwadies around coimbatore city. The evaluation was carried out in terms of nutritional status of children, nutritional knowledge of children and attitude of mothers and children towards the programme.

II REVIEW OF LITERATURE

The literature pertaining to this study on "Evaluation of the pre-school feeding programme in selected talukdies around Coimbatore is reviewed under the following heads:

A) Nutritional problems of pre-school children in India

B) Current feeding programmes for rural pre-school children in Tamil Nadu and

C) Parameters for evaluating feeding programmes.

A. Nutritional problems of pre-school children in India

Malnutrition can be defined as the lack of sufficient quantity or quality of nutrients to maintain the body system at some definite levels of functioning (Jacoff, 1976).

Malnutrition is a serious health hazard for two thirds of world's children (Kamal Arya, 1979). Malnutrition is undoubtedly the biggest public health problem in India today (ICMR 1977).

Malnutrition continues to be one of the leading causes of illness and death among young children in developing countries. Among those who survive a background of poor nutrition contributes to chronic debilitation and to impaired functional performance, intellectually and physically. Contrary to earlier expectation the problem appears to

be increasing both in the number of individuals already affected and in the range of population groups at risk (WHO Chronicle, 1979).

Recent investigations carried out in typical small population groups in different parts of the world have shown that malnutrition contributes considerable to a very high mortality especially among children of 1 to 4 years of age (WHO - 1973). Malnutrition contributes directly or indirectly to high mortality and morbidity. Nearly 75 per cent of infant mortality in the first year of birth is directly attributed to malnutrition and premature birth (Devadas and Jayaram, 1974).

The infant mortality rate has been regarded as a general indicator of the effectiveness of public health services, the death rate from 1 to 4 years might serve as a rough index of the prevalence of malnutrition (Mills and Waterlow, 1978). Every death of children below 5 years in the designated population was scrupulously followed up and it was shown that malnutrition contributed to death in about half the cases (Martin, 1970).

The prevalence of deficit in weight for age correctly indicates the incidence of malnutrition. Seaman and Lowenstein (1975) in Bangladesh used arm-circumference which correlates quite well with weight for age as an index of malnutrition. Kielmann and Uphoff (1975)

in Punjab found that mortality of children between 1 to 36 months old doubled with each 10 per cent drop below 80 per cent standard weight for age.

The relation between severity of malnutrition and mortality is not fixed. Cravioto and Delicardie (1976) mention that in their longitudinal study in Mexican village the provision of medical care halved the infant and pre-school mortality rate with no effect on the incidence of severe protein-energy-malnutrition. The results of Kielmann and Mallord (1976) referred that children less than one year old have an increased risk if they are below 80 per cent of standard weight for age, but above one year there is no increased risk until they are below 70 per cent of standard weight. Thus by this criterion what is significant malnutrition at one age is not significant at another age.

It is possible that in any country a high mortality rate in the 1 to 4 years of age group indicates widespread malnutrition (Semba et al, 1979) and the death rate in this age group can be used as an index of the nutritional status of the population (Mills et al, 1978).

A country wide nutritional survey show that 90 per cent of pre-school children had the heights and weights below the 90th percentile value of American children of corresponding ages (WHO, 1973).

The major causes of malnutrition enumerated by Devadas (1972) are low income and consequent purchasing power, ignorance of nutritional knowledge, certain harmful traditional habits, customs, beliefs regarding meals, infection and infestation and other factors connected with poor food and living habits and household tensions.

Malnutrition is probably the single most important health problem in developing countries (Mahler, 1977). The quantitative and qualitative deficiency of protein leads to kwashiorkor among pre-school children (Gopalan, 1970). Berg (1973) of the estimated that of the 667 million children in the developing countries suffer from protein calorie malnutrition of varying degrees. According to Swaminathan et al (1972) and Dsouza (1974) 70 per cent of the Indian children are suffering from Protein malnutrition. A survey carried out in South India showed that about one to two per cent of children aged 1 to 5 years showed symptoms of Kwashiorkor (Rao et al. 1959; Roy, 1974 Ramashwar Sarma, 1976; and Gopalan, 1977). A study on a tribal group of Andra Pradesh points out that the prevalence of protein calorie malnutrition was the highest among Gonds and Chenchus (Hanumantha Rao and Satyanarayan, 1974).

Vitamin A deficiency is another major nutritional problem causing over one million cases of blindness (Task force of Nutrition, 1972).

The prevalence of vitamin A deficiency in the form of xerophthalmia affects from 0.2 to 8 per cent of children. In the far East alone 100000 children go blind each year (FAO, 1975). Ramachar Sarma (1976) reports that about 3 to 5 precent of pre-school children suffer from vitamin A deficiency. The overall prevalence of conjunctival xerosis and Bitot's spot were 4.3 per cent and 2.9 per cent for all the regions taken as a whole (ICMR, 1977).

Blindness from all causes is about one per cent (WHO, 1978). Ramalinga Murthy (1979) states that about 8 per cent of children below 5 years of age in India suffer from severe forms of Vitamin A deficiency. Three fourths of pre-school children suffer from malnutrition and among this 10 to 15 per cent of the children of the same age group suffer from deficiency of vitamin A (Social Welfare, 1979).

Iron deficiency anaemia is widely prevalent particularly in young children and a recent study conducted in Hydrabad showed that the iron supplementation to pre-school children resulted in a significant increase in their haemoglobin level but there was no significant change in the morbidity pattern (Sarma, 1978). ICMR (1978) estimates that 47 percent of the pregnant women and 9 per cent of the pre-school children are suffering from this syndrome.

ICMR (1977) estimated the haemoglobin in 6062 pre-school children and showed that the prevalence of iron deficiency anaemia was

62.8 per cent in children between the ages of 1 to 3 years and 44 percent in children between 3 and 5 years. Severe and moderate anaemia with haemoglobin levels less than 7.8 g. percent was present in about 12 per cent of children. The prevalence of anaemia decreased with increasing age. Moderate and severe degrees of anaemia were more frequently seen in younger children below 3 years of age.

Angular stomatitis was the major deficiency sign of the B complex vitamin group. Studies conducted by ICMR (1977) showed that the prevalence increased with increasing age from 1.6 percent in the age group 1-2 years to 7.5 per cent in the age group of 4-5 years with an average percentage prevalence of 5.2 for the entire pre-school population.

Recent studies indicate that the prevalence of other deficiency diseases were also present among the pre-school children. The average percentage prevalence of dental caries was 6.7 and prevalence increased with age. Urban children seemed to suffer more than rural children (ICMR - 1977).

Cornelius (1968), Cuthbertson (1972) and Wall (1973) observe that malnourished children may emerge from childhood lacking the ability to reach their full genetic intellectual potential. Malnutrition interferes with a child's motivation, power of concentration and learning capacity (Ilin-1979).

FAO (1966) Gravioto et al (1971), Alan Berg (1971) Devadas (1972) and Gopalan (1973) emphasise that minimum investment in the prevention of malnutrition could avert large economic losses likely to accure to the society which might seriously cripple the whole developmental effort. Hence children must be given every opportunity to be mentally alert and physically strong (FAO Chronicle, 1974).

B. Current Feeding Programmes for pre-school children in rural areas of Tamil Nadu.

Nearly 40 percent of India's people live below the basic minimum economic level (Gopalan 1973). Immediate effort must be directed towards reducing malnutrition among the poorest sections of population. Where food resources are limitted it becomes specially important to ensure maximal absorption and utilisation of diet consumed. This consideration has produced the need to integrate Nutrition Programmes designed to minimise and control infection and infestations which often impair food absorption and utilisation in poor communities. The concept of integrated child care services of a composite package programme including immediate health-care, nutrition and family planning provides the right strategy.

Realising the staggering dimension of the problem of childhood malnutrition the government of India and the different states including Tamil Nadu have given high priority to the nutritional improvement of

children and sponsor several nutrition intervention programmes, some of which receive financial assistance of food from the U.N. agencies such as CARE, CRS, and other international organisations and the Co-operation of Voluntary agencies.

NIN (1979) states that feeding programmes should cover on a priority basis the most vulnerabel sections of population, the food ingredients necessary for these programme are locally available and the operational tests are reduced to the absolute minimum and thus in maximal community participation.

Feeding Programmes may be considered under five broad heads.

1. Emergencies

Feeding programmes may have to organised at a very short notice in time of disaster and emergencies like drought and flood. Such a feeding programme will be of short duration and they will have limited objectives of helping population to tide over the situation (Greaves, 1976).

2. For socially disavowed sections

The communities which are to be covered by these programme may be considered to submit will below the poverty line and will stand in need of continued support through feeding programmes for several years (Greaves, 1976).

3. For Rural Communities

Apart from the extremely backward areas there is a considerable section in the rural community today. Here feeding programmes have be used as an instrument to trigger off an ascending spiral of socio-economic development.

4. For Urban situation and Industrial establishment.

Apart from the slum dwellers the programme in Urban area must also seek to cover industrial and sectoarial establishment. The programme for the group will not be a give away programme but the cost of the supplement will atleast be partially recovered from the community.

The important supplementary feeding programmes operating in rural areas of Tamily Nadu are given below.

1. Mid-day meal Programme

The mid-day meal programme is mainly meant for school going children though a considerable number of pre-school children also benefit by it. The pride of starting the school lunch programme in India goes to Tamil Nadu day back in 1957 as a State Government sponsored massive mid-day meal scheme and as a people movement with a 40 per cent commitment from the government. CARE, CASA, Christian Agency and U/N-Agency assist the implementation of the programme by giving commodities

such as cornflour, bulgar wheat, Vegetable Oil and milk powder. FAO has given technical guidance and support through the ATF. The objectives of the programme.

1. To increase School attendance
2. To improve the Nutritional level among School children.
3. Gain knowledge of nutrition.
4. Develop good habits.
5. Appreciate the importance of good nutrition to health.
6. Produce protective foods through kitchen and School gardens.

Out of the 11.9 Million beneficiaries under this programme, it is estimated that over one million are pre-school children in India. It has been suggested by the National Institute of Nutrition that there should be atleast 250 feeding days in the year to have the desired impact on the children (NIN - 1973).

Today in Tamil Nadu Mid-day meal scheme operates in 32,000 Elementary School in the State providing mid-day meals to 1.86 million pupils (Devadas, 1972).

2. Feeding through balwadies and Day care centres

The programme is under the management of the State social welfare Board since 1971 - 1972. The main objective of this programme is (i) to provide supplementary nutrition to children in the age group of 2-5 years.

(ii) periodic health care and

(iii) Immunisation.

There are 1371 Balwadies catering to a maximum of 6,600 pre-school children. This programme is carried out for 300 days in a year. About one-third of nutritional requirements of the children is met by the supplement.

A supplement providing 300 calories and 15g. of protein and the cost of feeding per day is 20 paise. It is being promoted with the help of four voluntary organisations the Indian council of child welfare, Harijan Sevak Sangh, Bharatiya Adimjati Sevak Sangh, and Central Social Welfare Board (Report of the working group on nutrition, 1972).

Nutritional Programme

Feeding programmes in Pre-schools has been in operation in the rural area since 1972. It is implemented in collaboration with UNICEF by the State Department of rural Development and local administration and Social Welfare.

The main objectives of this feeding programme is

(i) to combat the protein calorie malnutrition among the vulnerable sections of the population

(ii) to prevent physical and neurological defect due to protein malnutrition in young children.

The commodities supplied by CSWB are 80 g. Balahar or 80 g. Bulgar wheat and 7 g of soled oil per day per beneficiary for 300 days. This programme covers 88,200 beneficiaries through 1000 Anganwadies Kendrams in 92 Blocks (Devadas,1972).

Non feeding charge is 4.5 paise/ beneficiaries per day.

3. Integrated child welfare programme

The integrated child welfare programme was originally sponsored by the central social welfare Board (CSWB) on a pilot basis on 1962-1963 and subsequently transferred to the state social welfare Department which is currently operating it with a special Medical officer in charge. The main objective of the programme in the state are

(i) to provide integrated health nutrition and educational development service to children of 0-6 years old.

