FACTORS INFLUENCING CHILDREN'S NUTRITIONAL STATUS IN ADAMI-TULU WOREDA

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Abbreviation

ARI:- Acute respiratory tract infection

ENI:- Ethiopian Nutrition Institutions

H/A:- Height-for-age

MOH:-Ministry of health

MUAC:- Mid-upper arm circumference

NCHS:- National Centre for Health Statistics

OR :- Odds ratio

PEM:- Protein Energy Malnutrition

SD:- Standard deviation

W/A:- Weight-for-age

W/H:- Weight-for-height

WHO:-World Health Organization

Abstract

Ethiopia is one of the developing countries where malnutrition and communicable diseases represent the major health problems. A community based cross sectional study was done in Adami-Tulu Woreda to determine and identify factors influencing nutritional status of children between 6 and 59 months of age in rural communities.

The result showed a high prevalence of malnutrition. Out of 568 children who were involved in the study, 255 (44.9%) were well-nourished and 313 (55.1%) malnourished, 264 (43.3%) under-weight, 210 (37%) stunted and 103 (18.1%) wasted. The rates of sever and moderate malnutrition were highest when using weight-for-age scale.

Age of the child, ethnicity, availability of latrine, family income, birth order, frequency of feeding and weaning age were significantly associated with nutritional status. As the prevalence of malnutrition among the children was found high and it is recommended that nutritional intervention aiming at altering the local factors be implemented all relevant social sectors in a coordinated way.

Introduction

Ethiopia is one of the countries in the horn of Africa with a population of about

54 million and life expectancy of 48 years with per capita income of 120 US dollar per year. In Ethiopia malnutrition and communicable diseases represent the major health problems. Malnutrition is common in all population groups, but children under five years old and women during pregnancy and lactation are most severely affected (1, 2).

Ethiopia has a large number of ethnic groups whose food and dietary habits and practices are highly diversified. The influencing factors for malnutrition vary from area to area, this may be due to cultural and environmental factors. In both agrarian and pastoral societies production, distribution and consumption of food determine the level of nutritional status (3). Food habits and choice also depend on what is available in the area or in the household (2).

Ethiopia ranks first in Africa and tenth in the World in its live stock population, though the amount of meat consumed per person is very small. This is due to the fact that live stock are considered as a sign of prestige among pastoralists and used by farmers for plowing rather than objects of consumption as source of protein. Milk production is similarly small because of low yielding breeds, lack of adequate grazing land and forage and inadequate veterinary services. Poultry is raised by most rural and urban households, but chicken and eggs are usually sold in the town for cash. The rift valley lakes and most of the large rivers have great fish resources but the consumption of fish is very limited owing to cultural aversion to eating fish and poor transporting system. A considerable number of food avoidance persist in Ethiopia, different among different ethnic, social, occupational, religious, age, and gender groups (2, 4, 5).

According to Ministry of Health (MOH) report of 1987, the prevalence of malnutrition in different regions of Ethiopia varies. It range from the lowest 27% under-weight in Addis Ababa and Harrarge to the highest 46% under-weight in Wollo (4).

The nutritional status of rural children was worse than that of urban children. The weight of about 50% of rural children was below 80% of the reference weight-for-age. Also, the weight of 7 to 13 percent of rural children was below 80% of the reference weight-for-height and the height of 28 to 53 percent of children fell below 90% of the reference height-for-age (2, 6). The nation wide survey conducted in 1993 among 6 to 59 months age group, 64.2% were found to be stunted, 8% wasted, and 47.7% underweight (7).

The nutritional status of Ethiopian children have shown seasonal variation due to seasonal fluctuation in food availability. This has been demonstrated in study done in rural Ethiopia (2). During the post harvest season 27% of the children were classified as normal by weight-for-height and weight-for-age indices, 7% were simultaneously wasted and stunted, and 27% were affected by different degrees of stunting. Before harvest season 16% were both wasted and stunted and 74% were stunted showing the effect of chronic malnutrition. Despite the country's agricultural potential, the stage of agricultural development is low and food consumption per head is well below the optimal level. The daily per capita calorie supply is the lowest (73%) in the world (2, 3, 8).

The low rate of food production is due to the primitive farming practices, high storage loss, inadequate and inefficient food transport systems, ignorance about

health family planning and nutrition, food taboos and malpractice, the high prevalence of infectious disease, the high proportion of vulnerable groups, low food purchasing power and drought. All of these play important roles in causing the poor nutritional status of the Ethiopian people (2, 3).

In Ethiopia the under five children constitute about 18% of the total population and out of these 90% of them are in the age group 6-59 months. They are the most vulnerable group with high morbidity and mortality (208/1000 live births) mainly due to infection and malnutrition. Identifying local risk factors and evaluating using available resources to benefit the largest number at risk of the consequences of malnutrition is mandatory (2, 7, 9, 10).

Therefore, with the aim of nutritional assessment and to identify influencing factors of nutritional status, the study was done in Adami-Tulu Woreda, East Showa Zone. Adami-Tulu Woreda is one of the 14 Woredas of East Shewa Zone of Oromia Administrative Region. It has 63 peasant associations and three towns of which Zeway is its capital town (11).

Literature review

Malnutrition has been defined by Gomez as a pathological condition of varying degrees of severity and diverse clinical manifestations, resulting from the deficient assimilation of the components of the nutrient complex (12). Food shortage can be acute shortage leading to mild or severe famine and long standing moderate food shortages, combined with poor utilization and misuse of available foods leading to chronic malnutrition (13).

Children are subject to continuous changes as they grow mentally, physically and emotionally. In less developed countries, children are particularly prone to the dangerous combination of malnutrition and illness (14). The 6-24 months period in a child's life has been identified by several workers as being critical for being able to meet the nutritional needs. This is the period when there is a gradual change from exclusive breast feeding to the family diet and if breast milk is not supplemented with suitable energy dense complementary feeds, growth falters. In developing countries under-nutrition occurs commonly at this time due to late and inappropriate nutrition intervention (15).

According to Haaga et al report of 22 developing countries, 39% of the children aged 6 to 59 months in developing countries weigh less than 80% of the WHO

(World Health Organization) reference median weight-for-age (16).

Study from China shows that, the prevalence of stunting among the preschool children in the study area were more than 40%, wasting less than 3%, and low weight-for-age 24-28% respectively (17). Similarly Indian study conducted 10 years back have shown that, 45% of the preschool children were under-weight, 51% were stunted, and 21% were wasted. The rate of severe malnutrition using any of these criteria were low and only 9.6% of them were both wasted and stunted (18).

Household food availability is the most important determinant of the nutritional status of a community and it is influenced by local food production and food price. Rain fall can be a fairly reliable indicator of variations in food production. Peasant agriculturists and pastoralists who harvests once a year, food has to be stored for the rest of the year with gradual consumption from the reserve. There is the liability to develop specific deficiency disease, when a large proportion of the dietary energy comes from a single staple food, such as, a cereal or starchy root (3).

Economic constraints are major factors in predisposing poor child nutrition, but limited knowledge and bad practices of child feeding and food hygiene were also found to be important. Some of the women are reluctant to add oil to the diets of children and further more they may also believe that cheese may impair their intellect, while eggs delay speech and cause stammering. The other negative practices include; the custom of stopping breast feeding during episodes of diarrhoea, late introduction to solid food, providing small quantities of food

during weaning, reluctance to wash milk bottles with detergents and not boiling water to prepare other feeds (19).

