

**Assessing determinants of acute and chronic undernutrition among under five children and providing suggestions to improve the undernutrition situation in Ethiopia**

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ROYAL TROPICAL INSTITUTE (KIT)  
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**“Assessing determinants of acute and chronic undernutrition among under five children and providing suggestions to improve the undernutrition situation in Ethiopia”**

A thesis submitted in partial fulfilment of the requirement for the degree of Master of Public Health

By

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Declaration:

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The thesis **“Assessing determinants of acute and chronic undernutrition among under five children and providing suggestions to improve the undernutrition situation in Ethiopia”** is my own work.

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## Abbreviations

AARR	Annual Average Reduction Rate
ANC	Antenatal Care
ARI	Acute Respiratory Infections
BMI	Body Mass Index
CBN	Community Based Nutrition
CF	Complementary feeding
DALYs	Disability-Adjusted Life Years
EBF	Exclusive Breastfeeding
EDHS	Ethiopian Demography and Health Survey
GDP	Gross Domestic Product
GMP	Growth Monitoring and Promotion
HDI	Human Development Index
HEP	Health Extension Program
HEWs	Health Extension Workers
HFA	Weight-For-Height
HFI	Household Food Insecurity
HH	Household
HSDP	Health Sector Development Plan
ICCM	Integrated Community Case Management
ICCIDD	International Council for Control of Iodine Deficiency Disorders
IDD	Iodine Deficiency Disorders
IMR	Infant Mortality Rate
ITNs	Insecticide Treated Nets
IYCF	Infant and Young Child Feeding practice
LB	Live Birth
MAM	Moderate Acute Malnutrition
MDGs	Millennium Development Goals
MMR	Maternal Mortality Ratio
MNCH	Maternal, Newborn, and Child Health
MoFED	Ministry of Finance and Economic Development of Ethiopia
MOH	Ministry Of Health
MUAC	Middle Upper Arm Circumference
NFP	Netherlands Fellowship Program
NGO	Non-Governmental Organization
NHA	National Health Account
NNP	National Nutrition Program
ORS	Oral Rehydration Solution/Salts
PHCU	Primary Health Care unit
PNC	Postnatal Care
RHB	Regional Health Bureau
SAM	Severe Acute Malnutrition

SD	Standard Deviation
SSA	Sub-Saharan Africa
SNNPR	Southern Nation Nationalities and Peoples Region
THE	Total Health Expenditure
UNICEF	United Nations Children's Emergency Fund
USI	Universal Salt Iodization
VAD	Vitamin A deficiency
WFA	Weight-For-Age
WFH	Weight-For-Height
WHO	World Health Organization



## **Glossary**

**Colostrum:** “The first fluid secreted by the breast during late pregnancy and the first few hours or days after birth. This thick fluid is rich in immune factors and protein” (World Bank 2013).

**Community nutrition program:** “A community-based program intended to prevent growth faltering, control morbidity, and improve survival of children by promoting breastfeeding, providing education and counseling on optimal feeding practices, preventing diarrheal disease, and monitoring and promoting growth” (World Bank 2013).

**Complementary feeding practices:** “A set of 10 practices recommended for caregivers to implement from 6 to 24 months, at which point breast milk and/or breast milk substitutes alone are no longer sufficient to meet the nutritional needs of growing infants” (World Bank 2013).

**Dietary diversity:** “Defined as the number of individual food items or food groups consumed over a given period of time. The seven food groups used as indicator for minimum dietary diversity are grains, roots and tubers, legumes and nuts, milk products, flesh foods, eggs, vitamin A rich fruits and vegetables, other fruits and vegetables” (WHO 2008).

**Diarrhoea:** “Defined as the passage of three or more loose stools over 24 hours period or more frequently than normal for a child” (WHO/UNICEF 2009).

**Early initiation of breastfeeding:** “Initiation of breastfeeding within one hour of birth. As a public health statistic, it is measured as the proportion of children born in the past 24 months who were put to the breast within one hour of birth” (World Bank 2013).

**Exclusive Breastfeeding (EBF):** “The feeding of an infant only with breast milk from his/her mother or a wet nurse, or expressed breast milk, and no other liquids or solids except vitamins, mineral supplements, or medicines in drop or syrup form” (World Bank 2006).

**Food insecurity:** “Is defined as lack of or unsure availability of nutritionally adequate and safe foods or limited or uncertain ability to obtain food in socially suitable ways in the household” (Anderson et al. 2012).

**Food security:** “When all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life” (World Bank 2013).

**Income poverty:** “According to United Nations and World Bank is poverty mainly based on monetary income level” (UNDP 2013).

**Malnutrition:** “An abnormal physiological condition caused by deficiencies, excesses or imbalances in energy, protein and/or other nutrients” (UNICEF 2013).

**Meal frequency:** “Is the time in which breastfed and non-breastfed children 6–23 months of age who receive solid, semi-solid, or soft foods (but also including milk feeds for non-breastfed children) the minimum number of times or more” (WHO 2008).

**Nutrition security:** “Is achieved when secure access to appropriately nutritious food is coupled with a sanitary environment – alongside with adequate health services and care, this ensures a healthy and active life for all household members or individuals” (Benson, 2005).

**Oral Rehydration Solution/Salts (ORS):** A liquid electrolyte solution that is used for the management of diarrhea among children. ORS is typically distributed in ready-to-use sachets that are added to one liter of clean water (World Bank 2013).

**Stunting (chronic undernutrition):** “Low height-for-age, defined as more than 2 SD below the mean of the sex-specific reference data. Stunting is the cumulative effect of long-term deficits in food intake, poor caring practices, and/or illness” (World Bank 2013).

**Undernutrition:** “Is a condition in which the body does not have enough kind of food to meet its energy, macronutrient (proteins, carbohydrates and fats) and micronutrient (vitamins and minerals) needs” (Pridmore and Carr-Hill 2011).

**Wasting (acute undernutrition):** “Low weight-for-height defined as more than 2 SD below the mean of the sex-specific reference data. Wasting is the result of a recent shock such as lack of calories and nutrients and/or illness, and is linked strongly to mortality” (World Bank 2006).

**Z-score:** “The variation of an individual’s value from the median value of a reference population, divided by the standard deviation (SD) of the reference population” (World Bank 2006).

## **Dedication**

I dedicate this work to my family, all Royal Tropical Institute staff and all my colleagues in 50<sup>th</sup> International Course in Health Development (ICHHD) 2013-2014, who supported me during the course.

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## Abstract

**Introduction:** acute and chronic undernutrition is a public health problem among under five children in Ethiopia. It is underlying cause for 57% of death among them.

**Objective:** This study assesses determinants of acute and chronic undernutrition among under five children in order to provide suggestions to improve the situation in Ethiopia.

**Methodology:** The UNICEF conceptual framework for undernutrition was adopted and used as a guide for literature review.

**Findings:** Inadequate nutrient/food intakes in terms of quality and quantity and childhood infectious disease like diarrhoea, pneumonia, malaria and other parasitic diseases are determinants for acute undernutrition among under five children. Household food insecurity, poor child and mother care practices with lack of access to health services and unhealthy environment are the underlying or behavioural determinants for chronic undernutrition among under five children. They affect dietary intake and status of infection among children. Furthermore, the income poverty, the base in which all hierarchal level was dependent and they together affect nutritional status among under five.

**Conclusion and recommendations:** immediate, underlying and basic determinants are important factors for status of acute and chronic undernutrition among under five children in Ethiopia. It is important to understand how these factors influence each other and affect nutritional status of children to provide response. Also, the best practices and the evidence based interventions are recommended to improve the undernutrition situation in Ethiopia. Finally, research is recommended to have evidence about multisectoral approach.

Key words: acute undernutrition, chronic undernutrition, under five children, Ethiopia, stunting and wasting.

Word count: 11,818

# **Assessing determinants of acute and chronic undernutrition among under five children and providing suggestions to improve the situation in Ethiopia**

## **Introduction**

Malnutrition generally comprises both undernutrition and over nutrition. In the context of this thesis undernutrition is the main problem of concern. Undernutrition is responsible for 11% of the worldwide disease burden or disability-adjusted life year (DALYs) loss and it involves limitation in foetal growth, chronic (stunting), acute (wasting), underweight and micronutrient deficiencies (Black et al. 2008). Undernutrition is underlying causes for about 54% of all deaths among under five children (approximately 11 million) worldwide and for 57% of mortality in Ethiopia per year (Egata et al. 2014).

In 2011, about 165 million under five children were stunted with uneven distribution around worldwide. The majority of them (90%) reside in countries of sub-Saharan Africa (SSA) 40% and South Asia 39%. In the same, year 52 million and 102 million under five children were wasted and underweight, respectively. Like stunting, the burden is common in SSA and South Asia (UNICEF; World Bank 2013). Even though prevalence of undernutrition has shown significant reduction globally, there are still some shocking exceptions particularly in the SSA and South Asia (Hobbs & Bush 2014).

Having said these, I became interested in nutritional status among under five children through the following process: after I graduated in 2008, I had worked in the District health office as an officer in growth monitoring and promotion among under two children in community based nutrition (CBN) program. This enabled me to understand undernutrition problem among children in Ethiopia with the highest prevalence of stunting (44.4%), wasting (10%) and underweight (29%) that is the highest range of public health important according to World health organization cut-off points (see annex 1). As well, the knowledge and skill that I learned at the Royal Tropical Institute (KIT) encouraged me to assess acute and chronic under nutrition among under five children in Ethiopian. And, the suggestion of these lessons will be shared with Ministry of Health (MOH) and its partner that work on nutrition and my colleagues in order to improve the nutritional status of under five children in Ethiopia.

## **CHAPTER ONE: Background**

### **1.1. Geography and Climate**

Ethiopia is situated in the Horn of Africa. The total area of the country is around 1.1 million square kilometres, and it shares borders with Djibouti, Eritrea, Kenya, Somalia, Sudan and south Sudan (see annex 2). Ethiopia is a country with great geographical diversity, a topography ranging from 4550 metres above sea level to 110 metres below sea level. There are generally three climatic zones: the Kolla or hot lowlands below approximately 1500 metres, the Weyna Dega at 1500-2400 metres, and the Dega or cool temperate highlands above 2400 metres. In general, the highlands receive more rain than the lowlands (FMOH 2010).

### **1.2. Demography**

Ethiopia is the second most populous country in Africa after Nigeria. The 2007 census showed that the country has a population of 73.9 million. The estimated population with annual growth rate of 2.6% in 2014 is 88.4 million. With the same growth rate, the total population is expected to reach 90.7 million by 2015. The population age structure of Ethiopia is mainly young, with children under 15 years of age accounting for some 44% of the population. Among them children under 15 years of age 15% are under five children. More than half (52%) of population are lies between 15 to 65 years old while persons over 65 years make up nearly 4% (FMOH 2010).

Female to male sex ratio is approximately equal and 24% of population represent women in reproductive age (FMOH 2010). According to EDHS 2011 report, the average lifetime fertility per woman is 4.8 and there are disparities in rural and urban and among regions. In rural woman, the fertility is 3 times higher than woman in urban while in Addis Ababa 3.3 children and in Somali region 9.7 children per woman. On a national scale, the average household size is 4.7 individuals (CSA and ICF International 2012 from now on referred to as EDHS 2011).

### **1.3. Administrative structure**

Ethiopia has nine regional states namely Southern Nation Nationalities and Peoples Region (SNNPR), Oromia, Somali, Harari, Gambella, Benishngul-Gumuz, Afar, Amhara, and Tigray; and two City Administrations: Addis Ababa and Dire Dawa. These states and City administrations are further categorized into 817 administrative districts (Woredas). These districts are further classified into 16,253 villages (kebeles), the smallest administrative

entity in the structure of governance. The Woreda is the fundamental decentralized governmental unit. Ethiopia is exercising decentralization by devolution system of federal government (FMOH 2010).

#### 1.4. Socioeconomic status

Agriculture sector is the main source of the country's economy. It shares about 45% of gross domestic product (GDP) and 80% of export goods and responsible for 83.4% of the work force. Poor farming system together with persistent drought make the economy very exposed to climate change (WHO 2013). According to the United Nations Development Program (UNDP) of 2013 report, Ethiopia ranked 173 out of 187 countries with equivalent data in the human development index (HDI) (UNDP 2013).

