BAHIR DAR UNIVERSITY INSTITUTE OF TECHNOLOGY

SCHOOL OF CHEMICAL AND FOOD PROCESS ENGINEERING

Master program In Applied Human nutrition

NUTRITIONAL STATUS OF CHILDREN 2-5 YEARS OLD, ITS RELATION WITH COW MILK CONSUMPTION AND OTHER ASSOCIATED FACTORS IN KILTEAWLAELO DISTRICT EASTERN ZONE TIGRAY, ETHIOPIA

M.Sc. Thesis

By

Amanuel Teklehaymanot

Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Science (MSc.) in Applied Human Nutrition

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THESIS APPROVAL SHEET

As member of the Board of Examiners of the Master of Sciences (M.Sc.) thesis open defense examination, we have read and evaluated this thesis prepared by **Mr. Amanuel Teklehaymanot** entitled **"Nutritional status of children 2-5 years old and the relation with cow's milk consumption and other associated factors in kilteawlaelo district, eastern zone Tigray, Ethiopia".** We hereby certify that, the thesis is accepted for fulfilling the requirements for the award of the degree of Master of Sciences (M.Sc.) in **Applied Human nutrition**.

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DECLARATION

This is to certify that this thesis entitled "**Nutritional status of children 2 to 5 years old and the relation with cow's milk consumption and other associated factors in kilteawlaelo district, Eastern Zone Tigray, Ethiopia**" submitted in partial fulfillment of the requirements for the award of the degree of Master of Science in "**Applied Human Nutrition**" to the Graduate Program of School of Chemical and Food process Engineering, Bahir Dar University by Mr. **Amanuel Teklehaymanot** (ID. No. BDU 060290 PR) is an authentic work carried out by him under our guidance. The matter embodied in this project work has not been submitted earlier for award of any degree or diploma to the best of our knowledge and belief.

Name of the Student

Amanuel Teklehaymanot

Signature & date _____

Name of the Supervisors

1) Dr. Enyew Tadesse (Major Supervisor)

Signature & date_____

2) Dr. Zelalem Tesfay (Co-Supervisor)

Signature & date_____

3) Dr. Yayneshet Tesfay (ILRI Supervisor)

Signature & date_____

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To my beloved father kes Teklehaymanot Mahari and grandmother Assay Melko who were passed away during my study

ABSTRACT

Globally malnutrition is responsible for nearly half (45%) of all deaths in children under five and responsible for around 3.1 million deaths annually. Agricultural products provide energy, protein, vitamins and minerals and critical to addressing malnutrition, particularly among children. Dairy products play a key role in healthy human nutrition and development throughout life especially, in childhood because of the concentrated source of macro and micronutrients. The aim of this study was to assess nutritional status of children two to five years' old, cow's milk consumption pattern and other associated factors. Community based cross-sectional survey was conducted in Kilteawlaelo district from April to June 2015. A total of 530 households were included using two stage sampling technique. Mothers/care givers were interviewed after consent was given to obtain the information on child care and feeding practices. Anthropometric measurements were used to assess the nutritional status of children 2 to 5 years old. Among the 530 sampled children 19% and 81% was living in urban and rural respectively. The prevalence of stunting, underweight and wasting was 43 %, 26 % and 10.9 % respectively. The Bivariate analysis, using chi square test revealed that marital status, occasion of soap use for hand washing, sex of care giver, most commonly consumed cereals ,father's occupation and birthplace showed significant association with all three indicators of undernutrition. The multivariate analysis using multiple logistic regressions model demonstrated that age of children and commonly consumed cereals were significant predictor of stunting and underweight; mother's educational level was significant predictor of wasting and underweight; sex of child, child vaccination status, source of cow milk and mother's occupation were significant predictor of wasting only; marital status, occasion of soap use, father's educational level and birthplace were significant predictor of stunting only; and sex of respondent were significant predictor of underweight only. The results of this study indicate that under nutrition among 2 to 5 years old children is still a problem in Kilteawlaelo district. Child age, mother's and father's educational level, mother's occupation, source of cow milk, sex of respondent and child, child vaccine, marital status, commonly consumed cereal and occasion of soap use were found to be significant risk factors of malnutrition.

Key words: *Malnutrition, stunting, underweight, wasting, 2 -5 years children, Kilteawlaelo*

ABREVATIONS AND ACRONYM

ADHD	Attention Hyperactivity disorder
ANC	Anti natal care
AOR	Adjusted odds ratio
CLA	Conjugated Linolic Acid
COR	Crude odds ratio
DHS	Demographic health survey
DNA	Deoxyribonucleic Acid
EDHS	Ethiopian Demographic Survey
EBF	Exclusive breast feeding
EPA	Eicosapentanoic Acid
FAO	Food and Agriculture Organization of the United States
GDP	Gross Domestic Product
GSH	Glutathione
HAZ	Height for Age Z- score
HDL	High density lipoprotein
LDL	Low density lipoprotein
LME	Liquid Milk Equivalent
MUAC	Middle Upper Arm Circumference
NCHS	National Center for Health Statistics
OKAWARD	Office of kilteawlaelo wereda agriculture and rural development

PUFA	Poly Unsaturated Fatty Acid
UNICEF	United Nations Children Fund
USD	United States Dollar
USDA	United States department of Agriculture
US	United State of America
WAZ	Weight for Age Z- score
WHZ	Weight for Height Z-score
WHO	World Health Organization

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1. INTRODUCTION

1.1 Background and Justification

Nutrition is the cornerstone of socioeconomic development of a country. It is an essential component of millennium development goals (Hassam *et al*, 2010). Nutritional status of under-five children is one of the most important indicator of a household's living standard and also an important determinant of child survival (Kanjilal *et al.,* 2010). Malnutrition is responsible for nearly half (45%) of all deaths in children under five and responsible for around 3.1 million deaths in children under five annually (lancet, 2015).

Globally, in 2011, nearly one in four children under-five years of age (165 million or 26 per cent) were stunted, 16 percent (estimated 101 million children under five years of age) underweight, 52 million children under five were moderately or severely wasted, and an estimated 43 million children under-five were overweight (UNICEF, 2013).

Regionally, Sub-Saharan Africa and South Asia are home to three fourths of the world's stunted children. In sub-Saharan Africa, 40% of children under-5 years of age are stunted; in South Asia, 39% are stunted. Underweight prevalence is highest in South Asia, which has a rate of 33 per cent, followed by sub-Saharan Africa, at 21 percent. The highest wasting prevalence is in South Asia, where approximately one in six children (16%) is moderately or severely wasted. In sub-Saharan Africa, nearly 1 in 10 children under the age of 5 (9 per cent) were wasted in 2011(UNICEF, 2013).

Nationally, according to Mini EDHS 2014, the prevalence of stunting, wasting, under weight and over weight in Ethiopia was 40 %, 9 %, 25 % and 3% and in Tigray, it was found to be 45.7 %, 14.3%, 31.3%, and 2.1 %, respectively.

Many African countries aspire to achieve middle income status, with vibrant, dynamic and knowledge led economies. But this aspiration is being hampered by the damage done to today's generation by a lack of proper nutrition. The impacts of under nutrition on economic development have implications for the agriculture sector in three ways, each truly debilitating.

First, with 45% of child deaths due to malnutrition, this has a significant impact on the number of young people entering the agriculture sector. Second, stunting rates are, in most cases, higher in rural areas than urban areas. This is important because of the impacts of stunting on physical strength which is critical to agricultural manual labor. Third, malnutrition is both an outcome and a driver of inequality (Save the children, 2014). Therefore, since Ethiopia is one of the agrarian countries the issue of agriculture nutrition linkage is sensitive. Agriculture and nutrition are closely connected, providing people irrespective of their age with their daily nutrient intake. Agricultural products also provide energy, protein, vitamins and minerals and critical to addressing malnutrition, particularly among children. However; a large proportion of malnourished children and adults live in rural areas are from the farming family who depend on smallholder farming for their livelihoods. An analysis of Demographic and Health Survey (DHS) data shows that people living in rural areas are between 1.3 and 3.3 times more likely to be stunted than their urban counterparts (Menon *et al.*, 2000).

Livestock products are appealing and convenient sources of nutrients.However, protein and micro nutrient deficiencies remain widespread in developing countries like Ethiopia, since people subsist on diets that are almost entirely made of starchy staples. Agricultural products such as milk provides protein, calcium, vitamins, and other nutrients that are lacking in diets, which are exclusively made up of staples such as cereals (Tesfaye Mengistie, 2007). Furthermore; milk contains numerous nutrients and it makes a significant contribution to meet the body's needs for calcium, magnesium, selenium, riboflavin, vitamin B_{12} and pantothenic acid (vitamin B_5).

Dairy products play a key role in healthy human nutrition and development throughout life especially in childhood because of the concentrated source of macro and micronutrients. In addition to this, milk and dairy products can play a role in human nutrition in developing countries where the diets of poor people lack diversity and consumption of animal-source foods is rare.

Despite the fact that the government of Ethiopia health sector has increased its efforts to enhance good nutritional practices, child under nutrition is still among the highest in the world. Children under five year are the most vulnerable groups to under nutrition. Under nutrition is one of the main health problems in Tigray National Regional State. It is predominantly seen among the rural population since the food source of this population is based on production of crops and the awareness about how to prepare and give value to food is limited (NNP, 2013).

1.2 Statement of the Problem

Despite of the highest number of cattle in Africa, the per capita consumption of milk in Ethiopia is about 16 kg per person per year, which is much lower than the averages consumption of Kenya 100 kg per year, 292 liters in United States and 342.5 litters in European Union (Multu and Berk, 2004).

According to the Mini Ethiopia Demographic and Health Survey, 9 % of children under the age of five in Ethiopia suffer from acute malnutrition (wasting), 25 % are underweight, and 40 % are chronically malnourished (stunted) and in Tigray region, 14.3% of children under the age of five are wasted, 31.3% are underweight, and 45.7% are stunted (EDHS, 2014). This indicates that the undernutritional of children under the age of five in the country at large and in Tigray region in particular is severe. Moreover, undernutrition of the under five children in Tigray region is above the country's undernutritional *i.e.* 5.3 % wasting, 6.3% underweight and 5.7% stunting.

Agricultural development is an important driver of nutritional change in the poorest countries, but there exists relatively little evidence linking agricultural production systems to nutrition outcomes (Hoddinott *et al*, 2014). However, in Ethiopia the ministry of Agriculture is the member of the national nutritional program of the country. In spite of the fact that the agriculture sector focus on the production and productivity until recent time, nowday's the sector is on a track towards agri-nutrition linkage.

1.3. General Objective

- To assess nutritional status of two to five years old children, cow milk consumption pattern and other associated factors in Kilteawlaelo district

1.3.1 Specific objectives

- To assess the nutritional status of the children
- To determine cow milk consumption patterns of children
- To identify associated factors for nutritional status of the children
- To determine the relationship of cow milk consumption pattern with nutritional status

1.4 Significance of the Study

The significance of this study is to give feedbacks to the community, kebele leaders, district Administrators and policy makers in order to take action towards the poor nutritional status of the children based on the results that obtained. This study will be also a base for other researchers for further study. In addition to this, my study will strengthen the agriculture-nutrition linkage of the region and the country.

1.5 Strengths and Limitations of the Study

Some of strengths of this study were the use of large sample size, high response rate and use of multivariate analysis to control the effects of confounders.

Some of the Weaknesses of this study were cross-sectional nature of the data, recall bias (respondent not remembering correctly) and interviewer effects. These factors might affect the internal validity of the result.

2. LITERATURE REVIEW

2.1 Consumption of Milk and Milk Products

2.1.1 Consumption of cow milk

The level of milk consumption in Asia, Africa and Latin America is 35, 20, and 92 liters per head per year. However, milk products consumption level in Western Europe is about 300-400 liters per head per year (Ganguly *et al*., 1999). The average milk consumption in Kenya is about 100kg per head per year. This number is 292 liters in United States and 342.5 litters in European Union (Multu and Berk, 2004).

Milk and milk products consumption level in Ethiopia is a function of supply, family income, and religious obedience. In the country the high human population growth rate of 2.6% annually and the high rural to urban migrations are expected to alter food production, marketing and consumption (Tanngka *et al*., 2002). Of the total urban milk production, 73 percent is sold, 10 percent is left for household consumption, and 9.4 percent goes to calves and7.6 percent is processed into butter and *Ayib* (cheese) (Mohamed *et al*., 2004). As compared to other African countries, Ethiopians consume less dairy products.

2.1.2 Frequency of consumption

Most African countries regularly consume dairy products. For instance, 82 % of all households in Northern Nigeria regularly (at least weekly) consume a dairy product. Sour milk and evaporated milks are the most popular and frequently consumed traditional and nontraditional dairy products (Hans, 1992). In the Southern part of Nigeria regularity of consumption was generally higher for imported products. However, local products were consumed regularly near the points of production (Jabbar and Domenico, 1992).

Seventy percent of the households in rural locations and 92% in urban locations in coastal Kenya regularly consume liquid milk (Mullins *et al*., 1994).

2.1.3 Types of milk products consumed

In Ethiopia, 68 % of the total milk produced in the small holder dairy producers used for human consumption in the form of fresh milk, butter, cheese and yogurt (Getachew Felleke and Gashaw Geda, 2001). Butter that is produced from fermented whole milk is the most

widely consumed milk product in Ethiopia. Traditional butter can keep for a year or longer, offering rural consumers a readily storable, long-lived dairy product. Ethiopians consume dairy products either as fresh milk or in fermented or soured form (Mohamed *et al*., 2004). Sour milk is the most common product, and milk is usually soured before any further processing is done.

In central highlands of Ethiopia, the family consumes raw milk and milk products but not sour milk because it is prepared for processing butter and *Ayib*, which have economic importance but for special guests are received pepper is mixed with the sour milk and offered (Zelalem and Inger, 2000a).

2.1.4 Mode of consumption

Mode of consumption was defined as the manner in which the dairy product is used or consumed (Mullins *et al*., 1994). Zelalem and Bernand (2006) reported that over 70% of the smallscale producers usually keep milk products at room temperature before consumption. Smoking of milk containers is used as a preservation method of camel milk (Tezera and Hans, 2000).

In the southern parts of Ethiopia, consumption of fresh milk is mainly limited to children and in most cases dairy products are consumed following fermentation and further processing. However, in the central high lands of the country the family consumes fresh and other milk products (Zelalem and Inger, 2000a).

The majority of consumers use butter for making traditional *wots* that are eaten with 'injera' made from 'teff' (*Eragrostistef*). Fresh whole milk and all milk products except whey are consumed within the family (Zelalem, 1999). In the rural areas of Ada'a butter is used for cosmetics (hair dressing) and cooking purposes is sold by almost 67% of the smallholders (Favely and Chantalakhana, 1999).

2.1.5 Determinants of consumption

Consumption of milk and milk products is affected by a number of socio-economic factors such as income, and demographic characteristics such as gender, ethnicity, region, urbanization and age. Both economic and non-economic factors are potentially important in explaining the demand for dairy products. Religion and availability of products have also an

impact on the consumption of dairy products (Mullins *et al*., 1994). On the other hand quantity consumed rapidly decreases as degree of processing increases because of the smaller quantities of the processed products (Mullins *et al*., 1994). Men are shown to be 90% as likely to consume low-fat milk. Moreover age can affect the consumption of low-fat milk and as increasing age consumption of low-fat milk increases (Cliff *et al*., 2007).

Regular consumption of imported and derived dairy products is largely confined to urban consumers and high income rural dwellers in Northern Nigeria (Hans, 1992). Consumption of imported products in Southern Nigeria were common among urban than rural households (Jabbar and Domenico, 1992). The rural consumption level in China is much lower than the urban level. Apart from income differences, limited access to dairy products in rural areas is an important limiting factor (Zhang *et al*., 2002).

Consumption of evaporated milk is significantly associated with educational level of the household head and per caput income. Consumption of powdered milk is influenced by income, geographical location and educational level. Consumers of powdered milk tend to be urban-based, relatively well-educated people with above-average incomes. Consumption of yoghurt is largely a function of per caput income and geographical location and is higher in relatively small households (Hans, 1992). In costal Kenya consumption of processed dairy products is observed less frequently among the medium and low income households (Mullins *et al*., 1994).

In rural low income group households of Ethiopia, dairy products, meat and fish contribute 2.8% of the daily diet, in the medium group they account for 4.6% and in the high income group 4.8%. This indicates that as income increases the consumption of protein rich foods increases (Michael, 1996). Most of the Ethiopian Orthodox Church followers do not consume animal products, including milk and milk products for more than half of the year due to fasting. Except for small children, consumption of animal protein is forbidden on every Wednesdays and Fridays and during the 55 days of fasting between February and April and 15 days in August. There are about 200 fasting days per year in the Ethiopian Orthodox church and most of the milk during this period is processed into *Ayib* and butter for later sales and consumption (Tanngka *et al*., 2002).

2.1.6 Consumers' belief on consuming and using milk and milk products

It is considered that fresh whole milk and butter have medicinal and cosmetic values. Fresh whole milk is consumed to neutralize toxins. Women put butter on the top of their head, which is assumed to have dual purpose as hair dressing and to entire headaches (Zelalem and Inger, 2000a). Almost all consumers of camel milk believe that it has medicinal value and as a result they use it for treating malaria or jaundice, gastrointestinal disorders and strong cough (Tezera Getahun and Hans, 2000). In China many people treat milk as a supplement for mothers' milk for infants, and as a special nutritious food for sick or elderly people (Zhang *et al*., 2002).

2.1.7 Consumer preference for milk

Sour milk is by far the most preferred milk product; followed by evaporated milk, fresh milk and local butter. In addition there was a clear preference for local butter to imported butter and margarine. Yoghurt is the most preferred dairy snack, followed by ice-cream, which is especially popular among children (Hans, 1992).

In Kenya raw milk is so popular due to the cheaper price than pasteurized milk, taste, and high butter milk content of raw milk, availability in variable quantities and easier to prepare.

Few consumers prefer dairy products produced at home to the fresh whole milk due to the off flavors absorbed and present in the unfermented milk which may not felt in the fermented milk (Zelalem and Inger, 2000a).

In Jijiga and Shinle, camel milk is highly preferred for consumption when it is in fresh form with tea. The soured milk is usually preferred with boiled sorghum, rice, or maize porridges (Tezera and Hans, 2000). Generally in Ethiopia organoleptic properties of dairy products are the commonly used quality tests while purchasing or consuming the dairy products in most parts of the country (Zelalem and Bernand, 2006).

2.2 Milk Composition, Nutrition and Health Effect

2.2.1 Lipids

In average, milk contains about 33 gm total lipid (fat)/litter (USDA, 2007). Triacylglycerols, which account for about 95 % of the lipid fraction, are composed of fatty acids of different

length (4–24 C-atoms) and saturation (Jensen and Newburg, 1995). Each triacylglycerol molecule is built with a fatty acid combination giving the molecule liquid form at body temperature.

More than half of the milk fatty acids are saturated fatty acid, accounting to about 19 g/lt whole milk (USDA, 2007). The specific health effects of individual fatty acids have been extensively studied (Mensink, 2003). Butyric acid (4:0) is a well known modulator of gene function, and may also play a role in cancer prevention. Caprylic and capric acids (8:0 and 10:0) may have antiviral activities, and caprylic acid has been reported to delay tumor growth (Thormar *et al*., 1994). Lauric acid (12:0) may have antiviral and antibacterial functions (Sun *et al*., 2002), and might act as an anti caries and anti plaque agent (Schuster *et al*., 1980). Interestingly, Helicobacter pylori can in fact be killed by this fatty acid (Sun *et al*., 2003).

Another interesting observation is that capric and lauric acid are reported to inhibit COX-I and COX-II (Henry *et a*l., 2002). Stearic acid (18:0) does not seem to increase serum cholesterol concentration, and is not atherogenic (Mensink, 2003). In contrast to this, the saturated fatty acids lauric, myristic and palmitic acid have low-density lipoprotein (LDL) and high-density lipoprotein (HDL) cholesterol-increasing properties (Mensink, 2003).

High intake of these acids raises blood cholesterol levels (Mensink, 2003). And diets rich in saturated fat have been regarded to contribute to development of heart diseases, weight gain and obesity (Insel *et al*., 2004).The increase in HDL cholesterol caused by the saturated fatty acids lauric-, myristic- and palmitic acid has beneficial effects as the reverse cholesterol transport is increased (Insel *et al*., 2004). HDL can also act as an antioxidant and prevent oxidation of LDL particles in the blood, and it may protect against infections and against toxins from microbes (German *et al*., 2004).

Oleic acid (18:1c9) is the single unsaturated fatty acid with the highest concentration in milk accounting to about 8 g/litter whole milk (USDA, 2007). Oleic acid is considered to be favorable for health, as diets with high amounts of monounsaturated fatty acid will lower both plasma cholesterol, LDL-cholesterol and triacylglycerol concentrations (Kris-Etherton *et al*., 1999), and replacement of saturated fatty acids with cis-unsaturated fatty acids reduces risk for coronary artery disease (Mensink, 2003).

The unsaturated fatty acids are reactive as they may give oxidative stress with free radicals and secondary peroxidation products (different aldehydes such as malonedialdehyde and 4-hydroxynonenale) that may be harmful to proteins and DNA in the cells (Bartsch *et al*., 2002; Bartsch and Nair, 2004). Milk fat is rich in oleic acid and it has a very high ratio oleic acid/polyunsaturated fatty acids. A diet rich in milk fat therefore may help to increase this ratio in the total dietary fatty acids (Haug *et al*., 2007).
The concentration of polyunsaturated fatty acid (PUFA) in milk is about 2 g/lt (USDA, 2007), and the main PUFA in milk are linoleic- (18:2 omega-6) and alpha-linolenic (18:3 omega-3) acid. These fatty acids may be converted to fatty acids with 20 carbon atoms, i.e. arachidonic acid (20:4 omega-6) and eicosapentaenoic acid, (EPA) (20:5 omega-3), and further converted to eicosanoids; metabolically very active compounds with local functions.

Bovine milk, milk products and bovine meat are the main dietary sources of the cis 9, trans 11 isomer of conjugated linoleic acid (9c,11t-CLA) (Wahle *et al*.,2004). Milk content of 9c, 11 t-CLA vary considerably but may constitute about 0.6 % of the fat fraction (Stene *et al*., 2002; Bell *et al*., 2006). Studies have shown that especially 9c, 11t-CLA can improve plasma cholesterol status (Tricon *et al*., 2004; Valeill *et al*., 2004).

2.2.2 Protein

Bovine milk contains about 32 gm protein per litter (USDA, 2007). The milk protein has a high biological value, and milk is therefore a good source for essential amino acids. In addition, milk contains a wide array of proteins with biological activities ranging from antimicrobial ones to those facilitating absorption of nutrients, as well as acting as growth factors, hormones, enzymes, antibodies and immune stimulants (Clare *et al*., 2000). The nitrogen in milk is distributed among caseins, whey proteins and non-protein nitrogen. The casein content of milk represents about 80% of milk proteins.

Several studies has suggested that there is an association between milk consumption and blood pressure; as hypertension is inversely related to milk consumption in some epidemiological- and intervention studies. It has been suggested that some milk peptides have

antihypertensive effects, both by inhibiting angiotensin-converting enzyme, having opoid-like activities, antithrombotic properties and by binding minerals (Jauhiainen and Korpela, 2007).

