MORBIDITY PATTERN OF SELECTED GROUP OF CHILDREN (0-6 YEARS) OF COIMBATORE

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A Dissertation Submitted To The University Of Madras
In Partial Fulfilment Of The Requirements
For The Degree of Master Of Science
May - 1980

ACKNOWLEDGEMENT

The investigator expresses her profound sense of gratitude and sincere sentiments of thanks to Dr.(Mrs) Rajammal P. Devadas, M.A., M.Sc., Ph.D(Ohio), D.Sc(Madras), Principal and Director, Sri Avinashilingam Home Science Autonomous College for Women, Coimbatore, for her continued guidance and valuable advice throughout the study. The investigator wishes to record her gratitude and sincere thanks to Miss A.Sakthivelmani, M.Sc., Dip.Education., Assistant Professor in Foods and Nutrition Department for her inspiring guidance, constructive criticism, persistant instruction and valuable advice which enable this study to attain its present stage.

The investigator expresses her deep sense of gratitude and sincere thanks to Dr.Krishnan, M.B.B.S., M.D., D.C.H., Chief Pediatrician of the Coimbatore Medical College Hospital and to Dr.Subbian, Director and Chief, Kumaran Nursing Home, and the mothers of the selected children for their co-operation throughout the conduct of the study.

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I INTRODUCTION

Evermince the era when man hunted for his food, one of the main reasons why he organised himself into societies was to ensure an adequate food supply for all. If people are to be productive, they must enjoy a satisfactory level of health. Only then they will be able to improve their work capacity and help to create the conditions required for improving their own well being and that of the society of which they are members. Hence the fundamental role of any society is to ensure the well being of its members.

Statistical census report (1971) and Bhashadri(1979) state that children below 60 months constitute 15 per cent of the population in our country as against 10 per cent in the developed nations. Protecting these children, developing their abilities and guiding their character are society's most vital tasks.

A child deprived of health care during these most impressionable years, is deprived of the opportunity of growing into a normal human being and the damage done in the first few years could be irreversible throughout one's later life (Bhansali et al, 1979).

The preschool age is most vulnerable deserving all attention from the health and nutritional planners. Often this segment of the population is the victim of malnutrition and suffers crucially from malnutrition. Malnutrition creates a greate hindrance to the growth and development of the children and inturn that of the country(WHO, 1979). Fifty per cent of the preschool population suffers from undernutrition and malnutrition (Devadas, 1977 and Chandrasekhara, 1979).

The immediate consequences of malnutrition are high morbidity and mortality (WHO, 1979) and the long term consequences are chronic undernutrition, retarded growth and mental development, stunted adult status, low working capacity and poor stature (Devadas, 1977; Arya, 1979 and Chandrasekhara, 1979).

The main causes for malnutrition are poverty, poor socioeconomic status, inadequate food intake, ignorance, false believes, traditions, caste, poor living and recreational facilities and faulty food habits (Gopalan, 1977; Harvazian and Behar, 1978; Obert, 1978; Shaw, 1978; Sreenath et al, 1978; Devadas, 1979 and WHO, 1979).

Malnutrition and infection together pose a serious threat to the health of the under privileged population(Reddy and Srikantia, 1978). Malnutrition often combined with infection affect the immune system of infants and children (Reddy and Srikantia, 1978 and WHO, 1979).

Infections increase the nutritional requirements of the child and thus widens the gap of deficiency and aggravate malnutrition. Malnutrition by lowering resistance, makes the child more vulnerable to infections, thus exposure even to mild infection which would be resisted by well nourished child leads to chronic illness in malnourished child. Slightly more serious infections which lead to death in malnourished children are less likely to end fatally in children below the age of six, who die in gastrointestinal and respiratory infections, the real cause of death is the uncerlying malnutrition. The infection merely acts as the last straw.

Infections like whooping cough, measles, tuberculosis, cough, colds affect the general growth of children. Diarrhoeal diseases in children particularly plays a major role in causing malnutrition (Athavale, 1971 and WHO, 1979). Respiratory tract infections are very common in infancy and childhood (Athavale, 1971). The damage done by infections and associated malnutrition to a young child in its formative years is manifested in retarded physical growth and mental development.

which it may not be able to catch upon, thus impairing the potential for a full and active adult life. For infants and young children, the risk of dying and being diseased are very closely related to the environment in which they live. Inadequate food, exposure to infections and lack of elementary hygiene and care pose obstacles which the young child is ill equipped to deal with yet which it cannot escape.

This is why, the mortality and morbidity rate is universally recognized not only as a most important indicators of the health status of the children but also of the level of social development (WHO, 1979).

A simple, properly functioning surveillance systems that detects the seasonal incidence and security of cases and changes that occur will also serve to provide early warning of the threat of epidemics indicating the need for laboratory and epidemiological investigations, reinforcement of treatment and sanitation facilities and institution of control measures.

The regular supply of information on the occurrence of diarrhoeas in a community can provide the basis for assessing the prevalence of incidence of diarrhoeal diseases, including cholera and for defining population groups at risk.

Successful prevention depends on knowledge of causation, identification of risk groups, availability of prophylactic or early detection measures, a favourable climate of social policy, and continuous evaluation and development of procedures applied (WHO, 1979).

Hence there is a greater need for different types of health and nutrition surveys to depict the present status and condition before launching any nutritional or health programmes on a large scale basis. The present study is an endeavour by the investigator to know the present trend of morbidity of children in the age group of 0-6 years in selected medical centres of Coimbatore.

The main objectives of the study were:

The morbidity pattern in the selected group of children;
Economic, social and cultural background of the families;
Food habits and food pattern of the children;
Personal hygiene and environmental sanitation;
Immunization measures adopted for the children;
Anthropometric measurements of the children and biochemical picture of selected components of blood.

II REVIEW OF LITERATURE

The literature pertaining to the study is discussed under the following heads:

A. The importance of nutrition in the community

B. Parameters used in the assessment of nutritional status of the community

C. Mortality and morbidity as a tool in the assessment of nutritional status.

D. Synergism between malnutrition and infection.

E. Mortality and morbidity rates of 0-6 years old children.

F. Factors responsible for high mortality and morbidity among children and

G. Preventive measures taken in India against high mortality and morbidity.

A. The importance of nutrition in the community:

The nutritional well being of a community or nation is an important determinant of its health status (PAG, 1976). Three hundred million children in the world today are physically and mentally retarded due to malnutrition. Hence in order to distinguish the well nourished from the malnourished and under nourished, assessing the nutritional status of the community is indispensable (Gopalan, 1978).

Good nutrition and malnutrition are the end results of many interacting factors operating simultaneously and concurrently

on the individuals physical, biological and cultural environment of the community (Devadas, 1972 and Gopalan, 1973).

The problem of malnutrition is plaguing all nutritionists, sociologists and national planners not only in our country but all over the world. Malnutrition is a malady affecting all the developing countries which constitute two third of the population of the world. It is a complex problem embracing many social, health and medical aspects (Devadas, 1979).

The number of people in the world suffering from such florid clinical manifestations of nutritional deficiency as kwashiorkor marasmus, keratomalacia, anaemia, rickets, pellagra and goitre must run in to several millions (Gopalan, 1977). Malnutrition is responsible for low birth weights of infants and result in a high degree of pregnancy wastage, nearly 30 per cent (Devadas, 1979).

The survivors of early malnutrition start with a developmental path characterized by defective psychological functioning, power of concentration, school failure, poor intellectual performance and lowered adaptive functioning and decreased response to stimulation (Gopalan, 1976; Devadas et al, 1978 and Arya, 1979). Therefore, malnutrition can no longer be considered as a micro clinical problem. It is a macro social problem, (Sundaram, 1973 and Gopalan, 1977).

B. Parameters used in the assessment of nutritional status of the community:

Gupta(1966) states that knowledge on nutritional status helps correctively in the cure and prevention of deficiency diseases and in the improvement of those in normal health.

Nutritional status of an individual or community could be assessed by various yardsticks, as dietary survey, physical anthropometry, biophysical and biochemical tests and vital statistics (Jelliffe, 1969; Davidson et al, 1973; Swaminathan, 1974 and Blackburn, 1977).

1. Dietary surveys:

Gopalan and Rao (1972) and Hegsted (1972) state that dietary studies contribute an essential part of any complete nutrition survey. Dietary surveys are carried out to obtain information on dietary intake to determine in large measures the nutritional level and health of its people and to identify groups and individuals suffering from malnutrition and rectify the effects of ill balanced diets (Martin, 1963; Sjolin, 1969; Darke, 1972 and Davidson et al, 1973).

2. Anthropometric measurements:

Jelliffe(1971), Bajina(1972), Gupta et al (1973) and Degwyun et al (1974) state that nutritional anthropometry may be a useful tool in the assessment of the magnitude of malnutrition.

According to Sikri(1972), Vijayaraghavan, (1976) and WHO(1979) height and weight are the best sensitive and reliable anthropometric trials to determine the growth pattern of a subject particularly of a specific population group.

Gurney(1969), Jelliffe(1970), Malina (1971), Jordan and Scrimshaw(1972) and Sabrycan(1973) opine that measurements of head, chest and arm circumference all form important anthropometric indices. At birth the head circumference is larger than the chest circumference. In Indian children (of both boys and girls) the crossing over of chest and head circumference takes place around two years whereas in American male infants this takes place by about nine months (Gopalan and Vijayaraghavan, 1971). Between one to four years of age, arm circumference shows little increased and is therefore relatively age independent. Arm circumference related to height has been used as an indicator for a quick classification of malnourished children(Vijayaraghavan, 1974) and Florentino and Dican, 1975). Arm circumference along with other measurements like height and weight will be of use for the assessment of nutritional status(Lowy, 1971 and ICMR, 1976).

3. Clinical examination

Clinical examination is one of the most essential and the simplest tool used in the evaluation of human nutritional status(Gopalan, 1961; Garn, 1962; Plough, 1962, FAO 1970;

Isaksson, 1974; Swaminathan, 1974; Visweswara Rao, 1977 and Gupta et al, 1979). This method has been found to be relatively inexpensive, rapid and not requiring elaborate field equipment or a costly laboratory (Jelliffe, 1969).

Nelson(1963) and Swaminathan(1969) point out that clinical examination adopted in nutritional surveys is a careful examination including medical history with special attention given to various symptoms and signs that are more or less associated with nutritional deficiencies. The common nutritional deficiency signs, that are looked for, are pale conjunctive, bitot spots, angular stomatitis, retarded growth, skin changes, bleeding spongy gums, pigeon chest, bow legs, knock knees and changes in the tongue (Wathur et al, 1974).

4. Biochemical methods:

The most objective means for assessing the nutritional status and to evolve some normal patterns of deficiency will be based on biochemical analysis of materials such as blood and urine that can be sampled easily(Sabry ean, 1973 and Sauberlich et al, 1974).

The methods found useful include estimation of plasma protein concentration, free aminoacids in serum, albumin and creatinine excretion or urea/creatinine ratio in the urine

(McLaren et al, 1965; Jonas and Schendal, 1966 and Swaminathan, 1969). The haemoglobin levels form satisfactory nutritional indices for survey purpose (Soof, 1969; Swaminathan, 1969 and Gupta et al, 1972).