Increasing the calorie-density of weaning foods can be attempted by adding oil, fat or sugar and/or by malting. The use of oil, fat and sugar is often limited by cost or by cultural considerations. Malting is less appreciated ancient traditional technique in various parts of the world, including India and Africa (20).

Study from Brazil had showed that, of the social variables studied, family income and father's educational level were the two risk factors that have the strongest association with the nutritional status. Environmental variables, particularly the type of housing, degree of crowding and type of sewage disposal were also strongly associated with malnutrition (21).

Study from Tanzania, showed that mother's education and frequency of feeding have considerable effect on nutritional status of children. Educated mothers had children with better nutritional status than non-educated mothers. Children who were fed three or more times a day were far better off nutritionally than those who were fed two or fewer times a day (15).

A high maternal work load had a negative impact on the nutritional status of young children (less than 2.5 year) despite ensuring higher family income. Mothers with heavy work load, away from home for more than 3 hours/day, their children were more wasted (35% v 17%) when compared to those children whose mother's were away from home less than three hours/day (19). In Mali the prevalence of protein energy malnutrition (PEM) was found to be higher among

children whose father had more than one wife (22).

Birth order was considered important because of its effect on child nutrition. A high birth order was associated with short birth intervals with the resultant adverse effects upon health and nutrition of the child. High birth order indicated also an elderly women who were likely to be less educated (23). When there were many children in a family there was less food for each person. Because the mother had so much work to do, she might not pay enough attention to feeding the smaller children. If a mother had pregnancies too close together, the health of both babies and the mother, would suffer. She would have less breast milk to feed the younger baby and also the older child would get less time for care and become malnourished. Poor families could not afford to buy or grow enough food for every one in the family (24).

Report from Nepal, indicated that death within five years was three times more likely in children with pre or post-birth interval less than 18 months compared to children within interval of 42 months or more (12).

Few nutritional studies were carried out in Ethiopia before the Interdepartmental Committee on Nutrition for National Defence (ICNND) conducted a country wide survey in 1958 which was followed by a series of surveys and research projects conducted by the Ethio-Swedish Paediatric Hospital in Addis Ababa, the Ethiopian Nutrition Institute (ENI), the Central Statistics Office, and other institutions (2).

According to the survey done by the ENI in 1980, the recommended dietary

allowance (RDA) for Ethiopian ranged from 57% to 96%. Dietary studies in the four major agricultural ecosystems revealed considerable variations in the contribution of calories and nutrients from different food groups. In the pastoralist communities, milk, butter, and cereals accounted for more than 90% of calories. All other nutrients, except Vit C, were obtained from milk and wild plant products. In the grain Zone, cereals accounted for the major intake of calories and most other nutrients (2, 3).

Age at first delivery, birth order, family size, and illnesses like diarrhoea, measles, malaria, and ARI have marked effect on the health of the child and the mother (25). It was estimated that there are about half a million under-five deaths annually in Ethiopia. Hospital data indicate that the major causes of morbidity and mortality are related to infections and malnutrition (7, 26). Because of multiple effects on host nutrition and metabolism, infection results in nutritional deterioration that must be corrected during convalescence. When these is precluded by limitations in the adequacy and availability of food and infections are frequent, progressive deterioration in nutritional status occurs (27).

Growth assessment is the single measurement that best defines the health and nutritional status of children, because disturbances in health and nutrition, regardless of their etiology, invariably affect child growth. It also provides an indirect measurement of the quality of life in an entire population (28).

To measure malnutrition, you may use biochemical or laboratory methods, dietary history and clinical including anthropometry and physical examination. The first two methods are expensive and need qualified health personnel to use and

difficult to assess children under field condition. The last method especially anthropometric measurements are particularly suitable for field studies because they are non-invasive, relatively inexpensive and relatively easy to do. The anthropometric measurements while being relatively simple, do require adequate training and standardization of technique (12, 29).

In-order to distinguish the phase and degree of protein-energy malnutrition, weight-for-height can be considered as a measure of the degree of acute under nutrition or wasting. While height-for-age reflects the level of malnutrition in the past, that is, impairment of physical development, stunting. Weight-for-age and the mid-upper arm circumference measurements (MUAC) have been extensively used to monitor early child growth in many developing country situations. The use of arm circumference as an indicator for detection of protein energy malnutrition in routine health check-up is supported by its low costs, simple technology, and an acceptable degree of correlation with weight-for age (17, 30).

The ENI survey clearly showed that children followed the same weight increment pattern as children of the same age in developed countries upto the age of 6 months, after which there was a relative deterioration. As far as height and age are concerned, the same studies reveal that there is also a gradual downward deviation with increasing age, reaching about 90% of the standard at approximately 2 years of age and continuing at slightly above this level. Arm circumference, also declining, the mean is down to 80% of standard at about one year of age and then, there was no marked change observed (2, 31, 32).

Young children (6 to 59 months of age) with mild-to-moderate malnutrition using

weight-for-age had 2.2 times risk of dying during the follow-up period than their better nourished counterparts. While severely malnourished young children had 6.8 times higher risk of dying during the follow-up period than better nourished children (16).

Attempts to reduce child mortality in developing countries through selective primary health care have focused primarily on the prevention and control of specific infectious diseases, with less effort being directed to improving children's underlying nutritional status. This may be due to lack of information on nutritional risk of morbidity and mortality or nutritional intervention being too complicated compared with alternative disease control programmes (33).

Generally children 6-59 months of age are more vulnerable to malnutrition. The risk of malnutrition increase with decreasing in socio-economic development. Factors that are contributing to malnutrition varies from country to country. Identifying the under lying causes of malnutrition in a particular locality is important approach to solve the nutritional problem.

General objective

To determine and identify factors influencing nutritional status among children 6-59 months of age in Adami-Tulu Woreda, East Shewa Zone.

Specific objective

1. To determine nutritional status of children 6 to 59 months of age in the study area.

2. To identify factors influencing nutritional status among children 6 to 59 months of age in the study area.

Methods

1. Study design

The study utilizes a cross-sectional epidemiological study design with both descriptive and analytical components. It was conducted in the period from October to December, 1995.

2. Study area

The study area was in Adami-Tulu Woreda, East Showa Zone, with a total population of about 84,500, out of which 28,357 are urban and 56,143 are rural inhabitants (16). Zeway town, the district capital is found 160 Km, South East of Addis Ababa, on the main road to Shashamane. It is situated in the rift valley near to lake Zeway.

The climate of Adami-Tulu Woreda is 85% Kolla and 15% Woinadega with minimal rain fall in a year. Its altitude ranges between 1,400 to 1,800 metre above

sea-level. The area was repeatedly attacked by drought and famine (3). Muslims dominate in the rural communities while in the urban communities Christians dominate.

The main ethnic groups in the Woreda are Oromo, Amhara and Gurage. The rural population depend on farming. The main agricultural products are maize, bean, tef, wheat, and sorghum. The main staple food is of cereal origin. The health institutions found in the Woreda are one health center, one health station and two pharmacies (3, 16).

3. Study population

The study population were all children in the age group 6 to 59 months in the three selected peasant associations. Children were included in the study according to the following criteria.

Inclusion criteria

1. Children 6 to 59 months of age.
2. Children and parent who resided in the area for six or more months before the study began.

Children in this age group were selected because:-

1. prevalence of malnutrition is high.
2. the morbidity and mortality from malnutrition is high in this age group.
3. the cause of malnutrition is the reflection of socio-economic level of the community.

Exclusion criteria

- critically sick and grossly deformed child.

