INDHRIA GANHD NATIONAL OPEN UNIVERSITY

PARTIALLY FULFILMENT THESIS OF MASTER DEGREE

IN SOCIAL WORK

DETERMINAT FACTORS OF CHILD MALNURATION IN AMBO TOWN OROMIA REGION

(THE CASE OF AMBO TOWN)

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SCHOOL OF SOCIAL WORK

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IGNOU

ADDIS ABABA

DEDICATION

This thesis is dedicated to my father Ayele Gonfa and my mother Arfesa Dame

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This thesis could not have been successfully completed without the unreserved and tireless contributions of individual and institutions.

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ABBREVITIONS

1 .ACC/SCN Administrative Coordinating Committee/ Sub- Committee on Nutrition of the United Nations

2 .ANC Antenatal Care

3 .ARI Acute Respiratory infections

4 .BCG Baccillus Calmette Gucerin

5 .BF Breastfeeding

6 .CDC Centre for disease control

7 .CSA Central statistical agency

8 .DPT Diphtheria pertussis and tetanus

9 .EDHS Ethiopian demographic and health survey

10 .EPHA Ethiopia public health association

11 .FAO Food and agricultural organization

12 .HHS Households

13 .NCHS Nation center for health statistics

14 .NGOs Non- governmental organizations

15 .KAs kebele administrations

16 .PEM Protein-energy malnutrition

17 .PSRC Population studies and research center

18 .SD Standard package for social sciences

19 .SPSS Statistical package for social sciences

20 .SNNP Southern nation, nationalities and peoples

21 .UN United Nations

22 .UNICEF United Nations international children emergency fund

23 .WHO World health organization

Table of Contents

LIST OF TABLE

Abstract

This study is an empirical study aimed at estimating the levels of child malnutrition and identifying the basic demographic, socio-economic, health and environment determinants of long-term nutritional status among children in Ambo Town Oromia Regional state.

First, all the available literatures were reviewed which later helped the development of five important hypotenuses and the conceptual framework. A questionnaire constricting of about 40 items was developed and a half day's training session was organized for data collator's and supervisor. A pilot test was conducted on 8 mothers having children 0-59 months who are selected through purposive sampling which helped the modification of the questionnaire. In selecting the 40 HHs, stratified sampling technique was used. Up on the successful completion of the fieldwork, the data entry and analysis were done using SPSS and EPI-INFO Computer soft ware package.

Both descriptive and inferential statistical techniques were used to analyze the variables. The univarite analysis was used to see the percentage share of background variables. The findings indicate that 51.3 percent, 13.7 percent and 48.4 percent of children in Ambo town were stunted, wasted and underweight, respectively.

The findings of the bivarite analysis using chi-square test showed the existence of association between 17 explanatory variables and stunting. Multivariate analysis using logistic regression clearly revealed age of child, sex of child, birth intervals, mothers age at deliver, number of under-five children, mothers education, HH income, place of residence, mother ethnicity, vaccination, mothers ANC visit, source of drinking water, sanitation facilities, BF and age at weaning are very important determinant factors.

Finally, improving HH income and mother education, improvement in ANC visits, expanding immunizations of children, the quality and quantity of safe water and sanitation facilities, extended duration of BF and a weaning through expansion of family planning for spacing and raising the mothers age at birth and minimum of age mothers at marriage are some of the recommendations of the study.

Chapter One
1. Introduction
1.1 Study Background

Child morbidity and mortality are major worldwide problems particularly in developing countries. The major causes of child morbidity in these countries are diarrhea, measles, malaria, ARI and malnutrition. Disease coupled with malnutrition contributes to high level of mortality (WHO, 1989). One-third to one-half of childhood mortality can be attributed to malnutrition (Pelletier, 1994). It is widespread and endemic in all developing countries and may reach epidemic proportions as a consequence of natural and/or man-made disasters. The problem is worse in most African countries where living conditions are worse than other countries with low economic development. This is further worsened by poor health care, scarcity of resources, political instability and rapid population growth (World Bank, 1993).Growth faltering occurs as a result of poor diets and/or recurrent infection which tend to increase the number of diarrhea episodes and susceptibility to certain infectious diseases (WHO, 1995). Studies found that poor growth is associated with delayed mental development (Pollitt et al., 1993; Mendez et al., 1999) and there is a relationship between impaired growth status and both poor school performance and reduced intellectual achievement (Martorell et al.,1992; pan American Health Organizations, 1998). Growth retardation in early childhood is also associated with significant functional impairment in adult life (WHO, 1995; Martorell et al., 1992) and reduced work capacity (Suprr, 1990), thus, affecting economic productivity. There is evidence that women of short stature are at a greater risk of obstetric complications and of delivering low birth weight babies (WHO, 1998). PEM works synergistically with disease leading to a weak immune system and an increase in infections such as persistent diarrhea, ARI and measles (Baker et al., 2004).

A number of studies showed that malnutrition is caused by multiple factors and complicated childhood diseases and serious issue in developing countries. Even then, its effects overshadowed by illnesses and mortality rates resulting from infectious diseases. And often times, underweight and lethargic children look normal to parents who do not know how healthy children behave. To make things worse many people even health workers, given little

consideration to this “silent emergency” (fosu, 1994). These worse effects of PEM on children as preventive and intervention measures are not taken early.

An attempt to reduce child mortality in developing countries though selective primary health care have focused primarily on the prevention and control of specific infectious disease. With less effect 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 compare with alternative disease control programmes (Grant, 1994).

Children are the most vulnerable group in any society. Their growth is mainly influenced by genetic programming and external influences. Nutrition is one of the external factors which influences growth and attainment of normal body dimension. It serves to meet the requirement for cell multiplication and for the process in which the growing tissues and organs take an increased complexity of function (Williams, 1997). Thus, nutritional status in early life is important for laying down the foundation of healthy adulthood through its effect on growth and development and subsequent on quality of life, productivity and economic development in later adult life (Ebrahim, 1991). The prevalence of stunting in Ethiopia was 60 percent in 1982 (CSA, 1983), 64 percent in 1992 (CSA,1993), 52 percent in 1998 (CSA, 1999),51 percent in 2000 (EDHS,2001) and 47 percent in 2005 (EDHS,2006). The data showed that the incidence of stunting remained high from 1982 to 2006. This high prevalence of stunting ranks the country among the highest in the world and almost the worst in Africa. For instance, in 1992 the third highest prevalence in the world slightly behind Bangladesh and Mauritian for countries with comparable data (UNICEF,1993) and the prevalence of stunting of the country is among the highest in Sub-Saharan African countries in 1997 followed by Mozambique and Rwanda (UNICEF, 1998).

Factors that are contributing to malnutrition may differ among regions, communities and over time. Identifying the underlying causes of malnutrition in particular locality is important to solve the nutritional problems. Few studies on the determinants of malnutrition are available both at the national and regional levels. However, detailed studies to point out the risk factors of the problem in different regions of the country are still lacking. This study, therefore, will thoroughly examine the various possible factors correlated with children’s malnutrition in Ambo

Town Oromia region and compare the relative importance of each factor in order to suggest appropriate intervention strategies.

1.2 Problem statement

Malnutrition can best be described in Ethiopia as a year round phenomenon due to chronic inadequacies in food intake combined with level of illnesses, the two immediate causes of malnutrition. It is not a problem uniquely during drought years rather a year round chronic problem found in the majority of HHs across all regions in the country. In Ethiopia, since 1960 domestic production has declined and failed to meet minimum food requirement and both food production and per capita food availability have experienced down ward trends. The average domestic production decreased by 0.4 percent per annum leading to an uninterrupted dependency on food import (EPHA, 1997).

In 2009, the population of Ethiopia was estimated to be over 76 million which is characterized by rapid population growth (2.7 percent) as the result of a high fertility rate (5.9 percent) and is a very high rate when compared with most of the developing countries, while its annual growth of agriculture is 2.4 percent. The agricultural performance in the country has not cop up with the population growth over the past four decades, and the gap between the population's food needs and food availability has continued to widen thus requiring additional food aid. Per capital income of US$ 110 per annum shows that the country is being characterized by low level of economic development (World Bank, 2009). Almost one in every thirteen babies born in Ethiopia (77 per 1,000) does not survive to celebrate the first birthday. Under-five mortality is also high (123 per 1,000 live births), with one in every eight children dying before the fifth birthday and child mortality is 50 per 1,000 live births. Wide regional differentials in infant and under-five mortality are observed. For example, under-five mortality ranges from a low of 72 per 1,000 live births in Addis Ababa to a high of 157 per 1,000 live births in Oromia. Infant mortality is also relatively higher in Amhara, Oromia and Gambella (EDHS,2009).

Although Ethiopia suffers from frequent drought based emergencies, it is important to not the event during a relatively good non-drought year, such as the year 2005 when the national EDHS was conducted, level of malnutrition in children is still extremely high and by no means confined

to emergency periods, rather it chronic year round phenomena. An “acute malnutrition emergency” on top of a “chronic nutritional problem” inevitably results in many vulnerable individuals falling over the edge of survival as they are unable to cope with further stress of too little food and too much disease.

One of the two children under the age of five stunted (too short for their age) and one in four is severely stunted. This very high level of malnutrition contributed to the country’s high under-five mortality rate, estimated at123 per 1,000 live births (EDHS,2009). International experts have ranked Ethiopia as the sixth highest country in the world facing shortage of food in year 2000 (Black et al., 2003). Various studies show that 58 percent of under-five deaths in Ethiopia are either directly caused by malnutrition, even in its milder forms (Ethiopia profiles, 2001).

From the total populations in the country 37 million live in Oromia region. The census results revealed that 17 percent of the total population in the region lives in urban areas while the remaining 87 percent live in rural areas. The number of children under-five was which accouters 19 percent of the total population. (EDHS,2009).

The 2005 Ethiopia’s Demographic and health survey revealed that long-term (chronic) malnutrition is common in Oromia. The survey also revealed that acute malnutrition (wasting) and general malnutrition (underweight) series existing problems in the region. This high level of malnutrition contributed to the region’s highest under-five mortality rate. In view of the fact that the prevalence of malnutrition in the region is among the highest, this study concentrates on the relationship between demographic, socio-economic, health and environmental factors on the one hand and long-term nutritional status of children under-five years of age on the other hand. Hence, it is expected that the results of this study will be helpful to the concerned bodies in order to overcome and improve the existing problems. Besides, this critical study is vital to draw relevant policy implications for the study area as well as for the region.

1.3 Rational for selecting the study area

Ambo Town, which is one of the in town west showa zone is the site on which the study is based. The most important reasons for conducting this study in Ambo town include:

1. The absence of adequate studies of the factors associated with malnutrition among children in the study area;
2. They are still bonding to traditions (likely early marriage and large family norm) which in one way or another affect the health of the mother and the child.
3. The town is heterogeneous in terms of socio-cultural conditions and the most populated town in the zone.
4. There is scarce distribution of health facilities; maternal and child health services are not easily available. In such community resorts to myriads of traditional health practices and beliefs affecting child health are common.
5. The researcher is familiar with the study area and expects high response rate.

1.4 Study objectives

1.4.1General objective

The general objective of this study is to identify the Determinant factors affecting long-term nutritional status of children under-five years of age in Ambo Town, Oromia region.

1.4.2 Specific objectives

The specific objectives of this study include:-

1. To determine the prevalence of child malnutrition in the study area;

2. To identify the contribution of selected socio-economic factors to chronic malnutrition;

3. To find out the contribution of certain demographic factors to chronic malnutrition;

4. To identify the contribution of health and environmental factors to chronic malnutrition and

5. To draw conclusions and recommendations for policy implication.

1.5 Definition of key terms

1. Malnutrition:- the level of nutritional status of children expressed by anthropometric indicators (weight and height) which may result from PEM (Berg, 1981).

2. Nutritional status:- the internal state of the individual as it reveals to the availability and utilization of energy and nutrients at the cellular level (Pelletier, 1994).
3. Protein-energy malnutrition:- under nutrition that result in an individual not receiving adequate protein or calories for normal growth, body maintenance and the energy necessary for ordinary human activities (Jellifee, 1982).
4. Anthropometric assessments:- measurement of variations of physical dimensions and gross composition of human body at different levels and degree of nutrition (Jellifee, 1982).
5. .Appropriate/optimal feeding practice:- the initiation of BF less than half an hour after birth; frequent on demand feeding (including night feeds); exclusive BF for six months of life; continued BF (at least up to the second year of life) including supplementation with locally available foods and appropriate foods from the age of around six months. Appropriate/optimal feeding practice also classified in to four age group: 0-5 months (initiation of BF, exclusive BF and no pre-lacteal feeds), 6- months (BF plus gradual introduction of complementary feedings; include animal foods, fruits and vegetables, legumes oils and fat in diet), 6.9-11 months (the same, but increasing the amount and frequency of complementary feeding) and 12-36 months (continued BF for as long as possible, gradual transition to family or adult diet) Omer et al.,1987).
6. .Exclusive breastfeeding: - the consumption of breast milk as the only nutrient source of infant food or liquid protects against illness for about six months of life (bergstrimess et al., 1993).
7. Complementary food:- any nutrient containing foods or liquids other than breast milk during the weaning period (Bergstrimes et al., 1993).
8. Antenatal care:- the regular observation and care of mother and fetus by trained health personnel through the whole pregnancy with necessary examinations and recommendations to assure a safe pregnancy.
9. Immunization/vaccination:- any incurable immunizing agent or a preparation containing bacteria so treated as to give immunity from specific diseases when injected in the subject.
10. Birth interval:- the length of time between two successive births indicates the pace of childbearing.