#### 1.5 Education

Although gross enrolment rate for primary school has improved, countrywide literacy rate is 36% (which is very low). The total adult literacy rate (persons above 15 years who can read and write) is 36% (56% for male and 44% for female). The variation in enrolment is seen between urban and rural, in which 85% male and 72% female in urban and 56% male and 42% female in rural. As well, there are large inconsistency in women's literacy levels among regions that range from 20% in Somali and Afar regions and 80% in Addis Ababa (EDHS 2011).

#### 1.6 Health System in Ethiopia

##### 1.6.1 Health status

High prevalence of communicable infections is responsible for high deaths and illness in Ethiopian. Even though both communicable diseases and undernutrition are potentially preventable, they affect about 75% of population. In 2012, life expectancy at birth was 62 years for male and 65 years for female (WHO 2014). Infant mortality rate (IMR) is 59 deaths per 1000 live births (LB). The under five mortality rate is 88 per 1000 LB in 2011 which decreases from 123 per 1000 LB in 2005. The maternal mortality ratio (MMR) is 676 per 100 000 LB (EDHS 2011). These indicators verbalize more on health and general socioeconomic state of the country.

##### 1.6.2 Organization of health system

According to the fourth health sector development plan (HSDP IV), a three-tier health care delivery system has put into practice. Level one is consisting of Primary Health Care Unit (PHCU). This is a District health system which



comprised of a primary hospital (to serve about 60,000- 100,000 people), health centres (1:25,000 population) and their satellite Health Posts (1:5,000 population) connected to each other by a referral system. In level two, a population of 1-1.5 million people are served in general Hospital while a population of 3.5-5 million people are covered under level three which is specialized Hospital (FMOH 2010) (see annex 3).

### 1.6.3 Human resources for health

In Ethiopia, scarcity of health staff, uneven distribution of health work-force within the regions and rising attrition of the workers are among the most serious crisis of the health system. Ethiopia has about 0.027 doctors per 1,000 people that are very lower than the Sub-Saharan Africa (SSA) average (0.1 per 1,000 people) (Hailemichael et al. 2010). According to Africa health workforce observatory in 2010, there was a great variation in ratio of health workers per 1000 population among the regions in Ethiopia. At national level the ratio was 0.84 and it ranges from the highest (2.8) in Harari region to the lowest (0.49) in Somali region. Three regions (Oromia, Amhara and SNNPR) which contribute more than 95% total population; however, the health staff ratio to population is smaller than that of the Harari region (AHWO 2010) (see annex 4).

Also, the health workforce varies between urban and rural in number. The health workforce density per 1000 population is higher in urban areas than in rural areas. Thus, the majority of population who residing in rural areas (more than 83%) have low ratio than urban and they benefit less than urban in terms of access to mid-level and high-level health professionals (AHWO 2010).

### 1.6.4 Health care financing

Health care is financed by different sources. According to the fifth National Health accounts (NHA) in 2010/2011, government has shared 15.6%, donors and non-governmental organizations (NGO) 49.9%, households 33.7% and others contributed 0.8% for health care. Although total health expenditure (THE) as percentage of GDP has shown increment by (5%) from 4.5% in 2007/2008 to 5.6% in 2010/2011, it is far less than Abuja declaration to spend 15% of GDP on health (FMOH 2014).

## **CHAPTER TWO: Problem statement, Justification, Objectives and Methodology**

### 2.1. Problem statement

Child undernutrition is a major public health problem in Ethiopia (Teshome et al. 2009). As it was indicated in EDHS data, 44% of children under the age of five are found to be stunted (chronic undernutrition), 33% were underweight and 10% were wasted (acute undernutrition) (EDHS 2011). According to WHO, stunting and underweight prevalence of over 40% and 30%, respectively as very high and a major public health important and wasting which is 10% is a serious problem (WHO 2010) (see annex 1).

Undernutrition is manifested as four forms that can be seen via physical growth failure and cognitive retardation among under five children in Ethiopia (Egata et al. 2013). Acute undernutrition is a case in which children remain thin with low weight for their height. Chronic undernutrition is that children are remaining too short than their counterparts for their age. Underweight is a situation in which children have low weight for their age and that might be acute and/or chronic (Victoria et al. 2013). Finally, micronutrient deficiency is seen as one form of undernutrition among under five children who affected chronically; namely: iron deficiency (anaemia), vitamin A deficiency (VAD), iodine deficiency disorders (IDD) and zinc deficiency (Hadgu et al. 2013).

Acute undernutrition is a condition that generally results from weight loss due to acute illness and/or reduced nutrient intake and inappropriate childcare practices or a combination of these factors. The degree of acute undernutrition is classified as either moderate or severe based on anthropometric and clinical measures (Black et al. 2008). In Ethiopia, the prevalence of acute undernutrition among under five children is 10%, out of which 3% are severely wasted. An estimated 51% of deaths among under five children is due to acute undernutrition of which 40% is because of moderate undernutrition (Egata et al. 2014).

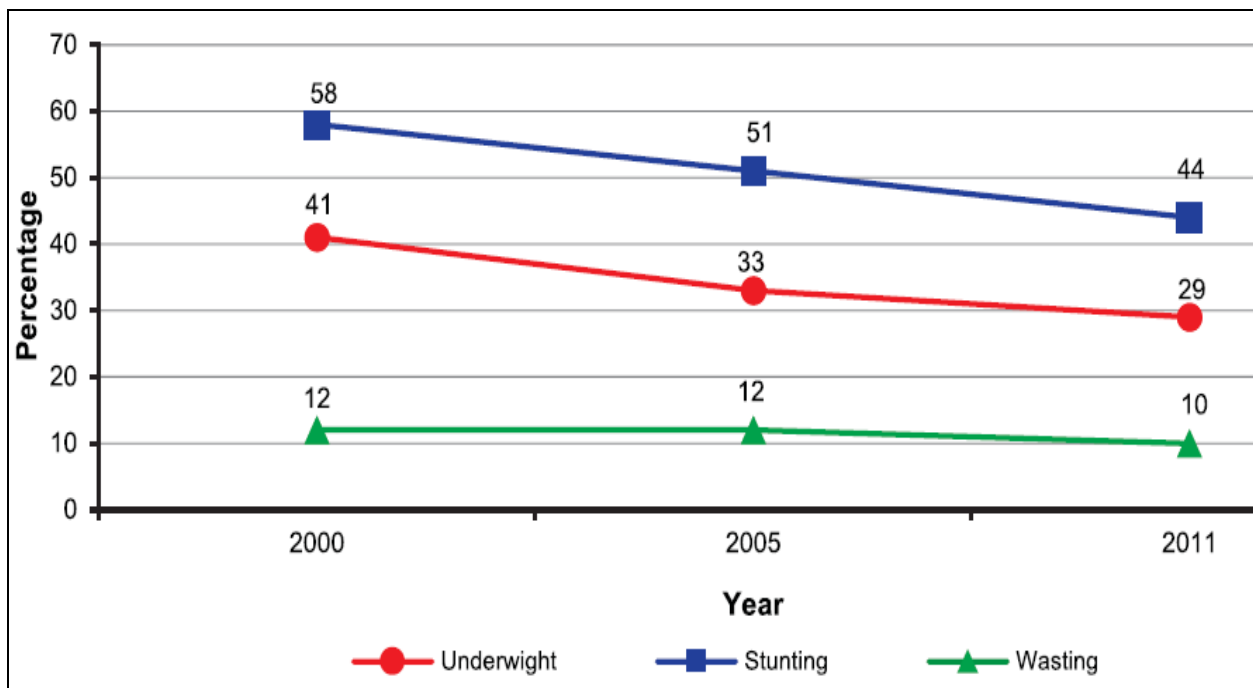
Chronic undernutrition among under five children is a public health problem in Ethiopia (Berihun & Azizur 2013). It is attributable to more than half of all child deaths in Ethiopia through raising the risk factors of other childhood illnesses. It also deteriorates cognitive development of children, particularly before the age of two that the effects may be irretrievable. A stunted child also has a limited ability in school performance and become more susceptible to chronic diseases later in life and productive ability will be lower (Fentaw et al. 2013; Abuya et al. 2012). In the past decade, Ethiopia has only limited success in reducing the prevalence of chronic child

undernutrition from 58% in 2000 to 44% in 2011 and underweight reduced from 41% to 29%. This is only 23% reduction for chronic undernutrition from baseline (58%) and 29% reduction for underweight from 41% (in 2000) (see figure 1). However, the annual average reduction rate (AARR) of stunting is very lower (2.3% per year) than required (4.7%) to achieve 40% reduction of stunting by 2025 (WHO 2014). To achieve this goal, undernutrition should be addressed comprehensively. Therefore, the aim of this thesis is to assess determinants of acute and chronic undernutrition among under five children and provide suggestions to improve the situation in Ethiopia.

## 2.2. Justification

Globally, about 165 million children under the age of five were stunted according to a new report on child nutrition (UNICEF 2013). In developing countries, undernutrition is one of the primary causes of morbidity and mortality in children younger than 5 years. In Ethiopia, undernutrition is underlying causes for about 57% of all deaths among under five children (Yebyo et al. 2013). Still, chronic undernutrition causes devastating and irreversible damage among children who survived, especially if it occurs under year two (Alemu 2013). Inability to reduce the prevalence of undernutrition among under five children will lead to long term impacts like potential of complicated delivery due to short stature among women in later life, retarded cognitive ability, economic and productive loss of the country as whole (Berihun & Azizur 2013). Therefore, it is very important to have nutrition specific and nutrition sensitive interventions to reduce prevalence of undernutrition among under five children and its impacts on nation in general.

Figure 1. Trends of stunting, wasting and underweight in under 5 in Ethiopia (from 2000 to 2011)



Source: (EDHS 2011)

## 2.3 Objectives

### 2.2.1 General objective

- To assess determinants of acute and chronic undernutrition among under five children in order to provide suggestion to improve the undernutrition situation in Ethiopia.

### 2.2.2 Specific objectives

- To identify determinants of acute and chronic undernutrition among under five children in Ethiopia
- To analyze best practices and other evidence based intervention to address acute and chronic undernutrition among under five children in Ethiopia
- To give recommendations to MOH and other partners in order to improve undernutrition among under five children

### 2.2.3. Study questions

- What are the determinants of acute and chronic undernutrition among under five children in Ethiopia?

- What are the evidence based interventions and best practices to address acute and chronic undernutrition among under five children in Ethiopia?
- What are the options to be provided to MOH and other partners in order to improve the undernutrition situation in Ethiopia?

## 2.4. Methodology

### 2.4.1 Literature review

Literature review was method used to answer the objectives of the thesis using UNICEF conceptual framework for undernutrition. This review was done through literature search using database of PubMed, Google scholar, Scopus and Wiley online library. Other websites such as that of MOH, WHO, UNICEF, save the children/UK, and World Bank were also used to collect relevant data on of acute and chronic undernutrition among under five children to accomplish the objective of the thesis. Also, relevant English literature on prevention and treatment of undernutrition among children under five years of age were reviewed. In addition, reviewed and systematic papers were incorporated in the literature review to answer the objectives of the thesis. The following key words were used for searching appropriate literature.

Key words: under five children, stunting, wasting, acute undernutrition, chronic undernutrition, undernutrition prevention, acute malnutrition treatment, Iron deficiency, Iodine deficiency, Anaemia, vitamin A deficiency, exclusive breastfeeding, complementary feeding, intergenerational cycle undernutrition, food insecurity, nutrition insecurity, Sub-Saharan Africa, and Ethiopia. The key words were used in combination to limit the number of articles to reach needed information for review. The combination of the words were done mostly using the connector AND/OR.