4. **Sampling method**

Ten of the 63 peasant associations that are reached within 10 Km radius from Zeway town were included in the study for logistic reasons. Out of 10 peasant associations identified using table of random number three peasant associations were randomly selected. All children in these peasant associations were selected according to inclusion criteria and included in the study.

5. **Sample size**

The prevalence of malnutrition in pre-school children in rural communities of Ethiopia using height for age range from 28 to 53%. Taking 30% prevalence rate of malnutrition, expecting a maximum disparity of 4% between the study and underlying population level at 95% C.I and power of 80%, the sample size calculated was 555.

7. **Data collection**

Key informant discussions were held in the study area to develop a structured questionnaire. Key informants were two elderly men and three elderly women: from Oromo, Amhara and Gurage ethnic group. They were asked separately about their attitude, knowledge and practice of their culture, food habit and food taboos as well as child rearing, breast feeding, supplemental and weaning age. Then the questionnaire was pretested in a community adjustent to the study area. Correction were made on the questionnaire following the pretesting. The

questionnaire was firs developed in English and later translated into Amharic and again back translated into English to check for consistency.

Twelve individuals who completed 12 grade were recruited as research assistants. To minimize inter-observer variation of data collectors and increase their performance in field activities, training of five days was given on the aim of the research, content of the questionnaire, and how to conduct questionnaire interview. Collected data was checked every day by principal investigator for its quality and coding. Data collection was completed in one and half months.

6. Measurement

Anthropometric measurements (weight, height, and arm circumference) were done for all children included into the study. All anthropometric measurements were taken by the principal investigator and recorded by a research assistant. Weight was measured in kilogram to the nearest 0.1 Kg. Salter hanging scale for children 6 to 23 months and beam scale for children over 24 months of age were used for measuring weight. Instruments were checked against a standard weight for its accuracy daily. Calibration of the indicator against zero reading was checked following weighting every child . Length was taken with length board for those children less than two years of age, while height was taken for children two and above years in centimetre. Length and height were measured to the nearest 1 cm. Left mid-upper arm circumference was measured to the nearest 1 mm. Weight, height and AC measurements were taken three times for every child and the average was taken for analysis.

The nutritional indicators, weight-for-height, weight-for-age, height-for-age and arm circumference-for-age were compared with reference data from the United State National center for Health Statistics (NCHS). Children below -2 SD of the NCHS median for weight-for-age, height-for-age and weight-for-height were considered under-weight, stunted or wasted, respectively. Values of the indicators below -2 SD of the median were considered to represent moderate under nutrition, while values below -3 standard deviation (SD) were taken to indicate sever malnutrition (34, 35, 36).

8. **Data processing and analysis**

Following data entry and clearing, analysis was done using EPI-INFO version 5 And SAS statistical packages. Editing and clearing data was done together with computer assistance. Frequency distribution were printed and unusually extreme values checked. Cross tabulations of related variables were examined and unexpected results checked. A bivariate and multivariate analysis were done to see for association and control for confounders, respectively. Odds ratio with 95% confidence intervals were used to show the significance of the association.

Ethical consideration

Ethical clearance was obtained from the Faculty of Medicine Research Committee for the study. Permission from the Adami-Tulu Woreda Administrative officials and leaders of peasant associations were obtained before field activities started.

Verbal consents were obtained from the Parents/guardians of the study subjects after explaining the study objectives and procedures.

Those children with health problems were treated on the spot by principal investigator and/or referred to health center for further management.

Results of this study will be provided to public health planner in the East Showa Zone and Adami- Tulu Woreda.

Operational Definition

Family size:- The total number of people living in a house during the study period.

Literacy:- Ability to read and write.

Quintal:- A unite of weight measurement which is about equal to 100 Kg.

Parent :- Biological father and mother.

Diarrhea:- Three or more loose stools over a period of 24 hours.

Supplemental Diet:- Any kind of food items (liquid or solid-form) other than breast milk.

Standard NCHS references:-

Z-score:- values used by NCHS, defined as SD score.

Wasting:- having <80% weight/height or Z-score <-2SD.

Stunting :- having <90% height/age or Z-score <-2 SD.

Under-Wt:- having <80% weight/age or Z-score <-2SD.

Kolla :- Altitude below 1500 metre above sea-level.

Woinadega:- Altitude 1500-2400 metre above sea-level.

Income :- It is periodical monthly (total annual) receipts from one's business, lands, work, investment, etc. Monthly Income of the family was estimated by converting what they have and got in a year to cash form and dividing to 12.

Result

A total of 568 study subjects were included in the study out of which 304 (53.5%) were males and 264 (46.5%) were females. The mean age for the study subject was 27.7 months for both sexes (Table 1). The majority 541 (95.2%) were born to married couples.

A total of 425 mothers responded to the questionnaire, out of this 288 (67.8%) had single child, 131 (30.8%) had two and 6 of them had three children in the age group 6-59 months, respectively. Out of 568 children from the three selected peasant associations who were involved in the study, 188 (33.1%) study subjects were from Edokontolla PA, 182 (32.0%) children from Weshigulla PA and 198 (34.9%) children from Gerbi-Gelgile PA.

The dominant ethnic group was Oromo constituting 382 (89.9%) of the total. Most of the parents were illiterate, (41.5%) of the fathers and 299 (70.4%) of the mothers. The dominant religion was Muslim (68.2%) followed by Christian (27.5%), and the rest (4.2%) believe in traditional ways such as Geda. Most of the parents 352 (82.8%) were farmers (Table 2). The majority of the houses were

with thatched roof (90.1%), had only one room (92.0%), were with out separate kitchen (81.2%), obtain drinking water from protected source (89.7%) and had no latrine (90.6%).

Table 1- Distribution of studied children by age and sex in Adami-Tulu Woreda, East Showa Zone, 1995.

Age(mnths)	Male (%)	Female (%)	Total (%)
6-11	40 (7.04)	32 (5.63)	72 (12.7)
12-23	79 (13.91)	57 (10.04)	136 (23.9)
24-35	76 (13.38)	78 (13.73)	154 (27.1)
36-47	59 (10.39)	52 (9.16)	111 (19.5)
48-59	50 (8.80)	45 (7.92)	95 (16.7)
Total	304 (53.52)	264 (46.48)	568 (100%)

Table 2:- Socio-economic, demographic and housing characteristics of the parents subjects in Adami-Tulu Woreda 1995.

Variable	(n=425)	Per cent
Study subject/mother		
One child	288	67.77
Two children	131	30.82
Three children	6	1.41
Educational level		
Mother		
Illiterate	299	70.35
Read and write	64	15.06
Formal education	62	14.59
Father		
Illiterate	175	41.47
Read and write	101	23.93
Formal education	146	34.60
Occupation		
Farmer	352	82.82
Daily labourer	38	8.94
Civil servant	27	6.35
Merchant	5	1.18
Others	3	0.71
Ethnic Group		
Oromo	382	89.88
Amhara	20	4.71
Others	23	5.41
Marital status		
Married	405	95.29
Widow	12	2.82
Divorced	5	1.18
Single	3	0.71
Religion		
Christian	117	27.53
Muslim	290	68.23
Traditional	18	4.24
Housing condition		
Roof		
Corrugated	42	9.88
Thatched	383	90.12
Room		
One	391	92.00
Two or more	34	8.00
Kitchen		
Separate	80	18.82
In living room	345	81.18
Water source		
Protected	381	89.65

Unprotected	44	10.35	
Latrine: Yes	40	9.41	
no	385	90.59	

The prevalence of malnutrition in the study population were, 246 (43.3%) of the children under weight (low weight for age); 210 (37.0%) were stunted (low height for age) and 103 (18.1%) were wasted (low weight for height). Out of 568 study subjects only 255 (44.9%) were well nourished. The prevalence rate of malnutrition increases as age increased from 6 months to 35 months followed by a tendency to decrease there after upto 59 months of age using H/A and W/A. But when using W/H it showed a decreasing tendency after second year of age on wards. The rate of malnutrition in the study subjects using MUAC was 176 (31.0%) of the reference population. With AC the prevalence rate of malnutrition showed a decreasing tendency as age increases (Table 3).