1.6 The study Hypotheses

In this study, attempt will be made to test the following hypotheses:

1. Female children have lower nutritional status than male children;
2. As the number of other under-five in the HH increases, the risk of chronic malnutrition increases;
3. As the mothers education increase, the risk of chronic malnutrition decline;
4. Children who start supplementary diet later than six months of age are at a higher risk of being stunted; and
5. The utilization of prenatal care by mothers has a negative association with long-term nutritional status of children.

1.7 Research Question

1. What Female and Male child nutritional Status
2. What is the risk of malnutrition when number of child under five age in the HH increases.
3. As mother education increase the risk of child malnutrition decline or increase.
4. What the risk of children who start supplementary diet later than six months of age.
5. What long-term nutritional status of children utilization of prenatal care by mothers.

1.8 Significance of the study

The significance of the study lies in that it may contribute to planners and policy makers aiming at improving the living standards of the communities in general and the well-being of mothers and 0their babies in particular. More specifically, this study:

1. Contribute to development projects concerned with child health care and nutrition;
2. Highlights one of the necessary conditions for reduction high level of malnutrition;
3. Identifies high risk groups and how action targets for programs of maternal and child welfare in the community;
4. Contributes its part by filling the knowledge gap among providers of health services by identifying area of interventions;

5. Can be useful for planning, monitoring and evaluating the activities of government and non-government agencies with regard to nutrition and health service coverage; and
6. Expected to be valuable for planning further studies in nutrition in this and other similar areas in the country.

1.9 Limitation of the study

This study came to an end after ups and downs. There were various human and nonhuman intervening limitations into the successful accomplishment of this study. The most important were:

1. Since appropriate feeding practice were collected retrospectively actual determination of appropriate feeding practices might not be correct due to the errors that could occur as a result of recall bias;
2. It has been unrealistic to ask for income on direct monetary terms in urban areas. As the question is a sensitive and threatening one it is anticipated that the respondents might have not reported the exact data/information. This have affected the determination of HH annual income; and
3. The town is having about 3 kebele 12 km distance across two extreme points (north to west), coupled with the absence of infrastructure and hence means of transportation to address each kebele was found to be a serious problem.

1.10 Organization of the study

This study contains five major chapters. Chapter one presents background of the study, objective and statement of the problem, definitions of key terms, hypothesis and significance of the study. Chapter two review of related literature, conceptual framework, Chapter Three discuss the methodology of the study (source of data, sampling, method of data collocation and analysis). Chapter four presents that back ground characteristic of the study area and study population. The differential and determinates of long-term nutritional status are thoroughly discussed in chapter four. Finally, summary of the main findings, conclusions and policy recommendations of the study area dealt with in chapter five

1.11 Scope of the Study

The study is limited to Ambo Town to estimating the levels of child malnutrition and identifying the basic demographic, socio-economic, health and environment determinants of long-term nutritional status among children in Ambo Town.

CHAPTER Two

2. Review of Related literatures

2.1 Introduction

Good nutrition is indispensable component of healthy life and access to healthy diet and optimum nutrition are important to good health. Better nutrition means stronger immune systems, less illness and better health. Whereas developing countries such as India, experiencing micronutrient malnutrition and under nutrition. The negative externalities of under nutrition are many, especially among the younger age group. Nutritional deprivation and infectious diseases among preschoolers feature prominently among the major public health concerns in developing countries (UNICEF, 1998; WHO, 1999; Kuate- Defo, 2001). Poor child health and nutrition impose significant and long-term economic and human development costs, especially on the poorest countries and communities, further entrenching their status. Improving child health and nutrition is not only a moral imperative, but also a rational long-term investment. Under six years old children are most vulnerable section of the society and the present study focuses on these age groups.

2.2 Theoretical framework

The theoretical approach has its origins in Becker's Microeconomic models of household production (Becker, 1965, 1981) in which households allocate goods and time to the production of commodities that are either sold on the market, consumed at home, or for which there is no market. This work was expanded to the demand for health by Grossman (1972) and it also modified by several economists like Behrman and Deolalikar (1989), Strauss and Thomas (1995) and Currie (2000).Becker (1965) has proven in illuminating the household determinants of nutrition. A 'nutrition production function' relates the child's nutritional status (measured in terms of height for age or weight for age) to a set of health 'inputs '.These include the child's nutrient intake, whether the child is breastfed and the duration of breastfeeding, preventive and curative medical care, and the quantity and quality of time of the mother or others in care-related

activities. The quality of child care time in turn is likely to be functions of the caregiver's age, experience, education, own health status and environmental factors are also enter the production function. The potentially conflicting effects of maternal labour supply on child nutrition are readily seen within the production function framework. Greater income from mother's employment translates into higher consumption of market-purchased inputs such as food and medical care that raise nutritional status, but reductions in the level or the quality of time in health-related activities reduce nutritional status.

A child's nutritional status reflects the combined effects of many factors, including nutrient intake, health, birth order, and behavioral factors governed by parental preferences. In recognition of the interrelated variables are expressed child's nutritional production functions, they represented as **Child's Nutritional status** = **f** (nutritional input, child's health, child's death, births, biological factors, childcare time, technology factors) the model is estimated at two levels: at the household level and at the child level. Child nutritional status provides an indirect indicator of overall child health as well as a direct measure of access to adequate nutritious foods. Malnutrition is a vigorous indicator of the presence of severe child deprivation. Theories of social arrangements emphasized on the freedom, equality and justice in social order in the society. John Rawls' 'Theory of Justice' proposes the universal access is called 'social primary goods' (like liberties, opportunities, self-respect etc) for all individuals in the society equally. One of the primary good, though not explicit in his theory but implicit, that has to be ensured to every citizen of the society is health. Moreover, it assumes primary significance in the perspectives of human capital, human development and human rights, the health and nutritional deprivation of children can have severe negative implications. But the unfinished reality is that even today many children in the developing societies are deprived in health and nutrition. Anthropometry is widely recognized as one of the useful techniques to assess the growth and nutritional status of an individual or population (Rao et al, 2001). Malnutrition is frequently part of a vicious cycle that includes poverty and disease. The three factors, viz., malnutrition, poverty and disease are interlinked in such a way that each contributes to the presence and performance of the others. Anthropometric (body measure) parameters such as weight-for-age, height-forage and weight-for-height are commonly used for assessing child nutritional status. In practical terms, anthropometric values need to be compared across individuals or populations in relation to

an acceptable set of reference values. Controversy arises over 47 the use of an international population both as ‘reference’ and ‘standard’, which has given rise to the emergence of two groups of experts – one is influenced by the Genetic potential theory or Deprivation theory and the other by Heretic Views (Osmani, 1992). The failure to achieve the maximum genetic potential is believed to be affected by the socio-economic factors like nutrition, socio-economic condition, etc., thereby resulting in growth retardation. The exponents of the Heretic View, on the other hand argue that deviation from genetic potential does not entail any functional impairment. Instead, children or adults may be ‘small but healthy’ (Seckler, 1982).

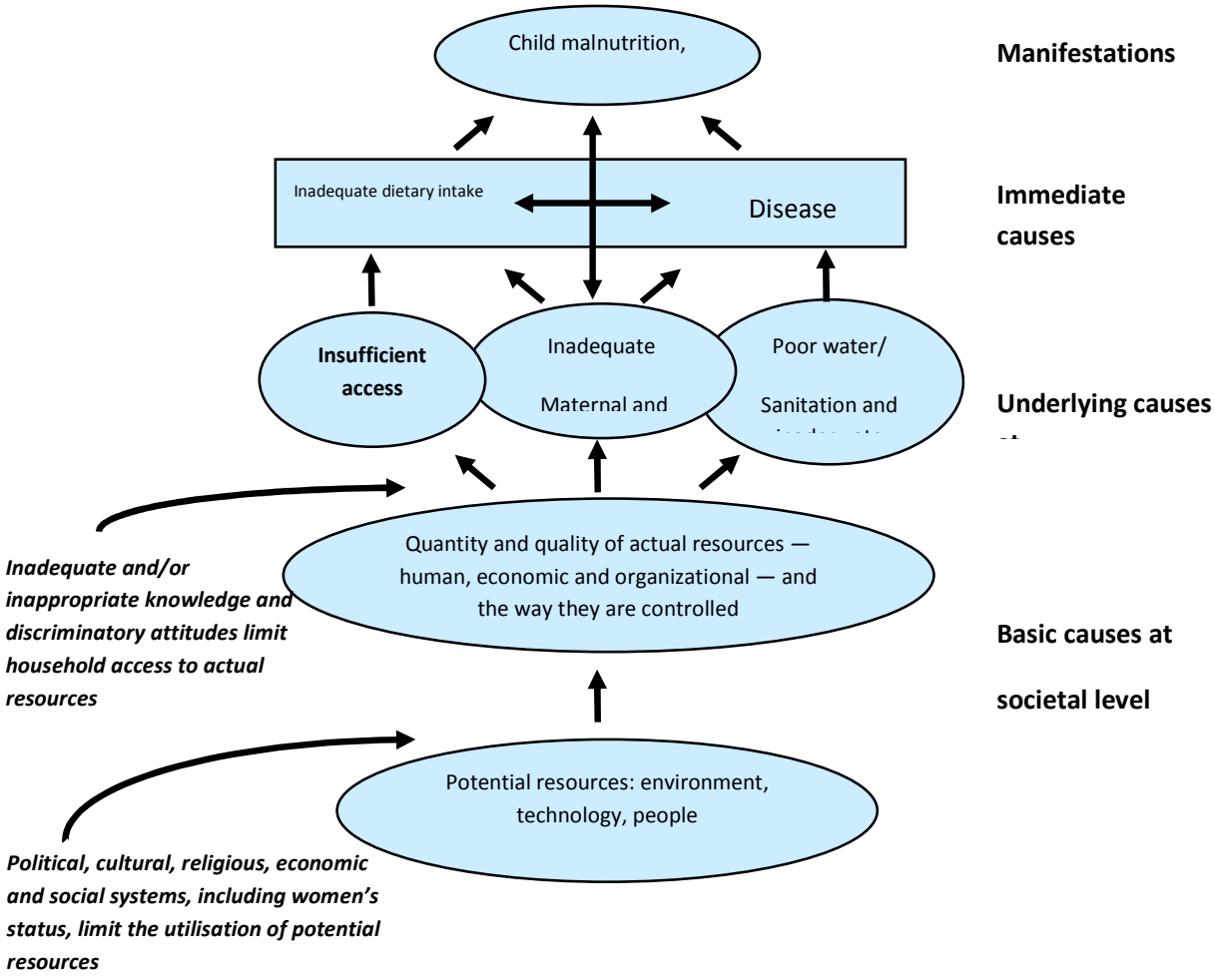
2.3 Conceptual framework

Conceptual frameworks demonstrate the theory of the sequence of cause and effect that ultimately lead to a particular problem or, turned around to a positive view, a particular ultimate result. They typically trace out several layers of causality as well as lateral relationships. In the example of the UNICEF conceptual framework on nutrition below, three levels of causes of child malnutrition are detailed:

- child malnutrition, death and disability are the manifestation of a problem;
- inadequate dietary intake, disease are the immediate causes;
- the underlying causes are insufficient access to food, inadequate maternal and child-care practices, poor water/sanitation and inadequate health services.

More encompassing is the UNICEF Conceptual Framework for Situation Assessment and Analysis of the Rights of Children and Women

(see next page).**Conceptual framework: Causes of child malnutrition**



Source: The State of the World's Children, 1998.

The conceptual framework for this study was developed by UNICEF (1990) and extended by Engle et al., (1999), Studies such as Maxwell et al. (2000) and Ssewenyama (2003) have adopted this causative conceptual framework to examine the determinants of nutritional status of children. This framework breaks the determinants into three levels of causality; immediate, underlying and basic. This framework shows how various nutrition problems, causes and consequences change and interact over time. The immediate determinants of child nutrition manifest themselves at the individual level and are dependent on each other; a child's poor dietary intake affects health status while at the same time poor health status will cause reduced appetite hence low food intake. The immediate determinants are in turn influenced by the underlying determinants which include food security, care for children and health environment. These manifest themselves at the household level. Adequate care of the children can only be achieved if the mothers have control of resources such as time attention and support to enable them provide sufficient care for the children. Underlying determinants are influenced by basic their organization and allocation coupled with sound political system which determines the quality of basic services such as provision of clean safe water, health facilities and infrastructure. The size allocation and fertility of the land will determine how much food can be produced in an area. The political system determines the distribution of national wealth and policy formulation which in turn will determine overall nutritional status of the community members.

2.4 Factors associated with Children's Malnutrition

The two important factors, inadequate dietary intake and diseases play a decisive role in the causation of malnutrition. These two essential factors are only the ultimate outcome of many other underlying causes. A variety of factors starting from the national level down to the individual interplay in the causation of malnutrition (UNICEF, 1990).

Factors that are contributing to malnutrition may differ among regions, communities and over time. Identifying the underlying causes of malnutrition in a particular locality is important to solve the nutritional problems.

2.5 Demographic Characteristics

One of the underlying causes of malnutrition is age of the child. Study on child nutrition in India showed that stunting is considerably less common in the first six months of life, when most babies are fully breastfed than at older ages, and prevalence of stunting increases rapidly up to 12-23 months of age, after which it increases more slowly (Vinod et al., 1999). Zolotkin (1991) also found out wasting to be a more relative risk in children older than 24 months of age. Child's age is also sensitive to certain specific child's feeding complementary foods along with

breastfed exclusively for the first six months of life, complementary foods along with breast milk have to be offered to the child beginning from the six months of age and gradual transition to adult food begins after twelve months of age. In Ethiopia the level of stunting increases with the age of the child (Aschalew,2000; Gugsa,l998; EDHS, 2001 and 2009).