#### Inclusion criteria

- Studies that focused on determinants of undernutrition, risk factors, management of undernutrition forms and evidence based intervention on children less than 5 years of age
- Studies conducted for ten years (2004-2014) but relevant studies before 2004 also were included
- Also relevant documents, reports and unpublished literature were included

#### Exclusion criteria

- Studies that focused on undernutrition among children above five years of age or school children
- Studies that focused on over nutrition among under five children

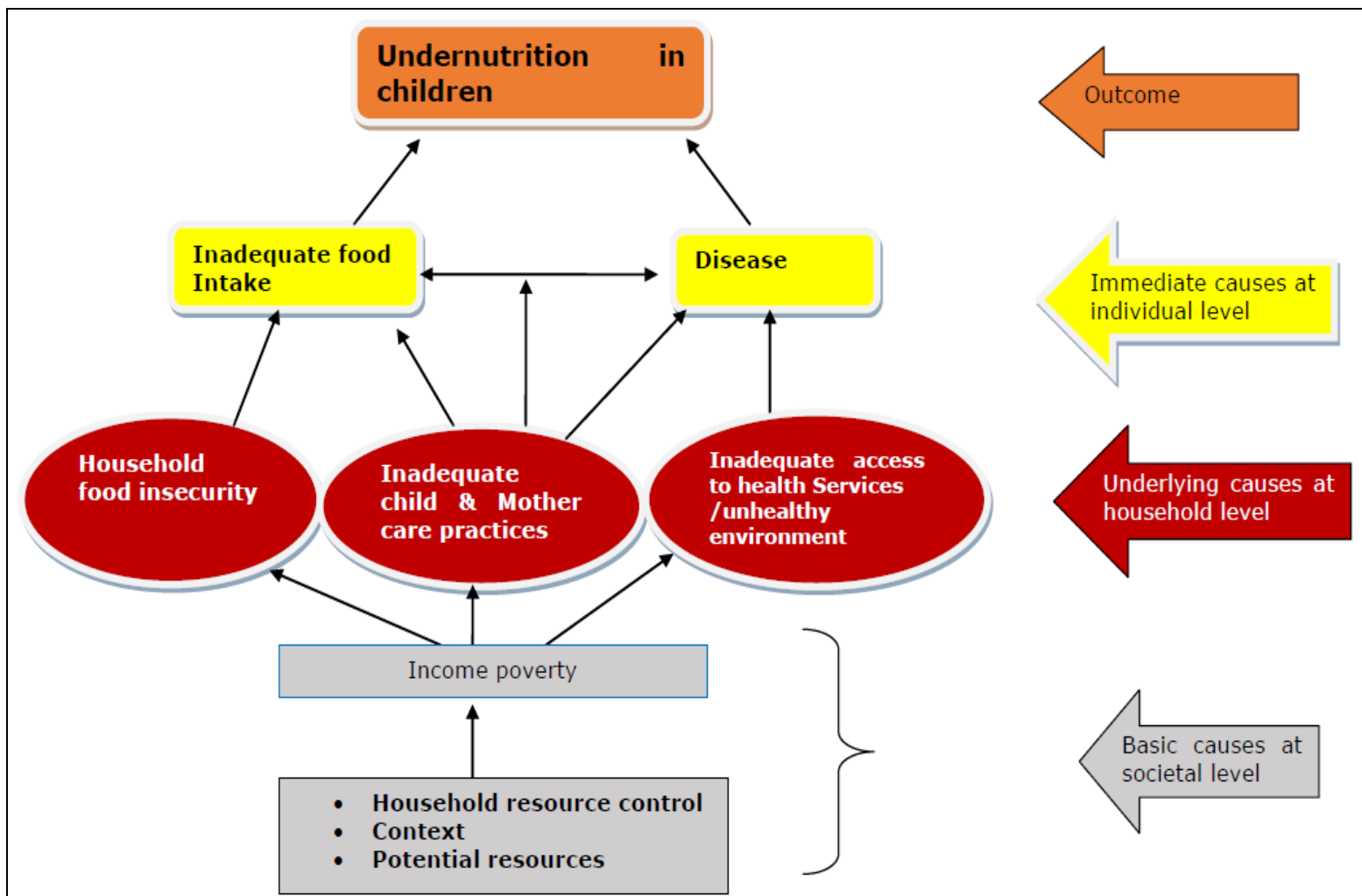
## 2.4.2 UNICEF conceptual framework

United Nations Children's Emergency Fund (UNICEF) conceptual framework as a strength of frame can be used in different economic situations, geographical, cultural and applications. Also, it is applied at different levels to assist useful actions to improve nutritional status of children (UNICEF 1998). It is important to understand the determinants of child undernutrition which needs to be recognized in order to take effective measure. These determinants are various and hierarchically interconnected to each other. Consequently, a systematic thoughtful of these factors is vital for a better intervention. In connection with this, the UNICEF in its conceptual framework acknowledged three key determinants that possibly cause child undernutrition (Egata et al. 2014). These three levels of causality are immediate (biological); underlying (behavioural) and basic (structural) factors (see figure 2).

The immediate cause of undernutrition is due to disparity between the amount of nutrients absorbed by the body and the amount of nutrients required by the body as a consequence of too little food intake and/or disease. The underlying causes of undernutrition can be grouped under the three broad categories of household food insecurity, inadequate child care practices and inadequate access to health services and unhealthy environment. Ultimately, Potential resources, context, resource control and decision making at household level and cultural factors may overcome the best efforts of households to attain good nutrition and these are described as basic causes of undernutrition.

The selected literature were analyzed to check their quality by using relevant key words, examining the complete reference for selected literature, sample size and sampling methods and study designs of the study.

Figure 2. UNICEF Conceptual framework for child undernutrition



Source: (Adopted from UNICEF 1998)

## **CHAPTER THREE: Study findings**

This chapter presents three categories of determinants of child undernutrition as elucidated in the conceptual framework: immediate, underlying, and basic determinants (see figure 2).

### **3.1. Immediate determinants**

Food, health and care are three most important factors which influence the nutritional status of children. Thus, their optimal nutritional status is maintained when they have enough nutrient rich food, get appropriate child care practices, have adequate access to health services and live in healthy environment. These factors straightforwardly have an effect on nutrient intake and the presence of disease/infection; hence, they affect nutritional status of children at individual's level (World Bank 2013).

#### **3.1.1 Inappropriate dietary intake**

##### **Dietary diversity and Meal frequency**

According to WHO, in infant and young child feeding practices (IYCF) both dietary diversity and meal frequency are considered as proxy indicators for minimum suitable diet of complementary feeding in children aged 6-23 months (WHO 2008). However, as indicated in EDHS 2011, only 4% of children aged 6-23 months were fed as recommended minimum acceptable diet (four or more food groups), 5% minimum dietary diversity while the minimum meal frequency was 49% of them nationally. The discrepancies were seen among regions, mother's educational status and wealth quintiles of children's families. Children in Somali region who fed according to IYCF practices were 22% and Dire Dawa 58%. But, the variation was nearly similar between urban and rural 48% and 52%, respectively (EDHS 2011).

A cross sectional study done by Teshome et al. (2009) in Northern Ethiopia showed that frequency of feeding has risk of stunting among children. Children who were fed greater than three times per day were less likely stunted than those who fed less than three. Also in the same study they confirmed that the type of complementary food has association with stunting. Children who fed food prepared only from cereals were stunted (51%). Also those who used 'Injera' or traditional food of Ethiopia as their main dish were stunted (47.6%). This can be explained that there is less nutrient variety since it is prepared from limited types of grain 'Teff'. While children who given food prepared from mixed type of categories were less likely stunted. For example, children who ate mashed potato with dairy products were tended to be less stunted.



### 3.1.2. Disease

Globally about 50-75% of measles, malaria, pneumonia and diarrhoeal diseases are contributed to child undernutrition (Gyampoh et al. 2014). In Ethiopia, an estimated 90% of under five children deaths are due to pneumonia, malaria, measles, diarrhoea and neonatal causes. In view of that, undernutrition is the underlying causes of mortality in about 57% of these deaths as it enhances the threat that children will die of these diseases (FMOH 2005).

#### Diarrhoea

According to UNICEF (2009) tracking progress report on child and maternal nutrition, diarrhoea is responsible for 19% of all deaths in under five children in Ethiopia. Of these, 30% of diarrhoeal death affects infants aged 1-11 months old (Rahman, 2014). The prevalence of diarrhoea among under five children ranges from 18-22.5% in Ethiopia (Dessalegn et al. 2011; Mengistie et al. 2013). But, it varies across regions being highest in children residing in Benishangul-Gumuz and Gambela regions (each 23%) and 14% in children's live with mothers who have no education (EDHS 2011).

Among under five children, about 5 diarrhoeal episode have occurred in Ethiopia per child in a year (Mamo & Hailu 2014). These multiple episodes of diarrhoea severely influence nutritional status of children by increasing nutrient loss and decreasing intake of nutrients or malabsorption; hence, they become acutely undernourished. Consequently, undernutrition increases the likelihood of become ill and severity of diarrhoea due to decreased immunity (Nandy et al. 2005). According to Checkley et al. (2008) five or more episodes of diarrhoea are taking place before 24 months of age are related with 25% of the burden of stunting in children. Also, Teshome et al. identified that diarrhoeal incidence has direct association with stunting in children. They noted that "Children who experiencing diarrhoea were 2.3 times more likely to be stunted compared to children without diarrhoea" (Teshome et al. 2009:103). According to data from selected countries, the odds of death in severely wasted under five children due to diarrhoea is 4.6 times more likely to die of diarrhoea than a child who is not; and for a severely underweight child the odd of death is 9.6 more times and for wasted 6.3 more times than a child who is not wasted (UNICEF 2013) (see table 1).

#### Pneumonia

UNICEF estimated that 24% of deaths in under five children is attributable to pneumonia in Ethiopia (UNICEF 2009). Pneumonia is a serious outcome of

acute respiratory infections (ARI) among under five children. Its prevalence is more common among under five children in households (HHs) using wood/straw (7%) than those HHs using electricity/gas (2%) as cooking fuel. Across the regions symptoms of ARI vary, the highest (10.6%) in Benesgangul-Gumuz and the lowest (1.3%) in Harari region (EDHS 2011). A recent cross sectional study in Este, Northwest of Ethiopia among 286 under five children selected by multistage sampling technique showed that prevalence of pneumonia is 16.1% (Fekadu et al. 2014).

The cross sectional study done in Somali region showed that children who had ARI were 1.96 times more wasted than those who were not suffered from ARI (Demissie & Worku 2013). Chisti et al. in systematic review explained that pneumonia increases the odds of death among severely malnourished children (Chisti et al. 2009). According to the data from countries like India, Ghana, Senegal and Bangladesh, the odds of death due to pneumonia among undernourished children are high. As indicated in the table 1, the odds of death in severely wasted children due to pneumonia are 8.7 times more than their counterparts who were no undernourished. The odds of mortality due to pneumonia among severely stunted children are 3.2 times more than children who were no undernourished (UNICEF 2013).