The rates of severe and moderate malnutrition in the study population were, 84 (14.8%) and 162 (28.5%) using weight for age and 73 (12.9%) and 137 (24.1%) using height for age respectively. 24 (4.2%) were severely and 79 (13.9%) moderately wasted (Table 4).

Table 3:- Prevalence of malnutrition by age group according to HAZ, WAZ and WHZ, Adami-Tulu Woreda, 1995.

Age(m)	n=568	HAZ (%)	WAZ (%)	WHZ (%)	AC (%)
6-11	72	11 (15.28)	25 (34.72)	15 (20.83)	47 (65.28)
12-23	136	46 (33.82)	55 (40.44)	28 (20.59)	68 (50.00)
24-35	154	77 (50.00)	85 (55.19)	33 (21.43)	44 (28.57)
36-47	111	40 (36.04)	47 (42.34)	19 (17.12)	12 (10.81)
48-59	95	36 (37.89)	34 (35.79)	8 (8.42)	5 (5.26)
Total	568	210(36.97)	246(43.31)	103(18.13)	176(30.99)

Table 4:- The prevalence of severe and moderate

malnutrition among children 6-59 months of age, in Adami-Tulu Woreda 1995.

	Prevalence of malnutrition					
	HAZ		WAZ		WHZ	
	Severe	Moderate	Severe	Moderate	Severe	Moderate
Age(m)	No(%)		No(%)		No(%)	
6-11	3 (4.17)	8(11.11)	7 (9.72)	18(25.00)	3(4.17)	12(16.67)
12-23	14(10.29)	32(23.53)	17(12.50)	38(27.94)	8(5.88)	20(14.17)
24-35	29(18.83)	48(31.17)	41(26.67)	44(28.57)	6(3.90)	27(17.53)
36-47	14(12.61)	26(23.42)	12(10.81)	35(31.53)	5(4.51)	14(12.61)
48-59	13(13.68)	23(24.21)	7 (7.37)	27(28.42)	2(2.11)	6 (6.32)
Total	73	137	84	162	24	79
	(12.85)	(24.12)	(14.79)	(28.52)	(4.23)	(13.90)

Severe = -3 SD

Moderate = -2 SD

Children from Edokontolla peasant association were better nutritionally than those children from Weshigulla or Gerbi-Giligile PAs. Out of 188 children from

Edokontolla PAs, 68 (36.2%) were stunted, 69 (36.7%) under weight and 29 (15.4%) wasted. While out of 182 children from Weshigulla PAs, 73 (40.1%) were stunted, 79 (43.4%) under weight and 34 (18.7%) wasted and of 198 children from Gerbi-Giligile PAs, 69 (34.8%) stunted, 98 (49.5%) under weight and 43 (21.7%) wasted. These differences were not statistically significant except for those from Gerbi-Giligile, who were under weight with OR of 1.76 (1.11, 2.62) (Table 5).

Though not statistically significant the study revealed a higher risk of malnutrition in those children whose family have three children in the age group 6-59 months when compared to those families who have one or two children in these age group.

The infection rate identified in the study subjects using symptom complex: such as, diarrhea, fever and chills, and cough and difficulty to breath in the last one week had showed a higher rate of wasting than those children without symptom, which was statistically significant. No significant difference was observed in HAZ and WAZ measurements.

No significant association was observed between immunization status of the children and their nutritional status.

Table 5:- Family and child factors influencing nutritional status in relation to height-for-age, weight-for-age and weight-for-height in Adami-Tulu Woreda, 1995.

Variable	HAZ OR (95% CI)		WAZ		WHZ	
	Mal.	Well-nourish	Mal.	Well-nourish	Mal.	Well-nourish
Peasant association						
Edokontola	68	120 1.00	69	119 1.00	29	159 1.00
Weshigula	73	109 1.18(0.76,1.84)	79	103 1.32(0.85,2.05)	34	148 1.26(0.71,2.25)
Gerbi-Gil.	69	129 0.94(0.61,1.46)	98	100 1.76(1.11,2.62)	43	155 1.49(0.86,2.59)
Study subject/mother						
One child	106	182 1.00	136	152 1.00	55	233 1.00
Two child.	94	168 0.95(0.66,1.37)	100	162 0.68(0.48,1.02)	48	214 0.93(0.59,1.46)
Three chi.	10	8 2.36(0.85,6.67)	10	8 1.40(0.49,4.01)	2	17 0.50(0.08,2.34)
Infection in the last 7 days						
Diarrhea						
no	191	343 1.00	215	319 1.00	85	449 1.00
yes	10	24 0.75(0.33,1.68)	16	18 1.32(0.62,2.78)	11	23 2.53(1.11,5.67)
Fever & chills						
no	188	356 1.00	220	324 1.00	88	456 1.00
yes	13	11 2.24(0.92,5.47)	10	13 1.13(0.45,2.81)	6	18 1.73(0.59,4.78)
Cough & difficulty to breath						
no	194	351 1.00	220	325 1.00	87	458 1.00
yes	6	17 0.64(0.22,1.76)	9	14 0.95(0.37,2.38)	7	15 2.46(0.88,6.66)
Immunization						
Fully	41	77 1.00	50	68 1.00	16	102 1.00
Partially	143	232 1.16(0.74,1.83)	162	213 1.03(0.67,1.61)	75	300 1.59(0.86,2.99)

Not imm.	**26**	**49**	**1.00(0.52,1.91)**	**34**	**41**	**1.13(0.60,2.11)**	**12**	**63**	**1.21(0.50,2.93)**

Note: Adjusted odds ratio not done.

The results showed a statistically significant higher chance of being malnourished in those who do not have latrine than those who have latrine with adjusted OR of 1.49 (1.32, 1.67), in those who share living room with animals than those who lived separately, house with thatched roof, among children born to Amhara ethnic group with adjusted OR of 5.49 (3.42, 6.54) than Oromo's and others, children who born to illiterate mother, in low income group with adjusted OR of 1.40 (1.17, 1.63), families who got 1-5 quintals per year with adjusted OR of 1.36 (1.20, 1.53), frequency of feeding with adjusted OR of 1.17 (1.10, 1.24), children who were weaned at age of 10-12 months with adjusted OR of 1.71 (1.45, 1.98).

Table 6 :- Family and child characteristics in relation to nutritional status in Adami-Tulu Woreda 1995.

	(n=568)	Height-for-age	
Variables	Mal.	Wel-nourished	OR (95% C.I)
Education			

Mother				
Formal edu.		29	54	1.00
Read & write		29	57	0.95 (0.48,1.88)
Illiterate		152	247	1.15 (0.68,1.94)
Father				
Formal edu.		67	128	1.00
Read & write		51	84	1.16 (0.72,1.88)
Illiterate		91	143	1.22 (0.80,1.84)
Religion				
Christian		53	103	1.00
Muslim		151	237	1.24 (0.82,1.86)
Traditional		6	18	0.65 (0.22,1.87)
Housing condition				
Roof:-				
Corrugated		18	38	1.00
Thatched		192	320	1.27 (0.68,2.38)
Room:-				
≥two		15	31	1.00
one	195	327	1.23 (0.62,2.46)	
Birth order				
First	59	105	1.00	
Second		76	130	1.04 (0.66,1.63)
≥third		70	125	1.00 (0.63,1.57)
Breast feeding				
yes	69	139	1.00	
no	141	218	1.30 (0.90,1.89)	
Supplemental feeding				
≤6 month		172	307	1.00
7-9 month		31	30	1.84 (1.04,3.26)
≥10 month		7	21	0.59 (0.22,1.51)

* Adjusted odds ratio not done.