C. Mortality and morbidity as a tool in the assessment of nutritional status:

Child health is the nation's wealth. The nutrition and health status of children, therefore, is an index of what the nation is investing in the development of its future man power potentials (Bhandari et al, 1975). Malnutrition influences morbidity rates for various diseases, maternal and perinatal mortality rates, life expectancy and other health statistics. As far as morbidity and mortality are concerned, widespread malnutrition has its most marked general ill-effect among young children (Jelliffe, 1966). Infant mortality rate is recognised not only as a most important indicator of the health status of children, but also the level of socio economic development(WHO,1979).

Some types of malnutrition have a particularly high incidence at certain ages, so that the mortality rates at these specific age periods have been suggested as indicators of the incidence of certain types of malnutrition(Jelliffe, 1966).

Communitywide nutritional survey of the major clinically identifiable syndromes, such as kwashiorkor, nutritional marasmus, pellagra, keratomalacia etc will provide useful information on prevalence(Jelliffe, 1966).

D. Synergism between nutrition and infections

Malnutrition and infection together pose a serious threat to the health of the under privileged populations in developing countries(Reddy and Srikantia, 1978). According to Martin(1970) well nourished body tends to resist and overcome infections, a poorly nourished body tends to be susceptible to disease and to delay the process of recovery.

The high levels of morbidity and mortality affecting mothers and children are related to the synergistic effects of malnutrition and infection (WHO, 1979).

Malnutrition combined with infection is responsible for the high infant morbidity and mortality rates in developing countries and the effect on the immune system of infants and children are particularly disturbing since they tend to be more drastic and long lasting than in adults(McLaren and Williams, 1976; Chandra and Newberne 1977; Reddy and Srikantia, 1978 and WHO, 1979).

About one million children die in our country every year as a result of malnutrition and may be due to nonnutritional diseases resulting from poor resistance due to malnutrition (Gopalan, 1973 and UNICEF, 1975).

According to Gopalan(1974) UNICEF, Swaminathan(1974) Cutting and Smith(1976) and Khanna(1977) diarrhoea, dysentery, pneumonia and malaria are the causes of childhood illness and infants diarrhoea is a common cause of infant morbidity and mortality.

Studies on experimental animals carried out by Vijayaraghavan(1974) and Reddy and Srikantia(1978) have shown that malnutrition imposed during critical periods of growth can lead to a permanent impairment of immune function and in protein calorie malnutrition there is a large increase in the total count of intestinal bacteria (Baskaran, 1978). Infections reduce appetite and tolerance of food(Swaminathan, 1974 and McLaren and Williams, 1976). It has been suggested that in children suffering from kwashiorkor, the ability to absorb vitamin A from the gut is impaired (Gopalan and Vijayaraghavan, 1971, and Swaminathan, 1971). High incidence of xerosis, bitotsspot and kertomalacia have been reported as associated features of kwashiorkor(Arroyave et al. 1969). The deficiency of protein in the diet may lead to a marked fall in the level of albumin in the plasma, while the level of immunoglobulin remains high.

The recent research works carried out by Srikantia(1974), Swaminathan(1974), NIN(1977) and Reddy(1978) on various aspects of immune competence in children suffering from varying

degrees of PCM show that in children suffering from severe degrees of kwashiorkor and marasmus, the ability to resist infection appeared to have been impaired.

Infectious diseases increase metabolism and the rate of breakdown of the tissues(Davidson and Passmore, 1976). As a result of infections, there is loss of nitrogen and lead to a negative nitrogen balance(Swaminathan, 1974 and Mclaren and Williams, 1976). Swaminathan(1974) reports that the liver glycogen stores are markedly reduced and sometimes wholly depleted when examined at autopsy.

Whitehead(1977) states that infection particularly gastroenteritis and malaria can have a profound effect on the growth and development among the rural African children. Infections or inflammatory states often cause significant increase in serum phenylalanine and phenylalanine-tyrosine ratio. More than 95 per cent of samples obtained during inflammatory disease in man showed that phenylalanine-tyrosine ratio increases greater than the maximum normal values(Klainer et al, 1976).

8. Mortality and morbidity rates of 0-6 years old children:

Mortality rate is the number of deaths per 1000 live births(Gopalan and Vijayaraghavan, 1971). The mortality rates among infants and preschool children are said to be the most

sensitive indices of the social levels of the community. India is a country of children with 230,245,000 children according to 1971 census(Malik, 1979).

According to Gopalan(1971) 45 per cent of infant death occurs with in first month due to maternal malnutrition and 40 per cent death occurs between 0-4 years as compared to four per cent in the U.K. and other developed countries.

More than 187.5 million children live in villages many of which have no health services, approximately 100,000 children die every month or even greater number dying of infectious diseases because they are undernourished leading to infant mortality rate of 124 per thousand(Malik, 1979).

Rao and Gopalan(1972) opine that the mortality between 1-4 years is about 43/1000 as compared to 1/1000 for Western Europe and North America.

About 50 per cent of the total death occur in the country takes place among children below 5 years of age(WHO, 1977).

The registered infant mortality rate in Tamil Nadu was 62.5/1000 live births in 1971. Nearly 1/3 of the total mortality is accounted for children below 4 years of which 50 per cent were in first year (Devadas, 1972).

Morbidity is the prevalence of any type of sickness or illness among population(Taylor, 1973). A survey on morbidity conducted by Sharma et al(1978) in India revealed that a majority(78%) of the children suffered from one or the other communicable diseases, acute respiratory infections,(48.9%) diarrhoea and dysentery(18.3%) pneumonia(7.6%) and worm infestation(6.3%).

A longitudinal survey of morbidity pattern of 350 children upto five years of age carried out by Department of Preventive and Social Medicine, Jaipur in 1973 showed that the main disorders affecting 90 per cent of children were acute nasopharyngitis, measles, acute bronchitis, injuries, pyrexia, whooping cough, diarrhoea and dysentery. The percentage prevalance of diseases was acute respiratory infection 29.8; diarrhoea and dysentery 29.8; multiple boils 10.3; acute nasopharyngitis 9.6; measles 5.3; worms 4.6; injuries 1.5; acute bronchitis 0.4; pyrexia 0.4; whooping cough 1.2 and others 7.2.

The survey conducted by Devadas et al (1976) on incidence of malnutrition revealed that nutritional disorders were considerably high in the morbidity pattern(49.16%). Among the nutritional disorders besides protein calorie malnutrition (39.71%), severe marasmus(35.93%), angular stomatitis(21.92%), bow legs and knock knees (0.73%) were common.

As per Gopalan(1973) the incidence of severe forms of protein calorie malnutrition like kwashiorkor and marasmus has been estimated to be around 1 to 2 per cent of all children between the ages of 1 to 5 years.

A recent study on some 5000 children under 5 years of age conducted by the ICMR with the assistance of WHO(1978) showed that 40 per cent of the children suffered from states of protein malnutrition(Sukhatme, 1976). The survey carried out by Rao et al (1970) revealed that in the major hospitals of the region, cases of kwashiorkor accounted for 16 per cent of paediatric admissions and that between one per cent and two per cent of children of the poor economic group between the ages of 0-4 years. The deficiency of vitamin A ranks as a potential hazard to growing children, coming next to PCM. The deficiency of vitamin A has become a major public health problem in India contributing to 5 million cases of preventable blindness (Comen, 1969; Srikantia, 1975 and WHO, 1976). Ninety five per cent of blindness is due to this deficiency occuring before the child is 5 years old. Occular manifestations of vitamin A deficiency are bitot spots(3.1%), conjunctival xerosis(4.3%), and corneal xerosis (0.1%) (Berg, 1973). Anaemia is widespread among preschool children, the prevalence rate being close to 50 per cent (Gopalan, 1977).

In addition to diseases directly aggravates malnutrition, it is not known that malnutrition aggravates the clinical course of many infectious diseases(Gopalan, 1976).

F. Factors responsible for high mortality and morbidity among children:

1. Malnutrition and mortality:

In many parts of the world, malnutrition contributes considerably to high mortality during childhood(WHO, 1979). Malnutrition is the underlying cause of death in seven per cent of deaths in the age group of 0-4 years and an associated cause in 46 per cent. Timmer(1965) in his investigations on the causes of death in 1300 children who had died in hospital during four years had shown that malnutrition was responsible for 9 per cent of deaths in the second year, 40 per cent during the third year and 10 per cent in the 6 and 7 years. Fifty per cent children who died under 5 years of age revealed signs of undernutrition(Chandra and Newberne, 1977).

About 2 per cent of pre school children suffer from either kwashiorkor or marasmus-the severe form of PCM(Sarma, 1976).

2. Diseases and infant mortality:

Communicable disease is the major cause of mortality and morbidity in Indian children. Though deficiency diseases are reported to be responsible for about one per cent of infant deaths, in reality the figure is much higher since many infant deaths are associated with non-nutritional causes like elementary disorders and respiratory infection(Gopalan, 1971). A mortality of 21.4 per cent in children under five year old is mainly due to the malignant synergism of malnutrition and infection.

Puffer and Serano(1973) in their study on patterns of mortality in childhood noted that among children under four, nutritional deficiency was associated with 61 per cent of deaths and only 33 per cent of deaths from other causes.

3. Morbidity:

The main causes of morbidity are deficient diet, food practices, unhygienic atmosphere and surroundings, poverty, education, customs, traditional beliefs, insufficient utilisation of local low cost and easily available foods, wastage of foods and nutrients through unsatisfactory and improper cooking methods, father's income and per capita income, housing facilities and roofing, mother's occupation, morbidity of other siblings, prestige and status, religion, caste system and joint family system(FAO, 1962; Jelliffe, 1962; King, 1963; Simpson, 1963; Autret, 1964; Sai, 1966; Gopalan, 1967; Devadas, 1968; Mathur et al 1974; Devadas, 1974; Gopalan, 1977; Barvazian and Meher, 1978; Obert, 1978; Shah, 1978; Sreeneth et al, 1978; Nutrition Reviews, 1978; Devadas, 1979 and WHO 1979). Its prevalence is also due to parasitic infestation, illiteracy and ignorance(Sinha, 1973; Gopalan, 1975; Ramalingaswamy, 1975; Cravito et al, 1976 and Chong, 1977).

(i) Income:

Forty to fifty per cent of the population in this country live below the poverty line(Devadas, 1974; Nagarajan, 1977; and Nagarajan, 1978; Harnala, 1979 and Jacob, 1980). Illness were found to increase from higher to lower socio economic status of the families. The percentage frequency of illness revealed that 55.5 per cent of children in lowest income group were frequently ill as compared to 15 per cent in high income goup.

(ii) Mother's occupation:

In families with mothers employed, the incidence of illness in children were only 65 per cent, while it was 71.4 per cent in those with mothers as house workers.

(iii) Morbidity of the siblings:

There was an incidence of 66.7 per cent illness in families over six members, similarly the families with over four children, the sibling morbidity was 67.9 per cent in contrast to those with less than 3 children where it was 60.3 per cent(Gupta et al, 1972).

(iv) Poor hygiene:

The mean number of episodes of sickness were highest in children living under poor housing conditions. Prevalence of mortality and morbidity were high in rural areas and urban slums due to unhygienic conditions(Arya, 1979). The crowded living conditions increase the spread of the diseases and

malnutrition makes young children very vulnerable to them (Duggal et al, 1977). WHO(1979) reports that the risk of diarrhoea is greatest during childhood for families living in an unsanitary environment and poor personal hygiene.

V. Age:

Morbidity is low in the first month of life. It rises in the latter part of the first year, shows a fall in the 1-2 year age group and a rise in the next two groups(Varma, 1968).