Table 1. The odds of death from diarrhoea or pneumonia in undernourished children (<5 years)

Odds ratio of dying from diarrhoea or pneumonia among undernourished children relative to well-nourished children, in selected countries*				
	Odds Ratio			
	Severe undernutrition	Moderate undernutrition	Mild undernutrition	No undernutrition
underweight				
Diarrhoea	9.5	3.4	2.1	1.0
pneumonia	6.4	1.3	1.2	1.0
Stunting				
Diarrhoea	4.6	1.6	1.2	1.0
pneumonia	3.2	1.3	1.0	1.0
Wasting				
Diarrhoea	6.3	2.9	1.2	1.0
pneumonia	8.7	4.2	1.6	1.0

\*Bangladesh, Ghana, Guinea-Bissau, India, Nepal, Pakistan, Philippines and Senegal

Source: (UNICEF 2013; Black et al. 2008)

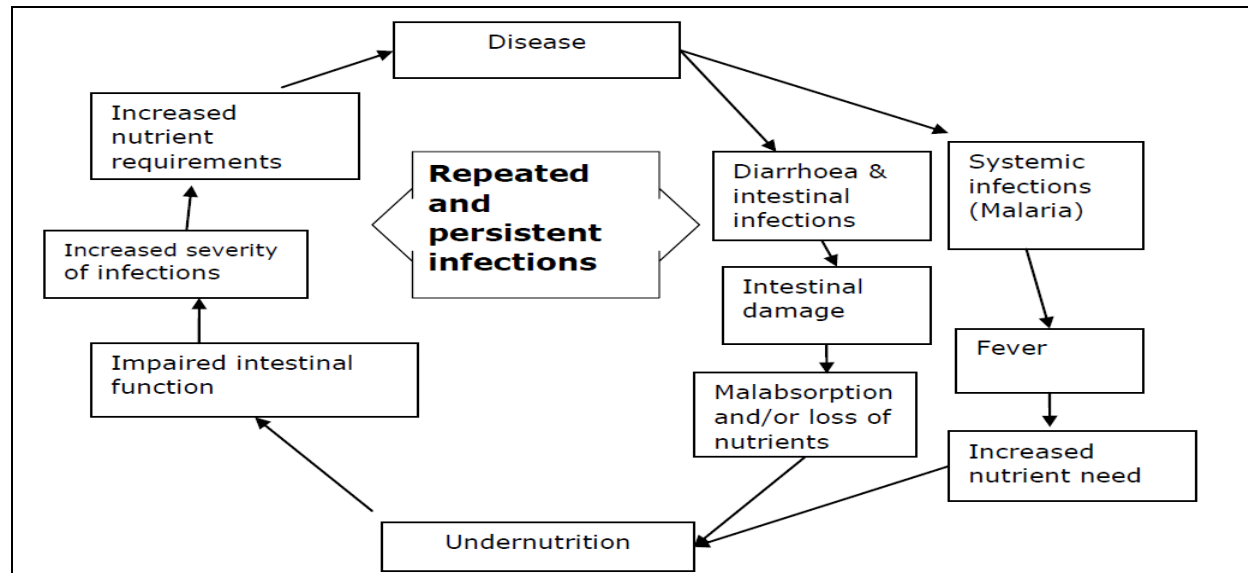
## Fever and Malaria

Fever is a symptom of malaria and other infections among children below five years old and it contributes to severe undernutrition and mortality (FMOH 2005). According to 2011 EDHS, fever prevalence among children younger than five years ranges from 28% in Gambela regions to 11% in Harari. Also, the prevalence is reasonably high among children living in Tigray and Benishangul-Gumuz (each 24%), 23% in Afar, and 21% in Somali region (EDHS 2011).

The community based study among under five children in Ethiopia revealed that high prevalence of anaemia (32.4%) due to malaria parasite resulted in undernutrition in 10% (1 in ten child) of children included in the study (Deribew et al. 2010). In prospective cohort study carried out in Ethiopia, Medhin et al. identified that mixture of deficient and unsuitable additional foods, and episodic diseases such as diarrhoea due to deprived cleanliness are the potential reasons for the high occurrence of undernutrition among under five children (Medhin et al. 2010).

Malaria infection can be a serious direct cause of short growth, too thin and underweight in children. According to EDHS, only 30% of under five children were used insecticide treated nets (ITNs) (EDHS 2011). Also, parasitic infections contribute to the prevalence of undernutrition in under five children by competing with nutrients and lead to micronutrient deficiency (Neufeld & Cameron 2012). What's more, such infections damage nutritional status of children through loss of desire for food, impair absorption of intestinal wall, increase breakdown of stored nutrients, and enhance loss of such nutrients away from growth and weakening immunity. On other hand, undernutrition influences the risk of infection by its negative impact that affecting the blockade functions of epithelial membrane (Stewart et al. 2013) (See figure 3).

Figure 3. undernutrition-disease interaction cycle



Source:(UNICEF 2013)

### 3.2. Underlying determinants

Underlying causes of undernutrition are factors which work at the HHs and community level. The causes are directly upsetting food intake and health conditions of the children. They encompass food insecurity in the HH, inadequate care practices among children and mothers and unhealthy environment and inappropriate health services that predisposed by income poverty.

#### 3.2.1 Household food insecurity

At the HH level, undernutrition among under five children is caused due to food insecurity that effected via poor food intake and its utilization (Benson 2005). Deribew et al. in community based study carried out among 2410 under five children in Southwest of Ethiopia identified that high level of food insecurity within households lead to high prevalence of undernutrition in children. Among the children involved in the study 40.4% were stunted of which 18% were severely stunted while 34.2% and 5.1% children were underweight and wasted, respectively (Deribew et al. 2010). Other study by Teshome et al. (2009) in Ethiopia showed that high prevalence of undernutrition among under five children were observed in community based cross sectional survey which was conducted for two months among 622 mother-child pairs of children aged 0-59 month. According to the study, 43.2 % under five children were too short, 14.8% were too thin and the

remaining was found to be under-weight. Teshome et al. found that nutritional insecurity at individual level is one of the contributing factors besides to food insecurity in the HH in determining nutritional status of children.

Household food insecurity is among underlying causes of undernutrition and it is important to notice its relation with child growth. Analytical cross-sectional study done among children 6-36 months of age in Ghana with sample of 337 children showed that HHs food insecurity is related with children stunted growth. About 30% of stunted growth (chronic undernutrition with z-score for HFA  $<-2$  SD) were observed in children of food insecure HHs (Saaka & Osman 2013). Just as the study in Nepal, HH food insecurity and under five children stunting and underweight status have direct relationship. In the same study, Singh et al. found that in rigorously food insecure HHs 51% and 40% of children were stunted and underweight, respectively. In other words, in non-food secure households stunting is 1.50 and underweight is 1.40 times more than children in food secure HHs (Singh et al. 2014).

Furthermore, study conducted by Ali et al. (2013) among children younger than 6-59 months old in Ethiopia revealed that household food insecurity (HFI) is associated with child undernutrition. In the particular study, HFI prevalence was 66% in Ethiopia. As a consequence; stunting, underweight, and wasting prevalence in Ethiopia was 50.7%, 27.5%, and 5.9, respectively. According to the study, children in HHs of seriously food insecure were more stunted and underweight (Ali et al. 2013). Sunguya et al. showed that HFI affects children growth and development at their early stages of life (Sunguya et al. 2014).

In addition, Anderson et al. recognized that HFI and childhood ill health has direct relationship. Children in poor families are more suffering from undernutrition which is risk factor for infectious diseases. These families spend their scarce resources for food and they are less likely to seek healthcare for their children (Anderson et al. 2012) and hold back the capability of caregivers to practice IYCF according to recommendations (Stewart et al. 2013). Thus, the availability and distribution of resources' within society determines the quality of nutritional status in the HHs particularly in under five children (Benson 2005). In general, food insecurity is determined by unavailability of food, lack of access for food, its instability and inappropriate utilization of food and low quality of food. Nonetheless, improved access may be not sufficient unless it is harmonized with a behavioural change component that under five children fed high quality foods (Stewart et al. 2013).

### 3.2.2. Inadequate child and mothers care practices

Proper growth and development in early life times of child requires good feeding and care practices. However, about 67% of deaths that caused by undernutrition among under five children has been attributed to inappropriate breastfeeding practices among infants (Setegn et al., 2012).

#### Sub optimal (Exclusive) breastfeeding

The risk of death among infants increase if breastfeeding is delayed in its initiation and exclusive breastfeeding is not maintained as it's recommended up to six month of age (Black et al. 2008). Also, untimely termination of breastfeeding results in too short growth and underdevelopment in children due to too little energy intake and nutrient scarcity (Stewart et al. 2013).

According to WHO and UNICEF exclusive breastfeeding is recommended throughout the first 6 months age of a child. Although breastfeeding is almost common in Ethiopia, optimal exclusive breastfeeding is not practiced as recommended up to 6 months (Alemayehu et al. 2009). As pointed in EDHS 2011, only 52% of children less than 6 months were exclusively breast feed. This was nearly similar with the prevalence of EBF 49% revealed by Alemayehu et al. and 50.3% by Seid et al., respectively (Alemayehu et al. 2009; Seid et al. 2013). However, the percentage of exclusively breastfeeding among children under six months was decline severely from 70% in infants 0-1 month old to 32% in infants 4-5 months old (EDHS 2011).

The EDHS 2011 survey showed that children who started breastfeeding within one hour of birth and within one day were 52% and 80%, respectively. Moreover, initiation of breastfeeding varies respective of place of residence, urban (57%) and rural (51%) and regional wise. The lowest percentage of children who started breastfeeding within one hour of birth was in Amhara 38% and Somali 40% while the highest in Dire Dawa and SNNP 66% and 67%, respectively (EDHS, 2011). Similarly, duration of breastfeeding was linked with the risk of stunting. Children who breastfed for more than 12 months were 2.2 times less likely stunting than children who not breastfed for less than 12 months (Teshome et al. 2009).

Based on the EDHS 2011, the mean exclusive breastfeeding in children under six month was 4.2 months while breast feeding was in average 25 month across the country ranging 16.7 month in Somali and 32.7 month in Amhara region. The report also elucidated the situation of breastfeeding related with educational level and employment status of mothers. Mothers with secondary and more education were breastfed their children less than

(21.5 months) those of with little or no education (25.4 months) (EDHS, 2011). This was consistent with findings that revealed by Setegn et al., among unemployed mothers 73% exclusively breastfed while an employed mothers only 33% of them exclusively breastfed their children (Setegn et al. 2012).

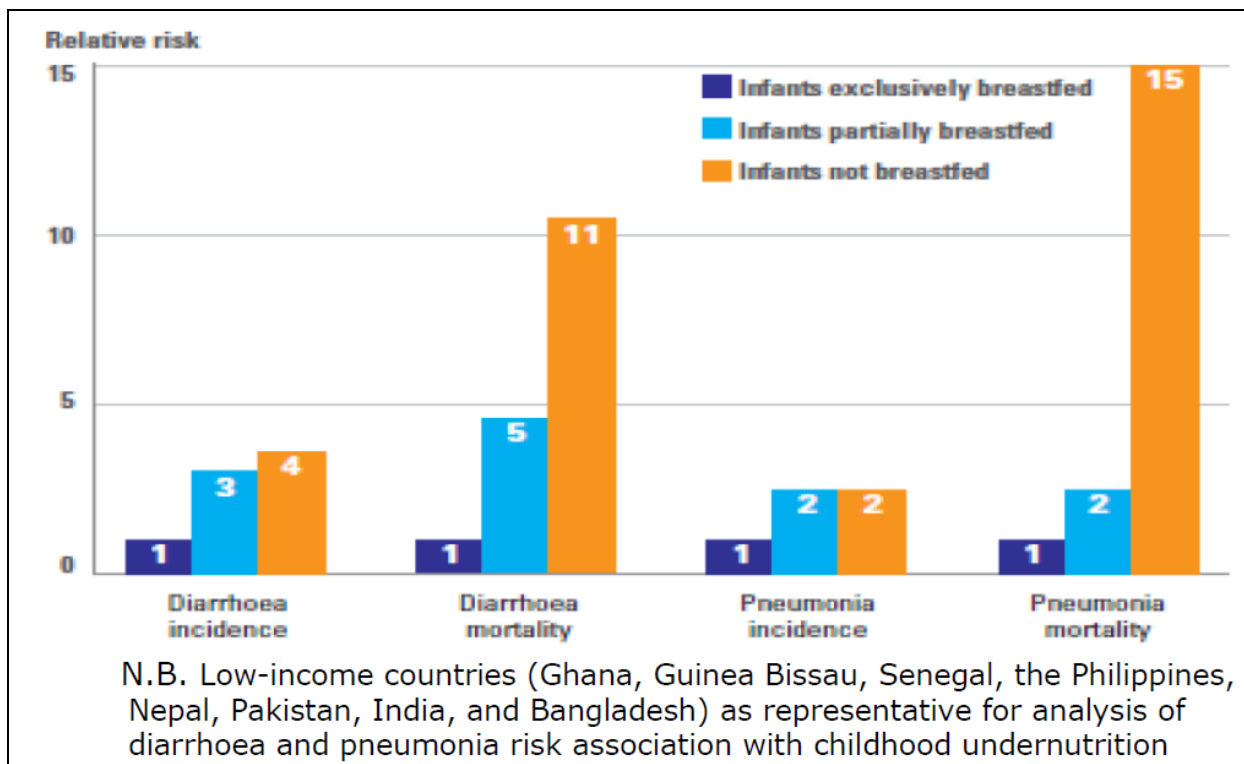
In prospective cohort study in rural setting of Ethiopia among 873 infants followed up to age of 6 months and 926 infants followed up to the age of 12 months, undernutrition prevalence was considerably higher in infants who colostrum was not given or breastfeeding initiation was delayed within one hour after birth (Medhin et al. 2010). Thus, care provider's knowledge about the initiation of breastfeeding after delivery and exclusive breastfeeding until 6 months of age and continuing breastfeeding in combination with complementary food for their children and providing appropriate care for them play a great role in nutritional status of children (Deribew et al. 2010).

