

Nutritional status and associated factors among primary school children of pastoral and agro-pastoral Communities of Meisoworeda, Shinile Zone, Somali Regional State, Ethiopia.

BY

Abdulkadir Abdella(BSc)

A thesis submitted to School of Graduate Studies and Department of Epidemiology, Jimma University, in partial fulfillment of the requirements for Master Degree in General Public Health

June 2014

Jimma, Ethiopia

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Advisors:-

Prof. Tefera Belachew (MD, MSc, DLSHTM, PhD)

Mr. Habtemu Jarso (BSc, MPH)

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ABSTRACT

Introduction: Globally, malnutrition among school children is becoming a major public health concern. More than 200 million school children are stunted and if no action is taken, about 1 billion stunted school children will be growing up by 2020 with impaired physical and mental development.

Objectives: To assess and compare nutritional status and its associated factors among primary school children of pastoral and agro-pastoral communities.

Methods: School based comparative cross sectional study was conducted in pastoral and agro-pastoral community schools of Meiso woreda on 655 primary school students using multistage sampling. Data were collected by pre-tested structured questionnaire and anthropometric measurements height and weight. Binary logistic regression was used to examine candidate variables for multivariable analyses. Multivariable analysis was done to determine independent predictors of stunting and wasting. Adjusted Odds ratio (OR) with 95% CI was used to show the strength of association.

Result: The prevalence of stunting was higher in agro-pastoral (14.5%) than pastoral (8.3%) communities. Meanwhile the prevalence of thinness was higher in pastoral community than agro-pastoral which was 26.2% and 19.6%, respectively. The overall prevalence of stunting and wasting was 11.5% and 22.6%. On multivariable logistic regression model, Stunting was significantly associated with place of residence, sex, age, family size, source of drinking water, wealth tertiles and adolescent food insecurity. Family size, the source of drinking water, availability of latrine, household wealth tertiles, hand washing with soap after toilet, diarrhea illness and adolescent food insecurity were significantly associated with wasting.

Conclusion: Generally, the study revealed the prevalence of stunting was significantly higher in agro-pastoral than pastoral community adolescents and the prevalence of wasting was higher in pastoral than agro-pastoral communities.

Recommendation: The Somali regional state health bureau and Meiso woreda health office should design intervention which targets adolescents' malnutrition specific to pastoralist and agro-pastoral livelihood systems.

Key terms: Stunting, Thinness, Pastoral, Agro-pastoral, Primary school, Somali region

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TABLE OF CONTENTS

CONTENTS	PAGE
ABSTRACT.....	I
ACKNOWLEDGMENTS	II
TABLE OF CONTENTS.....	III
LIST OF TABLES	V
LIST OF FIGURES	VI
ACRONYMS/ABBREVIATIONS.....	VII
CHAPTER ONE: INTRODUCTION.....	1
1.1. Background.....	1
1.2. Statement of the Problem.....	3
CHAPTER TWO: LITERATURE REVIEW.....	6
2.1. Prevalence of Malnutrition	6
2.2. Factors Associated with Malnutrition.....	7
2.3. Conceptual Framework.....	9
2.4. Significance of the Study.....	10
CHAPTER THREE: OBJECTIVES.....	11
3.1. General Objective	11
3.2. Specific Objectives	11
CHAPTER FOUR: METHODS AND MATERIALS.....	12
4.1. Study Area and Period	12
4.2. Study Design.....	13
4.3. Population	13
4.3.1. Source Population.....	13
4.3.2. Study Population.....	13
4.3.3. Inclusion and Exclusion Criteria:.....	14
4.4. Sample Size Determination & Sampling Procedures	14
4.4.1. Sample size determination.....	14
4.4.2. Sampling Procedure.....	15
4.5. Study Variables.....	16
4.5.1. Dependent variable.....	16
4.5.2. Independent variables.....	16

4.6. Data Collection Procedure and Technique	17
4.6.1. <i>Data collection procedure</i>	17
4.6.2. <i>Data quality control</i>	18
4.7. Data Processing and Analysis.....	19
4.8. Operational Definitions.....	20
4.9. Ethical Consideration.....	21
4.10. Dissemination Plan	21
CHAPTER FIVE: RESULTS	22
CHAPTER SIX: DISCUSSION	33
CHAPTER SEVEN: CONCLUSION AND RECOMMENDATION	37
7.1. Conclusion	37
7.2. Recommendation	37
REFERENCE.....	38
ANNEXES	43

LIST OF TABLES

Table 1: Socio-demographic/economic characteristics of the study participants in pastoral and agro-pastoral communities of Meiso Woreda, Shinile Zone, Somali Region, March to April 2014.....	23
Table 2: Hygiene, sanitation and health status of the study participants in pastoral and agro-pastoral communities of Meiso Woreda, Shinile Zone, Somali Region, March to April 2014....	25
Table 3: Children’s food consumption, meal frequency per day and adolescent food insecurity in pastoral and agro-pastoral communities of Meiso Woreda, Shinile Zone, Somali Region, March to April 2014.	26
Table 4: Binary logistic regression for the nutritional status of school children of pastoral and agro-pastoral community of Meiso Woreda, Shinile Zone, Somali Region, March to April 2014.	28
Table 5:Multivariable logistic regression of factors associated with stunting of school children of pastoral and agro-pastoral community of Meiso Woreda, Shinile Zone, Somali Region, March to April 2014.	30
Table 6: Multivariable logistic regression of factors associated with Thinness of school children of pastoral and agro-pastoral community of Meiso Woreda, Shinile Zone, Somali Region, March to April 2014.	32

LIST OF FIGURES

Figure 1: Conceptual framework developed after reviewing different literatures of similar studies on factors affecting nutritional status of school children.....	9
Figure 2: Map of the study area	13
Figure 3: Schematic Presentation of Sampling Procedures	16
Figure 4: Prevalence of nutritional status among school children of pastoral and agro-pastoral .	27

