TITLE

RISK FACTORS IN CHILDHOOD MALNUTRITION

IN

GENALE AWRAJA

SOUTH EAST ETHIOPIA

BY

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CERTIFICATE OF APPROVAL

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I hereby, recommend that the thesis prepared under my supervision by Dr. Takele Geressu entitled Risk Factors In Childhood Malnutrition In Genale Awraja, South East Ethiopia be accepted in partial fulfilment of the requirements for the degree of MASTERS OF SCIENCE IN COMMUNITY MEDICINE -M.Sc.(Comm. Med.)

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TABLE OF CONTENTS

LIST OF TABLES & FIGURES

LIST OF ABBREVIATIONS

1.	BCG	=	Bacille Calmett Guerein
2.	DF	=	Degrees of freedom
3.	DPT	=	Diptheria, Pertussis, Tetanus
4.	EPI	=	Expanded Programme on Immunization
5.	FAO	=	Food & Agricultural Organization
6.	MCH	=	Maternal & Child Health
7.	NCHS	=	National Centre for Health Statistics (United States of America)
8.	ORS	=	Oral Rehydration Salt
9.	PEM	=	Protein Energy Malnutrition
10.	PHC	=	Primary Health Care
11.	RR	=	Relative Risk
12.	SIDA	=	Swedish International Development Agency
13.	SPSS	=	Statistical Package for Social Sciences
14.	UNICEF	=	United Nations Fund for Children
15.	USD	=	United States Dollar
16.	WHO	=	World Health Organization

SUMMARY

The nutritional status of a homogenous rural Ethiopian community was studied. A total of 1020 children, 498 (48.8% boys & 522 (51.2%) girls in the age group 6-59 months participated in the study. Factors that may possibly be involved in protein energy malnutrition were studied. As age of study children was difficult to determine to the exact month the relatively age independent anthropometric index weight for height was used. In all cases bivariate analyses was done. 302 (29.6%) of the study children were found to be below -2 Z-SCORE of the NCHS weight for height reference. There was no difference in the prevalence of malnutrition in the two sexes. However, boys were heavier & taller than girls. Socio-demographic variables like income, family size, polygamy, membership of the family to a farmers' producers co-operatives and maternal literacy did not show any correlation with the nutritional status of the child. Having more than one child in the age group 6-59 months old in a family predicted malnutrition. Duration of breast feeding was shown to be inversly related to nutritional status. Recent illnesses of diarrhoea, fever & cough were strongly associated with poor nutritional status. Two hudred fifteen (21.1%) of the study children were completely immunized.

CHAPTER I

INTRODUCTION

A. STATEMENT OF THE PROBLEM

Adequate nutrition is a basic need and a prerequisite for health. No nation wide development scheme can be successful without providing citizens with enough food. It is believed that basically socio economic development guarantees improvement in nutritional status. This is a protracted venture and may take generations until outcomes are apparent. Nutritional status is the ultimate outcome of an interaction of a multitude of factors staring from the national level down to the individual(1). The problem must be tackled whenever possible at those points where it is possible to introduce change for the better. A lot can be done at the individual and the family level through the PHC worker to improve the nutritional status of a given community.

The role of the health sector in nutrition can not be overemphasized. Promotion of food supply and proper nutrition is one of the eight essential elements of PHC (2). This is not a mere coincidence, nor the fact that nutritional and health status indicators are interchangeable for the most part. The relationship between lack of food and ill-health was understood by mankind for centuries. A 17th century scholar and keen observer has put it dramatically; "whatsoever was the father of a disease, an ill diet was the mother".(3)

The diagnosis of nutritional problems at the level of the individual, the community and the population, as well as at the international level is the responsibility of the health care sector (4). The diagnosis of the problem of malnutrition should not limit itself to determining the magnitude of the the problem alone. Instead, it should answer the basic question of the Epidemeologist "who", "where" and "when" did malnutrition occur.

Identification of the at risk population should be an essential part of the diagnosis of the problem without which the resources used for the purpose would be fruitless. The at risk population should also be studied for geographic areas, seasonal difference and other relevant variations.

Until recently, there was no agreed way to obtain reliable estimates of malnutrition in the world. This is partly due to the different types of malnutrition that coexist (undernutrition, overnutrition and the specific deficiency diseases) partly due to the inherent difficulty in defining when biological adaptation may be considered to be pathological and partly due to the variety of measurements that are used and interpreted according to different criteria (4).

Despite the above mentioned difficulties, it has been estimated that, in the world as a whole, more than 100 million infants and small children are moderately or severely under weight (i.e. below 75% of the reference weight for age). Of these, 10%(or about 10 million) are below 60% of the reference weight, which implies an acutely life threatening situation for these infants and toddlers (5).

The magnitude of the problem being so serious, malnutrition should be a matter of concern for all, and particularly the health sector. This should be so because malnutrition has an adverse effect on life expectancy, well being and productivity. The impact on overall socio-economic development is obvious. Where institutionalization is not well developed, particularly in developing countries the problem of nutrition seems to be everybody's concern but nobody's responsibility. For many reasons units organized to deal with the problem fail to do so, varying from lack of clear description of objective or due to problems of identifying and mobilizing resources.

In this respect, the objectives of the JNSP programme in Ethiopia (6) is quite a good beginning. As this programme is also on trial in some other countries, it is with optimism that concerned sectors expect the experience to be duplicable to other areas. The due emphasis that is given to community involvement and intersectoral collaboration by this programme should be the aim of those sectors that are involved in the effort to alleviate the problems of malnutrition.

A study made of 1,114 underprivileged Ethiopian preschool children living in Addis Ababa the mean weight and length for age for all groups fall around -2.S.D (7). A survey in 11 administrative regions in Ethiopia shows that the prevalence of malnutrition was 6.43%, 10.82% and 18.46% by the indicators weight for length, weight for age and height for age in that given order (8). Therefore these children start life with major disadvantages with respect to both physical and mental development.

This study is an effort to ellucidate some of the factors that contribute to malnutrition in a rural Ethiopian setting. It is anticipated that the findings will form a basis for planning corrective action.

This study was conducted in Genale Awraja, southeast Ethiopia and entitled "Risk factors in childhood malnutrition". Since there was no study previously conducted in the Awraja concerning nutrition the study will give information on the prevalence of malnutrition. Moreover, by identifying factors that are strongly associated with malnutrition, results of the survey may help in the effort to alleviate the problem. It is suggested that studies of the same nature conducted in other areas is of vital importance to central planning and policy making.

B. OBJECTIVES OF THE STUDY

1. GENERAL

Determine the prevalence of PEM and its associated socio-demographic variables in children 6 to 59 months of age. in Genale Awraja of Ethiopia in the month of October to November 1987.

2. SPECIFIC

1. Determine the prevalence of PEM in children 6 to 59 months old as measured by the anthropometric indicator weight for height.

2. To determine the association of the following variables with nutritional status of study children.

1"Social-status" related (Demographic)

1. Family size
2. Polygamy
3. Maternal literacy
4. Separation & death of parents

2. "Economic Status" related

1. Household income
2. Membership to a Farmers' Producers' Co-operatives
3. Ownership of cow (s)
4. Keeping chicken
5. Growing vegetables

3. "Health Status" related

1. Duration of breast feeding
2. Age at start of supplementary diet
3. History of recent illnesses
4. Immunization status
5. Birth interval from elder sibling.

In addition to the objectives mentioned above some hypotheses of associations will be tested.

HYPOTHESES

The following hypotheses are tested in this study.

H1 = children who start supplementary diet later than 6 months of age are at a higher risk of being malnourished.

H2 = PEM is more prevalent in children born at intervals of less than 18 months.

H3 = The higher the household income the better the nutritional status of the child.

H4 = The prevalence of PEM is higher among children in polygamous families.

CHAPTER II

LITERATURE REVIEW

A. GENERAL

Hundreds of millions of children in developing countries suffer from one or another kind of malnutrition and its ill-effects. Malnutrition accompanies a staggering proportion of deaths in children under 5 years of age. Among children growing in the developing world more than two-thirds will encounter sickness or disabling diseases either brought on or aggravated by protein-calorie malnutrition (9).

It is true that malnutrition kills and exposes children to diseases, but the scope of the problem goes beyond that. The impact malnutrition has on the national economy by reducing productivity and the burden on the available health resources should not be overlooked. One may be tempted to ask then whether a convincing case have been demonstrated to warrant allocation of more resources to the problem of malnutrition. It was said that until a sufficiently strong case is presented, the impact of the extensive research of the scientific community would not reach beyond the periphery of the malnutrition problem (10).

It has been claimed that the purpose of nutritional surveillance is part of a continuing attempt to change government policy in favour of nutrition or social equity, where such concerns are missing (11). The diagnosis of the problem of malnutrition is the primary responsibility of the health sector(4).

In many developing countries, including Ethiopia, the prevalence of all degrees of PEM is reported to be in the range of 30-60% (12). A study conducted in a rural district and an urban slum in Ethiopia had found the prevalence of severe PEM to be less than 3% (13).