Also as pointed out in figure 4 below, the risk of death due to diarrhoea among infants who do not breastfed is 11 times more than those infants who breastfed exclusively. In the same way, the risk of death because of pneumonia among infants do not breastfed 15 times more than those infants who breastfed exclusively.

#### Pre-lacteal fed

Thirty-seven percent of children less than six month old received pre-lacteal fed nationally. Among them 19% were given plain water while 14% received milk in addition to breast milk and 4% were given juices and non-milk liquid. Provision of pre-lacteal fed showed discrepancy across the regions being the highest in Somali (73%) and lowest in SNNPR (10%) and slight difference between urban 24% and rural 28% (EDHS, 2011). Study done by Teshome et al. (2009) in Ethiopia showed that pre-lacteal fed has direct relation with stunting of children. Children who given pre-lacteal fed were 1.8 times more likely to be stunted than those who did not receive pre-lacteal fed after birth. Conversely, children who had not received colostrum were 2.1 times more likely to be stunted than their counterparts who had received colostrum after birth in short period of time. Pre-lacteal feeding practice is not encouraged since it restricts the frequency of suckling in infants and increases the risk of infection to the child.

Figure 4. The risk of death among infants 0-5 months old who are not breast fed, partially fed and exclusively fed



Source: (UNICEF 2013; Black et al. 2008).

### Complementary feeding

As the study done by Tehome et al. (2009) showed that the likelihood of stunting for children is associated with time of starting complementary feeding. Children who started complementary feeding after 12 months were 2.2 times more likely to be stunted than those started at six months. According to Gyampoh et al. the switch from exclusive breastfeeding to complementary feeding is coupled with problems in developing countries. During this transition time, the prevalence of undernutrition increases to a large extent due to an increase in infections and poor feeding practices like less meal frequency and dietary diversity (Gyampoh et al. 2014). Severe wasting (acute undernutrition) is higher at younger ages and declines as age increase while severe stunting (chronic undernutrition) increases gradually as children age go up (24-36 months) (Black et al. 2008).

Lassi et al. (2013) in systematic review documented that the occurrence of stunting is highest in the period of 24 months and above. This time is the critical for development and growth of infants in which the need of nutrients



is high. According to the WHO, complementary feeding should be timely, enough, suitable, and given in adequate quality and quantity. Conversely, the shortage in the quantity and quality of obtainable complementary foods; especially after exclusive breast feeding, aggravate the vulnerability of infants for undernutrition. In the same review, the lack of nutritional counselling to caregivers in order to nourish their children with safe and sufficient complementary foods as continuing regular breastfeeding leads them to undernourishment.

#### Micronutrient deficiency

About sixty-one percent of children aged 6-59 months were affected by vitamin A deficiency (VAD) in Ethiopia. VAD is one of the major contributing factors for the under-five children death in Ethiopia. If it is not treated early blindness can be occurred and its deficiency predisposes children to other infectious diseases like diarrhoea. According to the EDHS 2005, only about 50% of children 6-59 months received Vitamin A supplement. Also, discrepancy was seen in supplementation of vitamin A in rural (lower) than urban and the least was in Beneshngul-Gumuz region.

In case of iodized salt utilization, only 15.4% of children 6-59 months live in households using adequately iodized salt. The variation was seen among HHs by regions the highest (62%) was in Dire Dawa region and the least (14%) in Beneshngul-Gumuz region (EDHS, 2011). The prevalence of anaemia is more than 44% among under five children and it contributes for morbidity and mortality. It is mainly caused by iron deficiency and only 13% of children under the age of two years were ate iron rich foods (EDHS 2011).

#### Care and support for mothers

Care practices are influenced by situation of sanitation and access to water supply. Also the status of care providers, their responsibilities, decision making power and educational level of mothers affects the situation how care delivered to the children. Besides, well being of children and their mothers are affected due to uneven distribution of resources and labour with men in the family. During pregnancy, undernourished women have undernourished foetus which delivered with low birth weights and consequently growing into physically and mentally stunted children. Stunted adults imply low human capital, low incomes and poverty (Bain et al. 2013). Also, intergenerational cycle effects as malnourished females are more likely to give birth to low-weight babies (Berihun & Azizur 2013) (see annex 5). Childcare practices relate with maternal emotional wellbeing thus mothers in HHs of food insecurity show less child care (Anderson et al. 2012).

## Antenatal care (ANC) and postnatal care services

Both ANC and PNC are services given to improve health status of mother and her child. However, among pregnant women 57% of them did not receive any ANC service in Ethiopia. According to the EDHS 2011, about seventy-four rural pregnant women were not got the ANC. But only 26% of urban pregnant women were not got the ANC. Besides to this, differences in receiving the services were seen among educational status and wealth quintile of those pregnant women. In those with no education, the majority (75%) and only 9% of pregnant women with more than secondary education were not received ANC. Likewise, the ANC service was almost not given for the lowest quintile (17%) while highest quintile (75%) nearly four times higher than lowest quintile in getting ANC service. A cross sectional study conducted in Northern Ethiopia showed only 48% of women had 4 and more ANC visits as recommended by WHO (Medhanyie et al. 2012). A study in Nigeria showed that “under five children with mothers who not involved in the utilization of antenatal services during pregnancy was over 2 times more likely to be undernourished than under five with mothers who utilized antenatal services during pregnancy” (Ozor & Omuemu 2014:15). Other study in Nigeria showed that lack of ANC and maternal undernutrition resulted in foetal undernutrition which is the risk factor for early death of neonates (Adebami et al. 2007).

In case of PNC, ninety-two percent of delivered mothers with live births didn't get postnatal check up. Only 3% of rural women with live births got postnatal check up within the first two days after delivery while 32% of urban women got postnatal check up with stated time nationally (EDHS, 2011). Study on maternal, newborn, and child health (MNCH) in sub-Saharan Africa showed that absence of care and hygiene and lack of early treatment of infections is responsible for 88% of newborn deaths. This situation is increased in undernourished children (Kinney et al. 2010).

## Cultural norms

A study conducted by Demissie & Worku (2013) in Somali state of Ethiopia showed that sex of child had association with nutritional status among children younger than five years. Among the 541 sample of children who involved in the study undernutrition prevalence was 34.4% for stunting, 42.3% for wasting and 47.7% for underweight. Boys were more undernourished than girls. This could be due to the fact that high interest being given to girls' as well as reduced attention and care for older and weaned children. The cultural and gender issues often influence the care of children. In Somali society a great attention is being paid to girls than boys because of culture or traditional norms. Also the study revealed that having

of livestock among the family of the child had direct link with the status of wasting, stunting, and being underweight. This finding was consistent with finding in Afar region that is an agro-pastoral community. In the pastoral community stock is the main livelihood and less agricultural practice was hinder the consumption of variety food. Therefore, children were more vulnerable to undernutrition (Fentaw et al. 2013). Other study done by Teshome et al. (2009) in Amhara region revealed that male children were more stunted (47.8%) than their female counterparts (38.7%).

#### Early marriage and Workload of mothers

Age of mothers has influence on children nutritional status. Different studies in Ethiopia showed that children whose mothers married early were more vulnerable to undernutrition. Maternal characteristics like being motherhood at younger age, low body mass index (BMI) and short stature of mothers are also potential factors affecting children's nutrition. This could be explained that younger mothers were more involved in income generating activities and gave less time for care and support for their children. Also there is a probability of having low birth weight child that the risk for undernutrition (Fentaw et al. 2013; Gibson & Mace 2006; Haidar et al. 2005).

#### 3.2.3. Lack of access to health services and unhealthy environment inadequate health care services

Lack of access to preventive and curative healthcare service affects the health of under five children. Accordingly, access to reasonably priced and good quality health services is determined by reasonable physical distance of health facility, financial concerns, availability of qualified and enough staffs and adequate equipments for care (Stewart et al. 2013).

However, in Ethiopia access to health facility is one challenge for high-quality preventive and curative care service delivery. According to Ministry of Finance and Economic Development (MoFED) 2006, there was a great discrepancy among urban and rural population in accessing health facilities. In rural only about 33% of population got any kind of health facility within 5 km while almost all urban population got health facility within the mentioned distance. In contrast to this, 77% of rural population travelled more than 20 km to reach hospitals (MoFED 2006).

Community based study in Ethiopia among the cohort of children 6-36 months of age showed that wasting was linked with lack of maternal access to health facilities (Egata et al. 2014). Other longitudinal study conducted among children of the same age showed that insufficient access to health facilities by mothers of those children were related with child undernutrition.

Children whose mothers had more access to health facilities were half less likely to be undernourished compared those whose mothers had less access to the health facilities (Egata et al. 2013). Incapability to realize this access to the health facility as recommended within 10 km radius may lead to setback health seeking behaviour.

Also, treatment of severe acute undernutrition according to guidelines of WHO is hindered by lack of trained health staff. This problem becomes high in settings where the early detection or screening of severe acute undernutrition is very poor. And, if complication occurred in such resource limited set up, intensive care is needed and sizeable disparity among the huge figures of patients who need treatment and the small numbers of skilful staff worsen the problem (Collins 2007).

### Unhealthy environment

Lack of environmental sanitation has resulted in diarrheal disease among under five children which is an outcome indicator for lack of basic sanitation. Children are susceptible to diarrhoea (Benson 2005). Actually, an estimated 88% of diarrhoeal deaths globally are attributable to poor hygiene, insufficient sanitation and unsafe water (UNICEF/WHO 2009). Diarrhoea is responsible for 19% of all deaths in under five children in Ethiopia which is aggravated by undernourished status of children.

Lack of easily accessible source of water to HHs may limit the amount of appropriate water that is obtainable to a household use. In Ethiopia, percentage of using any improved source of drinking water was 54% with great discrepancy between urban 95% and rural only 42%. Also, the way how this water available for home use more depend on women 74% in rural and 34% in urban. Thus, the burden of collecting water often falls excessively on female members of the household (EDHS 2011). Besides to this, low coverage in water treatment is an issue which increases the burden of contamination of drinking water. According to the EDHS 2011 survey, only 12% in urban and 8% in rural HHs treat their water.

Furthermore, adequate sanitation (improved toilet and waste disposal) are very important factors that play role in healthy environment. Regarding to this, eighty-two percent of HHs use non-improved toilet facilities (open pit latrine or pit latrine without slabs) of which 91% (rural) and 54% (urban) in Ethiopia. Based on 2011 EDHS report, in general, households who had no toilet facility were 38%, among them 16% in urban areas and nearly half (45%) in rural areas. In addition, improper stool disposal of children's faeces leads to diarrhoeal diseases among under five children through contamination. In Ethiopia, in majority of HHs, high proportion of poor

practice in stool disposal seen in rural (69%) than urban (37%). As well, considerable differences were observed among HHs in stool disposal practices across regions ranging from 25% in Addis Ababa to 76% in Gambella region (EDHS 2011).

A community based comparative cross sectional study in Ethiopia showed that children from HHs who had not good waste disposal practice were 2.6 times more likely to have diarrhoea than children who are from good practice HHs. In the same study, low availability of latrine, shortage of rooms in the house, living with domestic animals in the same house, improper disposal of faeces (open defecation) and not washing hand after toilet visit are factors recognized as contributors for diarrhoea in under five children (Berhe & Berhane 2014). Unimproved sanitation and inadequate access to clean water lead under five children at risk of infections and disease that strongly correlated with increased levels of undernutrition. Infestation of intestinal worms is one of the risks which attributable by scarce sanitation and hygiene. Such huge number of parasites, for example hookworm infestations cause considerable loss of blood and are direct cause of anaemia in under five children (UNICEF 2013).

Additionally, health status of children is affected by the quality of shelter and other living conditions. Thus, unhygienic areas for instance landfill sites or sewage worsen the contamination of available potable water in urban areas. This situation intensifies the faecal-oral transmission of diarrheal disease which is the leading cause of death among children younger than five years resulting in 19% of all deaths among this age group (Mara et al. 2010). Furthermore, greater than four episodes of diarrhoea which are taking place before 24 months of age are related with 25% of the burden of stunting in children (Checkley et al. 2008).