ACRONYMS/ABBREVIATIONS

AOR	Adjusted Odds Ratio
BAZ	Body Mass Index -for-age z-score
BMI	Body Mass Index
CDC	Centers for Disease Control and Prevention
CI	Confidence Interval
Cm	Centimeter
COR	Crude Odds Ratio
DALYs	Disability-Adjusted Life Years
DPPC	Disaster Prevention and Preparedness Commission
EDHS	Ethiopian Demographic and Health survey
FANTA	Food and Nutrition Technical Assistance
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
HAZ	Height-for-Age Z-score
HEWs	Health Extension Workers
HH	Household
Kg	Kilogram
NCHS	National Center for Health Statistics
NGOs	Non-Governmental Organizations
NNP	National Nutrition Program
PAS	Proportion Allocation to Size
SD	Standard Deviation
SRS	Simple Random Sampling
SPSS	Statistical Package for the Social Sciences
UN	United Nations
UNICEF	United Nations International Children's Fund
VIF	Variance Inflation Factor
WAZ	Weight-for-Age z-score
WFP	World Food Program
WHO	World Health Organization

CHAPTER ONE: INTRODUCTION

1.1. Background

Nutrition is a basic human need that remains unmet for vast numbers of children, who are thus unable to achieve their full genetic developmental potential and for that adequate nutrition is a basic human right and a pre-requisite for good health (1). Growth and development are an important part of childhood and adolescence, and weight gain and increasing body size are normal components of this process (2). Normal growth is dependent on adequate nutrition, and in particular sufficient energy, and encompasses major transformations from birth to adulthood, progressing in an ordered stepwise fashion (2).

Nutritional status has powerful influence on a child's learning and how well a child performs in school. Children who lack certain nutrients in their diet do not have the same potential for learning as healthy and well-nourished children. Evidences show that there is strong link between nutrition and academic performance of children. Both acute and chronic malnutrition impairs children's ability to perform effectively at school (3).

Nutrition is the provision of adequate energy and nutrients (in terms of amount and mix and timeliness) to the cells for them to perform their physiological function (of growth, reproduction, defense and repair). Therefore, from this nutritional status can manifest itself as either malnourished or well-nourished. Malnutrition is a deficiency or excess in one or several essential or energy yielding nutrients. So the term malnutrition refers to under-nutrition, over-nutrition and micronutrient deficiencies. Under-nutrition arises from inadequate energy and protein, over-nutrition and obesity from excess energy and fat and while micronutrient deficiencies arises from inadequate vitamin and mineral supply to cells in body to satisfy physiological requirements. Even though micronutrient malnutrition is frequently superimposed on the above forms of malnutrition, it rarely occurring in isolation and reflects poor diet quality (4).

From the wide spectrums of malnutrition the milder forms of malnutrition like stunting and wasting are highly rampant in developing countries. In addition this silent form of malnutrition can have devastating impacts on the health, growth, and development of children of all ages (5).

Under-nutrition describes a range of conditions including being stunted, being wasted /thin and being underweight.

Stunting is normally an indicator of chronic or long-term insufficient energy or micronutrient intake although it has many non-nutritional causes such as helminth infestation and frequent or chronic infection. It results the child to be very short (i.e. they have a very short height for their age). Wasting is an indicator of acute malnutrition and it is usually the result of acute or short-term insufficient food intake often combined with frequent illness. It results the child to be dangerously thin (i.e. they have a very low weight for their height). However, weight for-age is inadequate indicator for monitoring child growth beyond pre-school years due to its inability to distinguish between relative height and body mass; therefore, BMI-for-age is recommended by the WHO and CDC to assess thinness/wasting in school-aged children and adolescents (6). Underweight is a composite of both acute and chronic malnutrition. A child can be underweight for his/her age because he or she is stunted, wasted, or both.

The concept of nutrition and its manifestation as malnutrition, involves complex processes at multiple levels, from individual to the household to the community to the national and international levels. Besides poverty, there are other factors that directly or indirectly affect the nutritional status of children (7). Within the household, conditions such as food security, clean water, safe sanitation facilities, hygiene practices, maternal care practices and access to health services can have an impact overall on the nutrition situation(8).

School going children are the future generation of any country and their nutritional needs are critical for the wellbeing of society. They are one of the most vulnerable groups for malnutrition and its consequences, because it is the dynamic period of physical growth and mental development. In Ethiopian context focusing on school age children is particularly pertinent as this age group represent more than 30% of total the population (9).

1.2. Statement of the Problem

Malnutrition is the most prevalent public health problem in the world today. It affects millions of people around the world especially in developing countries (10). Malnutrition, particularly in children, is a vice locked around humanity, preventing individuals and even whole societies from achieving their full potential (11).

In the world today there are 925 million undernourished people(12). Of the nearly 1.9 billion children in the developing world, 31% are stunted (13). Despite the continued progress in all developing countries, it is still predicted that there will be 128-155 million underweight children by the year 2020 with 35% of these children to be from sub-Saharan Africa (14). Globally, malnutrition among school age children is becoming a major public health concern. More than 200 million school age children are stunted and underweight and if no action is taken at this rate, about 1 billion school children will be growing up by 2020 with impaired physical and mental development (15-16).

Ethiopia is listed under poorest health status related to other low-income countries, the poor health status of the country largely attributed to potentially preventable infectious diseases and malnutrition. That is way malnutrition is a defining characteristic of Ethiopia for much of the outside world. Just under half (47%) of Ethiopia children under 5 experience chronic malnutrition resulting in stunting and 35% resulting in underweight; these figures are among the highest in sub-Saharan Africa and the world too (17). Furthermore the level of under-nutrition among under 5 children in Somali Region; Stunting, wasting and underweight are at 33.0%, 22.2%, and 33.5% respectively; is among the highest in the country (18).

Malnutrition is common in all population groups and it is an underlying factor in many diseases in both children and adults, and it affects physical growth, morbidity, mortality, cognitive development, reproduction, physical work capacity and risks for several adulthood chronic diseases and also it contributes greatly to the disability-adjusted life years (DALYs) worldwide (19). Malnutrition accounts for 11 percent of the global burden of disease (20). It attribute for more than one third of the 7.6 million child deaths each year before their fifth birthday, making it the leading cause of child death and it remains a major public health problem worldwide especially in developing countries (10,21). Nearly 12 million children, who die each year in

developing countries mainly from preventable causes, the deaths of over six million or 55%, are either directly or indirectly attributed to malnutrition (22).