ICMR(1978) stated that 41 per 1000 live birth died during the first 7 days of life. Seventeen between the 8th and 30th day and 44 between the 1st and 12th month of life between 1st and 2nd year of life, 17 per 1000 died and between 2nd and 3rd 5 per 1000 died. As compared with 3rd years mortality, the death rate was about 20 times higher in the first and about 3 times higher in the second year of life.

Illness were found more, over three years ranging from 78.7 - 78.9 per cent while, they were 62.5 per cent below the age of 12 years. Although majority of the children belonged to age group 0.12 months in case of dirrhoea and dysentery there was a gradual decline in the percentage of the childeren as the age advanced (Sharma et al, 1979).

(vi) Sex:

According to Bazaz, et al, 1979 human male is believed to be more susceptible to infections than the human female and the difference is considered to be more marked during infancy to childhood.

A study conducted by Ghosh(1978) revealed that still births and early neonatal deaths were higher in males (41.6%) compared to females (35.3%). The neonatal mortality rate too was higher in males. In post neonatal period there was a higher death rate in females (27.06) compared to males (21.6%) and the infant mortality was almost the same in both sexes.

(vii) Mother's age:

Extremes of maternal age less than 20 and more than 40 resulted in abnormalities and higher mortality rates of infants.

(viii) Feeding practices:

Infants deprived of breast milk were given various substances, food mixtures and milk powders which are associated with high infant mortality because of ignorance of the mothers of the proper degree of dilution and pollution which may lead to digestive troubles (Aykroyd, 1971 and Pai, 1974).

(ix) Immunizations

In developing countries, because immunization had not been generally available, the childhood diseases have continued to be an important public health problem and they still contribute to high infant mortality (WHO, 1979).

G. Preventive measures taken in India against high mortality and morbidity:

To combat all the possible problems regarding nutrition and health aspects of children different preventive measures are taken by various agencies and several action programmes came into existence. Some of them are as follows:

Various voluntary and international agencies like FAO, WHO, UNICEF and CARE have been attempting through successive five year plans to continuously augment the provision of basic health services to women and children as part of general health services. Presently a wide net work of primary health centres and maternal and child health centres with their subcentres form the ministry of delivery of basic health services to woman in our country. The primary health centres render its help to the community through personal hygiene, maternal and child care, family planning, immunization against major infectious diseases and periodical check up of the pregnant women(Parihadrao, 1975). Diseases like small pox, diphtheria, tetanus and poliomyelitis are dangerous and therefore care should be taken to protect children against these disorders.

One of the measures of preventing malnutrition is feeding programmes. Feeding the children of different ages adequately will reduce the morbidity and mortality rates. Naidu et al (1979) opine that supplementary feeding had beneficial impacts on growth of undernourished children.

Many feeding programmes have been launched and are in operation under the auspices of the Central and State Governments and voluntary agencies both national and international. They are:

1. Special and modified special nutrition programme
2. Applied nutrition programme
3. Composite nutrition programme
4. Family and child welfare programme
5. Feeding through balwadies
6. School lunch programme
7. Integrated child development service
8. Integrated child welfare programme
9. Integrated nutrition programme
10. Kuzhandaikal kappagam
11. Mother and child welfare programmes undertaken by Catholic Relief Services

The prophylaxis against nutritional anaemia is launched in 1970 to prevent nutritional anaemia among preschool children, expectant and nursing mothers. A tablet containing 60mg of iron, and 0.5mg of folic acid is given per day for 100 days in a year.

The prophylaxis against blindness is launched in 1970 to prevent vitamin A deficiency in children(WHO, 1976) and the beneficiaries are given a solution of 2ml/child, once in 6 months.

Improving the environmental sanitation is one of the most important factor in preventing morbidity and schemes for ensuring safe drinking water to the people should be given high priority. Greater use should be made of drilling rigs for the installation of hand-pump tube-wells and for starting piped water supply schemes. Steps should also be simultaneously taken to control the fly nuisance.

Nutrition education is a tool for living, needed by all people and is the foundation on which any programme for nutritional improvement can be built(Devadas et al, 1970 and Robinson et al, 1976). Mothers have to be educated on why good nutrition is essential for infants, preschoolers, school children, adolescents and physiological stresses like pregnancy and lactation.

According to WHO (1979) health education is an essential element in the control and prevention of diseases. It must be directed to the population in order to raise the standards of hygiene and to obtain community participation.

III EXPERIMENTAL PROCEDURE

The procedure pertaining to this study on the morbidity pattern of the 0-6 year old children is discussed under the following headings:

A. Selection of the centres

B. Selection of the subjects

C. Formulation of the schedule

D. Selection of the method

and E. Collection of data

1. Socioeconomic and dietary survey

2. Immunization

3. Anthropometric measurements

4. Clinical examination and morbidity pattern

and 5. Biochemical analysis of selected components of blood.

A. Selection of the medical centres:

The Coimbatore Medical College Hospital and Kumaran Nursing Home in Coimbatore city were selected for conducting the study as the authorities were ready to render their full co-operation throughout the study.

B. Selection of the subjects:

Five hundred infants and preschool children of 0-6 years were selected at random for the study since the morbidity and

mortality rates are very common in the age group of 0-6 years (Devadas, 1977; Sheshadri, 1979 and Chandrasekhara, 1979).

C. Formulation of the schedule:

A schedule, as shown in Appendix I, was formulated to elicit information on socioeconomic background, breast feeding, food habits, meal pattern, health status and environmental sanitation. Information regarding immunization measures taken for the children also formed a part of the schedule. Provisions were made to enter the anthropometric measurements, the clinical symptoms and morbidity data of the selected children.

D. Selection of methods

The interview cum schedule method was used to elicit the information on socioeconomic pattern, dietary pattern and environmental sanitation. Interview as stated by the Food and Agricultural Organisation(1970) is more accurate than the other methods as the interviewer comes in direct contact with the interviewee. Rangasamy(1976) opines that this method can be successfully employed to collect wide range of information. It is a good source of hypotheses as well as a good means of testing hypotheses.

E. Collection of data:

Both the Coimbatore Medical College hospital and Kumaran Nursing home had out-patient and in-patient departments. The out patient department of the Coimbatore Medical College

Hospital was working from 7.30 to 10.00 A.M. and that of Kumaran Nursing Home from 9 A.M. to 12.00P.M. and 4 P.M. to 8 P.M. The investigator visited the outpatient as well as the in-patient departments regularly to collect information on different aspects with the help of the schedule.

1. Socioeconomic and dietary surveys

The socioeconomic status was assessed with the help of the schedule which included the age and sex of the family members, type of family, educational level, occupation, and income per month. The parent, especially the mother who accompanied the child was interviewed to collect the data. The age of the child was noted as given by the mother and confirmed, to be as accurate as possible, by asking the parents to associate the births of the child with either a particular season or relating it to some important local festival or function. The dietary survey consisted series of questions to know about the daily meal pattern of the child, breast feeding and its duration, age of weaning, formula feeding, supplementary foods given to the child and cleaning the bottles etc.

2. Immunizations

The information on the immunization of the children included in the current study was collected by noting the scars of small-pox and BCG as far as possible and also by asking the history of immunization against DPT and polio.

3. Anthropometric measurements

The anthropometric measurements namely height, weight, mid arm circumference, head circumference and chest circumference were taken for all the five hundred children. The height of the infants and young children was measured nearest to 0.1 centimeter using the infantometer and tape. The height of children aged two to five years was measured nearest to 0.1 centimeter using a tape.

The mid arm circumference, chest and head circumference were taken with the help of a tape nearest to 0.1 centimeter. The weight of the children was taken using weighing balance nearest to 0.5kilogram. The anthropometric measurements were taken since nutritional anthropometry may be a useful tool in the assessment of the magnitude of malnutrition (Gupta et al. 1973).

4. Clinical examination and morbidity patterns

The children were subjected to a thorough clinical examination in good light. Clinical examination was carried out with the help of a well trained medical practitioner, using the clinical schedule formulated by Indian Council of Medical Research(ICMR) to determine the nutritional deficiency diseases. The children were also examined by the doctor to know the presence of other infectious diseases and other disorders.

5. Biochemical analysis of selected components of blood:

A random sample of 100 blood samples were collected to know the red blood corpuscles (RBC) count and the level of haemoglobin, since the haemoglobin level form satisfactory nutritional index for survey purpose (Gupta et al, 1972). RBC count was carried out by preparing the blood smear. Haemoglobin was estimated by sahli's method using haemometer. Serum protein, albumin and globulin were estimated colorimetrically for 20 samples selected randomly, using tyrosine method. The produce followed is given in Appendix II.

IV RESULTS AND DISCUSSION

The results pertaining to the study on "Morbidity pattern of selected group of children(0-6years) of Coimbatore" are discussed under the following headings:

A. Family background of the selected children

B. Distribution of children of the present study, according to age and sex

C. Feeding and dietary practices followed for the children

D. Health practices of the children and their families

E. Anthropometric measurements of the children

F. Morbidity pattern of the children under study

and G. Biochemical analysis of the selected components of blood.

A. Family background of the selected children

1. Type of family:

Out of 500 families studied, 498 families were nuclear and only two families were on joint family system.

2. Size of the family:

Fifty two per cent of the families had three to four people in their families whereas 35 per cent of families had 5-6 members. It was discouraging to note that 12 per cent of the families had more than seven members. Only one per cent of the families had less than two members.

3. Distribution of the family members according to age and sex

The age and sex distribution of the family members are presented in Table I.

TABLE I

DISTRIBUTION OF FAMILY MEMBERS ACCORDING TO AGE AND SEX

Sex	Age in years					
	0-6	7-12	13-18	19-45	46 and above	Total
Male	353 (16)	181 (8)	51 (2)	454 (20)	56 (3)	1045 (47)
Female	450 (20)	169 (8)	53 (2)	495 (22)	7 (41)	1174 (53)
Total	803 (35)	350 (15)	104 (5)	949 (42)	63 (3)	2219 (100)

The numbers in parenthesis indicate percentage

It was found that 35 per cent of children were belonging to the age group of 0-6 years and 15 per cent of children were belonging to the age group of 7-12 years. Fourty two per cent of adults were belonging to the age group of 19-45 years.

4. Educational status of the family members:

The educational status of the family members of the selected children is depicted in Table II.

TABLE II

EDUCATIONAL STATUS OF THE FAMILY MEMBERS

Educational level	Male		Female	
	No	Percentage	No	Percentage
Primary school	336	23	291	20
Middle school	81	5	69	5
High school	138	9	98	7
College	17	1	13	41
Professional	83	<1	1	<1
Illiterate	177	12	266	18
Total	752	50	738	50

It is evident from the table that 23 per cent of males and 20 per cent of female members of the families of the selected children had education only upto primary level. In contrast to this, only one per cent of the people had college and professional education. It is disheartening to note that 30 per cent of the members had not even been to the schools.

5. Occupation of the family members:

Table III presents the occupational status of the family members.

TABLE III

OCCUPATION OF THE FAMILY MEMBERS

Sex	skilled		unskilled	
	No	Percentage	No	Percentage
Male	139	24	381	64
Female	3	<1	68	12
Total	142	24	449	76

It is clear from the table that majority(76 per cent) of the family members were engaged in unskilled work namely cooli, business, agriculture, peon, police, conductor and the like whereas, only 24 per cent of the family members were doing skilled work such as weaving, carpentary, tailoring, barbering, driving, workshop manual and the like. Among the unskilled workers, 45 per cent of males and 10 per cent of females were working as coolies and their income was not permanent.

6. Income level of the families:

Monthly income of the family members of the selected children is presented in Table IV.