Table 7:- Factors influencing nutritional status as measured by height-for-age (n=568) among children in Adami-Tulu Woreda, 1995.

Variables		OR (95% CI)		
	Mal.	Wel-nourished	Crude	Adjusted

Age				
6-11	11	61	1.00*	1.00*
12-23	46	90	2.83(1.29, 6.33)	2.07(0.61,3.54)
24-35	77	77	5.55(2.59,12.13)	2.79(2.21,3.84)
36-47	40	71	3.12(1.40, 7.11)	6.45(5.74,7.17)
48-59	36	59	3.38(1.49, 7.83)	3.87(3.32,4.42)
Sex				
Male	120	184	1.00	1.00
Female	90	174	1.27(0.89, 1.82)	1.28(1.13,1.29)
Ethnic				
Oromo	186	324	1.00	1.00
Amhara	12	15	1.39(0.60, 3.23)	1.03(0.35,1.71)
Other	12	19	1.10(0.49, 2.44)	1.68(0.65,2.70)
Family size				
≤5	100	164	1.00	1.00
6-10	105	180	0.96(0.67, 1.37)	1.09(0.61,1.57)
≥11	5	14	0.59(0.18, 1.81)	1.13(0.66,1.59)
Income Birr/mon.				
≥250	15	43	1.00	1.00
150-249	38	54	2.02(0.93, 4.43)	1.07(0.57,1.57)
50-149	75	140	1.54(0.77, 3.11)	1.22(0.78,1.67)
<50	82	121	1.94(0.97, 3.93)	1.12(0.63,1.60)
Latrine				
yes	11	42	1.00	1.00
no	199	316	2.40(1.16, 5.08)	1.49(1.32,1.67)
Weaning age **				
>24mt.	7	27	1.00	1.00
13-24	80	114	2.71(1.06, 7.21)	1.37(1.08,1.67)
10-12	47	57	3.18(1.18, 8.86)	1.71(1.45,1.98)
≤9	4	16	0.90(0.20, 4.54)	1.46(1.29,1.63)
Feeding freq./day				
≥5	30	83	1.00	1.00
≤4	175	265	1.83(1.13, 2.97)	1.17(1.10,1.24)
Kita(bread)				
Daily	71	145	1.00	1.00
Occ.	107	157	1.39(0.94, 2.06)	1.31(1.24,1.39)
Milk				
Daily	101	109	1.00	1.00
Occ.	108	163	0.72(0.49, 1.05)	1.13(0.87,1.38)

* Reference group
** n=350

Table 8:- Factors influencing nutritional status as measured by weight-for-age (n=567) among children in Adami-Tulu Woreda, 1995.

Variable	OR (95% CI)		
	Mal.	Wel-nourished	Crude	Adjusted

Age (m)				
6-11	25	46	1.00*	1.00*
11-23	55	81	1.25(0.66,2.37)	2.29(0.19,2.50)
24-35	85	69	2.27(1.22,4.23)	1.05(1.00,1.10)
36-47	47	64	1.35(0.70,2.62)	1.63(1.23,2.02)
48-59	34	61	1.03(0.51,2.05)	1.19(1.04,1.33)
Sex				
male	144	160	1.00	1.00
female	102	162	0.70(0.49,0.99)	1.26(1.19,1.34)
Ethnic				
Oromo	218	292	1.00	1.00
Amhara	18	9	2.67(1.11,6.56)	5.49(3.42,6.54)
Other	10	21	0.64(0.27,1.45)	1.88(0.87,2.89)
Family size				
≤5	119	145	1.00	1.00
6-10	121	164	0.90(0.63,1.28)	1.01(1.00,1.02)
≥11	6	13	0.56(0.18,1.65)	1.10(1.04,1.16)
Income Birr/mnth				
≥250	11	47	1.00	1.00
150-249	43	48	3.83(1.66,8.97)	1.48(1.21,1.76)
50-149	96	119	3.45(1.62,7.48)	1.63(1.33,1.93)
<50	96	107	3.83(1.80,8.34)	1.40(1.17,1.63)
Latrine				
yes	15	37	1.00	1.00
no	231	284	2.01(1.04,3.93)	1.62(1.42,1.82)
Frequency of feeding/day				
≥5	48	77	1.00	1.00
≤4	197	243	1.30(0.85,1.99)	1.41(1.22,1.60)
Quintal/year				
≥11	36	72	1.00	1.00
6-10	45	55	1.64(0.90,2.98)	1.44(1.22,1.65)
1-5	90	106	1.70(1.01,2,85)	1.36(1.20,1.53)
non	66	79	1.67(0.97,2.90)	1.07(1.03,1.12)
Kita				
Daily	110	144	1.00	1.00
Occ.	136	176	1.01(0.71,1.43)	1.39(1.00,1.79)
Milk				
Daily	19	128	1.00	1.00
Occ.	127	192	0.71(0.50,1.01)	1.27(1.04,1.35)
Living room with animal				
Separ.	107	166	1.00	
Togeth.	93	102	1.40(1.04,2.07)	

* Reference group

Table 9:- Factors influencing nutritional status as measured by weight-for-height (n=568) among children in Adami-Tulu Woreda, 1995.

Variable

	Mal.	Wel-nourished	OR (95% CI) Crude	Adjusted
Age (m)				
6-11	15	57	1.00*	1.00 *
12-23	28	108	0.99(0.46,2.12)	1.14(1.11,1.45)
24-35	33	121	2.20(1.09,4.49)	2.00(1.43,2.58)
36-47	19	92	0.78(0.35,1.78)	1.97(1.48,2.46)
48-59	8	87	0.35(0.13,0.95)	1.15(1.05,1.25)
Sex				
Male	61	243	1.00	1.00
Female	42	222	0.75(0.48,1.19)	1.13(0.89,1.38)
Ethnic				
Oromo	90	420	1.00	1.00
Amhara	10	17	2.75(1.13,6.59)	1.31(1.12,1.51)
Others	3	28	0.54(0.13,1.92)	2.29(1.41,3.17)
Family size				
≤5	49	215	1.00	1.00
6-10	51	234	0.96(0.61,1.51)	1.28(0.80,1.77)
≥11	3	16	0.82(0.18,3.17)	1.02(0.55,1.49)
Income Birr/mnth				
≥250	7	51	1.00	1.00
150-249	13	79	1.20(0.41,3.59)	1.06(1.04,1.09)
50-149	46	169	1.98(0.80,5.14)	1.44(1.27,1.61)
<50	37	166	1.64(0.64,4.26)	1.68(1.42,1.93)
Latrine				
yes	8	45	1.00	1.00
no	95	420	1.27(0.55,3.03)	1.62(1.42,1.82)
Weaning age **				
>24	7	27	1.00	1.00
13-24	31	161	0.74(0.28,2.06)	1.96(1.00,2.93)
10-12	17	87	0.75(0.26,2.25)	1.60(1.09,2.10)
≤9	6	14	1.65(0.39,7.00)	1.24(0.78,1.69)
Feeding freq./day				
≥5	21	103	1.00	1.00
≤4	81	359	1.11(0.63,1.94)	1.22(1.14,1.30)
Kita				
Daily	41	214	1.00	1.00
Occ.	62	250	1.29(0.82,2.05)	1.03(0.75,1.31)
Milk				
Daily	52	195	1.00	1.00
Occ.	51	269	0.71(0.45,1.11)	1.32(0.02,1.58)

* Reference group

** n=350

Discussion

This cross-sectional rural study revealed that the over all prevalence rate of malnutrition in the study population was high. Some of the study subjects were affected by more than one type of malnutrition. The prevalence of stunting was low when compared to the report of nation wide survey conducted three years back which showed 64.2% stunted children in the similar age group. But other reports are comparable to this study with 47.7% underweight (7, 26).