The national development vision of Ethiopia will rely on adequate human resources and will only be realized if the children being conceived and born today are given the opportunity to live to their full potential. If not addressed now malnutrition has enormous consequences for the country but the enormous consequences of malnutrition are often not appreciated because they are hidden. Usually there are no obvious signs, and the victims themselves are silent and not aware of the problem, as a result not enough attention is paid to malnutrition. Malnutrition kills more children than any other single disease: it is the underlying cause of over 50% of child deaths in Ethiopia. Only 1 in 5 malnutrition-related deaths is due to severe malnutrition whereas over 80% of deaths are due to mild and moderate malnutrition, which increase the risk of dying from diarrhea, malaria, tuberculosis, pneumonia and other communicable diseases (4).

Improving nutrition contributes to productivity, economic development, and poverty reduction by improving physical work capacity, cognitive development, school performance, and health by reducing disease and mortality. Poor nutrition perpetuates the cycle of poverty and malnutrition through; direct losses in productivity from poor physical status and losses caused by disease linked with malnutrition; indirect losses from poor cognitive development and losses in schooling; and losses caused by increased health care costs. The economic costs of malnutrition are very high several billion dollars a year in terms of lost gross domestic product (GDP) and also it contributes greatly to the disability-adjusted life years worldwide (23-24).

According to many researches, poor nutritional status in primary school-age children are among the most common causes of low school enrolment, high absenteeism, early dropout and unsatisfactory classroom performance (25-26, 28).

When looking in to the contributing factors of malnutrition, it is a physical condition involving complex processes that results from the interaction of inadequate diet and infection at multiple levels. Factors that contribute to malnutrition are many and vary from area to area and in Ethiopia, this may be due to cultural and environmental factors as the country have a large number of ethnic groups whose food and dietary habits and practices are highly diversified. The prevalence of malnutrition in different regions of Ethiopia varies too. Moreover as there is a

difference in production, distribution and consumption of food in agrarian and pastoral societies we hypothesized that nutritional status of adolescents between pastoral and agro-pastoral communities have more likely to have a difference.

Despite the emergence of a number of advancements in areas of health and nutrition services in developing countries including Ethiopia, nutritional status of school children is not yet commonly included in health and nutrition surveys and an up-to-date overview of their nutritional status across the world is not available (28-29). The same situations also prevails in Ethiopia as they are not included in Ethiopian Demographic and Health Surveys (EDHS), which provide nutritional status data at national and regional level (20). Even the existing studies conducted on nutritional status of school children in Ethiopia and other parts of the world did not look on the pastoral and agro-pastoral area contexts.

Therefore, keeping this in view, the aim of the present study was to assess nutritional status and identify its associated factors among primary school children of pastoral and agro-pastoral communities of Meiso woreda, Shinile zone, Somali Regional State, Ethiopia.

CHAPTER TWO: LITERATURE REVIEW

Malnutrition is the most prevalent public health problem in the world today. It affects millions of people around the world especially in developing countries (10). Child malnutrition is among the most serious problem facing Ethiopia as the national development vision of the country depends on its younger generations (4,9).

Nutritional status of children is a manifestation of a host of factors including household access to food and distribution of this food within the household, availability and utilization of health services, and care provided to the child. There is a general consensus today that a complex set of causes determines malnutrition. Inadequate and/or inappropriate dietary intake and infectious diseases are the immediate direct causes, while these are related to a number of determinant factors such as insufficient access to food, child care, water supply and environmental sanitation which are underlying causes. Political, cultural, religious, economic and social system including women's status in the society is considered to be the basic factors(6,30,31). Poor growth is attributable to a range of factors closely linked to overall standards of living and the ability of populations to meet their basic needs, such as access to food, housing and health care. Children who suffer from growth retardation as result of poor diets and /or recurrent infections tend to have increased numbers of severe diarrhea episodes and heightened susceptibility to certain infectious disease. There is an association between increasing severity of Anthropometric deficits and mortality, and a substantial contribution is made by all degrees of malnutrition to child mortality (32-33).

2.1. Prevalence of Malnutrition

A nationwide survey on a total of 7572 children in all 11 regions of Ethiopia, on health and nutrition of schoolchildren indicated that 22.3% were short for age (stunting) and 23.1% thin for age (thinness) (34).

A cross-sectional study conducted on a total of 358 children from four primary schools in Adama town, eastern Ethiopia from 19 December 2007 to 24 February 2008 showed that the overall prevalence of malnutrition was 21.2% and out of the studied school children, 12.6%, 1.4% and 7.2% were stunted, wasted and underweight, respectively(35). A cross sectional study conducted

on nutritional status, intestinal parasite infection and allergy from January–February 2008 on a total of 405 children in two elementary schools in Gondar, Ethiopia indicated that the overall prevalence of underweight, stunting and thinness/ wasting was 15.1%, 25.2%, 8.9%, respectively (37). An institutional and community based cross sectional study conducted in Fogera District, Northwest Ethiopia from June to December, 2012 on Malnutrition and its Correlates among 790 rural primary school children indicated that prevalence of stunting, underweight and thinness were 30.7%, 59.7% and 37.2% respectively. Those children who were found to be both stunted and underweight were only 1.01% (38). In another cross-sectional study at Meseret Elementary School in Gondar town, Northwest Ethiopia with 100 sample size of children, on a study of micronutrient levels and nutritional status of school children indicated the prevalence of stunting, underweight and wasting was 23%, 21%, and 11% respectively(39). However, none of these studies see the context of pastoral and agro-pastoral areas of the country.

A descriptive cross-sectional study conducted in peri-urban slums in Nairobi Kenya among school age children indicated that 30.2% were stunted, 14.9% underweight and 4.5% wasted (41). However these studies did not use the recommended indicator, BMI-for-age, to assess thinness/wasting rather it uses weight for-age which is inadequate indicator for monitoring of child growth beyond pre-school years due to its inability to distinguish between relative height and body mass.

A study conducted in Kumi district, in Eastern Uganda on school children aged 9–15 years in 2006–2007 revealed that 8.7%, 13% and 10.1% were stunted, underweight and thin respectively (43). A cross-sectional study conducted in the Atwima-Nwabiagya district of the Ashanti region of Ghanaian upper primary school pupils (9 to 17years), among the surveyed 120 children the prevalence of stunting and underweight were 56.7% and 45.8%, respectively(44).