(ii) Help improve the nutritional status of the children in the age range 0 - 6 years through regular mid-day meals and

(iii) Emphasise the educational component in health care and feeding programme.

The programme is in operation in one community Block namely near the Madras City. There are 20 pre-schools, ten of which have creches also. 2,000 children enrolled in the pre-school and 100 in the creches in the age group of a month to 2 years are the beneficiaries.

Every child receives daily Balahar 80 g and soled oil 7 g for 300 days in a year. The Medical officer employed specially for this

project takes cares of immunization health checkup and the clinics for mothers. Nutrition education is given by the Balasevikas to the mothers of the beneficiaries through home visit.

This programme was introduced in 1967-68 as a Central Government sponsored Scheme with its focus on the health and nutritional care of pre-school children in the rural areas and education of their mothers and young women in child care and home management by the end of 4th five year plan that is 1971 the programme covered 51,000 children (Government of India 1974-75).

Each have the five main centres and sub centres.

Applied Nutrition programme (ANP)

The applied nutrition programme was launched in Tamil Nadu in the year 1962-63. The definition of ANP as given by the Joint FAO/ WHO/ UNICEF and FAO/ UNICEF Policy committee of 1967 is co-ordinated educational activities between agriculture, health, interested agencies with the aim of raising the levels of nutrition of local populations particularly mothers and children in rural areas. This is the general objectives of ANP.

This programme is joint a effort of UNICEF, Government of India and State Government.

The beneficiaries are the children who attend the Kushanthaigal Kappagam, children who do not attend the above but are given food and expectant and nursing mothers.

All the beneficiaries receive food-Bulgar wheat 80 g. and salad oil 7g. perday for 300 days with the assistance of CARE. Apart from this two eggs are supplied/ beneficiary/ week. This programme caters to 1,200 beneficiaries per block per year. The ANP is basically an educational programme it aims at imparting knowledge and new skills to people.

The supplementary feeding programme under taken by the State and central Government now top the list among many efforts taken to develop health of pre-schooler and to combat malnutrition (Swaminathan 1973).

India ranks high among the countries of world is supplementary feeding programme. The attack on malnutrition played a prominent role in the 4th five year plan of the country with the allocation of substantial financial support.

C. Parameters for evaluating feeding programme

Evaluation is an essential element of planning. Evaluation is a means to appraise carefully, judge, measure or estimate the value with care. It is a process of arriving at a considered judgement (Joint FAO/WHO Technical Committee, 1966. As Reddy (1971) define evaluation is the process of determining how well the desired behavioural changes have taken place or are taking place as a result of the educational efforts. According to Swaminathan (1973) evaluation is the process

of measuring the progress of a project or programme towards a present goal or objective. Thus this procedure involves periodical assessment period varying according to the needs with criteria which are capable of measuring the programme and are based on clear cut definitions of objectives.

Baumann et al (1972) and Latham (1972) advise that evaluation in Applied Nutrition Programmes should be constructive, a continuous process which will act as an early warning system and enable sidecourse correction to be made. There are three factors intimately concerned in the evaluation process namely the objective, the information or result and the analytical system applied.

Evaluation helps to determine the process of any programme from its starting point towards established objectives and helps to keep the programme on useful and practical lines (Usha et al. 1965). According to Gopalan (1974) evaluation to be really meaningful should be directed towards assessing the true benefits of a programme to the community.

Martin (1964) and Klipstein et al (1972) assert Nutritional Status as the condition of the health of the individual as influenced by the utilisation of nutrients. Elmby (1972) equates the nutritional status of an individual to his intelligence. Beaton and Bengoa (1966) and Devadas (1970) regard objective nutritional assessment as an excellent means of assessing any feeding programme.

[redacted]

ICMR (1968), Martin (1964), Jelliffe (1966) and the joint FAO/ WHO Technical Committee (1966) record the methods available for assessing nutritional status. They are dietary surveys, [redacted], clinical and [redacted], health and vital statistics.

The health agencies and the nutrition workers are primarily concerned with the basic objective of how far the nutritional status has been improved by the feeding programme. The criteria adopted are

1) Diet surveys
2) [redacted]
3) Clinical assessment
4) [redacted] assessment
5) Health and vital statistics.

1. Diet surveys

According to Stigmolin (1972) food consumption studies are greatly needed for disclosing possible dietary defects and for planning improved food habits.

Dietary intake studies involve collection of information concerning food habits, ration allowance, meal preparation, food [redacted] and [redacted], food waste and nutritional adequacy of food available and those actually consumed (Rao, 1975).

Gibson and Larkin (1972) warn that diet and food consumption surveys are time consuming, costly, laborious and they require skilled personnel. The social, cultural and economic information which may help to define the ecology of food and diet practices of the population should also be considered.

A common pitfall in the interpretation of dietary data is viewing the average intake or allowances adopted for the population controls strictly. This approach fails to identify the proportion of the population with low dietary intakes.

Rangaraman (1974) point out the factors which affect the success of a nutrition survey to be the unavailability of adequate funds for

a) the field operations
b) the analysis of data and
c) the publicising of the findings.

Different methods are used for collecting data on diets consumed.

Madhavan and Swaminathan (1976) are of the opinion that the questionnaire or 24 hour recall method is an abbreviated survey method which requires skilled and careful interviewing technique. In the inventory or log method the food on hand at the begining of the survey is recorded and an account of all the food purchased or brought during the month is kept. This helps to elicit the amount of food consumed by the family.

Whiting and Loverton (1960) regard the weighing method especially as an accurate estimate of intake of an individual.

Anthropometry:

Jelliffe (1966), Tanner (1969) and Mukherji and Sharma (1972) note that anthropometry provides the operational measure of long term nutritional status particularly for children.

Bisner et al (1970) states that height and weight measurements may be useful in follow up and evaluation of nutrition programmes if combined with other measurements.

Garn (1962), Mathan (1969), Tanner (1971) and Sims et al (1972) cite the growth rate of children as one of the most simple, inexpensive, reliable and important tools available as an index on the physical growth and development of the child.

Somasundara Rao (1961), Mc Laughlin (1964) and ICMR (1973) consider the proper measurement of a child's growth and development as an index of their nutritional status. According to Susainathan (1969), Vijayaraghavan (1970) and Vakila (1972) weight is the simplest measurement of growth and nutritional status. Benare and Latham (1971) suggest that a good measure of the type of malnutrition affecting a population is obtained by determining those factors deficient in weight for age, height for age and weight for height.

The mid-upper arm circumference abbreviated to arm circumference or arm girth has been suggested as a useful public health index of protein calorie malnutrition for the assessment of nutritional status of a community (Jelliffe 1969).

Kamaumi and Mclaren (1977) regard anatic measurements as being easy to carry out, amenable to automation in the parents and require simple apparatus. They list the disadvantages as the non-availability of international standards.

Clinical assessment

The joint FAO/WHO expert committee (1966), Jelliffe (1966), Swaminathan (1966) and ICNR (1977) opine that clinical examination is an important practical method of assessing nutritional status of the community and relatively inexpensive. The limitations are that trained physicians are needed to do the examination and the same groups must be examined periodically to detect improvement.

Biochemical assessment

According to Somasundara Rao (1964) and Whitehead (1972) the biochemical method is the most objective means for assessing nutritional status and should be carried out with relatively simple apparatus without the need for highly skilled technical assistance.

Rusina et al (1972) and Whitehead (1972) consider that biochemical measurement should be undertaken along with anthropometric, clinical and dietary intake studies for assessing nutritional status.

Haemoglobin is perhaps the most widely used index in the assessment of malnutrition. Wilson et al (1973), Napier and Gupta (1940), Bhave and Bopaiya (1942), Ramalingaswami and Paturardhan (1949), Krishnaswamy and Sundar (1951) and Tomosumra et al (1953-54) had estimated haemoglobin during the course of nutrition survey carried out by them. In addition in most of the recent surveys undertaken by the Nutrition Departments of different states determination of haemoglobin was also included.

The determination of plasma iron and percentage transferrin saturation is a sensitive index in determining haemoglobin levels (Finch, 1970).

While biophysical and biochemical methods of assessment are useful they are restricted to certain well equipped laboratories only (Paturardhan, 1963 and Jelliffe, 1972).

Health and vital Statistics

The joint FAO/WHO Technical Committee (1966) has expressed that vital statistics is a suitable indicator for measuring changes in health. Infant mortality rate, death rate of children below five years in relation to total death, specific mortality rate by diarrhoea and some infectious disorders are indicator related to the prevalence of protein calorie deficiency (Scrimshaw, 1972). ICMR (1971) consider a low mortality rate as a characteristic of good nutritional status.

III. EXPERIMENTAL PROCEDURE

The methodology for the study entitled "Evalution of the pre-school feeding programme in selected balwadies around Coimbatore" included the following steps

A. Selection of centres and samples

B. Determination of the socioeconomic background of the subjects and

C. Evaluation of the feeding programme through

1. Observation of the feeding programme in operation.

2. Assessment of the nutritional status of the children through

a. Anthropometry

b. Bio-chemical estimation

c. Clinical assessment and

d. Diet surveys.

3. Nutritional knowledge of mothers and children and their attitude towards the feeding programme and

4. Regularity of children and their participation in the programme.

A. Selection of Centres and samples

For the present study five panchayat unions around Coimbatore City were selected. From each union two rural balwadies with feeding programme were selected in consultation with the Commissioner of the unions for their each approach.

The children participating to the programme received balahar, uppuma for lunch every day. CARE supplies 80 g. balahar and 7 g. salad oil per day per child for three hundred days a year. This was the only food being supplied to the children as a routine.

In every balwadi 25 to 30 pre-school children of the age 1 to 5 years were enrolled and they participated in the supplementary feeding programme. All the children participating in the programme were included in the study.

Fifty pre-school children who were not attending the balwadi or the feeding programme were selected from all the 10 villages put together to serve as the control group. The details of the blocks and the villages selected and the subjects selected are presented in Table I.

TABLE I

DETAILS OF VILLAGES AND SUBJECTS SELECTED.

S.No.	Name of the Block	Name of the Village	No. of children selected
1	Karamadai Panchayat Union	Tholampalayam	45
		Thayanure	22
2	Madukkarai Panchayat Union	Thummalayam palayam	37
		Madukkarai Market	42
3	Perur Panchayat Union	Podanure	40
		Nattare	40
4	Periyanaickenpalayam Panchayat Union	Periyanaickenpalayam	39
		Periyanaickenpalayam Harijan Colony Kaludi	25
5	Sarkar Samakulam Panchayat Union	Kalapatti	46
		Sarkar Samakulam	33
	Total number of experimental children	:	369
	Total number of control children	:	30

B. Determination of the Socioeconomic background of the subjects

Before conducting any study in a community it is necessary to understand thesocio economic status of the target group (Gopalan 1970).

Hence for all the experimental and control children their socio-economic background was assessed by administering a specially evolved questionnaire to the mothers. The details on family composition, occupation, income and expenditure pattern and educational background of the families was elicited through this survey.

C. [illegible]

1. [illegible]

As a first step in the evaluation of the feeding programme in ten centres the investigator made a thorough observation of the feeding centres and the programme using a specially evolved check list. The criteria used was availability of cooking and storage facilities, cleanliness of the area, cleanliness and the eagerness of the children in participating in the programme. The observation was made for three consecutive days in each centre and the entries were made.

2. [illegible]

(a) [illegible]

Weight, height, arm and chest circumference and skinfold are the important, simple but reliable and objective anthropometric indices (Devadas et al., 1977). Hence height and weight of all the selected experimental subjects and 20 control subjects were measured nearest to 0.1 cm. and 0.1 kg., respectively with all the precautions as given by Jelliffe(1966). The chest, midarm and head circumferences were also measured for all the experimental and control subjects as described by Jelliff (1966).