The result of our study was comparable to Indian study done 10 years back which showed 45% of the children were under-weight and 21% were wasted even though the rate of stunting 51% was higher than our findings (18). This may be due to different socio-economic and cultural factors between the two communities and also in their study children less than 6 months of age were included.

Our study result was also comparable to the finding of 22 developing countries that were done 11 years back, which had showed a prevalence rate of 39% below reference median weight-for-age (16). The small difference observed may be due to time difference or to difference in ecological zone that were detected in those surveys.

The risk for malnutrition increased with age in both sexes upto the age of three and then relatively decreases as age increases. This probably is due to inappropriate weaning method at earlier age and then later after the age three the improvement seen may be due to the fact that the child can demand and take adult type of food when he need (15). This is in agreement with the report from India which showed the nature of malnutrition to be strongly dependent on age (18).

The rate of malnutrition that was found using MUAC was higher when compared to weight-for-height in our finding even though both are relatively age independent. This may be due to marked seasonal variation observed in weight-for-height as compared to arm-circumference which is relatively unaffected by seasonal variation (3, 10). Our result of the MUAC was lower than weight-for-age detected, even though there is an acceptable degree of correlation to detect prevalence rate of malnutrition using MUAC and weight-for-age (12, 22).

The high rate of malnutrition observed in the two peasant associations, Weshigulla and Gerbi-Giligile PAs, probably due to lack of enough farm land as we observed during the survey when compared to Edokontolla PAs. Also the key informants have indicated that the above two PAs, have lost their farm land during the previous government (Derge). Their land was taken for state farming . But the differences observed was not statistically significant and do not warrant any further analysis by peasant association.

In our study families with three children in the age group 6-59 months, their children were more malnourished as compared to having one or two children in this age group even those not statistically significant. This was probably due to poor child care and food shortage due to many under five children. Similar finding was observed in other studies with high birth order in which malnutrition rate increased with increasing in number of under five children a family have (23, 24).

In this study infection rate in the study subjects were identified using symptom-

complex in the last one week affect acute nutritional status as observed by high rate of wasting in those with symptom than those children without symptom. This may be due to the fact that infection can cause apatite loss, decrease absorbtion and increase metabolic activity. If not adequately fed during convalescence period, it will took them a longer time to catch-up their normal growth (27). Those children who were immunized had no difference nutritionally than those who were not immunized in this study. This may be due to low EPI coverage in the study subject since some of the children were born during transition period when EPI coverage was low. The observed difference were not statistically significant.

Our study revealed a high prevalence rate of malnutrition in those who have latrine than those who do not have latrine. This may be due to the fact that the chance of getting infection was higher in those who did not have latrine there-by adversely affecting child nutritional status. There may be better home environment in those families who have latrine due to their ability to appreciate importance of hygienic condition (27). A study on our country hospital data revealed that the major causes of morbidity and mortality were related to infections and malnutrition (7, 26).

Our study did not show significant association between malnutrition and type of housing (type of roof and number of rooms); this may probably be due to inadequate sample size between these factors to detect the difference. The study from Brazil reveal a strong association with malnutrition and type of housing, degree of crowding and type of sewage disposal (21).

The risk of malnutrition was high in those who shared room with animals than those who lived separately and this may be due to economic difference between the two groups. As we observed during the survey those parents with many cattle had barrack for their cattle than the others.

The result of our study showed a strong association between family income and risk of malnutrition. It also true with the amount of quintals they got in a year. As the income and number of quintals they got increases the chance of becoming malnourished decreases. It was indicated that when income of the family decreases the risk of malnutrition in the studied children increases. The study done by Cesar and his colleges was in agreement with our finding. Of the social variables studied, family income and father's educational level were the two factors that showed the strongest association with the nutritional status (21). In our study the educational status of the parents showed a trend, with increasing educational level the risk of malnutrition showed a decreasing tendency although it lack statistical significance. This may probably be due to other factors that may contribute to nutritional status, such as income of the family.

The high rate of malnutrition observed in Amhara ethnic group in the study area when compared to other may be due to difference in Socio-economic factors. The study done by Lindtjorn and Alemu in the same area has revealed low risk of malnutrition using height-for-age and weight-for-age in Arsi (Oromo) or in people who were Muslim (3). In our study there was no significant association observed between religion and risk of nutritional status.

This study showed that, those who got milk daily were better nutritionally than

those who were fed occasionally. This may be due to high protein-calory provided by the milk and may also be a reflection of economic status.

Our study also revealed a strong association between frequency of feeding in a day and risk of malnutrition. It is known that a child with a small stomach and high metabolic rate should have to eat more frequently in order to satisfy himself and maintain optimum growth. In contrary with the Tanzanian study, this study has shown that frequency of feeding had considerable effect on nutritional status of children (15).

Children who weaned early before their first year of age were more malnourished as observed in our study. Weaning pattern affect the linear development of the child as detected in this study. One of the factors may be due to deficient in energy density of the weaning food, malpractice during child feeding and exposure of weaned child to infection and predisposing to malnutrition (19, 20, 24).

Validity

This study is internally valid because the role of chance minimized by use of 95% confidence interval. Bias was minimized by training of data collectors, regular supervision and use of random sampling method. Anthropometric measurement was taken by one person only and instruments were checked against known standard weight every day. Confounders controlled by the use of multivariate analysis.

Limitation of the study

♦ The factors expected to influence malnutrition may not be exhaustive. There could be other influencing factors which our study did not reveal.

♦ Generalizability is limited by the fact that the study was conducted in a small locality.

♦ Exact age determination was difficult as there was no birth registration in the area.

♦ Seasonal variation was not accounted.

Conclusion

The findings of the study indicated that the magnitude of malnutrition in the study

population is high. Factors significantly influencing nutritional status in the study population were: age of the child, ethnicity, short birth interval, availability of latrine, family income, daily milk consumption, frequency of feeding and weaning age.

Recommendation

1. To decrease malnutrition in the study population multisectoral approach is needed in order to co-ordinate and prevent duplicating and contradicting each other during planning and implementation.

2. The nutritional intervention should aim at identified local factors influencing nutritional status in order to decrease the prevalence of malnutrition in the area. This will be done by carrying out regular health education on the importance of adequate nutrition for the child normal growth and development.

Reference

1. Hailemariam A and Kloos H. Population. In: Kloos H; Zein Az. eda. The Ecology of Health and Disease in Ethiopia. Westview press 1993: 43-66.
2. Bekele A, Wolde-Gebriel Z, and Kloos H. Food, Diet, and Nutrition. The Ecology of Health and Disease in Ethiopia. Westview press 1993: 85-102.
3. Lindtjorn B, Alemu T, and Bjorvatn B. Dietary pattern and state of nutrition among children in drought prone areas of southern Ethiopia. Journal of Trop Pediatrics 1992; 13: 21-32.