### 3.3. Basic determinants

Basic causes of undernutrition are factors which function at societal level. They operate locally, nationally and globally and vary from resources, structural, socioeconomic, cultural and political ideology. All these factors leads to income poverty, in turn, which affects the underlying causes of undernutrition in children.

#### 3.3.1 Income poverty

Poverty at the household level is the main basic cause of child undernutrition. Child undernutrition and shortage of resources often go hand in hand in creating vice-versa effect (UNICEF, 1998). This creates vicious cycle between poverty and malnutrition (Sunguya et al. 2014). According

World Bank estimation, individuals who suffered from malnutrition in average lose 10% of their potential life time earnings and countries lose 2-3% of their GDP due to undernutrition (World Bank 2006; Bain et al. 2013).

Poverty also confines sufficient feeding practices in the family level and this leads to food insecurity that hinders the choice for enough nutritious food items. In such particular family which is affected by food insecurity, children are not getting adequate food at right frequency and adequate diversity. As a consequence, they are more liable to be prejudiced by undernutrition (Sunguya et al. 2014). This situation is aggravated in the HHs of Ethiopia where 39% of population estimated to live below poverty line (UNDP 2013).

Poverty is the core cause of undernutrition and it elucidates to a large extent its persistence in the developing world (Delisle 2008). Children are the most susceptible to undernutrition in developing countries. This is as a result of low dietary intakes, infectious diseases, inappropriate care practices and unequal distribution of food within the household (Fentaw et al. 2013).

Poverty also restricts the ability to provide age-appropriate, nutritionally balanced diets or to modify diets when diarrhoea develops so as to mitigate and repair nutrient losses. The impact is exacerbated by the lack of adequate, available, and affordable medical care. Thus, the young suffer from an apparently limitless series of infections, rarely receive appropriate preventive care, and too often encounter the health care system when they are already severely ill (Keusch et al. 2006).

### 3.3.2. Household resource control and decision making

Nutritional status of children within the household is determined by socioeconomic status and decision making among the partners during health care seeking. Egata et al. found that parental role in decision making affects children nutritional status and lead them to acute undernutrition due to lack of timely decision for action (Egata et al. 2014). According to 2011 EDHS, women's who participate in decisions for health care and making household purchases were 54% nationally while 11% were not participate in either of decisions. This decision making also varies across the regions, urban and rural, educational level and wealth quintile of women's. The percentage of urban was 70% and rural 51% and across regions in Addis Ababa 76% of women play role in decision making while in Somali 31% (lowest). In case of educational status women's with no education share 51% while those who were more than secondary education were 88% in decision making. Regarding wealth quintile, 47% of women are in lowest quintile and 69% of women in highest quintile involved in decision making process in their households (EDHS 2011).

In community based study Egata et al. identified that in the families whose decision was made by individual partner the acute undernutrition was high in children compared to those children of families decision was made with partners or jointly. This could be the fact that involvement of both partners in decision making process during care or treatment of child influences the nutritional status of children (Egata et al. 2014). Correspondingly, other study carried out in Ethiopia acknowledged that low maternal autonomy and place of residence (urban/rural areas) are associated with children undernutrition. As stated by Medhin et al. (2010) low household income, lower education of parents, high food values and low maternal nutritional knowledge are the key determinants of growth faltering in children. In households which are vulnerable to food insecurity, women are at greater risk of undernutrition than men. Undernutrition in mothers, especially those who are pregnant or breastfeeding can set up a cycle of deprivation that increases the likelihood of low birth weight, child mortality, serious disease, poor classroom performance and low work productivity (Bain et al. 2013).

The interaction of food, health and care play a great role in nutritional status of the families. Thus, households with food insecure or poor households pay out their income largely for food and they cannot increase their income to consume high calorie and quality foods (macronutrients and micronutrients) due to economic constrains (UNICEF 1998).

### 3.3.3. Context (Socioculture, politics, economy and religion)

Ethiopia has more than 80 ethnic groups with their own languages and cultures. The two predominant religions are Christianity and Islam, with 43% of the population being Orthodox Christians, 33.9% Muslims, and 18% Protestant Christians, with the rest following a diversity of other faiths (AHWO 2010). About 10% of populations in Ethiopia are pastoralist from total nationwide population. Ethiopia is one of least urbanised countries in the Sub-Saharan Africa with almost 84% of population living in rural areas while 16% in urban (FMOH 2010).

Food insecurity at household level and undernutrition among under five in the HHs are influenced by government structure which affecting economic policies, markets and services (World Bank 2006). Furthermore, household nutrition is affected through lack of income and wealth and unemployment that not allow households to access nutritious foods, health care, and other more underlying determinants of growth and development (Stewart et al. 2013). Thus, socioeconomic status among rural and urban households and communities play a great role in child undernutrition that occurs frequently

among children from poorer households and/or poorer communities (Bain et al. 2013).

Attitudes towards certain food type and their preparation, infant feeding practices and breastfeeding are influenced by cultures. Culture also affect food allotment and division among intra-family that associated with priority given head of family (mostly male) while mothers and children obtain a smaller distribution of the family's food, relative to their needs (Oniang'o et al. 2003). According to the study in India, beliefs and traditional practices that depriving food for child affected by diarrhoea aggravates the illness and a child can suffer from severe undernutrition (Benakappa & Shivamurthy 2012).

#### 3.3.4. Potential resources

Agriculture, climate, education, human resources, gender and infrastructure including technology influence the income poverty; in turn, that affect underlying causes of undernutrition among under five children. These factors influence dietary diversity which can leads to micronutrient deficiency and climatic change may worsen climate sensitive diseases like malaria, diarrhoea and undernutrition. Also, climatic change may influence food availability and due to high price affordability can be a challenge. Due to these reasons reduced calorie availability leads to child undernutrition (Stewart et al.; Bain et al. 2013).

Behavioural communication change predicts health and nutritional status of children. According to Stewart et al. (2013) about 43% of undernutrition reduction among under five children can be achieved by educating mothers. Mothers' education is an input that helpful to improve children's nutritional status (Fentaw et al. 2013). This enables them to easily understand and respond nutritional need of their children. Also, gender role has direct link with care providing for children through decision making ability. Because women are usually the primary care providers and empowering them is an important for healthy child growth and development (Stewart et al. 2013).



## **CHAPTER FOUR: Best practices and evidence based intervention**

This chapter includes best practices from Malawi and community based nutrition (CBN) program which is piloted in some Districts of Ethiopia as evidence that can improve acute and chronic undernutrition situation in Ethiopia. Also some evidence based interventions are included. Furthermore, multisectoral approach is incorporated as a strategy to address chronic undernutrition that nutrition specific interventions cannot address.

### **4.1 Best practices**

#### **Malawi: infant and young child feeding practice**

Malawi is one of SSA countries with highest problem of undernutrition among under five children. However, Malawi has shown substantial reduction of stunting from 53% in 2004 to 47% in 2010 by 11.3% of reduction within six years. Also underweight reduction of 24% in the same years has similar pattern of progress from 17% in 2004 to 13% in 2010. This is achieved by proper implementation of complementary feeding practices (79%) among children aged 6-24 months in 2004 (MDHS 2011) and integrating with continuum care. This has increased institutional delivery coverage up to 73% and early initiation of breast milk within one hour of birth to 95% and EBF to 71% (USAID 2005).

This continuum care promotes early initiation of breastfeeding, EBF, introducing appropriate complementary feeding and other behavioural change interventions like hand washing. These services are delivered at community level with integration of community nutrition programmes (MDHS 2011). In my opinion, if this integration be done at community level with the other health extension packages, especially emphasizing complementary feeding and exclusive breastfeeding, acute undernutrition can be reduced among under five children.

#### **Community based nutrition in Ethiopia**

The Community Based Nutrition Program (CBN) is one of the key components of the Ethiopian national nutrition program (NNP) launched in 2008. It is a preventive program which runs growth monitoring and promotion (GMP) among under two children at community level, providing counselling on child feeding and care, screening for case management and hygiene and sanitation (UNICEF/Ethiopia 2013). The program has implemented in 228 Districts (Woredas) of four regions (Tigray, Amhara,

Oromia, and SNNPR) as pilot program. This has brought change in reduction of stunting from 44.4% in 2010/11 to 38% in 2012/13 by 14.4% and underweight reduction from 29% to 25% in the same years (Lemma & Matji 2014). The program covers only 28% of all Districts in Ethiopia (Lassi et al. 2010). To reduce the burden of undernutrition, scaling up the program to other Districts is important.

#### 4.2 Evidence based intervention

##### Micronutrient deficiency intervention

In order to eliminate IDD, WHO and International Council for Control of Iodine Deficiency Disorders (ICCIDD) standard recommended 90% of HHs consume adequately iodized salt (FMOH 2010). As evidence shows, salt iodization reduces risk of iodine deficiency by 41% in children and it reduces infant mortality by 56.5% (World Bank 2013). Also, therapeutic zinc supplementation with 99% coverage decreases risk of death by 2.8% in children less than 2 years (Bhutta et al. 2008). According to Bhutta et al. 13% of diarrhoea incidence and 19% of pneumonia can be reduced by preventive zinc supplementation (Bhutta et al. 2013; Bhutta et al. 2008). In the same way, vitamin A supplementation in under five children reduces 15% of all-cause mortality (Imad et al. 2011). Seventy-three percent reduction of anaemia at term or birth is achieved by iron-folic acid supplementation for pregnant women during pregnancy (Lamberti et al. 2011).

##### Prevention or treatment of moderate and severe acute undernutrition

As reported by WHO, 80% of nutrition related mortality is attributable to mild form of undernutrition. However, evidence shows that with 99% coverage of balanced energy protein supplementation 3.1% reduction in deaths before 24 months of age can be achieved (Bhutta et al. 2008). And, early screening and treatment of severe acute malnutrition reduces 55% of case fatality in children. However, according to UNICEF/Ethiopia report, only limited figure of children have treated from severe acute malnutrition (SAM) by HEWs. In order to address those children who suffered from SAM, scaling up of community management of acute malnutrition (CMAM) and integrating it with CBN services through the health extension package is important (UNICEF/Ethiopia 2013).

##### Sanitation practices and access to water

Improvements in water quality and water quantity reduce diarrhoea by a factor of 60% as compared to latrine provision only. In developing countries

like Ethiopia, where hygienic practices are extremely poor and the exposure-risk relationship in diseases is multiple, the approach should be to seek multiple interventions. Benson indicated that when interventions include water, sanitation, and hygiene (hand washing), the median reduction of diarrhoea was up to 65% and that progress in the amount of water available, regardless of its quality, reduced diarrhoea by between 22-25% (Benson 2005).

As evidences showed EBF and introduction of complementary feeding have important result in improving nutritional status of children (Bhutta et al. 2013). According to WHO, all infants should have to initiate breastfeeding within one hour after birth and EBF until 6 months of age. Early initiation of breastfeeding prevents 22% of neonatal deaths and EBF for infants 0-6 months prevents 15% of child death. Also, complementary feeding besides to continuing breastfeeding reduces the risk of death among children 6-23 months by 3.69 times than those children do not breastfed (Lamberti et al., 2011; Bhutta et al., 2008).

#### 4.3 Multisectoral approach

Black et al. (2008) in Lancet series showed that nutrition specific interventions reduce global stunting by 1/3, while the 2/3 need nutrition sensitive strategies: multisectoral approach. In order to reduce the impact of undernutrition, all key sectors or stakeholders have to play role in reduction of undernutrition among under five children. Although multisectoral approach is in place (on paper) in Ethiopia, there is no evidence of implementation. This may be explained as sectors have no commitment for planning together, lack of priority for nutrition and only ministry of health has supervisory role. This is also there is no responsible nutrition department or unit at all levels of service delivery (national to health facility level). Nonetheless, in order to have evidence for response research has to be done to identify why it is not working and what could be done to make multisectoral approach functional. Also, ministry of health should advocate the situation of undernutrition through collaboration with other sectors to reduce the consequences of child undernutrition.

## **CHAPTER FIVE: Discussion of findings**

This chapter provides discussions of the findings from literature review on the basis of conceptual framework and best practices.