A nutrition survey in 1049 households consisting of 1510 children of age less than 5 years, the prevalence of malnutrition reported was 20.8%, 23.9% and 31.5% for the indicators weight for length, height for age and weight for age (14) respectively.

B. MEASUREMENT OF NUTRITIONAL STATUS

Anthropometric indicators have long been used to separate groups of children who are "normally nourished" and "malnourished" and to identify them as targets for preventive and therapeutic services (15). Assessment of the nutritional status of children based on a deficit in weight, originally proposed by Gomez & modified by Jelliffe (15,16,17) was most frequently used. Gomez classification had been criticized in that the cut-off points are arbitrary and have little physiological or statistical justification (18). It was also criticized for not taking overweight as a form of malnutrition.

The eighth joint FAO/WHO Expert committee on nutrition (19) emphasized the importance of distinguishing between acute and chronic, or present and past malnutrition. Several authors have suggested methods for the classification of nutritional status based on measurements of height and weight which take into account this distinction (18,20,21).

A joint FAO/UNICEF/WHO Expert committee on nutritional surveillance (1) recommended the use of height for age and weight for height as primary indicators of nutritional status in children. Deficit in height for age was termed "stunting" and that of weight for height "wasting". It is also recommended that weight for height be used as an indicator of present state of nutrition and height for age as an indicator of past nutrition (22).

What reference to use for presentation and comparison of data from anthropometric measurements had long been a debatable issue. The question of whether all children throughout the world have the same genetic potential for growth is still unresolved (23). A study in privileged Ethiopian Children shows that they have exhibited a rate of growth very close to the western standard (24). There was an implication that Ethiopian children have a genetic potential for growth (at least during the first 5 years of life) that corresponds well to that of Caucasian children. Socio-economically privileged Togolese children were also found to have a nutritional status nearly equivalent to the American (NCHS) reference population (25).

In light of the above knowledge and the difficulty involved in establishing local standards authorities recommend the use of the NCHS reference (22,26). The NCHS reference is drawn from a defined sample of American Children which contains between 300 & 1600 children in each yearly group.

It is recommended that measurements of a study population should be related to the NCHS reference population by standard deviation scores (Z-scores) rather than as a percentage of the median(22). The use of centiles is not recommended because of the fact that in less developed countries a large number of children are so far outside the range of the reference population that they cannot be accurately classified by centiles.

C. FACTORS ASSOCIATED WITH MALNUTRITION

The influence of ill-health on the nutritional well being of the child is a well established fact (27). Two important factors, inadequate food intake and diseases play a decisive role in the causation of malnutrition. These two essential factors are only the ultimate outcomes of many other underlying causes. A variety of factors starting from the national level down to the individual interplay in the causation of malnutrition.

In a famine year in Bangladesh (28), seasonal factors, family income, mothers education, sex & birth order of the children appear to be important determinants of malnutrition. The same study showed that an interaction between family income and mothers education in relation to child nutrition was quite apparent. The study concludes that a higher family income was of relatively greater benefit to children of literate mothers than to those of illiterate mothers in improving their nutritional status. There was a threshold point below which income appeared as the main constraint on child nutrition.

A study in a Palestinian Refugee Camp in Jordan (29) revealed that illiteracy of mothers, marital problems and mothers marriage before the age of 17 to be some of the risk factors in child malnutrition. [illegible]dy has also indicated that occurrence of another pregnancy in mothe[illegible]nd female sex are also risk factors. Twenty percent of t[illegible] in this study had not been breastfed at all and 24% [illegible] than 3 months.

In another study in Brazil which included several socio-economic and environmental indicators, family income was shown to stand above all other variables in determining malnutrition (30). Other factors that were found to be associated with PEM in this study were mothers education level and number of siblings.

A review of nutritional studies conducted in Tanzania (31) summarizes the findings. There was no statistical difference in the prevalence of PEM in either sex. Most studies show no relationship with family size while few studies indicate a worsening of nutritional status with increase in family size only in children below 5 years of age. There was no correlation for older children. The review continues to state that there was no correlation between nutritional status and parental education. This was explained by the fact that parents tend to be mostly of the educational levels of primary and few post primary school. Duration of breast feeding had been found to determine the age at which malnutrition sets in.

The influence of polygamy on nutritional status had little been studied. In a study in Tanzania (31) no relationship was established between number of wives and nutritional status of children below 5 years of age. There seemed to be improvement in nutritional status among those with 3 wives. In Malawi (32) the prevalence of PEM was found to be higher among children whose father had more than one wife.

A study in India showed that PEM occurred more commonly in smaller families (33). The same study revealed that mothers of severely malnourished children were younger than mothers of mildly and moderately malnourished children. This same study shows that breast feeding was successful in only 37% of the severely malnourished children compared to 58% in the mild to moderately malnourished children. Among the severely malnourished children in this study none of them were started on supplementary diet in their first six months of life.

In Tanzania (34) higher percentage of underweight, stunted and wasted children was observed among children with a post-birth interval of less than 24 months, than among those with longer birth intervals.

Recent illnesses significantly contribute in precipitating malnutrition in marginally nourished children. Diarrhoea exerts this influence by depleting the body of fluids. The traditional practice of withholding food from the child suffering from diarrhoeal diseases also plays an important role (35). Fever accelerates the onset of malnutrition by reducing food intake and increasing catabolic reactions in the organism.

One study demonstrates that the nutritional status of pre-school children based on weight for height is associated with the presence of recent symptoms of illness, fever and diarrhoea (36). In this study children with weight for height less than -2 Z-SCORE values had double the prevalence of symptoms compared to those between - 1 Z SCORE.

In Juba, southern Sudan, a prospective study shows that death in children was most often preceeded by growth faltering (37). Severe attacks of diarrhoea and respiratory infections were attributed to growth faltering which finally resulted in death.

The role of immunization programmes in improving the nutritional status of children is an important area to be studied. If diseases like measles, whooping cough and tuberculosis are factors that precipitate malnutrition, it should in theory be possible to demonstrate that immunizations raise the nutritional status of children benefiting from the programme. In a district in Uganda, the nutritional status of children was assessed before and after a comprehensive immunization programme that went on from 1965 to 1969 and achieved a 63% coverage (38). The increase in weight for age was significant at 1% level. However, from 1968 onwards other services were added, especially general "under 5" clinics and it is not possible to say that the improvement was due to immunization alone.

A study in a Palestinian Refugee Camp (29) has shown that the rate of immunization for each antigen in healthy and undernourished children was in the range of 33 to 93% and 20-80% respectively.

CHAPTER III

MATERIALS & METHODS

A STUDY POPULATION

Genale Awraja is found in Bale Administrative Region, in the south eastern part of Ethiopia. According to the 1984 nationwide census, the Awraja is reported to be inhabited by 223,691 people. It covers an area of 818,900 hectars. Most of the Awraja is a highland with an altitude of above 2,500 meters from sea level. Wheat & barley are the commonest crops.

The Awraja has got four smaller administrative units called Woredas. There are a total of 103 farmers' villages in the four Woredas. Dodolla Woreda, where the Awraja main town is located was chosen for this study for reasons of accessibility. This Woreda contains 33 farmers' villages. The study was carried out in 4 randomly selected villages. All children in the age group 6-59 months old in these villages were studied.

B STUDY DESIGN

The sampling frame is all villages in the Woreda, which are 33. Of these, 2 villages where the pilot study had been conducted and one village where a growth monitoring project is underway for about a year and a half were excluded. Out of the remaining 30 villages 4 were selected on simple random sampling.

The study is descriptive and analytic. All children in the age group 6-59 months old in study villages were the subjects of the study. The prevalence of PEM was determined. The role of attributable factors in PEM was analyzed and the frequency of their occurrence in well nourished and under nourished children compared as shown in Fig. 1

FIG. 1 STUDY DESIGN

C. SAMPLE SIZE

The minimum sample size required for the study was calculated on the basis of the first hypothesis which states that children started on supplementary diet later than 6 months of age are at a higher risk of being malnourished. α & β error levels were specified as .05 & 0.1 respectively. The following formula (39) was used

$$n = \left[\frac{Z_\alpha \sqrt{\bar{\Pi}_0 (1-\bar{\Pi}_0)} - Z_\beta \sqrt{\bar{\Pi}_1 (1-\bar{\Pi}_1)}}{\bar{\Pi}_1 - \bar{\Pi}_0} \right]^2$$

where; n=sample size

Z_α = Upper percent pointof the normal distribution = 1.96

Z_β = Lower percent point of the normal distribution =-1.28

$\bar{\Pi}_1$ = Proportion of malnourished children among those started on supplementary diet before the age of 6 months = 0.3

$\bar{\Pi}_0$ = Proportion of malnourished children among those started on supplementary diet later than 6 months of age = 0.4

Substituting for the above values the calculated total sample size was 450 i.e; 225 children started on supplementary diet before 6 months of age & the remaining 225 later than 6 months of age.