2.2. Factors Associated with Malnutrition

Study conducted in Pakistan in 2002 found that malnutrition was more commonly observed in larger families (42). A community-based cross-sectional study conducted from 2010 adolescents enrolled in the second round of the five-year longitudinal study of adolescents in Jimma zone, South west Ethiopia showed household size were negatively associated with the Height for Age z-score while household income were positively associated with Height for Age z-score and

positively associated with BMI for Age z-score but the relationship was not statistically significant (45).

A cross-sectional study done in school children from Iseyin area of Oyo State, Nigeria, was malnutrition increases with the age of the child. A cross-sectional study conducted in school children from the capital, Baghdad, Iraq revealed the progression of stunting with increasing age(48). Study conducted in Uganda indicated that the level of nutritional status increases with increasing age of child (43). A study among school children in Uganda revealed that the prevalence rates were significantly higher among males compared to the females (43). Gender differential in the study of nutritional status of children in the less developed countries has frequently reported that boys were favored in that they were breast-fed longer, received better quality diet, child care time, health treatment and had better nutritional status (49).

A cross sectional study conducted in Tigray, Ethiopia to assess nutritional status of rural adolescent girls showed that lack of latrine facilities was significantly associated with stunting and thinness. Age was also strong predictor of stunting and thinness (50).

A cross-sectional study was carried out to assess the malnutrition and some socio-economic related factors among primary school children in north of Iran in 2010 showed that the risk of malnutrition in low economic group was 2.01 times greater than in good economic group and in students whose father were illiterate was 1.98 times more than students whose father were academic educated (51).

A study conducted in Shinile zone, somali region Ethiopia on 6-36 month children by Save the children UK reveled as there was higher prevalence of stunting in agro pastoral than pastoral communities and this difference showed significant association (47).

A study conducted in rural area of anti-atlas, Morocco total of 162 children (64 boys and 98 girls), aged 12 - 15 years revealed that child age, illiteracy of the mother was determinant factors with wasting. Stunting was significantly associated with gender and parents' employment (52).

A study conducted in Jimma zone, Ethiopia in adolescents age 13- 17 years on the effect of food insecurity on linear growth of adolescents showed that food insecurity is negatively associated with the linear growth of adolescents, especially on girls (54) .

2.3. Conceptual Framework

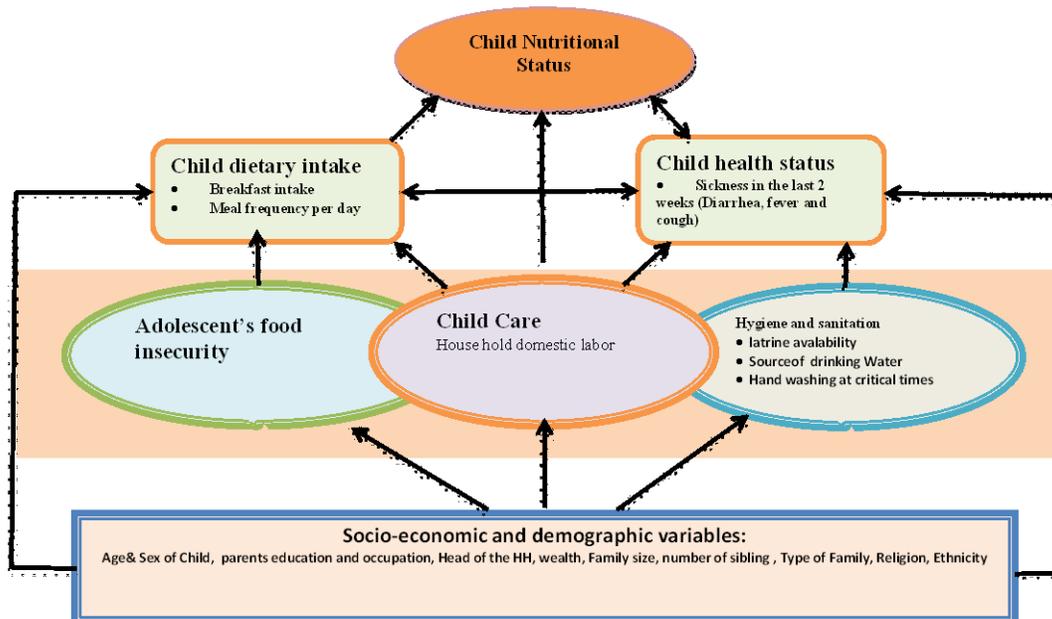


Figure 1: Conceptual framework developed after reviewing different literatures of similar studies on factors affecting nutritional status of school children.

2.4. Significance of the Study

School children are often overlooked from health and nutrition surveys and hardly thought of as at risk population. However, consequences of malnutrition increases many fold in this age. Even the existing handful studies conducted on nutritional status of older children and adolescents in Ethiopia and other parts of the world did not look on the pastoral and agro-pastoral area contexts. In addition in this particular study area also there is no information regarding nutritional status and its associated factors among school children. Therefore this study could help to close the research gap in the contexts of pastoral and agro-pastoral communities.

The National Nutrition Program(NNP) of Ethiopia has already put in place programs with set of targets that directly and indirectly contribute to the reduction of under-nutrition towards the realization of optimal nutritional status for all Ethiopian citizens by interventions like, nutritional assessment for adolescents at community, school and health facility level. Therefore this study could support the successful implementation of the program.

Helps to forward appropriate recommendation to responsible bodies based on the study findings so as to handle the predictors of malnutrition in a feasible way.

The findings of this study could provide information for the different stakeholders; planners, programmers, researchers and policymakers for designing appropriate interventions to improve the nutritional status of school children in the study area.

CHAPTER THREE: OBJECTIVES

3.1. General Objective

- To assess and compare nutritional Status and its associated factors among School age children of pastoral and agro-Pastoral communities of Meiso woreda, Shinile zone, Somali Regional State, Ethiopia, from March to April 2014.

3.2. Specific Objectives

- To determine the prevalence of malnutrition among school children of pastoral and agro-pastoral communities.
- To compare nutritional status of school children between pastoral and agro pastorals communities.
- To identify factors associated with nutritional status of school children of pastoral and agro-pastoral communities.