Milk is especially rich in essential amino acids and branched chain amino acids. In addition to provide substrates for protein synthesis suppress protein catabolism and serve as substrates for gluconeogenesis, they also trigger muscle protein synthesis and promote protein synthesis (Layman, 2003 and Etzel, 2004).
Essential amino acids are important in muscle protein synthesis (Wolfe, 2002), and the branched chain amino acid *leucine* in particular triggers muscle protein synthesis which is sensed by the insulin signaling pathway (Etzel, 2004).

Fresh milk may be a good source of glutathione, a tripeptide of the sulphur amino acid *cysteine*, plus *glycine* and *glutamic* acid. In the organism *glutathione* has the role as an antioxidant. Glutathione appears to have different important roles in leukocytes, as a growth factor, as an anti-apoptotic factor in leukocytes and to regulate the pattern of cytokine secretion. GSH, moreover, is also central for antioxidative defense in the lungs, which may be very important in connection with lower respiratory infections including influenza (Cai *et al*., 2003).

2.2.3 Minerals, vitamins and antioxidants

Milk contains many minerals, vitamins and antioxidants. The antioxidants have a role in prevention of oxidation of the milk, and they may also have protective effects in the milk-producing cell, and for the udder. Most important antioxidants in milk are the mineral selenium and the vitamins E and A.
The calcium concentration in bovine milk is about 1 g/lt. Getting enough calcium in the diet gives healthy bones and teeth, and it may also help prevent hypertension, decrease the odds of getting colon or breast cancer, improve weight control and reduce the risk of developing kidney stones (Insel *et al*., 2004).

Selenium is important in human health; it has a role in the immune- and antioxidant system and in DNA synthesis and DNA repair (Dodig and Cepelak, 2004). Selenium protects against

many (but not all) types of cancer (Insel *et al*., 2004).There are indications that selenium may protect against asthma, and that low selenium intake may worsen the asthma symptoms (Allam and Lucane, 2004). Selenium deficiency has even been linked to adverse mood states (Rayman, 2002). Selenium is also a component of enzymes involved in metabolism of thyroid hormone.

Iodine is an essential component of the thyroid hormones. These hormones control the regulation of body metabolic rate, temperature regulation, reproduction and growth. The recommended iodine intake is 150 ug/d for adults (Insel *et al*., 2004). Accordingly, a daily intake of 0.5 liters milk with an average content of 160 ug iodine/lt meets about 50% of the requirement.

Magnesium is ubiquitous in foods, and milk is a good source, containing about 100 mg/lt milk (USDA, 2007). Recommended intake is 400 mg/day for men and 310 mg/day for women (Insel *et al*., 2004). Magnesium has many functions in the body, participating in more than 300 reactions. Magnesium deficiency has been linked to atherosclerosis, as studies have shown that deficiency may give oxidative stress (Hans, 2002).

Zinc is an essential part of several enzymes and metallo proteins. Zinc has several functions in the body, in DNA repair, cell growth and replication, gene expression, protein and lipid metabolism, immune function, hormone activity, etc (Insel *et al*., 2004). Milk is a good zinc source; containing about 4 mg/lt (USDA, 2007).

Vitamin E concentration in milk is about 0.6 mg/lt (USDA, 2007), but may increase 3–4 folds by proper feeding regimes. In whole milk, alpha-tocopherol is the major form of vitamin E (>85%); gamma-tocopherol and delta-tocotrienol are present to a lesser extent, about 4 % each of the sum of tocoferols and tocotrienols (Kuashik, 2001).

Milk is a good source of retinoids, containing 280 ug per litter (USDA, 2007). Recommended daily intake is 700–900 ug/day (Insel *et al*., 2004). Vitamin A has a role in vision, proper growth, reproduction, and immunity, cell differentiation, in maintaining healthy bones as well as skin and mucosal membranes (Insel *et al*., 2004).

Bovine milk contains 50 ug, folate per litter (USDA, 2007). Studies indicate that 5-methyl-tetrahydrofolate is the major folate form in milk (Forssen *et al*., 2000). Recommended intake of folate is 400ug/day for adults (Insel *et al*., 2004). Folate-binding proteins occur in

unprocessed milk, pasteurized milk, spray-dried skim milk powder and whey (Forssen *et al*., 2000).

Milk is a good source of riboflavin, 1.83 mg riboflavin/lt milk. Daily recommended intake is 1.1 and 1.3 mg for women and men, respectively (Insel *et al*., 2004). Riboflavin is part of two important coenzymes participating in a numerous metabolic pathways in the cell. It has a role in the antioxidant performance of glutathione peroxidase and DNA repair via the ribonucleotid reductase pathway.

Milk is also a good source of vitamin B12, being 4.4 ug/litter (USDA., 2007). The daily recommendation is 2.4 μg (Insel *et al*., 2004). Vitamin B12 is found only in animal foods, and plays a central role in folate and homocysteine metabolism, by transferring methyl groups. Vitamin B12 deficiency may cause megaloblastic anaemia and breakdown of the myelin sheath.

2.3 The Importance of Cow's milk and Nutritional status of Children

2.3.1 Importance of cow's milk

Milk and dairy products as nutrient dense sources of macro and micronutrients play a key role in healthy human nutrition and development throughout life, especially in childhood (FAO, 2013). Cows' milk provides energy and high-quality protein (defined as protein that supports optimal growth). It is an excellent source of all the essential amino acids including lysine which is often limiting in plant/cereal based diets. Milk and dairy products can make a significant contribution to meeting the required nutrient intakes of calcium, magnesium, selenium, riboflavin, vitamin B_{12} and pantothenic acid (FAO, 2013).

The beneficial effect of milk on weight gain and linear growth among nutritionally or socio-economically disadvantaged young children was observed. The strongest effects may be seen on the growth of children with existing undernutrition (Hoppe *et al*., 2006; Wiley, 2009; Michaeleson *et al*., 2009 and Da beer, 2012).

Milk is important for treatment of undernutrition both in industrialized countries where almost all products used for enteral feeding of malnourished hospitalized children and adults are milk-based and in developing countries, leading to higher recovery rates (Michaelson *et al*., 2011).

Milk consumption increased skeletal bone mass in younger people (FAO, 2013). Milk and dairy products decreased risk of dental caries; including the relationship between maternal consumption and dental health in their children (Tanngka *et al*., 2012) hard cheese decreases the risk of dental erosion.

A higher intake of animal sourced foods (ASF) has been associated with better growth, micronutrient status, cognitive performance, motor development and activity in children (Dror and Allen, 2011; Hoppe *et al*., 2006; Michaeleson et al., 2009 and Da beer, 2012).

People with cows' milk allergy have a significant risk of poor bone health and early osteoporosis (Nachshon *et al*., 2014).

In general children's diets that are low in dairy have been associated with increased risk of fracture in children (Goulding *et al*., 2004 and Konstantynowicz *et al*., 2003) and a doubling of hip fracture later in life as seen in American postmenopausal women, independent of current milk or calcium intake (Kalkwarf *et al*., 2003).

The greatest challenge of dairy products consumption by the poor is the price. Like other animal-source foods, dairy products tend to be a more expensive source of energy compared with cereal staples in developing countries. At times of economic stress livestock products are replaced by other proteins or starchy staples, and consumption of animal products generally rises as incomes rise (FAO, 2009).

FAO states that a balanced diet is a core part of food security and ensuring access to sufficient safe and nutritious food will help eradicate hunger and poverty. Milk and dairy products hold potential to improve nutrition and livelihoods for hundreds of millions of poor people throughout the world. Milk, yoghurt, ghee and cheese are known and accepted foods in many cultures, making it easy to encourage people to consume them. It seems highly likely that there would be an improvement in the food security of the poor if more dairy products were added to their diet (FAO, 2013).

Milk and dairy products can play a particularly important role in human nutrition in both developed and developing countries especially where the diets lack diversity through either poor food choices or poverty (FAO, 2013). Milk and dairy products can add much needed

diversity to plant-based diets and can contribute to promoting child growth. They are nutrient dense and provide energy, high-quality protein and micronutrients in an easily absorbed form that can benefit both nutritionally vulnerable people and healthy people when consumed in appropriate amounts.

In children with poor nutritional status, the addition of milk to the diet is likely to supply nutrients that are important for growth (Hoppe *et al*., 2006). Milk is also an efficient vehicle for delivering several critical micronutrients and improving the nutritional status of pregnant and lactating women and the growth of young children. Policy-makers must ensure that not only sufficient staple foods are produced but a variety of micronutrient-rich foods are accessible to the world's poor and malnourished.

Cow's milk protein is a key ingredient in products used for treatment of severe acute malnutrition (SAM), such as F-100 and ready-to-use therapeutic foods (RUTFs).

In F-100, cow's milk is the only protein source, and in RUTFs, cow's milk provides typically about 50% of the protein content. These products have been very effective in improving recovery and in reducing mortality, and there is general agreement that dairy protein should be the main protein source in products used to treat SAM (Michaelsen, 2013).

There is convincing evidence that dairy protein has a specific stimulating effect on linear growth and effective in promoting weight gain in children with malnutrition (Hoppe *et al*., 2006)

Studies on cow's milk and linear growth show an effect in children in both developing and industrialized countries, suggesting that milk has a growth-stimulating effect even when nutrient intake is adequate. Many studies suggest that this is due to a stimulating effect on plasma insulin-like growth factor 1 (IGF-1) (Michaelsen, 2013).

2.3.2 Nutritional status of children

An estimate of 230 million under five children is chronically malnourished in developing country (Poel *et al*., 2008). In Sub Saharan Africa, 41% under five children are malnourished (FAO, 2008). Worldwide, more than one billion people are undernourished (Habicht, 2008) and under nutrition contributes to more than 30% of all deaths in children below five years (UNICEF, 2009). Under nutrition includes being stunted (low height for age), wasted (low weight for height) and underweight (low weight for age).

The causes of under nutrition are multi factorial and embrace inadequate dietary intake and diseases, food insecurity, inadequate care, unhealthy environment and inadequate health services (UNICEF, 2009). The growth of children was related to socio economic environment in which they live and children from developing countries grow more slowly and achieve a shorter adult height than those from wealthier regions (Poel *et al.*, 2008). Wasting is a measure of thinness; a wasted child has suffered from substantial weight loss, usually as a consequence of acute food shortage and/or diseases (UNICEF, 2003).

Ethiopia has the second highest rate of malnutrition in sub Saharan Africa. According to the 2011 Ethiopia Demographic and Health Survey, 9.7% of children under the age of five are acute malnutrition (wasting), 28.7% are underweight, and 44.4% are chronically malnourished (stunted) and in Tigray region, 10.3% of children under the age of five are wasted, 35.1% are underweight, and 51.4% are stunted (EDHS, 2011)

2.3.3 Anthropometric indicator

To assess the nutritional status of children in low and middle-income countries, an anthropometric indicator such as height-for-age (stunting), weight-for-age (underweight) and weight-for-height (wasting) is an important tool. The global trends of under nutrition from 1980 to 2000 showed that there is no remarkable improvement in the prevalence of wasting, but limited improvement in stunting as well as underweight. Stunting was declined by 14% and underweight by 7% (Dewey and Adu-Afarwuah, 2008).

Wasting and underweight are significantly associated with proximal factors of morbidity such as feeding practices and child health status. Socioeconomic factors such as mother's education, presence of a latrine, de-worming status, environmental factors such as maternal/reproductive and health delivery, morbidity like history of fever, child health status are significantly associated with stunting (Wamani *et al.*, 2005).

2.4 Determinants of Child Nutritional Status

2.4.1 Sex of child

Sex is an important determinant for childhood under-nutrition. Boys are more vulnerable to be stunted than girls (Kandala *et al.,* 2011). However, a study conducted in India, revealed that girls suffered more from stunting than their counterparts. But generally boys are more prone to underweight than girls and the association is statistically significant (Kumar *et al,* 2006).

2.4.2 Age of child

Age is a factor influencing the variation on under-nutrition among children. Literature studies showed that second year of life is vulnerable for stunting and underweight. The highest prevalence of stunting and underweight was found within the age group among under-five children. The rate of stunting declined after two years of age. However, wasting was found at higher level among the age group between 37- 48 months (Kumar *et al.,* 2006).

A study finding from Mozambique has showed that two to five year of children are more vulnerable in terms of their health and nutritional status compared to the younger children. At that stage, they are more dependent on complementary foods along with breast milk. Their mobile nature requires high energy to maintain growth and development and becoming used to the variety of family foods. Hence, increasing the exposure to environmental contaminants might lead them to a higher risk of infectious diseases and poor health. Thus, food safety as well as factors of environmental hygiene becomes more crucial for their optimum growth and development (Garrett and Ruel, 1999). The higher prevalence of wasting was found among the age group between 48-59 months old children (Hien and Kam, 2008). Children aged 6-11 months and 24-35 months are more vulnerable to under-nutrition (Pongou *et al*., 2006).

Another study, conducted in the Democratic Republic of Congo found that age is a strong determinant of stunting among the age of under-five children. There is an inverse linear association between age group and stunting. As the age of the children is increasing, the risk of being stunted also increases. Among the stunting prevalence, the highest prevalence was found among the age group of five years while the lowest prevalence of stunting was in the age group of one-year-old children (Kandala *et al.,* 2011).

2.4.3 Residence

Residence has a significant impact on child nutritional status. Based on an observational study, it has been found that rural and mountainous children have a higher risk to become undernourished for all three forms of anthropometric indices (underweight, stunting and wasting) compared to urban children. Children of mountainous areas are the most vulnerable among the three area of residence (Hien and Kam, 2008).

Also, a study in Democratic Republic of Congo depicted that the area of residence is an influential factor of stunting. Rural children are more stunted than urban children. The rate of stunting among children is differing from their place of birth. More stunted children were found among the ones not born at hospitals (Kandala *et al.,* 2011).

2.4.4 Sex of household head

A study conducted in Bangladesh showed that a better nutritional status was seen among female headed household members, particularly better nourished children. The fact that women who are in charge of the budget, were more child and nutrition inputs-centered, hence could prefer to buy better foods and seek better medical care for their children (Pryer *et al.,* 2003).

It is assumed that women are much more involved in child healthcare and the older the mother, the more important the care for her child (Sunkanmi, 2012).

2.4.5 Family size and number of children

Family size has been positively associated with the nutritional status of under-five children.

However, the number of under-five children in a household negatively associated with the nutritional status. In families having more than three children, the children were on average four or even more times are more likely to be underweight, stunted, wasted compared to those having less than three children (Hien and Kam, 2008).

A study showed that with a ten percent increase of the number of under-five children within the family, the chance of being stunted increased by 3.7 percent. Several studies revealed that households with a small number of children have more chance to consume adequate energy.

Intra-household food distribution does not favor the food intake of young children, especially female children (Garrett and Ruel, 1999).

2.4.6 Mother's educational level

Several studies have been conducted over the past decade and found that mother's schooling level and child survival has a nearly universal and positive association. This association has been persisting even when the other variables like socio-economic factors have been kept constant (Govindasamy and Ramesh, 1997).

A study in India showed that for a better use of healthcare services , maternal education presume to be a more significant, powerful and positive predictor when considering alo other background factors such as maternal residence, work status , caste and religion, age, sex and birth order of the children. Mother's who have at least middle school education are 40 to 60 percent more likely to use in a better way the health care facilities for the treatment of their children suffering from infectious diseases (ARI and diarrhea and so on) compared to illiterate mothers. Women educated with at least some years of primary school education are two times more likely to be utilizing modern healthcare services compared to illiterate women (Govindasamy and Ramesh, 1997).

Mother's who are educated may have a strengthened capacity to substitute with less expensive sources of nutrients at the periods of recessions, thereby mitigating the risk of under-nutrition of their children. However, those mothers who have limited education and low economic status have less chance for such type of substitution (Weil *et al.,* 199l).

Mother education is a crucial determinant of child malnutrition. It has been found that mother education has a linear association with child's stunting. The highest prevalence of stunting was found among the mothers with no schooling and followed by mothers with primary education. The lowest prevalence was found among mothers with secondary education, followed by higher education. Household's socio-economic status is one of the strongest determinants of child under-nutrition. It has a great influence on stunting among the children of under-five years and is linearly associated with stunting. The highest rate of stunting was found among the poorest group, followed by children whose household economic status was poor at middle class. Lowest stunting was found among children of households with high economic status considered as richest (Kandala *et al.,* 2011).

There are 3 major pathways of influence, linking between maternal schooling and child mortality. Firstly, educated women can take the decision to break away the tradition. For

better results they can seek the modern means of safeguarding for their own health as well as for their children. Educated mothers can take the challenges of neglecting childhood morbidities as they are concerned on the remedy for childhood morbidities. They can use the modern means to keep safe their children from illnesses (Cleland, 1990).

2.4.7 Mother's occupation

Mother's occupation has a positive association with the nutritional status of children younger than five years. A study found that mothers engaged with office work has significantly less underweight and wasted children compared to them who are occupied as a laborer, farmer and housewife. Mother's occupation is also significantly associated with child stunting. But the risk for being stunted by the type of occupation is not as high compared to underweight and wasting (Hien and Kam, 2008).

2.4.8 Mother's Body-Mass-Index

Studies have found that there is a significant association between maternal Body-Mass-Index (BMI) and child nutritional status. Children of malnourished mothers had a higher risk of being underweight compared with children of well nourished mothers. The reason behind is that mother with poor nutritional status may not be able to provide sufficient breast milk due to their inadequate intake of nutrients. Maternal malnutrition could be a hindrance for her child's growth and development (Rayhan and Khan, 2006).

2.4.9 Infant and young child feeding practices

Infant feeding practices is a strong determinant of stunting as well as of underweight among the under five year's children. Studies have shown that the proportion of underweight and stunted children is significantly lower whose mothers initiated breastfeeding within six hours of birth. A higher prevalence of both stunting and underweight is found among under five children who are deprived from colostrums. Improper complementary feeding is a risk factor for underweight among children. More underweight children were found among the groups who did not get proper complementary foods follow their needs (Kumar *et al., 2006*).
Duration of exclusive breastfeeding is an important determinant of child nutritional status.

Children of mother's who were exclusively breastfeeding their infants for less than six months, had a higher risk on being underweight, stunted and wasted compared to the children whose duration of exclusive breastfeeding is up to six months (Hien and Kam, 2008).
Inadequate dietary intake by the children due to frequent infectious diseases is considered to be an immediate cause of stunting (Frongillo *et al*., 1997).

2.4.10. Inadequate food intake and improper health care

Poor maternal nutritional status at conception and under nutrition in utero, inappropriate or inadequate breastfeeding, delayed and inadequate complementary feeding, poor absorption of nutrients due to parasites or intestinal infection or the combination of these factors are considered the most common immediate causes of poor growth among children in developing countries (Allen and Gillespie, 2001).

Child malnutrition is a complex phenomenon. Nutritional status of children is influenced by multiple factors. Inadequate food intake and improper health care are the most important immediate factors causing childhood's under nutrition. However, both factors are highly related with household socio-economic status. Allocation of household's resources on food and healthcare and the household's decision maker attitudes on children are the influential factors on child nutritional status. Studies showed that better nourished children are found in households with higher land resources (Bhuiya *et al.,* 2001).

2.4.11 Environmental contamination factors

A study in Bangladesh demonstrated that the better the use of appropriate sanitary means to defecate was significantly associated with better child nutrition (Pryer *et al.,* 2003).
Unhygienic environment caused by unavailability or poor accessibility of clean and safe water and defecation in an open place, increases the probability of infectious diseases that leads the children to certain types of under nutrition (UNICEF, 1990; and Engle, 1992).

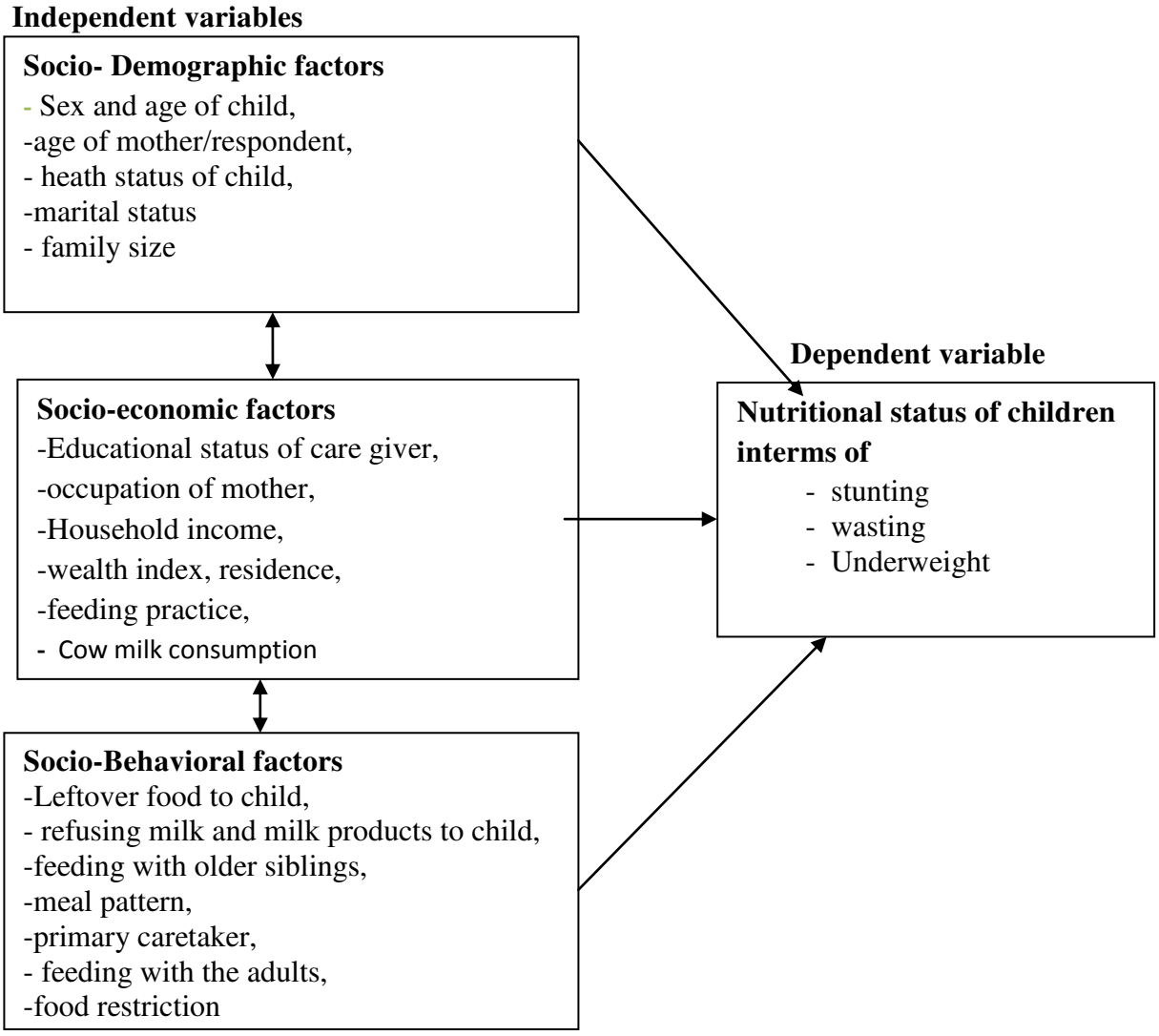

Figure 2. 1: Conceptual framework

3. MATERIALS AND METHODS

3. 1 Study Area

Kilteawulaelo district is geographically located between 39^0 30' E - 39^0 45' E longitude and 13^0 45' N -14^0 00' N latitude in the eastern part of Tigray at a distance of 45 km from Mekelle. It borders with Howzien and SeaseTsadamba districts in the north, Atsbi Womberta in the east, DougaTembien in the west and Mekelle in the South. The district currently encompasses a total of 19 villages and 64 goats. Kilite Awulaelo district is classified in to three main agro-climatic zones. These are 15% Dega, 82% Wina Dega and 3% kola agro-climatic zone.