D. DATA COLLECTION

The purpose of study was communicated to farmers' villages through the Awraja and Woreda administrations. Chairmen of the respective Peasant Associations were contacted in person by the principal investigator and the field co-ordinator to facilitate participation in the study villages. Residents were informed about the study during village meetings for other purposes and announcements made the day before data collectors (interviewers) go to the respective villages. Village leaders fix the days of the week that are convenient for the villagers by considering market and holidays and give an appointment date for the principal investigator and/or the field co-ordinator.

Houses in study villages were numbered with a plate of tin on which is written the respective housenumber and nailed at the doors. After numbering houses a census of children 6-59 months of age was made. The census form is shown in Annex B.

Interviewers were recruited among high school completes. An intensive training of 10 days duration was given on how to administer the questionnaire and measure weight and height. The interviewers worked in 5 groups of 2, each group composed of a male and a female. All of the interviewers speak the local language Oromigna very well. Instructions that interviewers had to follow during data collection is shown in the Annex.

The questionnaire has got 3 parts of which the first part deals with household/mother information. The second part contains questions pertaining

to the index (study) child. The third part is a space provided for recording anthropometric measurements. In part one variables like family size, age and educational status of mother, income, and ownership of cow(s), chicken and vegetables was studied. The child questionnaire deals with age, sex, birth interval from elder sibling duration of breast feeding, history of recent illnesses and immunization status. The questionnaire is shown in Annex A.

The questionnaire was translated to Oromigna and administered as such. The questionnaire was pretested on mothers that visited the health centre in Dodolla town for various reasons. Weight and height measurements were also exercised on children that visited the same health centre.

After the questionnaire was pretested and interviewers acquired the skill of measuring weight and height a pilot study was conducted in 2 farmers/ villages in 69 children. Some ammendments were made to the questionnaire and data for final study was collected from October 21 to November 26, 1987. Every questionnaire was verified every night for errors and missing data.

During the study children with diarrhoea, conjuctivitis & scabies were treated by a health worker that goes out to the villages with the interviewers. Drugs for this purpose were secured from the health centre in Dodolla & Bale regional medical store.

Weight was measured by a hanging Salter spring balance which has a capacity of 25 kgs. and caliberated by intervals of 0.1kg. Children were weighed with light clothing and their weight recorded to the nearest 0.1kg. The scales were adjusted with a known weight before every measuring session.

Height/length was measured by a wooden board that is made locally to which a measuring tape with accuracy of 0.1 cm. is attached and recorded accordingly. The board measures up to 130 cms and has a movable foot/head piece. Children 2 years old and above had their standing height measured on a flat surface and with barefoot. They stand on the measuring board with feet parallel and the heels, buttocks and shoulders & back of the head touching the upright. Their heads were held erect, with the lower border of the orbit of the eye in the same horizontal plane as the external canal of the ear. The head piece is gently lowered, crushing the hair and making contact with the top of the head. For children below 2 years of age recumbent (crown-heel) length was measured. The child is laid on the board and the head is positioned firmly against the fixed headboard, with the eyes looking vertically. The knees are extended and the feet flexed at right angles to the lower legs. The sliding food piece is moved to obtain firm contact with the heels and the length read(26).

Ages of study children were recorded in months as reported by respondents. When date and/or month & year of birth was remembered and reported by respondents it was recorded and the age of the child calculated from it.

Income was determined by asking for the number of quintals of harvest from different grains and cereals during the last harvest season and multiplied by the average local market price in Birr.

History of morbidity was obtained by asking mothers/proxy if the child had had diarrhoea, fever and cough in the 2 weeks time before the study.

Immunization status was obtained from the childs vaccination (EPI) card. When children did not have a vaccination card interviewers had to look for a BCG scar.

E. DATA ANALYSES

Data were processed by a computer of the Hewlett Packard Brand using the SPSS Soft Ware. The data were edited for 100 randomly picked questionnaires. Cross tabulations were made for the variables in the study. Tests of significance were made by the chi-square method. Corrected chi-square was used for chi-square tests with one degree of freedom.

F. LIMITATIONS OF THE STUDY

As all the study villages are rural and agrarian by their very nature it had been unrealistic to ask for income on direct monetary terms. For this reason annual harvest which is a universal source of subsistence in the villages is used as an index of income. The number of quintals of different cereals harvested by the family in the previous harvest season was recorded and multiplied by the average local market price in Birr. Market prices were obtained from the Awraja agricultural office. Since other sources of income and indicators of economic status in the village set up like cattle, chickens and vegetables are not taken into account it is expected that incomes are under-reported. As the question is a sensitive and threatening one it is anticipated that interviewers might have not reported the exact quintals of harvest that the family had.

In the pilot study birth dates of study children were reported as remembered by mothers/proxy for 19 out of 69 (27.5%) children. No birth records were found as there is no tradition of keeping birth certificates in the villages. An attempt to establish a local events calender was not successful in that it could only help memories of 2 events that took place 2 & 5 years ago respectively. Establishing a dependable & working local events calender required an extensive study in each village which was beyond the time and personnel allocated for the present study. Developmental milestones did not help many mothers to determine approximate age in the pilot study. Given this condition, it has become an impossibility to determine age of study children to the exact month.

Since age is one of the essential anthropometric measurements besides weight and height and can't be determined to the exact month in this study, the option left was to use the age independent anthropometric indicator weight for height. It is recommended that primary reliance should be placed on weight for height as indicator of present state of nutrition and on height for age as indicator of past nutrition (22). The authors continue to state that weight for height is nearly independent of age between 1 & 10 years. A WHO Working Group (40) claims that weight for height is an index that is particularly important for the description of current health status. In circumstances where age can not be determined exactly the use of weight for height for the assessment of nutritional status is particularly advantageous (22). Other workers (41-42) had also showed that the anthropometric index weight for height is independent of age.

As the study deals with many variables as determinants of nutritional status, it was initially planned to conduct multivariate statistical analyses. For reasons beyond the capacity of the investigator this had not been possible. The gaps in the study as a result of this is duly acknowledged.

G. DEFINITION OF TERMS (OPERATIONAL DEFINITIONS)

1. Household - A unit of people living in the same house which include the mother/child pair & those related to them.

2. Family size - The total number of people living in a household during the study period. This did not include guests and residents in transit.

3. Quintal - A unit of weight which is about equal to 100 kg.

4. Literacy - Ability to read and write in Amharic and/Oromigna. A mother who can only read or write is considered illiterate.

5. Years of formal schooling - The number of years of schooling attended. A mother who can read and write but never been to school will have 0 year of education.

6. Parents - Biological fathers & mothers.

7. Diarrhoea - Three or more loose stools over a period of 24 hours with or without mucus and/or blood in it (35).

8. Supplementary diet - Any kind of food item(s) other than breast milk .

9. EPI Card - The individual child's vaccination card on which is written the dates at which he/she is given the different antigens (BCG, DPT, Polio & Measles) and kept with the child.

10. BCG scar - A circumscribed small scar on the right upper arm (deltoid region) that develops after an intradermal administration of the live attentuated BCG vaccine.

11. Farmers' (agricultural) Producers' co-operatives. An economic society through which farmers in a Peasant Association join their means of production on their own free will in part or as a whole under a single administration or a common property so as to preserve and consolidate their common benefits (43).

12. Malnutrition - Weight for height Z-SCORE of less than -2 according to the NCHS reference. The cut off point -2 Z-SCORE is the equivalent of 80% of median weight for height.

CHAPTER IV

RESULTS

Out of the total of 1128 children that were registered by the census 1020 (90.4%) were studied. These included 498 (48.8%) boys and 522 (51.2%) girls (Table I). No information is collected concerning non respondents that enables one to determine specific behaviour. The mean age of study children was 29.6 months. The children belonged to 763 households. The average number of children 6 to 59 months old in study households was 1.3. For 914 (89.6%) of the children respondents were their respective mothers.

The average household size in study villages was 5.4. The majority of the households (53.6%) have 4-6 family members. One hundred ninety seven (25.8%) households were members of farmers' producers' co-operatives'. Table II shows distribution of annual income in study households. The average annual income was 347.2 Birr per household. The ownership rate for cow(s), chicken & vegetables was 82.8%, 22.4% and 20.5% in that given order.

Only 8.9% of the mothers were able to read and write. Eight hundred fifty three (93.3%) mothers had never been to schools. Only 10 (1.0%) mothers have reached the level of high school. Table III shows age of mothers at giving birth to their first child. About 50% gave birth to their first child before the age of 20 years. Seventy three (8.9%) mothers had their first delivery at or before the age of 15 years.

Three hundred ninety two (38.4%) of the study children had their birth date reported to the exact date and/or month. One hundred sixty nine (16.6%) children were of the first birth order.

Length of time breast feeding is continued for study children is shown in Table IV. Only 1 (0.1%) child was breast fed for less than 6 months while 536 (52.5%) children were breast fed for 2 years and more. History of diarrhoea, fever and cough in the 2 weeks time period before the study was elicited from respondents. 35.6%, 40.3% and 52.8% of the children had diarrhoea, fever and cough in the given order.