CHAPTER FOUR: METHODS AND MATERIALS

4.1. Study Area and Period

The study was collected from March 10 to April 11, 2014 at Meiso woreda which is located in Shinile zone of Somali Regional State. The woreda is located at a distance of 327 kilometer from capital of the region, Jigjiga town and at 312 kilometer from the capital of the country, Addis Ababa. The woreda is typically rural area which is organized into 10 main administrative kebeles and it is bordering with Afdem woreda, Afar and Oromia zonal administrations. The woreda is characterized by pastoral and agro-pastoral livestock production system and the livelihood of the society is entirely depending on livestock and livestock products. Agro- ecologically the woreda is divided in to dry mid highland, semi-arid, and arid zones. The woreda has an estimated total population of 85,570 (47,589 males and 37,981 females) in 2013 from 2007 population projection. In Meiso woreda, the age structure of the population is typical as other wored as of the region, with 44.14% of the population under the age of 15 years; Children under the age of five years are 17.45%. A large proportion of women (22.85%) are in the reproductive age group (15-49 years).

In the woreda the total number of primary schools in the 2013 academic year was eleven (six schools with grade 1-6 and five full cycle primary schools with grade 1-8) and one general and upper secondary school (9-12 grades). The total numbers of school age children is estimated to be 20,218 (11,243 male and 8,974 female). In the 2006/7 academic year, a total of 6700 (4,550 male and 2150 female) children have been enrolled in all schools. Under the woreda health office there are three health centers and ten health posts which gives health care delivery to the people. But the existing health facilities also lack the necessary medical supplies, equipment, pharmaceuticals and even some are nonfunctional which further aggravate and create serious impact on the health care delivery. The poor health status of the woreda, just like the country's, largely attributed to potentially preventable infectious diseases and malnutrition. Acute febrile illness, diarrhea, pneumonia and malnutrition cases are the leading causes of outpatients, admissions and deaths in the woreda.

In Meiso woreda almost there is no road infrastructure which connects the kebeles with each other and even the existing ones are seasonal roads this is for one reason because of its bad topographical features.

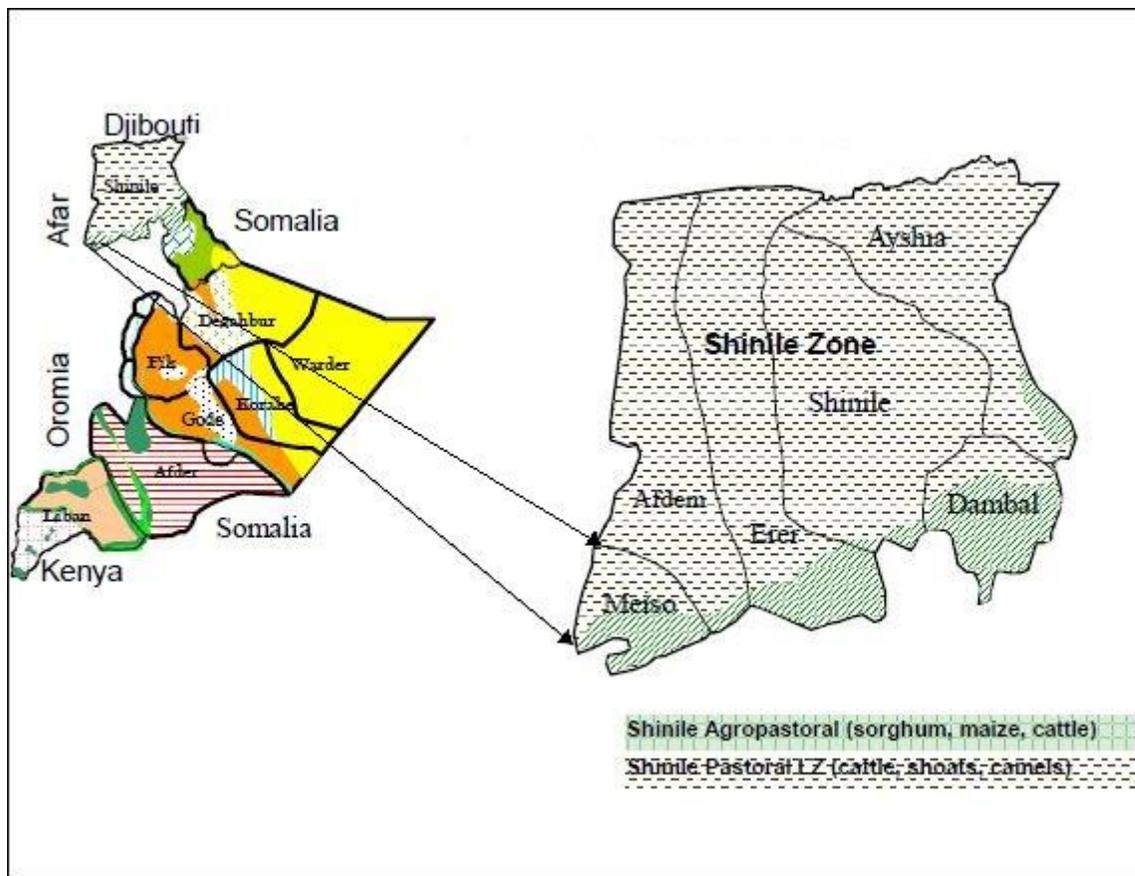


Figure 2: Map of the study area

4.2. Study Design

School based comparative cross sectional study design was employed.

4.3. Population

4.3.1. Source Population

- All grade 4 to 8 primary school children in Meiso woreda.

4.3.2. Study Population

- All sampled students who were attending grade 4 to 8 regular primary school in Meiso woreda, who fulfill the inclusion criteria.

4.3.3. Inclusion and Exclusion Criteria:

- All adolescent students who were attending grade 4 to 8 regular primary school in the selected schools during sampling included in the study.
- Whereas students who were in age group less than 10 and greater than 18 years, obvious physical deformity as well as evidence of chronic illness and being out of school were excluded from the study.
- Only one child was allowed to participate in the study if they belong to the same family i.e. the one who was selected first at the time of sampling.