The altitude of the district ranges from 1980 to 2500 m above sea level. The average daily temperature of the area range between 15 ^{0}C and 30 ^{0}C, the mean annual rainfall of the area is about 558 mm. The population of the district is estimated to be 117,862 in 2005 (CSA, 2005). Out of the total population, 60,330 (51.2%) were female. About 70.3% of the population lives in rural areas. The rural household heads in the district were 21,676 of which 7157 (33%) were female (OKAWARD, 2014). The dominant crops grown in the area include wheat, barley, *hanfets*a and *teff*. The irrigated land of the study district accounts 752 ha (3.9% of the cultivated land). The livestock populations of the district include 13,048 oxen, 46,188 cattle, 46,418 small ruminants 6,644 beehive, 42,733 poultry and 13,036 equines (OKAWARD, 2014).

Map of the study area

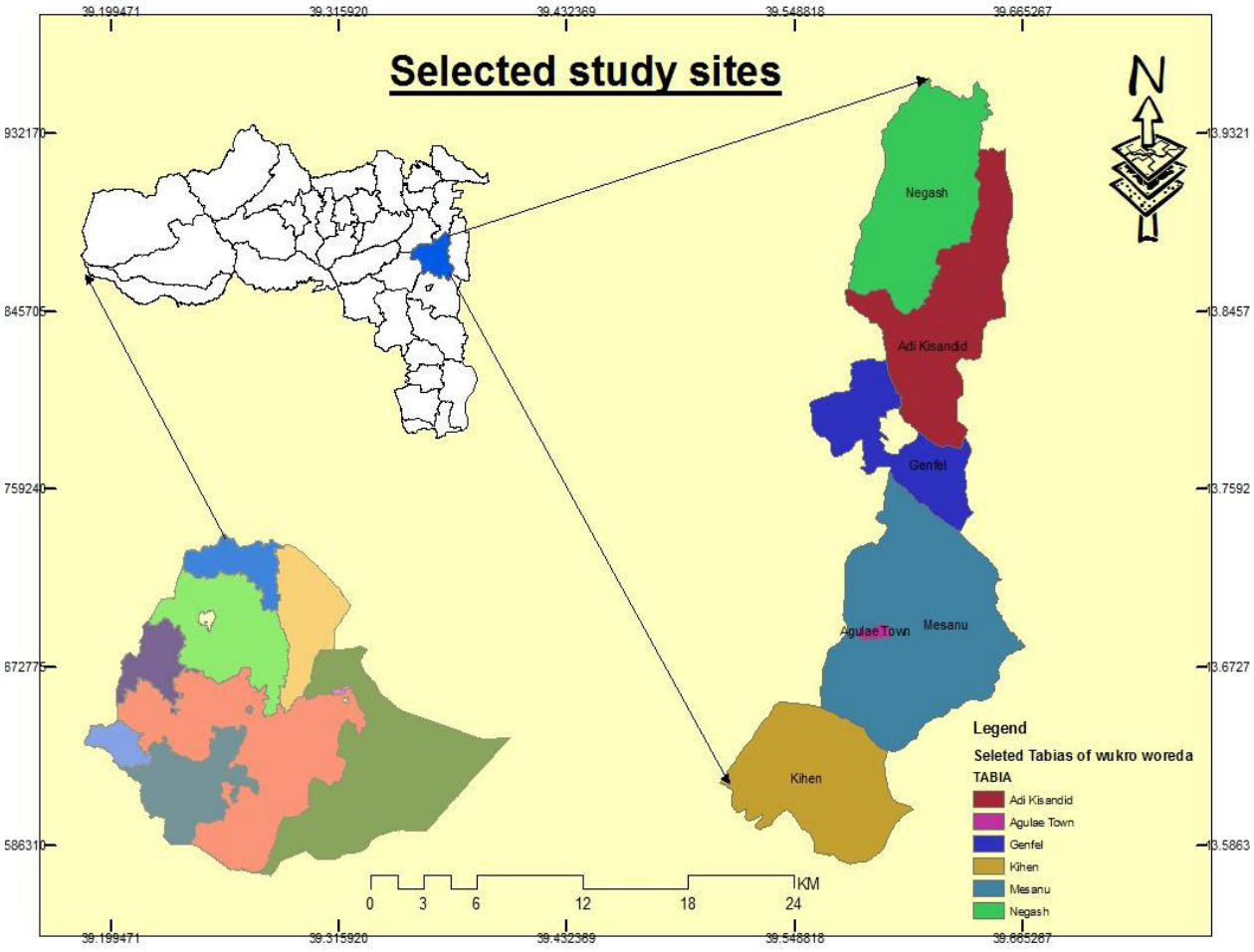

Figure 3. 1: Map of the study area

Source: Kilteawlaelo agriculture and rural development office

3.2 Study Design

Community-based cross-sectional survey design was undertaken. For the questionnaire survey, mothers/care givers having children in the age of 2 up to 5 years were selected. Children in the age of 2 up to 5 were used for anthropometric measurements

3.3 Population

The source population for this study was all children aged 2–5 years old with their mothers of kilteawlaelo district

The study populations were children aged 2 to 5 years from the randomly selected villages of Kilteawlaelo district.

3.4 Inclusion and Exclusion Criteria

The inclusion criteria was all children age 2 to 5 years old for anthropometric measurements and mothers/cargivers were the key respondent during the questionnaire survey.

The Exclusion criteria were children who were seriously ill at the time of survey, disabled children and those who lived less than six months in the study area and leaved the district.

3.5 Sample Size and SamplingPprocedure

3.5.1 Sample size determination

Sample size was computed by using single proportion formula (Cochran 1963:75) by using 95 % confidence interval and 5 % level of precision for stunting, 3% level of precision for wasting and 4% level of precision for underweight as described below.

$$n = \frac{(Z_{\alpha/2})^2 P(1-P)}{e^2}$$

Where; n = sample size, e= level of precision, $Z^2_{\propto/2}$ the abscissa of the normal curve that cuts off an area α at the tails, P is the estimated proportion of an attribute that is present in the population.

According to Mini EDHS (2014) the study sample size was calculated using the proportion of stunting (45.7%), wasting (14.3%) and underweight (31.3%) for Tigray region as follow:

$$n_1 = \frac{(1.96)^2 x 0.457(1-0.457)}{(0.05)^2} \approx 382$$

$$n_2 = \frac{(1.96)^2 \, x0.143(1-0.143)}{(0.03)^2} \approx 524$$

$$n_3 = \frac{(1.96)^2 \, x0.313(1-0.313)}{(0.04)^2} \approx 517$$

From the above calculated sample size n_1, n_2 and n_3 which are 382, 524 and 517 respectively plus 10 % non responsive rate *i.e.* the total sample size for each was n_1= 421 n_2= 577 and n_3= 569. Therefore, the largest sample size which is n_2 = 577 was taken for the study.

3.5.2 Sampling Procedure

Two stage sampling method was used; in which, firstly, Kilteawlaelo District was selected purposively as study site. Then from the total 19 villages of the district, 30% of which six villages were selected randomly with lottery method for this study. Following this, list of all 24 to 59 months of age children were obtained from each selected villlages' health post.

Next, the total sample size (577) was distributed to each of the selected six villages using proportionate allocation. Therefore, the sample size of each selected village was Genfel =101, Tahtay adiksanded = 99, Negash= 103, Agulae =103, Mesanu = 93 and Kihen = 78 children. After allocated this sample size to each village, the required sample size was selected using computer generated simple random sampling technique from the list of total number of children of two to five years age from each selected kebeles.

3.6 Data Collection Procedures and Quality Control

Data collection from the selected six villages (Kihen, Mesanu, Agulae, Negash, Genfel and tahtay adi ksanded) of kilteawlaelo district was conducted from May to July 2015. Data was collected using structured and semi-structured interviewer administered questionnaire for the survey and anthropometric measurements for child nutritional status measurement. The questionnaire was adapted from different relevant studies and was first developed in English and then translated in to Tigrigna and back translated to English by different persons to check for their consistency. Pretest was conducted in other nearby village of another district which

was Enderta district and there were some items that need adjustments. The data was collected by 12 health extension workers, 3 development agents and 3 supervisors diploma in nurse who were given training for three days on how to collect the information of the questionnaire and handle the collected data; and the overall activity was coordinated by the investigator. Data quality was addressed by training data collectors and supervisors and providing day-to-day supervision during the whole period of data collection. The supervisors were responsible to care of smooth process of data collection. At the end of each day, the questionnaires were checked for completeness.

Anthropometric measurements: Age, sex, weight and height were recorded.

Age: Was collected from the mother and available vaccination cards, baptismal certificates or other forms of informal recording. When these recordings were not available, a calendar of locally important events was used.

Sex: was recorded from the participant as female and male.

Weight: Weight of the lightly clothed children was measured to the nearest 100 g by UNICEF weighting Scale. The weighting scale was calibrated by known 2.5 kg material.

Height: Height of children aged 24-59 months measured in a standing position to the nearest 0.1 cm using a board with an upright wooden base and a movable headpiece being the child barefooted and free of head wearing.

Finally, WHO growth standard chart for 2 to 5 years for boys and girls was used to calculate height-for-age (HAZ), weight-for-age (WAZ) and weight-for-height (WHZ) z-scores. Children with HAZ, WAZ and WHZ below -2 were characterized as stunted, underweight and wasted, respectively. These variables considered as the dependent variables during statistical analysis.

3.7 Data Processing and Analysis

The data from the questionnaire were entered, sorted; cleaned and analyzed using SPSS version 20 and anthropometric measurements was calculated using WHO growth chart for age. Binary logistic regression was used to see the independent effect of predictors on outcome variables. Candidate variables from bivariate analysis were selected and transferred to multi variable binary logistic regression by using pre set p-value of < 0.2 to include important variables. Enter method standard regression model building technique was used to

build final model. Before building final model, multi co linearity effect was assessed and the VIF (variable inflection factor) > 10 was used as cut off point. Furthermore, confounding was managed using the multivariate analysis. The final model was then tested for its goodness of fit by Hosmer and Lemeshow p-value and > 0.05 was best fit and all the models were fit for the respective outcome variables. Significance was declared when p-value was < 0.05.

3.8 Study variables

3.8.1 Dependant variable

Child nutritional Status in terms of wasting, stunting and underweight

3.8.2 Independent variables

Socio-demographic factors**;** selected village, Sex and age of child, age of mother/care giver, sex of household head, marital status and family size

Socio-economic; Educational status of mother and father, occupation of mother & father, Household income, wealth index, residence, feeding practice, source of cow milk, milk availability and milk consumption, child vaccine, child disease status and sanitation.

Behavioral factors; Leftover food to child, refusing milk and milk products to child, feeding with older siblings and adults, meal pattern, primary caretaker and food restriction

3.9 Operational definitions

Nutritional status: refers to the physical measurement of children in height and weight. The data was obtained by measuring height to the nearest 0.1 cm using a wooden height measuring board, weight to the nearest 0.1 kg on a battery powered digital scale and MUAC measured by MUAC measuring tap. Theerefore, the classification was based on: Height for age Z-score (<-2 SD) = Stunted, Weight for age Z-score (<-2 SD) = Underweight, Weight for height Z-score (<-2 SD) = Wasted and MUAC measurement (<11 cm) = Sever under nourished. Height for age Z-score and Weight for age Z-score focus on chronic malnutrition where as Weight for height Z-score and MUAC are for acute malnutrition.

Anthropometric: is measurement that allows classification of children into categories of nutritional status according to developed standards or reference data (WHO, 2006).

Milk consumption: refers to feeding pattern of milk in terms of serving in a day for the children. The milk consumption according to guidelines is two to three servings per day. Therefore, this study addressed by assessing the servings and amount of servings per day of milk consumption of the children

Cow's milk availability: refers the presence of cow's milk in the study area weather the participants their own production or some other nearby producers. It was mainly categorized in to 0= not available 1= yes, available

Cow's milk source: refers to the source of milk for consumption for the child in particular and to the household in general. This was categorized in to 1= from own production 2= from market 3= gift from neighbor, relatives or some other

Cow's milk serving: refers to the amount of cow's milk provided to the child in one serving. In this study it was categorized in to local serving equipments i.e. 1= one coffee cup, 2= one tea cup, 3= one cup and 4= one glass. According to USA and UK guidelines One serving = 200mls milk or 30g cheese or 125g pot of yoghurt. Children should have at least 350mls milk per day but no more than 600mls.

Total amount of cow's milk: refers to the total number of servings and amount of milk taken by the child per day. It was categorized as 1= one coffee cup 100 ml, 2= one tea cup 150 ml, 3= one cup 250 ml and 4= one glass 300 -400 ml

Income of the household: the average income of the family per month from the crop production, livestock production, labour, salary or business/trade. It was categorized as < 1000 birr, 1000 -5600 birr, 5700 – 20000 birr and > 20000 birr based on the safety net benchmark.

Source of water: refers to the drinking water of the household. It was assessed by the classification of 1) river water, 2) stream water 3) unprotected well, 4) protected well 5) hand pump/water tap

Water treatment: refers to the treatment of drinking water obtained from the source of water before giving to a child. This was categorized as 1) boiling, 2) chemical use and 3) no treatment used.

Occasion for hand washing: refers to the time of hand washing situation of the household. This was categorized as 1) after eating 2) after defecation 3) before feeding child 4) after cleaning child's bottom and 5) in all situations.

Occasion for soap use: refers to the condition where the participants use soap for hand washing. This was categorized as 1) after eating 2) after defecation 3) before feeding child 4) after cleaning child's bottom and 5) in all situations.

Father occupation: refers to the present job of father. It was categorized 1) own farm work 2) daily laborer 3) salaried employee 4) business/trade 5) other (specify).

Father educational level: refers to the highest education level of the child's father. This was assessed based on 1) unable to read & write 2) able to read & write 3) elementary school completed 4) secondary school completed 5) diploma 6) degree

Mother occupation: refers to the present job of mother. It was categorized 1) own farm work 2) daily laborer 3) salaried employee 4) business/trade 5) housewife 6) other (specify).

Mother educational level: refers to the highest education level of the child's mother. This was assessed based on 1) unable to read & write 2) able to read & write 3) elementary school completed 4) secondary school completed 5) diploma 6) degree

Wealth index: it was developed based on the ownership of fixed assets including radio/tape, television, table/chair, refrigerator, sofa, watch, motorcycle, mobile/telephone and others using factors analyses. The wealth index was then rank divided into tertiles.

Exclusive breastfeeding: where an infant receives only breast milk and no other liquids or solids, not even water, with the exception of drops or syrups consisting of vitamins, mineral supplements or medicines (Bland, 2007)

3.10 Ethical consideration

Ethical clearance was secured from ethical review board of institute of Chemical and food process engineering Bahir Dar University. Permission for use of secondary data and actual study was also obtained from the districts Agriculture and health offices. In addition to this, verbal consent was provided to the participants. Communication of results to concerned bodies was performed for the maximization of benefits of the community.

4. RESULTS

From the total sample size (577) allocated proportionally to each selected village (Genfel=101, Tahtay adiksanded= 99, Negash= 103, Agulae= 103, Mesanu=93 and Kihen= 78), 530 children (Genfel= 95, Tahtay adiksanded= 93, Negash= 97, Agulae= 97, Mesanu= 87 and Kihen= 61) with their mothers's or caretakers were participated in this study with a response rate of 92 %.

Table 4. 1: Prevalence of undernutrition of children 2 to 5 years

Indices of Nutritional status (n=530)	Frequency	Percentage
Wasting		
➢ **Not wasted (≥ -2 SD)**	472	89.1
➢ **Wasted (< -2 SD)**	58	10.9
Stunting		
➢ **Not stunted (≥ -2 SD)**	302	57
➢ **Stunted (< -2 SD)**	228	43
Underweight		
➢ **Not underweight (≥ -2 SD)**	392	74
➢ **Underweight (< -2 SD)**	138	26

4.2 The Nutritional Status of Children 2 -5 years

From the 530 sampled children 0.2 % was severely wasted (< -3 SD), 9.8 % moderately wasted (-3 to -2.01 SD), 20.9 % mildly wasted (-2 to -1.01 SD), 68.1 % normal (-1 to +1 SD) and 0.9 % overweight (table 4.3).

For stunting; 8.7 % severely stunted (< -3 SD), 34.3 moderately stunted (-3 to -2.01 SD), 11.3 % mild stunting and 45.7 % normal (-1 to +1 SD) (table 4.3).

For underweight: 1.5 % severely underweight (<-3 SD), 24.5 % moderately underweight (-3 to -2.01 SD), 18.9 % mild underweight (-2 to -1.01 SD) and 55.1 % normal (-1 to +1 SD). In

addition to this the nutritional status of the children based on mid upper arm circumference was 0.9 % severe (< 11 cm), 9.4 % moderate (11 to 12.5 cm), 27.2 % at risk of malnutrition (13 to 13.5 cm) and 62.5 % normal (≥ 13.5) (table 4.3).

Table 4. 2: Detailed nutritional status of children 2 to 5 years

Indices of Nutritional status (n=530)	Frequency	Percentage
Wasting		
➢ **Severely wasted (<-3 SD)**	1	0.2
➢ **Moderately wasted (-3 to -2.01 SD)**	52	9.8
➢ **Mild wasting (-2 to-1.01 SD)**	111	20.9
➢ **Normal (± 1 SD)**	361	68.1
➢ **Overweight (> +2 SD)**	5	0.9
Stunting		
➢ **Severely stunted ((<-3 SD)**	46	8.7
➢ **Moderately stunted ((-3 to -2.01 SD)**	182	34.3
➢ **Mild stunting (-2 to-1.01 SD)**	60	11.3
➢ **Normal ((± 1 SD)**	242	45.7
Underweight		
➢ **Severely underweight (<-3 SD)**	8	1.5
➢ **Moderately underweight (-3 to -2.01 SD)**	130	24.5
➢ **Mild underweight (-2 to-1.01 SD)**	100	18.9
➢ **Normal (± 1 SD)**	292	55.1
MUAC (mid upper arm circumference)		
➢ **Severe (MUAC <11 cm)**	5	0.9
➢ **Moderate (MUAC 11-12.5)**	50	9.4
➢ **At risk of malnutrition (MUAC 13-13.5)**	144	27.2
➢ **Normal (MUAC >13.5)**	331	62.5

4.3. Socio- demographic Characteristics

The percentage of children participated in this study for each village was Genfel 18%, Tahtay adiksanded 17.5%, Negash 18.3%, Agulae 18.3%, Mesanu 16.4% and Kihen 11.5%.
The mean age of mothers/respondents was 33.98 ±7.303.

The sex of respondents/care givers for the questionnaire survey was 98% (519) female and 2% (11) male. Marital status of mothers and/or respondents was 92% (487) married, 3% (16) widowed and 5% (27) divorced. Sex of the participant child was 50.9% (270) female and 49.1% (260) male.Age of child was 35.1% (186) in the age group of 24 to 35 months, 37.2 %

(197) in the age group of 36 to 47 months and 27.7 % (147) in the age group of 48 to 59 months. The mean age of the children was 40.5 ± 9.5 months (table 4.3).

Table 4. 3: Socio - demographic characteristics

Socio demographic factors (n=530)	Frequency (N)	Percentage (%)
Selected kebeles		
➢ **Genfel**	95	94
➢ **Tahtay adiksanded**	93	93.9
➢ **Negash**	97	94
➢ **Agulae**	97	94
➢ **Mesanu**	87	93.5
➢ **kihen**	61(	78.2
Sex of mother/respondent		
➢ **Female**	519	98
➢ **Male**	11	2
Age of Mother/respondent (in years)		
➢ **20-29**	143	27
➢ **30-39**	273	51.5
➢ **40-49**	98	18.4
➢ **≥ 50**	16	3.1
Marital status of Mother/respondent		
➢ **married**	487	92
➢ **widowed**	16	3
➢ **divorced**	27	5
Family size (in number)		
➢ **1-4**	113	21.3
➢ **5-9**	390	73.6
➢ **≥ 10**	27	5.1
household head		
➢ **Mother**	49	9.2
➢ **Father**	481	90.8
Sex of child		
➢ **Female**	270	50.9
➢ **Male**	260	49.1
Age of child (in months)		
➢ **24-35**	186	35.1
➢ **36-47**	197	37.2
➢ **48-59**	147	27.7

4.4 Socio-economic Characteristics

Educational level of mother's/ care givers was 65.8% (349) unable to read and write, 19.6% (104) able to read and write, 7.4% (39) elementary school completed and 7.2% (38) secondary school completed. Educational level of father's was 41.9% (222) unable to read and write, 44.9% (238) able to read and write, 8.5% (45) elementary school completed and 4.7% (25) secondary school completed. Mother's/respondents occupation was 70.8% (375) house wife,

14.3% (76) daily laborer and 14.9% (79) own farm. Father's occupation was 73.7% (391), 17% (90) daily laborer, 3% (16) salaried employee and 2.5% (13) other (Table 4.4).

Table 4. 4: Socio - economic characteristics

Socio-economic factors (n=530)	Frequency (N)	Percentage (%)
Residence of the HH		
➢ **Rural**	428	80.8
➢ **Town**	102	19.2
HH income per month		
➢ **<1000**	7	1.3
➢ **1000-5600**	160	30.2
➢ **5700-20000**	324	61.1
➢ **>20000**	39	7.4
Educational level of mother/respondent		
➢ **Unable to read & write**	349	65.8
➢ **Able read & write**	104	19.6
➢ **Elementary school**	39	7.4
➢ **Secondary school**	38	7.2
Educational level of father		
➢ **Unable to read & write**	222	41.9
➢ **Able read & write**	238	44.9
➢ **Elementary school**	45	8.5
➢ **Secondary school**	25	4.7
Mother's occupation		
➢ **Housewife**	375	70.8
➢ **Daily labor**	76	14.3
➢ **Own farm**	79	14.9
Father's occupation(n=530)		
➢ **Own farm**	391	73.7
➢ **Daily labor**	90	17
➢ **Salaried employee**	16	3
➢ **Business or trade**	20	3.8
➢ **Other(soldiers)**	13	2.5

4.5 Cow's milk Consumption Characteristics

According to the respondents, the source of cow milk for the household was 78.7% (306) from their own farm production and 21.3% (83) purchasing from markets. Commonly consumed dairy product for a child in the study area by the respondents was 74.3% (394) buttermilk and 25.7% (136) boiled whole milk. From the total 530 children, 73.4% (389) were consumed cow's milk but 26.6% (141) were not consumed (table 4.5).

Table 4. 5: Cow milk consumption characteristics

Cow milk consumption(n=530)	Frequency (N)	Percentage (%)
Cow milk availability in the area		
➢ **No**	129	24.3
➢ **Yes**	401	75.7
Cow milk source		
➢ **Own production**	306	78.7
➢ **Market**	83	21.3
Commonly consumed dairy products in the area		
• **Boiled whole milk**	136	25.7
• **Butter milk**	394	74.3
Child consume cow milk products		
➢ **No**	141	26.6
➢ **Yes**	389	73.4
Cow milk preparation in a day		
➢ **Once**	138	35.5
➢ **Twice**	177	45.5
➢ **Three times**	74	19
Amount of cow milk provided in one serving	86	22
➢ **One coffee cup 100 ml**	148	38.2
➢ **One tea cup 150 ml**	90	23.1
➢ **One cup 250 ml**	65	16.7
➢ **One glass 300 ml**		
Total amount of cow milk provided in a day	-	-
➢ **One coffee cup 100 ml**	10	2.6
➢ **One tea cup 150 ml**	114	29.3
➢ **One cup 250 ml**	265	68.1
➢ **One glass 300 ml**		

4.6 Child Feeding Practice

Meal prepared in a day for the children in the study area was 3.4% (18) one type of meal, 18.7% (99) two type of meal, 64% (339) three type of meal and 14% (74) four type of meal.