(b) Bio chemical estimations

The blood haemoglobin levels were determined in ten children from each of the five villages namely Tholampalayam, Thrumalayam palayam, Podanure, Periyanaicken palayam and Kalapatti belonging to five blocks. Ten children from the control group were also selected randomly for this purpose. Haemoglobin estimation was carried out from the finger prick blood using the cyanmethaemoglobin method, (Varley, 1968).

(c) Clinical assessment

A clinical examination of all the experimental and the control children was carried out using the ICMR clinical schedule. This is carried out to determine the presence of deficiency diseases and other health problems among children.

(d) Diet survey

To find out the nutrient intake of children through homediet food intake survey was carried out on five randomly selected children from each of the five villages namely Tholampalayam, Thrumalayampalayam, podanure, Periyanaicken palayam and Kalapatti belonging to five blocks and five subjects from the control group. It was carried out on three consecutive days as described by McCance and Widdowson (1946). From the data obtained the daily food and nutrients consumed by the subjects were computed.

3. Nutritional knowledge of mothers and children and their attitudes towards the feeding programme

Two questionnaires were evolved, one to assess the nutritional knowledge of the children and the other to assess the knowledge of the mothers, their attitudes towards the food and their food practices. Through interview method every mother and the child was contacted and their knowledge was assessed. Apart from the nutritional knowledge the attitude of the mother towards the feeding programme was also obtained during the interview.

4. Regularity of children and their participation in the feeding

The percentage of attendance of all the experimental children was noted from the records maintained in the balwadies over a period of three months (from January 8th to March 8th) and the regularity of the experimental children for the feeding programme was found out.

IV. RESULTS AND DISCUSSION

In this study the impact of feeding programme in ten selected balwadies around Coimbatore was evaluated.

Among the ten centres selected six centres had kitchen and store room facilities and four centres namely Thayanure, Thennalayam palayam, Periyanaikken palayam and Sarkar Samakulam had no separate kitchen. Cooking, storing, serving and teaching went on in the same room. In Madukkarai Market, Periyanaikken Palayam, Kalapatti and Sarkar Samakulam water was brought from long distances. This posed the problem of keeping the place and utensils clean. Further observations on the evaluation are discussed under the following heads:

A. Socio-economic background of the selected children
B. Nutritional status of the children
C. Nutritional knowledge of the children and their mothers
D. Opinion of the mothers about the feeding programme, and
E. Participation of children in the feeding programme

A. Socio-economic background of the children:

Among the ten experimental villages studied in three villages 80 to 90 per cent of the families were nuclear and in seven villages 90 to 100 per cent was belonging to nuclear families. In the control village 64 per cent alone were belonging to nuclear families.

All the experimental villages put together 38 per cent of the families had 2 to 4 members and 43 per cent of the families had 5 to 6 members. Big families were fewer in every village. In the case of control group 30 per cent had 2 to 4 members and 44 per cent had five to six members.

In the ten villages 32 per cent (28-42%) of the population studied were pre-schoolers of the age zero to five years and in the control group 24 per cent were pre-schoolers. The next elder group namely the school going children of age 6 - 15 years comprised of 23 per cent in the experimental groups and 24 per cent in the control group.

As far as educational status of the family members was concerned in the experimental villages 37 per cent (26-40%) had upto primary school education, 21 per cent (3-30%) had upto secondary school education andhigher secondary education was very meagre or nil. Illiterates were maximum namely 70 per cent in Thayanur and Thirumalayan palayam. In other experimental villages it ranged from 10-62 per cent and in the control group the illiterates were 27 percent. Since the educational levels of the parents were very low, they were mainly agricultural, industrial or mill workers, coolies or petti businessmen. In every village very few members were working in offices.

1. Income level of the families.

The income level of families in different villages is presented in Table No. II.

TABLE II

INCOME LEVEL OF THE FAMILIES STUDIED

Sl. No.	Name of the Centre	Income range in Rupees 100 - 200		200 - 300		300 - 500		500 and above	
		No	%	No	%	No	%	No	%
1	Tholam Palayam	22	49	10	22	11	24	2	4
2	Dhayanure	3	13	17	77	2	10	-	-
3	Tharumalayan Palayam	20	54	11	30	6	16	-	-
4	Vadakkarai Market	-	-	8	19	28	67	6	14
5	Podanure	-	-	6	15	28	70	6	15
6	Kottare	1	2	4	10	29	73	6	15
7	Periyanaicken Palayam	1	2	5	13	25	64	8	21
8	Periyanaicken Palayam Harijan Colony	6	24	7	28	12	48	-	-
9	Kalapatti	9	19	19	41	11	24	7	16
10	Sankar Nagalalam	9	27	14	43	8	24	2	6
	Mean		19		30		42		9
11	Control	1	2	17	34	22	44	10	20

The mean monthly income of the parents varied from Rs.100 to Rs.500 and above. However maximum number of families had an income between Rs.200 to Rs.500 in every villages.

2. Expenditure on food

Table III presents the percentage of income spent on food in families of experimental groups and the control group.

TABLE - III

EXPENDITURE PATTERN ON FOOD

Sl. No.	Name of the Centre	40 - 50%		50 - 60%		60 - 70%		70 - 80%		80 and above	
		No	%	No	%	No	%	No	%	No	%
1	Tholam palayam	2	4	4	8	14	25	11	25	17	38
2	Dhayanure	-	-	4	18	8	36.5	8	36.5	2	9
3	Thirumalayam palayam	-	-	-	-	4	11	17	45	16	44
4	Madukkarai Market	-	-	8	19	12	29	16	38	6	14
5	Pogamure	3	7	18	45	13	33	4	10	2	5
6	Matture	8	20	13	33	12	30	4	10	3	7
7	Periyanaicken palayam	11	28	6	15	13	33	2	5	7	18
8	Periyanaicken palayam - Harijan Colony	2	8	1	4	10	40	5	20	7	28
9	Kalapatti	2	4	4	8	11	24	8	17	21	46
10	Sarkar Semakulam	2	6	1	3	8	24	12	36	10	31
	Mean		8		15		29		24		24
11	Control	6	12	12	24	16	32	8	16	8	16

In the whole 40 to 80 and above percent of the income was spent on food alone in the families. This observation is in the line with the reports of the study conducted by Devadas et al (1976) where the families were spending 60 to 80 per cent of their income on food.

3. Details of expenditure pattern on foods

Table IV presents the details of expenditure pattern on food by the experimental and control groups.

TABLE - IV

DETAILS EXPENDITURE PATTERN ON FOOD

Sl. No.	Items		0 - 5 Percent	5 - 10 Percent	10 - 20 Percent	20 - 30 Percent	30 - 40 Percent	40-50 Percent	50-60 Per cent	60 and above percent	Nil Per-cent
1	Cereals	Experimental	-	-	-	-	19	24	26	31	
		Control	-	-	-	-	10	32	34	24	
2	Pulses	Experimental	-	70	22	8	-	-	-	-	
		Control	-	82	18	-	-	-	-	-	
3	Root and tapes	Experimental	59	37	4	-	-	-	-	-	
		Control	68	24	8	-	-	-	-	-	
4	Green leaf and veg.	Experimental	48	-	-	-	-	-	-	-	52
		Control	46	-	-	-	-	-	-	-	54
5	Other-Veg.	Experimental	73	22	5	-	-	-	-	-	
		Control	58	36	6	-	-	-	-	-	
6	Fruits	Experimental	72	18	-			-	-	-	10
		Control	80	14	-			-	-	-	16
7	Nuts and Oils	Experimental	46	28	26	-	-	-	-	-	-
		Control	52	32	16	-	-	-	-	-	-
8	Fleshy Foods	Experimental	34	42	24	-	-	-	-	-	-
		Control	52	38	10	-	-	-	-	-	-
9	Milk	Experimental	24	26	16			-	-	-	34
		Control	28	26	10			-	-	-	36
10	Sugar and Jaggery	Experimental	60	20	-	-	-	-	-	-	20
		Control.	52	22	-	-	-	-	-	-	26

In general the majority of food expenditure was on cereals and it was 30 to 60 and above per cent and on pulses it was below 20 per cent of the food expenditure. In majority of the families the expenses on roots and tubers, vegetables, milk and milk products, sugar and Jaggery ranged from 0 to 10 per cent each. It was noted that except Nettare and Periyanaickan palayam in all the other villages there were families who were not consuming any milk or milk products.

C. Nutritional Status of the Children:-

1. Food intake of children:

The food intake of 25 randomly selected children, participating in the feeding programme of five villages and five children from the control group is presented in Table - V.

TABLE V

FOOD INTAKE OF PRE-SCHOOL CHILDREN

	Tholam Palayam		Thirumalayam Palayam		Podanure		Periyanaikkan palayam		Kalapatti		Mean		Control		R.D.A ICMR	
	Amount g	% of RDA	Amount g	% of RDA	Amount g	% of RDA	Amount g	% of RDA	Amount g	% of RDA	Amount g	%of RDA	Amount g	%of RDA	Amount g	%of RDA
Food Item	142	71	153	77	146	73	150	75	150	75	148	74	208	104	200	
Pulse	23	46	28	47	21	42	24	48	30	60	25	50	22	44	60-50	
Green leafy vegetables	7	10	1	2	8	11	4	5	5	7	5	7	4	5	75	
Other Vegetables	21	42	36	72	28	56	33	66	17	34	27	54	29	58	50	
Milk	Nil	-	-	-	30	15	24	12	4	2	12	6	-	-	250-200	
Flesh foods	7	23	-	-	33	110	6	20	17	57	12	40	19	63	- 30	
Fruits	10	20	15	30	32	64	24	48	6	12	17	34	22	44	50	
Sugar and Jaggery	Nil	-	4	10	25	62	25	62	10	25	13	30	21	53	40	
Fats & Oil	12	48	10	40	15	60	13	52	12	48	12	48	14	56	25	
Balahar	89	—	65	—	52	—	55	—	70	—	66	—	—	—	—	

The children selected for the food intake survey were of the age group 4 to 5 years. It was observed that none of the children met the entire requirement of foods as given by the ICMR (1968). The control group children received the required amount of cereals and the children in Pedasuru consumed the recommended quantity of flesh foods. It was clear that in all the experimental villages the balwadi feeding remained as a substitute and not a supplement. In the five experimental villages, the cereal consumption ranged from 71 to 75 per cent of the recommended allowance. These children, however consumed at most more than 60 g of cereal pulse mixture in the form of balahar in the balwadi.

It was further noted that the consumption of green leafy vegetables was the most deficient in the diets of experimental as well as the control children. The consumption was below 10 grams by the children. As far as the consumption of milk is concerned it was meagre in three experimental villages (6-15% of R.D.A) and in other places it was totally omitted. Hence the foodintake was very low in all the children and this observation is line with the reports of the study conducted by ICMR (1977). The results showed that the diet of children in all the regions studied were predominantly cereal-based and the consumption of flesh foods and milk was low in all the regions.

2. Nutrient intake of children

The nutrient intake of the children studied in five balwadies and the control group is presented in Table VI with the details of the individual consumption in Appendix A.