TABLE IV

MONTHLY INCOME OF THE FAMILIES

	Monthly income in rupees			
	100-200	201-300	301-400	401-500
Number	90	236	102	72
Percentage	18	47	20	15

It was found that majority of the families were belonging to an income of 200-300 rupees per month (47 per cent) and only 15 per cent of families had an income above 400 rupees per month.

B. Distribution of the children according to age and sex:

Table V shows the distribution of children according to age and sex.

TABLE V

DISTRIBUTION OF CHILDREN ACCORDING TO AGE AND SEX

Age in years	Male		Female	
	No	Percentage	No	Percentage
0 - 1	82	16	54	11
1 - 2	66	13	51	10
2 - 3	36	7	34	7
3 - 4	40	8	28	6
4 - 5	29	6	15	3
5 - 6	38	8	27	5
Total	291	58	209	42

It was found that 27 per cent of children belonged to the age group of 0-1 year. Among this, the percentage of male (16 per cent) was found to be higher than the females. In all the age groups, except 2-3 year group, boys were more affected than the females. This shows that human males were more susceptible than the human females and the difference is considered to be more marked during infancy and in the age of 1-2 years. It was suggested that the difference in the susceptibility to infection may be due to difference in the immunoglobulin levels (Nezaz et al, 1979).

C. Feeding and dietary practices followed for the children:

1. Breast feeding:

Out of the 500 sample studied, 99 per cent were breast fed in the infant age. Thirteen and 23 per cent of the children were breast fed upto six months and one year respectively. Breast feeding was continued upto 1½ years for 32 per cent of the children. Nineteen per cent of the children had breast milk upto three years. For two per cent of the sample, breast feeding was continued beyond three years. The long duration of breast feeding by majority of the mothers might be attributed to the fact of their low socioeconomic status. These results are in accordance with the results reported by Mahadevi et al (1972), Sharma et al (1972) and Manik (1975).

2. Formula feedings

Cow's milk and buffaloe's milk were the predominent substitutes used by 83 per cent of the families. Only 17 per cent were using other infant formula namely Amul, Glaxo and Farex. But it was discouraging to note that the quantity and quality of milk used for the children was not adequate to their growing demands. Milk was diluted to 50 per cent and fed to the children for long duration with same dilution by 73 per cent of the families without any supplements. This practice was followed by the mother due to poverty and ignorance. Only six per cent of the families gave unaliuted milk to the children as they grow.

The other reasons mentioned by the mothers for diluting milk were difficult to digest, due to thick consistency and fear of gastro intestinal upset. No weaning food was especially prepared for the children by majority of the mothers. The diet, which was poor in quality and inadequate in quantity, prepared for the adults was given to the children. The failure of mothers to breast feed their children adequately, failure to introduce adequate supplements after six months of age and failure to observe the minimum standards of cleanliness in the preparation and storage of milk were resulted in the high incidence of gastro-intestinal infections in the selected children. These results are in tune with the results reported by Ghosh(1977).

3. Supplementary foods:

Supplementary foods were included at the age of 6-12 months by 28 families. It is discouraging to note that 56 per cent of the families started supplementing the diet only after the age of one year. Only three per cent of the families started the supplementation below five months, and two per cent after two years. It is striking to note that 11 per cent of the families did not supplement the diet of the children. The children were switched over to adult diet directly.

The supplements given to the children by majority of the families (76 per cent) were mostly cereal preparations like rice, appam, iddli, biscuit, bun, varkki and poori, bonda, bajji, vadai, candies, murukku and little vegetables were the other supplements mentioned by the rest of the families.

4. A day's meal pattern of the child:

The sample menu followed for the children is presented in Table VI.

TABLE VI

MEAL PATTERN OF THE CHILDREN

Name of the meal	Items prepared
Early morning	Diluted milk/coffee/tea
Breakfast	Appam/iddli/rice
Lunch	Rasam, rice/rice with buttermilk
Tea	Bun/biscuit/Bil
Dinner	Rice with butter milk/rasam

The meal pattern of the children under study was predominantly cereal based. Protective foods such as milk and its products, pulses, vegetables and fruits received very little attention.

D. Health practices of the children:

1. Immunization followed for the children:

Table VII presents the immunization schedule followed for the children.

TABLE VII

IMMUNIZATION MEASURES FOLLOWED

Type of immunization	Children immunized	
	Number	Percentage
Small pox	282	56
DPT	201	40
BCG	135	27
Polio	53	11
Polio, DPT, BCG, and small pox	30	6
Not immunized	129	26

Out of the 500 sample, only six per cent of the children had all measures of immunization. It is saddening to note that 26 per cent did not take any immunization measures, inspite of

the availability of vaccines in all government hospitals and primary and maternity centres at free of cost. The nation wide small pox eradication programme could have resulted in immunising 5o per cent of the children. The combined vaccine (DPT) was administered to children whenever they were registered in the hospital, but the routine doses following the first dose were not given to the children due to negligence on the part of the parents to immunize them at the correct time.

(ii) Health status of mothers during pregnancy

It was found that only 6 to 7 mothers were in good health throughout the 1st, 2nd and 3rd trimesters of their pregnancy period.

It was found that 155 women had suffered from some complications or diseases during their course of pregnancy. Out of this, the major leading one was anaemia and vomiting (52 per cent) followed by muscular pain (21 per cent). Oedema was present in 14 per cent of the mothers.

(iii) Diseases of other siblings in the family

The non-nutritional diseases of other siblings in the family is presented in Table VIII.

TABLE VIII

NON-NUTRITIONAL DISEASES OF OTHER SIBLINGS IN THE FAMILY

Disease	Number
Acute gastro-enteritis	10
Respiratory infection	5
Tonsilitis	2
Jaundice	1
Appendicitis	1
Chicken pox	1
Enteric fever	6
Polio	1
Surgery	1
Tuberculosis	1
Others	16
Total	45

It was found that forty five children had infectious diseases in the selected families. Among all the diseases, acute gastro enteristis ranked first followed by entric fever (Six children) and respiratory infection.

(vii) Birth order of the child

The birth order of the selected children is presented in Table IX.

TABLE IX

BIRTH ORDER OF THE CHILDREN

Birth order	1	2	3	4	5	6	7	8
Number	125	149	110	55	37	18	3	3
Percentage	25	29	22	11	7	4	1	1

It was found that the incidence of diseases were common in the birth order of second first, and third accordingly. It was also found that there was no relation between the birth order of children and the incidence of diseases.

(viii) Personal hygiene

Majority of the children(75 per cent) took bath on alternate days and only 17 per cent took bath every day. In all the 500 families, the children's garments were washed along with the garments of other family members and it was found that none of the disinfectants were used while washing the children's garments. The garments were dried in the sunlight. Majority of the children(440) were given ordinary cold water for drinking. Only 60 mothers expressed that boiled water is good for health.

(iv) Environmental sanitation:

It is painful to note that 78 per cent of the families did not have any toilet facilities. Even where the toilet facilities are available, the children used to go for toilet purposes only in the open yard. It was found that only in 13 per cent of the families, the drainage, dust bin and toilet facilities were available. It was observed that the environmental sanitation was very poor in all the families.

5. Anthropometric measurements of the children:

Table X and XI present the anthropometric measurements of the children. Height and weight of the 500 children selected for the study are presented in Table X.

TABLE X

HEIGHT AND WEIGHT OF THE SELECTED CHILDREN IN COMPARISON WITH THE STANDARD

Age	Sex	Height(cms)	Weight(kg)
0 - 6 Months	M	58.8±7.72 (58.5)	5.13±1.32 (5.4)
	F	57.67±5.2 (57.5)	4.77±1.14 (5.1)
6 - 12 Months	M	68.22±5.5 (72.0)	6.54±1.46 (9.1)
	F	65.91±5.84 (70.3)	6.95±1.53 (8.3)
1 - 2 Years	M	73.48±5.85 (82.8)	7.97±2.06 (9.9)
	F	72.11±6.78 (81.8)	7.56±2.38 (9.90)
2 - 3 Years	M	77.36±7.68 (88.9)	9.19±2.47 (11.6)
	F	74.71±6.98 (82.8)	9.29±2.08 (12.1)
3 - 4 Years	M	82±8.7 (93.0)	10.53±1.9 (13.1)
	F	80.54±8.49 (82.5)	9.29±1.93 (12.2)
4 - 5 Years	M	91.64±8.2 (103.3)	12.36±2.45 (15.4)
	F	87.83±9.56 (105.2)	10.57±1.77 (14.1)
5 - 6 Years	M	96.98.11.22 (105.8)	13.53±2.75 (16.5)
	F	98.24±4.85 (108.2)	14.2±1.84 (15.6)

The numbers in parenthesis indicate standards given by ICMR(1971) and Ghosh(1977).

Regarding the height, all the children except the children of 0-6 months were shorter than their counterparts of the nation. This may be attributed to the fact that most of the children were belonging to the low income families and had an inadequate and improper diet. This fact is also evident from the weight of the children. The weight of the children of all the age groups when compared to the national standard was lighter. This aspect may be due to the ill health and inadequacy of the diet both in quantity and quality. Figure 1 and 2 show the heights and weights of boys and girls.

Table XI presents the head, arm and chest circumference of the children.

FIGURE-I

HEIGHTS AND WEIGHTS OF GIRLS

FIGURE-1

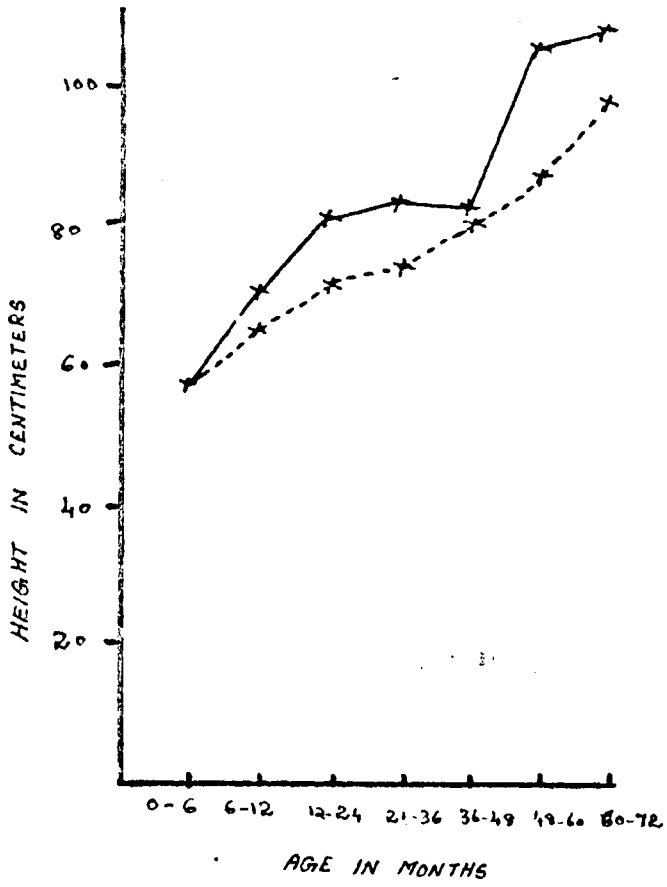
HEIGHT - GIRLS

Scale . 1cm = 10 cm

KEY:

X——X STANDARD

X----X PRESENT STUDY



WEIGHT- GIRLS

Scale: 1 cm = 2 kg

KEY:

X——X STANDARD

X----X PRESENT STUDY

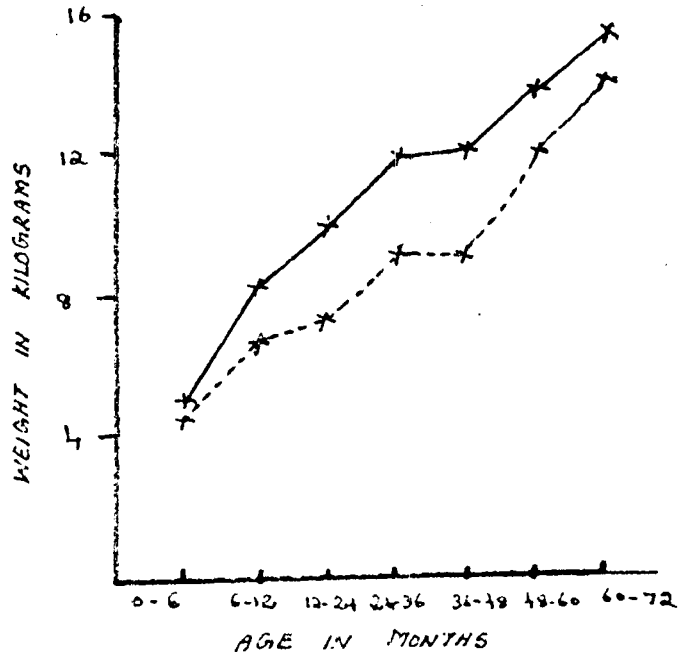


FIGURE. 2

HEIGHTS AND WEIGHTS OF Boys

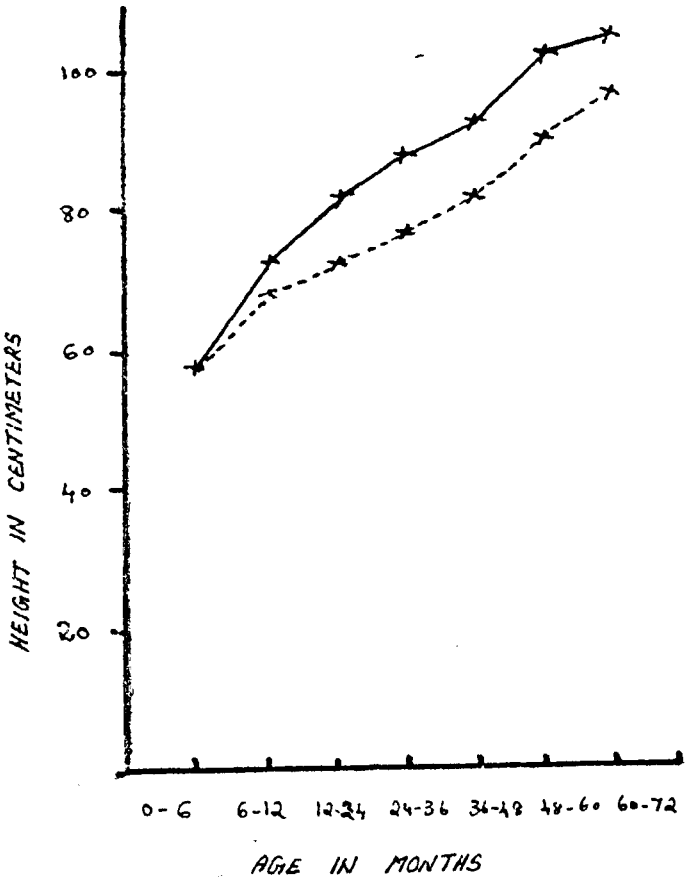


FIGURE - 2

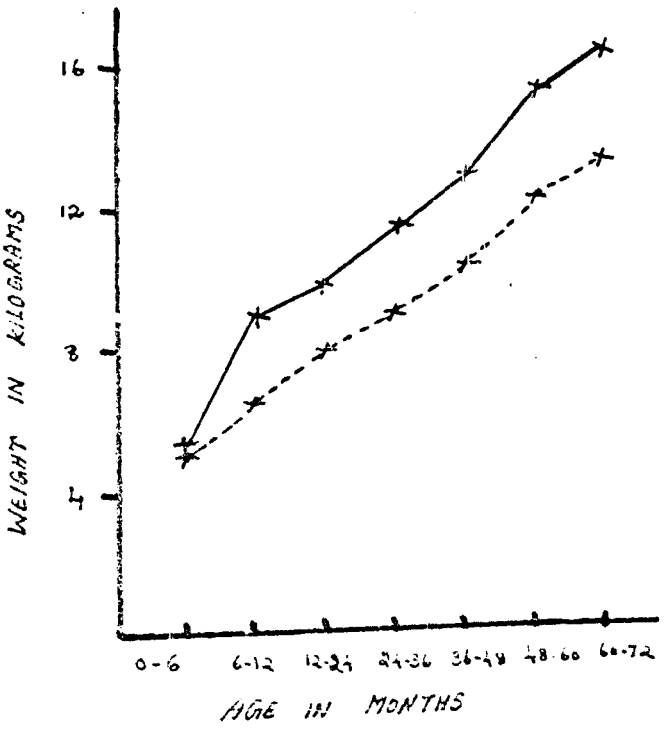
HEIGHT - Boys

Scale : 1cm = 10 cm

KEY :

x——x STANDARD

x----x PRESENT STUDY



WEIGHT - Boys

Scale : 1cm = 2 kg

KEY :

x——x STANDARD

x----x PRESENT STUDY.

TABLE XI

HEAD, CHEST AND MID ARM CIRCUMFERENCE OF THE CHILDREN

Age	Sex	Circumference of		
		Mid arm (cms)	Head (cms)	Chest (cms)
0 - 6 Months	M	11.40±2.3	39.88±2.65 (38.5)	41.91±3.68
	F	10.68±1.99	38.29±1.55 (38.2)	41.28±1.97
6 - 12 Months	M	12.49±1.69	41.76±2.26 (44.5)	45.12±2.11
	F	12.81±1.2	42.0±2.65 (43.7)	44.88±2.55
1 - 2 Years	M	13.11±1.49 (15.1)	44.31±3.17 (45.2)	45.27±3.59 (45.8)
	F	12.81±1.66 (14.5)	43.65±3.83 (45.2)	44.74±2.71 (45.2)
2 - 3 Years	M	13.11±1.71 (15.3)	43.61±1.98 (47.3)	47.61±3.49 (48.0)
	F	12.74±1.29 (14.8)	44.65±2.73 (46.2)	46.82±3.33 (47.2)
3 - 4 Years	M	13.49±1.32 (15.5)	46.1±2.1 (48.0)	49.25±3.07 (49.4)
	F	12.8±1.89 (15.0)	45.5±2.95 (47.1)	47.78±3.9 (48.7)
4 - 5 Years	M	13.94±1.58 (15.7)	47.03±2.38 (48.5)	50.86±3.4 (50.8)
	F	13.18±1.99 (15.4)	46.27±2.7 (47.8)	49.93±.3.17 (50.1)
5 - 6 Years	M	14.09±1.30 (16.2)	47.47±2.58 (49.0)	51.95.2.54 (52.5)
	F	14.45±1.46 (15.7)	48.15±2.4 (48.3)	52.0±0.72 (51.3)

The numbers in parenthesis indicate standards given by ICMR(1971) and Ghosh(1977).

As in the case of height and weight, the arm circumference of the children of all age groups was lower than the standard measurements. Similarly, the head and chest circumference of the children were lower than the standard. The individual height, weight, head, chest and arm circumference are given in Appendix III A, B, C, D, E, F and G.

F. Morbidity pattern of the selected children registered in the hospital

The morbidity pattern of the selected children is depicted in Tables XII and XIII.

Table XII presents the prevalence of non nutritional diseases among the selected children.

TABLE XII

NON NUTRITIONAL DISEASES AMONG THE SELECTED CHILDREN

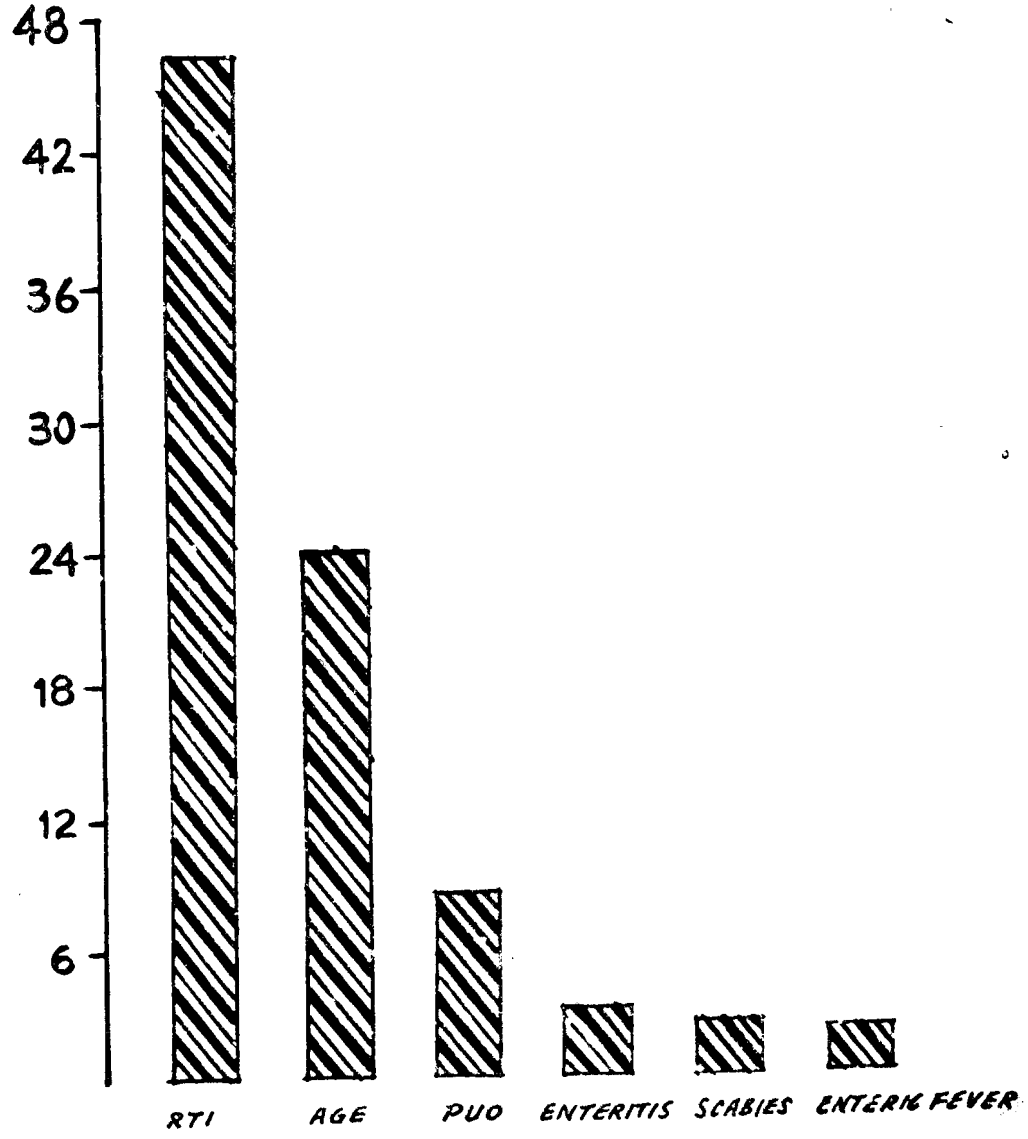
Diseases	Age in years						Total	
	0–1	1–2	2–3	3–4	4–5	5–6	No.	Per cent
Respiratory tract infection	66	42	35	32	19	36	230	46.0
Acute gastro enteritis	47	44	11	9	4	3	118	23.6
Pyrexia of unknown origin(PUO)	8	12	6	8	5	5	44	8.8
Enteritis	10	1	3	-	-	-	14	2.8
Scabies	2	4	3	3	1	-	13	2.6
Polio	1	7	1	2	1	1	13	2.6
Enteric fever	-	-	-	1	1	9	11	2.2
Nephritis	-	-	1	1	2	4	8	1.6
Viral hepatitis	1	-	-	3	-	3	7	1.4
Primary complex	-	3	1	-	1	1	6	1.2
Congestive cardiac failure	2	2	-	1	-	-	5	1.0
Hepatospleenomegaly	2	-	-	1	-	1	4	<1
Ascariasis	-	1	1	-	1	-	3	<1
Gastritis	-	1	-	1	-	1	333	<1
Otitismedia	-	-	-	1	1	-	2	<1
Common cold with fever	-	3	1	-	-	-	4	<1
Dysentery	-	1	-	1	-	-	2	<1
Ulcerative colitis	-	-	1	-	1	-	2	<1