Child feeding practice of the study area was 97.9 % (519) children fed alone and 2.1 % (11) children fed with their siblings and adults. (Table 4.6)

Table 4. 6: Child feeding practice characteristics

Feeding practice factors (n=530)	Frequency (N)	Percentage (%)
Feeding child with siblings		
➢ **Yes**	11	2.1
➢ **No**	519	97.9
Feeding child with adults		
➢ **Yes**	11	2.1
➢ **No**	519	97.9
Commonly consumed cereals		
➢ **Wheat**	57	10.8
➢ **Millet**	106	20
➢ **Teff**	34	6.4
➢ **All**	333	62.8
Commonly consumed legumes		
➢ **Grass pea**	198	37.4
➢ **Field pea**	22	4.2
➢ **All**	310	58.5
Nº of meal type prepared per day		
➢ **One type**	18	3.4
➢ **Two type**	99	18.7
➢ **Three type**	339	64
➢ **Four type**	74	14

4.7 Water, Hygiene and Sanitation Characteristics

The source of water for the participated household was 2.5 % (13) river water, 4.9 % stream water and 92.6 % (491) hand pump/water tap.

The type of toilet used for the child by the respondents was 39.2 % (208) bucket, 37.7 % (200) traditional pit latrine, 23% (112) open field defecation. The availability of hand washing facility near the toilet by the respondents was 64.2 % (340) respond available and 35.8 % (190) respond not available.

The occasion of soap use for hand washing by the household of the participants was 65.1 % (345) after defecation, 12.1 % (64) before breast feeding, 6 % (32) after cleaning child's bottom and 16.8 % (89) in all cases (after defecation, before breast feeding, after cleaning child's bottom). (table 4.7).

Table 4. 7: Water suorce, hygeine and sanitation characteristics

Variables	Frequency (N)	Percentage (N)
Water source		
• **River water**	13	2.5
• **Stream**	26	4.9
• **Water tap(pipe)**	491	92.6
Water treatment		
• **Boiling**	18	3.4
• **Use chemical**	12	2.3
• **nothing**	500	94.3
Toilet type		
• **bucket**	208	39.2
• **traditional pit latrine**	200	37.7
• **open field defecation**	112	23
Hand washing near the toilet		
• **no**	190	35.8
• **yes**	340	64.2
Occasion for hand wash		
• **after eating**	4	0.8
• **after defecating**	13	2.5
• **before feeding child**	92	17.4
• **after cleaning child's bottom**	3	0.6
• **in all cases**	418	78.9
Occasion for soap use		
• **after defecating**	345	65.1
• **before breast feeding**	64	12.1
• **after cleaning child's bottom**	32	6
• **in all cases**	89	16.8
Overall water supply & sanitation		
• **poor**	14	2.6
• **good**	45	8.5
• **very good**	471	88.9

4.8 Maternal and Child Care Characteristics

The selected children for the study were 27.4 % (145) exclusively breast fed (EBF) up to 6 months, 5.5 % (29) EBF 7-8 months and 67.2 % (356) EBF 10-12 months. The time of complementary food started for the participated children were 24.7 % (131) on 6 months, 67 % (355) within 10-12 months, and 8.3 % (44) greater than 12 moths.

The feeding interval of the participating children per day was 5.8 % (31) twice, 27.4 % (145) three times, 32.5 % (172) four times, 28.1 % (149) five times and 6.2 % (33) six times. The primary care giver for the participated children was 98.7 % (523) mother and 1.3 % (7) grandmother.

Birth place of the participant children was 16.8 % (89) at home without the help an expert, 15.1 % (80) at home with the help of traditional birth attendant, 13.6 % (72) in clinic and 54.5 % (289) in hospital.

Table 4. 8: Maternal and child characteristics

Variables	Frequency (%)	Percentage (%)
Exclusive breast feed		
➢ **Up to 6 months**	145	27.4
➢ **7-8 months**	29	5.5
➢ **10-12 months**	356	67.2
Complementary food started		
➢ **On 6 month**	131	24.7
➢ **10-12 month**	355	67
➢ **>12 month**	44	8.3
Breast feed stopped		
➢ **13-18 month**	357	67.4
➢ **19-24month**	173	32.6
Interval of food eating per day		
➢ **Twice**	31	5.8
➢ **Three times**	145	27.4
➢ **Four times**	172	32.5
➢ **Five time**	149	28.1
➢ **Six time**	33	6.2
Primary caretaker		
➢ **Mother**	523	98.7
➢ **Grandmother**	7	1.3
Mother follow up ANC		
• **Yes**	357	67.4
• **No**	173	32.6
Place of birth		
• **At home without expert**	89	16.8
• **At home with traditional birth**	80	15.1
• **At clinic**	72	13.6
• **In hospital**	289	54.5
Health status of child with in two week before assessment		
➢ **Healthy**	522	98.4
➢ **Sick**	8	1.6

4.9 Associated Factors of Undernutrition

4.9.1 Risk factors of wasting for children 24 to 59 months

The associated factors of wasting in the bivariate analysis were identified by using Pearson's chi-square with P-value < 0.2 in order to include important variables in the multivariate analysis. These variables were; mother's educational level, mother's occupation, occasion of soap use for hand washing, child vaccination status, source of cow's milk, sex of participant child, marital status of respondent, sex of mother/respondent, father's occupation, commonly consumed dairy products in the study area, cow's milk availability, child consumption of cow's milk, milk safety concern, household head and birth place of the child. All these variables were analyzed in the multivariate logistic regression analysis and from the sixteen independent variables; five variables were significant with p-value < 0.05. Therefore, the final predictors of child wasting in this study were source of cow's milk, mothers/ respondent's educational level, mother's occupation, sex of child and child vaccination status (table 4.9).

The households who have got cow's milk for their children from market were 3.8 times more likely wasted than children who have got from their own farm production (table 4.9). This may be due to frequent utilization of cow's milk of the children from the household who have their own production whereas children from the households who bought milk from market may not consume frequently because of the price of milk and buying interval. In the current study for those children of the households who were got cow's milk from market increased the risk of being wasted for a child was increased by 38 %. This can be argued that as the source or access of cow's milk of the household increase child consumption of cow's milk increases and thus the nutritional status (wasting) of the children will improve.

Children whose mothers were uneducated were 2.8 times more likely to be wasted than children whose mothers were educated. Children who were from the mothers unable to read and write were 7.1 % wasted, but those from the mothers elemntay and secondary school completed were 0.8% wasted.

This may be due to educated mother is capable of efficient management on household limited resources, has a better health promoting behavior, utilizes healthcare services, better child centered caring practices is conscious about child health status, more income generating

activities and allocates higher proportion of income to child care but not the uneducated mother. Thus, controlling the other variables children from the uneducated mothers increase the risk of being wasted by 28 %. So this can be argued that as the educational level of mothers increases the awareness of child feeding practice increases, the nutritional status (wasting) of children improve (table 4.9).

Children whose mothers occupation were farm work were 3.2 times more likely to be wasted than children whose mother's occupation were housewife. This may be due to that farm work takes long time even the whole day in the field. So that mothers where their occupation were farm work spent their time in farm activity and they do not have time for chald caring. This may a risk for the children to be wasted (table 4.9).

Female children were 2.1 times more likely to be wasted than male children. This may be due to the less focus given to the female children feeding and caring practice than male children in the study area. Therefore, controlling the other variables female children increase the risk of being wasted by 21%. Thus, can be argued that equal feeding and caring practice for male and female children may decreased the high level of wasting in female children in the study area (table 4.9).

In this study, children who were not vaccinated were 9.8 times more likely to be wasted than the vaccinated children (table4.10). This may be due to the diarrhea, infections and other diseases faced to the children who were not vaccinated. Therefore, controlling the other variables children who were not vaccinated increased the risk of being wasted by 98 %. Thus, can be argued that as child vaccination increases, diseases faced to the children decreases and nutritional status (wasting) of children improves.

Table 4. 9: Associated factors of child wasting in the bivariate and multivariate logistic analysis

Variable	Wasting			
	No N (%)	Yes N (%)	COR(95% CI)	AOR(95% CI)
Marital status of Mother/respondent				
➢ **married**	434(81.9)	53(10)	1	1
➢ **widowed**	14(2.6)	2(0.4)	.583 (.075 , 4.505)*	.261 (.057, 1.200)
➢ **divorced**	24(4.5)	3(0.5)	3.059 (1.232, 7.593)*	.141 (.009, 2.173)
Educational level of mother/care giver				
➢ **Unable to read & write**	311(58.7)	38(7.1)	1	1
➢ **Able read & write**	93(17.5)	11(2.1)	1.342(.393, 4.584)	2.738 (.466, 16.081)
➢ **Elementary school**	35(6.6)	4(0.8)	2.608(.725, 9.377)*	2.765 (1.246 , 6.134)**
➢ **Secondary school**	34(6.4)	4(0.8)	-	
Mother's/care giver occupation				
➢ **Housewife**	334(63)	41(7.7)	1	1
➢ **Daily labor**	68(12.8)	8(1.5)	1.180(.523, 2.660)*	1.220 (.310, 4.801)
➢ **Own farm**	70(13.2)	7(1.7)	2.547(1.327, 4.890)*	3.246 (1.271, 8.292)**
Source of Cow milk				
➢ **Own production**	273(70.2)	33(8.5)	1	1
➢ **Market**	74(19)	9(2.3)	2.370(1.234, 4.552)*	3.840 (1.227, 12.016)**
Sex of child			.	
➢ **Female**	241(45.5)	29(5.4)	0.429(0.241, 0.764)*	.471 (.224 , .992)**
➢ **Male**	232(43.8)	28(5.3)	1	1

Table 4.9: Associated factors of child wasting (Continued)

Variable	Wasting			
	No	Yes		
	N (%)	N (%)	COR(95% CI)	AOR(95% CI)
Occasion for soap use				
• **after defecating**	307(58)	38(7.2)	1	1
• **before breast feeding**	57(10.8)	7(1.3)	.315(.194, .513)*	.629 (.240, 1.648)
• **after cleaning child's bottom**	29(5.5)	3(0.5)	.416(.215, .803)*	1.676 (.456, 6.168)
• **in all cases**	79(15)	10(1.8)	.416(.182, .947)*	2.065 (.429, 9.932)
Child vaccinated				
• **No**	8(1.5)	1(0.2)	4.236(1.030-17.418)*	.102 (.013, .801)**
• **Yes**	464(87.5)	57(10.5)	1	1
Cow's milk availability ¥				
➢ **No**	115(2.7)	14(2.6)	.618 (.303, 1.260)*	-
➢ **Yes**	357(67.4)	44(8.3)	1	
Milk safety concern				
➢ **No**	326(61.5)	40(7.5)	.704 (.400, 1.240)*	1.781 (.603, 5.259)
➢ **Yes**	146(27.5)	18(3.4)	1	1
Father's occupation #				
➢ **Own farm**	348(65.7)	43(8)	1	
➢ **Daily laborer**	80(15.1)	10(1.9)	.681 (.311, 1.493)	
➢ **Salaried employee**	14(2.6)	2(0.4)	.465 (.060, 3.601)	

Table 4.9 Associated factors of child wasting (Continued)

Variable	Wasting			
	No N (%)	Yes N (%)	COR(95% CI)	AOR(95% CI)
Most commonly consumed dairy product				
➢ **boiled whole milk**	121(22.8)	15(2.8)	1	1
➢ **buttermilk**	351(66.2)	43(8.1)	.650 (.327, 1.292)	.990 (.399 , 2.459)
Child consume cow's milk ¥				
➢ **No**	126(23.8)	15(2.8)	.636 (.320, 1.264)	-
➢ **Yes**	347(65.5)	42(8)	1	
Birth place				
➢ **At home without expert**	79(14.9)	10(1.9)	1	1
➢ **At home with the help of traditional birth attendant**	71(13.4)	9(1.7)	2.934 (1.069 , 8.053)*	.663 (.190 , 2.316)
➢ **In clinic**	64(12)	8(1.5)	.814 (.221, 3.00)	1.495 (.582 , 3.840)
➢ **In hospital**	258(48.7)	36(6.8)	1.844 (.748, 4.54)	.565 (.126 , 2.528)
Sex of care giver #				
➢ **female**	462(87.2)	57(10.8)		
➢ **Male**	10(1.9)	1(0.2)		
House head				
➢ **Mother**	44(8.3)	5(0.9)	1.984 (.908 , 4.332)	.713 (.185 , 2.757)
➢ **Father**	429(80.9)	52(9.8)		

* P-value < 0.2 in the bivariate analysis
** P-value < 0.05 in the multivariate analysis

- the variables cannot be computed in statistical analysis as some of their categories are < 5

¥ - independent variable which were not candidate

4.9.2 Risk factors of stunting for children age 24 to 59 months

The associated factors of stunting in the bivariate analysis were identified by using Pearson's chi-square with P-value < 0.25 in order to include important variables in the multivariate analysis. These variables were; mother's educational level, mother's occupation, occasion of soap use for hand washing, father's educational level, father's occupation, marital status of respondent, sex of mother/respondent, residence, commonly consumed dairy products in the study area, mother's age, commonly consumed cereal products in the study area, commonly consumed staple diet, wealth index, exclusive breast feeding, complementary food started, breast feed stopped, type of meal, source of water, type of toilet used, overall water supply and sanitation, participant child age, family size, income of the household and birth place of the child. All these variables were analyzed in the multivariate logistic regression analysis and from the 24 independent variables 6 variables were statistically significant with p-value <0.05.

Therefore, the final predictors of child stunting in this study were: marital status, age of child, father's educational level, birthplace of participant child, commonly consumed cereal products, selected villages and occasion of soap use for hand washing (table 4.10).

Children from divorced households were 4.4 times more likely stunted than children from married households, but children from widowed household were slightly (0.052 times) stunted than the married households. This may be due to that the households of married were took the responsibility of child caring and feeding practice together whereas those households of widowed and divorced had the burden on the mothers only. Moreover, the nutritional status of the children from the divorced household may affect by the conflict between the father and mother. Therefore, children from these household increased the risk of being stunted by 44% (table 4.10).

Children whose fathers were uneducated were 1.897 times more likely to be stunted than children whose fathers were educated. This may be due to the awareness of educated fathers about child feeding practice to help the mother than the uneducated fathers. Thus, children from the uneducated fathers increased the risk of being stunted by 19 %. So this can be argued that as the educational level of fathers' increases the awareness of child feeding practice increases and the nutritional status (stunting) of children improves (table 4.10).

Children in the age group from 48 to 59 months were 2.2 times more likely to be stunted as compared to the children in the age range from 24 to 35 months old (table 4.10). This result revealed that stunting among the study children showed variation by age. Thus, the highest percentage of stunting was found in the age category of 24-35 and 36-47 months and then started to decline from the age of 48 months onwards. This may be due to the mobile nature of the children in the age group 48 to 59 in which requires high energy to maintain growth and development. In addition to this less attension may be given to this age group by the household since the household may shift towards the preceding child. Therefore, children from this age group may increase the risk of being stunted by 22%.

Children from the households who were used soap for hand washing after defecation only were 0.507 times more likely to be stunted than the children from the households that use soap in all cases (after defecating, after cleaning child's bottom, before and after eating). This may be due to the lack of sanitation in the households who wre not used soap for hand washing in all cases. Therefore, these children from the household may increases the risk of being stunted by 5% (table 4.10).

Children from the household who were consumed millet only were 2.2 times more likely to be stunted than children from the household who were consumed diversified cereals (table 4.10). This may be due to that the children who were consumed diversified cereal products got many proteins, vitamins and other nutrients. Therefore, controlling the other variables children from the household who were consumed millet only increased the risk of being stunted by 22 %. This can be argued that children who consume diversified cereal products got different proteins, vitamins and other nutrients therefore the nutritional status (stunting) improved.

In this result revealed that children who were born at home with out the help of an expert were 0.33 times more likely to be stunted than children who were born in clinic (table 4.10). This may be due to that those children born in clinic got anti natal care and follow up from the expert during delivary, but may not those born at home with out the help of expert. This can be argued that children who wre born in hospital or clinic with the help an expert may get breast feed initiation, vaccination and information for the mother.

Children from Genfel village were 0.139 times more likely to be stunted than children from Mesanu village. This may be due to the difference of child feeding practice and caring between the villages (table 4.10).

Table 4. 10: Associated factors of chilg stunting in the bivariate and multivariate logistic analysis

Variable	Stunting			
	No N (%)	Yes N (%)	COR(95% CI)	AOR(95% CI)
Residence of the HH(n=530)				
➢ **Rural**	244(46)	184(34.7)	2.318(1.442, 3.726)*	.904 (.366, 2.233)
➢ **Town**	58(11)	44(8.3)	1	1
Marital status of Mother/respondent				
➢ **married**	278(52.5)	209(39.4)	1	1
➢ **widowed**	9(1.7)	7(1.3)	.188(.042, .838)*	.052 (.007 , .411)**
➢ **divorced**	15(2.8)	12(2.2)	1.919(.872, 4.220)*	4.370 (1.492 , 12.796)**
Mother's/respondents occupation				
➢ **Housewife**	214(40.4)	161(30.4)	1	1
➢ **Daily labor**	43(8.1)	33(6.2)	.502 (.294 , .858)*	.830 (.375 , 1.835)
➢ **Own farm**	45(8.5)	34(6.4)	1.142 (.702, 1.857)*	1.013 (.542, 1.894)
Age of child (in months)				
➢ **24-35**	106(20)	80(15.1)	1	1
➢ **36-47**	112(21.1)	85(16)	1.380 (.914, 2.083)*	1.382 (.845 , 2.259)
➢ **48-59**	84(15.8)	63(11.9)	2.00 (1.286, 3.110)*	2.196 (1.300 ,3.712)**
Overall water supply & sanitation				
• **poor**	8(1.5)	6(1.1)	1	1
• **good**	26(5)	19(3.6)	.207(.046,.936)*	.217 (.031 , 1.540)
• **very good**	269(50.8)	203(38.3)	.686(.363, 1.296)*	1.165 (.440 , 3.082)
Water source				
• **River water**	7(1.3)	6(1.1)	.224(.049, 1.021)*	2.719 (.383 , 19.320)
• **Stream**	15(2.8)	11(2.1)	.370(.146, .936)*	4.547 (.798 , 25.919)
• **Water tap(pipe)**	280(52.3)	211(40)	1	1

Table 4.10: Associated factors of stunting (Continued)

Variable	Stunting			
	No N (%)	Yes N (%)	COR(95% CI)	AOR(95% CI)
Commonly consumed dairy products				
• **Boiled whole milk**	78(14.7)	58(11.2)	1	1
• **Butter milk**	225(42.5)	169(31.8)	1.68 (1.118, 2.523)*	1.241 (.751, 2.051)
Commonly consumed cereals				
➢ **Wheat**	32(6)	25(4.7)	1.043 (.588 , 1.850)	1.232 (.592 , 2.563)
➢ **Millet**	60(11.3)	46(8.7)	2.259 (1.447,3.528)*	2.215 (1.082 , 4.535)**
➢ **Teff**	19(3.6)	15(2.8)	.737 (.348 , 1.563)	.839 (.340 , 2.066)
➢ **All**	190(35.8)	143(27)	1	1
Breast feed stopped				
➢ **13-18 month**	203(38.3)	154(29.1)	.692(.480-.997)*	1.047 (.664 , 1.650)
➢ **19-24month**	99(18.7)	74(13.9)	1	1
Father's occupation				
➢ **Own farm**	223(42.1)	168(31.7)	1	1
➢ **Daily labor**	51(9.6)	39(7.4)	.482 (.295 , .789)*	. .824 (.373 , 1.821)
➢ **Salaried employee**	9(1.7)	7(1.3)	.260 (.073 .925)*	1.041 (.556 , 1.949)
➢ **Business or trade**	11(2.1)	9(1.7)	.606 (237 , 1.551)	-
➢ **Other(soldiers)**	7(1.3)	6(1.1)	1.312 (.433 , 3.976)	-
Occasion for soap use				
• **after defecating**	197(37.2)	148(27.9)	.315(.194, .513)*	.507 (.260 , .989)**
• **before breast feeding**	36(6.8)	28(5.3)	.416(.215, .803)*	.510 (.220 , 1.181)
• **after cleaning child's bottom**	18(3.4)	14(2.6)	.416(.182, .947)*	.824 (.286 , 2.376)
• **in all cases**	51(9.6)	38(7.2)	1	1

Table 4.10 associated factors of stunting (Continued)

Variable	Stunting			
	No N (%)	Yes N (%)	COR(95% CI)	AOR(95% CI)
Sex of care giver				
➢ **female**	296(55.8)	223(42)	1	1
➢ **Male**	6(1.1)	5(0.9)	2.360 (.682, 8.160)*	4.673 (.921 , 23.706)
Father's educational level				
➢ **Unable to read & write**	127(24)	95(18)	1	1
➢ **Able to read &write**	136(25.7)	102(19.2)	1.475 (1.019, 2.137)*	1.897 (1.182, 3.044)**
➢ **Elementary complete**	26(4.9)	19(3.6)	.776 (.395 , 1.525)	.724 (.316 , 1.661)
➢ **Secondary complete**	14(2.6)	11(2)	1.034 (.445 , 2.407)	1.603 (.584 , 4.401)
Wealth index				
➢ **Poor**	91(17.2)	68(12.8)	1	1
➢ **Medium**	180(40)	136(25.7)	1.419 (.960 , 2.097)*	1.246 (.244 , 6.349)
➢ **Rich**	31(508)	24(4.5)	1.412 (.759 , 2.627)	2.411 (.362 , 16.065)
Exclusively breast feed				
➢ **Up to 6 months**	83(15.7)	62(11.7)	1	1
➢ **7-8 months**	17(3.2)	13(2.5)	2.387 (1.06 , 5.378)*	2.662 (.557 , 12.718)
➢ **10-12 months**	203(38.3))	153(28.9)	1.33 (.894 , 1.976)*	1.625 (.435 , 6.078)
Complementary food started				
➢ **On 6 months**	75(14.2)	56(10.6)	1	1
➢ **7-8 months**	202(38.1)	153(28.9)	1.450 (.959 , 2.193)*	.750 (.194 , 2.902)
➢ **10-12 months**	25(4.7)	19(3.6)	1.787 (.896 , 3.565)*	.897 (.182 , 4.413)
Commonly consumed staple food				
➢ **Injera**	63(11.9)	47(8.9)	1	1
➢ **Porridge**	8(1.5)	6(1.1)	.400 (.118 , 1.353)*	1.360 (.606 , 3.050)
➢ **All**	231(43.6)	175(33)	.713 (.467 , 1.088)*	.340 (.078 , 1.474)

Table 4.10 Associated factors of stunting (Continued)

Variable	Stunting			
	No N (%)	Yes N (%)	COR(95% CI)	AOR(95% CI)
Number of meal type prepared per day				
➢ **One type**	10(1.9)	8(1.7)	1.175 (.407 , 3.394)	.844 (.210 , 3.393)
➢ **Two type**	56(10.6)	43(8.1)	1.102 (.588 ,2.063)	1.144 (.520 , 2.516)
➢ **Three type**	193(36.4)	146(27.5)	1.612 (.955, 2.718)*	1.547 (.803 , 2.977)
➢ **Four type**	42(7.9)	32(6)	1	1
Type of toilet used				
➢ **Bucket**	119(22.5)	89(16.8)	1	1
➢ **Traditional pit latrine**	114(21.5)	86(16.2)	1.390 (.940 , 2.057)*	1.143 (.615 , 2.126)
➢ **Open field defecation**	70(13.2)	53(10)	.846 (.534 , 1.340)	.889 (.383 , 2.062)
Age of Mother/respondent (in years)				
➢ **20-29**	82(15.5)	61(15.5)	1	1
➢ **30-39**	156(29.4)	117(22)	.842(.559, 1.269)	.617 (.359 , 1.062)
➢ **40-49**	56(10.6)	42(7.9)	1.539(.918, 2.58)*	1.081 (.546 , 2.138)
➢ **≥ 50**	9(1.7)	7(14.2)	.784(.270, 2.273)	.538 (.149 , 1.947)
HH income per month				
➢ **<1000**	4(0.8)	3(0.5)	2.381 (.465, 12.197)	8.010 (.420 , 152.578)
➢ **1000-5600**	91(17.2)	69(13)	1.071 (.517 , 2.220)	2.364 (.314 , 17.818)
➢ **5700-20000**	185(34.9)	139(26.2)	1.539 (.772, 3.068)*	3.369 (.820 , 13.848)
➢ **>20000**	22(4.2)	17(3.2)	1	1
Birth place of the child				
➢ **At home without expert**	51(9.6)	38(7.2)	1	1
➢ **At home with the help of traditional birth attendant**	46(8.7)	34(6.4)	1.871 (1.006 , 3.480)*	1.641 (.787 , 3.424)
➢ **In clinic**	41(7.7)	31(5.8)	1.664 (.879 , 3.152)*	3.016 (1.326, 6.862)**
➢ **In hospital**	165(31.1)	124(23.4)	1.520 (.925 , 2.499)*	1.642 (.793 , 3.400)

* P-value < 0.2 in the bivariate analysis
** P-value < 0.05 in the multivariate analysis

4.9.3 Risk factors of underweight for children age 24 to 59 months

The associated factors of underweight in the bivariate nalysis were identified by using Pearson's chi-square with P-value < 0.25 in order to include important variables in the multivariate analysis. All these variables were: mother's educational level, child consume cow's milk, occasion of soap use for hand washing, child weighed at birth, father's occupation, marital status of respondent, sex of mother/respondent, residence, commonly consumed dairy products in the study area, mother's age, commonly consumed cereal products in the study area, water treatment, hand washing facility, participant child age, source of water, type of toilet used, overall water supply and sanitation, participant child age and birth place of the child. All these variables were analyzed in the multivariate analysis and from the 19 independent variables 5 variables were statistically significant with p-value <0.05. Therefore, the final predictors of child underweight were; age of participant child, mother's educational level, commonly consumed cereal products, amount cow's milk for one serving and sex of respondent (table 4.11).