### **5.1 Immediate determinants**

The study findings show that diseases like diarrhoea, pneumonia, malaria and other parasitic infections are immediate determinants of (acute) undernutrition among under five children in Ethiopia. These diseases are the risk for death among undernourished children. Besides to this, anaemia is resulted due to malaria and other parasitic infections. As it was demonstrated in figure 3, the interaction of undernutrition and disease has a vicious cycle which is worsening illness and reinforcing undernutrition among children.

Multiple diarrhoeal episodes occurring among children aggravate loss of nutrients and leads children to dehydration. This affects nutritional status of children and results in acute undernutrition. Also, recurrent episodes of diarrhoea incidence cause chronic undernutrition (UNICEF; Stewart et al. 2013). On the other hand, the integrated community case management (ICCM) strategy has started to provide treatment for common childhood illnesses since 2007 at community level and it is delivered by health extension workers (HEWs). However, according to Mille et al. about 3 in 10 children with severe illnesses were correctly managed (Mille et al. 2014). Even though, the coverage is very low, the ICCM has great impact on reduction of acute undernutrition among under five children.

Also, pneumonia and malaria are the most common infectious diseases among under five children in Ethiopia. Treating both diseases through ICCM strategy brings substantial progress in health and nutritional status of under five children. Poor and destitute under five children who have not access to institution based case management are at even greater risk for undernutrition. Conversely, health extension workers who work in rural communities of Ethiopia delivered 2.5 times as many treatments for malaria, pneumonia and diarrhoea for under five children. Also through the efforts of HEWs, ICCM has reduced mortality of pneumonia among children younger than five years (Degefi et al. 2009). Thus, the author suggests the implementation of ICCM has to be strengthened to reduce the acute undernutrition below the rate of public health importance (see annex 1).

In addition, inadequate nutrient/food intake is one of immediate determinants of acute undernutrition among children under the age of five years. Children those who have not got enough amounts (quality and

quantity) of required nutrients suffer from other infectious diseases that increase burden of acute undernutrition. Lesson taken from Malawi in good practice of IYCF contribute to increase the percentage of early initiation of breast milk, promote EBF and complementary feeding that improves the quality in food intake. However, the improvement of food quantity depends on household food security. In order to achieve individual level nutrition security, household food security has to be secured. Still, MOH cannot fulfil household food security. To solve the problem, involvement of other responsive sector; for example, ministry of agriculture (MoA) is important. MoA has two programs that used to intervene household food insecurity (food-for-work and food security package) (Veen & Gebrehiwot 2011).

## 5.2 Underlying determinants

Household food insecurity affects nutritional status of children in Ethiopia. It hampers adequate dietary intake among children and they become undernourished acutely or chronically. Also, undernourished child easily exposed for infectious disease due to loss of immunity. Thus, undernutrition is risk for increased morbidity and mortality (Piwoz 2012). Moderate acute undernutrition has a greater risk than severe acute undernutrition. This is due to higher prevalence's of mild and moderate form of undernutrition than severe undernutrition and greater chance of developing severe form of undernutrition if not treated (World Bank 2013). The CBN program can address acute undernutrition through intervention that can improve inadequate child care practices and access to health facility/unhealthy environment. In such way CBN program can tackle acute undernutrition at individual level. But the household food insecurity remains as a challenge to intervene inadequate food intake in sustainably manner. Moreover, household food insecurity leads individual nutritional insecurity. Thus, the gap needs compulsory body to achieve reduction of acute undernutrition among children.

Also from the study, IYCF are not exercised in accordance with recommendations in Ethiopia. The coverage of EBF is low and early initiation of breastfeeding within one hour after birth is not satisfactory. From the finding, duration of breastfeeding of child was influenced by mothers' educational status. As well, the low coverage of EBF in Ethiopia was determined by educational status and place of work of mothers (Alemayehu et al. 2009). This is might be due to short leave of maternity which is two months after delivery in context of Ethiopia that may compromise exclusive breastfeeding among children whose mothers are employee. Also, mothers may have departed from their children in searching for a work in order to secure their income. This workload on shoulder of mothers and lack of

appropriate care hampers their infants and children nutritional status. Therefore, leave of maternity has to be extended to encourage mothers in order to breastfed exclusively (Setegn et al. 2012). So, the need for policy is important to extend maternity leave. Likewise, pre-lacteal practice is common and widely exercised throughout Ethiopia. The episode of diarrhoea, denial of first breast milk immediately within 1 hour after birth, duration of breastfeeding, provision of pre-lacteal feeds, and lack of proper complementary feeding practices and unacceptable meal frequency were the determinants for wasting and stunting (Teshome et al. 2009).

The finding of review also reveals that child and mother care practice are low in Ethiopia. These practices influence the nutritional and health status of child and mother and manifested through intergenerational cycle. Mothers who did not visit ANC and PNC services and have not got adequate food have LBW infants. Due to lack of access for care, these neonates/infants have got inadequate services after delivery. In such way, contamination may take place because of poor utilization of care services and due to lack of early treatment for infection/sepsis a child may exposed for undernutrition (see figure 3). In scarce health service setting the situation is become worsened.

This study also shows that access to health facilities is not equitable among the rural and urban in Ethiopia. From the findings, access to health services affects nutritional status of children and limits the health seeking behaviour. Also, treatment of SAM and absence of early screening may hinder the nutritional status of children and expose them for infectious diseases. This study shows that low access to water sources and poor sanitation and hygiene practices are low in Ethiopia. From the study, environmental health is associated with lack of access to water, inadequate sanitation and poor waste disposal practices. Thus, the diarrhoeal episodes are common among under five children in Ethiopia. Insufficient access to safe water may serve as an important barrier to appropriate hygienic practices and safe preparation of complementary foods for children (Stewart et al. 2013). However, the undernutrition situation among under five children in Ethiopia will be reduced if the best practices from Malawi has to be integrated both child and maternal care (continuum care) in setting of Ethiopia and CBN program that piloted in few Woredas of Ethiopia scaled up to other prioritized or to where the burden of undernutrition is high.

### 5.3 Basic determinants

From this particular study, income poverty affects the underlying determinants of child undernutrition; in turn, that influence dietary intake and occurrence of infections among children. Also, household resource

control and decision making capability and context and potential resources determine income poverty. The burden of undernutrition has been directly linked to poverty, quality and quantity of food intake, recurrent occurrence of diseases and poor health status. The relationship between education and poverty is too close, and virtually integrates into the virtual cycle of lack of knowledge, disease and poverty (Bain et al. 2013).

Literature findings also shows that poverty is associated with poor living status, crowdedness, lack of access to sufficient clean water or poor sanitary disposal of faecal waste and co-living with domestic animals that may carry human pathogens all of which increase diarrhoea rate of recurrence. Also, poverty leads low income, low educational status (especially among women) and low access to health services that added to the high burden of infirmity in the children (AHWO 2010). In addition, poverty undermines maternal, newborn, and child health (MNCH) through scarce diet, reduced care-seeking behaviour and access to health care services all together leads to frequent illness and undernutrition especially among children. In general, discrimination between gender, low education level among women and lack of empowerment prevent them from seeking care (Kinney et al. 2010). Thus, the multisectoral approach play role to reduce chronic undernutrition through concerted effort of the stakeholders. This will have potential to improve income poverty that influences the underlying determinates of chronic undernutrition in the long run.

#### 5.4 Limitations of the findings

- Some data used from EDHS 2005 may not show the relatively recent situation of undernutrition may affect the result
- Conceptual framework does not consider specific factors that influence nutritional status of children
- Also the framework lacks consideration of different factors that have impact on nutrition may be affected by seasonality

## CHAPTER SIX: Conclusion and recommendations

### 6.1 Conclusion

Inadequate nutrient intake and diarrhoea, pneumonia, malaria and other parasitic infections are proximate determinants for acute undernutrition among under five children. Also, parasitic infections are determinant that cause anaemia among children.

Household food insecurity determines the frequency of feeding and dietary diversity intake within household. Improper infant and young child feeding practice is a determinant that affect nutrient intake and/or an infant/ a child may not get immunity from her/his mother through colostrum. Moreover, time that complementary feeding has started determine the nutritional status of children. Lack of access to health services and unhygienic environment with poor sanitation synergize the episodes of diarrhoea and other diseases that directly cause acute undernutrition. While the recurrent occurrence of diseases leads to chronic undernutrition. Additionally, income poverty hinders all the sequences of determinants and leads under five children for acute undernutrition as short deprivation of nutrients or diseases outcome and chronic undernutrition in long term deficiency.

Finally, the determinants of acute and chronic undernutrition among under five children in context of each regions of Ethiopia need further assessment and will be explored as conditions.

### 6.2 Recommendations

On the basis of literature findings, the following recommendations are made. They are categorized as intervention, research and policy.

At the **intervention level**: as community, facility and sectoral level

The recommendations are prioritized according to their relevance to settings, feasibility and activities that can be done by MOH and other ministries. The activities which are directly related to MOH and that can be done in short period of time:-

At community level

- Enhance infant and young child feeding practices by integrating child care and maternal care (continuum care) a lesson from Malawi.
- Integrate community case management of childhood illness (ICCM) with growth monitoring and promotion program.
- Train health workers especially health extension workers who work at the community level in order to improve IYCF and ICCM to address the majority of infants and children.



- Improve access to health facilities by availing supplies at health post level that health extension workers can provide during health care seeking (like ORS, ITNs, etc) and providing refresher training for HEWs
- Enhance ANC/PNC services to improve health of mothers, in turn, healthy mothers provide adequate care for their child.
- Provide micronutrients periodically (for example, vitamin A, and folic acid and iron).
- Involve volunteer community health workers to improve child growth monitoring and promotion by providing training and incentives like recognition for their participation.
- Scale up CBN program which is restricted to some Districts or Woredas to the other especially regions like Somali, Afar, Beneshngul-Gumuz where the program is not started yet.

#### Facility level

- Strengthen the referral system for treatment of acute undernutrition children.
- Maintain good nutrition information system to provide timely response if needed.

#### Sectoral level

- MOH has to made collaboration with other sectors through advocacy to reduce the consequences of child undernutrition.
- Even though the following recommendations are run out of MOH, they can be done in the long time that has impact on reduction of undernutrition.
  - Maintain household food security by integrating poor HHs into food-for-work and food security package. But the sustainability of household food security is secured if advanced technologies are used in agricultural production at large scale.
  - Increase participation or enrolment of girls in education
  - Improve access to water, hygiene and sanitation through collaboration of NGOs and other local civil society organizations

#### Research

- Carry out qualitative research to identify why multisectoral approach is not implemented and take measure based on the evidence from research. Multisectoral approach is good strategy to address chronic undernutrition that the direct or nutrition specific interventions cannot respond. This research should have to involve different responsible bodies, sectors, beneficiaries and other stakeholders. The research findings disseminated to all partners to advocate the burden of undernutrition among under five children and its impacts.

#### Policy

- Formulate or revise policy that permits maternity leave to stay for at least more than four months to practice exclusive breastfeeding. It needs collaboration of different sectors and commitment of

government. Breastfeeding has a significant impact on nutritional status of children. However, this recommendation can be effective if the government has willingness to make change in policy.