The influence of the sex of a child on nutritional status has been the object of numerous and often contradictory hypothesis or results. The prevalence of malnutrition is higher among female children than among male children because of the preferential treatment of male children or advantages given to male infants by way of paternal care, feeding pattern, food distribution within the family and treatment of illness (Abey) Koon, 1995). Similar results are also obtained in studies done by pedley et al. (1991) in developing countries and Melville (1998) in India. On the contrary, most studies based on anthropometric data not find a higher prevalence of malnutrition among girls (Sommerfelt et al., 1998; Sommerflet and Stewart, 1994; Chaudhury, 1988). Studies in Ethiopia (CSA, 1993 and 1998) similarly showed that the proportion of stunted male children was slightly higher than females.

Birth order is the other cause of under nutrition in children. As the number of children increases within a HH, competition for nutrition also increases, and one might expect that children of higher birth order would have a greater risk of stunting than would children of lower birth order because a high birth order is associated with short birth intervals with the resultant adverse effects up on health and nutrition of the child. Comparative studies conducted by Stewart (1994) in 27 Sub-Saharan Africa countries indicates that children of birth order four or higher are considerably more likely to be stunted than are children of lower birth order. Studies done by

Vinod et al. (1999) and Alleyne (as cited in Gugsa, 1998) in India, and Chaudhury (1998) in Bangladehs also support the above findings. The negative effect of birth order four and above is also confirmed in the study dine in Ethiopia (Melaku et al., 1997; Gugsa 1998; Aschalew, 2000; EDHS, 2001 and 2009).

Birth intervals are among many important factors affecting nutritional status of children. A short birth intervals means a mother becomes pregnant is short period of time and will give birth to many children that she cannot feed properly because she may have more children to care for. In connection to this, it is not only the youngest child who suffers when there are many children born close together frequently, and old baby must be prematurely weaned from the breast because a new baby is coming. This often results in malnutrition for the older child because the other available food is not sufficient for his proper growth. Childbearing with short birth interval may also result in an enormous effect on the health and nutritional condition of the children, and it is expect that children born too close together may not receive adequate car and sufficient feeding from the parents as required. In addition, the mother's health could suffer from short birth intervals and she is more vulnerable to infectious and other diseases. This implies that longer intervals between births are the means of preventing children from malnutrition. The prevalence of chronic malnutrition for those children born less than 24 months are higher than for those greater than 24 months (Roosmale et a., 1995; Renate, 1998; Al-Debbagh and Ebrahim, 1994).

Research findings suggest that mother's age may affect the health and nutritional status of children. Stunting is most common among children of younger mothers (under 20 years of age). Young maternal age can increase the health risks of children for both physiological and behavioral reasons. Young mothers may be physically less mature and less able to handle the demands of pregnancy, child birth and subsequent child care. The birth weights of children to young mother are generally lower than those of other children. Adolescent mothers are also lack experience and tend to be less psychologically mature and emotionally stable. Leading to poorer child health care can infant feeding behaviors (Vinod et al., 1999; Le Grand and Mbacke, 1993; Haggerty et al., 1999; Smith 1993; Oni 1996; Al-Debbagh and Ebrahim, 1994).

The contribution of large HH size for under nutrition of children is also well counted. This is because high parity and short birth interval give rise to large families which contribute to an increased morbidity and malnutrition due to overcrowding.

An increase in disease transmission and shortage of HH goods and food
A study done be Venod et al., (1999) in India, the largest percentage of stunted children was observed for those HHs with seven and above member. Similar results were found in a study done by Morley (as cited in Guggsa 1998) in Nigeria, Chaudhury (1998) in Bangladesh, and Gugsa (1998) and Aschalew (2000) in Ethiopia. Number of under-five children in the HH is also another contributory cause for under nutrition. As the number of children per women increases, fewer HH resources are available for each child. In the case of more than one child under age five the mother gives less attention to each child individually and there will be competition for food among children. Various studies have shown that the transmissions of different types of infectious diseases are also facilitated in the case of more than one other under-five child in the HH which in turn affects the growth performance of children. Cohen et al. (1994) suggested that crowding may be a risk factor facilitating transmission of respiratory infection, measles and other diseases. According to studies in Ethiopia, more percentage of stunted children was observed for one other number of children under-five than with no other under-five children live in the HH (Nigussie, 1994; Gugsa, 1998).

2.6 Socio-Economic characteristics

Among the socio-economic variables maternal education is one of the major factors to be considered very important in determining children's nutritional status. Maternal education is believed to exert an impact on nutritional status of children since it provides the mother with the necessary skills for child care; increase awareness of nutritional needs and preference of modern health facilities as well as change of traditional beliefs about disease causation, and use of contraceptives for birth spacing (UN,1985).Therefore, an inverse relationship between long-term nutritional status of children and maternal education has been supported by studies in Kenya (Kog-Makua, 1996; Whaihenya, 1994), in Bangladesh (Helga et al., 1999; Guldan et al,. 1993; chaudhury 1998),in plestinan (Al-Dabbagh and Ebrahim, 1994), in Lao(phimmasone et al.,

1996), in Nigeria (Oni, 1996) and in Tanzania (Mauric, 1992). This inverse relation between maternal education and

Long-term nutritional status of children was also evidence of different studies in Ethiopia (Michael, 2000; Gugsa, 1998; Aschalew, 2000; EDHS, 2001 and 2006).

HH income is the other socio-economic factor that affects the nutritional status of children. Income serve as an indicator of children consumption of goods and services that affect their health including among others calories and nutrients, clothing and shelter, sanitary facilities, use of medical system and adult supervision. Increasing individual income and purchasing power is, therefore, regarded as an important prerequisite for improved nutritional status of the community and with the improvement of HH income; absolute expenditure on food is likely to go up, as it the calorie and protein intake of the HH (UN, 1985). A study done in developing countries on the relationship between food consumption and nutrition reveals high significance difference among different economic group of a society (FAO/WHO,1996). Similar studies have been reported by Melville et al.(1988) and Chaudhury (1988). A study in Ethiopia found a positive correlation between income and adequate growth of infants (Gugsa, 1998; Aschalew,2000). Culture and food habit also play their role in affecting children's nutritional status. In societies where there in unwanted cultural belief and practices it is likely that children are not adequately and properly fed (Cohen et al., 1994; Rizvi, 1993). For instance, some people living in the Rift valley lakes (Abaya and Chamo) and the River Omo are avoiding eating fish (high protein rich food) because of cultural belief (Gugsa, 1998). Culturally, Oromo and Amhara mothers give non-lacteal feeds such as butter to grease the guts and warm water to clean the intestines of the newborn babies (Almedom, 1991), and because of food restriction (food taboos), in Hadiya Zone Southern part of Ethiopia, pregnant women avoid milk, cheese, linseeds and fatty meat (Tsegaye, 1998).

Mother's religion influences the feeding practices of a child. Certain foods are consumed by certain religious groups because of religion reasons. For instance, animal products such as milk, meat, eggs are not consumed by Orthodox Christian for nearly two months during fasting season, and this could have effect on infant and child survival (Alemayehu, 2002). In a study by mayling Simpson (1985) in Iran the respondents women were asked why they breastfed their babies and most responded that in Islamic law babies should be breastfed for two years, while others explained that Iranian women bottle fed because of lactation failure but not by choice.

Urban-rural deferential of a population is also important because it determines, in most cases, the availability of foods, health services and the cultural set up of an area in terms of the type of food preferred and consumed by a certain group of people. As argued by the UN, the pattern of variation in the less developed countries appeared to be different from that of the developed region where the geographic distribution in socio-economic factors. In developing nation, regional differences in child's nutritional status are not entirely explained with disease environment (where major disease victors flourish) are suspected to be the other causes of malnutrition (UN,1995). Sommerflet and Stewart (1994) were found that there was a significant difference in the prevalence of chronic malnutrition between and urban children.

2.7 Health and Environmental Characteristics

Recent illnesses significantly contribute in precipitation malnutrition in marginally nourished children. Diarrhea exerts this influence by depleting the body of fluids. The traditional practice of withholding food from the child suffering from diarrhea diseases also plays an important role. Fever accelerates the onset of malnutrition by reducing food intake and increasing catabolic reactions in the organism (WHO, 1986). Studies in New-Guinea (Han-Am and sleigh-A,1995) and in Ethiopia (Aschalew,2000;Gugsa,1998) revealed that the nutritional status of children on height-for-age is associated with the presence of recent symptoms of illness, fever, diarrhea and ARI. The role of immunization programmes in improving the nutritional status of children is also an important factor. If diseases like measles, whooping cough and tuberculosis are factor that precipitate malnutrition, it should in theory be possible to demonstrate that immunizations raise the nutritional status of children benefiting from the programme (Wallace, 1990; Boerma et al., 1990). A study in palestinian (Al-Dabbagh and Ebrahim, 1994) indicates that immunized children were less likely to be stunted than those who did not immunized. In Ethiopia according to EDHS preliminary report (2009) the proportion of children who have received all immunization against BCG, DPT, Polio and Measles are 24 percent. ANC is another underlying cause of malnutrition. ANC can help to prevent low birth weight and birth complications while, at the same time, providing mothers with valuable information about childcare, health and nutrition. In addition, a women who has ANC is more likely to bring her child for postnatal check-up during which visit the child would be nutritionally assessed and the mother given nutritional advice (Jiro Jwog, 1990; EDHS, 2006). Under normal circumstance, WHO

recommends that a woman without complications have at least four ANC visit to provide sufficient care.

It is possible during these visits to detect health problems associated with pregnancy. In the event of any complications more frequent visits are advisable and admission to a health facility may be necessary. The risk of stunting is significantly higher among women who had not attended ANC services compared to those who attended (Mustard and Ross. 1994; Royston and Armstrong, 1998). According to studies in Ethiopia antenatal attendance showed a significant protective affect against low birth weight and the lack of this care is among the most important factors determining nutritional status of children (Getnet et al., 1996; Ali, 1995). But only 28 percent of mothers received antenatal care (EDHS, 2006). Appropriate/optimal feeding practices have also a significant role for the nutritional status of children. The newborn child should be put to the breast within less than an hour in order to provide the child with colostrums. Delaying the initiation of BF increase the likelihood that a child will not receive colostrums instead pre-lacteal fluid (Haggerty et al.1999). Introduction of complementary food before age four to six months of a child is an undesirable practice.

Early supplementation of food inhibits the child's absorption of breast milk iron, thus potentially resulting in iron deficiency. Besides, supplementary foods prepared under unhygienic condition may increase the risk of getting food-born diarrhea pathogens by the infants. Moreover, when nutrient deficient fluids other than breast milk are given, the infant may become nutritional disadvantageous even it the items are prepared hygienically (CSA, 1999; Motarrjemi et al., 1993; Who, 1998). Delayed supplementation of BF is reported widely in Ethiopia (CSA, 1992; Gugsa, 1998; Tesfaye et al., 1998) and thus can be a majority factor that can contribute to low intake of nutrients and which can cause a deterioration of the nutrition condition of children. Evidences from many studies suggest that exclusive BF in early life protects against infections and reduces mortality, especially in developing countries where microbial continuation of foods and fluids is common (Al-Dabbagh and Ebrihim, 1994). WHO recommends that children be exclusively breastfed for the first four to six months of life? However, in Ethiopia less than 50 percent of such children were exclusively breastfed (EDHS,2006). On the other hand, prolonged exclusive BF, feeding low quality diets and delayed introduction of complementary foods also contributes to high prevalence of growth faltering. The supplementation of foods at age six months of life is

an acceptable practice since breast milk is no longer sufficient beyond six months of age to sustain the growing child. Studies on child feeding practice revealed that delayed introduction of complementary foods was found to be a major cause for the declining of childhood nutritional status after six months of age (Wallece et alm., 1990). Studies done by Abebe and Yemane (1998), and CSA (1993) indicated that the problem of stunting in Ethiopia is due in part to delayed introduction of complementary foods in the first year of life.

Studies conducted in many Africa countries indicate that traditional weaning foods lead to under nutrition due to feeding low quality diets. Staple foods mainly cereals cooked in water in the form of porridge do not satisfy the increasing energy and other nutrient requirements as they are either too watery, have a very low energy density or to bulky and lack enough nutrients. As a result of inadequate food intake and frequent diarrhea, many children (6-24 months of age) experience weight-loss and impaired growth development (walker et al., 1990). In Ethiopia high percentage of household prepare supplementary foods from a single cereal, which may lead to the formulation of low quality diet (SCA, 1992; Tesfaye, 1998).

One subset of the set of intermediate/proximate determinants of the survival chance of children is environmental contamination which refers to the transmissions of infectious agent to children. Levels of potential exposure to disease can be approximated and scaled by using a series of simple physical indexes that are known to be strongly correlated with the levels of biological contamination of the environment (Cohen et al., 1994). Access to proper toilet facilities lowers the risks of environmental contamination (Pant, 1991) and thus increases the probability if infant and child survival. For instance, in Nepal (Gubhaju et al.,1991) found that the probability of survival of children in the HHs which had their own toilet facility was 64 percent higher than that of those belonging to HHs who did not have their own toilet facilities. Similar results were also obtained in studies done in Ethiopia (Mulugeta, 1995; Gugsa, 1998; Aschalew, 2000). In various studies, source of drinking water was found to have a significant influence on nutritional status of children. For instance, the probability of stunting of children born to HHs which use drinking water from a river or a lake etc., is found to be 90 percent higher than children born to HHs which use piped drinking water as their source (UNICEF,1989). Besides, in the context of Ethiopia (Gugsa, 1998; Aschalew, 2000; CSA, 1993 and 1998; Nigussie, 1994), chronic malnutrition is higher for those who did not use water piped/protected well.