Children whose mothers were unable to read and write were 3.3 times more likely to be underweight than children whose mothers were completed secondary school (table 4.11). This may be due to the awareness of educated mothers about child feeding practice they developed than the uneducated mothers. Thus children from the uneducated mothers increase the risk of being underweight by 33 %. So this can be argued that as the educational level of mothers increases the awareness of child feeding practice increases and having this the nutritional status (underweight) of children improves.

The sex of respondent or caretaker of the child who were male was 0.139 times more likely to be underweight than the female (table 4.11). This may be due to the better knowledge and practice of the female caretakers about child feeding and caring as compared to male caretaker. Therefore, controlling the other variables male caretaker increased the risk of being underweight by 14 %.

Children who were consuming millet only were 1.914 times more likely to be underweighet than children who were consume all cereals (wheat, millet, *teff* and barely). This may be due

to that the children who were consumed diversified cereal products got many minerals, vitamins, proteins and other nutrients. Therefore, controlling the other variables children from the household who were consumed millet only increased the risk of being underweigt by 19 %. This can be argued that children who consume diversified cereal products got different proteins, vitamins and other nutrients therefore the nutritional status (underweight) improved.

Children in the age range from 36 to 47 and 48 to 59 months were 1.9 and 2.5 times more likely to be underweight than children in the age range from 24 to 35 months old respectively. This may be due to the mobile nature of the children in the age group 36 to 47 and 48 to 59 in which requires high energy to maintain growth and development. In addition to this less attention may be given to these age groups by the household since the household may shift towards the preceding child. Therefore, children from these age groups may increase the risk of being underweight by 19% and 25% respectively.

Children who were served cow milk with one coffee cup per serving were 3.7 times more likely to be underweight than the children who were served with one glass per serving (table 4.11). This may be due to that the amount of cow's milk provided for a child per one serving was 22% one coffee cup, 38.2% one tea cup, 23.1 % one plastic cup (*kubaya* in Amharic) and 16.7 % one glass. Majority of the children were served with a tea cup and minor children with a glass. This revealed that the amount of cow's milk provided per serving for the children was very low since the serving equipment was very small as compared to the different serving guidelines in different countries.

Table 4. 11: Associated factors of child underweight in the bivariate and multivariate logistic analysis

Variable	Underweight			
	No N (%)	Yes N (%)	COR(95% CI)	AOR(95% CI)
Residence of the HH(n=530)				
➢ **Rural**	317(59.8)	111(20.9)	2.143 (1.208 , 3.802)*	.787 (.333, 1.859)
➢ **Town**	75(14.2)	27(5.1)	1	1
Sex of mother/respondent				
• **Female**	384(72.5)	135(25.5)	.284 (.085 , .947)*	.139 (.025 , .772)**
• **Male**	8(1.5)	3(0.5)	1	1
Age of child (in months)				
➢ **24-35**	138(26)	48(9.1)	1	1
➢ **36-47**	146(27.5)	51(9.6)	1.911 (1.170, 3.122)*	1.883 (1.085 , 3.269)**
➢ **48-59**	109(20.6)	38(7.2)	2.481 (1.488, 4.136)*	2.500 (1.395 , 4.478)**
Commonly consumed dairy products				
• **Boiled whole milk**	101(19.1)	35(6.7)	.560 (.345 , .910)*	1.302 (.795 , 2.130)
• **Butter milk**	292(55.1)	102(19.3)	1	1
Commonly consumed cereals				
➢ **Wheat**	42(8)	15(2.8)	1.160 (.601 , 2.236)	1.199 (.550, 2.611)
➢ **Millet**	78(14.7)	28(5.3)	2.337 (1.464, 3.732)*	1.914 (1.059, 3.460)**
➢ **Teff**	25(4.7)	9(1.7)	1.282 (.573 , 2.868)	1.282 (.484, 3.396)
➢ **All**	246(46.4)	87(16.4)	1	1

Table 4.11: Associated factors of underweight (continued)

Variable	underweight			
	No N (%)	Yes N (%)	COR(95% CI)	AOR(95% CI)
Place of birth				
• **At home without expert**	66(12.5)	23(4.3)	.858(.488-1.50)	1.384 .098 , 19.638)
• **At home with traditional birth attend**	59(11.1)	21(4)	1.872(1.11-3.156)*	2.001 (.141 , 28.369)
• **At clinic**	53(10)	19(3.6)	.714(.376-1.356)	1.386 (.643 , 2.990)
• **In hospital**	214(40.4)	75(14.2)	1	1
Toilet type				
• **bucket**	154(29.1)	54(10.2)	1	1
• **traditional pit latrine**	148(28)	52(9.8)	1.551(1.008-2.387)*	1.000 (.551 , 1.813)
• **open field defecation**	83(15.7)	29(5.5)	.604(.340-1.072)*	.791 (.315 , 1.988)
Water treatment				
• **Boiling**	13(2.5)	5(0.9)	2.937(1.141-7.561)*	.360 (.050 , 2.588)
• **Use chemical**	9(1.7)	3(0.5)	.587(.127-2.717)	.643 (.200 , 2.069)
• **Nothing**	370(70)	130(24.5)	1	1
Occasion for soap use				
• **after defecating**	255(48.1)	90(17)	.414 (.252 , .681)*	1.542 (.729 , 3.259)
• **before breast feeding**	47(8.9)	17(3.2)	.866 (.445 , 1.682)	1.339 (.491 , 3.653)
• **after cleaning child's bottom**	24(4.5)	8(1.5)	.432 (.169 , 1.106)*	1.756 (.909 , 3.392)
• **in all cases**	66(12.5)	23(4.3)	1	1
Child consume cow milk products				
➢ **yes**	288(54.3)	101(19.1)	1	1
➢ **No**	104(19.6)	37(7)	.616(.383-.990)*	1.747 (.382 , 7.985)

Table 4.11: Associated factors of underweight (continued)

Variable		underweight			
		No N (%)	Yes N (%)	COR(95% CI)	AOR(95% CI)
Mother/respondent education level					
➢	**Unable to read & write**	258(48.7)	91(17.2)	3.225 (1.115 , 9.331)*	3.263 (1.013 , 10.506)**
➢	**Able to read & write**	77(14.5)	27(5.1)	3.132 (1.019 , 9.626)*	3.080 (.900 ,10.534)
➢	**Elementary complete**	29(5.5)	10(1.9)	2.931 (.831, 10.343)*	2.915 (.708 , 11.997)
➢	**Secondary complete**	28(5.3)	10(1.9)	1	1
Marital status					
➢	**Married**	360(70)	127(24)	1	1
➢	**Widowed**	12(2.3)	4(0.8)	.189 (.025 , 1.445)*	.227 (.026 , 1.960)
➢	**Divorced**	20(3.8)	7(1.3)	1.667 (.744 , 3.737)*	2.306 (.900 , 5.913)
Father's occupation					
➢	**Own farm**	289(54.5)	102(19.2)	1	1
➢	**Daily laborer**	67(12.6)	23(4.3)	.667 (.384 , 1.157)*	.856 (.400 , 1.830)
➢	**Salaried employee**	12(2.3)	4(0.8)	.166 (.022 , 1.272)*	.200 (.022 , 1.818)
➢	**Business or trade**	15(2.8)	5(0.9)	.440 (.126 , 1.529)*	.576 (.135 , 2.454)
➢	**Other**	10(1.9)	3(0.6)	.747 (.202 , 2.766)	.787 (.147 , 4.216)
Cow's milk availability					
➢	**no**	96(18)	34(6.4)	.651 (.402 , 1.055)*	.506 (.109 , 2.356)
➢	**yes**	297(56)	104(19.6)	1	1
Main source of water					
➢	**river water**	10(1.9)	3(0.6)	1.718 (.552, 5.344)	2.262 (.322, 15.888)
➢	**stream**	19(3.6)	7(1.3)	.229 (.053 , .982)*	3.815 (.687 , 21.184)
➢	**hand pump/water tap**	363(68.5)	128(24.2)	1	1

Table 4.11: associated factors of underweight (continued)

Variable	underweight			
	No N (%)	Yes N (%)	COR(95% CI)	AOR(95% CI)
Hand washing facility near toilet				
➢ **No**	141(26.6)	49(9.2)	.763 (.506 , 1.153)*	1.472 (.766 , 2.831)
➢ **Yes**	252(47.5)	88(16.6)	1	1
Water supply & sanitation				
➢ **Poor**	10(1.9)	4(0.8)	.731 (.201 , 2.662)	.185 (.026 , 1.327)
➢ **Good**	33(6.2)	12(2.3)	.494 (.215 , 1.134)*	.967 (.383 , 2.442)
➢ **Very good**	349(65.8)	123(23.2)	1	1
Child weighed at birth				
➢ **No**	128(24.2)	45(8.5)	1.297 (.864 , 1.948)*	.424 (.033 , 5.436)
➢ **Yes**	264(49.8)	93(17.5)	1	1
Age of Mother/respondent (in years)				
➢ **20-29**	106(20)	37(7)	2.625 (.570, 12.082)*	.746 (.448 , 1.244)
➢ **30-39**	202(38)	71(13.4)	2.187 (.484 , 9.878)	1.132 (.604 , 2.122)
➢ **40-49**	73(13.8)	26(4.9)	3.394 (.727 , 15.840)*	.566 (.159 , 2.014)
➢ **≥ 50**	12(2.3)	6(1.1)	1	1
Amount of cow milk provided in one serving				
➢ **One coffee cup 100 ml**	64(16.5)	22(5.7)	1	1
➢ **One tea cup 150 ml**	110(28.3)	38(9.8)	.850 (.477, 1.515)	1.932 (.788, 4.737)
➢ **One cup 250 ml**	67(17.2)	23(5.9)	.837 (.412, 1.700)	2.342 (.924, 5.938)
➢ **One glass 300 ml**	48(12.3)	17(4.4)	.795 (.414, 1.526)	3.727 (1.292, 10.756)**

* P-value < 0.2 in the bivariate analysis
** P-value < 0.05 in the multivariate analysis

The variables cannot be computed in statistical analysis as some of their categories are < 5%

¥ Independent variable which were not candidate

5. DISCUSSION

5.1. Prevalence of Undernutrition

The magnitude of wasting, stunting and underweight obtained in this study was higher when we compare to the national nutritional status whereas it is below the Tigray regional nutritional status.

This result was consistent with a study report from Saesie Tsada emba district, eastern zone Tigray (Amha kahsay *et al*, 2015), a study from lalibela, north wollo zone (Birara melesse, 2014) and with the national nutritional status report (mini EDHS 2014). However, the result of this study was lower as compared with the report of mini EDHS 2014 for Tigray region and the result of west Gojam zone (Beka teshome *et al*, 2006)

5.2 Risk Factors of Undernutrition

5.2.1 Sex of children

This study revealed that the prevalence of wasting among female children was slightly higher than male children. However, the prevalence of stunting and underweight was nearly same in both sexes.

This result was consistent with the study from India (Kumar *et al*, 2006), but in contradiction with a study in Sri Lanka that male children were at higher risk (Jayastissa *et al.,* 2006) and study that males are more vulnerable to be stunted than girls (Kandala. *et al.,* 2011) .

5.2.2 Age of children

This study also revealed that undernutrition among the study children showed variation by age. The highest percentage of stunting and underweight was found in the age category of 24-35 and 36-47 months and then started to decline from the age of 48 months onwards in both categories whereas the percentage of wasting was nearly the same among the age categories.

This result was consistent with the study children aged 24-35 months are more vulnerable to undernutrition (Pongou R. *et al*., 2006) and a study finding from Mozambique that two to five year of children are more vulnerable in terms of their health and nutritional status compared to the younger children

5.2.3 Mother's educational level

This result revealed that higher prevalence of acute and chronic undernutrition among the sampled children whose mothers' uneducated were observed. The prevalence of wasting were found highest in children whose mothers had unable to read and write, higher in children whose mothers had able to read and write, as compared to the children whose mothers had elementary and secondary school completed. In the some token the prevalence of underweight were found highest in children whose mothers had unable to read and write, higher in children whose mothers had able to read and write as compared to the children whose mothers had elementary and secondary school completed. A pattern of decreasing wasting and underweight was observed with increasing mother's education level. However, stunting did not show any association with mother's educational level.

This result was consistent with study that mother's schooling level has a positive association (Govindasamy and Ramesh, 1997); mothers who have limited educational level have less chance for mitigating the risk of undernutrition of their children (Weil *et al.,* 199l); and educated mothers can take the challenges of neglecting childhood morbidities and they can use the modern means to keep safe their children from illnesses (Caldwell, 1988; Cleland J, 1990).

5.2.4 Father's educational level

This study variable also showed that the prevalence of stunting for children whose father's educational level had unable to read and write were highest, for children whose father's educational level had able to read and write were higher as compared to the children whose fathers educational level had elementary and secondary school completed. A pattern of decreasing stunting was observed with increasing father's education level. However, wasting and underweight did not shown any association with father's educational level. This may be due to that increased father's educational level will complement for mother's educational level towards the information of child feeding with nutritional rich food commodities like cow milk.

This result was inline with a study conducted in India where uneducated father multiplies the risk of child undernutrition by the factor 1,2-1,7, compared with having a father with secondary/higher education.

5.3. Cow's milk Consumption Pattern of Children

5.3.1 Source of cow's milk for the household

The highest prevalence of wasting was observed from those who had their own production as compared to those who were used from market, but it was not associated with stunting and underweight. Although the majority of the household of the participated children had their own production, the high prevalence of wasting was observed in this group. This may be due to the feeding practice and type of milk product provided to the children.

In line with this study, FAO states that there would be an improvement in the food security of the poor if more dairy products were added to their diet (FAO, 2013). In addition to this, children with poor nutritional status, the addition of milk to the diet is likely to supply nutrients that are important for growth (Hoppe *et al*., 2006)

5.3.2 Cow's milk Consumption of children

The higher prevalence of wasting and underweight were observed from those who were consumer of cow's milk, but it was not associated with stunting in the bivariate analysis. Even thought there was high percentage of cow's milk consumption of the children in this study, there was high prevalence of wasting and underweight. This may be due to the lack of proper utlization of cow milk and low consumption level.

Other studies in contrary to this study showed that children who consumed cow milk during childhood revealed accelerated growth in height for age (wiley, 2011) and milk content providing 25–33% of the protein requirement is likely to have a positive effect on weight gain and linear growth (Michaelsen *et al*., 2011*)*.

5.3.3 Most commonly consumed dairy product

The most commonly consumed dairy product in the study area was 25.7 % boiled whole milk and 74.3 % buttermilk. This revealed that majority of the children were consumed buttermilk and there was high prevalence of the under nutrition of children with this group. This may be due to that the fat content of the milk removed in buttermilk.

This result is consistent with a study in southern Ethiopia that consumption of fresh milk is mainly limited to children and in most cases dairy products are consumed following

fermentation and further processing (Fekadu and Abrahamson, 1994). In contrast to this study a study in the central high lands of the Ethiopia the family consumes fresh and other milk products (Zelalem and Inger, 2000a).

5.3.4 Amount of cow's milk per serving for a child

Majority of the children were served with a tea cup and minor children with a glass. This revealed that the amount of cow's milk provided per serving for the children was very low since the serving equipment was very small as compared to the different guidelines. This variable was not associated with the outcome variable in the bivariate analysis, but it was statistically significant with underweight in the multivariate logistic regression analysis.
This result was in line with a survey conducted in central Uganda (Kikafunda JK *et al*, 1998).

5.3.5 Total amount of cow's milk consumption per day

The total cow's milk consumption per day of the children was 2.6% one tea cup, 29.3 % one cup and 68.1 % one glass. Majority of the participated children were consumed one glass of cow's milk per day and this was small amount as compared to developed countries guideline, which is 500 to 600 ml per day, however; it was not associated with the outcome variables in the bivariate and multivariate analysis.
The result of this study was below the recommended amount of milk for young children are 2 cups (0.5 liter) per day. Recommendations for dairy product intake in developed countries are approximately two–three servings (approximately 500 ml) per day for children under the age of 9 years and three–five servings (>600 ml) per day for adolescents, with a number of national guidelines (Dror and Allen, 2013).

6. CONCLUSION AND RECOMMENDATION

6.1 Conclusions

In this study, child-hood undernutrition for 24 to 59 months age children was observed in kilteawlaelo district. When compared to the national prevalence of undernutrition, prevalence of wasting, stunting and underweight in children who lives in Kilteawlaelo were higher, but it was below the regional (Tigray) prevalence. More importantly, comparison of the prevalence of the under nutrition of this current study with the report of mini EDHS 2014 for Tigray region it was promising result for all the three indices (stunting, wasting and underweight. However, it was far away in magnitude when compared to the national prevalence and targets of national nutrition program 2014/15 of Ethiopia. This will be then an alarming message to all the nutrition sensitive sectors of the district and other concerned bodies that all have a long way to go; to address both the chronic and acute under nutrition of the children.

Even though the study district has a potential for cow milk production, the consumption pattern of the children was low, in which the majority of children consumed one tea cup per day as compared to WHO recommendation (2 cup approximately 500 ml) per day. Therefore, in this study the contribution of cow milk consumption for the improvement of child undernutrition was not promising because of the small amount of consumption. In addition to this, majority of the children consumed buttermilk which is low in nutrient content than whole milk. This may be due to the awareness of child feeding of cow's milk and milk product in the study household in particular and in the district in general.

The associated factors of undernutrition for this study in the multivariate logistic regression analysis were age of the children and commonly consumed cereals were a significant predictor of stunting and underweight; mother's educational level was a significant predictor of wasting and underweight; sex of child, child vaccination status, source of cow's milk and mother's occupation were a significant predictor of wasting only; marital status, occasion of soap use for hand washing, father's educational level and child birthplace were a significant predictor of stunting only; and sex of respondent and amount of cow milk per serving were significant predictor of underweight only. Therefore, one can conclude that low socio-economic status, poor maternal and paternal schooling, low consumption of cow's milk,

unhygienic and poor sanitation practices were found to be the most attributable factors of undernutrition among the 2 to 5 years old children in the district.

Finally, even though this study did not showed strong relation between cow's milk consumption and child nutritional status due to low consumption level of the children, but many other studies showed a positive associated in child growth and development since cow's milk contain high quality protein, several minerals, vitamins and growth factor. Therefore, awareness of child feeding of cow's milk should be created as to the WHO recommendation in the study district in particular and in the country in general.