4.4. Sample Size Determination & Sampling Procedures

4.4.1. Sample size determination

To determine the required sample size, the formula for two-population proportion was used based on the assumption of the nationwide survey figure of wasting prevalence 23.1% in Ethiopia on school children (34) as a prevalence of wasting for agro-pastoral communities. To get larger sample size for comparison purpose between the two communities a 15% wasting prevalence gap assumption was made so, the estimated prevalence of wasting for pastoralist community was 38.1%.

Therefore, 23.1% and 38.1% prevalence of wasting was used to calculate the required sample size, with a 95% confidence level, power of 80%, and a design effect of 2 to adjust for multi-stage sampling techniques was used.

As the population size of the two communities nearly the same an equal sample size assumption was made to calculate the sample size.

$$n_1 = n_2 = \frac{[P_1(1 - P_1) + P_2(1 - P_2)](Z_{1-\frac{\alpha}{2}} + Z_{1-\beta})^2}{(P_1 - P_2)^2}$$

Where:

n_1 = required sample size from pastoral communities

n_2 = required sample size from agro-pastoral communities

D = design effect = 2

P_1 = (0.381) estimated prevalence of wasting in pastoral communities

P_2 = (0.231) estimated prevalence of wasting in agro-pastoral communities

α = level of significance (0.05), $Z_{1-\alpha/2}$ = 1.960;

β = (.20), $1 - \beta$ = power of the study = 80%, $Z_{1-\beta}$ = 0.84

Inserting these figures in Epi INFO Software gave us 323 of sample sizes. Multiplying this figure with a design effect of 2 for the multi stage sampling technique used gave 646 and a 10% contingency was added and it gave a final sample size of 710. Therefore the final sample size for each community was 355.

4.4.2. Sampling Procedure

A multistage sampling technique was used. At different stages stratified, simple random sampling (SRS), proportion allocation to size and systematic random sampling methods were used.

There were five full cycle primary schools (grade 1 to 8) in the woreda; the four schools were included in the study. First by stratifying the schools in to pastoral and agro-pastoral community schools then by simple random sampling the four schools were selected then proportion allocation to their size was given for each school then finally the study participants were recruited by using systematic random sampling technique based on proportion allocation to size (PAS) to their grade level.

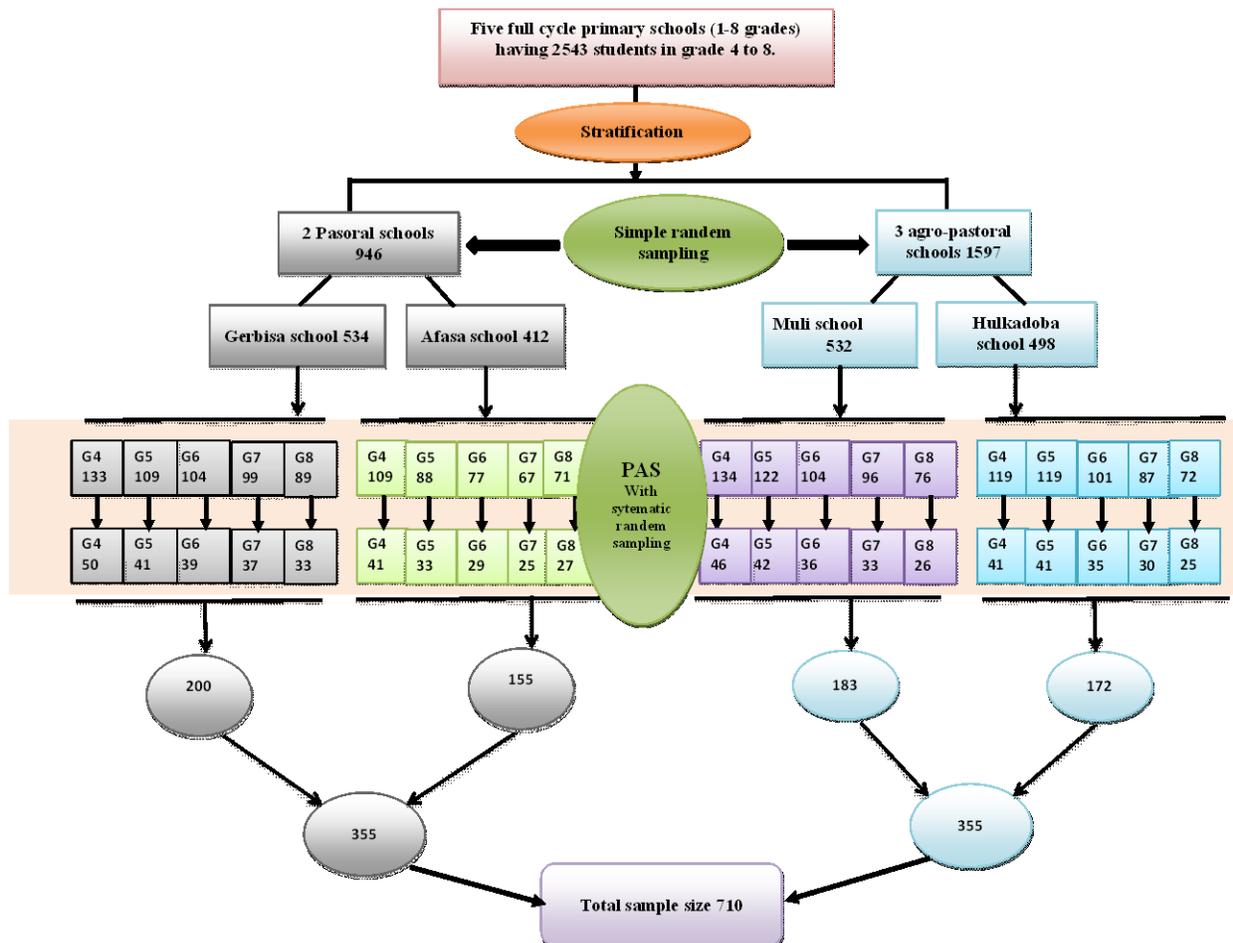


Figure 3: Schematic Presentation of Sampling Procedures

4.5. Study Variables

4.5.1. Dependent variable

Malnutrition (Stunting and thinness)

4.5.2. Independent variables

Socio economic and demographic factors: Age & Sex of Child, Parents education level & occupation, Head of the HH, family size, type of family, number of siblings, religion, ethnicity, wealth, place of residence.