TABLE VI

NUTRIENT INTAKE OF PRESCHOOL CHILDREN (4-5 Years)

Nutrients	Tholam-palayam		Thrumalayam palayam		Pedanure		Periyanicken palayam		Kalapatti		Control		R.D.A (ICMR)
	Amount g	% of RDA	Amount g	% of RDA	Amount g	%of RDA	Amount g	%of RDA	Amount g	%of RDA	Amount g	%of RDA	
Calories	1071	71	1073	71	1085	72	1075	71	1084	72	1043	59	1500
Protein (g)	36	163	35	159	32	145	30	136	34	154	23	104	22
Calcium (mg)	310	77	169	42	134	33	145	36	30.3	76	17.2	43	450
Iron (mg)	15.5	75	14.5	70	14.8	70	14.7	70	15.2	75	11.5	55	20
B.Caretene (g)	480	40	255	21	502	41	449	37	442	35	257	21	1200
Thiamine (mg)	1.38	172	1.24	155	0.98	122	0.95	118	1.28	160	0.91	113	0.8
Piboflauin (mg)	0.86	108	0.63	78	0.76	95	0.78	97	0.87	108	0.73	94	0.8
Niacin (mg)	8.48	84	8.14	84	8.55	85	8.86	86	8.04	80	7.04	70	10
Vitamin-C (mg)	19.7	65	13.3	44	20.6	68	12.8	42	14	45	10.9	36	30/50

It is clear from Table VI that all the children in the experimental as well as in the control groups were deficient in diarries and they consumed only 70 per cent of therecommended allowance for calories. Where as in the case of protein all the children including those in the control group received more than the adequate quantity of protein. Recent studies conducted by ICMR showed that the dietary intake of protein by the pre-school children is adequate to meet the recommended allowance. On the other hand the intake of calories falls far short of recommended allowance (Rin, 1973 and Gopalan, 1973).

The children in pedasure who consumed adequate amount of fleshy foods received enough quantity of calcium. Among the vitamins Bcarotene and ascorbic acid were deficient uniformly in all the groups and the position of B complex vitamins was better. This was mainly due to the consumption of vitamins fortified balahar. In general there was no remarkable difference between the nutrient intake of the experimental and the control groups revealing that the feeding programme remained as a substitute and not as a supplementary programme.

3. Anthropometric Assessment of Children

The details of the anthropometric measurements are presented in Tables VII and VIII with the individual values presented in Appendix B. Malnourished and well nourished children in the population studied (Result based on Quetlet's Index).

ANTHROPOMETRIC MEASUREMENTS OF CHILDREN

Sl. No.	Name of the centre	Height in cm		Wight in cm		Arm circumference in cm		Chest circumference in cm		Head Circumference in cm.	
		3-4 yrs	4.5 yrs	3-4 yrs	4-5 yrs	3-4 yrs	4-5 yrs	3-4 yrs	4-5 yrs	3-4 yrs	4-5 yrs
1	Tholam palayam	87.5	94.8	11	13.6	13.1	14.1	47.4	49.2	46.3	47.2
2	Dhayanure	87.3	93.5	10.8	13.0	12.8	13.9	46,9	48.6	46.2	47.2
3	Thrumalayam palayam	84.3	93.0	10.5	12.4	13.0	13.9	46.1	48.2	46.0	47.0
4	Madukkarai Market	88.0	95.4	11.4	13-4	13.6	14.3	47.3	50.8	46.8	48.00
5	Podanure	89.0	91.0	11.2	13.5	13.5	14.1	47.3	49.7	46.7	47.3
6	Mettur	87.8	93.9	10.8	13.3	13.4	14.0	47.9	49.5	46.9	48.0
7	Periyanaickanpalayam	87.3	94.5	10.9	12.4	13.1	13.8	47.3	48.9	46.5	47.2
8	Periyanaicken palayam Harijan Colony Balwadi	85.4	93.9	10.7	12.4	13.0	13.5	46.6	49.0	46.4	47.3
9	Kalapatti	89.1	93.0	10.4	12.9	13.3	14.0	46.9	48.2	46.7	48.1
10	Sarkar samakulam	87.4	92.0	10.8	13.2	13.1	13.8	47.7	48.7	46.4	47.3
11	Control	87.1	91.3	10.4	12.3	13.3	13.8	46.3	48.2	46.0	47.1
	ICMR	94.5	101.4	12.9	14.5	15.9	16.3	48.7	50.1	47.1	47.8

TABLE -VIII

Sl. No.	Name of the centre	Normal Children %	Malnourished children %
1	Tholam palayam	37	63
2	Mayanur	36	64
3	Thennalayam palayam	27	73
4	Madukkarai Market	33	67
5	Podanur	36	64
6	Kottur	35	65
7	Periyanaicken palayam	40	60
8	Periyanaicken palayam Harijan Colony balwadi	32	68
9	Kalapatti	26	74
10	Sarkar Samakulam	33	67
	Mean	33	67
11	Control	30	70

No difference in the measurements was noted between the ten centres as well as the experimental and the control groups. It could be noted that none of the groups reached the measurement given by the ICMR (1977). However the mean head circumference and the chest circumference of the children were somewhat nearing the values of ICMR.

The entire group of children were classified as "Normal" and "Malnourished" based on Quetlet's Index. In the experimental groups 34 per cent were assessed as normal and 66 per cent were assessed as malnourished. Whereas in control group 30 per cent were normal and 70 per cent were malnourished.

4. Biochemical picture of children

The mean haemoglobin levels of the pre-school children are presented in Table IX.

TABLE IX

MEAN HAEMOGLOBIN LEVELS OF PRE-SCHOOL CHILDREN

Sl. No.	Name of Centre	Haemoglobin level g/ 100 ml.
1	Tholam palayam	10.3
2	Thirumalayam palayam	9.38
3	Vadamure	9.9
4	Periyanaickan palayam	10.8
5	Kalapatti	10.2
6	Control	8.8
7	Mean	9.86

The mean haemoglobin levels of children ranged from 8.8 g. in control children to 10.8 g/ 100ml. in the children from the [redacted] palayam village. Based on the criterion of the WHO study group on [redacted] anaemia (1972) all the children could be considered as suffering from anaemia since they had the [redacted] levels below 12 g percent and it could be recalled that all the children received deficient quantities of iron and the children in the control group received the least amount of iron through their home diet.

5. [redacted]

Table X present the clinical picture of the children studied in 10 villages.

TABLE X

CLINICAL TESTS OF CHILDREN

Sl. No.	Name of the Centre	Healthy free from disease	Mild anaemia	Angular stomatitis	Xerosis of Conjunctiva	Dental Caries
1	Tholam palayam	51	17	24	2	11
2	Dhayanure	32	36	31	9	26
3	Thrumalayam palayam	35	9	21	5	28
4	Madukkarai Market	45	9	21	5	28
5	Podanure	52	17	17	2	22
6	Mettupalayam	60	20	22	5	17
7	Periyanaicken palayam	46	7	13	2	18
8	Periyanaicken palayam Harijan Colony balwadi	44	28	24	8	28
9	Kalapatti	61	13	13	4	2
10	Sankar Nagalulam	45	12	33	3	9
	Mean	47	18	22	5	19
11	Control	46	16	24	4	32

In the experimental villages 47 per cent of children looked healthy and free from diseases and in the control group 46 per cent were healthy and free from disease. Anaemia (18%), angular stomatitis (22%), xerosis of conjunctive (5%), and dental caries (19%) were symptoms observed among the experimental children. These symptoms were the results

of the dietary deficiencies observed and since the nutrient intake among the experimental and the control groups were not different to any reasonable extent there was no difference in the clinical picture of the children between the two groups.

4. [redacted]

Table XI presents the results of the interview made with all the children in the experimental villages to assess their nutritional knowledge.

TABLE XI

NUTRITIONAL KNOWLEDGE OF CHILDREN

Sl. No.	Question	Answer given	per cent answered
1	Name of the foods required for health	Upma	40
		Rice	37
		Idli	14
		Fruits & vegetables	14
		Dhal	10
		Non-vegetarian foods	10
		Milk	9
2	What are the foods that you like best?	Sweets	39
		Fruits & vegetables	32
		Upma	31
		Biscuit	23
		Non-vegetarian foods	19
		Rice	18
		Dhal	15
		Greens	15
3	Why do we need good food?	For health	35
		For strength	14
		For growth	10

The results showed that in general no special efforts were taken in any of the balwadies to impart nutrion education to the children. They seemed to be familiar with the normal items of food they consumed every day and they liked these items very much.

Children in the control group were poorer in their knowledge when compared to the experimental groups and none of the control children answered the questions.

The nutritional knowledge of the mothers

The nutritional knowledge of the mothers of experimental and the control children is presented in Table XII

TABLE XII

NUTRITIONAL KNOWLEDGE OF THE MOTHERS

	Question	Answer given	Experimental group mothers %	Control group mothers %
1	The best substitute for milk is	Dhal	16	10
		Rice gruel	81	84
		Vegetable soup	3	6
2	Breast feeding alone is sufficient to children upto	6 Months	6	16
		One Year	59	72
		Two Years	35	6
3	Should water be given to children during diarrhoea	Yes	23	10
		No	77	90
4	Do you take milk during pregnancy	Yes	29	22
		No	71	78
5	Do you cut vegetables into big pieces	Yes	2	-
		No	98	100
6	Do you throw away the water after cooking rice	Yes	18	34
		No	82	66
7	Do you give castor oil to your child	Yes	82	84
		No	18	16

Majority of the mothers (67.9) felt that the food distributed to the children was tasty. But 10 per cent of the mothers complained that the aposma caused diarrhoea in children and 32 per cent did not observe any change in the health of the children after participating in the following programme.

The mothers contributed a few suggestions for the improvement of the Bulwadi feeding programme. They are presented in Table XIV.

TABLE XIV

SUGGESTIONS GIVEN BY THE MOTHERS FOR THE IMPROVEMENT OF THE PROGRAMME

Sl. No.	Name of the Centre	Quality of food must be improved (%)	Sugar may be provided (%)	Rice should be included %	Rice and vegetables should be served %	Fruits should be served %	Milk/ Boiled egg must be supplied (%)
1	Tholam palayam	5	-	86	11	15	70
2	Dhayanure	100	-	100	-	54	43
3	Thrumalayam palayam	-	-	89	24	51	55
4	Madukkarai Market	7	47	74	12	33	53
5	Podanure	30	-	15	-	20	72
6	Metture	20	77	80	-	-	61
7	Periyanaicken palayam - Harijon colony Balwadi	8	-	86	13	59	49
8	Periyanaicken palayam - Harijon colony Balwadi	16	-	84	-	20	63
9	Kalapatti	-	-	82	26	69	67
10	Sarkar Samakulam	-	36	62	18	39	41

From the Table it is clear that the mothers in general desired some improvements of the existing feeding. But no one stressed on the need for nutrition education or health education. Previously the ANP feeding was in operation in Thalampalayam, Podamuru, Netturu and Kalapatti and hence the mothers in these villages stressed more on the inclusion of fruits, vegetables, milk and egg.

5. Children's participation in the programme

Table XV presents the mean attendance percentage of the children in ten balwadies over a period of three months.

TABLE XV

REGULARITY OF THE CHILDREN FOR THE FEEDING PROGRAMME

S.No.	Name of the Centre	Mean attendance
1	Tholam palayam	86
2	Dhayamuru	45
3	Thirumalayam palayam	98
4	Kodikkarai Market	92
5	Podamuru	96
6	Netturu	98
7	Periyamuthan palayam	90
8	Periyamuthan palayam Harijan Colony balwadi	88
9	Kalapatti	93
10	Sarkar Samakulam	87

The percentage attendance of the children varied from 86 to 98 per cent in nine balwadies except Bhayanure where the attendance percentage was only 45%. When the mother's opinion about programme was taken, maximum number of mothers in Bhayanure felt that the programme was not good and of no use. Hence the attendance in that balwadi was also very poor. The mothers expressed that the upma caused diarrhoea and their children did not improve their health after participating in the programme.

Table XVI present the attitude of the children towards food and their participation in the programme.

TABLE XVI

ATTITUDE OF THE CHILDREN AND THEIR PARTICIPATION IN FEEDING PROGRAMME

Sl. No.	Name of the Centre	Acceptance of dishes served (%)		Sociability while eating			Participation in the feeding programme	
		Ateing willing as much as needed	Ate without interest	Conversed freely with others	Shy to talk	Never talked with other	Helped in serving	Not participating in serving
1	Tholam palayam	100	-	58	27	15	16	84
2	Dhayanure	45	55	41	14	45	-	100
3	Thirumalayan palayam	100	-	75	19	6	24	76
4	Madukkarai Market	93	7	79	14	7	-	100
5	Podanure	77	33	62	22	16	15	85
6	Metture	100	-	67	22	11	15	85
7	Periyanaicken palayam	100	-	61	21	18	10	90
8	Periyanaicken palayam - Harijan colony	68	32	76	14	20	20	80
9	Kalapatti	82	18	74	15	11	11	89
10	Sarkar Samakulam	85	15	69	12	19	-	100

Children in Thayanure, Madukkarai Market and Sarkar Samakulam never participated in any of the activities and in other villages they participated in serving the food.