Three hundred thirty one (32.5%) children had an EPI card. Two hundred fifteen (21.1%) were completely immunized as was evident from the EPI card of the study children. There was evidence of BCG administration in 721 (70.8%) children either from the EPI card or BCG scar. 24.6%, 22.1% and 21.6% of the children were found to be given DPT3, Polio3 and measles. Figures are shown in Table V. The drop out rate from the first to the third dose of DPT was 18.6%.

Mean weight of study children by age group and sex is shown in Table VI. Boys were found to be heavier than girls in all age groups.

Table VII shows the mean height of study children by age groups and sex. Boys were slightly taller than girls in all age groups.

Weight for height Z-SCORE distribution of study children is compared with that of the NCHS reference population (FIG. 2). The percentage of study children below and equal to -2 Z-SCORE is 32.8 while this figure for the reference population is only 2.3. Among study children 12.8% were found to be above 2 Z-SCORE compared to the reference population which is only 2.3%. Stunted children who later had an increase in their weight might have contributed to the proportion of these children. Errors in measuring & recording weight & height might also be one possible explanation. On the other hand the possibility that such children exist in actuality amongst the study population is not easily ruled out. Overall there were more underweight and over weight children in the study population than in the reference.

Comparison of the nutritional status of boys and girls is shown (Table VIII). One hundred forty nine (29.9%) of boys and 153 (29.3%) of girls were malnourished. There was no statistically significant difference in the prevalence of malnutrition in the 2 sexes (X^2 = 0.02 (1df), P Value = 0.8).

Table IX shows nutritional status by family size. No statistically significant difference (X^2 = 1.1 P value = 0.5) was found in relation to family size.

The number of children 6-59 months of age in study households was found to be strongly associated with malnutrition. (X^2 = 23.7 (2df.), P value < .0001). The prevalence of malnutrition in families of 1,2 and 3 children was 22.7%, 37.0% and 31.3% respectively. The RR was 1.9 (95% CI: 1.4-1.6) for families of 3 children. See Table X.

Nutritional status by current age of mothers is shown in Table XI. Eventhough there was a trend of decreasing rate of malnutrition with increase in age of mother, differences of statistical significance was not seen (X^2) = 5.4, P value = 0.1).

Table XII shows nutritional status by membership of families to farmers producers' co-operatives. The proportion of malnourished children in member and non-member families was 30.1% and 29.5% respectively. There was no significant difference (X^2(1df) = 0.01, P value = 0.9).

Nutritional status by income groups is shown (Table XIII). The rate of malnutrition in different income groups did not show any difference (x^2(4df)=1.8. P value = 0.7).

The rate of malnutrition among children in monogamous & polygamous families is compared (Table XIV). 30.1% & 29.0% of the children in monogamous and polygamous families were malnourished. The chi-square value with one df was .09, P value = 0.7.

Nutritional status of study children by mothers ability to read and write and years of formal schooling is shown in Tables XV(A) and XV(B). The proportion of malnutrition among children of literate mothers was 32.6%, while that of illeterate mothers was 29.4%. There was about the same porportion of malnourished children of mothers who had never been to school (29.0%) and those who had some high school education, 27.3% . The respective denominators 915,and 11 were not comparable from which no reasonable conclusion can be made.

Separation and death of either or both parents did not seem to influence the nutritional status of the child (x^2(4df) = 4.8, P value = 0.3) Figures are shown in Table XVI. This may be attributable to the fact that the extended family tends to cater for orphaned children unless this occurs in massive numbers.

Nutritional status of study children by ownership of the households of cow/s, chicken and vegetables is shown in Table XVII. The proportion of malnourished children in families that own and do not own cow(s) was % 29.4 & 30.4% respectively, 29.6% children in households that keep chickens are malnourished and 29.5% children in households that do not keep chickens are malnourished. 30.4% and 26.4% of the children in households that grow and do not grow vegetables are malnourished respectively. Ownership of cow(s). Chickens and vegetables were not found to predict nutritional status.

Birth interval from elder sibling didnot significantly influence nutritional status. Results are shown in Tables XVIII(A) & XVIII(B). However, there were a higher proportion of malnourished children among those with shorter birth intervals.

Nutritional status by length of time breast feeding was continued is shown in Table XIX. The length of time the child is breastfed was inversly related with the nutritional status (X^2(3df) = 11.8, P value = 0.008).

It is suspected that children that are breastfed for a longer period of time are also deprived of supplementary feeding on the assumption that breast milk meets their nutritional demand. While in the one hand the nutritional requirement of the infant/child increases with age, it is an established fact that the quantity of breast milk decreases with time. This may be one possible factor that contributed to the poor nutritional status of children that are breastfed for a longer period of time. Besides, the difference in the duration of time off-breast milk among the children makes comparison difficult.

Children that were started on supplementary diet(s) before the age of 6 months did not fare better in their nutritional status (X^2(1df) = 0, P value = 1.0). As the number of children who had supplementary diet before the age of 6 months was very small, i.e. only 6 (0.6%) it was difficult to make any valid conclusion. Results are shown in Table XX.

History of recent illnesses, diarrhoea, fever and cough were found to be strong predictors of malnutrition (Table XXI). The incidence of these diseases was significantly higher among the malnourished children. The relative risk for children who had diarrhoea, fever & cough was 2.7 (95% CI=2.6-2.7), 2.0 (95% CI=1.9-2.0) and 1.5 (95% CI=1.4,1.5) with P values of <0.0001, <0.0001 & 0.007 respectively.

Nutritional status by immunization status is shown in Tables XXII(A) & XXII(B). For all the antigens except measles the proportion of immunized children among the malnourished was significantly higher than that of the well nourished. 18.8% of the well nourished and 27.2% of the under nourished children were completely immunized. The difference was statistically significant (X^2 (2df) = 47.3, P value = 0.002). The RR for partially and fully immunized children was 1.3 (95% CI=1.2-1.4) & 1.9 (95% CI=1.8-1.9) respectively.

Incidence of recent illnesses by immunization status is shown (Table XXIII). For all the three diseases, i.e. Diarrhoea, fever and cough the incidence was consistently higher among the fully immunized when compared to the partially immunized or not immunized at all, but the difference was not statistically significant.

The tables refered to are presented in the following pages.

TABLE I

	MALE	FEMALE	TOTAL
Age (months)	No. (%)	No. (%)	No. (%)
6 - 11	20 (2.0)	22 (2.2)	42 (4.1)
12 - 23	98 (9.6)	91 (8.9)	189 (18.5)
24 - 35	110 (10.8)	120 (11.8)	230 (22.5)
36 - 47	124 (12.2)	141 (13.8)	265 (26.0)
48 - 59	146 (14.3)	148 (14.4)	294 (28.8)
Total	498 (48.8)	522 (51.2)	1020 (100.0)

TABLE II

Annual Income Distribution

n = 763

	Households	
Income (Birr)	No	%
0- 100	216	(28.3)
101- 300	180	(23.6)
301- 600	259	(33.9)
601-1000	64	(8.4)
1000 +	44	(5.8)
Total	763	100.0

TABLE III

Age of mothers at giving birth to their first child

n = 914

	Mothers	
Age at first delivery (years)	No.	%
≤ 15	73	8.0
16 - 17	157	17.2
18 - 19	206	22.5
- 20	478	52.3
Total	914	100.0

TABLE IV

Duration of breast feeding for study children

Duration (months)	No	%
less than 6	1	0.1
6 - 11	321	31.5
12 - 23	162	15.9
24	536	52.5
Total	1020	100.0

TABLE V

Immunization status of study children for different antigens

n = 1018

	Immunized Children	
Antigen	No	%
BCG	721	70.8
DPT complete	250	24.6
Polio complete	225	22.1
Measles	220	21.6

TABLE VI

Mean weight of study children by age groups & sex

n = 1020

Age Groups	Male X(+S.D)*	Female X(+S.D)*	Sexes combined X(+S.D)*
6 - 11	8.3(1.3)	7.8(0.9)	8.1(1.2)
12 - 23	9.3(1.3)	9.1(1.8)	9.2(1.6)
24 - 35	12.5(1.0)	11.0(1.6)	12.2(1.8)
36 - 47	12.9(1.8)	12.3(1.9)	12.4(1.20
48 - 59	13.6(1.6)	12.4(1.9)	12.6(1.8)
	12.1(4.4)	11.3(3.5)	11.7(4.8)

* Weight in kg

TABLE VII

Mean height of study children by age group & sex

n = 1020

Age Groups	Male X(+S.D)*	Female X(+S.D)*	Sexes combined X(+S.D)*
6 - 11	72.1(3.6)	69.8(3.1)	70.9(3.5
12 - 23	74.8(4.8)	74.8(6.2)	74.8(5.5)
24 - 35	82.6(6.8)	82.3(6.2)	82.3(6.2)
36 - 47	86.7(13.4)	84.5(12.8)	85.6(13.1)
48 - 59	89.0(7.0)	87.8(6.6)	88.4(6.8)
	83.1(10.3)	82.8(10.1)	83.0(10.2)

* Height in cm.