Health status: Sickness in the last 2 weeks and the type of illness (Diarrhea, fever, cough and others)

Feeding practice: breakfast intake, meal frequency per day, adolescent food insecurity

Environmental factors: Source of drinking water, availability of latrine at home, Hand washing practice at critical times.

Caring practices: Child domestic work load

4.6. Data Collection Procedure and Technique

4.6.1. Data collection procedure

A structured questionnaire was used to assess the nutritional Status and its associated factors among school children of pastoral and agro-pastoral communities of Meiso woreda. The questionnaire was developed after reviewing different literatures of similar studies and it incorporated socio-economic and demographic, environmental factors, feeding practice, food insecurity experiences items and adolescents domestic work load which may contribute to malnutrition of school children in the study areas.

Eight nurses who can speak Somali language fluently participated in the data collection and two BSc holder health professionals supervised the data collectors and monitor the data collection process. In addition the principal investigator was also involved in coordination, supervision and monitoring of the overall activities.

Data were collected from the students through face to face interview technique. Data on the nutritional status of school children for two indices, namely height-for-age and BMI-for-age taking age and sex into consideration was collected. Weight measurement was taken using a well calibrated Seca digital scale to the nearest 0.1kg and height measuring board with a moveable headboard to the nearest 0.1 cm. The subjects' height was measured barefoot. Each subject was asked to stand on the flat surface, with weight distributed evenly on both feet, heels together against the stadiometer and the head positioned so that the line of vision was perpendicular to the body. The arms hanging freely to the sides, and the head, back, buttocks and heels were in contact to the measuring rod. The moveable headboard was brought on to the topmost point on the head with sufficient pressure to compress the hairs. To reduce the possible recall bias about the age of the school children school age records was used.

Adolescent food insecurity was measured using a four item index adopted from household food security questionnaires used in developing countries (36). Briefly, adolescents were asked whether in the last three months they (1) had ever worried about having enough food, (2) had to reduce food intake because of shortages of food or money to buy food, (3) had to go without having eaten because of shortage of food or money to buy food and (4) had to ask outside the home for food because of shortage of food or money to buy food. A “Yes” response to any of the food security questions was labeled to have score of “1” and “No” was labeled to have score “0”. The values were summed to produce a food insecurity index. The index of food insecurity is defined as the number of items with a positive answer. The index was dichotomized as “food insecure” for adolescents having a value of 1 and above and “food secure” for those who had a value of 0. The index has high internal consistency (Cronbach’s Alpha=0.82). which is above the cut off for reliability (46).

Household wealth was assessed with ownership of assets items containing animal asset, ownership of house, and farming land that are commonly used as an indication of wealth status in the study area. After Principal component analysis was done and then converted into tertiles coded as “higher”, “medium” and “lower”

4.6.2. Data quality control

To ensure quality of data, the questionnaire was prepared in English and translated to Somali local language and back to English to keep the consistency and reliability of the questions among data collectors. Two days training was given for the data collectors and supervisors on basic data collection skills such as how to obtain oral consent, interview techniques, how to complete the questionnaires, and how to take anthropometric measurements.

Pre testing of questionnaire were done on 20 primary school students from those not selected schools, 10 from pastoral communities and 10 from agro pastoral schools to ensure the reliability of the instrument prior to the actual data collection and based on the findings corrective measures was taken.

Supervision was carried out on daily basis by principal investigator and supervisors to assure the completeness, accuracy and clarity of the collected data.

The weighing scale was carefully handled and periodically calibrated with the help of 2 kg weight iron bar after weighing 20 subjects. To avoid variability among the data collectors, the same measurement was employed for a given anthropometric measurement.

4.7. Data Processing and Analysis

Data were checked for completeness and consistency and then coded and entered in to EpiData version 3.4 and exported to SPSS version 20.0 for analysis. Before analysis the entered data were cleaned, recoded and explored for checking of outliers and missing values.

The anthropometric indices relative to the new World Health Organization child growth references was calculated using the WHO AnthroPlus software version 1.0.4.

Descriptive statistics such as frequencies, percentages and summary statistics was used to summarize and present the essential features using visual data displays like tables and figures. Bivariate logistic regression analysis was done to examine association of each independent variable with the outcome variable. Those variables with p-value less than 0.05 in bivariate analysis were entered to multivariable analysis by backward stepwise method. Goodness-of-fit of the models was assessed using Hosmer and Lemeshow goodness of fit tests. Multicollinearity between predictor variables was checked using variance inflation factor (VIF); and multivariable regression to control for confounding was done. Finally, those variables with p-values than 0.05 at 95% confidence interval in multivariable analyses were considered statistically significant and used to determine the independent predictors of malnutrition. Adjusted Odds ratio (OR) with 95% CI was used to show the strength of association.

4.8. Operational Definitions

Malnutrition /under nutrition: those children classified or diagnosed as having stunting, wasting/thinness or underweight according to WHO child growth standard.

Chronic malnutrition (stunting): reflects long-term cumulative effects of inadequate nutrition and health. It refers to low height-for-age < -2 SD of median value of the NCHS/WHO international growth reference(55).

Acute malnutrition (Wasting): A nutritional deficit state of recent onset related to sudden food deprivation or mal-absorption or poor utilization of nutrients which results in rapid weight loss. It refers to low BMI-for-age (BAZ) < -2 SD of the median value of the national center for health statistics (NCHS/WHO) international growth reference(55).

Pastoralist community: communities those are practicing of herding as the primary economic activity of their family income.

Agro-pastoralist community: communities those are practicing both crops production and herding as their primary family income economic activity.

Past episode of diarrhea: school children who had three or more loose stool in 24 hours in the past two weeks from the date of survey.

Food security: is defined as the situation when all people, at all times, have physical and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life (12).

4.9. Ethical Consideration

Ethical clearance was obtained from the Institutional Review Board of Jimma University (Ethiopia). Supportive letters was obtained from the department of Epidemiology to Meiso woreda administration and to Somali Regional health Bureau. Permission was obtained from all the concerned bodies; regional health bureau, Meiso woreda administration, Woreda health office, educational office and from the respective school directors.