In general it was found out that in all the villages feeding programme was going on as a routene without any element of nutrition education. Feeding remained as a substitute rather than a supplement. Hence no notable difference was observed between the experimental and the control children, though the children participating in the programme was slightly better in their nutritional status and nutrition knowledge .

V. SUMMARY AND CONCLUSIONS

The present investigation entitled, "Evaluation of the pre-school feeding programme in selected balwadies around Coimbatore" was carried out in the villages belonging Karamadi Panchayat Union, Madukkarai Panchayat Union, Perur Panchayat Union, Periyanaicken palayam Panchayat Union and Sarkar Samakulam Panchayat Union. All the 369 children of three to five years old participating in the feeding programme of 10 balwadies were selected to be the experimental group. A group 50 pre-school children not attending the balwadi were selected from all the ten villages put together to serve as the control group.

To start with a thorough observation of feeding centres and the programme was made using a specially evolved checklist. For all the experimental and the control children their socio-economic background was elicited using a questionnaire. For all the children heights, weights chest, mid-arm and head circumferences were measured and their clinical picture was assessed using a clinical assessment schedule. The nutritional knowledge of the entire group of children and their mothers was also tested using specially evolved questionnaires. From five villages namely Tholam palayam, Thrumalayam palayam, Podanure, periyanaicken palayam and Kalapatti belonging to five blocks, and the control group 10 children were randomly selected and their blood haemoglobin levels were estimated.

From each of these five villages and from the control group five children were randomly selected and a three day weighment survey was carried out on these children.

The results of the study revealed the followings

1. The majority of the families studied had an income between Rs. 200 to 300 and 40 to 80 per cent of their income was being spent on food alone.

2. In all the families studied around 30 to 60 per cent of the food expenses were on cereals, below 20 per cent was on pulses and 0 to 10 per cent of their food expenditure was on other items of food individually.

3. When the supplement given in the balwadi was also taken into account all the children met their requirement for cereals. The consumption of green leafy vegetables was deficient in the diets of all the experimental as well as the control children. Milk consumption was meager in three villages and it was totally omitted in the rest of the villages. Consumption of other foods was also deficient in all the places.

4. The children in both the experimental as well as the control groups consumed adequate amount of protein and fairly adequate amount of B complex vitamins. They consumed only 70 per cent of their requirement

for calories. There was no difference in the food or nutrient consumption of the children belonging to experimental and the control groups showing that the feeding programme mainly acted as substitute and not as a supplement.

5. All the experimental and the control children were below the standards given by the ICMR for the anthropometric measurements of normal children. No obvious difference was observed between the experimental and the control groups. However based on the Quetlet's Index, 34 per cent of the experimental and 30 per cent of the control children were adjudged to be normal and the others were malnourished.

6. The mean blood haemoglobin levels of the experimental and the control children ranged from 8.8 g to 10.6 g/100ml and were found to be deficient in iron nutriture.

7. In the experimental villages 47 per cent of children appeared healthy and in control group 46 per cent appeared healthy. Presence of anaemia, angular stomatitis, xerosis of conjunctiva and dental caries were noted among these children in different degrees.

8. Both the mothers and the children were very poor in their nutritional knowledge. None of the control children could answer the questions on nutrition and there was no difference between the mothers of experimental and control children in their nutritional information.

9. The percentage attendance of the children varied from 86 to 98 per cent in nine balwadies except Bhayanure where the attendance was only 45 per cent. In Bhayanure more complaints were there about the programme from the mothers.

It may be concluded that in all the 10 balwadies selected for the present investigation the feeding programme was being carried out as a routine and it operated as a substitute and not as a supplement. Since practically no difference was found between the nutritional status of the experimental and the control groups, it may be inferred that the food distribution reduced the little responsibility on families and nothing beyond that. If an element of compulsory nutrition education is introduced in all these balwadies this programme may improve towards reaching the goals.

BIBLIOGRAPHY

1. Ansoff,S. (1976) "The impact of mal and under nutrition on the learning situation", United Nation and Educational Scientific and Cultural organisation. Uppsala University pp. 1-5.

2. Berg,A. (1973) The Nutrition factor The brookings Institution Massachusitts Avenue Washington pp. 1-8.

3. Baroosh,P.R. (1976) "To reach the unreached" Yojana vol xx/19 Nov. pp. 1-6.

4. Behar,M. (1976) "Nutrition and the future of mankind" WHO chronicle Vol. 30 No.4 1976 April p.140.

5. Gravioto and Dellcardie. (1971) Food and Nutrition a quartely review devoted to world development in food policy and nutrition FAO - United nations publication Vol.2 No.4 p.4

6. Gravioto and Dellcardie. (1976) "Malnutrition in Early childhood". Food and nutrition a quarterly review devoted to world developments in food policy and nutrition. FAO - U.N. publication Vol.2, No.4 p.2

7. Devadas, R.P. (1970) "Evaluation of supplementary feeding programme in terms of growth and development" Abstract pp. 2-6.

8. Devadas,R.P. (1971) Report of the seminar on preschool Children from 14th - 19th Dec. Indian Journal of Nutrition and Dietetics Vol. 8 p-45.

9. Devadas,R.P. (1972) "Current efforts to combat malnutrition in Tamil Nadu". Nutrition in Tamil Nadu Sangam publishers Madras, p. 15, 22, 34.

10. Devadas, R.P (1972) — "Problems in Organisation and implementation of school meal programme in India". Proceedings of the first Asian Congress of Nutrition Hyderabad pp. 181 - 192.

11. Devadas, R.P and Easwaran (1974) — "Prevalence of malnutrition, causes and prevention". A manual of Basic principles of Foods and nutrition. p- 25.

12. Devadas, R.P (1975) — "Incidence of malnutrition among pre-school children". Ind. J. Nutri Diets 13 p-95.

13. Gopal, M.S (1976) — "Department of social Welfare" proceeding of a workshop held in New Delhi 29,30 April and May p-9.

14. Devadas, R.P. (1976) — "Evaluation of Supplementary feeding programme in terms of growth and development of pre-school children" Abstract pp. 1-8.

15. Devadas, R.P (1976) — Stategies to overcome malnutrition Abstract of lectures delivered under the programme of national lecture of I.C.M.R p.1

16. Devadas, R.P (1977) — "Evaluation of the effectiveness of the feeding programme" The Ind. J. Nutri. Dietet Vol. 14 No. 3 p. 61 - 64.

17. Kilogy, C.P. (1972) — "A comparison of two pre-school feeding programme in a village". Indian Journal of nutrition and Dietetics Vol. 4 No. 10 p. 37.

18. FAO (1966) — "Food and Nutrition" Series No. 1 p-7

19. Garn, M (1962) — "Anthropometry in clinical appraisal nutritional status", American Journal of Clinical Nutrition, 11, 5, pp. 418, 433

20. Gupta, M. (1966) — Role of voluntary organisations in comprehensive child Health care programme J. Ped, 33, p=214.

21. Gopalan, C. (1970) — "The protein problem" Science reporter No. 7 pp. 30-34.

22. Gopalan, C Ramasastri, B.V and Balasubramanian S.C (1971) — "Nutritive value of Indian foods" NIN - ICMR.

23. Gopalan C. and Vijaya Sadhavan K. (1971) — "Nutrition Atlas of India". NIN, ICMR Hyderabad India p. 44-47.

24. Gopalan, C. (1973) — "General objectives and guide lines for Supplementary feeding programme for Pre-school children".

25. Gopalan, C. (1973) — Malnutrition - its impact on national development report of the task force on nutrition. Proceedings of nutrition society. No.13 p. 1-5.

26. Gopalan, C. (1975) — "The terrible ravages of malnutrition". The courier vol.28 May p.24.

27. Graves, J.F (1976) — "Feeding programmes at village level" Ind. J. Nutr. Diete Vol. 14, p. 325.

28. Gopalan, C. (1973) — Nutrition and rural development, Akashavani XIII, p. 6-7.

29. ICMR (1977) — "Studies on pre-school children "Technical report series No. 26 pp. 1, 15, 19-23.

30. ICMR (1978) — ICMR Bulletin pp. 4-6

31. Jelliffe, D.B (1966) — "The Assessment of the nutritional Status of the community". p. 87, 89, 212.

32. Jelliffe, D.B (1966) — Assessment of Nutritional status of a community WHO Monograph series No. 53 pp. 168, 194, 195.

33. Klaimann and McCord, C. (1978) — "Effect of malnutrition and Mortality" Indian Journal of pediatrics, 45, 365 p-15.

34. Martin, E.A (1976) — Nutrition in Action, Oxford and IBH Publishing Co. New Delhi pp. 23-24.

35. McCance (1971) — "The effect of malnutrition on growth metabolism and final form" Proceedings of the nutrition Society of India 12, P. 14.

36. Murthy R.V. (1972) — Nutrition and infection "Nutrition" Vol. 6 No.1 p-28.

37. Mathur, C.M. (1972) — "A study of morbidity pattern in pre-school children" Indian Journal of pediatrics 46, 372, p. 13-23.

38. Mahler, H. (1977) — WHO Vol 31, No.12, P. 492.

39. Nutrition (1973) — Supplementary feeding programme Vol. 7 No.4 July p. 9-14.

40. NIN (1973) — "Supplementary feeding programmes" Nutrition Vol. 7 No.4 Pp.15 - 19.

41. NIN (1973) — Approach to prevention of malnutrition "Nutrition" 7 p-12.

42. Natarajan K.V and Panikkar, S.N. (1973) — "Supplementary Feeding programme for preschool children in the 5th year plan" Proceedings of nutrition society of India No. 15 p. 58.

43. Pandey, V.P (1972) — "Child development through montessori method" Social Welfare Vol. 19, p. 29.

44. Reddy, K.J. Viswesware Rao, K and Narayanan T.P. (1971) — "Indian Journal of nutrition and dietetics". Vol. 15 No.4 Pp. 112.

45. Reddy K.V. (1972) — Family Size and Nutritional status, proceeding of the 1st Asian Congress of Nutritional Hyderabad, pp. 339 - 348.

46. Report of the working group on Nutrition (1972) — "Task force on Health and Nutrition" State planning Commission Tamil Nadu p. 51

47. Rao, V. (1975) — "Diet surveys by weighment method - A comparison of reference periods" "Indian Journal of nutrition and Dietetics". Vol. 10 No.2 April P. 12.

48. Ramadas Murthy, V. (1979) — "Iam Vitamin - A". Nutrition national Institute of Nutrition I.C.M.R. - Hyderabad India April p.20

49. Scrimshaw, N.S (1968) — Interaction of Nutrition and infection published by WHO Geneva Pp. 24-54.

50. Socane and Latham, M.C (1972) — "Studies of child growth", Indian Journal of Medical Research No. 48, p- 927.

51. Sharma, V.K. (1972) — Nutritional anthropometry of rural school children in Udaipur city". Indian Journal of pediatrics Vol.8 No.5 pp. 10-12.

52. Swaminathan, M.C and Rao. D (1973) — "Supplementary Feeding programme organised operated by village community Kuntloor experience". Proceedings of Nutrition Society of India. No.15, pp. 37, 53-56.

53. Swaminathan M. (1974) — "Assessment of Nutritional status. Essential of Food and Nutrition Vol.II Ganesh & Co. Madras P. 236, 238.