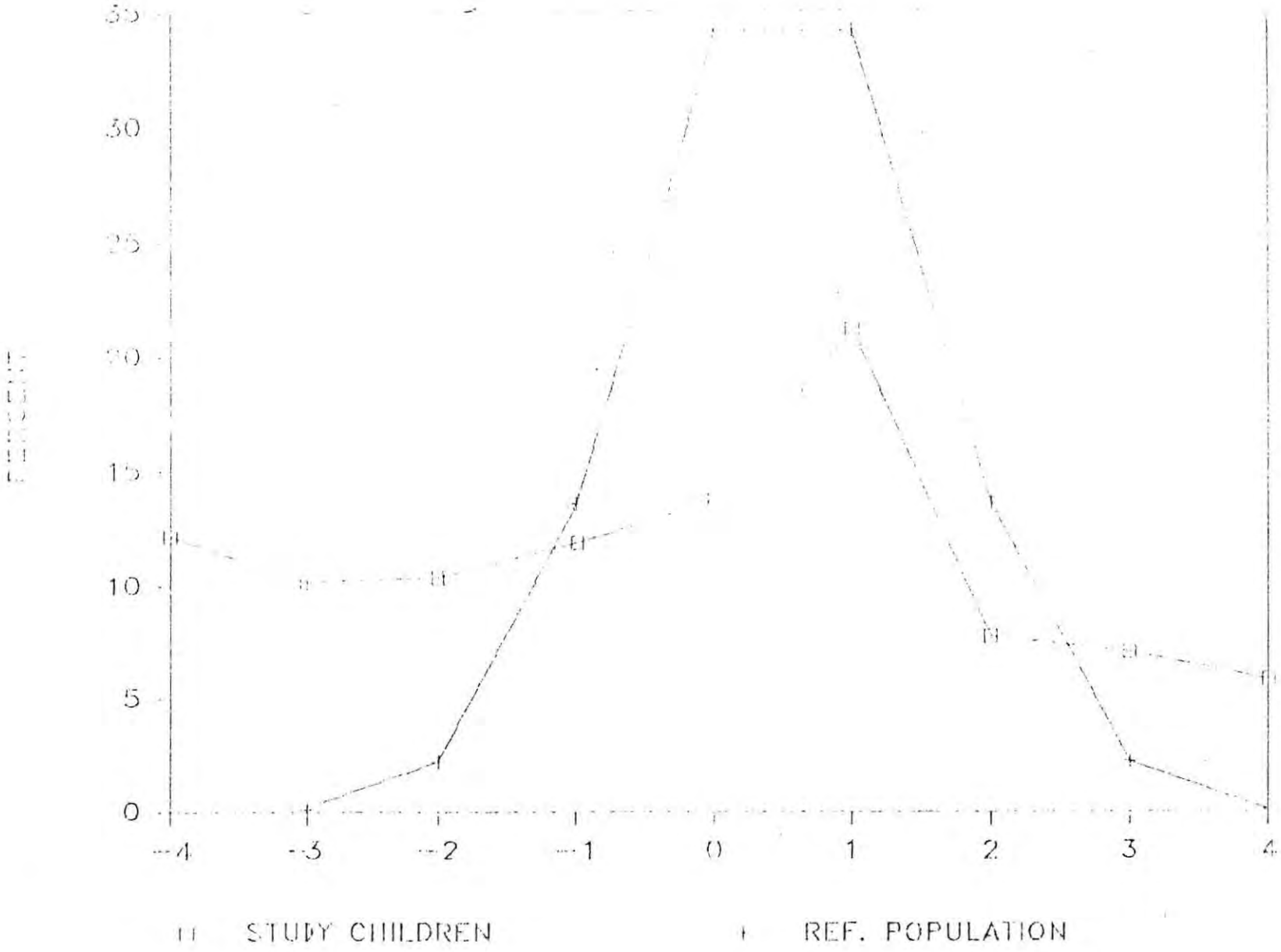
TABLE VIII

Nutritional status by sex

n = 1020

Sex	Well Nourished		Under Nourished		Total
	No	%	No	%	
Male	349	(48.6)	149	(49.3)	498(48.8)
Female	369	(51.4)	153	(50.7)	522(51.2)
	718	100.0	302	100.0	1020(100.0)

X^2 = .0Z P value = 0.8



Weight for height Z- Score distribution of study children as compared with NCHS reference.

TABLE IX

Nutritional status by family size

n = 1020

Family size	Well nourished		Undernourished		Total	
	No	%	No	%	No	%
2 to 3	76	10.6	37	12.3	113	11.1
4 to 6	386	53.8	166	55.0	552	54.1
≥ 7	256	35.7	99	32.8	355	34.8
	718	100.0	302	100	1020	100.0

X^2 = 1.1 P value = 0.5

TABLE X

Nutritional status by number of children in study households

n = 1020

No of children in study households	Wellnourished		Undernourished		Total	
	No	%	No	%	No	%
1	394	54.9	116	38.4	510	50.0
2	291	40.5	171	56.6	462	45.3
3	33	4.6	15	5.0	48	4.7
	718	100	302	100	1020	100

X^2 = 23.7, P value < .0001

TABLE XI

Nutritional status by current age of mothers

Age of mother (years)	Wellnourished		Undernourished		Total	
	No	%	No	%	No	%
< 20	66	9.2	33	10.9	99	9.7
20-25	134	18.7	69	22.8	203	19.9
26-30	181	25.2	81	26.8	262	25.7
Above 30	337	46.9	119	39.4	456	44.7
	718	100.0	302	100.0	1020	100.0

X^2 = 5.4, P value 0.1

TABLE XII

Nutritional status of study children by membership of the family to Farmer's Co-operatives

n = 1020

Membership	Wellnourished		Undernourished		Total	
	No	%	No	%	No	%
No	539	(75.1)	225	(74.5)	764	(74.9)
Yes	179	(24.9)	77	(25.5)	256	(25.1)
	718	(100.0)	302	100	1020	100.0

X^2 = 0.01, P value = 0.9

TABLE XIII

Nutritional status by income groups

n = 1020

Income groups (Birr)	Wellnourished		Undernourished		Total	
	No	%	No	%	No	%
0 - 100	199	(27.7)	75	(24.8)	274	(26.9)
101 - 300	173	(24.1)	75	(24.8)	248	(24.3)
301 - 600	234	(32.6)	109	(36.1)	343	(33.6)
601 - 1000	68	(9.5)	25	(8.3)	93	(9.1)
Above 1000	44	(6.1)	18	(6.0)	62	(6.1)
	718	100.0	302	100.0	1020	100.0

X^2 = 1.8, P value = 0.7

TABLE XIV

Comparison of nutritional status of children in mono & polygamous families

n = 1020

Families	Wellnourished		Undernourished		Total	
	No	%	No	%	No	%
Monogamous	414	57.7	178	58.9	592	58.0
Polygamous	304	42.3	124	41.1	428	42.0
	718	100.0	302	100.0	1020	100.0

X^2 = 0.09, P value = 0.7

TABLE XV (A)

Nutritional status by mothers' ability to read and write

n = 1019

Mothers' ability to read and write	Wellnourished		Undernourished		Total	
	No	%	No	%	No	%
Yes	58	8.1	28	9.3	86	8.4
No	659	91.9	274	90.7	933	91.6
	717	100.0	302	100.0	1019	100.0

X^2 = 0.2, P value = 0.6

TABLE XV (B)

Nutritional status by years of formal schooling attended by the mother

n = 1020

Schooling (Years)	wellnourished		undernourished		Total	
	No	%	No	%	No	%
0	678	94.4	277	91.7	955	93.6
1 - 6	16	2.2	14	4.6	30	2.9
7 - 8	16	2.2	8	2.6	24	2.4
9	8	1.1	3	1.0	11	1.1
	718	100.0	302	100.0	1020	100.0

X^2 = 4.5, P value = 0.2

TABLE XVI

Nutritional status of study children by separation and death of either or both parents

n = 1020

State of parents	wellnourished		undernourished		Total	
	No	%	No	%	No	%
Both alive & together	648	90.3	281	93.0	929	91.1
Both alive but separated	20	2.8	6	2.0	26	2.5
Only mother alive	21	2.9	10	3.3	31	3.0
Only father alive	11	1.5	1	0.3	12	1.2
Both dead	18	2.5	4	1.3	22	2.2
	718	100.0	302	100.0	1020	100.0

x^2 = 4.8, P value = 0.3

TABLE XVII

Nutritional status by ownership of Cow(s), chicken & vegetables

n = 1018

Ownership status		wellnourished		undernourished		Total	
		No	%	No	%	No	%
Cow (s)	Yes	607	84.7	253	84.1	860	84.5
	No	110	15.3	43	15.9	153	15.5
Chicken	Yes	159	22.2	67	22.3	226	22.2
	No	558	77.8	234	77.7	792	77.8
Vegetables	Yes	153	21.3	55	18.3	208	20.4
	No	564	78.7	246	81.7	810	79.6