6.2. Recommendations

- Since prevalenece of under nutrition is high in the district, effective food and nutrient supplementation programmes have to be ensured at regular and continuous basis with proper monitoring and evaluation by the government and NGO's.
- Community of kilteawlaelo district should provide boiled whole cow milk for their children (2 – 5 years old) rather than buttermilk.
- Majority of the children served cow milk with tea cup which is small in volume, so the health extension worker together with the development agent should create awareness on the the community to serve the children with a glass per serving.
- The amount of cow milk consumption per day of the children was very small as compared to WHO recommendation therefore; the policy maker should formulate a policy on cow milk consumption to meet the WHO recommendation.
- Clear and appropriate guidelines of milk and milk product consumption for the children should adopt with cheap, easily available and accessible by the health sector together with other nutrition sensintive sectors of the district.
- Nutrition education on cow milk consumption for both mother and father is crucial. Therefore, the village and district administrations of the district should have an intervention of nutrition education for their society especially on milk consumption.
- Need to pay more attention on older children (2-5 years) since households shift their attention to the presiding child.
- Further research on cow milk consumption and child nutrition should be carried out
- Further research on determinant of cow milk consumption and nutritional status of young children should carried out

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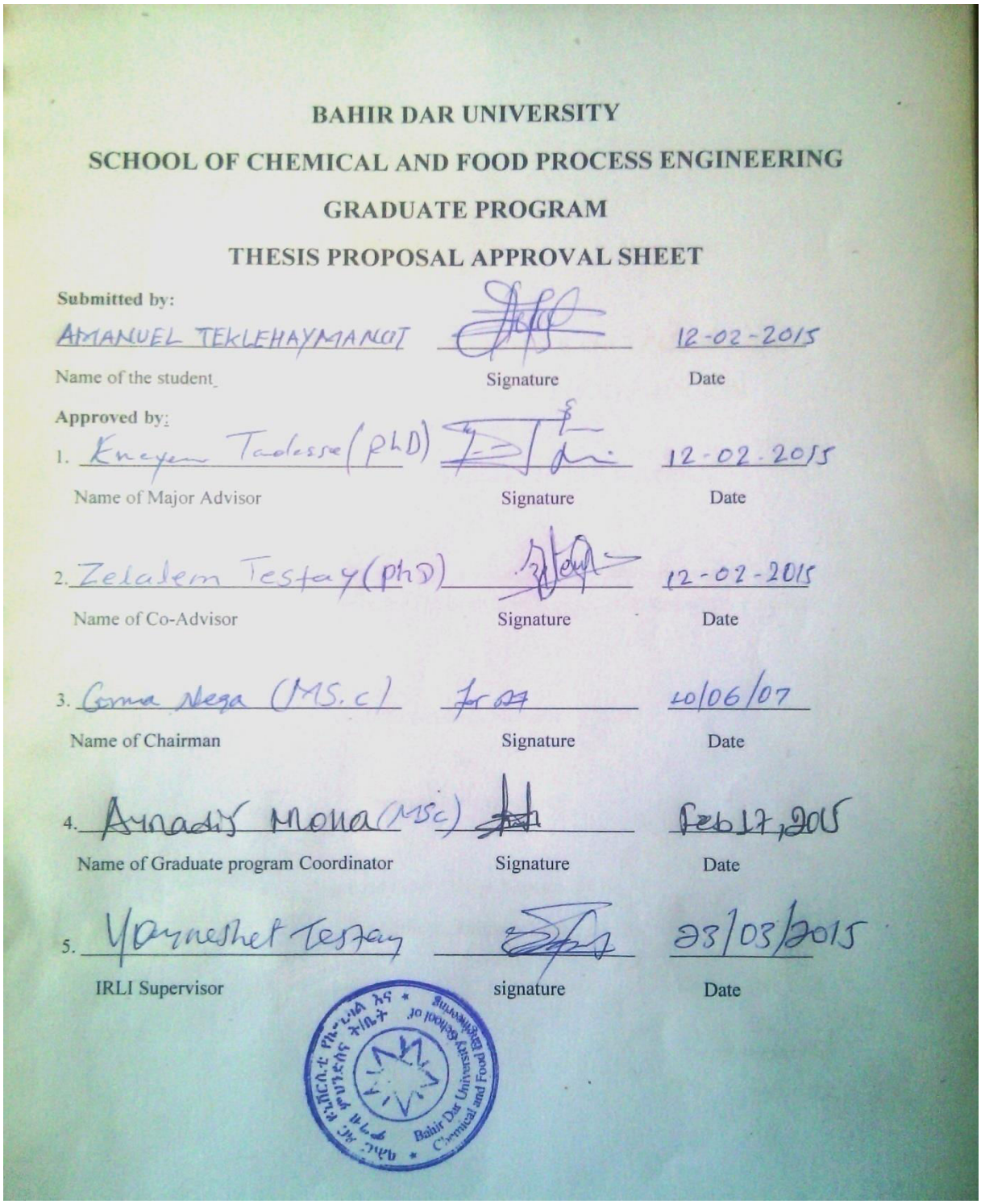
APPENDIX

Appendex A: Ethical clearance and support letters



BAHIR DAR UNIVERSITY

SCHOOL OF CHEMICAL AND FOOD PROCESS ENGINEERING

GRADUATE PROGRAM

THESIS PROPOSAL APPROVAL SHEET

Submitted by:

AMANUEL TEKLEHAYMANOT — 12-02-2015

Name of the student — Signature — Date

Approved by:

1. Enayen Tadesse (PhD) — 12-02-2015

Name of Major Advisor — Signature — Date

2. Zeladem Testay (PhD) — 12-02-2015

Name of Co-Advisor — Signature — Date

3. Coma Nega (M.S.c) — 10/06/07

Name of Chairman — Signature — Date

4. Amadis Mona (MSc) — Feb 17, 2015

Name of Graduate program Coordinator — Signature — Date

5. W/aynesht Testay — 03/03/2015

IRLI Supervisor — signature — Date

Bahir Dar University School of Chemical and Food Engineering

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Bahir Dar Institute of Technology (BiT)
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✉ 26 ☎ +251 (058) 2266692 Fax +251 (058) 2202027 email scfe@bdu.edu.et

ቁጥር/ Ref.No BDU/BiT/SCFE/ 478/2007

ቀን/ Date 12/06 /2007

ለትግራይ ግብርና ምርምር ኢንስቲትዩት

መቐለ፣

ጉዳዩ፡- ትብብርን ይመለከታል

በባህርዳር ቴክኖሎጅ ኢንስቲትዩት በኬሚካል እና ምግብ ትምህርት ክፍል የApplied human nutrition የሁለተኛ ዲግሪ ተማሪ የሆኑት አቶ አማኑኤል ተ/ሃይማኖት የመመረቅያ ፅሁፋቸው በ Assessment of cow milk consumption, nutritional status and associated factors for children 2 to 5 years በሚል ርእስ በመስራት ላይ ይገኛሉ፡፡ ስለሆነም ለሚያደርጉት የምርምር ስራ ማጠናቀሪያ ይረዳቸው ዘንድ የሚፈልጉትን መረጃዎችና ዳታዎች ማግኘት ይችሉ ዘንድ አስፈላጊውን ትብብር እንድታደርጉላቸው በአክብሮት እንጠይቃለን፡፡

<< ከሠላምታ ጋር >>

ባህር ዳር ዩኒቨርሲቲ የኬሚካልና ምግብ ምህንድስና ት/ቤት Bahir Dar University School of Chemical and Food Engin

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- ለኬሚካልና ምግብ ምህንድስና ት/ቤት ቴክኖሎጂ ኢንስትትዩት

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Bahir Dar Institute of Technology (BiT)

SCHOOL OF CHEMICAL AND FOOD ENGINEERING

ኬሚካልና ምግብ ምህንድስና ት/ቤት

✉ 26 ☎ +251 (058) 2266692 Fax +251 (058) 2202027 email scfe@bdu.edu.et

ቁጥር/ Ref.No BDU/BiT/SCFE/483/2007

ቀን/ Date 12/06 /2007

ለሚመለከተው ሁሉ

ጉዳዩ፡- ትብብርን ይመለከታል

በባህርዳር ቴክኖሎጅ ኢንስቲትዩት በኬሚካል እና ምግብ ትምህርት ክፍል የApplied human nutrition የሁለተኛ ዲግሪ ተማሪ የሆኑት አቶ አማኑኤል ተ/ሃይማኖት የመመረቅያ ፅሁፋቸው በ **Assessment of cow milk consumption, nutritional status and associated factors for children 2 to 5 years** በሚል ርእስ በመስራት ላይ ይገኛሉ፡፡ ስለሆነም ለሚያደርጉት የምርምር ስራ ማጠናቀሪያ ይረዳቸው ዘንድ የሚፈልጉትን መረጃዎችና ዳታዎች ማግኘት ይችሉ ዘንድ አስፈላጊውን ትብብር እንድታደርጉላቸው በአክብሮት እንጠይቃለን፡፡

<< ከሠላምታ ጋር >>

ፋንታ (ዶር)
ዳይሬክተር

ግልባጭ//

- ለኬሚካልና ምግብ ምህንድስና ት/ቤት ቴክኖሎጂ ኢንስትትዩት

ብክራዊ ክልላዊ መንግስቲ ትግራይ
ቢሮ ኣለቦ ጥዕና

The Government of the National Regional State of Tigray Bureau of Health

Ref ቁፅሪ 297/1418/07 Date ዕለት 25/6/07

ክብ/ንይዳ/ሰ

ናብ/ወረዳ ኢንጸርጥ ጥህና ቤት ዕልኣት

ምንኮ፦ ትብብር ይመሓትኦም።

በርዕሱ እንደተገለፀ በባህሪር ቴክኖሎጂ ኢንስትትዩት በኬሚካል እና ምግብ ትምህርት ክፍል የ/Applied Human Nutrition/ ተማሪ የሆኑት አቶ አማኑኤል ተ/ሃይማኖት በAssessment of cow milk consumption nutritional status and associated factors for children 2 to 5 years በሚል ርእስ ለመስራት ስለሚመጡ አስፈላጊውን ትብብር እንዲደረግላቸው እንጠይቃለን።

ለጤናችን ብጋራ እንስራ !!

ሓላፊ ጎደፋይ ደበብ
ቢሮ ሓላፊ

ግልባጭ

→ አቶ አማኑኤል ተ/ሃይማኖት

ስ.ቁ 7 ☎ 034-4-40-02-22 / 034-4440-31-10 / 416058 / 034-4-41-01-01/02/03 ፋክስ 251-4-40-88-30 Fax ኢመይል tigrayhealth@ethionet.et E-mail መቐለ, ትግራይ, ኢትዮጵያ Mekelle, Tigray, Ethiopia

ብሄራዊ ክልላዊ መንግስቲ ትግራይ
ቤት ፅሕፈት ጥዕና ወረዳ ክልተ አውላዕሎ

The Government of the National Regional, State of Tigray
Kilte Awalaelo Wereda Health office

ቁፅሪ 1006/11/07
ዕለት 10/07/2007

ናብ ---------- ጥዕና ኬላ

ኣብዘለውኦ

ዋኒኑ፡- ብዛዕባ ትሕብብር ይምልከት፡

ኣብ ርእሰ ዋኒኑ ከምዝተገለፀ ኣቶ ኣማኑኤል ተ/ሃይማኖት ዝተብሃሉ ኣብ ባህርዳር ዩኒቨርስቲ ብኬሚካል እና ምግቢ ክፍሊ ፅንዓት ዝኾኑ ኣብ ዙርያ Applied human Nutrition ክይኑ ብCow milk consumption nutritional status & associated factors for children 2 to 5 years ዝብል ከፅንዑ ስለዝደልዩ ካብ ክልል ጥዕና ቢሮ ተሓባበሩዎም ዝብል ደብዳቤ ብዕለት 25/06/07 ዓ/ም ቁፅሪ 297/1418/07 ተዋሒፉልና ስለዝኾነ ደብዳቤ ፅሒፍናልክን ዘለና ጥ/ኬላታት ድማ ትሕብብር ክትገብሩሎም ንገልፅ።

"ወፍ ንግስተ ሰማይ ድሓን ኣዴታትን ህፃናትን!"

ብርኸቲ ገ/መድህን
ሓላፊት ቤት ፅሕፈት

ቕዳሕ፡

- ንኣቶ ኣማኑኤል ተ/ሃይማኖት

ኣብዘለዉዎ

034-4-43-01-13
ራእይና ጥዑይ ሰድራ ኣብ ሕድሕድ ገዛን ወረዳናን ምርኣይ

ወቅሮ ትግራይ ኢትዮጵያ
Wukro, Tigray, Ethiopia
T.IN. R.D

Appendix B: consents

Informed Consent Script in English

Hello Ms/Mrs _____ My name is _____ .

What is your child's name? _____

When was (child's name) born? Day_____ Month _____ Year _____

We are conducting a study on milk consumption pattern and nutritional status of young children in this district. So, I would like to ask you some questions concerning your child's nutritional status.

First, I would like to inform you Ms/Mrs. _____ that you are not required to take part in this study. And if you decide to participate, you can stop at any time you want to and you will not be penalized.

This interview will take about 1 hour of your time. The surveyor will ask you different questions and s/he will weigh and measure your child.

Any information about you or your child Ms/Mrs _____ will not be released to anyone else without your permission. We will not write your name or child's name on the forms we use to write the information we get from you and your child.

Would you like to participate in this survey Ms./Mrs _____?

(If **YES**) Thank you Ms./Mrs_____ for accepting to participate in this study. Please sign or put your thumbprint here:

_____ _____

Participant's Full Name Signature or Thumbprint of Participant

Informed Consent Script in local language (Tigrigna)

ቃላዊ ስምምዕነት

ኣነ _____ዝተበሃልኩ ምርምራዊ መፅናዕቲ ኣብ ኣመጋግባ ህፃናት ካብ 2 - 5 ዓመት ኣብ ከባቢኸም ንምካያድ ኣብ ከይዲ ይርከብ:: ስለዚ ኣብዚ መፅናዕቲ እዚ ክሳተፉ/ፋ እንድሕር ፍቃደኛ ኮይነን/ኮይኖም ዝርዝር ሕቶታት ቃለ መሕተት እቲ መፅናዕቲ ክሕተታ/ቱ እየን/ዮም ብተወሳኺ ድማ ኣብቲ ስድራቤት ዝህሉ ህፃን ካብ 2-5 ዓመት ዓቕን ቁመት፣ ክብደቱን ቅልፅም ኢዱን ክንወስደ ኢና:: እዞም ዝስፅቡ ነጥብታት ድማ ከም ዝሕለወሉም የፍልጥ:-

- ኣብዚ መፅናዕቲ እዚ ምስታፍ ንሰን/ንሶም ይኸፍ እቲ ዝዕቀን ህፃን ምንም ዓይነት ኣካላዊ፣ ስነ ኣእምራውን ሞራላውን ዝበፅሕ ጉድኣት ከምዝየለ
- ኣብዚ መፅናዕቲ እዚ ምስታፍ ንሰን/ንሶም ይኸፍ እቲ ዝዕቀን ህፃን ምንም ዓይነት ቀጥታዊ ዝኾነ ረብሓ/ ኣብ ገዜ እቲ ፅንዓት ዝኽፈልዎ ገንዘብ/ ከምዝየለ
- ኣብዚ መፅናዕቲ እዚ ምስታፍ ንሰን/ንሶም ይኸፍ እቲ ዝዕቀን ህፃን ምንም ዓይነት ክፍሊት ዝኽፍልዎ ከምዝየለ
- ኣብ መወዳእታ እዚ መፅናዕቲ እዚ ስመን/ሞም ይኸፍ ስም እቲ ህፃን ከምዝይጥቀስ ወይም ደሞ ንኻለእ ኣሕሊፍካ ከም ዘይወሃብ ንሕበር
- ኣብዚ ምርምራዊ መፅናዕቲ እዚ ምስታፍ ማኣ ብማኣ ብድልየት እንትኸውን ኣብ ዘድልየን/ዮም እዋን ከቋርፅኦ/ዎ ከም ዝኽእላ/ሉ እናሓበርና ብምቁራፅን/ዖም ምንም ዓይነት ቅፅዓት ወይም ዝጎድል ረብሓ ከምዝየለ ንሕበር

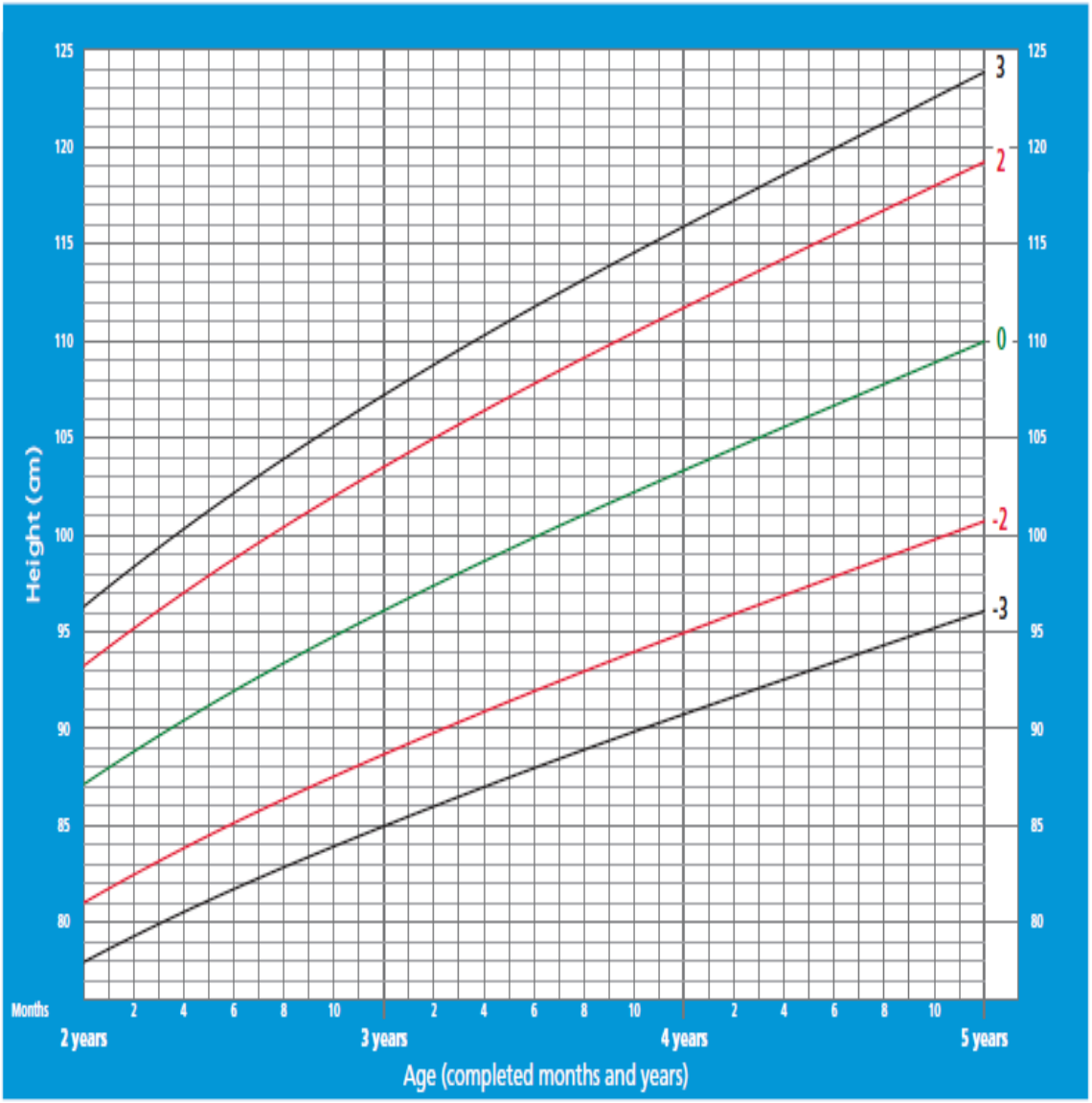
ስለዚ ኣበዚ መፅናዕቲ ንምስታፍ ፈቃደኛ ድየን/ዮም ሀ. እወ ለ. ኣይኮንኩን

Appendix C: WHO growth charts for children 2 to 5 years old of both sexes

Height-for-age BOYS

2 to 5 years (z-scores)

World Health Organization

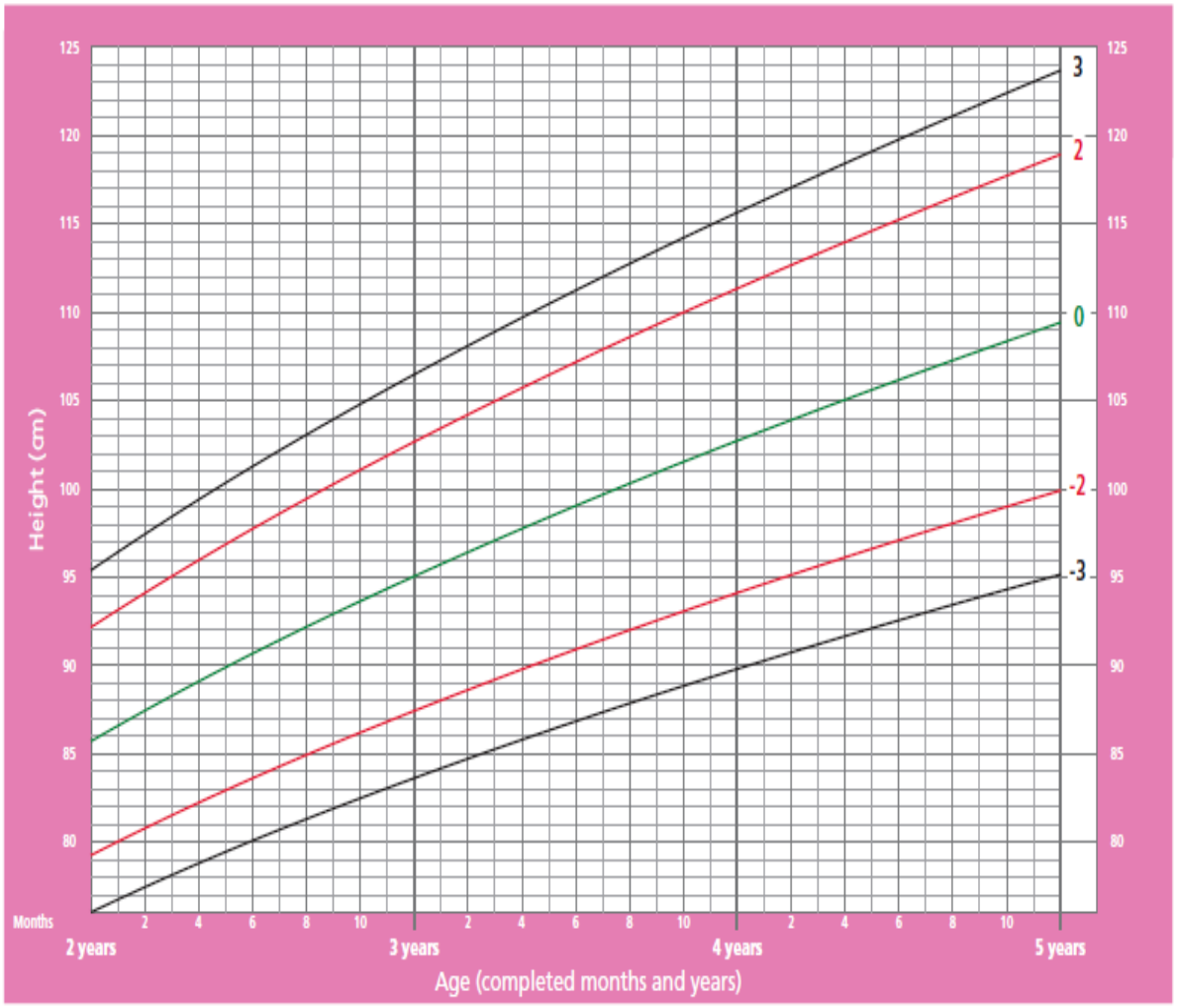


WHO Child Growth Standards

Height-for-age GIRLS

2 to 5 years (z-scores)