4. MOH, Primary Health Care Review. MOH 1985.

5. Knutsson K. E and Selinus R. Fasting in Ethiopia. An anthropological and nutritional study. Am. J. Clin. Nutrition 1970; 23: 956-959.

6. Ethiopian Nutrition Institute (ENI). First round nutrition survey. Addis Ababa, ENI 1980.

7. Meksha A, Lema F, and Shiferaw T. Child health problem in Ethiopia EPHA expert group report. Ethiopian J Health Dev 1995; 9(3): 167-187.7.

8. Bekele A. Malnutrition in women and children in Ethiopia. Addis Ababa, ENI 1991.

9. Kasongo Project Team. Growth declarations among under five children in Kasongo, Zaire. WHO Bulletin 1986: 64: 5.

10. Derrick B. Jelliffe and Patrice Jelliffe E F. Community Nutrition Assessment with special reference with less technically developed countries. Oxford Medical publication 1989.

11. Tesfaye F. Health profile of Adami-Tulu Woreda, East Showa Zone. School of Graduate studies, Department of Community Health, Faculty Medicine, AAU 1994. (Unpublished).

12. Cogon J, Pickering J and Suder P. Measuring malnutrition in children in developing country. Clinical Epidemiology 1986: 513-628b.

13. Maletnlema T N. The problem of food and nutrition in Africa. Tanzania Food and Nutrition Centre. World Rev. Nutr. Diet. 1986; 47: 30-79.

14. Nabarro D. Social, economic, health and environmental determinants of nutritional status. Department of human nutrition, London school of Hygiene and Tropical Medicine, England. Food and Nutrition Bulletin 1981; 6(1): 18-32.

15. Mauric C Y, Mbago and Namfaa P. Some determinants of nutritional status of one-to-four year old children in low income urban areas in Tanzania. Journal of Tropical Pediatrics 1992; 38(6): 299-306.

16. Haaga et al. An estimate of the prevalence of child malnutrition in developing countries. World Health Statistics quarterly 1985; 35: 332-347.

17. Change Y, Zhai F, Wenjun L, Ge K, Jin D, and Onis M de. Nutritional status of preschool children in poor rural areas of China. Bulletin of WHO 1994; 72(1): 105-112.

18. Steinhoff M C, Hilder A S, Strilatha V L, and Mukarji D. Prevalence of malnutrition in Indian pre-school age children: a survey of wasting and stunting in rural Tamil Nadu. Bulletin of WHO 1986; 64(3): 457-463.
19. Rabiee F and Geissler C. Cause of malnutrition in young children. Gilan, Iran. In: Journal of Tropical Pediatrics 1990; 36(4): 165-170.
20. Editorial: Improving Nutritional dietary density and nutrient bioavailability for young children. Less appreciated considerations. Journal of Tropical Pediatrics 1990; 36:5.
21. Cesar G V, Patrick J V, Betty R K W., Jose C M. Risk factors for malnutrition in Brazilian children: the role of social and environmental variable. Bulletin of WHO 1986; 64(2): 299-309.
22. Burgess H J L et al. Growth assessment in Children. Malawi. Trop geogr Med 1975; 27: 375-382.
23. Gupta M C. Effect of ascariasis upon nutritional status of children. Journal of Tropical Pediatrics 1990; 36: 189-191.
24. MacMilan/CFNI. Nutritional hand book for community workers in the tropics. Caribbean Food and Nutrition Institute 1986.
25. UNICEF/WHO/UNESCO. Fact for life. A communication challenge. USA 1986.
26. Central Statistical Authority. National Nutritional Surveillance System. Statistical Bulletin 113. Addis Ababa May 1993.
27 Gerald T K and Nevin S S. Selective primary health care. Strategies for control of infectious disease in the developing world. Control of infection to reduce the prevalence of infantile and childhood malnutrition. University of Chicago 1986: 8(2): 273-287.
28. Onis M D, Monteiro C, Akre J and Clugston G. The world wide magnitude of protein-energy malnutrition; an overview from the WHO Global data base on child growth. Bulletin of WHO 1993; 71(6): 703-712.
29. Zerfas A. Assessment of protein energy malnutrition. Manual for anthropometry. Los-Angeles, Division of Epidemiology, school of Public Health 1985: 203-208.
30. Shrestha R M, Tyson S and Selenje L. Association between weight-for-age and Mid-upper Arm Circumference measurement (MUAC): Finding from Malawi. Journal of Tropical Pediatrics 1990; 36: 192-195.

31. Belew B M, Jacobsson K, Tornell G, Uppsall L, Zaar B and Vahlamist B. Anthropometric, Clinical and Biochemical studies in children from five different Regions of Ethiopia. Journal of Tropical Pediatrics and Environmental Child Health 1972; 18: 245-277.
32. Hofvander y, Eksmyr R. An applied nutrition programme in an Ethiopian community. Unpublished report to the Ethiopia Nutrition Institute, Addis Ababa, 1968.
33. Grant J P. The state of the World's children. Oxford University Press for UNICEF 1993 and 1994.
34. Wennberg A. WHO, Anthropometric assessment of the nutritional status of pre-school age children. Cape Verde 1988; 66(3): 283-420.
35. National Center for Health Statistics. Growth curves for children birth to 18 years. Washington DC: National Centers for Health Statistics 1977.
36. WHO. Use and Interpretation of anthropometric indicators of nutritional status. Bull. WHO 1986; 64: 929-941.
37. Tonglet R, Mudosa M, Masumbuko B D, Ibeghin and Hennart P. The causual model approach to nutritional problems: an effective tool for research and action at the local level. WHO Bulletin 1992; 70(6): 715-23.
38. Jordan M D. Anthropometric Software Package. Tutorial guide and handbook 1986.
39. Keller W and Fillmore C M. The prevalence of Protein Energy Malnutrition. Wld Hlth Stat Quart 1983; 36: 129-167.
40. Gladys B. Review of Validations of Dietary Assessment Methods. USA 1982; 115: 4.
41. Beghin I, Mirian C and Dujardin B. A guide to nutritional assessment. WHO, Geneva 1988.
42. Weiner J J and Lourie J A. Human Biology. A guide to field methods. Black Well Scientific Publications. Oxford and Edinburgh 1969.
43. Bagenholm G, Christianson B and Nasher A A A. Growth and malnutrition among pre-school children in Democratic Yemen. Bulletin of WHO 1988; 66: 491-98.
44. Selinus R, Gobezie A, Knutsson K B, Vahlquist B. Dietary studies in Ethiopia. Dietary pattern among the rift valley Aris, Galla Am J Clin Nutr 1971; 24: 365-377.

45. Interdepartmental Committee for Nutrition and National Defense. Ethiopian Nutrition Survey. Ministry of Defence Washington D.C, 1959.
46. Teka G E. Water supply and sanitation. In Kloos and Zein H Z. The Ecology of Health and Disease in Ethiopia 1993; 179-190.
47. Waterlow J C. Classification and Definition of Protein-Calorie Malnutrition. British Medical Journal 1972; 3: 566-569.
48. Shamebo D. Special Issue on Epidemiology of Public Health research and action in a developing society. The Ethiopian Journal of Health Development 1994: 8.
49. Editorial. Nutrition into the 1990's. Journal of Tropical Pediatrics 1991; 37: 50-52.