2.7 Anthropometric Assessments

Anthropometry is the most commonly used direct methods for the assessment of nutritional status. The frequently employed anthropometric measurements are weight and height. Anthropometric measurements are economical to carry out, objective, easily understandable, gives result which can be numerically graded and provides information on different degree of malnutrition. Therefore, most studies of nutritional status are performed using anthropometric measurements. An anthropometric-linked survey has advantage over "anthropometric only" studies for it assesses nutritional status in relation to the factors involved. This is important to plan, implement and evaluate feasible and sustainable nutrition interventions (Tefera, 2003; Malerenlema, 1996).

The NCHS standard is based on a reference population made up of children who are assumed to be well nourished and is recommended by WHO as reference to be used in the evaluation of nutritional status (Dibley et al., 1987). CDC package, ANTRO, was used to calculate the height-for-age, weight-for-height and weight-for-age Z-score. For a given child the Z-score is the number of SD units that the child's measurement deviated from the reference population median. The three indicators of child malnutrition are expressed in term of standard deviation units from the median in the international reference population. It is suggested that measurements of a study population should be assessed in relation to the NCHS reference population in terms of standard deviation Z-score and -2SD is taken from the median as cut-off point between malnourished and normal children in the epidemiological study of childhood malnutrition. A cut-off point of less than -2SDs was considered as low nutritional status, -3SD considered as severed as severely low nutritional status and values greater than or equal to -2SDs were considered as normal for the three indices of nutritional measurement. The most frequently used anthropometric indices to determine the nutritional status in infants and children are height-for-age, weight –for-height and weight-for-age) EDHS, 2009).

The height-for-age index is an indicator of linear growth retardation and cumulative growth deficits. Children whose height-for-age Z-score is blow minus two standard deviations (-2SD) from the median of the reference population are considered short for their age (stunted) and are chronically malnourished. Children who are below minus three standard deviations (-3SD) from

the median of the reference population are considered severely stunted. Stunting reflects failure to receive adequate nutrition over a long period of time and is also affected by recurrent and chronic illness. Height-for-age therefore, respects the long-term effects of malnutrition in a population and does not vary according to recent dietary intake.

The weight-for-height index measures body mass in relation to body length and describes current nutritional status of children. Children whose Z-scores are below minus two standard deviation (-2SD) from the median of the reference population are considered thin (wasted) for their height and are acutely malnourished. Wasting represents the failure to receive adequate nutrition in the period immediately preceding the survey and may be the result of inadequate food intake or a recent episode of illness causing loss of weight an the onset of malnutrition. Children whose weight-for-height is below minus three standard deviations (-3SD) from the median of the reference population are considered severely wasted.

The weight-for-age is a complex index of height-for-age and weight-for-height. It takes into account both acute and chronic malnutrition. Children whose weight-for-age is below minus two standard deviations from the median of the reference population are classified as underweight. Children whose weight-for-age is below minus three standard deviations (-3SD) from the median o the reference population are considered severely underweight. All the three anthropometric indicators are used to examine the prevalence of malnutrition in this study. However, in depth analysis was performance on stunting particularly focusing on the factors affecting chronic malnutrition. Because, height-for-age index measure linear growth retardation among children and is measure of long-term effects of under nutrition.

Variable specification

As it is illustrated in the figure demographic, socio-economic, health and environmental characteristic are thought to be proximate determinants of malnutrition.

A) The dependent Variables

The dependent variable of the study is chronic malnutrition (stunting) which is a dichotomous variable categorized in to two; those children who are exposed to the event

(i.e stunted) and those who are not exposed to the event (i.e. not stunted). ". In this study, the dependent variable is "stunting" where a child will fall in one of two categories: a child is either "stunted" or "not either".

The independent variables

The independent variables to be analyzed are of different categories since malnutrition is caused as a result of various factors.

Therefore, the independent variables for this study are grouped into demographic, socio-economic, health and environmental factors.

i) Demographic characteristics

The demographic characteristics include age of the child, sex of the child, birth intervals, HHs size, number of under-five children, birth order and maternal age. While some of these demographic variables may have positive relationship with dependent variable, others may exert negative influence on the dependent variable.

ii) Socio-economic Characteristics

The socio-economic status of mother's has strong relationship with chronic malnutrition. Education, HH income, place of residence, ethnicity and religion are taken as proxy indicators of the socio-economic status of mothers'.

iii) Health and Environmental Characteristics

There are certain health and environmental characteristics that may increase or decrease the risk of chronic malnutrition among children. Water supplies, toilet facilities, ANC, vaccination and optimal feeding practices are important health and environmental factors include in this section.

Chapter Three

3. Research Design and Methodology

3.1. Materials and methods

3.1.1 Site description

The regional state of Oromia is one of the nine ethnic divisions of Ethiopia and covering 353, 632 km^2 stretching from the eastern border in an arc to the Southwestern corner of the country. West Showa is one of the zones of the Oromia Region in Ethiopia. Ambo is one of the Woredas found in west Shewa zone.

Ambo town is located in West Shewa zone, western part of the Oromia and at a distance of 112 km from Addis Ababa. The inter-zonal road connecting to Nekemte town passes through this town. The town was established in 1889, covering an area of 1,320 ha and it is one of the oldest towns.

Ambo means ‘lake’, which has salt in it. Even today, it is well known tourist spot attraction for its hot spring called as "Ambo Tsebel", (Shanmugham and Bekele, 2011). For a short time, this town’s name was changed to ‘Hagere Hiwot’ during the Haile Selassie regime but reverted to its present name “Ambo” in 1975 during the Dergue administration. The town municipal administration prepared a master plan in 1931, due to its strategic position of serving as an administrative, commercial, and transportation center of Western Shewa.

3.1.2 Climate and Topography

The geographical location of Ambo town is $08^0$58'N latitude and $37^0$51'E longitude. Ambo District has a mean annual temperature ranging between 23-25°C and a mean annual rainfall of 1300-1700mm. The lowlands, midlands and highlands respectively cover 17%, 60% and 23% of the district. The altitudinal range of the agro-climatic zones in the district fall between 500 and 3,200 m above sea level respectively and represent lowest point of low land and highest point of highland agro-climatic zone.

3.1.3 Hydrology and Hydrogeology

The available water sources include ground water and surface water source in and around the town. There are perennial rivers, such as Huluka, Dabbis and Aleltu stream, which is seasonal, that flows from northeast to northwest at the boundary of the town and joins into the Gudder River. Huluka and Dabbis rivers are used as a source of water supply for animals, sanitation, and house hold uses, such as cooking and making local beverages. The water source is used for drinking purpose during water shortages by the surrounding towns.

The water supply for the town began in 1952 during the Haile Selassie regime for the king residential place by using a channel. A foreign visitor promised to change the water supply system to pipeline and the plumbers were sent from England and Italy. The first pipeline was laid in 1954 for the Ethiopian Hotel and former ACAI (Ambo College of Agricultural Institute) today known as Ambo University (Shanmugham and Bekele, 2011). Initially, the water meter was not installed and the payment was made by rough estimations. Later on, Poland water meters were installed and payment was made as per the meter reading. The situation transformed after the establishment of the Town Water Bureau, when it attained the status as a separate autonomous government department in 1960.

3.1.4 Population characteristics

Based on the census conducted by the central statistical agency of Ethiopia (CSA), Oromia has a total population of 27,158, 471 consisting of 13,676, 159 men and 13,482, 312 women.
In 2007 the population of the Ambo town is 50,267 and with the growth rate being 2.5%, its projected population is about 52,845. But the population of the town in 2009 is 67,514 or 15,223 households living in three Kebeles (Deyessa, 2011). There is a discrepancy between the CSA and the town administrative results (Shanmugham and Bekele, 2011). Figure 1 below shows the map of the study area.

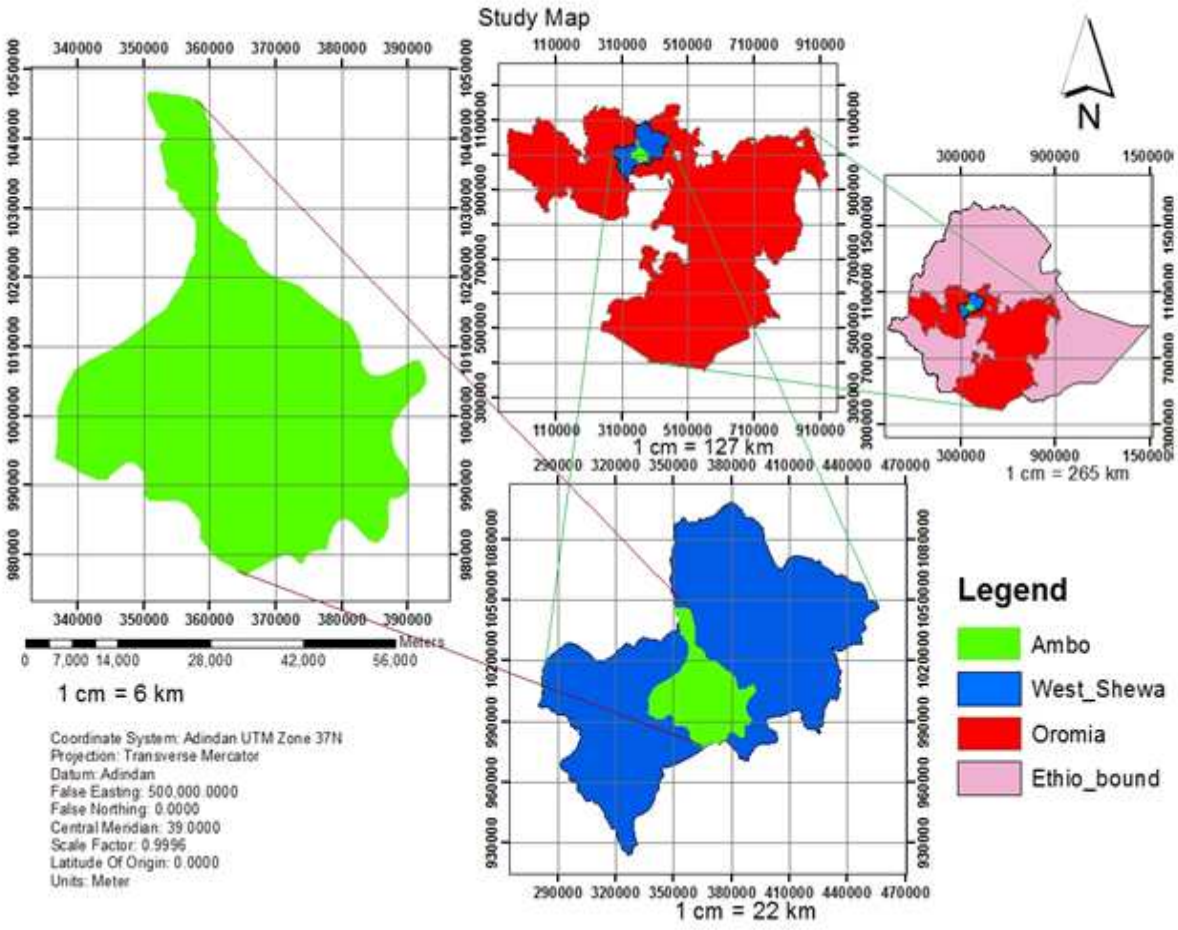


Figure 1.Study area map.

3.2. Data sources

Data was acquired through primary source such as interview questionnaire, anthropometric assessments and field observation. Secondary data sources such as government documents, publication and other research outputs were also used.

3.2.1 Sample Size Determination and Sampling procedure

In order to enhance generation and validity of the study, taking adequate sample size and employing appropriate sampling techniques were given special care and emphasis. Based on

Gordon and Gordon's (1994:369) formula, a sample size of 40 HHs having children aged 0-59 months were selected for the survey.

The underlying assumption used to determine the sample size in the study area is that the 2006 EDHS revealed that the prevalence of stunting in Oromia is 25 percent and thus p=0.25. therefore, the required sample size is determined on the basis of the following formual.

$$n=\frac{z^2 p.q}{d^2}$$

where

n=sample size

z= the standard normal value at the required confidence level (2.00)

p= an estimate of the population proportion assumed to be stunted (0.25)

q=1-p(0.60)

d= the level of statistical significance (0.50)

$$n=\frac{(2.00)^2\ (0.25)\ (0.60)\ +10\%}{(0.50)^2}$$

n=40

A total sample size of 40 HHs was taken using stratified sampling techniques. This technique is known to be an important component of probability sampling. There are three indispensable reasons for employing stratified sampling technique. First, the techniques help to improve up on the sampling technique thereby raising the representativeness of the sample. The aim of stratification is also create homogeneous group to reduce the sampling error are each stage. Finally, this technique also helps to ensure that all section of the society would be surveyed i.e. it provides all the HHs with equal chance of being include in the sample.