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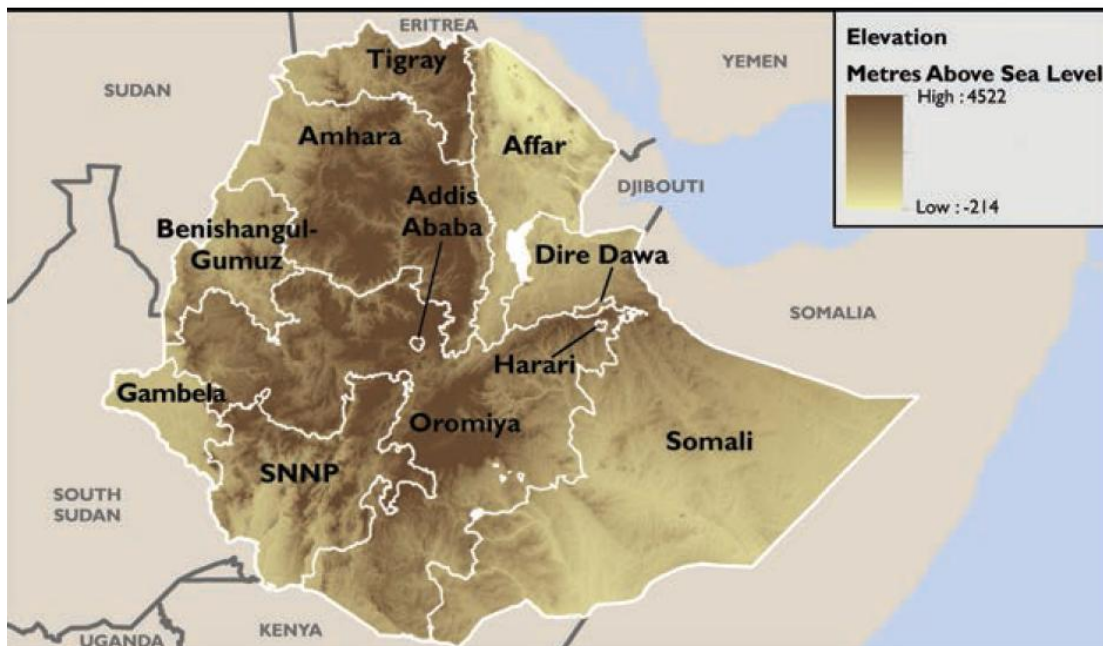
Annexes:

Annex 1: Prevalence cut-off values for public health significance in undernutrition

Indicator	Prevalence
Stunting	<20%:Low prevalence
	20-29%:Medium prevalence
	30-39%:High Prevalence
	≥40%:very high prevalence
Wasting	<5%:acceptable
	5-9%:poor
	10-14%:Serious
	≥15%:critical
Underweight	<10%:Low prevalence
	10-19%:Medium prevalence
	20-29%:High Prevalence
	≥30%:very high prevalence

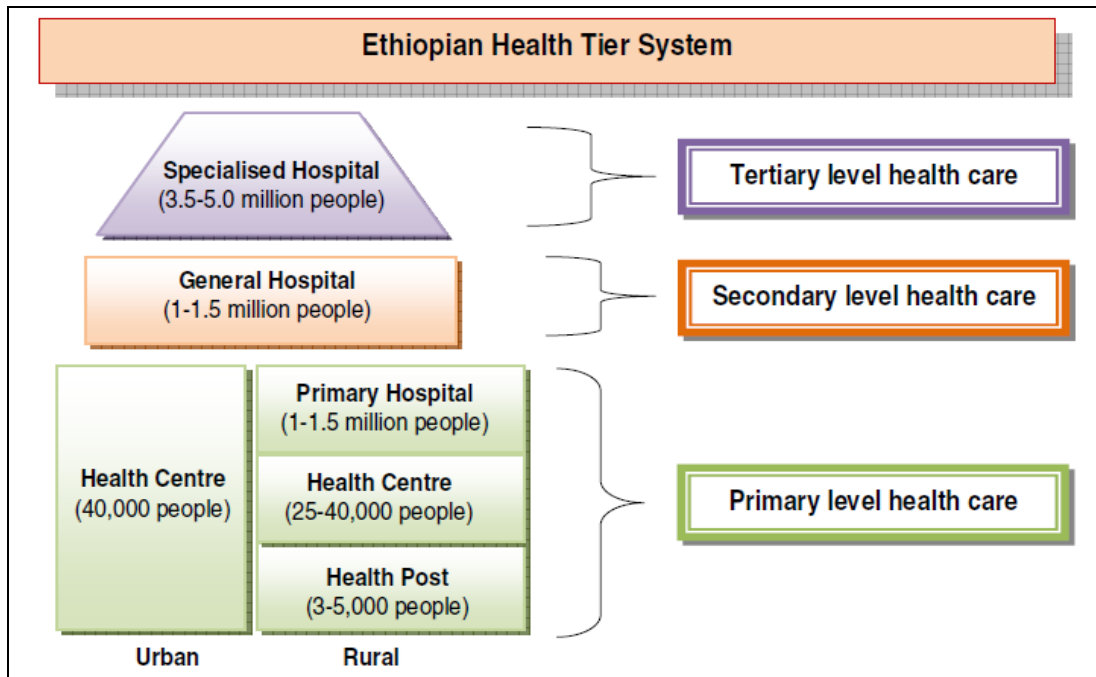
Source: (WHO 2010)

Annex 2: Map of Ethiopia and its neighbour counties.



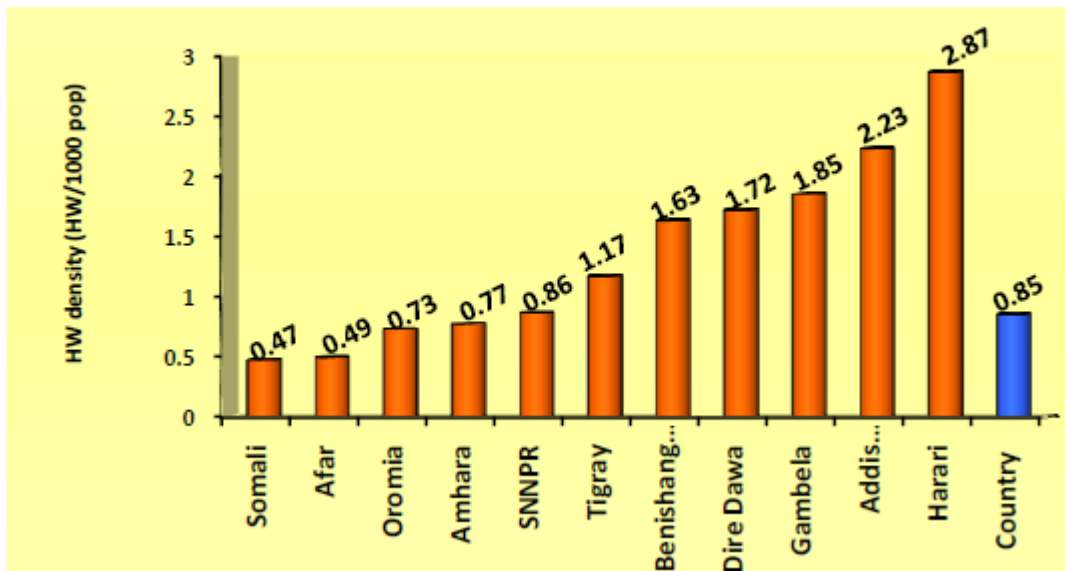
Source: (EDHS, 2011)

### Annex 3: Ethiopian health tier system



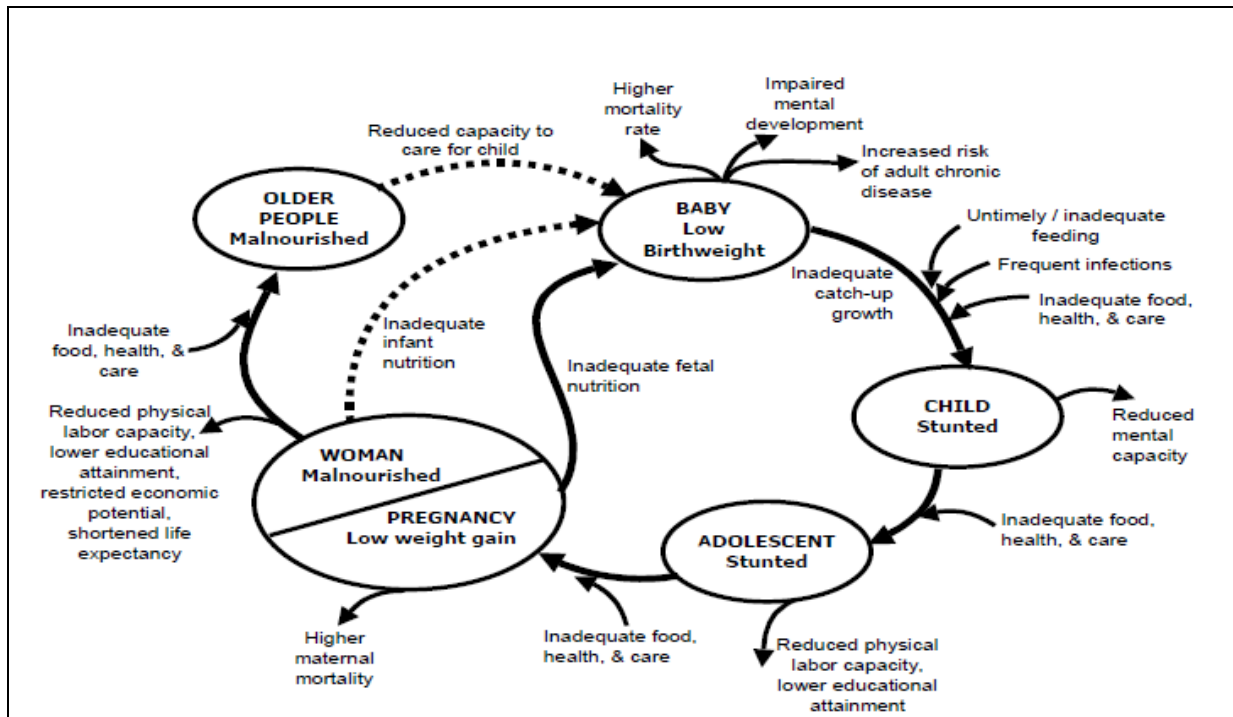
Source: (FMOH, 2010)

### Annex 4: Health worker density per 1000 population by region, 2009



Source: (AHO-Ethiopia, 2010)

## Annex 5: Intergenerational-undernutrition cycle



Source: (Benson, 2005)

## Annex 6: Nutrition specific and nutrition sensitive interventions in Ethiopia

<b>Nutrition specific strategies/programmes/guidelines</b>		
<b>Document</b>	<b>Body</b>	<b>Date</b>
Micronutrient guidelines	Federal Ministry of Health (FMOH)	2004
National Strategy for IYCF	FMOH	2004
Management of SAM Protocol	FMOH	2007
National Nutrition Strategy	FMOH	2008
National Nutrition Programme	FMOH	2008
Nutritional and HIV guidelines	FMOH	2006
Food Supplement and Infant Formula Registration guidelines	Food, Medicine and Health Care Administration and Control Authority (FMHACA)	2011
<b>Nutrition sensitive strategies/programmes/guidelines</b>		
<b>Document</b>	<b>Body</b>	<b>Date</b>
<b>Poverty reduction and development</b>		
Agricultural Development Led Industrialization (ADLI) Strategy	Federal Government	2007
Growth and Transformation Plan	Ministry of Finance and Economic Development	2010–2015
<b>Agriculture and food security</b>		
Agriculture Growth Programme	Federal Ministry of Agriculture	2010
Food Security Strategy	Federal Ministry of Agriculture	2007
<b>Public health</b>		
Health Policy	The Transitional Government of Ethiopia	1993
Health Sector Development Plan	FMOH	2010
Reproductive Health Strategy	FMOH	2011
National Strategy for Child Survival	FMOH	2005
Water Sanitation and Hygiene Strategy	Federal Ministry of Water and Energy	2011–2016
<b>Education</b>		
School Health and Nutrition Strategy	Federal Ministry of Education	2012
<b>Social protection</b>		
National Social Protection Policy	Ministry of Labor and Social Affairs	Draft
Health Insurance Strategy	FMOH	2008
<b>Nutrition relevant regulations/standards/proclamations</b>		
Civil Servant Proclamation (maternity protection)	Civil Service Commission	2007
Salt iodization legislation	FMHACA	2011
Iodized salt standard	FMHACA	2012
Iodized salt manufacturer, importer, exporter and wholesaler directive	FMHACA	2011/12
Fortified flour manufacturer, importer, exporter and wholesaler directive	FMHACA	Draft
Fortified oil manufacturer, importer, exporter and wholesaler directive	FMHACA	Draft
Fortified oil standard	FMHACA	Draft
Fortified flour standard	FMHACA	Draft
Infant formula directive	FMHACA	Draft
Food supplement directive	FMHACA	Draft
Food, Medicine and Health Care Administration and Control Proclamation	Government of Ethiopia	2009

Source: (NNP, 2013)