Annex A

QUESTIONNAIRE ON NUTRITIONAL ASSESSMENT

Data Collecting Sheet

Date:- Day ------ Month ------ Year --------
Registered by:- ----------
Name of head of house hold:- ----------
House No. ---------
Peasant association ----------

1. Number of children 6 to 59 months of age ---------
2. Name of father ---------- age --------
3. Name of mother ---------- age --------
4. Education level:-
   Illiterate Read and write Formal education
   Father ------ ------ ------
   Mother ------- ------ -------
5. Occupation:-
   1.Farmer 2.Merchant 3. Daily labourer 4. Civil servant
   5. Fisher 6. Others
6. Ethnic and tribal origin:-
   1.Oromo 2. Amhara 3. Gurage 4. Kembata
   5. Hadia 6. Wolita 7. Silte 8. Other
7. Marital status:-
   1.Married 2. Single 3.Widow 4. Separated
8. Religion:-
   1. Christian (Orthodox--Protestant-- Catholic--)
   2. Muslim
9. Family size
   1. <5 2. 6-10 3. >11
10. Housing condition:-
    Roof:- 1. corrugated 2. thatched
    Flower:- 1. muddy 2. other
    Window:- 1. yes 2. no
    If yes, how many 1. one 2.≥ two
    Room:- 1. One 2. Two
    3. Greater than two
    Kitchen:- 1. Separate 2. In the living room
    Barrack:- 1. Separate 2. In the living room
11. Water supply:-
    1.Protected well 2.Unprotected well
    3.spring 4. River 5. Lake 6. Other
12. Latrine and refuse disposal:-
    Do you have a latrine? 1. yes 2. No

If yes, which type of latrine do you have?

1.Pit 2. VIP

If no, do you use open field? 1. yes 2. No

What do you use for refuse disposal?

1.Pit 2. Open field

13. Economy:-

Do you have domestic animal? 1. yes 2. No

If yes, how many do you have of the following?

Cattle ----- (oxen ----) Sheep ---- Goat ----

Horse ----- Donkey ---- Mule ---- Poultry ------ Others ---------

How many quintals do you harvest in a year? -----

What are your cash crops?

1. Vegetables ----- 2. Tef------- 3. Boloke --------

4. pepper------- 5. Others --------

14. Estimated monthly income in Birr ---------

1. >50 2. 50-149 3. 150-249

4. 250-349 5. 350-449 6. >500

15. What is your staple food?

1. Teff 2. Maize 3. Barley 4.Sorghum

5. Wheat 6. Boloke 7. Others

16. Do you grow vegetables around the house?

1. yes 2. No

If not, how often do you buy?

1. Daily 2. Weekly 3. Occasionally

17. How accessible is the market?

1. Half hour walk 2. One hour walk

3.Two hour walk 4. Greater than two hour walk

Questions directed to mother:-

18. Age at first marriage --------

19. Age at first delivery --------

20. Number of pregnancies --------

21. Number of children alive:-Male ---- Female ----

If there is death, specify the cause?

Diarrhea ---- Cough ---- Fever and chills ----

Accidents ----- Others ----------

If there is abortion, how many times? ----------

22. Have you ever used birth control method?

1.Yes 2.No

If yes, what type?

1. Pills 2. Injection 3. Condom 4. Others

23. Do you usually work out-side home?

1. Yes 2.No

24. Have you got enough time to prepare food?

1.Yes 2.No

25. Do you usually take your child to health institution when sick?

1. Yes 2.No

If not, where do you prefer to take? --------

26. How do you usually prepare food for children under five year of age?

1. Together with adult food

2. Separately for them

27. In which order is food served to the members of the household?

(First = 1, second = 2, all together = 3)

Husband --- Husband and wife -- Children -----

Mother and children ----- All together ---

For child of 6 to 59 months of age:-

28. Name:- ---------- Age ----- Sex -----

Birth order ----

29. General appearance:- 1. Normal 2. Deformed

30. Anthropometric measurement:-

	First	Second	Third time	Average
Weight	------	-----	-----	------
Height	------	-----	-----	------
AC	------	-----	-----	------

31. Immunization status:-

1. Not vaccinated 2.Partially vaccinated

3. Fully vaccinated 3.Not known

32. History of illness in the last one week:-

Difficulty to swallow Yes ---- No ----

Refuse to feed Yes ---- No ----

Cough and difficulty in breathing? Yes --- No ---

Fever with rash Yes ---- No ----

Fever with chills Yes ---- No ----

Worm expelled Yes ---- No ----

Diarrhea Yes ---- No ----

Vomiting Yes ---- No ----

Diarrhea with vomiting Yes ---- No ----

Diarrhea With blood Yes ---- No ----

Number of liquid stool on worst day:-

Two ---- Three ---- Four ---- >Four times ----

Number of vomits on worst day:-

Two ---- Three ---- Four ---- >Four times ----

33. Severity of illness:-

Did the child stay in bed? 1. Yes 2. No

If yes, for how long? --------- (in days).

Did the illness subside by itself? 1.Yes 2. No

If not, did you took him/her to health institution?

1. Yes 2. No

34. Do the child breast feed now? 1. Yes 2. No

If yes, when is breast feed given?

1. When child cry 2. According to time

3. According to mothers feeling 4. Other

35. At what age is the child given supplemental feeding?

1. Before 4 months 2. 4 to 6 month

3. 7 to 9 months 4. 10 to 12 months

5. After 12 months

36. What was the first supplementary food given to the child?

1. Milk 2. Genfo 3. Soup 4. Other

37. If not breast feed, at which age discontinued breast feeding?

1. <3 months 2. 4 to 6 months

3. 7 to 9 months 4. 10 to 12 months

5. 13 to 24 months 6. >24 months

38. At his age, how frequent should the child eat?

1. Less than times 2. 3-4 times 3. 5-6 times

4. Greater than six times.

39. At his age, what type of food or drink is not allowed to be taken by the child?

1. meat 2. alcohol 3. coffee 4. others

40. What kind of food did you feed your child yesterday?

1. breast milk only 2. breast milk and cows milk

3. cows milk 4. cereals and legumes

5. meat and egg 6. vegetables

7. others

41. How frequent do you feed your child the following foods?

	Daily	Weekly	Occasionally	Never
Injera	----	-----	------	-----
Dabo	----	-----	------	-----
Kita	----	-----	------	-----
Kolo	----	-----	------	-----
Nifro	----	-----	------	-----
Genfo	----	-----	------	-----
Kinche	----	-----	------	-----
Chechebsa---		-----	------	-----
Shiro wot --		-----	------	-----
Vege. wot --		-----	------	-----
Meat wot ---		-----	------	-----
Milk	-----	-----	------	-----
Meat	-----	-----	------	-----
Ayib	-----	-----	------	-----
Egg	-----	-----	------	-----
Butter	-----	-----	------	-----
Fish	-----	-----	------	-----
Oil	-----	-----	------	-----
Beverage----		-----	------	-----

Tea ----- ----- ------ -----
Coffee ----- ----- ------ -----

Annex B

Sample size

The required sample size was calculated based on the following.

$$n = \frac{(Z\alpha)^2 \times P(1-P)}{d^2}$$

n= sample size

P= prevalence rate in the population

Z= the critical value corsponding to a 95% C.I.

d= the degree of certainty for the result to be with in this discrepancy.

Assuming that 80-90% will respond, the calculated sample size will be

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Declaration

I, the under signed, declare that this thesis is my original work, has not been presented for a degree in any other university and that all resources of material used for this thesis have been fully acknowledged.

Name ——————————————

Signature ——————————————

Place ——————————————————

Date of submission ——————————————

This thesis has been submitted for examination with my approval as University Advisor.

Dr TADESSE ALEMU ----------

Advisor