Once the size and sampling technique were determined, the next step was employing appropriate procedure of selecting the HHs. The sampling frame was made use of the Town administrative structure which is by KAs. All the 3 KAs were grouped in to three based on the existing ethnic groups. A kebele consist of differ ethnic groups, it is grouped based on the dominant ethnic grouped. Then 3 were randomly selected from the 8 KAs and they were categorized into three ethnic groups, namely, Oromo, Amhara, and Tigire . The numbers of selected kebeles from each ethnicity were relatively proportional to size. In selecting the HHs a two stage stratified sampling

technique was used. First, the sample KAs, within the Town were selected as primary sampling units and then eligible HHs for the survey was those that had members aged 0-59 months.

The total number of sample HHs for survey were allocated to the sample KAs according to the HH sizes of sampled kebeles with additional requirement that would insure a minimum number of HHs in each KAs. The selection of HHs for each KAs carried out using probability proportional to size; size being total number of HHs in each sample KAs (table 2.1).

From each sample KAs, selection of eligible HHs for the survey was carried out as follow. A fresh list of all HHs in each sample KAs was prepared by distinguishing HHs having at least one child aged 0-59 months, inclusive, from those not having by data collectors. Finally, the sample HHs was systemically drawn form each sample KAs. The systematic selection was conducted across every three HHs with a random start. In case where a selected respondent happened to be away from home or unwilling to be interviewed, the next HH was substituted.

As might have been expected certain HHs in the sample could have more than one child. However, all children within the selected HHs falling in the given age were included the survey.

Table 2.1: Sample size distribution of HHs having children 0-59 months by KAs.

KAs	Dominant ethnic groups	Total HH size having children 0-59 months	Sample size
01	Mixed	284	13
02	Mixed	298	14
03	Mixed	288	13
Total		**870**	**40**

Source: Author's Survey, 2012.

3.2.2 Data management, processing and analysis

The instruments used for the collection of the required data for the study were questionnaire and anthropometric assessment. So as to minimize potential complexities and data defects, many of the items were pre-coded with a great deal of caution. The first draft of the questionnaire was initially prepared in English and was given to, at least, two professionals and principal advisor

for comments in light of the objectives of the study and its ability in eliciting pertinent data. On the basis of the comments, the necessary corrections were made and the final English version was prepared which is annexed to this report. The questionnaire was directly translated to Amharic using very simple words because mixed ethnic group and phrases by keeping original meaning intact so that certain inconsistencies and communication barriers could be avoided. The final Amharic questionnaire, which was ultimately administered for generating the required information, consists of 40 items. The questionnaire has got two parts of which the first part deals with HH/mother information.

The second part contains questions pertaining to the index (study) child.

The fact that the data collectors, supervisors and an editor occupy the central position in this study, special attention was given to their recruitment and training. Three health extension workers were recruited as data collectors in order to achieve reliable and valid data. These interviewers then were given a half-days training mainly focused on interviewing techniques, interviewing regulations, field observation, pre-testing the questionnaire in the field for its validity, sharing of experiences among data collectors and on measures of weight and height of children.

One health officers by profession participated in further training to discuss duties and responsibilities. All along the training of supervisors and an editor ensuring data quality was emphasized. The supervisors were required to act as the leaders of the field team and to be responsible for the well-being and safety of team members as well as the completion of the assigned workload and maintenance of data quality. Close supervision of the interviewers and editing of completed questionnaires were emphasized to ensure accurate data collection. Once the training sessions were over, the Amharic version of the questionnaire was pre-tested on 12 mothers having children aged 0-59 months in one KAs, which in fact not included in the sample. The selection of the samples for the pre-test was purposively.

The outcomes of the pre-test helped in re-phrasing some of the questions, necessitated further training of data collectors for data quality control during the pre-test which helped the researcher in planning the fieldwork in view of the tight schedule in which the data collection was required to be completed. Once training of field staff and pre-testing were over, the questioner was

duplicated and became ready for actual fieldwork. The field work began on the first week of March and continued for ten consecutive days. Weight was measured by hanging Salter spring balance which has a capacity of 25 kg and calibrated 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 measurement was taken using wooden scales graded to the nearest centimeter for recording recumbent length of children under two years of age and standing height measured on a flat surface with bare foot for children older than two years by using stadiometer.

After the data collection was completed, the questionnaires were made ready for the data entry. Data entry carried out using EPI-INFO and analyzed with SPSS soft ware by orderly applying analytical method beginning with simple descriptive statistical displays and summaries. In descriptive part of the study percentage distribution of sampled children background characteristics was displayed using university analysis; a bivariate test (chi-square) was used to examine the association of each independent variable and long-term nutritional status. Only those variables having significant (Pearson chi-square p-value of <0.05) with the dependent variable were entered in multivariate analysis.

Multivariate analysis (logistic regression) was used to examine the relative effect of each independent variable (predictor) on the risk of stunting. The rational for selecting this model is that, chronic malnutrition is used as binary and the logistic regression model lends itself to biologically meaningful interpretation.

In addition to this, the model is widely applicable in epidemiological and health studies and is a powerful statistical tool for estimating the magnitude of the association between independent variable and binary outcome variables. Furthermore, from mathematical point of view it is extremely flexible and can easily be used for further research and investigation (David et al., 1989).

The result of the analysis is presented in the form of odds ratio (that is the ratio of the probability that the event will occur to the probability it will not). This model estimates the probability that stunting will occur (or a child will be stunted). Regression estimates greater than one indicates

that stunting is greater than for the reference category (P-value of <0.05 is used to determine the significance level).

The three indices of nutritional status (height-for-age, weight-for-height and weight-for-age) of the children were computed to estimate the proportion of stunting, wasting and underweight respectively.

3.2.3 Ethical considerations

Ethical clearance was obtained from PSRC IGNOU. Then officials at different levels in the target district were communicated through formal letters and permission had been obtained from the district administration and selected concerned governmental institutions. The objective of the study was explained for the target participant in order to get informal verbal consent. Furthermore, it was told to participants than names will not be written on the data and information obtained was anonymous.

Chapter Four

4. Discussion, analysis and Empirical results of the study

4.1 Discussion and analysis

4.1. Background characteristics of the study area and the sampled population

In this chapter, the overall background characteristics of the study area and the sample population are presented. In the first section, attempted is made to highlight the geographic, demographic and socio-economic characteristics of Ambo town. The second section of the chapter is devoted to the presentation of general demographic, socio-economic, health and environmental characteristics of the sample population.

4.2 Characteristics of the study area

Ambo town is found in Oromia regional state. It is located in the West Shoa zone. It is bordered by Dandi weroda in the north, Toke weroda in the west, Wench weroda in the south and Gindabarat weroda in the east (see appendix 3). The town encompasses 8KAs (see appendix 4). Ambo town is situated 110 kms north west of Addis Ababa. (see appendix 2)

The total area of the town is about 3,280 hectare where 85 percent highlands and 15 percent are midlands. The climate of the Ambo town is characterized as wenadega. Population grows at different rates each year depending on the birth and death rates, and on the balance of in and out migrations. According to the estimation of the Ambo town administrative Council (2010), the total population is 89500. And also the total HH in the Ambo town is about 13,411. Out of the total population, 44392 (49.60 percent) are females and 45108 (50.40 percent) are males. This shows that the sex ratio is relatively balanced. There is two health center and one hospital in the study area that is constructed by the government. It is under-equipped by material, drug, and health human resources. So one can understand that the health center is inefficient to provide quality services to the population of the study area (Ambo town Health Office, 2010).

4.3. Background Characteristic of the sampled population

As already revealed in the literature review section, certain background characteristics of respondents may have significant association with stunting. It is, thus, very important to describe the overall background characteristics before looking into the differentials and the relative contribution of each independent variables.

4.4.Demographic Characteristics of sampled population

Table 3.1: Percentage distribution of sampled children by major demographic characteristics of the HHs.

Background variables	Number	Percent
❖ Sex of the child		
Male	48	54.45
Female	40	45.45
❖ Age of the child (Months		
<6	9	8.18
6-11	17	15.45
12-23	22	20.00
24-35	26	23.65
36-47	24	21.82
48-59	12	10.90
❖ Mothers age at deliver (Year)		
15-19	84	11.60
20-24	160	22.20
25-29	144	19.90
30-34	121	16.75
35-39	76	10.50
40-44	64	8.90
45-49	70	9.70
❖ Birth intervals (Months)		
first birth	110	14.00
<24	420	53.40
24-47	134	17.00
48+	122	15.50
❖ Family size		
2-4	66	25.20
5-7	120	45.80
8+	76	29.00
❖ Number of under-five children		
1	28	29.45
2	48	50.50

3+	19	20.00
❖ Birth order		
First birth	38	42
2-3	32	35
4 and above	21	23
❖ Mother's marital status		
Married	126	77.80
Divorced	12	7.40
Widowed	16	9.40
Single	8	4.90

Source: Author's survey, 2012.

Table 3.1 presents the major demographic background characteristics of the respondents and children. The total number of children covered in the present study in Ambo town was 40. The sex distribution of the study children shows that males account for about 51.40 percent while the proportion of females in only 49.60 percent of the total sample size. Large proportions in the age groups of <6 months and 48-59, respectively. Information on the age distribution helps us to know the average initiation into stunting.

The first birth order constitutes the highest proportion (42 percent) while infants with birth order of four and above, 2-3 birth order accounts for 35 and 23 percent, respectively (table 3.1). Short birth interval may adversely affect a mother's health and her children's chances of survival. Past research has shown that children born too close to previous birth are at increased risk of stunting, especially if the interval between the births is less than 24 months. Majority of birth (53.40 percent) occur within two years of previous birth and 17 percent and 15.50 percent occur within the birth intervals of four and above, and birth intervals of 2-3 years, respectively. The order most important demographic characteristics revealed in table 3.1 is the reported number of under-five children and family size.

It can be observed that higher percentage of the study children have two numbers of siblings (52-.9 percent). The average number of children under-five in the study HH was 2.1. The average HH size of the study HH size of the study HHs was about 6.1 persons. Majority of the HHs (44.8 percent) had 5-7 members. As can be seen from table 3.1 very small proportion (only 4.90 percent) of the women reported their marital status as single and 77 percent as married while the rest reported divorced or widowed.

5.1.1. Major socio-economic Characteristics of sampled population

Table 3.2: Percentage distribution of sampled children by major socio-economic background characteristics of the HHs

Background variables	Number	Percent
❖ ***Mother's education***		
Illiterate	65	37.00
Primary (1-4)	48	27.00
Junior secondary (5-8)	32	18.00
Secondary (9-12)	24	13.70
Post-secondary (12+)	6	3.40
❖ ***Husband's education***		
Illiterate	58	20.60
Primary (1-4)	42	14.90
Junior secondary (5-8)	54	19.15
Secondary (9-12)	56	19.90
Post-secondary (12+)	16	5.70
❖ ***Mothers occupational status***		
professional	12	12.80
Trade	16	17.00
Laborer	24	25.50
House wife	28	29.80
Other services	14	14.90
❖ ***Husband's occupational status***		
professional	22	14.96
Trade	46	31.30
Laborer	34	23.10
other services	11	7.50
❖ ***HH annual income (Birr)***		
<2000	150	25.90
2001-2800	168	29.00
>2801	260	44.90
❖ ***Mother's religious status***		
orthodox	265	42
Muslim	62	9.80
protestant	258	40.90
Others	46	7.30
❖ ***Mother's ethnicity***		
Oromo	160	54.40
Tigire	24	8.16
Amhara	94	31.90
Gurage	16	5.50

Source: Author's survey, 2012.

Table 3.2. the major socio-economic characteristics of respondents. The literacy status of the mother of the study children is an important variable for the determinants of chronic malnutrition. As table 3.2. The illiterate mother is 37 percent. The proportion of literature mothers is quite large (67 percent). Even among the literate mothers, very small fractions have reached post-secondary level. The literacy status of husbands has almost similar pattern with that of the literacy status of mothers. It is found out that small proportion of husbands to be illiterate. Most of the literate husbands did not go beyond secondary school and that small proportion reached post-secondary level.

The educational level or literacy status of parents is also very important variable from the point of view creating employment/work status of the parents. In line with this, we observe very high gap in the reported work status of parent (see table 3.2). It is indicated that only 12.80 percent of the mother has reported to be engaged in professional work, while large size (29.8 percent) of the mothers work in house wife. On the other hand only 25.5 percent of the husbands engage in laborer work.

Table 3.2 presents the information collected in the HH annual income from the respondents followed by their own self assessment relative to others in the community. This indicates that the annual income of the majority of the HHs (60.7 percent) is low which shows the majority of sampled HHs were poor. When are assess the place of residence of sampled HHs.

The religious status of the respondents is presented in table 3.2. Majority of the respondents are followers of Orthodox Christians accounting for 42 percent. Protestant are the second dominant accounting for 4.90 percent. With regards to the ethnic background of the respondents, high proportion of Oromo (54.40 percent) is found followed by Amhara (32 percent)

1.5.1Major health and environmental characteristics of sampled population

Table 3.3: Percentage distribution of sampled children by major health and environmental background characteristic of the HHs.

Background variables	Number	Percent
❖ ***Source of drinking water***		
Protected	90	32.60
Unprotected	186	67.40
❖ ***Sanitation facilities***		
pit toilet	68	66
None	35	34
❖ ***Number of ANC visits***		
None	48	18.50
1-3	46	17.70
4+	36	13.80
❖ ***Vaccination status***		
vaccinate	48	42.90
Not vaccinate	64	57.10
❖ ***Recent illnesses***		
Yes	78	60
No	52	40
❖ ***Age at weaning***		
0-3	120	31.70
4-6	78	21.00
7+	98	26.50
Exclusively breastfeed	82	22.10

Source: Author's survey, 2012

As stated in different literature, health and environmental characteristics of HHs play role on the nutritional status of children. The source of water supply and the available of sanitary facilities are important determinants of the nutritional status of children. The information on source of water supply is shown in table 3.3 reveals that majority of the children born to mothers (79.1 percent) who had no access to clean water and 20.39 percent of the children occurring to the mothers who had access to availability of safe food. A very high proportion of HHs was not having toilet facilities. Since environmental contamination is the main cause of diseases, this significant difference observed in the study area may also bring variations in the nutritionals status of children.