54. Sommer, A and Lotwenstein M.S (1975) — "American Journal clinical nutrition". No. 28, P. 287.

55. Shah J.C (1976) — "Nursery school for beginners". Indian Journal of Home Science Vol.14, No.10 October p-1.

56. Sarma R.K.V (1976) — "Health and Nutrition through Balwadies" Nutrition Vol.10 No. 2 April P. 14.

57. Saroj Arya (1979) — "Nutrition in child's Intellectual Development". "Nutrition". National Institute of nutrition ICMR. Hyderabad-500 007 India October 1979 p. 27.

58. Social Welfare (1979) — Meeting the needs of children Vol. 27 No. 9 December pp. 8-9.

59. Usha, P.M. and Devadas, R.P (1965) "Diet Survey" A review Indian Journal of dietetics No. 1 No. 11 P. 322

60. Vijayaraghavan, K. (1976) "Growth and development of Indian Children" Indian Journal of physiology and pharmacology 20, p. 268.

61. Waterlow, J.C (1963) "The assessment of protein malnutrition proceedings of the nutrition society 23, p-68.

62. Whitehead, R.G. (1972) Changes in haemoglobin concentrations during the development of Kwashiorkor". British Journal of Nutrition 28, p-463.

63. WHO (1972) Technical report Series No. 503 p-27.

64. WHO Chronicle (1974) "Malnutrition and mental development" No.28 p-100.

65. WHO Chronicle (1979) "Malnutrition in early childhood". No.33, pp. 225-227.

APPENDIX - A

FOOD INTAKE OF PRE-SCHOOL CHILDREN IN THOLAM PALAYAM

A.

Sl. No.	Food Item G./day	1 Amount	2 Amount	3 Amount	4 Amount	5 Amount	Mean Amount	% of R.DA
1	Cereals	130	144	150	140	143	142	71
2	Pulses	23	18	37	13	32	23	46
3	Green leafy vegetables	6.3	8.8	9.5	6.9	4.5	17	10
4	Other Vegetables	16.7	19.6	20.5	23	23.7	21	42
5	Milk	-	-	-	-	-	-	-
6	Flesh foods	15	-	-	21	-	7	23
7	Fruits	2.2	6.0	11.0	26.8	5.8	10	20
8	Sugar and Jaggery	-	-	-	-	-	-	-
9	Oils and fats	10.4	16	11	11.34	11	12	48
10	Balamar	89	98	100	96	61	89	-

APPENDIX A

B. FOOD INTAKE OF PRE-SCHOOL CHILDREN (4-5) IN THIRUMALAYAN PALAYAM

Sl. No.	Food Item G./day	1 Amount	2 Amount	3 Amount	4 Amount	5 Amount	Mean Amount	% of R.D.A
1	Cereals	155	158	138	164	151	153	77
2	Pulses	20.3	30.8	33	28	31	28	47
3	Green leafy Vegetables	0.81	1.0	1.05	1.00	1.2	1.00	2
4	Other Vegetables	43	28	25	28	46	-	-
5	Milk	-	-	-	-	-	-	-
6	Flesh foods	-	-	-	27	-	5	15
7	Fruits	25	24	10	12	6	15	30
8	Sugar and Jaggery	-	-	-	-	-	-	-
9	Oils and fats	10.5	8.8	12.5	10.3	10.2	10	40
10	Balahar	60.2	62	72	61	70	65	-

APPENDIX. A

C. F FOOD INTAKE OF PRE-SCHOOL CHILDREN (4-5) YEARN IN PODANURE

Sl. No.	Food Item g/day	1 Amount	2 Amount	3 Amount	4 Amount	5 Amount	Mean Amount	Mean % of R.D.A
1.	Cereals	160	168	133	136	134	146	72
2.	Pulses	22	21	14	20	24	21	42
3.	Green leafy Vegetables	5.7	8.0	5.1	4.1	21	8	11
4.	Other Vegetables	17.5	32	23.8	21	40	28	56
5.	Milk	20	36	30	20	40	30	15
6.	Flesh Foods	45	-	36	39	12	33	110
7.	Fruits	32	37	30	26	48	32	64
8.	Sugar and Jaggery	20	30	25	20	30	25	60
9.	Oil and fats	10.1	11.8	21.7	12.7	13.9	15	60
10.	Balahar	48	46	54	46	55.5	52	-

APPENDIX.A

D. FOOD INTAKE OF PRE-SCHOOL CHILDREN (4-5) YEARS IN PERIYANAICKEN PALAYAM

Sl. No.	Food Item g/day	1 Amount	2 Amount	3 Amount	4 Amount	5 Amount	Amount	Mean % of R.D.A
1.	Cereals	145	147	144	154	158	150	75
2.	Pulses	21	17	27	28	28	24	48
3.	Green leafy vegetables	1	1.8	12.5	1.5	1.2	4	5
4.	Other vegetables	30	25	38.5	33	31.8	33	66
5.	Milk	20	20	20	20	40	24	20
6.	Flesh Foods	-	29	-	-	-	6	20
7.	Fruits	20	28	36	13	22	24	48
8.	Sugar and Jaggery	30	20	25	20	30	25	62
9.	Oil and fats	15.5	13.1	9.7	12.8	12.5	13	52
10.	Balahar	58	54	56.6	58.8	48.2	55	-

APPENDIX A

E. FOOD INTAKE OF PRE-SCHOOL CHILDREN (4-5) YEARS IN KALAPATTI

Sl. No.	Food Item g/day	1 Amount	2 Amount	3 Amount	4 Amount	5 Amount	Mean Amount	Mean % of R.D.A
1.	Cereals	127	139	167	147	150	148	74
2.	Pulses	32	31	29	17	28	28	47
3.	Green leafy vegetables	4.4	48	5.6	6.3	5.1	5	7
4.	Other vegetables	28.5	28.5	26.5	24.5	27.5	27	54
5.	Milk	-	-	-	-	-	12	6
6.	Flesh Foods	30	-	Nil	32	-	12	40
7.	Fruits	20.1	15.8	18	18	15	17	34
8.	Sugar and Jaggary	20	15	20	-	-	13	30
9.	Oil and fats	11.6	11.2	11.8	12.8	13.4	12	48
10.	Balahar	68	70.5	76	72	69	70	-

APPENDIX A

F. FOOD INTAKE OF PRE-SCHOOL CHILDREN OF AGE 4-5 YEARS IN CONTROL GROUP.

Sl. No.	Food item g/day	1 Amount	2 Amount	3 Amount	4 Amount	5 Amount	Mean Amount	Mean % of R.D.A
1	Cereals	187	221	213	218	204	208	104
2.	Pulses	20	22	24	18	26	22	44
3.	Green leafy vegetables	5.2	-	-	11.5	3.5	4	5
4.	Other vegetables	20.5	27.9	24.1	33	38.6	29	58
5.	Milk	-	-	-	-	-	-	-
6.	Flesh foods	31	11.9	21	32	-	19	63
7.	Fruits	26	23	20.2	21	20	22	44
8.	Sugar and Jaggery	20	35	-	22	30	21	53
9.	Oils and fats	16.8	17.2	11.3	11.8	12.4	14	56

APPENDIX. A

A. NUTRIENT INTAKE OF PRE-SCHOOL CHILDREN (4-5) YEARS IN THOLAMPALAYAM

Sl. No.	Nutrients	1 Amount	2 Amount	3 Amount	4 Amount	5 Amount	Mean Amount	Mean % of R.D.A
1	Calories	1067	1004	1107	1168	1109	1071	71
2	Protein (g)	35	37	39	40.1	30	36	163
3	Calcium (mg)	430	298	340	260	224	310	77
4	Iron	15	16	15.5	17.3	13.8	15.5	75
5	B.Carotene (g)	446	515	607	572	346	633	52
6	Thaimine (mg)	1.28	1.54	1.39	1.42	1.17	1.38	172
7	Riboflavin (mg)	0.77	0.89	0.94	0.91	0.57	0.86	108
8	Niacin (mg)	7.3	9.42	8.00	9.58	8.00	8.48	84
9.	Vitamin C (mg)	1.98	20.7	22.5	22.4	13.1	19.7	65

APPENDIX.A

B. NUTRIENT INTAKE OF PRE-SCHOOL CHILDREN (4-5) IN THRUVALAYAM PALAYAM

Sl. No.	Nutrients	1 Amount	2 Amount	3 Amount	4 Amount	5 Amount	Mean Amount	% of R.D.A.
1	Calories	1079	1062	1105	1085	1035	1073	71
2	Protein (g)	29.6	36	36	38	34	35	159
3	Calcium (mg)	98	267	132	220	129	159	42
4	Iron (mg)	13.1	16	14.5	15.4	13.4	14.5	70
5	B.Carotene (mg)	265	270	388	327	264	352	29
6	Thiamine (mg)	1.09	1.37	1.28	1.2	1.18	1.24	155
7	Riboflavin (mg)	0.51	0.67	0.68	0.68	0.64	0.63	78
8	Niacin (mg)	9.3	7.82	9.12	8.80	10.41	8.14	84
9	Vitamin C (mg)	25	11.1	6.6	10.0	13.69	13.3	44

APPENDIX. A

C. NUTRIENT INTAKE OF PRE-SCHOOL CHILDREN (4.5) IN PODANURE

Sl. No.	Nutrients	1 Amount	2 Amount	3 Amount	4 Amount	5 Amount	Mean Amount	Mean % of R.D.A
1	Calories	1279	1089	1094	969	994	1085	72
2	Protein (g)	43	30	31	28	30	32	145
3	Calcium (mg)	113	147	113	95	201	134	33
4	Iron (mg)	17.7	13.0	15	13.3	14.8	14.8	70
5	B.Caretene (g)	334	371	311	214	1338	519	43
6	Thiamine (mg)	0.09	1.3	0.89	0.81	0.91	0.98	122
7	Riboflavin (mg)	0.49	0.49	1.03	0.37	0.32	0.75	95
8	Niacin (mg)	9.30	9.71	8.06	7.49	8.12	8.55	85
9	Vitamin C (mg)	14.9	19.10	14.5	13.00	41.7	20.6	58

APPENDIX. A

D. NUTRIENT INTAKE OF PRE-SCHOOL CHILDREN (4-5) YEARS IN PERIYANAICKAN PALAYAM

Sl. No.	Nutrients	1 Amount	2 Amount	3 Amount	4 Amount	5 Amount	Mean Amount	% of R.D.A
1	Calories	1108	1087	1048	1027	1109	1075	71
2	Protein (g)	30	32	31	30	29	30	136
3	Calcium (mg)	112	111	237	123	141	185	36
4	Iron (mg)	12.5	20.9	14.6	13.5	12.0	14.7	70
5	B.Carotene (mg)	297	368	981	352	345	468	39
6	Thiamine (mg)	0.91	1.00	0.80	1.12	0.90	0.95	118
7	Riboflavin (mg)	1.10	0.86	0.53	1.00	0.42	0.78	97
8	Niacin (mg)	8.69	8.75	8,8	9.00	8.75	8.86	86
9	Vitamine C (mg)	9.03	9.5	23.3	9.4	13.1	12.8	42

APPENDIX.A

E. NUTRIENT INTAKE OF PRE-SCHOOL CHILDREN (4-5) YEARS IN KALAPATTI

Sl. No.	Nutrients	1 Amount	2 Amount	3 Amount	4 Amount	5 Amount	Mean Amount	% of R.D.A
1	Calories	1070	1035	1187	997	1130	1084	72
2	Protein (g)	37	33	39	30	37	34	154
3	Calcium (mg)	255	399	288	293	430	30.3	75
4	Iron (mg)	13.7	15.3	16.06	14.0	17.2	15.2	75
5	B.Carotene (mg)	430	473	508	514	489	482	40
6	Thiamine (mg)	1.12	1.31	1.35	1.23	1.4	1.28	150
7	Riboflavin (mg)	0.58	0.67	0.71	0.61	0.51	0.87	108
8	Niacin (mg)	7.37	7.7	9.11	7.7	8.15	8.04	80
9	Vitamin C (mg)	10.02	18.6	15.7	14.8	15.04	12.08	46

APPENDIX A.