	X^2	P value
Cows	0.02	0.8
Chicken	0	1.0
Vegetables	1.0	0.3

TABLE XVIII (A)

Nutritional status by birth interval from elder sibling

n = 843

Birth Interval (months)	wellnourished		undernourished		Total	
	No	%	No	%	No	%
12	3	0.5	3	1.1	6	0.7
12 - 17	79	13.7	30	11.4	109	12.9
18 - 23	47	8.1	27	10.2	74	8.8
24 - 35	211	36.3	112	42.4	323	38.3
36	239	41.3	92	34.8	331	39.3
	579	100.0	264	100	843	100.0

X^2 = 6.2. P value = 0.1

TABLE XVIII (B)

Comparison of nutritional status of children born at intervals of less than and greater than 18 months

n = 843

Birth Interval (months)	wellnourished		undernourished		Total	
	No	%	No	%	No	%
≤ 18	99	(17.1)	43	(16.3)	142	(16.8)
> 18	480	(82.9)	221	(83.7)	701	(83.2)
	579	(100.0)	264	(100.0)	843	(100.0)

X2 = 0.04, P value = 0.8

TABLE XIX

Nutritional status by length of time breast feeding continued

n = 1020

Length of Breastfeeding (months)	wellnourished		undernourished		Total	
	No	%	No	%	No	%
< 6	1	(0.1)	-	-	1	(0.1)
6-11	232	(32.3)	89	(29.5)	321	(31.5)
12-23	96	(13.4)	66	(21.9)	162	(15.9)
≥ 24	389	(54.2)	147	(48.7)	536	(52.5)
	718	(100.0)	302	(100.0)	1020	(100.0)

X^2 = 11.8, P value = 0.008

TABLE XX

Comparison of nutritional status of children started on supplementary diet before & after the age of 6 months

n = 1020

Age at start of Supplementary diet (months)	wellnourished		undernourished		Total	
	No	%	No	%	No	%
< 6	4	(0.6)	2	(0.7)	6	(0.6)
≥ 6	714	(99.4)	300	(99.3)	1014	(99.4)
	718	(100.0)	302	(100.0)	1020	(100.0)

$X^2 = 0$, P value 1.0

TABLE XXI

Nutritional status by history of recent illness

n = 1020

Symptom		wellnourished		undernourished		Total	
		No	%	No	%	No	%
Diarrhoea	No	512	71.3	145	48.0	657	64.4
	Yes	206	28.7	157	52.0	363	35.6
Fever	No	465	64.9	143	47.5	608	59.7
	Yes	252	35.1	158	52.5	410	40.3
Cough	No	358	49.9	122	40.5	480	47.2
	Yes	359	50.1	179	59.5	538	52.8

	X^2	P value
Diarrhoea	49.3	< 0.0001
Fever	25.7	< 0.0001
Cough	7.1	0. 007

TABLE XXII (A)

Comparison of nutritional status of children that are immunized and not immunized by antigens

n = 1018

Antigens		Wellnourished		Undernourished	
		No	%	No	%
BCG	Yes	489	(68.3)	232	(76.8)
	No	227	(31.7)	70	(23.2)
DPT3	Yes	144	(20.1)	106	(35.1)
	No	572	(79.9)	196	(64.9)
Measles	Yes	156	(21.8)	64	(21.2)
	No	560	(78.2)	238	(78.8)

	X^2	P value
BCG	7.0	0.007
DPT3	24.9	< 0.0001
Measles	0.01	0.8

TABLE XXII (B)

Nutritional status of study children

by overall immunization status

n = 1017

Immunization Status	wellnourished		undernourished		Total	
	No	%	No	%	No	%
Not Immunized	222	(31.0)	69	(22.8)	291	(28.5)
Partially Immunized	363	(50.8)	151	(50.0)	514	(50.4)
Completely "	130	(18.2)	82	(27.2)	212	(21.1)
	715	(100.0)	302	(100.0)	1017	(100.0)

X^2 = 47.3 P value = 0.002

TABLE XXIII

Comparison of Incidence of recent illnesses

in immunized & not immunized children

n = 1017

Symptoms		Not Immunized		Partially Immunized		Completely Immunized	
		No	%	No	%	No	%
Diarrhoea	Yes	95	32.6	183	35.6	84	39.5
	No	196	37.4	331	64.4	128	60.5
Fever	Yes	111	38.1	207	40.3	92	43.7
	No	180	61.9	307	59.7	120	56.3
Cough	Yes	151	51.9	271	52.8	115	54.2
	No	140	48.1	243	47.2	97	45.8

	Diarrhoea	Fever	Cough
X^2	2.5	1.6	0.2
P value	0.2	0.4	0.8

TABLE XXIV

Relative risk for significant bivariate associations with malnutrition

Variable	P vale	Crude Relative Risk (95% CI)
1.No. of children 6-59 months old in the family	< .0001	
*1		
2		1.9(1.8-1.9)
3		1.5(1.4-1.6)
2. History of diarrhoea in the last 2 weeks	<.0001	
* No		
Yes		2.7(2.6-2.7)

3.History of fever in the last 2 weeks	<.0001	
* No		
Yes		2.0(1.9-2.0)
4. History of cough in the last 2 weeks	.007	
*No		
Yes		1.5(1.4-1.5)
5. Immunization status	.002	
*Not immunized		
Partially immunized		1.3(1.2-1.4)
Completely immunized		1.9(1.8-1.9)

*Reference categories for relative risk calculations.

CHAPTER V

Discussion

Because of the difficulty in determining the age of study children to the exact month it was not possible to use the age dependent anthropometric indices, i.e, height for age and weight for age. The relatively age independent anthropometric index (22,41,42) weight for height is used. A deficit in weight for height termed as "wasting" is said to be the best indicator of current health and nutritional status (22,40)

The prevalence of PEM in this study (29.6%) is higher than what had previously been reported as 6.43% (8) & 20.8% (14) in other parts of the country that used the same anthropometric index. This must be seen in light of 2 essential considerations. The first consideration is the fact that this study used Z-SCORES to present the data unlike the other studies which used percentage of the median. Even though it is stated that -2 Z-SCORE is the equivalent of 80% of the reference median weight for height the 2 measurements give quite different estimates of prevalence. In one study(40) of weight for height of children, 27% had Z-SCORES of -2 or below, whereas only 15% were below 80% the reference median.

The second consideration may be that of the season factor. This study was made on a pre-harvest season when the family's food store is nearly depleted which directly influences the amount of food consumption. In Bangladesh (28) the prevalence of severe malnutrition i.e. weight for

age less than 60% was 15.0% and 25.6% in a harvest and pre-harvest seasons respectively. However, an attempt to compare the weight of children during the "hungry season" and the "harvest season" in Lake Zwai area (Ethiopia) did not reveal significant weight variation (44).

Regional differences may also have contributed to the difference in the incidence of malnutrition in different parts of the country.

There was no difference in the incidence of malnutrition among boys and girls in this study. In Tanzania (31) there was no difference in the nutritional status of boys and girls. However, workers in Jordan(29), India (45) and Bangladesh (28) have shown a better nutritional status in boys. The explanations given were social and cultural factors that are more in favour of boys.

Contrary to what was expected and found in many other studies (24,25,28,30) family income did not help in improving the nutritional status of the study children. As the average annual income was 347 Birr (below 200 USD) the entire community is poor. This may also be explained by the fact that all children despite differences in family income are equally exposed to the unhygienic village environment that adversely affect nutritional status. Unlike urban areas (24) it is doubtful if a better income in the villages brings about any change in child rearing and feeding practices. A study in Bangladesh (28) shows that a higher family income was helpful in improving the nutritional status of the children of educated mothers than to those of illiterate mothers. In a traditional community where the maternal illiteracy rate is above 90%, it may not be surprising if available resources are not exploited to the best because of ignorance.

Absence or presence of cow(s), chicken & vegetables in the household did not discriminate between the nutritional status of the study children. It is possible that parents may not feed their children with these essential nutrients for lack of knowledge. Information as to what households do with the cow(s) milk, chicken &vegetables (for sale or households consumption) and whether they feed their children with these food items might have shown a different picture. As the data on the ownership of these assets was collected on only a "yes" or "no" dichotomy, information on the quantity of these items might have also sheded some light on the matter.

Unlike family size, the number of children 6-59 months old in the household was found to predict the nutritional status of the child, i.e. the greater the number of children the higher the chance of their being malnourished. A summary of nutrition studies in Tanzania (31) states that while most studies did not show correlation between family size &nutritional status few studies have found a worsening of nutritional status with increasing family size. Workers in India (33) have shown a higher incidence of severe PEM in smaller families. While in theory one would expect a higher malnutrition rate with increase in family size, the enigma behind the finding to the opposite raises special interest.

The number of siblings had been found to be associated with the nutritional status of the child in Brazil (30). This finding coincides with that of the present study. The more the number of children below 60 months of age, the less the time to care for each child and the less the food share per child.