Table 3.3 shows the percentage distribution of the number of ANC visits. In Ambo, many mothers (55.2 percent) have not received any prenatal checkups, and other mothers of (10 percent) received four and about antenatal checkups. A sound size of the mothers (49.9 percent) given as a reason for not attending ANC is health institution related problems, i.e. Accessibility, quality and cost and followed by lack of knowledge (30.7 percent). The percentage distribution of sampled children by vaccination status is presented in table 3.3. It can be seen from the table that, a very high proportion of children were not vaccinate.

The percentage distribution of recent illnesses from table 3.3 reflects that almost two-third of the study children were sick during the last two weeks of the survey. The most widely spread child disease in the study area was diarrheas (52.9 percent) followed by malaria (37.1 percent). The mother's health seeking behavior when their children get sick was also analyzed and it was reported that 42. 9 percent and 28.2 percent were taking their sick children to traditional healers and wizards respectively.

The practice of BF is almost universal in the study area. Nearly 81 percent of the study children were being breastfed at the time of the survey (table 3.3.) ,Through milk is regarded as an ideal feed for children, about 19 percent of the children were not breastfed at the time of the survey. The common reason for not BF is mother's illness (36.9 percent). In general, the median duration of any BF in the study area was 22.4 months. On the other hand, the median duration of excusive BF was 2.8 months. The provision of colostrums to new born children can protect the neonates against certain early life disease (Ezumezu as cited in Kalu, 1997). However, more than 40 percent (43.4 percent) children were given colostrums. Only about 56.6 percent were not fed colostrums. Many of the mother's given the reason for squeeze out of colostrums in unclear (49.2 percent) followed by thickness (28.6 percent). This reflects that large portion of children were not getting highly nutritious food that child protect disease. This might expose children to malnutrition and infectious diseases. Many mothers (43.8 percent) initiate BF soon after birth or less than one hour after birth, 29 percent after one day and 1 percent after 48 hours. It is also recognized that the kind of pre-lacteals foods used.

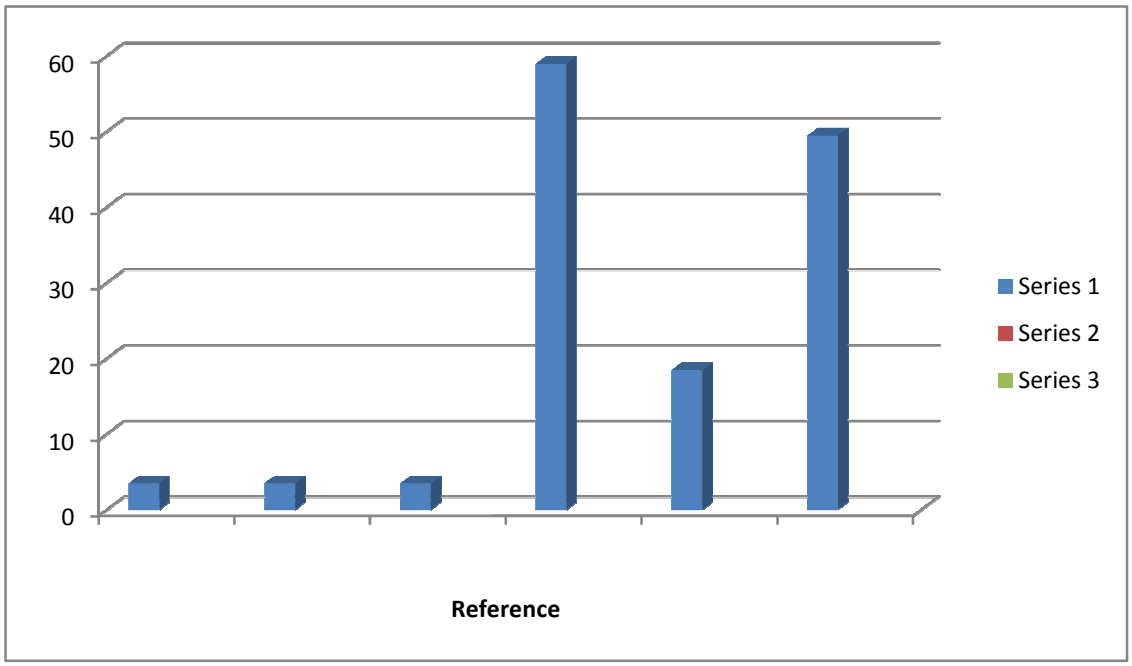
Breast milk improves the health and nutritional status of children and children should be breastfed exclusively for the first four months of age. WHO estimates indicates that one million deaths a year could be prevented if all children were breastfed for the first four months after

delivery (Kalu, 1997). However, out of the study children, about 42.6 percent were being give foods other breast milk contrary to recommended child feeding practices. On the other hand, breast milk alone is not sufficient not maintain the rapid growth and development of children after six months, that is, complementary foods in addition to breast milk are recommended from the age of six months onwards.

This study clearly showed that supplementation of food starts very early in the study HH. In the third months of life, Enjera and Wat were given to about 42.6 percent of the babies, which is too early for optimal infant growth. In this study 23.1 percent of the study children were given complementary food after seven months, which is too late for good infant nutrition.

1.5.1. Levels of malnutrition in the study area

Figure 2 presents the percentage of children classified as undernourished according to height-for-age (stunting), weight-for-age (underweight), and weight—for-height (wasting). As clearly seen, the levels of stunting, wasting and underweight are much higher than that of the reference population in the Ambo town.



The prevalence of stunting in the town was high, where 51.3 percent of children aged 0-59 months were short for their age (figure 2). The proportion of children who were stunted was 22.3 times more the level of expected in a healthy, well nourished population of the children who were stunted, 28.3 percent were severely stunted (i.e., below -3SD from the reference median). In a healthy well nourished population only 1 in 1000 children is expected to be severely malnourished.

The level of wasting, that is, the percentage of children classified as too thin, was 13.7 percent. The proportion of children who were wasted was six times more than the level of expected in a healthy, well nourished population. The percentage of children who were severely wasted (below -3SD) was 1.7 percent.

Weight-for-age (underweight) is a complex index of height-for-age and weight-for-height. It takes into account both acute and chronic malnutrition. About 48.4 percent of children aged 0-59 months were underweight. In addition, the proportion of severely underweight children was 20.4 percent.

4.2. Empirical results of the study

4.2.1. Differential of long-term Nutritional status: Bivaraite Analysis

In this chapter, the demographic, socio-economic, health and environmental differential of long-term nutritional status are presented. The chi-square test was used to examine the possible association of each independent variable with the dependent variable (stunting). It should, however, be noted that, unlike the multivariate analysis that is presented in the preceding sub-section, the chi-square statistical analysis does not tell us the relative contribution or net effect of each independent variable, but only indicate the existence of association. Once the chi-square result is presented, the differential of each independent variable is discussed thoroughly. In order to have a clear understating, independent variables are categorized into demographic, socio-economic, health and environmental characteristics.

4.2.2. Demographic differentials of Long-term Nutritional Status

Table 4.1 Results of the chi-square statistical significance test and percent of children aged 0-59 months that were stunted by selected demographic characteristics of the HHs.

Background variables	Number	Percent
❖ Sex of the child		
Male	42.9	**
Female	55.7	.00602
❖ Age of the child (Months		
<6	34.9	***
6-11	53.1	.00000
12-23	57.4	
24-35	55.4	
36-47	55.2	
48-59	49.5	
❖ Mothers age at deliver (Years)		
15-19	57.7	***
20-24	55.2	.00000
25-29	53.5	
30-34	51.9	
35-39	47.6	
40-44	45.3	
45-49	40.4	
❖ Birth intervals (Months)		
first birth	38.7	***
<24	57.8	.00000
24-47	54.6	
48+	41.9	
❖ Family size		
2-4	52.1	.10963
5-7	51.8	
8+	49.6	
❖ Number of under-five children		
1	43.8	**
2	51.1	.00130
3+	57.3	
❖ Birth order		
First birth	53.8	**
2-3	51.73	.01574
4 and above	50.9	

Source: Author's survey, 2012.
Note ***- significance at p<0.001
**- Significance at p<0.05

Table 4.1 shows that female children are more stunted than male children. There was statistically significant association in the prevalence of stunting by sex of children. The higher difference in proportion of females and males is a clear indication of the presence of sex differentials. The presence of gender differences in child nutritional status may imply the preferential treatment was given to male children. Similar finding was observed I the study done by (Melveille et al., 1988).

Table 4.1 presents the relationship between age of the child and long-term nutritional status. Age of a child is significantly associated with long-term nutritional status. As far as long-term nutritional status is concerned, the large proportions of the stunted children (57.4 percent) are found to be in the age group 12-23. This age range is known to be very critical from physical and biological point of view. It is said that the period many be related to infection, possibly diarrhea, caused by the introduction of weaning food. The age distribution, generally, give us a clue on the extent to which these children face the risk of stunting. The relationship between age and chronic malnutrition was also shown by Gugsa (1998) for Southern region and Nigussie (1994) for Bale region of Ethiopia.

As the chi-square test revealed, there is a significant relationship between mother's age and long-term nutritional status measurement index. Table 4.1 portrays that the percentage of nutritionally stunted children decreases as the age of mothers increases. This may largely be explained by the fact that older mothers appear to be relatively better experienced in child care and nutrition than younger mothers (Haggerty et al., 1999).

Table 4.1 depicts the possible association between birth intervals and stunting. As indicated in chi-square test, the two variables were found to have strong relationship (see table 4.1). The percentage of stunted children decreases with an increase in the length of preceding birth interval (table 4.1.). Previous birth interval also associated with the percentage of children stunted. The results of the study confirms previous findings that the prevalence of chronic malnutrition is high

in children born less than two years of birth interval compared with children born after birth interval of four or more years older (Renate, 1998). Long-term nutritional status shows no statistical difference as far as HH size is concerned. But variation in the level of stunting by HH size shows that the nutritional status of children was slightly better among children of HHs with eight and above members compared with children of the HHs with 2-3 members (table 4.1).

This may be due to the fact that HHs with lower members could be those newly married and therefore who are relatively less experienced in childcare and nutrition than those HHs headed by older experienced persons. In addition, large HH size increases the potential productivity of the HH especially where decline Similar report hypothesized that in large or joint families there is a greater likelihood of adult women being available to care for children (Grewal et al., 1993). Similar results have been reported for Southern region in Ethiopian (Gugsa, 1998).

As indicated by the chi-square result (table 4.1), the number of siblings and long-term nutritional status have quite significant association the inclusion of reported number of siblings in this study is aimed at looking into the possible relationship between the increase in number of children under-five and the limited resources. It is quite logical to say that increased number of siblings in any HH undoubtedly sharpens the competition for HH resources among them. Parents thus may be able to fulfill the increasing demand of children with very limited HH sources at their disposal. In addition to its consequences of increasing competition for HH resources, having large number of siblings may also create and crowed which makes the transmission of diseases among the HH members.

The prevalence of stunting varies by birth order. The relationships between birth order of a child and stunting is significantly associated (table 4.1). large number of children, 53.8 percent and 51.7 percent of nutritionally stunted children is reported for the first birth and 2-3 birth order, respectively. This may be explained by the fact that 1-3 birth order belongs to younger mothers who are usually inexperienced in child care and nutrition than older mothers.

4.2.3 Socio-Economic Differentials of long-term Nutritional status

4.2. Results of the chi-square statistical significance test and percent of children aged 0-59 months who were stunted by selected socio-economic characteristics of the HHs.

Background variables	Percent stunted	chi-square(X^2) Significance (P-value
• Mother's education illiterate Literate	 57.4 39.2	 *** .00000
HH annual income (Birr) <2000 2001-2800 >2800	 51.3 46.1 62.5	 *** .00000
• Mother's ethnicity Oromo Tigire Amhara	 56.0 25.4 46.3	 *** .00024
• Mother's religious status Orthodox Muslim Protestant Others	 42.3 9.9 40.0 8.2	 .11330
• Place of Residence Urban	 43.9	 **

Source: Author's survey, 2012.

Note ***- significance at $p<0.001$

**- Significance at $p<0.05$

Table 4.2 shows that mother's education has a significant effect on nutritional status of children. The percentage of children stunted among children of illiterate mothers is 59.4 percent compared with only 39.2 percent among children of literate mothers. Cross-tabulation result indicates that stunting was significantly associated with maternal education.

An important reason for the large influence of education may be that educated mothers are more knowledgeable about appropriate and sanitation in the HH. Other studies similar (EDHS, 2006; Vinod et al., 1999).

Table 4.2 shows the distribution of stunted children by HH income. Different studies have shown that HH income has strong positive effect on nutritional status. With the improvement of HH income, absolute expenditure on food is likely to go up as is the calorie-protein intake of the HH and also clothing, shelter and sanitary services (UN, 1985). As presented in the table, children who were from HHs of low economic status are relatively the most stunted prevalent ones (59.7 percent). This indicates that, poor HH could not afford and feed their children with the required types of food and care which directly affects child's growth performance.