Respiratory tract infections(46 per cent) followed by acute gastro intestinal enteritis (24 per cent) ranked high in the morbidity pattern. These results are in t line with the results reported by Sharma et al (1972) who stated that 49 per cent respiratory infections and 18.3 per cent diarrhoea and dysentery were present in his morbidity survey. Pyrexia of unknown origin was also present in nine per cent of the children. Diseases such as enteritis, skin infection, polio were also present, ranging from 2.2 to 2.8 per cent. The incidence of nephritis was also noted. It is lightly encouraging to note that the diseases namely viral hepatitis, primary complex, congestive cardiac failure, hepato splenomegaly, ascariasis and gastritis were fewer in number. It is evident that the prevalance of respiratory infections was distributed throughout the childhood(0-6 years) indicating the vulnerability of the age group. The incidence of respiratory infections was slightly high in children belonging to 0-1 year age group. Figure 3 shows the percentage prevalence of non-nutritional diseases in children.

Acute gastro enteritis(AGE) and diarrhoeal diseases were more prevalent among the children of six months to two years old. This indicates that this period of complete weaning from breast milk and switching over to improper and

FIGURE-3.

PERCENTAGE PREVALENCE OF NON-NUTRITIONAL DISEASES.



inadequate diet supplements and inadequate food to meet the demands of rapid growth is one of the most dangerous periods in life of the Indian child (McCance, 1971).

Table XIII presents the deficiency symptoms observed among the selected children.

TABLE XIII

DEFICIENCY SYMPTOMS OBSERVED AMONG THE SELECTED 500 CHILDREN

Deficiency symptoms	Age in years						
	0-1	1-2	2-3	3-4	4-5	5-6	Total
Gross anaemia	10	19	25	20	15	10	99
Facial oedema	--	4	9	5	4	5	27
Muscle wasting	2	5	6	6	2	1	22
Oedema in legs	-	2	5	5	4	5	21
Dry skin	2	2	3	3	3	2	15
Hair changes	-	1	5	6	1	-	13
Moon face	-	2	3	4	2	1	12
Keratomalacia	-	3	4	1	3	-	11
Pot belly	-	1	-	1	1	2	5
Angular stomatitis	-	1	1	2	1	-	5
Bitot's spots	-	-	2	1	-	-	3
Costechondral enlargement	-	1	-	1	-	1	3
Follicular keratosis	-	-	-	1	-	1	2
Phrynoderma	-	-	-	1	-	-	1
Xerosis conjunctiva	-	-	-	-	-	1	1
Bleeding gums	-	-	-	-	+	-	+

Figure 4 shows the percentage prevalence of deficiency symptoms in children.

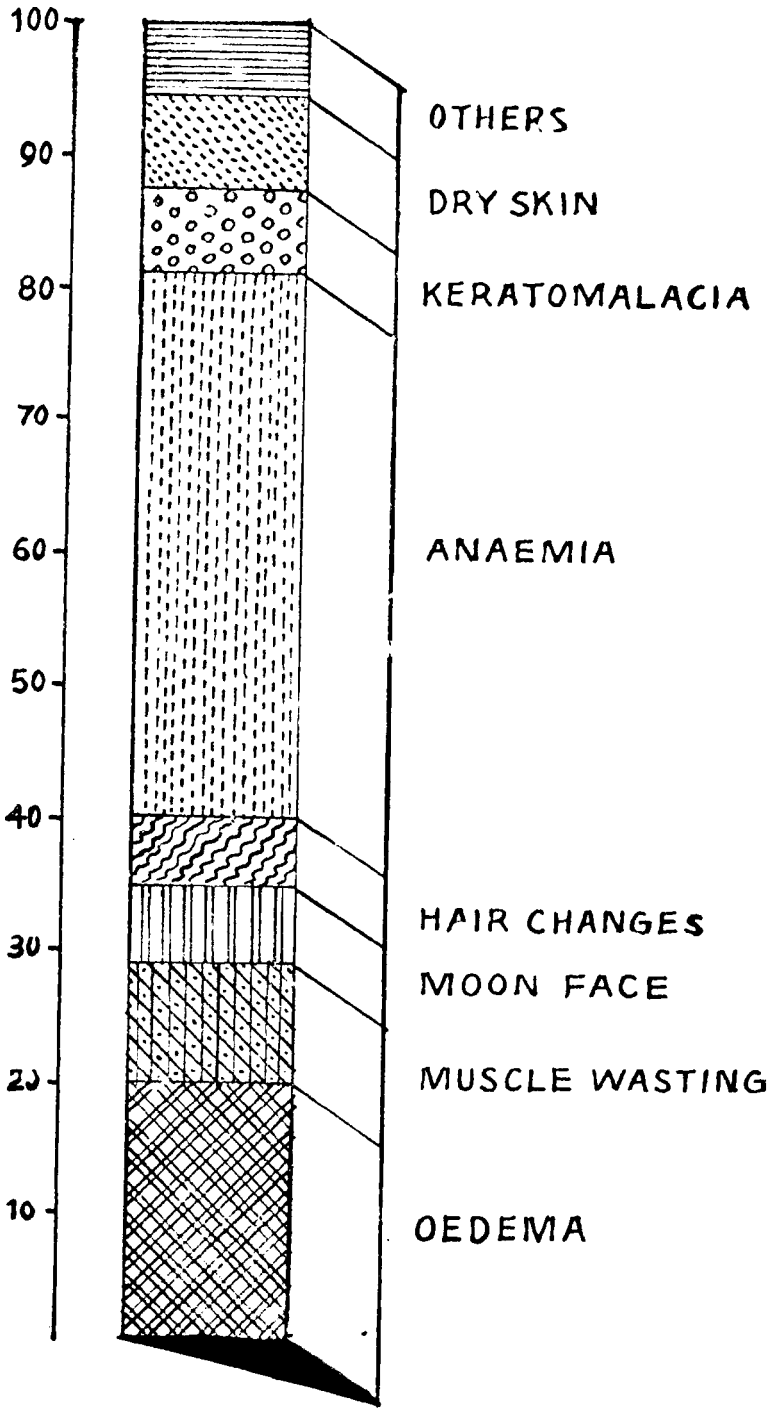
According to this study 76 children (15 per cent) had signs and symptoms of protein deficiency and 37 children (7.4 per cent) had symptoms of calorie deficiency. Among these children, 4 per cent of children (20) were suffering from typical marasmus and 3.6 per cent (18) had kwashiorkor.

The incidence of PCM is low in the present study when compared to the studies by Gupta et al (1972) who reported PCM in 13.9 per cent and 23 per cent in urban and rural children respectively but is higher than that reported by Ghai et al (1970) from Haryana (kwashiorkor 0.9% and marasmus 1.7%) and Rao et al (1969) from Hyderabad (0.6% kwashiorkor and 1% marasmus). In the present study muscle wasting was the most frequent sign of PCM (4.4 per cent). This result coincides with the result reported by Gupta et al (1972).

According to Gupta and Bhandari(1973) the common age group in which marasmus encountered was 12 to 36 months(1-3 years) and kwashiorkor in the age group of 18-30 months(1½-2½years). In the present study also, the occurence of the above disease was seen in the respective age groups. The fall in the incidence after three years indicate a greater need of calories and protein in the early ages of child's life.

FIGURE-4.

PERCENTAGE PREVALENCE OF DEFICIENCY SYMPTOMS AMONG CHILDREN.



Keratomalacia and Bitot's spots were present in 2.2 per cent and 0.6 per cent of children respectively. Conjunctival xerosis was seen only in one case. These figures are lower as compared to these from Hyderabad(Rao et al, 1969) in which the incidence of keratomalacia and Bitot's spots was found in 7.9 per cent and 4.8 per cent respectively.

This variation in incidence is explainable on the basis of dietary habits and availability of foods.

The incidence of iron deficiency was 19.8 per cent. This value is low when compared to the values (54.2 per cent) reported by Bhansali et al (1979). Pot belly and costochondral enlargement were found to be present in 1.6 per cent of the children. Figures 5, 6 and 7 present the children affected by various diseases.

(i) Morbidity and educational

Table XIII and Appendix IV show the correlation between education and morbidity.

FIGURE V

MARASMIC CHILD

FIGURE VI

A CHILD WITH MARASMIC KWASHIORKOR

FIGURE VII

A CHILD SUFFERING FROM ACUTE NEPHRITIS WITH AVITAMINOSIS

TABLE XIII

MORBIDITY AND EDUCATION

Educational level	Non-nutritional diseases	Deficiency diseases	Deficiency diseases + non-nutritional diseases	'r' value
Illiterate	126	14	114	
Primary school	40	4	53	-0.03
Middle school	30	2	33	
High school	50	7	14	
College	13	-	--	
Total	259	27	214	

An attempt was made to see whether there is any correlation between education of the mother, who is the pivot of the family and the morbidity pattern. The diseases were classified into three categories namely non-nutritional, nutritional and nutritional and non-nutritional diseases. The result indicated that a there is a negative correlation between the education of the mother and the morbidity of the children and that it could be concluded that as the educational level increases the incidence of morbitity decreases.

(ii) Morbidity and income

Table XV and Appendix V present the morbidity and income correlation.

TABLE XV

MORBIDITY AND INCOME

Monthly income in rupees	Non-nutritional deficiency diseases	Deficiency diseases	Deficiency diseases and non-nutritional diseases	'r' value
100-300	130	21	175	-0.3
300-500	129	6	39	
Total	259	27	214	

The correlation between the morbidity and income revealed that there is a negative correlation between the income and morbidity pattern. As the income increased the incidence of morbidity decreased accordingly.

8. Biochemical analysis of the selected components of blood:

Table XVI shows the percentage haemoglobin and RBC count of hundred samples. The individual values are given in Appendix VI.