Polygamy, in the present study was not found to be associated with malnutrition . A study in Malawi (32) has shown a higher percentage of malnutrition among children of fathers who had more than one wife, while in Tanzania (31) there was a better nutritional status among children whose father had 3 wives. Whether Polygamy represents an economic well being of the father and hence an improved living condition was entertained as a possible explanation for the finding in Tanzania (31).

There was no difference in the rate of malnutrition among children of mothers in different age groups. A study in India (33) has found out mothers of severely malnourished children to be younger. The chance of the child of the young and inexperienced mother to be malnourished (33) might perhaps be balanced by the fact that the older and experienced mother will usually have more children to look after in the population under study.

Literacy and education of the mother were not found to be of benefit in terms of the child's nutritional well being. It should be noted that the study population was predominantly illeterate and so literacy is a very relative term here. More than 90% of the mothers of the study children were illiterate & only 6.5% of them had ever been to schools. Only 1.1% have reached the level of high schools. Besides it is unlikely for a mother to change the culture and tradition in which she has been brought up and lived in with only few years of schooling. In addition what is taught in schools might have been of little or no help in changing one's living style.

Only 6 (0.6%) children were started on supplementary diet before the age of 6 months. As these represent an insignificant proportion of the study children it was difficult to make any valid comparison and conclusion. This study did not investigate what constitutes the supplementary feeding. Had this been done it would have been possible to compare nutritional status with the kind of the supplementary diet given to children.

Although there was no statistically significant difference in the rate of malnutrition among children born with shorter and longer post-birth intervals a trend was observed. This was more apparent among children with post-birth intervals of less than 3 years and greater than or equal to 3 years which have a malnutrition rate of 33.6% and 27.8% respectively. In Tanzanian children (34) a higher percentage of malnutrition was observed among those with post birth intervals of less than 24 months than those with longer birth intervals. A study from Nepal (46) demonstrated that children with a pre or post birth intervals of less than 30 months had a much higher risk of dying when compared to those with longer intervals. If this finding was to operate in the present study population it is possible that many children with shorter birth intervals have died (which would mostly be malnourished) without being detected by a study which is a cross sectional one. In other words, had those children with shorter birth intervals survived during the study period, the true birth interval that determines the child's nutritional status would have been detected.

There is increasing evidence on the role infection plays on the nutritional status of children (27). The anthropometric index of weight for height which explains the current health status of the child more than any

of the other indices, i.e. weight for age and height for age was shown to be significantly affected by recent illnesses (36,47). In the present study history of fever and diarrhoea in the 2 weeks before the study were found to be strong predictors of malnutrition more than any of the variables studied (P-values <.0001). A positive history of cough was also associated with poor nutritional status (P value = .007). The reported incidence rates for diarrhoea, fever and cough, 35.6%, 40.30% and 52.8%, respectively were very high by any standard.

It was a paradox that in the present study immunized children tended to be malnourished. This was contrary to what one would expect. A study in Uganda (38) has shown an increase in weight for age of children after an immunization programme that achieved at total coverage rate of 63%. The percentage of children that are fully immunized in the present study was only 21.1%. One study(48) found out children immunized with the antigens BCG,Polio,DPT who also were below 6 months of age suffered statistically significant reduction in their weight for age. The study children were followed for 30 to 90 days after immunization. In the same study immunized children who also were below 80% of the Harvard median weight for age experienced larger decrease in their nutritional levels than those above.

The prevalence of diarrhoea, fever & cough was higher among fully immunized children. The difference was not statistically significant. Wether children that are frequently brought to immunization sessions present a particular risk group remains to be investigated.

CHAPTER VI

A. Conclusions

As the present study is a cross sectional one, no attempt is made to establish a cause effect relationship between the variables that are studied and the nutritional status of the study children. With all its drawbacks however, the study has brought some important findings to focus on. These are believed to be of particular benefit to the concerned PHC worker especially in the MCH sector.

1. Very few children (0.6%) were started on supplementary diet before the age of 6 months. Efforts must continue to teach mothers to give their children supplementary diet at the right time that is both qualitatively and quantitatively sufficient.

2. The greater the number of young children in a household the higher the likelihood that they will be malnourished. The introduction & accessibility of contraceptive methods may strongly help alleviate the malnutrition problem.

3. Illnesses like diarrhoea, fever and cough should be viewed as a threat to the child's life. Managing such children by health workers must include educating mothers to feed these children vigorously. The use and availability of ORS in the village should be what every health worker strive for.

4. There seem to be more variables which affect the nutritional status of the children than included in the present study . Future studies of this kind better include such variables as source of water, availability and use of latrines, degree of crowding in residences... etc. Longitudinal studies would be preferable to elucidate the relationships. This is the kind of undertaking that a District Health Manager can carry out in his/her district of responsibility in the course of his/her duties.

5. Establishing a local events calender, though time consuming must be an integral part of any nutrition survey (except for emergency situations) in a rural set up for increasing the reliability of the age of young children reported by mothers. Establishment of lay reporting of birth by community health workers would be benficial in this direction.

B. RECOMMENDATIONS

1. The proportions of children that are started on supplementary diet before the age of 6 months is very low. This may be a result of lack of knowledge on the part of mothers. It is recommended that every health worker should exploit every opportunity to explain to mothers to start their children with supplementary diet between the ages of 4 to 6 months.

2. The number of children below 5 years of age in a given household was inversly associated with their nutritional status. Amongst measures that could possibly be entertained as a solution to the problem, child spacing is one. It is recommended that family planning services be extended & strengthened in all health institutions in the awraja.

3. The impact of recent illnesses like diarrhoea, fever & cough on the nutritional status of study children is demonstrated. Emphasis should be given to the nutritional status of children presenting with above symptoms to health units. We recommend appropriate treatments of synptoms & feeding children as frequently as possible during their sickness and convalescence.

4. It is recommended that ORS should be available in each village. This must include demonstration of preparation and use of ORS to mothers. Emphasis should also be given to use of home-made rehydrating fluid.

5. We recommend a study to be conducted to determine the effect of immunization on nutritional status. It is also suggested that similar studies be conducted in other areas.

6. Results of study should be communicated to administrators, community leaders, health personnel & agricultural workers so as to ensure a combined effort to alleviate the problem of undernutrition.

CHAPTER VII

ANNEXES

ANNEX A

Household/Mother No. _____

Title: Risk factors in childhood malnutrition in Dodolla Woreda, Genale Awraja, S.E. Ethiopia.

Part I. Household/Mother questionnaire

1. Date of interview .....
2. Name of interviewer.....
3. Name of village.....
4. Name of head of household.....
5. Name of respondant.....

0 Not Mother

1 Mother

6. List of members of household

No.	Name	AGE	
		Year	Month	Sex
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

Family size _____

No. of children 6 - 59 months old _____

Age of mother _____

7. Is the family a member of farmers' producers' co-operative?

Yes No

8. How many quintals of the following did you harvest last year?

Wheat_____ X Birr _____ = _____.

Barley_____ X Birr _____ = _____.

Maize _____ X Birr _____ = _____.

Sorghum_____ X Birr _____ = _____.

Teff _____ X Birr _____ = _____.

Total income from cereals _____ Birr

9. Does your husband have another wife?

0 No

1 Yes

10. Can the mother read & write Amharic Oromigna?

0 No

5 Yes

If yes, how many years of formal schooling had she had? 10 x _____ years.

11. How old were you (the mother) when giving birth to your first child? _____years.

12. Are parents of the child/children alive?

1. Both parents alive & living together.
2. Both parents alive but not living together.
3. Only mother alive.
4 Only father alive.
5. Both parents dead.

13. Do you own a cow (cows)?

0 No

1 Yes

14. Do you keep chickens?

0 No

1 Yes

15. Do you grow vegetables?

0 No

1 Yes

Child No._____

Study No. _____

Part II child Questionnaire

1. Name of child _____

2. Age of child _____

Date of birth ____ _____ _____

Day Month Year

Age stated by respondent _____ months.

3. Sex of child 0 Male

1 Female

4. Is the child the first son/daughter to the mother?

0 No

1 Yes

If not, what was the birth interval between this child & his/her next elder sibling?

_____months.

5. Is the child still breast feeding?

0 No

1 Yes

If not, at what age did he/she stop breast feeding?

_____months.

6. How old was the child when he/she was started on supplementary diet other than breast milk?

_____ months.

7. Did the child have any of the following symptoms in the last 2 weeks?

Diarrhoea	0	No	1	Yes
Fever	0	No	1	Yes
Cough	0	No	1	Yes

Child No _____

8. Does the child have an EPI card?

0 No

1 Yes

If no EPI card, look for BCG Scar.

0 No

1 Yes

If yes, record respective dates at which the child was immunized against:

BCG	_____	0	No	1	Yes
Polio 1	_____	0	No	1	Yes
Polio 2	_____	0	No	1	Yes
Polio 3	_____	0	No	1	Yes
DPT 1	_____	0	No	1	Yes
DPT 2	_____	0	No	1	Yes
DPT 3	_____	0	No	1	Yes
Measles	_____	0	No	1	Yes

0 Not immunized

1 Defaulter

2 Not complete because of age

3 Completely immunized

Part III. Anthropometric Measurements

1. Age of child .....Months.

2. Sex of child

Male

Female

3. Body weight (Kgs.) _____

4. Height/Length (cms.)_____

5. Mean weight for length _____

6. Weight for length (Z-score)_____

ANNEX B

Risk Factors in PEM in children 6-59 months old in Dodolla Woreda, census form.