In table 4.2 the percentage of stunted children by mother's religion is presented. According to the chi-square test of significance, mother's religion has not shown any statistical significance difference as far as long-term nutritional status is concerned. Orthodox, however, have relatively more percentage of stunted children. Similarly, researcher agreed on the non-explaining nature of religion on infant and child survival (UN, 1985; Gugsa, 1998; Vella, 1992). Percentage of stunted children by mother's ethnicity is shown in the table 4.2. Mother's ethnicity has shown statistically significant relationship with long-term nutritional status index. The highest percentage (56 percent) of stunted children belongs to the Ambo town. This may be due to low income, access to health services, and economic condition of HHs.

4.2.4. Health and Environmental Differentials of Long-term Nutritional status

4.3. Results of the chi-square statistical significance test and percent of children aged 0-59 months that were stunted by select health and environmental characteristics of the HHs.

Background variables	Percent stunted	chi-square(X^2) Significance (P-value)
• Source of drinking water		
Protected	42.9	**
Unprotected	57.5	.00160
• Sanitation facilities		
Pit toilet	43.4	**
None	57.1	.00166

• Number of ANC visits None 1-3 4+	 57.4 55.7 39.9	 *** .00000
• Vaccination status Vaccinate Not vaccinated	 52.9 47.7	 ** .0443
• Recent illnesses Yes No	 56.8 44.2	 ** .00111
• Age at weaning 0-3 4-6 7+ Exclusively breast feed	 51.3 40.7 58.0 45.9	 *** .00000

Source: Author's survey, 2012.

Note ***- significance at $p<0.001$

**- Significance at $p<0.05$

The environmental variables included in the (water sources and toilet types) were associated with long-term nutritional status of children Contaminated environment Such as contaminated water and personal and domestic hygiene can cause disease that affect the nutritional status of children. As can be seen from table 4.3, the highest percentage of stunted children is observed in the HHs who had no latrine and used unsafe water supply for drinking. The possible reason for this, sanitation facilities and source of drinking water directly or indirectly (mostly through diarrhea) affects nutritional status and hence the growth performance of children. A research found significant relationship between the anthropometric parameter, long-term nutritional status index, and type of drinking water and toilet facilities in North West Uganda (vella, 1992) and Amhara Region of Ethiopia (Aschalew, 2000).

The number of ANC visits a mother had during pregnancy is an indicator of some contact with health services and health seeking behavior. As can be seen in table 4.3, the number of ANC visits a mother had was inversely related to stunting. The prevalence of stunting among children of mothers who had four or more visits was low (39.9 percent) compared with 57.4 percent among children of mothers who had no visits. Vaccination status of a child is the other indicator of contact with health services would help correct incipient nutritional problems. Vacation status is positively related nutritional status. However, as can be seen in table 4.3 vaccinated children

were more likely to be stunted than children who had not vaccinated. An important reason could be that may children get stunted before they receive all recommended vaccinations. Consistent to this findings, Retestin (1996) found similar results. As presented in table 4.3, variations in the long-term nutritional status of children were observed by recent illnesses in the previous two weeks of the survey.

Prevalence of stunting was higher for those children who experienced recent illnesses (mostly diahhrea). This may result from use of unprotected water and lack of pit latrine (WHO, 1986).

Table 4.3 depicts the possible association between age at weaning and long-term nutritional status. As indicated in the chi-square test, the two variables were found to have very strong relationship (table 4.3). Children that started feeding semi-solid and solid food after seven months of age constituted the highest percentage Long-term Nutritional deficiency and age at weaning increase because the child needs Energy, protein, and other nutrients at the appropriate age to grow normally .A positive association has also been reported by vella (1992) in north west Uganda

4.3. Determinants of Long-term Nutritional Status: Multivariate Analysis

4.3.1. The model

It is recalled from sub-section 4.1 that an attempt was made to show the association, not the net effect of each independent variable using the chi-square statistical test. In order to examine the relative importance of each independent variable to the dependent variable, by controlling all the confounding effects, multivariate analysis (using logistic regression technique) was employed.

The logistic regression technique is used when the dependent variable is dichotomous (binary) in which case the event either “occurs” or “does not occur”. In this study, the dependent variable is “stunting” where a child will fall in one of two categories: a child is either “stunted” or “not either”.

In the odds ratio, e^{i} is the factor by which the odds change when the i^{th} independent variable increases by one unit. If β_i is positive, this factor will be greater than one ($e^{\beta i}>1$), which means that the odds increase (increased risk of stunting), if β is negative, the factor will be less than one

(e^{β} <1), which means that the odds decrease (decreased risk of stunting), when β is zero, the factor equals one ($e^{\beta i}$ =1) which leaves the odds unchanged. For each variable, there is a reference category against which all other values are compared. For this study, the reference category for each variable was set to be "the first" in an ordinal series. By default, the values of the reference category are given progression estimate of 1.00 by which the results of other remaining categories will be higher or lower than the reference category. The significance level of repression coefficients or the cut-off point for rejecting/accepting the null hypothesis used in this study is P-value of 0.05.

4.3.2. Demographic determinants of long-term nutritional status

Table 4.4: Results of logistic Regression of the net effects of demographic variables on stunting.

Background variables	β	S.E	Sig T	Exp (β)
◆ Sex of the child				
Male [RC]	Reference	Reference	Reference	Reference
Female	.3642	.1412	.0099**	1.4394
◆ Age of the child (month)				
<6 [RC]	Reference	Reference	Reference	Reference
6-11	.0740	.0120	.0000***	1.0666
12-23	.5323	.4300	.0000***	1.5144
24-35	.3018	.0204	.0002***	1.3461
36-47	.2831	.0201	.0077**	1.3283
48-59	.0760	.0220	.4143	1.0753
• Mother's age at deliver (Year)				
15-19[RC]	Reference	Reference	Reference	Reference
20-24	-.1136	.2366	.0812**	.8926
25-29	-.2490	.3519	.0202**	.7796
30-34	-.3301	.2606	.2052	.7189
35-39	-.4636	.2261	.0403**	.6290
40-44	-.8820	.3317	.0078**	.4139
45-49	-1.166	.4768	.0290**	.3114
• Birth intervals (Months)				
First Birth [RC]	Reference	Reference	Reference	Reference
<24	.2072	.1517	.321**	1.1208
24-47	.1091	.0757	.8005	1.0193
48+	-.2928	.0001	.0034**	.7462

• Number of under five children 1 2 3+	 Reference .2663 .4359	 Reference .1262 .1573	 Reference .0656** .0055**	 Reference 1.3051 1.5464
• Birth order First birth 2-3 4 and above	 Reference -.3571 .-0681	 Reference .0156 .0108	 Reference .5002 .0230**	 Reference 1.1326 1.0130

Source: Author's survey, 2012.

Note β- Regression coefficient
EXP (β)- odds ratio (probability of stunted)
S.E.- Standard Error
RC- Reference Category
Significant at P
** P<0.05
***P<0.0001

Table 4.4 reveals that the association between child's age and long-term nutritional status was examined through the logistic regression model. The model clearly reveals the existence of negative and significant associations between age of the child and stunting. The odds of becoming stunted child increased by 51.44 percent for the age interval 12-23 as compared to the reference category. This indicates that the second year of life was the most disastrous for nutritional status of children. Accordingly, the model also reveals that as the age of children rises stunting tends to increase from 0-5 months to 12-23 months and thereby gradually declines up to 48-59 months of life. A similar finding reveals the contribution of age to the risk of stunted Vinod et al. (1999) and Zolotkin (1991). In the case of sex of the child, the logistic regression model showed that the risk of being stunted for female children was increased by 43.94 percent when compared with male children (Hypothesis one is accepted). The possible reason for this differential of stunting may have been brought biologically or because of the sex preference attached with the traditions (culture) which is generally related to the economy, region, social and biological factors that the societies follow in feeding children. Similar findings was observed in a different survey (Melville et al. 1988).

Table 4.4 reveals the effect or association of maternal age and long-term nutritional status. Controlling other variable, the likelihood of the child being stunted decreases with maternal age moving from age group 15-19 to 20-24 and from 25-29 etc. The risk ration (table 4.5) suggests mothers aged between 45-49 years are more likely to physiologically mature and able to handle

the demands of pregnancy, child birth and child care. The chance of stunting of their children is reduced by a factor of 68.9 percent (e^B=.3114) compared with the case of children to mothers aged 15-19 years. The importance of mother's age on long-term nutritional status of children was evident in other studies. Adolescent mothers also lack experience and tend to be less psychologically mature and emotionally stable, leading to poorer child health care and infant feeding behaviors (Le Grand Mbacke, 1993).

After controlling for the effect of other factors, the logistic regression model has revealed a negative and significant relationship between birth interval and long-term nutritional status. The probability of occurrence of being stunted decreases by 25.38 percent (e^B=.7462) Moving from first birth to children of birth interval of 48 months or higher. The spacing of birth interval is important both for child's health and for the health of the mother. This result is similar with the findings of Roosmalen et al. (1995) and Renate (1998). Long birth interval decreases mother's exposure to infection and other diseases and improve child's survival. In addition, a child cannot be frequently and properly fed by a mother if there us very close spacing if birth (Al-Dabbagh and Ebrahim, 1994).

The net effect of the number of other under-five children to the risk of stunting was examined through the logistic regression model. Controlling for the effects of other the likelihood of stunting among children within a HH (Hypothesis two is accepted). The analysis of this study indicates that nutritional status of children of HH with no children other than the study child is less likely to be stunted than children from HHs that have additional children. The likelihood of being stunted increases by 30.51 percent moving from HHs with no or one other under-five children to HH with two other under-five also increases by likelihood of 54.64 percent moving from HHs with no other under-five also child to HHs with three and above. Too many under-five children within a HH increases competition between children for scarce HH resource such as maternal time, attention, food and clothing, and children of high birth order increases children's exposure to malnutrition (Vinod et al., 1999).

Birth order of the child, which is one of the most important demographic characters tics, was entered into the logistic regression model. As clearly indicated in the review of literature section and reaffirmed in the chi-square test, birth order has significant association with long-term

nutritional status. The logistic regression result, controlling for all other risk factor, reveals that birth order of the child has positive and significant contribution to stunting. The likelihood of stunting increases by 1.3 percent for four and above as compared to the reference category (See table 4.4).Similar findings were observed in the studies conducted by Nigussie (1994) and Ascahlew (2001) in Bale and Amhara Region of Ethiopia, respectively.

4.3.3. Socio-Economic Determinants of Long-term Nutritional Status.

4.5: Results of Logistic Regression of the net effects of Socio-Economic variables on stunting.

Background variables	B	S.E	Sig T	Exp (β)
◆ Mother's education Illiterate [RC] Literature	 Reference -.9439	 Reference .4529	 Reference .0001**	 Reference .3891
◆ HH annual income (Birr) <2000 [RC] 2001-2800 >2801	 Reference -.0101 -.4300	 Reference .7740 .1442	 Reference -.0021*** .0036***	 Reference .6702 .4418
• Mother's ethnicity Oromo[RC] Amahara Tigire Gurage	 Reference -.1580 -.8020 -.5410	 Reference .2466 .3117 .2663	 Reference .0463** -.0068** -.0471	 Reference .7385 .4081 .6532
• Place of Residence Urban [RC]	Reference	Reference	Reference	Reference

Source: Author's survey, 2012.
Note β- Regression coefficient
EXP (β)- odds ratio (probability of stunted)
S.E.- Standard Error
RC- Reference Category
Significant at P
** P<0.05
***P<0.0001

The educational level of mother was one of the socio-economic characteristics entered into the logic model. By controlling for the effect of all the other variables, the logistic model showed

negative and significant association of the variable with the dependent variable (Hypothesis three accepted). The likelihood of occurrence of being stunted decreases by 61.1 percent (e^B=.3891) from moving no education to literate. Children of educated mothers no educations are more likely to be stunted Than children of education mothers.

For example, educated mother gave complementary foods more frequently and in more protected, cleaner settings than non-educated mothers did (Guldan et al., 1993). Better-educated mothers are more likely to be better aware of modern nutrition and child rearing (Jelliffee, 1982) where as low nutritional awareness to be a risk factor nutritional status of HH member (Kogi-Makua, 1996).

Controlling for the effect of all other variables, the net contribution of HH income to stunting was examined. The HH income has negative and significant association with the dependent variable. The odds of stunting decreases by 55.82 percent (e^B=.4418) for HHs having HH income greater than birr 2801 as compared to the reference category. HH income can affect children's nutritional status through its association with increased likelihood of adequate dietary for all HH members, and access to and use of health services (UN, 1985).

The logic output reveals a similar trend between mother's ethnicity and chronic malnutrition similar to the bivariate approaches.

Concerning the association between place of residence of child's mother and long-term nutritional status, the logistic regression result showed significant relationship between these two variables. The probability of occurrence of being stunted increases by 52.07 percent of the urban area. Place of residence is slum to HH environmental condition such as the availability of safe water, sanitation and environmental pollution, which in turn have been associated with the prevalence of various types of childhood diseases (Majumder, 1993).

4.3.4 Health and Environmental Determinants of Long-term Nutritional Status

4.6: Results of Logistic Regression of the net effects of health and environmental variables on stunting.