F. NUTRIENT INTAKE OF PRE-SCHOOL CHILDREN (4-5) YEARS IN CONTROL GROUP

Sl. No.	Nutrients	1 Amount	2 Amount	3 Amount	4 Amount	5 Amount	Mean Amount	Mean % of R.D.A
1	Calories	1035	1109	1049	1027	995	1043	69
2	Protein (g)	26.10	22	22	20	21.5	23	104
3	Calcium (mg)	101	112	225	123	201	172	43
4	Iron (mg)	11.3	12.0	12.5	11.26	11.4	11.5	55
5	B.Carotene (mg)	227	277	341	332	338	303	25
6	Thiamine (mg)	0.59	0.63	0.80	0.72	0.91	091	113
7	Riboflavin (mg)	067	098	0.53	1.00	1.21	0.73	94
8	Niacin (mg)	7.01	6.80	7.02	8.85	8.1	7,04	70
9	Vitamin C (mg)	14.5	9.00	20.5	9.4	14.1	10.9	36

APPENDIX -B

ANTHROPOMETRIC MEASUREMENTS OF PRE-SCHOOL CHILDREN (3-5) Years)

Number of children	Age in years	Weight in kg.	Height in cm	Mid-Arm circumference in cm	Chest Circumference in cm	Head Circumference in cm.
I. Cholamadavu						
1.	4½	15	92.8	13.9	50.2	47.5
2.	4	14.5	97	14.5	51.5	49.5
3.	4½	16	100.5	14.7	49.7	48.0
4	4½	15.5	102.1	14.0	51.6	49.7
5.	3	92	77	13.2	49.1	44.5
6.	4	13	91.5	13.3	49.5	46.5
7.	4	13	96	13.2	49.2	48.0
8.	4½	14	99	13.8	51.2	49.5
9.	4½	13.5	99	13.5	48	47.2
10.	4½	16	100	14.3	52.1	50.3
11.	4½	13	86	13.2	48.9	48
12.	3	11	90.5	13.0	46	45.5
13.	4½	12	95	13.4	48	47.2
14.	3½	11	88	13.3	47.5	46.2
15.	4	12	90.5	13.8	48.1	46.0
16.	4½	13	99	14.1	48.5	47.5
17.	3½	11.5	88.5	13.5	47.2	45.5
18.	4	91	12.5	47.5	46	46
19.	4	13.5	99	12.6	48.5	46.4
20.	3	10	80	13	47	45.2
21.	3	9.5	72	10	45	44
22.	4	13	91	13.3	47.5	46
23.	4½	13.5	93.8	93.8	48.2	47.2
24.	4½	14	96.3	13.5	49	47.5
25.	3½	12	86.2	13.1	47.5	46.4
26.	4	13	96.6	13.3	48	47.1
27.	4½	15	98.5	14.1	50.5	48.2
28.	4	13.5	95.2	13.8	49.0	47.3
29.	3	9.5	78	12.5	45	44.5
30.	3½	11	86	12.9	46.5	45.7

1	2	3	4	5	6	7
31.	4½	13	96.4	13.5	50	49
32.	4	11	84	13.1	46	45
33.	4	14.5	96	14.5	49.5	49.5
34.	4	13.5	94.7	14.0	48	47.5
35.	4½	14	96.5	13.5	49	48.5
36.	4½	16	100.5	13.8	49	47.9
37.	3½	11	88	12.8	48.0	45.5
38.	3	12	28.8	13.0	38	46.5
39.	43.5	13.5	92	13.5	49.5	48
40.	4½	16	100.5	14.5	50.5	49.5
41.	4	13	96	13.8	49.5	48.4
42.	4½	14.3	96.2	14.5	50.5	49.0
43.	4	13	92.5	13.5	49.7	48.0
44.	3	11	84.1	13.1	46	45.5
45.	3½	11.5	87.4	13.3	48	47.0

II. [illegible]

1.	3	12	86	12.5	49.5	45.3
2.	3	11	83	12.8	46.2	45.3
3.	3	9	73	11.8	43.5	42.5
4.	3½	13	88	13.5	49.6	46.3
5.	4	14	95	13.7	51.2	46.8
6.	4	14	95.5	14	52	49
7.	3	11	87.5	12.7	49.5	47
8.	4½	13	96	15	49.5	47.5
9.	3	13	91	13.8	49.5	46.5
10.	4	16	94	14.2	50.5	48.5
11.	3	9	81.5	12.4	48	43.7
12.	3	11.5	89	13	47	46.5
13.	3½	10	86	12.9	47	46
14.	3½	11	86.5	12.3	46	45.5
15.	4	12	92	13.1	48	47
16.	4½	14	97	13.3	49	48
17.	4½	14.5	99	13.5	49.5	48.5
18.	3	11	87	12.7	46	45.5
19.	4	13	98.7	13.1	47.5	47
20.	3½	11	87	12.7	46	45.1

1	2	3	4	5	6	7
21.	4	12	93	12.9	46.8	46.3
22.	3½	9	29.5	12.4	49	46
XXI. [illegible]						
1.	4	13	95	13.1	48.2	48.0
2.	4	13	95.5	13.2	49	48
3.	4½	14	97	14	50	48
4.	4	12	92	12.7	47.9	47
5.	[illegible]	10	86	12.7	47.1	46.6
6.	3½	12	90.5	12.6	49	47.8
7.	3	12.5	86	12.7	46	48
8.	4	10	92	12.8	46	45.5
9.	3	10	89	13.2	47	46.5
10.	4	14	99	13.6	48	47
11.	3½	12	91	12.8	47	46.8
12.	4½	14.5	102	14.8	50	48
13.	4	12.5	95.5	13.1	48.4	47.5
14.	3½	11	82.5	12.8	49	46.5
15.	3	12	89.5	12.8	48	47.2
16.	3½	10	92	12.1	45	44.5
17.	3	10	91	12.6	46	45
18.	4	14	97	13	48	47
19.	3½	11	97	13	46.2	45.8
20.	4	12	92	12.6	47	47
21.	3	12	96	13	47	46.9
22.	4	14	95	13	48	47
23.	4	13	97	12.8	46.5	46
24.	3	10	90	12	45	45
25.	3	12	88.5	12.6	46	45.5
26.	3½	11	87.5	13.1	46	45.3
27.	3½	10	79	11.5	45	43.6
28.	3½	13	87	12.2	46	45.5
29.	3	10	86	12	45	44.5
30.	3½	10	87.5	13.5	45	44.5
31.	4	14	101	15.8	51	48.5
32.	4	13	96	13.5	49.5	47.5

1	2	3	4	5	6	7
33.	3½	11	95	12.8	45.5	45
34.	3	12	98	13.2	49	47.5
35.	3	12	96	13.6	46.5	46.0
36.	3½	92	89	13	43	45
37.	4	14.5	99	13.6	50	49
4. [illegible] Landwirt-						
	4	14	94	13	50.5	47
2.	4	14	101	12	49	47
3.	3	12	92	11.8	47	46.5
4.	4	13	95	12.5	48	47.1
5.	4½	13	99.5	12.5	47	48.4
6.	4½	11	98	12.3	47	46.8
7.	4	12	94.5	13	48	47.5
8.	3	11	81	13.2	47.1	47.2
9.	4½	13	95.7	13	49.5	48.2
10.	4	16	99	13.8	48	47.5
11.	4½	15.5	98.7	14.1	49	47.5
12.	4	13	94	14.1	48	47.8
13.	3	14	89	13.5	47	46.5
14.	4	13	102	12	48.5	47.5
15.	4	12.5	100	11.5	47.5	44.5
16.	3½	13	13.5	14	48.1	47.5
17.	4½	14	100	13	49	47.5
18.	3	11	87	12.5	46.5	45.5
19.	4	13	95	13	48	47.5
20.	4½	16	101	14.1	49.9	48.7
21.	3½	14	96	14	47.5	47.0
22.	3	12	91.5	13.5	46.5	46.2
23.	3	10	86	13.1	47	45.5
24.	4	12	90	11	48	47.2
25.	4	15	93	13.5	50.1	49.2
26.	4½	13	99	13.5	49	48
27.	3½	14	92	13.8	50.5	49
28.	3½	13	93	12.7	48.1	47.0
29.	3½	12	89	13.7	46	45
30.	4	15	97	13.8	47	47
31.	3½	11	88	12.9	47.5	46.5
32.	4	14	99	13.8	49	47.2
33.	3½	12	89	13.1	46.5	46
34.	4	16	100	14.0	48	47.2
35.	4	11	93.5	12.9	47	47
36.	4	12	95.5	13.1	48	47.5
37.	3½	12	91	12.8	46	45.5
38.	3	10	88	12.5	48.5	45.3
39.	4	15	95	13.6	48	47.1
40.	4½	15	96	13.8	48.5	47.5
41.	3	10	86	12.7	46.5	45.2
42.	3½	11	89	12	49	47

5. [illegible]

1	2	3	4	5	6	7
1.	[illegible]	12	86.3	13.2	48	47.6
2.	[illegible]	15	96.4	14.8	51.5	46
3.	[illegible]	12	87.7	14.1	48.5	48.0
4.	[illegible]	15	100	13.9	50.5	48.0
5.	[illegible]	11	89.5	13	46	45
6.	[illegible]	14.5	98.5	13.9	46	46.0
7.	[illegible]	10	85	13.8	43.3	44.5
8.	[illegible]	12	91.8	13.5	47	46.0
9.	[illegible]	15.5	105	15	49.8	48.0
10.	[illegible]	13	96	14	49	48.2
11.	[illegible]	14.5	96.2	13.9	50.5	48.5
12.	[illegible]	13	92.5	14.1	51	48
13.	[illegible]	14	99.5	15	49.5	48
14.	[illegible]	11	84.1	18	46	45.5
15.	[illegible]	15	96	14.8	51.1	48.5
16.	[illegible]	11.5	87.4	13.3	48	47.0
17.	[illegible]	12.5	98	13.6	48	46.0
18.	[illegible]	13.	98	13.4	48	46.0
19.	[illegible]	11	84.5	13	47	44.5
20.	[illegible]	13.5	91	13.9	47	47
21.	[illegible]	11.5	85	12.9	46.3	45.5
22.	[illegible]	13	48.5	13.4	48.5	48
23.	[illegible]	11	87	13	47.5	46.5
24.	[illegible]	13.5	91.5	13	49	49
25.	[illegible]	13.5	99	13.9	49.5	48
26.	[illegible]	12.5	90	13.8	48	47
27.	[illegible]	16	98.5	15	53.5	49
28.	[illegible]	13	89	12.9	48	47
29.	[illegible]	13.5	91	12.5	51	48.5
30.	[illegible]	11	87.5	12.8	47	46
31.	[illegible]	12	86.5	13.8	47	46.5
32.	[illegible]	16	93	15.1	51.5	49.5
33.	[illegible]	15	98.5	17.5	51.5	48.2
34.	[illegible]	8.14	98	15	49	48
35.	[illegible]	9.5	78	12.5	45	44.5
36.	[illegible]	11	84	13	46	45
37.	[illegible]	13.5	96.4	13.5	48	47
38.	[illegible]	14	96	13.7	49	47.5
39.	[illegible]	12	88	12.8	47	45.5
40.	[illegible]	10	86	12.5	46	45