World Health Organization

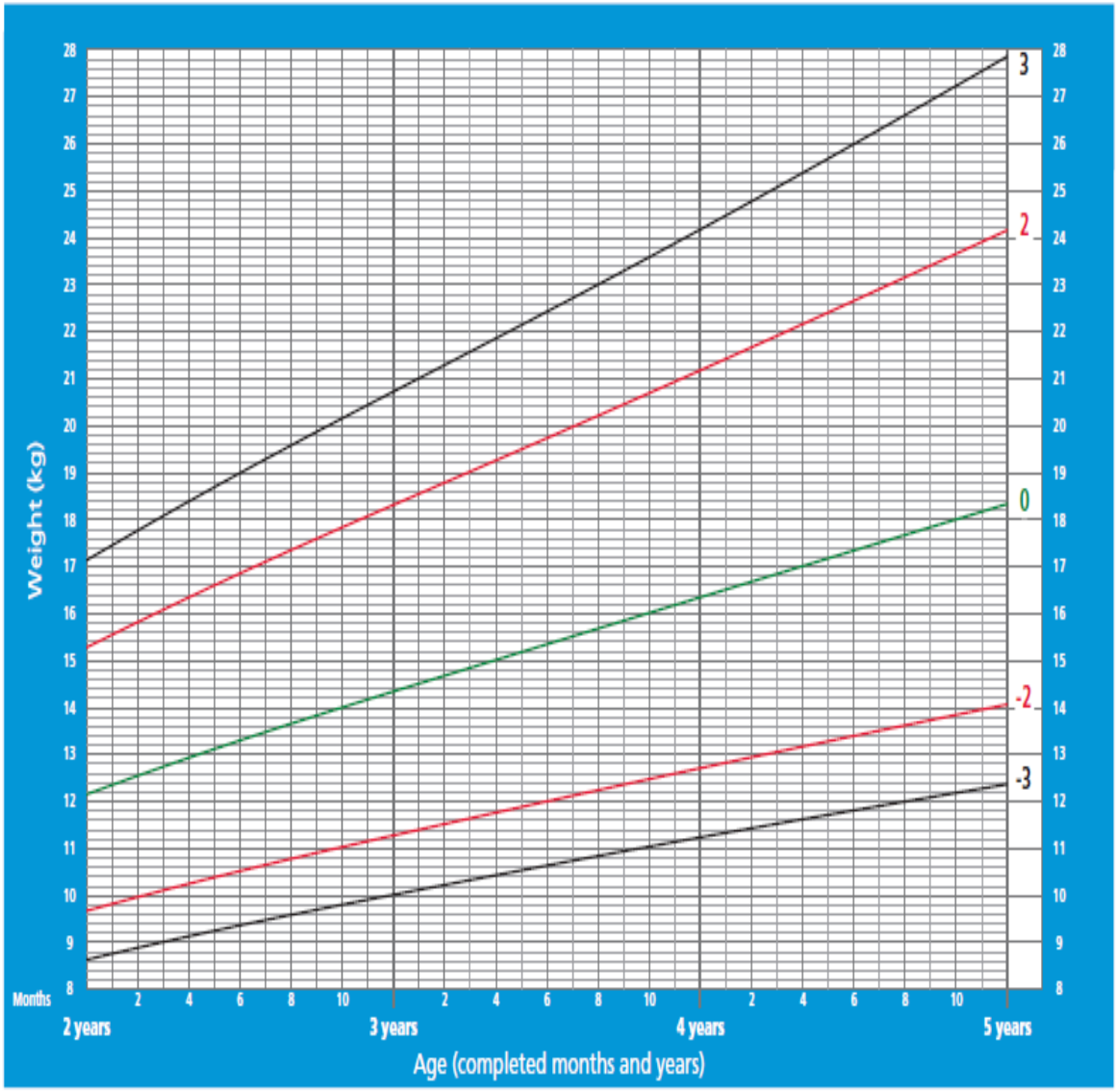


WHO Child Growth Standards

Weight-for-age BOYS

2 to 5 years (z-scores)

World Health Organization

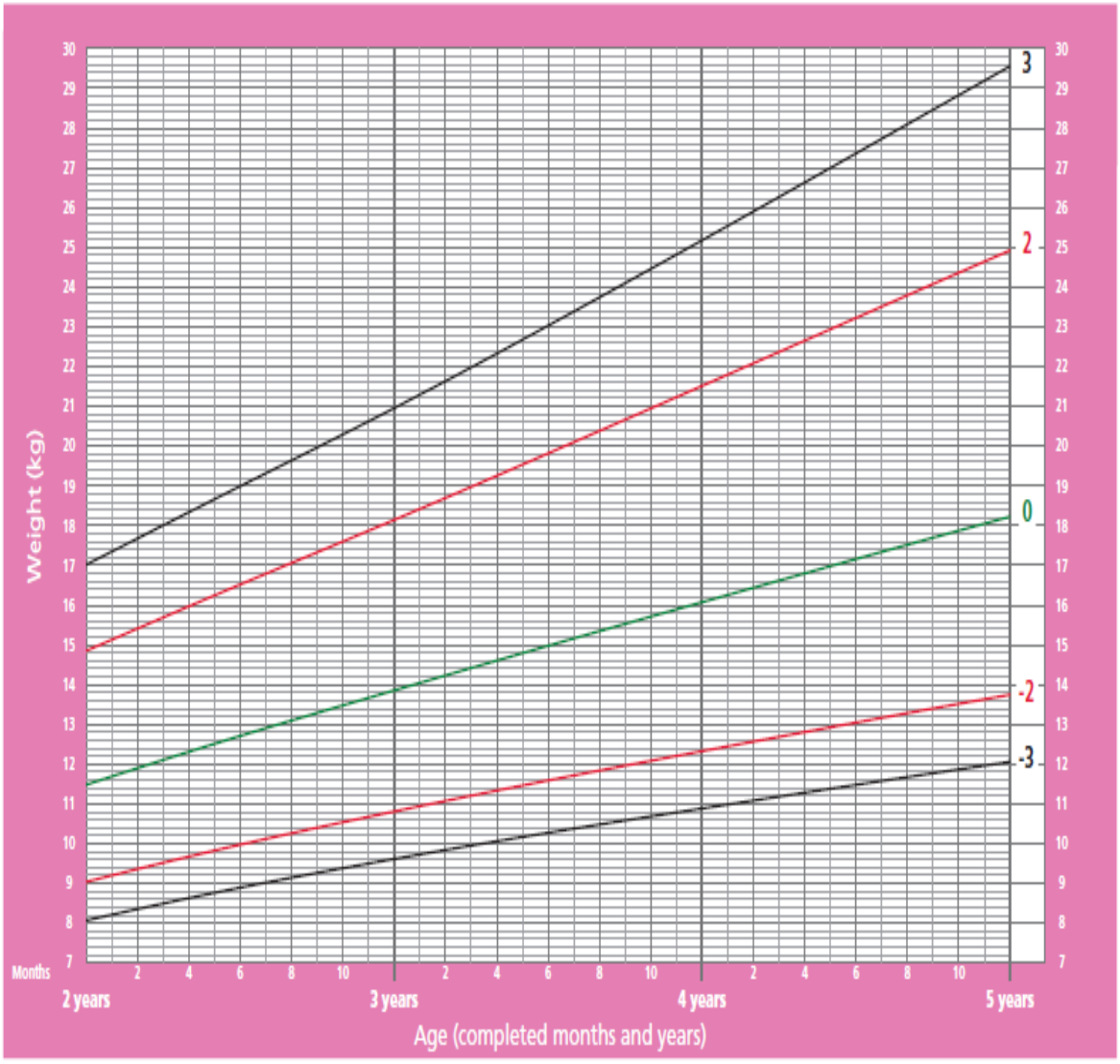


WHO Child Growth Standards

Weight-for-age GIRLS

2 to 5 years (z-scores)

World Health Organization

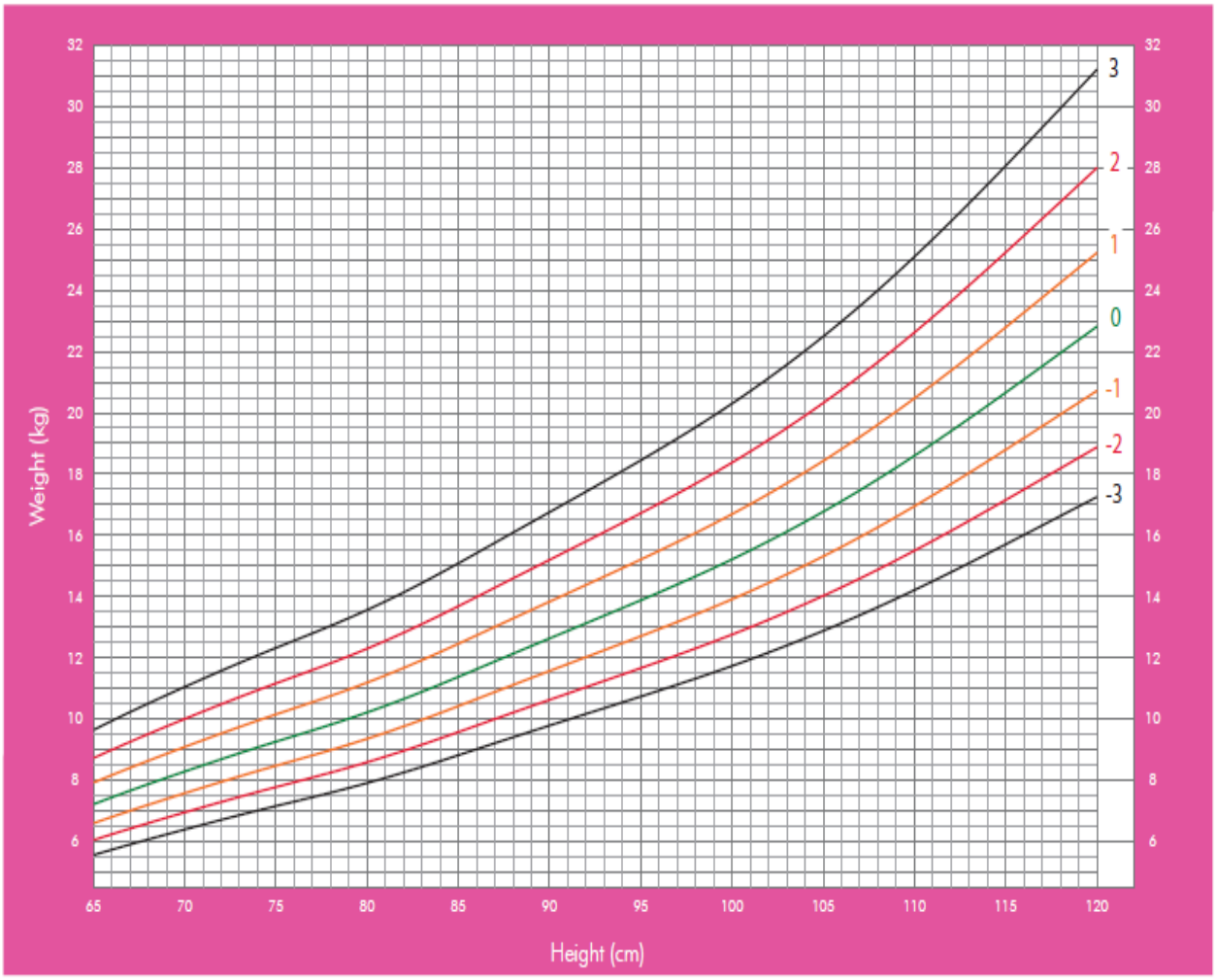


WHO Child Growth Standards

Weight-for-Height GIRLS

2 to 5 years (z-scores)

World Health Organization

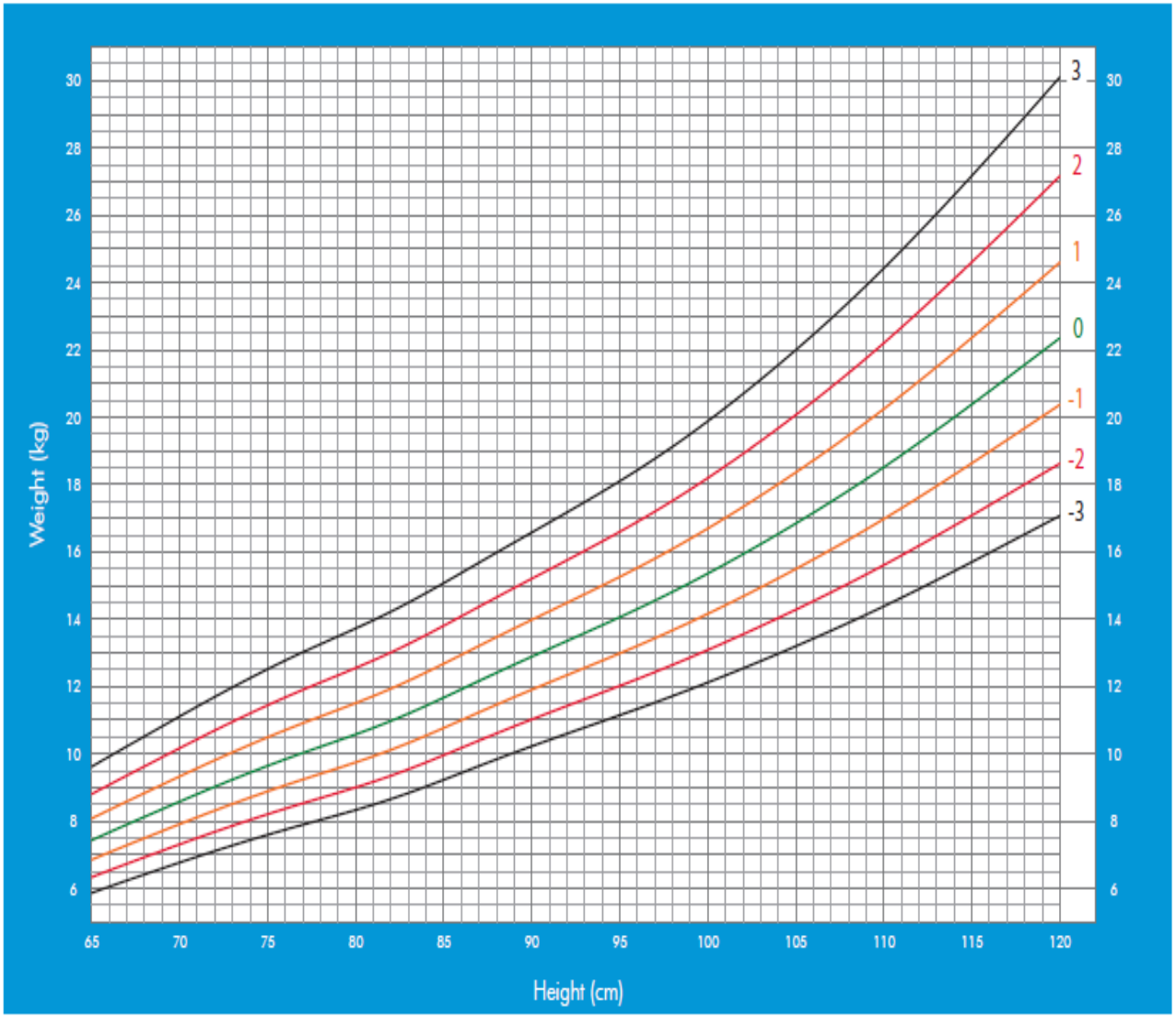


WHO Child Growth Standards

Weight-for-height BOYS

World Health Organization

2 to 5 years (z-scores)



WHO Child Growth Standards

Appendix D: Questionnaire

Questionnaire for Respondents in English

CODE _____

I. Socio- demographic information

1. Date of interview _____Name of enumerator_____

2. District _____ Kebele_____ village _____

3. Name of the respondent/mother or care giver _____

4. Gender 1 = Female 2=Male

5. Your Age _____

6. Your Marital status 1= Married 2= Single 3= Widowed 4=Divorced

7. Who is the HH head? 1= mother 2=father 3= other (specify)_____

8. Family size of your household

	< 2 yrs	**2-5 yrs**	**6–10 yrs**	**11 – 15 yrs**	**16 – 20 yrs**	**>20 yrs**	**Total**
Male							
Female							
Total							

9. How many children 2 to 5 years do you have? _____

10. The name of the selected child aged 2 to 5 years _____

11. The sex of the selected child aged 2 to 5 yrs old? 1= Female 2=Male

12. The age of the selected child? _____

II. Socio – economic information

1. Educational status of mother: 1= Degree 2= Diploma 3 = Secondary school 4= Elementary school 5= Read and write 6= Illiterate 7= Other specify_____

2. Your husband's educational status: 1= Degree 2= Diploma 3 = Secondary school 4= Elementary school 5= Read and write 6= Illiterate 7= Other specify_____

3. Your occupation: 1= housewife 2= Salaried Employee 3= Business / trade 4= daily Labor 5= other (specify) _____

4. If you have occupation how much time did you work per day?

1= 2:30-11:30 2= 2:30-6:30 3= 3 hour 4= 2 hour 5= 1 hour 6= I did not know

5. Your husband's occupation: 1= Own farm work 2 = Salaried Employee 3= Business / trade 4= daily Labor 5=Other (specify) _____

6. The residence of the household? 1= Rural 2=peri urban 3=Urban

7. Income of the household (HH) based on the information in the table below

S/N	Questions	Choices for answer	Remarks
1	Land for Agriculture	1= owned land 2= rented land 3=No land	
1.1	If the HH has owned land	1=0.25 ha 2=0.5 ha 3=0.75 ha 4= 1ha 5=other----------	
1.2	If the HH has rented land	1=0.25 ha 2=0.5 ha 3=0.75 ha 4= 1ha 5=other----------	
2	Animals owned by the HH	1= cow---------- 5=chickens--------- 2=oxen--------- 6=donkeys--------- 3=Goats-------- 7=other---------- 4=sheeps------- 8=no animal	
3	The house for residence is	1= rent 2=own 3=temporary gift 4= other (specify)----------	
4	The livelihood of the HH	1= crop farming 2= Animal raring 3= mixed farming 4= assistance program 5= regular employment 6= daily labor 7= other (specify) _____	

8. What is the wealth index of the HH based on the total income of the HH?

1=very poor 2=poor 3= medium 4=rich 5= very rich

Feeding practice

1. How long did you exclusively breast feed (NAME) ----------?

1= 1-3 month 2= 4-6 month 3= 7-9 month 4=10-12 month 5= > 12 month

2. At what months' of the child did you start complementary feeding?

1= 1-3 month 2= 4-6 month 3= 7-9 month 4=10-12 month 5= > 12 month

3. Are you still breastfeeding? 1= No 2= Yes

4. At what months'/years' of the child did you stop breastfeeding?

1= 1-3 month 2= 4-6 month 3= 7-9 month 4=10-12 month 5= 12 – 17 month

6= 18 – 24 month 7= >24 month

5. What is the most commonly consumed cereal for a child in your area?

1= Maize 2= Wheat 3= Sorghum 4= Millet 5= *teff* 6=other specify (_____)

6. What is the most commonly consumed legume for a child in your area?

1= faba bean 2= Field Peas 3= Chick Peas 4=Soya bean 5= Lentils

6= grass pea 7= other specify _____

7. What is the most commonly consumed staple diet for a child in your area?

1= Enjera 2= Porridge 3= Kita 4= Bread 5= soup

6= other specify (_____)

8. What is the most commonly consumed dairy products for a child in your area?

1= skim milk 2= Boiled whole milk 3=Buttermilk / Arera /

4=Yoghurt 5= Cheese 6=Butter

9. How many meals do you prepare for this child in a typical day?

1= once 2 =twice 3= three times 4= more than four

Cow milk availability, consumption and access

1. Does cow milk available in your locality? 1= Yes 2=No

2. Do you prepare cow milk for your child? 1= Yes 2= No (if No skip to vaccine part)

3. (If **YES**) How many times in a day did you prepare milk for this child?

1= 3 times a day 2= once a day 3= twice a day 4= 4 and above times per day

4. What amount of cow milk did you provide at a one serving for your child?

1= one coffee cup 2= one tea cup 3= one glass 4= half cup 5= other ----------

5. From where did you get the cow milk for your child?

1= own production 2= market 3= gift from neighbor 4= Other (specify) _____

6. If you get from market which type of market outlet do you visit most frequently for milk purchases?

1 = Kiosk 2 = Supermarket 3 = Street vendor 4 = Local market

5 = neighbor 6= contract 7= Other (specify)_____

7. Why do you visit this market frequently?

1 = nearest one 2 = Reputable one 3 = One with more variety of products sold

4 = One that sells fresh products only 5 = One with reasonable price

6 = Credit sales available 7=Other (specify)_____

8. How frequently do you visit this market?

1 = Daily 2 = Once weekly 3 = Twice weekly 4 =3-4 times a week

5 = As necessary 6 = Other (specify) _____

9. Are you concerned about the safety of milk and milk products when you buy from the market sources? 1= no 2= yes

Child Vaccination status

1. Did your child received BCG?

   1=Yes(card) 2=Yes(recall) 3=Yes (scar) 4=NO 5=Don‟t know

2. Did your child received Penta 1 and OPV 1

   1=Yes(card) 2=Yes(recall) 3=No 4=Don‟t know

3. Did your child received Penta 2 and OPV 2

   1=Yes(card) 2=Yes(recall) 3=No 4=Don‟t know

4. Did your child received Penta 3 and OPV 3

   1=Yes(card) 2=Yes(recall) 3=No 4=Don‟t know

5. Did your child received Measles immunization?

   1=Yes(card) 2=Yes(recall) 3=No 4=Don‟t know

6. Did your child received deworming tablets in the last 6 months?

   1=Yes (card) 2=Yes(recall) 3=No 4=Don‟t know

7. Did your child received Vitamin A in the last 6 months

   1=Yes (card) 2=Yes(recall) 3=No 4=Don‟t know

Child Disease status

1. During the past 2 weeks did (Name) suffer from any illness or injury?
   1=Yes 2=No (if No go to the next section)
2. If yes for how many days did (Name) suffer due to illness or injury during the past 2 weeks? ----------
3. Can you describe the symptoms that (Name) primarily suffered from the major illness or injury during the past 2 weeks? 1=Diarrhea (acute) 2=Fever (acute) 3=Difficult breathing
   4=Diarrhea (chronic) 5=Skin infection 6= Measles 7= Malaria
   8= Vomiting 9=Coughing 10=Others (Specify)……
4. Was anyone consulted for the major illness or injury during the past 2 weeks?
   1=Yes 2=No
5. How soon did you seek assistance?
   1= within 24hrs 2=After 24 hrs 3= after 3 days 4= after 1 week 5= after 2 week
6. Where did you go for the first consultation during the past 2 weeks?
   1=Public clinic 2=Private clinic 3=Friend/Relative 4=traditional healer 5=others (specify)
7. If No Why was no one consulted for the major illness?
   1= mild illness 2= Staff attitude 3= No medicine 4= Others (Specify)……

Water consumption and sanitation

1. What is your main current water source for consumption?

   1= running water 2= stream 3= unprotected well 4=protected well

   5=Borehole 6 =Water tap 7=others specify…

2. What do you do to the water before giving it to the child?

   1=Boiling 2=Use water treatment 3= Nothing

3. What type of toilet does the household have?

   1=Bucket 2=Traditional pit latrine 3=Flush toilet 4= open defecation

4. Is there hand washing facility near the toilet? 1=Yes 2= No

5. If yes did you use it properly? 1=Yes 2 =sometimes 3= No

6. On what occasions do you usually wash your hands, (tick all that apply)

   1= before eating 2=After defecating 3=Before feeding the child 4=Before breastfeeding

   5=After cleaning child's bottom 6=others (specify)

7. On what occasions you usually use soap when washing hands?

   1= Before eating 2=After defecating 3=Before feeding the child 4=Before breastfeeding

   5=After cleaning child's bottom 6=others (specify)----------

III. Behavioral information

1. Did you feed your child leftover food instead of his/her own food? 1= Yes 2=No
2. Did you refuse giving cow milk to your child? 1=Yes 2= No
3. If yes why did you refuse? 1= it is unsafe 2= forbidden 3=malicious 4=other----------
4. Did you feed the child with his/her older siblings? 1=Yes 2=No
5. Did you feed the child with the adults of the HH? 1=Yes 2=No
6. How many times in a day does this child eat? 1=once 2=twice 3= three times 4=four times 5=five time 6=six times 7= seven times and above
7. Is there any food restriction for this child? 1=Yes 2= No
8. If yes what is the restricted food? _____
9. Why is restricted this food for the child? _____
10. Who does give care for this child? 1=mother 2=father 3= daughter 4=son 5= house made 6= grandmother 7= neighbor 8=other ----------

IV. Anthropometric Measurement

1. Where was he/she born?

   1= at Home 2= at home with the help of Traditional birth attendant

   3= Hospital 4= Other (specify)_____.