Background variables	B	S.E	Sig T	Exp (β)
◆ Source of drinking water				
Protected [RC]	Reference	Reference	Reference	Reference
Unprotected	.3120	.1015	.0001***	1.4668
◆ Sanitation facilities				
Pit toilet [RC]	Reference	Reference	Reference	Reference
None	.4043	.1038	.0030**	1.4950
• Mother's ethnicity				
None [RC]	Reference	Reference	Reference	Reference
1-3	-.1092	.1476	.0014**	.9121
4+	-.1573	.1720	.0004**	.3781
• Vaccination status				
Vaccinated [RC]	Reference	Reference	Reference	Reference
Not vaccinated	.0130	.0420	.5700	1.0113
• Age at weaning				
0-3[RC]	Reference	Reference	Reference	Reference
4-6	-.2670	.0744	.0033**	.7656
7+	.2724	.6799	.492**	1.7934
Exclusively breastfeed	.0669	.2665	.7079	1.5069

Source: Author's survey, 2012.
Note β- Regression coefficient
EXP (β)- odds ratio (probability of stunted)
S.E.- Standard Error
RC- Reference Category
Significant at P
** P<0.05
***P<0.0001

After controlling all other confounding factors the risk of being stunted for children of HHs who obtained their water supply from unprotected source was 46.68 percent higher than those children who have been come from HHs who used water supply from protected source. In addition, the prevalence of stunting was somewhat 49.50 percent higher among children whose HHs did not have latrine facilities. This is because without an adequate supply of good quality water, a HH personal, domestic, and food hygiene are compromised and the risk of pathogen

contamination (and diarrhea diseases) increases affecting indirectly the nutritional status of children (WHO,1985).

With regard to vaccination, the general expectation is that those children who had been vaccinated have lower prevalence of chronic malnutrition. The logistic regression output after controlling all the confounding factors reveals that children who had not been vaccinated have higher chance of being stunted than the vaccinated ones (table 4.6). From the table, the risk of being stunted for those children who were not vaccinated is higher by 1.13 percent when compared with those children who were vaccinated. On the other hand, children of women who had received four and above ANC during the pregnancy of the child were 62.19 percent less likely to be stunted compared to children of women who did not receive any ANC (Hypothesis four is accepted). ANC can help prevent low birth weight and birth complications while, at the same time. Providing mothers with valuable information about child care, health and nutrition. In addition, a woman who has ANC is more likely to bring her child for a post-natal check up during which visit the child would be nutritionally assessed and the mother is given nutritional advice. Similar results were reported in Thailand (Jiro Jwong, 1990) and in Sudan (Ali, 1995).

As indicated in the review of literature, there is clear evidence of association between age at weaning and long-term nutritional status. After controlling for the effect of other confounding factors, the variable showed positive and significant association with the dependent variable (table 4.7). That is the odds of stunting increases by 79.34 percent for those children who started supplementation after six months of age as compared to the reference category (Hypothesis five is accepted). Children need nutritious food at the appropriate age to grow normally.

Chapter Five
5. Summary, conclusions and recommendations
5.1 Summary

Children's malnutrition is one of serious and widespread problems of many developing countries of Africa, Asia and Latin America. Though Southeast Asia hosts 72 percent of malnourished children found in the entire world, the problem is also becoming a very sensitive health issues in the regions of Africa and Latin America. In Ambo town, the 2011 health and Demographic Survey indicate that the level of both acute and chronic malnutrition is high. As indicated in the first chapter, the size and depth of the problem differ from place to place and from situation to situation. Taking into consideration the various psychosocial and developmental consequences of chronic malnutrition, identification of the basic causes of malnutrition is undoubtedly the first step towards any action plan aimed ameliorating the situation.

This study, thus, was devoted to examining the basic demographic, socio-economic, health and environmental determinants of long-term nutritional status in Ambo town. The absence of adequate studies of the determinants of long-term nutritional status in the area was cited as the foremost important reason for conducting this study in Ambo town.

On order to make this study comparable with other previous studies, various related literatures were reviewed. The review of related literature, thus, later served as a springboard for developing six different alternative hypotheses. These hypotheses were required to be tested for the association and relative contribution of selected demographic, socio-economic, health and environmental variables. The review of related literature also served as a point of reference for developing the conceptual framework of the study.

The methodology section (which consisted of data source, data collection, data organization and analysis) was one of the most important parts of the study to which the researcher paid a great deal of attention. A questionnaire consisting of 40 items was developed and was used to elicit the required information from the respondents. About 40 HHs having children 0-59 months old were selected using stratified sampling technique.

Recruitment and training of investigators was one of the first steps towards data collection endeavor. On the basis of certain criteria, qualified data collectors, supervisors and an editor were recruited and given to a half days training. Then, pre-test aiming at assessing the efficiency of the questionnaire and the fieldwork was conducted on 10 mothers having children 0-59 months in five KAs that are not included in the sample KAs who were selected through purposive sampling. The actual data collection was successfully completed after tireless effort was made for 8 consecutive days.

Following the fieldwork, the organization and analysis of the data were the other major components of the study, which required enormous time, labor, and care. According to this study, 51.3 percent of children 0-59 months old were found to suffer chronic malnutrition (stunting). The level of acute malnutrition (Wasting) and general malnutrition (underweight) for the study area were 13.7 percent and 48.4 percent, respectively.

Both univariate and multivariate techniques were used for analyzing the data. The univariate analysis was used to depict the background characteristics of the study population and differentials in stunting. The chi-square test was used to examine the association of each dependent variable with the dependent variable. The relative importance or contribution of each independent variable (controlling for all other variables) was assessed in the multivariate analysis section using logistic regression techniques. The bivariate result using the chi-square test proved the existence of strong association between each of the 17 independent variables and the dependent variable (i.e. stunting). Accordingly, out of the 17 independent variables entered 15 were found to be significant risk factors for stunting. These 15 independent variables were later entered into the logistic regression model to examine their relative importance in influencing the risk of stunting. As a measuring index of the relative contribution or strength of each independent variable sex of the child, age of the child, mothers age at delivery, birth intervals, number of under five children in the HH, birth order, mothers education, HH income, mothers ethnicity, place of residence, source of drinking water, sanitation facilities, number of ANC visits, vaccinations status and age at weaning, respectively, were very important determining variables.

5.2 Conclusion

The objectives of the study were to identify demographic, socio-economic, health and environmental factors associated with long-term nutritional status of children. In general, on the basis of data collected, objectives and hypotheses set, and analysis made, the following conclusions can be drawn.

a) Certain demographic characteristics are found to be highly significant determinants of long-term nutritional status of children in Ambo town.

- Females are at higher risk of stunting than males.
- Children in the age group 12-23 as compared to other age groups are more susceptible to the risk of stunting.
- Short birth intervals (less than 2 years) increased the likelihood of stunting.
- The higher the number of siblings under-five years of age in the HH that a child has, the more will be the likelihood of stunted.
- Family size becomes insignificant factor of stunting.
- Children born to young mothers are at higher risk of stunted than children born to mothers aged 45-49 years.

b) **Certain socio-economic and environmental characteristics have significant contribution to the risk of stunting among children in Ambo town.**

- Children of illiterate mothers are at higher risk to be stunted.
- Children from high HH income are at lower risk of stunting.
- Mother's ethnicity come significantly increases the likelihood of stunting.
- Children in rural areas are at higher risk of stunting as compared to children in urban area.
- Mother's religion does not significantly influence stunting.

C)Certain health and environmental characteristics are important in explaining stunting among children in Ambo town.

- Children who were introduced to complementary food lately (after six months of age) are more stunted than those who are introduced to complementary Food according to internationally recommended time table.
- Frequent use of ANC visits by pregnant mothers significantly decreases the likelihood of stunting. Equally important is vaccination status of children, in which case, children that

received vaccination as recommended according to their age are relatively at lower risk of being stunted.

- Children having HHs with protected drinking water supply and latrine facilities are at lower risk of stunting than children whose HHs use unprotected water supply and no latrine.
- Children who are exposed for frequent illnesses are at higher risk of stunting.

Finally, it should be mentioned that stunting is a function of many factors and no single factor alone determines the occurrence of the dependent variable. It is, however, true that one factor may better predict or influence the dependent variable than the others.

5.3 Recommendations

Having indentified many demographic, socio- economic, health and environmental factors determining long-term nutritional status of children, it is the felt need of the researcher to bring to the surface some of the strategies and forward valuable recommendations that can help in reducing the problem. The following are the recommendations for prevention and alleviation of child malnutrition in the study area:

1)The findings of this study indicated the factors such as birth order, birth interval, number of under-five children, birth interval, the BF, mother's age at birth and sex of the child exerting a significant effect on the nutritional status of children. Hence, talking sound policy measures on program development and implementation are highly vital.

2) Regional health Bureau, family planning program services, non-governmental agencies, Regional Bureau of Education, social Affairs and the community should plan and implement counseling services in family life related education in order to promote BF, improving birth spacing, raising mothers age at birth, avoid sex preferential and the minimum age at marriage.

3) The findings of this study has revealed that large proportion of mothers to be illiterate. The regional Education Bureau, NGO's and the community should give more attention to improve the educational status of females by increasing their participation at the levels of educational system. In addition, one important community based approach is providing alternative education to mothers. Because of the irregular house and variable conditions of their work, many mothers cannot take good advantage of the regular school system, which observes relatively inflexible hours and curriculum. It is, therefore, very important to provide them with non-formal education.

4) The study indicated that large percentage of mother are engaged in house wife a activities which is not worthy of gaining substantial amount of income. It is very important to create better income generating activities for mothers such as establishing credit and saving scheme for poor families, creating employment opportunities.

5) The findings of this study demonstrated that there was a significant variation in the prevalence of malnutrition across ethnic groups. This might be related to differences in cultural practice like child care practice (such as duration of BF, weaning foods etc.) or food taboos and economic condition of the area. Therefore, the fact that the increased risk of stunting is proved to be highly related to lack of awareness/knowledge, creating awareness and advocacy is one of the main preventive measures. Considerable advocacy works are needed to be made by governmental and NGOs focusing on the family and community. The advocacy program, thus, focuses on teaching the risks and consequences of stunting, and proper childcare and rearing method. Creating public awareness, sympathy and understanding of the health and nutrition of children through organizing health and nutrition educators is also another component of such program.

6) Regional office of Water Resource, Health Bureau, non-governmental agencies and the community should give priority attention by improving the quality and quantity of sources of drinking water and latrine facilities so as to reduce the high risk of infants and child stunting in the study area.

7) Poor coverage of utilization of ANC and vaccination services is probably the result of not knowing the importance as well as where even these services are available and limited access to these service. In this respect, policy makers and health professionals can play a major role in providing this information while the increase in number of health institutions will no doubt increase the accessibility of these services.

Finally, it is recommended that these preventive and alleviation measures must be combined in any attempt to reduce or ameliorate the problem of stunting. Therefore, further research is required to investigate the root cause of mal nutritional in this and other similar areas in the region.

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APPENDEX

QUESTIONNAIRE

INFORMED CONSENT

Hello my name is ……and I am working with (name of the organization). We are conducting a survey on factors associated with malnutrition among children under-five years of age in Ambo town. The data and information gathered through this questionnaire are confidential and will be used for research purposes alone.

Participation in this survey is voluntary and you can choose not to answer any individual question or all of the questions. However, we hope that you will participate in the survey since your views are very important and in getting all children under-five living in the household for measuring their height and weight at the end of the interview is very much appreciated. At this time, do you want to ask me anything about the survey? May I begin the interview now?

Identification

- Date of Interview ……..…….
- Interviewee Code …….
- Kebele (KA's) …….
- Residence

    1. Urban

Identification

- Time to Start ……..……. Time taken to complete
- Result
    - Complete ……
    - Partially completed ……....
    - Other (Specify)……..

I. House hold and respondent's Background information

No	QUESTIONS	CODING	SKIP
1	What is your religion?	1. Orthodox 2. Muslim 3. Protestant 4. Pother (Specify)……	
2	What is your ethnicity?	1. Oromo 2. Amhara 3. Tigire 4. Gurage	
3	Have you ever attended formal school?	1. Yes 2. No	
4	What is the highest grade you completed?	1. Primary (1-4) 2. Junior secondary (5-8) 3. Secondary (9-12) 4. Post secondary (+12)	
5	What is your marital status?	1. Married 2. Divorced 3. Widowed 4. Single	
6	What is your current occupation status? *Include any type of income generating activity	1. Professional 2. Trade 3. Laborer 4. House wife 5. Other (specify) ……..	
	Is your husband attended formal school?	1.Yes 1. No	
8	What is the highest grade your husband completed?	1. Primary (1-4)	

8	What is the highest grade you completed?	1. Primary (1-4) 2. Junior secondary (5-8) 3. Secondary (9-12) 4. Post secondary (+12)	
9	What is the current occupation of your husband?	1. Professional 2. Trade 3. Farmer 4. Laborer 5. House wife 6. Other (specify) ……..	
10	What is the annual income of the house hold? *probe for approximate number	Income source Birr 1.Wood and wood products sale _____ 2.Off-farm work _____ 3.Salary _____ 4.Daily labor _____ 5.Trade _____ 6.Other income _____ Total income _____	
11	What is the main source of drinking water for members of your household?	1. Protected (piped, tap, covered well/spring) 2. Unprotected (rivers, lakes, ponds, open well/spring)	
12	What type of toilet quality do most members of your household use?	1. Pit toilet 2. No latrine	
13	How many people living in this housing unit?	_____(specify)	
14	How many children of under-five	_____ (Specify)	

INTERVIER'S OBSERVATIONS

Comment about respondents:

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Comment on Specific questions:

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Any other Comments:

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SUPERVISOR OBSERVATION

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…….

Name of supervisor…….Date ……