1	2	3	4	5	6	7
6. Lettres						
1.	4	13	95.5	13.5	48.7	48.1
2.	4	12	81.8	13.3	47	46
3.	4	13	93.5	13.6	48.2	47.4
4.	4	13	95	13	47.5	47.0
5.	4	12	92	13.2	48	47.0
6.	3	12	87	12.5	46	45.2
7.	3	10	86	12.4	46	45
8.	3½	12	86.4	13.6	47	46.0
9.	4	12	94.5	12.5	47.4	44.6
10.	3	11.5	89	13.3	47.5	46.5
11.	4	13	98.1	14.1	49	48
12.	4	12	91	13.7	46.2	44.5
13.	4	12	92	13.8	48.8	45.1
14.	3	11	89	13	47	46
15.	4	12	92	13.2	47	48
16.	4½	13	99	13.5	48	47.2
17.	4	13.5	97	13	47	47
18.	3½	11	83	13	47	44.5
19.	4½	14.5	97.5	15.1	50.4	46.8
20.	4	13	92	13.7	47	45.5
21.	3½	11	90	12	46	45.1
22.	4½	15	102	14.7	49.5	49
23.	4½	13	96.7	12.6	47.7	47
24.	4	14.5	97.5	14	50	45.6
25.	4	11.5	98	13.7	48.5	47.4
26.	3	10	84.4	11.9	47	45.5
27.	3	11	87	12.1	47.4	47
28.	4½	14	102	13.5	50.2	48.3
29.	4	13	97.9	13.8	48	47
30.	3	11	87	12.7	47.1	46.5
31.	4	12	95	13	47	46.1
32.	4	13	92	13.2	48	47
33.	4	13	94.5	13.6	47.5	47
34.	3	12	89	13.3	49.0	47.0
35.	3	11	86	13.1	48	45.3
36.	3½	12	87	13.3	48	45.1
37.	4	13	95	13.5	47	46
38.	4	14	97	13.8	48	47
39.	3½	11	86	13.1	46	45.2
40.	3	10.5	84.7	12.8	46	44.8

1	2	3	4	5	6	7
7. [illegible]						
1.	4	13	91	13.8	47.5	45.5
2.	4½	16	94	13.9	50.5	[illegible]
3.	3½	12	87.5	12	45.5	45.8
4.	3	11	84	13.1	47.2	[illegible]
5.	4½	13	98.3	14.1	48	46.5
6.	4	12	92	12.8	45.5	45
7.	4	12	92	12.8	45.5	45.1
8.	[illegible]	15	98	15.1	50.1	48.6
9.	[illegible]	15	97	15.2	[illegible]	47.6
10.	5	[illegible]	89	14.8	48.1	45.8
11.	3½	[illegible]	88	13.2	47.0	[illegible]
12.	4	13	93.5	13.8	47.5	46.5
13.	3½	12	87	12.3	47.0	46.1
14.	4	13	92	12.8	46.3	45.0
15.	4½	14	98	13.0	49.8	47.1
16.	4½	14	100.5	15.1	50.0	48.5
17.	3½	13	89	13.2	47.3	[illegible]
18.	3	12	88	13.0	47.0	45.1
19.	4½	13	95	13.4	49.8	[illegible]
20.	4½	13	95	13	48.0	47.0
21.	4	13	92.5	13.9	49.0	[illegible]
22.	3	10	87	12	46	45.3
23.	[illegible]	15	99	13.8	48	47.2
24.	[illegible]	16	100.2	13.9	48	47
25.	[illegible]	13	97	13.7	47	46.9
26.	[illegible]	13	98	13.3	47	46.7
27.	3	10	86	12.3	46	45.1
28.	3½	11	87	12.7	47	45.7
29.	4	12	93	13.2	48	47
30.	[illegible]	13	99	13.0	49	48
31.	4	14	97	13.5	47	[illegible]
32.	4	13	91	13.8	47	[illegible]
33.	3	11	88	12.5	46	[illegible]
34.	4½	[illegible]	100.1	13.2	49	48
35.	[illegible]	11.5	86	12.3	46	45.2
36.	4	15	95	13.2	49	48
37.	4½	12	92.5	13.3	47.5	[illegible]
38.	4	13	96	13.1	47.5	[illegible]
39.	3½	11	86.3	13.0	46.5	[illegible]

8. [illegible]

1	2	3	4	5	6	7
1.	4½	14.5	99	15.8	49.1	48.7
2.	4	12.5	89	13.7	4.9	46.8
3.	4	14	96	14.1	50.1	48.3
4.	4½	13.5	94	13.8	47.5	47
5.	4	13	99.5	13.8	48.1	46.9
6.	4½	13	93.3	13.5	49	48
7.	3	10	86	12.4	46	45.1
8.	3½	11	87	12.7	47	46.2
9.	4	12	91	13.2	47	47
10.	4½	12.7	97.7	13.4	47.2	45.3
11.	4½	13	93.5	14.2	48.5	47.0
12.	3½	11	89	12.3	47.2	47.0
13.	3	10	88	12.5	47.5	46.5
14.	4½	16	100.1	13.9	49	48
15.	4½	15	98.3	14.1	48	47
16.	4	13	93	12.9	47	46.2
17.	3½	11	89	12.3	47	47
18.	4½	13.5	95.5	13.8	48.2	47.0
19.	4	13	94.4	13	49.5	48.3
20.	4½	14	99	12.8	51.5	49
21.	3	10.5	88.5	12.8	47.5	46.5
22.	3½	11	87	13.1	47.3	45.6
23.	4½	16	100.5	14.2	50	49.2
24.	4	14	92	12.8	47.2	46.9
25.	3	11	87	12.8	48.4	46.2

9. [illegible]

1.	4	13	94.2	13.1	48.5	48.1
2.	3½	13	99	13.0	48.5	45.7
3.	4½	14	99	13.6	49.8	48
4.	4	13	94	13.0	48.0	45.5
5.	4	12	98	13.5	48.5	47.2
6.	3½	11	89	12.9	47.5	45.7
7.	4½	14	93	14.2	51.0	48.2
8.	3½	11	96	13.3	46.0	46.0
9.	3	11	92	12	47.0	46.5
10.	3	10	79	12.6	46.0	45.2

1	2	3	4	5	6	7
11.	4	12	92.5	13.8	48.0	47.1
12.	4	13	98.5	13.5	48.0	47.5
13.	4½	12	96	12.8	47.0	47
14.	3½	10	88	12.5	46.0	45.0
15.	3	9	76	12.4	46.0	46.0
16.	3	10	88	12.5	46	45
17.	4	11	94.5	13.3	45	45
18.	4½	12	99	13.0	45	45
19.	4½	13	96.5	12.8	47	44.5
20.	4½	16	101.2	12.6	48	47.5
21.	3½	12	93	13.1	47	46.5
22.	4	15.5	98	13.8	50.5	49.5
23.	3	10	89	12.2	47	45.8
24.	3½	12	89	13.1	48	47.2
25.	4½	14.5	93	14.2	51.0	50.0
26.	3	9	76.5	12.0	44	44
27.	4	15.5	96	13.8	49	48.5
28.	3½	10	79	13.3	47	45.5
29.	3½	13	90	12.5	49.5	49.0
30.	3	12	90	12.8	47	46.0
31.	4½	14.5	94.5	13.8	49.5	48.5
32.	4	13	93	13.3	47	47
33.	4½	15.5	102	13.9	49.8	49.3
34.	3	12	88	12.8	48.5	46.5
35.	3½	12	92	13.5	48.2	47.5
36.	4½	15	101	12.6	48	46.5
37.	3	10	81	12.3	47	46.0
38.	3½	12	89	12.8	47	57
39.	4	12	94	13.1	48	47.5
40.	4½	14	98	13.5	49.5	49.0
41.	3	11	89	12.5	97	46.5
42.	4½	15	100	12.8	48	97.5
43.	4½	15.5	96	14.5	51	49.5
44.	3½	12	89	13.3	47	48
45.	4	14.5	98	13.5	49.5	48
46.	4	13	91	12.5	49.5	49
10. [illegible]						
1.	3	11	88.5	13.1	47.5	46.0
2.	4	13	96.4	13.7	48.5	47.2
3.	4½	15	97.8	13.8	49	47.5
4.	4	13	95	13.1	48	46.7
5.	4	13	95.5	13.2	49.2	48.0

1	2	3	4	5	6	7
6.	3	10	92	11.8	46	45.5
7.	3½	10	89	13.2	47	48.5
8.	4	12	99	13.6	48	47.9
9.	4½	16	99.8	14.2	51.5	49.5
10.	4	15	99.2	13.9	49	48.0
11.	4½	15	104	13.2	49.5	47.2
12.	3½	12	89	13.5	47	46.5
13.	3	11	87	13.3	47.5	45.8
14.	4	12	97	13.0	48	47
15.	3	10	75.1	13	46.5	44
16.	4	12	99	12.9	47	47
17.	4	13	99.5	12.7	45.9	45.1
18.	4½	15.5	99.8	14.1	49.5	48.2
19.	4½	15.5	99.8	14.1	49.5	48.2
20.	3	11	88	13.2	47	45.5
21.	3	10	86	13.5	48	46.5
22.	4	13	94.5	13.9	49	47.7
23.	4½	14	96.8	13.0	51	48.7
24.	3½	11	87.5	12.5	45.8	44
25.	4	13.5	91	13.1	48	46.2
26.	4½	14	98.9	14.3	50.0	47.8
27.	4½	15.5	101	14.3	51.2	49.8
28.	3½	10	86.8	12.7	46.5	45.3
29.	4½	16	100.5	14.3	49.7	48.0
30.	3½	12	86.3	13.0	48	47.6
31.	4	13	93.8	13.5	47	46
32.	3½	11	90	13.1	46.5	45.1
33.	4	11.5	96.8	13.9	48	17.3

11. [illegible]

1.	4	13	94	14.5	49.5	45.8
2.	4	14	94.6	13.9	50.5	49.5
3.	3½	12	87.5	12.3	45.5	45.0
4.	4	13	98.3	14.4	49.0	47.5
5.	3½	12	92	12.8	45.5	45.0
6.	4½	15	98	15.4	52	49.6
7.	3	12	83.5	14.2	49	47.5
8.	4	14	98.5	13.9	49	46.5
9.	3	13	89	14.3	48.3	45.5
10.	4	14	98.5	13.9	49	47.5

1	2	3	4	5	6	7
11.	4	15	100.5	15.6	50	48.5
12.	3	13	89	13.2	47.5	47.0
13.	3	12.5	86.5	13.0	47	46
14.	4	13.5	93	13.1	50	48.9
15.	3	12	89	13.3	47.5	45.2
16.	3	11	88.5	13.5	48	47.2
17.	4	14	96.7	13.8	49	48
18.	4	15	99	13.6	48	47.5
19.	4	16	100.5	14.4	47.5	46.5
20.	4	14	96	14.4	49	49
21.	3	12	87	13.6	49.5	49
22.	3	13	91	13.8	49	48.5
23.	3	12	88	12.5	48	47.5
24.	4	15	99	13.2	49.5	49.0
25.	4	12	92.5	13.8	47.5	46.5
26.	4	14	96	15.5	50	48.5
27.	3	13	90	13.5	47	47
28.	4	13.5	92.5	15.0	50	49
29.	4	13	94	14	48	48
30.	3	11.5	88	12.7	45.5	44
31.	4	13	96	13.0	48	48
32.	4	13.5	97	13.8	49.5	49.3
33.	3	11	86	12.5	47.5	46.5
34.	3	11	89	12.6	46.5	45.0
35.	4	14	95.2	13.8	49.6	48
36.	4	14.5	95	15.5	49	48.5
37.	3	10	87	12.5	47	46.5
38.	3	11	88	12.8	47	47.0
39.	4	14	95.5	13.3	49.5	48.0
40.	4	13.5	93	15	50	49.0
41.	3	11.5	88	12.7	45.5	44.0
42.	4	13	96	13.1	49	48.0
43.	4	14.5	98.5	13.5	49.5	48.3
44.	4	14	99	13.8	49.5	47.9
45.	4	12	94	13.8	47.5	47
46.	3	12	92	12.5	45.5	45
47.	3	12	84	14.0	47.5	46
48.	4	14	98	13.8	49.5	49.5
49.	4	12	88.5	12.3	49.5	45.5
50.	4	14.5	98.5	13.5	49.8	48.5