Date _____

Name of village _____

House No. _____

Name of head of household _____

List of children 6-59 months old.

No.	Name	Age	Sex
1			
2			
3			
4			
5			

Total Number of children 6-59 months _____

ANNEX C

INSTRUCTIONS TO INTERVIEWERS

In order to ensure consistency in the process of data collection interviewers were instructed to strictly adhere to the following instructions.

1. Before starting interviewing make sure that there is at least one child in the age group 6-59 months in the household.

2. Unless circumstances forbid always look for the mother to answer the questionnaire.

3. Read questions as they are written in @Oromigna@, do not interprete.

4. Use pencil to fill all answers.

5. Try as much as possible to get all questions answered. Leave no blank, but write "no information" if respondent is not able to answer questions.

6. If you find more than one mother in a household use separate questionnaire for each one of them.

7. When you find more than one child in the age group 6-59 months old in a household attach child's questionnaire to the main questionnaire with staples.

8. Write numbers and letters in an elligible and clearly readable manner.

9. Do not ever write on the space provided for coding.

10. Never forget to write household/mother number and child number on the space provided on the upper right hand corner of each page.

11. If you find a closed house or no respondent, return to the same house next day, only once.

CHAPTER VIII

REFERENCES

1. WHO Technical Report Series No. 593. 1976 (Methodology of Nutritoinal Surveillance. Reprot of a joint FAO/UNICEF/WHO Expert committee)

2. Alma-Ata 1978: Primary Health Care Geneva, World Health Organization. 1978 ("Health For All"series No 2

3. Quoted from Cicely D. Williams & Derrick B. Jelliffe. Mother and Child Health; Delivering the services Oxford Medical Publications. Second impression. 1976 London PP 39

4. WHO Technical Report Series. No. 667, 1981. The role of the health sector in food & nutrition. Report of a WHO Expert Committee WHO Geneva

5. Bengoa J.M & Donoso, G. Prevalence of protein - calorie malnutrition. 1963 to 1973. PAG Bulletin, 4 (1); 24 - 35 (1974)

6. Reprot on the base line survey, part 2 Joint WHO/UNICEF Nutrition Support Programme in Ethiopia, ENI, Addis Ababa, December 1986.

7. Tafari' N. Anthropometric data on underprevileged preschool Ethiopia children. Eth. Med. J. 10.7 (1972)

8. Nutrition survey, ENI, 1980

9. Lives in Peril. Protein & the child. Food agr. organ. U.N., Rome, 1970, P.7.

10. Berg & Muscat. Nutrition & development. The view of the planner. Am. J. Clin. Nutr. 25, 1972, PP 186 - 209

11. Nutritional surveillance. WHO Geneva 1984. P 29

12. James P. Grant, UNICEF, 1986. The state of the World's Children, Oxford University Press, PP 134 - 135.

13. Y. Hofvander & R. Eksmyr. Anthropometry of children in a typical rural district & an urban slum in Ethiopia, CNU report series No. 37

14. Girma & Teshome. Report on the nutritional status of children in A.A, ENI. A.A July 1985

15. Jelliffe D.B. The assessement of the nutritional status of the community. Geneva, WHO, 1966 (WHO monograph series No. 53)

16. Gomez. F. et al. Mortality in second and third degree malnutrition. Journal of tropical paediatrics and African Child Health, 2:77 (1956)

17. Bengoa, J. M. The problem of malnutrition. WHO chronicle, 28:3-7 (1974)

18. M. Gueri et al. The Gomez classification. Time for a change? Bull. WHO 58 (5): 773 - 777 (1980)

19. WHO Technical Report Series, No 477, 1971. (Joint FAO/WHO Expert Committee on Nutrition Eighth report)

20. McLaren, D.S. & Read, W.W.C. Classifications of nutritional status in early childhood. Lancet, 2:146 - 148 (1972)

21. Waterlow, J.C. Note on the assessment & classification of PEM in children. Lancet, 2: 87 - 89 (1973)

22. J.C. Waterlow et al. The presentation & use of height & weight data for comparing the nutritional status of groups of children under the age of 10 years. Bull WHO, 55 (4): 489 - 498 (1977)

23. Habicht, J. P. et al. Height and weight standards for preschoold children. Are there really ethnic difference in growth potential? Lancet 1:611 - 615 (1974)

24. R. Eksmyr. Anthropometry in previleged Ethiopian preschool children. CNU report No. 33. Acta Paediat. Scand. 59: 157 - 163, 1970

25. H.C. Stetler et al. Nutritional status of preschool children in Togo. Bull. WHO 58 (6): 889 - 895 (1980)

26. WHO, Measuring Change in Nutritional status. Guidlines for assessing the nutritional impact of supplementary feeding programmes for vulnerable groups, Geneva, 1983

27. Scrimshaw et al. Interactions of nutrtion & infection. WHO monograph series No. 57 P. 12, 1968, WHO Geneva.

28. R. Bairgi. Is income the only constraint on child nutrition in rural Bangladesh? Bull. WHO 58 (5); 767-772 (1980)

29. A. Al-Dabbagh & G.J Ebrahim. the preventable antecedents of childhood malnutrition; Jour. trop. Paed. Vol. 30 PP 50 -52. February 1984

30. C.G. Victoria et al. Risk factors for malnutriton in Brazilian children: The rate of social & environmental variables. Bull WHO, 64(2); 299-309 (1986)

31. F. Mrisho. Malnutrition in Tanzania Proceedings of the fifth meeting organized by the Italian Medical Team. Tanzania PP 7 -16, 7 - 8 October 1985.

32. H.J.L Burgess et al. The nutritional status of children aged 0 - 5 years in NKHOTAKOTA, Malawi Trop. geogr. Med., 27 (1975) 375 - 382

33. S. Mehta et al. Growth profile of preschool children from an urban low socioeconomic community in India. Trop. Geogr. Med. 29 (1977) 177 - 186

34. M.W. Van Roosmalen - Weibenga et al. Action oreinted assessment of nutritional status of young children in Mbozi - SW Tanzania. East Afr. Med. J. Vol. 62 No. 9 September 1985

35. Treatment & Prevention of Acute Diarrhoea, WHO Guidlines for Trainers of Health Workers, 1986, WHO, Geneva

36. Phillip L. Graitzer et al. Anthropometric indicators of nutritional status & morbidity. Jour. Trop. Paed. Vol. 27 (1981) 292 - 298

37. A.W. Woodruff et al. Children in Juba, Southern Sudan: The second & third years of life. The Lancet, September 13, 1986: 2 (8507): 615 - 8

38. R. Cook. Immunization programmes in the context of prevention of malnutrition. WHO monograph series No. 62 PP 268 - 276, 1976. WHO, Geneva

39. Theodore Colton, Sc. D. Statistics in Medicine. Little, Brown & Company 1974 PP 161

40. WHO working group. Use & interpretatin of anthropometric indicatros of nutritional status. Bull WHO, 64(6);929 - 941 (1986)

41. A.E. Dugdale. An age independent anthropometric index of nutritional status Am. J. Clin. Nutr. 24: 1174-6, 1971

42. Jelliffe & Jelliffe. Age - independent anthropometry Am. J. Clin. Nutr. 24: 1377 - 1379, 1971.

43. የገበረ ምቸ አምራችቸ የሕብረተ ሥራ ማኅበራተ መመሪያ፣የኅ.ኢ.ጊ. ዐ. መ ብርሃንና ሰላም ማተሚያ ቤተ ሰኔ 1971 አ.አበባ.

44. M. Belew et al. Anthropometric, clinical & biochemical studies in children from five different regions of Ethiopia. Reprinted from the Journal of Tropical paediatrics & environmental child health. September 1972, CNU Report Series No. 65

45. Abolghassem Djazayery et al. Assessemnt of the nutritional status of preschoold childrne in Mahabad Rural Areas Jour. Trop. Paed. Vol. 29, Dec. 1983 PP 329 - 332

46. Carlow. R. W., Vaidya. K. Birth interval & the survival of children to age five - some data from Nepal. J. Trop. Paed. 29:31, 1983

47. A. Tomkins. Nutritonal ststus & severity of diarrhoea among preschool children in rural Nigeria. The Lancet, April 18, 1981

48. Arnfried A. Kielmann. Weight flactuations after immunization in a rural preschool child community. Am. J. Clin. Nutr 30: 592 - 598, 1977

DECLARATION

I, the undersigned, declare that this thesis is my work and that all sources of material used for this thesis have been duly acknowledged.

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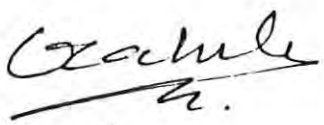
Signature 

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