2. Was (Name of child) weighed at birth? 1= Yes 2= No

3. If yes, How much did s/he weigh _____

4. What was the weight of (name of child) at birth?

   1=Very small 2= Small 3= Average size 4= Large 5= Very large

5. Now we are going to measure your child's weight, height and arm to see how he/she is growing.

6. Check the child whether s/he has oedema on his/her feet? 1= yes 2=No

	Measurement 1	**Measurement 2**	**Average**
7. Child's MUAC	_____._____ cm	_____._____ cm	_____._____cm
8. Child's height	_____._____ cm	_____._____ cm	_____._____ cm
9. Child's weight	_____ kg _____g	_____ kg ____g	_____kg_____g

10. Name of assessor_ _ _ _ _ _ _ _ _ _ ___ __ _ _ _ _ _ _ Date _____

11. Clothes worn by the child 1= No clothes 2= Light clothes 3= Heavy clothes 4 =Other (specify) ....

12. Shoes worn by the child 1= barefoot 2= light shoe 3= heavy shoe 4= other (specify) _

Questionnaire for Respondents in local language (Tigrigna)

ቃለ መሕትት

መፍለይ ቁፅሪ_____

I. ማሕበረ ምጣኩ ስድራ ቤት (Socio- demographic information)

1. ዕለት _____ ሽም ሓታቲ _____
2. ሽም መላሲ/እኖ ወይ ሓቡሓቢ/ት _____
3. ወረዳ _____ ጣቢያ_____ቁሸት
4. ዖታ ሀ. ኣንስታይ ለ. ተባዕታይ
5. ዕድመ _____
6. ኩነታት ሓዳር ሀ. ዝተመርዓወ/ት ለ. ዘይተመርዓወ/ት ሐ. ስብኣያ/ሰበይቱ ዝሞታ/ዝሞተቶ መ. ዝተፋተሐት/ዝተፋተሐ
7. መሩሒ ስድራ መን እዩ ሀ. ሰበይቲ/እኖ ለ. ሰብኣይ/ኣቦ ሐ. ካሊእ _____
8. በዝሒ ስድራ

	<2 ዓመት	2-5 ዓመት	6-10 ዓመት	11 - 15 ዓመት	16 - 20 ዓመት	>20 ዓመት	ድምር
ተባዕታይ							
ኣንስታይ							
ድምር							

9. ክንደይ ህፃናት ኣብ ክሊ ዕድመ ካብ 2 ክሳብ 5 ዓመት ኣለወኻም? _____
10. ሽም ዝተመረፀ ህፃን ካብ 2-5 ዓመት _____
_____
11. ዖታ ዝተመረፀ ህፃን ካብ 2-5 ዓመት ሀ. ኣንስታይ ለ.ተባዕታይ
12. ዕድመ ዝተመረፀ ህፃን ካብ 2-5 ዓመት _____

II. ማሕበራዊ ቁጠባ (Socio – economic information)

1. ደረጃ ት/ቲ እኖ/ሓቡኣቢ/ት ሀ. ዘይተምሃረ/ት ለ. ምፅሓፍን ምንባብን
ሐ. ቀዳሜይ ደረጃ መ. ካልኣይ ደረጃ ረ. ሰርቲፍኬት ሰ. ዲፕሎማ ሸ. ድግርን ልዕሊኡን
ቀ. ካለእ _____

2. ናይ ባዓል ገዛኺ/ባዓልቲ ገዛኻ ደረጃ ት/ቲ ሀ. ዘይተምሃረ/ት ለ. ምፅሓፍን ምንባብን
ሐ. ቀዳሜይ ደረጃ መ. ካልኣይ ደረጃ ረ. ሰርቲፍኬት ሰ. ዲፕሎማ ሸ. ድግርን ልዕሊኡን
ቀ. ካለእ _____

3. ኩኔታት ስራሕኪ/ካ ሀ. ናይ ባዕለይ ሕርሻ ለ. ደመወዘተኛ ሐ. ንግዲ መ. ሞኣለታዊ
ስራሕ ረ. ናይ ገዛ ስራሕ ሰ. ካለእ _____

4. ኩኔታት ስራሕ ባዓል ገዛኺ/ባዓልቲ ገዛኻ ሀ. ናይ ባዕሉ/ላ ሕርሻ ለ. ደመወዘተኛ ሐ.
ንግዲ መ. ሞኣለታዊ ስራሕ ረ. ካለእ _____

5. ካብ ቆልዓ ምሕቡኣብ ተወሳኪ ስራሕ እንተልይኪ/ካ ክንደይ ዝኣክል ትሰርሒ/ሕ?
ሀ. ሞኡእ መዓልቲ ለ. ፍርቂ መዓልቲ ሐ. 2 ሰዓት መ. 1 ሰዓት ረ. ኣይፈልጥን

6. መዛባብሮ ስድራቤትኩም ኣበይ እዩ? ሀ. ገጠር ለ. ገጠር-ከተማ ሐ. ከተማ

7. ጠቕላላ እቶት ስድራቤትኩም ብመሳረት እዚ ዝስዕብ ሰንጠረዥ

ተ/ቁ	ሕቶታት	መመረፂ መልስታት	መበርሂ
1	ንሕርሻ ዝወፅል መሬት ኣለኩም ዶ?	ሀ. እወ ዝተዓደልናዮ ለ. እወ ዝተካረናዮ ሐ. የብልናን	
1.1	ዝተዓደኩምሞ መሬት ብፅሞድ	ሀ. 1 ፅሞድ ለ. 2 ፅሞድ ሐ. ½ ፅሞድ መ. 3 ፅሞድ ረ. 4 ፅሞድ ሰ.ካለእ ----------	
1.2	ዝተካረኩምሞ መሬት ብፅሞድ	ሀ. 1 ፅሞድ ለ. 2 ፅሞድ ሐ. ½ ፅሞድ መ. 3 ፅሞድ ረ. 4 ፅሞድ ሰ.ካለእ -----	

2	ከንደይ ሃፍቲ እንስሳ ኣለወኽም? በዝሒ ሕድ ሕድ እንስሳ ኣብ ቅድሜኹ ኣቕምጥ	ሀ. ኣላሕም ___ መ. ኣባጊዕ _____ ለ. ኣበፅር _____ረ. ደርሁ ____ ሐ. ኣጣል_____ ሰ. ኣእዳግ _____ ሸ. እንስሳ ዝበሃል የብልናን ቀ. ንህቢ	
3	እትነብርሉ ገዛ ወይም መንበሪ ገዛኽም ናይ ባዕልኽም ድዩ?	ሀ. ክራይ ለ. ናይ ባዕልና ሐ. ግዝያዊ መህቡዶ መ.ካለእ _____	
4	ብምንታይ ትመጹደሩ?	ሀ. ሕርሻ ዘራእቲ ለ. እንስሳት ምርባሕ ሐ. ሀ እና ለ መ. ሓባዝ/እርዳታ ረ. ደመዎዝ/ወርሓዊ መሃያ ሰ. መንልታዊ ስራሕ	

8. ብመሳረት እቲ ሰንጠረዥ ናይቲ ስድራቤት ሃፍቲ ኣበየናይ ይምደብ? ሀ.ብጣዕሚ ድኻ ለ. ድኻ ሐ. ማእኸላይ መ. ሃፍታም ረ. ብጣዕሚ ሃፍታም

<u>ሀ. ኣመጋግባ ዝምልከት</u>

1. ህፃን---------- ንክንዳይ ዝኣክል ጡብ ኣደ ጥራይ ወሲዱ/ዳ? ሀ. 1-3 ወርሒ ለ. 4-6 ወርሒ ሐ. 7-9 ወርሒ መ. 10-12 ወርሒ ረ. ልዕሊ 12 ወርሒ
2. ኣብ ክንደይ ወርሕ/ሓ ህፃን------- ተወሳኺ መግቢ ጀሚሩ/ራ? ሀ. 1-3 ወርሒ ለ. 4-6 ወርሒ ሐ. 7-9 ወርሒ መ. 10-12 ወርሒ ረ. ልዕሊ 12 ወርሒ
3. ህፃን ------ ክሳብ ሐዚ እናጠበወ/ት ድዩ/ያ? ሀ. እወ ለ. ኣይጠቡን
4. እንድሕር ህፃን---- ጡብ ገዲፉ/ፉ ኣብ ክንደይ ወርሓ/ሑ ገዲፉ/ፉ? _____
5. ክንደይ ዓይነት መግቢ ንህፃን----- ኣብ ሓደ መንልቲ ይዳለወሉ/ላ? ሀ.ሓደ ለ. ክልተ ሐ. ሰለስተ መ. ኣርባዕተን ልዕሊኡን
6. ኣብ ከባቢኽም ብበዝሒ ንህፃን ንምግብነት ዝወፅል ፀባን ወፅኢት ፀባን እንታይ እዩ? ሀ. ዘይፈለሐ ፀባ ለ. ርጉኦ ሐ. ዝፈለሐ ፀባ መ. ማንጩ ረ. ኣጅቦ ሰ. ዓወሶ ሸ. ጠስሚ ቀ. ካለእ ____
7. ኣብ ከባቢኽም ብበዝሒ ንህፃን ንምግብነት ዝወፅል ጥራጥረ እንታይ እዩ? ሀ. ምሸላባሽሪ/ ዕፉን ለ. ስርናይ ሐ. ምሸላ መ. ዳጉሻ ረ. ጣፍ ሰ. ካለእ_
8. ኣብ ከባቢኽም ብበዝሒ ንህፃን ንምግብነት ብመልከዕ ፀብሒ ዝወፅል ዓሌት ዓተር ኣየናይ እዩ? ሀ.ዓልቋይ/ዓተር/ባለቓጓ ለ. ዓይኒ ዓተር ሐ. ሽምበራ መ.ኣዳጉራ ረ. ብርሽን ሰ.እንጓያ ሸ. ካለእ ____

9. ኣብ ከባቢኹም ብበዝሒ ንህፃን ንምግብነት ዝወፅል ተበላዓይ ምግቢ እንታይ እዩ? ሀ. እንጀራ ለ. ጋዓት ሐ. ቅጫ መ. ሕምጣሻ ረ. ካለእ _____

ለ. <u>ፀባ ዝምልከት ሓበሬታ</u>

1. ኣብ ከባቢኹም ፀባ ላሕሚ ይርከብ ዶ? ሀ. እወ ለ. ኣይርከብን
2. ንህፃን ----- ፀባ ላሕሚ ይዳለወሉ/ላ ዶ? ሀ. እወ ለ. ኣይዳለወሉን
3. እንድሕር ዝዳለወሉ/ላ ኮይኑ ኣብ ሞንልቲ ክንደይ ግዜ እዩ ዝዳለወሉ/ላ? ሀ. ሰለስተ ግዜ ለ. ሓደ ግዜ ሐ. ክልተ ግዜ መ. ኣርባዕተን ልዕሊኡን
4. ክንደይ ዝኣክል ሞጠን ፀባ ላሕሚ እዩ ኣብ ሓደ ግዜ ዝቐርበሉ/ላ? ሀ. ሓደ ፊንጃል ለ. ሓደ ናይ ሻሂ ቡሽ ሐ. ሓደ ብርጭቆ መ. ሓደ ከባያ ረ. ካለእ
5. ነቲ ህፃን ዝወሃቦ/ባ ሞጠን ፀባ ላሕሚ ኣብ ሞንልቲ ክንደይ እዩ? ሀ. ሓደ ብርጭቆ ለ. ሓደ ከባያ ሐ. ሓደ ፊንጃል መ. ሓደ ታኒካ ረ. ሓደ ናይ ሻሂ ቡሽ ሰ. ካለእ _____

_____

6. ፀባ ላሕሚ ካበይ ኢኹም ትረኽቡ? ሀ. ካብ ናይ ባዕልና ምህርቲ ለ. ካብ ዕዳጋ ሐ. ብመህብቶ ካበ ጎረቤት መ. ካለእ _____
7. እንድሕር ካብ ዕዳጋ እትጥቀሙ ካብ ኣየናይ ዕዳጋ ኢኹም እትገዝኡ? ሀ. ናይ መንገዲ መኻፋፈልቲ (ኮይስኪ) ለ. ሱፐርሞርኬት ሐ. እናዘሩ ዝሸጡ መ. ናይ ከባቢ ዕዳጋ ረ. ካብ ጎረቤት ሰ. ኩንትራት ሸ. ካለእ _____
8. ንምንታይ እዩ እዚ ዕዳጋ እዚ መሪፅኩም? ሀ. ቀረባ ስለ ዝኾነ ለ. ፅቡቕ ስለ ዝኾነ ሐ. ብዙሕ ምህርቲ ስለ ዘለዎ መ. ፍሬሽ ፀባ ስለ ዝሸይጥ ረ. ተመጣጣኒ ዋጋ ስለ ዘለዎ ሰ. ልቓሕ ስለ ዝህብ ሸ. ካለእ _____
9. ክንደይ ግዜ ካብ እዚ ዕዳጋ እዚ ትገዝኡ? ሀ. ሞንልቲ ሞንልቲ ለ. ሓደ ግዜ ኣብ ሰሙን ሐ. ክልተ ግዜ ኣብ ሰሙን መ. 3-4 ኣብ ሰሙን ረ. ከም ኣድላይነቱ ሰ. ካለእ _____
10. ብዛዕባ ፅሬትን ፅፈትን ፀባ ክትገዝኡ ከለኹም ትግደሱ ዶ? ሀ. እወ ለ. ኣይንግደስን

ሐ. <u>ከኣ ታት ክታብት ህፃን</u>

1. ህፃን----------ቢሰጂ ክታብት ወሲዱ ዶ? ሀ. እወ ካርዲ ለ. እወ ብምኽትዋስ ሐ. እወ ጠበሳ መ. ኣይወሰደን ረ. እንድዒ ኣየስታወሶን
2. ህፃን---------ፔንታ 1 እና ኦፒቪ 1 ክታብት ወሲዱ ዶ? ሀ. እወ ካርዲ ለ. እወ ብምኽትዋስ ሐ. እወ ጠበሳ መ. ኣይወሰደን ረ. እንድዒ ኣየስታወሶን
3. ህፃን---------ፔንታ 2 እና ኦፒቪ 2 ክታብት ወሲዱ ዶ? ሀ. እወ ካርዲ ለ. እወ ብምኽትዋስ ሐ. እወ ጠበሳ መ. ኣይወሰደን ረ. እንድዒ ኣየስታወሶን
4. ህፃን---------ፔንታ 3 እና ኦፒቪ 3 ክታብት ወሲዱ ዶ? ሀ. እወ ካርዲ ለ. እወ ብምኽትዋስ ሐ. እወ ጠበሳ መ. ኣይወሰደን ረ. እንድዒ ኣየስታወሶን
5. ህፃን---------ናይ ሚዘል ክታብት ወሲዱ ዶ? ሀ. እወ ካርዲ ለ. እወ ብምኽትዋስ ሐ. እወ ጠበሳ መ. ኣይወሰደን ረ. እንድዒ ኣየስታወሶን
6. ህፃን ------- ኣብ ዝሓለፈ 6 ወርሒ ናይ ዲዋርሚግ ኪኒና ወሲዱ ዶ? ሀ. እወ ካርዲ ለ. እወ ብምኽትዋስ ሐ. እወ ጠበሳ መ. ኣይወሰደን ረ. እንድዒ ኣየስታወሶን
7. ህፃን ------- ኣብ ዝሓለፈ 6 ወርሒ ቪታሚን ኤ ወሲዱ ዶ? ሀ. እወ ካርዲ ለ. እወ ብምኽትዋስ ሐ. እወ ጠበሳ መ. ኣይወሰደን ረ. እንድዒ ኣየስታወሶን

መ. <u>ከኣ ታት ጥዕና ህፃን</u>

1. ኣብ ዝሓለፈ 2 ሰሙን ህፃን------ ዝኾነ ዓይነት ሕሙም ሓሚሞዶ ነይሩ?
   ሀ. እወ ሓሚሙ ለ. ኣይሓመመን
2. እንድሕር ሓሚሙ ነይሩ ንክንደይ መዓልቲ ተሸጊሩ? _____
3. ናይቲ/ታ ህፃን ምልክታት ሕሙም ክትገልፅዮም/ዮም ዶ ትኽእሊ/ል? ሀ. ግዝያዊ ወፅኢት ለ. መቐት ሐ. ናይ ምትንፋስ ሕፅረት መ. ስር ዝሰደደ ወፅኢት ረ. ናይ ቆርበት ሕሙም ሰ. ሚዘል ሸ. ዓሶ ቀ. ተምላስ በ. ምስዓል ተ. ካለእ _
4. ንዝኾነ ሰብ/ባዓል ሞያ ብዘፅባ ሕሙም እቲ ህፃን ኣማኸርኪ/ካ ዶ ነይርኪ/ካ?
   ሀ. እወ ኣማኸረ ለ. ኣየማኸኩን
5. እንድሕር ብዘፅባ ሕሙም ህፃንኪ ሓገዝ ኣተኣላሊሽኪ ኣብ ወሽጢ ክንደይ ግዜ ነይሩ? ሀ. ኣብ ወሽጢ 24 ሰዓት ለ. ድሕሪ 24 ሰዓት ሐ. ድሕሪ 3 መዓልቲ መ. ድሕሪ ሓደ ሰሙን ረ. ድሕሪ 2 ሰሙን
6. እንድሕር ኣማኸርኪ/ካ ናበይ ከይደኪ ኢኺ ኣማኸርኪ/ካ? ሀ. ናይ ህዝቢ ጥዕና ጣቢያ ለ. ናይ ግሊ ጥዕና ጣቢያ ሐ. ዓርኪ/ዘመድ መ. ናይ ባህሊ ሕክምና ረ. ካለእ
7. እንድሕር ዘየማኸርኪ/ካ ምኽንያቱ እንታይ እዩ? ሀ. ቀሊል ሕሙም ስለ ዝኾነ ለ. ናይ ስድራ ኣሚኻኺታ ሐ.መድሓኒት ስለ ዘየለ ረ. ካለእ _____

ረ. ፅሬትን ኣጠቓቕማ ሜይን

1. ብዋናነት ንመስተ እትጥቀምሉ ሜይ ካብይ እዩ? ሀ. ካብ ሩባ ለ. ካብ ፍልፍል ሐ. ካብ ዘይተከደነ ዒላ መ. ካብ ዝተኸደነ ዒላ ረ. ሜይ ቧንቧ ሰ. ካለእ ____
2. ቅድሚ ንህፃን ምሃብኪ/ካ እቲ ሜይ እንታይ ትገብርዎ? ሀ. ነፍለሉ ለ. መፈይ ኬሜክል ንገብረሉ ሐ. ምንም ኣይንጥቀምን
3. ነቲ ህፃን እንታይ ዓይነት ሽቓቕ ኢኹም ትጥቀሙ? ሀ. ባዞ ለ. ባህላዊ ጉደጓድ ሽቓቕ ሐ. ተነቓላቓሊ ሽቓቕ መ. ኣብ ሜዳ
4. ኣብ ከባቢ ሽቓቕ ማሕፀቢ ኢድ ሜይ ኣሎ ዶ? ሀ. እወ ኣሎ ለ. የለን

5. እንድሕር ኢድ ማሕፀቢ ሜይ ላብ ጥቓ ሽቓቕ ሃልዩ ብትክክል ዶ ትትቀምሉ?
ሀ. እወ ለ. ሓደ ሓደ ግዜ ሐ. ላይንጥቀሙን
6. ላብ ምንታይ ከነታት እዩ ላዘውቲርኪ/ካ እደኪ/ካ እትሕፀቢ/ብ? ሀ. ቅድሚ ምባቢ ምበላዕ ለ. ድሕሪ ሽቓቕ ምጥቃም ሐ. ቅድሚ ቆልዓ ምምጋብ መ. ቅድሚ ቆልዓ ምጥባው ረ. ድሕሪ ቆለዓ ምፅራይ ሰ. ካለእ _____
7. ላብ ምንታይ ከነታት እዩ ላዘውቲርኪ/ካ እደኪ/ካ ብሳማኛ እትሕፀቢ/ብ? ሀ. ቅድሚ ምባቢ ምበላዕ ለ. ድሕሪ ሽቓቕ ምጥቃም ሐ. ቅድሚ ቆልዓ ምምጋብ መ. ቅድሚ ቆልዓ ምጥባው ረ. ድሕሪ ቆለዓ ምፅራይ ሰ. ካለእ _____

III. ልማዳዊ ሓበሬታታት (Behavioral information)

1. ንህፃን----- ላብ ክንዲ ናይባዕሉ ምባቢ ተረፍ መረፍ ዲዩ ዝወሃቦ?
ሀ. እወ ለ. ላኮነን
2. ህፃን ---- ፀባ ላሕሚ ከይወስድ ይክልከል ዲዩ? ሀ. እወ ለ. ላይክልከልን
3. እንድሕር ዝኽልከል ኮይኑ ንምንታይ ሀ. ንብኽለት ዝተቃለዐ ስለ ዝኾነ ለ. ነዊሪ ስለ ዝኾነ ሐ. ሓደገኛ ስለ ዝኾነ መ. ካለእ _____
4. ህፃን ----- ምኳ ምፅባዩን ካልኦት ዓበይቲ ላሕዋቱ ዶ ይምገብ? ሀ. እወ ለ. አይኮነን
5. ህፃን ----- ምኳ ዓበይቲ እቲ ስድራ ዶ ይምገብ? ሀ. እወ ለ. አይኮነን
6. ህፃን ------ ላብ ማኣልቲ ክንደይ ግዜ ይምገብ? ሀ. ሓደ ግዜ ለ. ክልተ ግዜ ሐ. ሰለስተ ግዜ መ. ኣርባዕተ ግዜ ረ. ሓሙሽተ ግዜ ሰ. ሽዱሽተ ግዜ ሸ. ሸውዓተን ልዕሊኡን
7. ንህፃን ----- ዝኾነ ዓይነት ምባቢ ዝክልከሎ ላሎ ዶ? ሀ. እወ ለ. የለን
8. እንድሕር ዝክለከል/ትኽልከል ላየናይ ዓይነት ምባቢ _____
9. ንምንታይ እዩ እዚ ዓይነት ምባቢ ዝክልከል? _____

10. ንህፃን ------ ብፅሉይ ዝከናኸኖ መን እዩ? ሀ. እኖ ለ. ኣቦ ሐ. ሓፍቱ መ. ሓዉ ረ. ናይ ገዛ ሰራሕተኛ ሰ. እኖ ሓጎ ሸ. ጎረቤት ቀ. ካለእ _____

IV. ዓቕን ቆልዑ ዝምልከት ሓበሬታ (Anthropometric Measurement)

1. ህፃን ----- ኣበይ ተወሊዱ/ዳ? ሀ. ኣብ ገዛ ብዘይሓገዝ ለ. ኣብ ገዛ በሓገዝ ባህላዊ መዋለድቲ ሐ. ኣብ ሆስፒታል ብሓገዝ ባዓል ሞያ መ. ካለእ _____
2. ህፃን-----ክወለድ/ክትወለድ ከሎ/ከላ ተማዚኑ/ና ዶ ነይሩ? ሀ. እወ ለ. ኣይተማዘነን
3. እንድሕር ተማዚኑ/ዛ ነይሩ/ራ ብ ኪ/ግ ክንደይ ተማዚኑ/ና? _____
4. መጭለዪ ቁፅሪ _____ ስም _____
5. ዕድመ ብወርሒ _____ወይም ብዓመት_____
6. ቁመት cm ዓቕን 1 _____ ዓቕን 2 _____ ማእኸላይ_____
7. ክብደት kg ዓቕን 1 _____ ዓቕን 2 _____ ማእኸላይ_____
8. MUAC cm ዓቕን 1 _____ዓቕን 2 _____ማእኸላይ_____
9. ደረጃ ሕበጥ ሀ. ደረጃ 1 ለ. ደረጃ 2 ሐ. ደረጃ 3 መ. ምንም ዓይነት ሕበጥ የብሉን/የብላን