TABLE XVI

PERCENTAGE HAEMOGLOBIN AND RBC COUNT OF SELECTED 100 CHILDREN

Hb percentage	R.T.I	Nep	V.H	M	PCM	Men	Epi	PUO	Ent.	As	Cirr.	Feb.	Ence	P.C.	Mea.	CCF	A.hep
40 - 50	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
50 - 60	10	4	4	3	10	3	-	-	3	1	-	2	-	1	-	-	-
60 - 70	23	3	-	1	4	2	3	5	5	-	2	3	2	-	2	1	-
70 - 80	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
RBC Million per cc																	
2 - 3	11	5	4	3	10	3	-	-	3	1	-	2	-	1	-	-	1
3 - 4	23	3	-	1	4	2	3	5	5	-	2	3	2	-	2	1	-

Foot Notes:

R.T.I - Respiratory tract infection
Nep. - Nephritis
V.H - Viral hepatitis
M - Marasmus
PCM - Protein calorie malnutrition
Men - Meningitis
Epi - Epilepsy
PUO - Pyrexia of unknown origin
Ent. Enteric fever
As - Ascariasis
Cirr- Cirrhosis
Feb. - Febrihfits
Ence - Encephalitis
P.C. - Primary complex
Mea - Measles
CCF - coggestive cardiac failure
A.hep - Anaemic with hepatosplenomegaly.

It was found that in diseases like marasmus, PCM, viral hepatitis, nephritis and ascariasis, the haemoglobin and RBC values were decreased. According to Coward (1972) the fall in this levels might be due to lack of aminoacids required for the synthesis of erythropoietin. The decrease in haemoglobin production might also be due to decreased interferon production by lymphocytes (Grey et al, 1976).

The other reasons for the decrease in haemoglobin and RBC were as follows: In PCM it might be due to malabsorption, decreased metabolism, depression of bone marrow and decrease in the production of thyroid gland.

In viral hepatitis and cirrhosis, it might be due to impaired metabolism of proteins and aminoacids. In ascariasis, the presence of parasites might be a contributing factor. In enteric fever it might be due to improper absorption of nutrients and reduction in the intake of food.

Table XVII shows the serum protein levels of twenty samples. The individual values are presented in Appendix VIII.

TABLE XVII

SERUM PROTEIN LEVELS

Gm/100 ml.	PCM	Cirrhosis	Meningitis	Enteric fever	Primary complex	Nephritis	LRI with Avitaminosis	T.B.Meningitis
3 - 4	4	-	-	-	-	1	1	1
4 - 5	-	1	-	-	2	-	-	-
5 - 6	-	-	1	4	1	-	-	-
6 & above	-	1	2	1	-	-	-	-

It was found that the serum proteins markedly decreased in protein calorie malnutrition, nephritis and T.B. Meningitis and the levels were found to be between 3-4 gms/100ml. These data are in line with the study conducted by Coward et al(1972). The reduction in serum proteins in nephritis might be due to haematuria. In T.B. meaningitis, the central nervous system might have been effected and the child did not cry often for food, (inability to express itself for hunger) and might also be due to vomiting and inability to take foods.

V SUMMARY AND CONCLUSION

A study on the "Morbidity pattern of the selected group of children (0-6 years) of Coimbatore" was carried out to know the prevalence, severity, causes and remedial measures available for the children concerned. Five hundred children, belonging to the low socioeconomic group, who attended the Government hospital and the Kumaran clinic for some complaints were selected at random for the study. The socio economic background, health status and dietary pattern were assessed through an interview schedule for all the 500 children. Clinical examination and anthropometric measurements were carried out for all the children. Haemoglobin and red blood cell count were carried out for a sub sample of 100 children selected at random. Serum protein levels were analysed for a group of 20 children selected randomly.

The study revealed the following:

1. The economic status of the families was poor. The monthly income of the selected families ranged from 100 to 500 rupees.

2. The total number of members in the 500 families were 2219 constituting the size of the family as four. All the families except two were nuclear type.

3. The educational status of the family members showed that 43 per cent of the family members had education only upto primary level. Thirty per cent of the members had not even been to the schools.

4. Fifty five per cent of the family members were engaged in cooli work. Only 24 per cent of the members were doing skilled work.

5. Among the 500 children selected for the study, 136 children (27 per cent) belonged to the age group 0-1 year and 117 children (23 per cent) in the 1-2 year group. Among the 50% children, the number of boys affected were more, when compared to girls.

6. Breast feeding was adopted as a common practice by 495 families. Fifty one per cent prolonged breast feeding upto two to three years. Cow's milk and buffaloe's milk were the substitutes used commonly for the breast milk. Supplementary foods were not given to the children adequately at the correct age. Due to their poverty and ignorance, milk was provided in the diluted form only.

7. The meal pattern of the pre-school children revealed that the diet was cereal based and only negligible quantities of protective foods were included.

8. Regarding the immunization measures, only six per cent of the children had all measures of immunization and 26 per cent did not take any immunization measures at all.

9. Regarding the personal hygiene, majority(75 per cent) of the children used to take bath only once in two days. No disinfectant was used for washing the garments of the children, even during illness, only ordinary cold water was given to the children affected by various diseases.

10. Regarding the environmental sanitation, majority(78 per cent) did not have any toilet or bathing facilities at all.

11. The anthropometric measurements of the children of all the age groups were below the standard measurements.

12. The morbidity pattern of the children under study revealed that the major diseases noted were respiratory tract(upper and lower) infections, acute gastroenteritis, and pyrexia of unknown origin. Among the nutritional disorders, anaemia, kwashiorkor, marasmus and vitamin A deficiency ranked high in the morbidity pattern. The [illegible] between [illegible] and

The results revealed that there is a negative correlation between income and morbidity and education and morbidity.

13. The values for haemoglobin, red blood cell count and serum protein levels were markedly lowered for the sub sample studied.

Thus this study provides background of the magnitude, causes and associated factors of the diseases of the infants and pre-school children, that it is hoped it will be useful in designing effective intervention programmes aimed towards the eradication for varied diseases.

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APPENDICES

APPENDIX I

SCHEDULE FOR ELICITING INFORMATION REGARDING THE INCIDENCE OF MORBIDITY, SOCIO ECONOMIC AND DIETARY PATTERN

A. [redacted]

1. Name of the investigator: II Name of the Interviewee

Date:

Type of family: Nuclear/Joint

Sl. No.	Name of members	Age	Sex	Educational qualification	Occupation	Monthly income Rs.

Other sources of income

Amt. Rs./ month	Land	Building (Rent)	Interest	Others (specify)

B. Food habits survey:

1. Whether the child is breast fed Yes ☐ No ☐

If yes,

Number of feeds/day	Duration of breast feeding

2. A day's meal pattern of the child

Time of feeding	Food item	Quantity fed	Raw item used
Early morning			
Breakfast			
Lunch			
Tea			
Dinner			
Bed time			

3. If bottle fed, give details of the formula

Formula type of milk	Frequency of feeding	Dilution	Quantity/feed

4. Supplementary foods given if any?

Age at which foods given	Foods given	Amount given	Frequency	Cost	Home made	Bought from outside

5. Method of cleaning the equipment

Methods	Yes	No
1. Using cold water		
2. Using hot water		
3. Using any brush for cleaning		
4. Using any cleaning agents		

C. Health status and environmental sanitation

1. Childs age Sex
2. Birth order of the child
3. Immunization

Age at which immunized

B.C.G.	Small pox	Polio	DPT	Cholera	Typhoid

4. Health condition during pregnancy

1st trimester			
2nd trimester	Good	Satisfactory	Complicated
3rd trimester			

5. Whether the mother had any infectious disease during her pregnancy.

Yes (Specify) No

6. Whether there is any effect of the disease shown in the child:

7. Type of complications during pregnancy

Bleeding Underweight Anaemia Muscular pain

D. Deficiency diseases Eclampsia Fever Oedema

Severe vomitting Varicose veins Any other(specify)

8. Whether any other sibbings had any infectious disease during the past years?

Yes (specify) No

9. Whether this child had any of the above diseases

Yes No

10. Do you bathe the child?

Daily/Alternate days/Once in three days/Once in a week

11. Methods of washing the children's garments

Washing with other/Washing seperately/Using disinfectants/ Drying in the sunlight.

12. Where do you get water?

Well Municipality water

13. What type of water you give to the child?

Boiled Filtered Ordinary

14. Stagnation of water, around the house

Drainage facilities	Yes	No
Facilities for dust bins	Yes	No
Urinal	Yes	No
Latrines	Yes	No

15. The reason for the present visit

Illness	Duration	The diet given	
		By the Mother	Prescribed by the Doctor

D. Anthropometery

Height (cm)	Weight (kg)	Mid arm circumference (cm)	Head circumference (cm)	Chest circumference (cm)

5. Clinical examination

Whether there are any symptoms of the following:

Schedule for clinical examination

Childs age Sex

Deficiency diseases

1) Thyroid a) Grade
b) adematous

2) Parotid enlargement

3) Hair changes

4) Moon face

5) Eye signs

a) Xerosis conjunctiva
b) Bitot's spot
c) Xerophthalmia
d) Keratomalacia
e) Malnutrition scar

6) Angular stomatitis

7) Cheilosis

8) Tongue

a) Papillary atrophy
b) Magenta

9) Gums

a) Gingivitis
b) Scorbutic

10) Dermatosis
a) Kwashiorkor
b) Pellagra

11) Follicular Keratosis

a) Arms
b) Back
c) Legs

12) Muscle wasting

a) Arm
b) Buttocks
c) Legs

13) Pot belly

14) Skeleton

a) Casto chondral enlargeme
b) Knock knees
c) Enlargement of epiphysis

15) Calf muscle tenderness

16) Reflexes

a) Absent of kneejerks
b) Absent of anklejerks

17) Oedema

a) Facial
b) Dependent
c) Unilateral

18) General pallor

19) Gross anaemia

20) Frank malnutrition
a) Maraemus
b) Kwashiorkor
c) Rickets
d) Others

21) General appearance
a) Good
b) Just adequate
c) Poor

22) Other findings
(if any)

Other diseases

1) Upper respiratory tract infections
2) Lower respiratory tract infections
3) Bronchitis
4) Acute gastro enteritis
5) Diarrhoea
6) Dysentery
7) Constipation
8) Malabsorption syndrome
9) Sprue
10) Ulcerative colitis
11) Viral hepatitis
12) Jaundice
13) Cirrhosis
14) Impetigo
15) Common cold with fever
16) Pneumonia
17) Typhoid
18) Cough
19) Septicum
20) Ascariasis
21) Scabies
22) Cardiac diseases
23) Kidney disorders
24) Vomiting
25) Worm infections
26) Febrile fits
27) Polio
28) Chicken pox
29) Cholera
30) Tonsilitis
31) Other findings

APPENDIX II

ESTIMATION OF SERUM PROTEIN

Procedure

Diluted 0.5ml of serum to 10ml by adding 9.5ml of physiological saline in a test tube and mixed well.

Took two 50ml standard flasks and marked them as standard(s) and test(T). Took a little amount of water and one ml, of tyrosine standard. In one of standard flasks marked as S. In the flask marked as T, took a little amount of water and 1.0ml of diluted serum.

To both standard flask added 1ml of 20% sodium hydroxide. Mixed well and added 0.75 ml of phenol reagent drop by drop shaking the flask after each addition. There should not be any precipitate. Made up the solution to 50ml mark. Mixed well and compared the colours at 610 milli microns

Calculation

Gm% total protein

$$= \frac{\text{Reading of test}}{\text{Reading of standard}} \times 0.0032 \times \frac{100}{0.05}$$

$$= \frac{T \times 6.4 \text{ gms \%}}{S}$$

Albumin

Took 0.5 ml of serum in a test tube and 9.5ml of 22.5% sodium sulphate. Mixed well and incubated for 3 hours at 37°C or kept in the room temperature for overnight. Filtered using Whatman 42 filter papers. If the filtrate is not clear at first returned the filtrate to same filter paper until the clear filtrate is obtained.

In a 50ml standard flask took a little amount of water and added 1ml of filtrate and 1ml of 20% sodium hydroxide. Added 0.75 ml of phenol reagent drop by drop shaking after each addition. Made up to the mark with distilled water. There should not be any precipitate. Compared with the standard prepared for the total protein.

Calculation

$$\text{Gm\% albumin} = \frac{RT}{RS} \times 0.00336 \times \frac{100}{0.05}$$

$$= \frac{RT}{RS} \times 6.72 \text{ Gms\%}$$

Gm% Globulin = Gm % total protein - Gm% albumin

APPENDIX III A

HEIGHT AND WEIGHT OF INFANTS(0-6 MONTHS)

Height in cms	Numbers		Weight in kg.	Number	
	Male	Female		Male	Female
40 - 42	1	-	3-3.5	6	5
42 - 44	1	-	3.5-4	-	-
44 - 46	-	1	4-4.5	7	5
46 - 48	2	1	4.5.5	-	-
48 - 50	-	-	5.5.5	11	7
50 - 52	-	-	5.5-6	-	-
52 - 54	3	2	6-6.5	3	3
54 - 56	6	2	6.5-7	-	-
56 - 58	3	6	7-7.5	6	1
58 - 60	1	-			
60 - 62	4	5			
62 - 64	5	3			
64 - 66	1	-			
66 - 68	2	1			
68 - 70	-	-			
70 - 72	3	-			
72 - 74	1	-			

APPENDIX III B

HEIGHT AND WEIGHT OF INFANTS (6–12 MONTHS)

Height in cms.	Number		Weight in kg.	Number	
	Male	Female		Male	Female
54 – 56	–	2	3–3.5	1	–
56 – 58	–	1	3.5–4	–	–
58 – 60	–	–	4–4.5	2	1
60 – 62	6	5	4.5–5	–	–
62–64	6	5	5–5.5	14	7
64 – 66	9	6	5.5–6	–	–
66 – 68	8	5	6–6.5	13	8
68 – 70	1	–	6.5–7	–	–
70 – 72	7	4	7–7.5	8	8
72 – 74	4	2	7.5–8	–	–
74 – 76	4	1	8–8.5	6	6
76 – 78	1	1	8.5–9	–	–
78 – 80	1	–	9–9.5	5	1
80 – 82	1	1	9.5–10	–	–
82 – 84	1	–	10–10.5	–	1
			10.5–11	–	–
			11–11.5	–	1

APPENDIX IV

CORRELATION BETWEEN EDUCATION AND MORBIDITY

		-1	0	1				
	1	1	2	3	f	fdy	fdy^2	fdxdy
-2	2	240 120	0 14	28 114	254	-508	1016	12
-1	3	40 40	0 4	-53 53	97	-97	97	-13
0	4	0 30	0 2	0 33	0 65	0	0	0
1	5	-50 50	0 7	14 14	71	71	71	-36
2	6	-26 13	0	0 -	13	26	52	-26
	f	259	27	214	500	-503	1236	-63
	fdx	-259	0	214	-45			
	fdx^2	259	0	214	473			
	fdxdy	204	0	-267	-63			

$$r = \frac{\Sigma fdxdy - \frac{\Sigma fdx \cdot \Sigma fdy}{N}}{\sqrt{\Sigma fdx^2 - \frac{(\Sigma fdx)^2}{N}} \quad \Sigma fdy^2 - \frac{(\Sigma fdy)^2}{N}}$$

$$= \frac{63 - \frac{(45 \times 508)}{500}}{\sqrt{473 - \frac{(45)^2}{500} \times 1236 - \frac{(52)^2}{500}}} = -0.03$$

APPENDIX V

CORRELATION BETWEEN INCOME AND MORBIDITY

	dx	-1	0	1				
dy	y^x	1	2	3	f	fdy	fdy^2	fdxdy
0	200	6	0	0	326	0	0	
		130	121	175				
+1	400	-129	0	39	174	174	174	
		129	6	39				
	f	259	27	214	500	174	174	
	fdx	-259	0	214	-45			
	fdx^2	259	0	214	473			-90
	fdxdy	-129	0	39	-90			

$$\beta = \frac{\Sigma fdxdy - \frac{\Sigma fdx \cdot \Sigma fdy}{N}}{\sqrt{\Sigma fdx^2 - \frac{(\Sigma fdx)^2}{N} \times \Sigma fdy^2 - \frac{(\Sigma fdy)^2}{N}}}$$

$$= -90 - \frac{(-7830)}{500}$$

$$\sqrt{473 - \frac{(-45)^2}{500} \times 174 - \frac{(174)^2}{500}} = -0.3$$

APPENDIX VI

HAEMOGLOBIN AND RBC COUNTS OF HUNDRED SAMPLES

S.No.	Sex	Disease	Hb Percentage 100ml	RBC Million/ CC
0-1				
1.	M	Respiratory tract infection(R.T I)	58	2.9
2.	F	" "	67	3.4
3.	F	" "	50	2.5
4.	M	" "	62	3.1
5.	M	" "	63	3.1
6	F	" "	65	3.3
7.	M	" "	64	3.2
8.	F	" "	72	3.7
9.	F	R.T I with Congestive cardiac failure (CCF)	67	3.4
10.	F	R.T.I	68	3.4
11.	M	"	60	3.0
12.	F	PCM	52	2.7
13.	M	Juandice	67	3.3
14.	M	Viral hepatitis	57	2.9
15.	M	Marasmus + AGE	52	2.7
16.	F	Meaningitis	67	3.4
17.	M	Febrile fits	60	3.0
2-3				
18.	M	R.T.I with CCF	50	2.4
19.	M	R.T.I with primary complex	60	3.0
20.	F	R.T.I	54	2.7
21.	F	R.T.I	60	3.0
22.	M	R.T.I	56	2.9

Foot notes: R.T.I Respiratory tract infection
AGE Acute gastro enteritis
CCF Congestive cardiac failure

S.No.	Sex	Disease	Hb Percentage 100ml	RBC million/cc
23.	M	R.T.I	60	3.1
24.	M	"	60	3.1
25.	F	R.T.I with diarrhoea	63	3.1
26.	M	Kwashiorkor with anaemia	65	3.3
27.	F	Kwashiorkor with R.T.I	60	3.1
28.	M	Kwashiorkor with enteritis	58	2.9
29.	M	Kwashiorkor	60	2.9
30.	M	Meningitis	64	3.2
31.	F	Meningitis	52	2.6
32.	M	Epilepsy	65	3.3
33.	F	PUO	60	3.0
2-3				
34.	M	R.T.I with fits	60	3.0
35.	M	R.T.I	60	3.1
36.	F	R.T.I	57	2.9
37.	M	R.T.I	57	2.8
38.	F	R.T.I	59	2.9
39.	M	Kwashiorkor with ascites, + Avitaminosis	51	2.5
40.	F	Kwashiorkor with hypo-proteinemia	50	2.5
41.	F	Marasmus with Keratomalacia	52	2.6
42.	M	Marasmus	60	3.0
43.	F	PCM	57	2.8
44.	M	PCM	60	3.1
45.	M	Acute nephritis	48	2.5
46.	M	Cirrhosis with R.T.I	65	3.3
47.	M	Ascariasis	51	2.6
48.	M	Febrile fits	58	2.9
49.	F	Measles	60	3.0
50.	F	Anaemic with hepato spleenomegaly	52	2.7
3-4				
51.	F	R.T.I	50	2.4
52.	F	"	68	3.4
53.	M	"	62	3.1
54.	F	"	60	3.0

Foot note: R.T.I. Respiratory tract infection

PUO Pyrexia of unknown origin

S.No.	Sex	Disease	Hb Percentage/ 100ml	R.B.C million/cc
55.	M	R.T.I	68	3.5
56.	M	R.T.I with febrile fits	68	3.5
57.	M	P U O	64	3.2
58.	M	P U O	68	3.4
59.	M	Measles	62	3.1
60.	F	Febrile fits	68	3.5
61.	M	Acute nephritis	68	3.5
62.	M	Cirrhosis	62	3.1
63.	M	Viral hepatitis	58	2.8
64.	M	Marasmus + AGE	51	2.6
65.	F	PCM + R.T.I	57	2.9
66.	F	Encephalitis	69	3.9
67.	F	R.T.I	60	3.1
68.	F	R.T.I	67	3.4
69.	F	Acute nephritis	67	3.4
70.	M	Acute nephritis	51	2.5
71.	M	Acute nephritis	57	2.9
72.	F	Primary complex	58	2.3
73.	M	Kwashiorkor with vitamin A deficiency	57	2.9
74.	F	Kwashiorkor with keratomalacia	50	2.5
75.	F	Entericfever	53	2.6
76.	F	Entericfever	58	2.8
77.	F	Meningitis	56	2.5
78.	F	Meningitis	58	2.8
79.	F	Viral hepatitis	52	2.7
80.	M	CCF	64	3.2
5-6				
81	M	Enteric fever	67	3.8
82.	F	" "	63	3.1
83.	M	" "	65	3.3
84.	M	" "	62	3.1
85.	M	" "	67	3.3
86.	F	" "	57	2.7
87.	M	" "	62	3.2
88.	M	Acute nephritis	52	2.7

Foot note: R.T.I Respiratory tract infection
CCF Congestive cardiac failure

S.No.	Sex	Disease	Hb Percentage/ 100ml	RBC million/CC
89.	M	Acute nephritis	63	3.1
90.	M	Acute nephritis	50	2.7
91.	M	Kwashiorkor with R.T.I	52	2.4
92.	M	Kwashiorkor with keratomalacia	60	3.0
93.	M	Primary complex	55	2.7
94.	M	PUO	62	3.1
95.	M	PUO	65	3.0
96.	M	Febrile fits	60	3.0
97.	F	Febrile fits with R.T.I	57	2.9
98.	M	Post measles encephalitis	60	3.0
99.	F	Epilepsy	56	2.7
100.	F	Epilepsy	62	3.2

Foot note: PUO Pyrexia of unknown origin

RTI Respiratory tract infection

APPENDIX VII

SERUM PROTEIN, ALBUMIN AND GLOBULIN LEVELS

S.No.	Sex	Disease	Serum Protein	Albumin (g/100ml)	Globulin
1.	F	PCM with anaemia	3.94	2.28	1.66
2.	M	Cirrhosis	6.4	3.8	2.6
3.	F	PCM with keratomalacia	3.6	1.52	2.08
4.	F	Meningitis	5.94	4.18	1.76
5.	F	Enteric fever	5.04	2.85	2.19
6.	F	Enteric fever	5.58	3.42	2.16
7.	M	Enteric fever	6.40	4.18	2.12
8.	M	P C M	3.24	2.28	0.96
9.	M	Primary complex	5.76	3.99	1.77
10.	M	Meningitis	6.84	4.18	2.60
11.	M	Meningitis with Bronchopneumonia	6.66	4.18	2.48
12.	F	Cirrhosis	4.86	2.66	2.2
13.	M	Primary complex	4.5	2.47	2.03
14.	F	Primary complex	4.68	3.42	1.26
15.	F	Viral hepatitis	4.86	2.47	2.75
16.	F	Enteric fever	5.22	2.47	2.75
17.	M	Enteric fever	5.40	3.22	2.18
18.	M	P C M	3.60	1.52	1.44
19.	M	T.B.Meningitis	2.06	1.52	1.44
20.	M	Viral hepatitis	6.12	4.37	1.75