A written information and consent form was sent for parents/caregivers a week before data collection by the selected study participants. After obtaining signed consent from their parents/caregivers and an informed verbal consent was also obtained from each study subjects before commencing the study. Privacy of students was kept during anthropometric measurements. In addition, confidentiality of the information was insured.

4.10. Dissemination Plan

The general objective of the study is to assess the nutritional status of primary school children and its associated risk factors. The information generated will be used to design specific nutrition program for school children in the study area. Hence, dissemination of the study results is imperative. To this effect, the results of the study primarily will be presented to Jimma University College of Public Health and Medical Sciences School of Graduate Studies. In addition, it will also be shared and communicated with concerned governmental offices and developmental partners in Meiso woreda, Shinile zone Somali Regional state. Moreover, efforts will be made to publish the article in a peer reviewed journals and to make presentation in scientific conferences.

CHAPTER FIVE: RESULTS

Socio-demographic and economic characteristics

A total of 655 students from four primary schools two from pastoral and two from agro-pastoral communities were enrolled in this study, 324(49.5%) and 331(50.5%) students from pastoral and agro-pastoral communities respectively were participated with a response rate of 91.3% for pastoral and 93.2% for agro-pastoral communities respectively. Forty seven students were absent during data collection time and the remaining eight entries were flagged for incompleteness and inconsistency of the information. These records were deleted.

The participants from the four schools were recruited from grade 4 - grade 8. One hundred seventy five (54.0%) and 172(52.0%) of the study participants from pastoral and agro pastoral respectively were male. The mean age of pastoral community study participants was 12.89 (SD=1.87) and the mean age of agro-pastoral community study participants was 12.71 (SD=1.98).

In both communities, majority (99.1% in pastoral, 99.4% in agro-pastoral) of the study participants were Somali in ethnicity and at the sometimes in both communities, majority (97.5% in pastoral, 97.3% in agro-pastoral) were Muslim in region. One hundred sixty (49.4%) and 182(55.0%) of the participants live within family size of greater than five in pastoral and agro-pastoral communities respectively.

Regarding the sex of the head of the household 318(98.1) and 317(95.8) were male in pastoral and agro-pastoral communities respectively. Two hundred eighty (86.4%) and 305(92.1%) of families were monogamous in pastoral and agro-pastoral communities respectively.

Concerning the educational status of mothers and fathers 316(97.5%) and 285(88.0%) in pastoral and 317(95.8%) and 269(81.3%) in agro-pastoral communities were unable to read and write.

In both communities, majorities (93.2% in pastoral, 88.8% in agro-pastoral) of the mothers were housewives and majorities (79.9% in pastoral, 74.0% in agro-pastoral) of the fathers were farmers.

The main staple food of pastoral communities were sorghum (38.0%), rice (25.0%), wheat (19.1%), maize (13.0%) where as the main staple food of agro-pastoral communities were sorghum (44.7%), wheat (23.9%), maize (22.0%).

Table 1: Socio-demographic/economic characteristics of the study participants in pastoral and agro-pastoral communities of Meiso Woreda, Shinile Zone, Somali Region, March to April 2014.

Characteristics (N=655)		Pastoral (%)	Agro-pastorals	Total N (%)
		(n=324)	(n = 331)	
		N (%)	N (%)	
Sex of the child	Male	175 (54.0)	172 (52.0)	347 (53.0)
	Female	149 (46.0)	159 (48.0)	308 (47.0)
Age category	10-14	246 (75.9)	258 (77.9)	504 (76.9)
	15-18	78 (24.1)	73 (22.1)	151 (23.1)
Grade level	4 th	88 (27.2)	79 (23.9)	164 (25.0)
	5 th	69 (21.3)	82 (24.8)	151 (23.0)
	6 th	61 (18.8)	65 (19.6)	126 (19.2)
	7 th	53 (16.4)	58 (17.5)	111 (16.9)
	8 th	53 (16.4)	47 (14.2)	100 (15.3)
Religion	Muslim	321 (99.1)	329 (99.4)	650 (99.2)
	Orthodox	3 (0.9)	2 (0.6)	5 (0.8)
Ethnicity	Somali	316 (97.5)	322 (97.3)	638 (97.4)
	Others	8 (2.5)	9 (2.7)	17 (2.6)
Number of sibling	≤3	179 (55.2)	157 (47.4)	336 (51.3)
	>3	145 (44.8)	174 (52.6)	319 (48.7)
Family size	≤5	164 (50.6)	149 (45.0)	313 (47.8)
	>5	160 (49.4)	182 (55.0)	342 (52.2)
Sex of Head of the HH	Male	318 (98.1)	317 (95.8)	635 (96.9)
	Female	6 (1.9)	14 (4.2)	20 (3.1)
Type of Family	Monogamy	280 (86.4)	305 (92.1)	585 (89.3)
	Polygamy	44 (13.6)	26 (7.9)	70 (10.7)
Mother's educational status	Can't read and write	316 (97.5)	317 (95.8)	633 (96.6)
	Can read and write	8 (2.5)	14 (4.2)	22 (3.4)
Father's educational status	Can't read and write	285 (88.0)	269 (81.3)	554 (84.6)
	Can read and write	39 (12.0)	62 (18.7)	101 (15.4)
Mother's main Occupation	House wife	302 (93.2)	294 (88.8)	596 (91.0)
	Others	22 (6.8)	37 (11.2)	59 (9.0)
Father's main Occupation	Farmer	259 (79.9)	245 (74.0)	504 (76.9)
	Merchant/trade	48 (14.8)	50 (15.1)	98 (15.0)
	Others	17 (5.2)	36 (10.9)	53 (8.1)
Main staple food of the area	Sorghum	123 (38.0)	148 (44.7)	271 (41.4)
	Wheat	62 (19.1)	79 (23.9)	141 (21.5)
	Maize	42 (13.0)	73 (22.0)	115 (17.6)

Household Ownership of assets	Rice	81 (25.0)	14 (4.2)	95 (14.5)
	Others	16 (4.9)	17 (5.1)	33 (5.0)
	Shoats	249 (76.9)	129 (39.0)	378 (57.7)
	Cattles	90 (27.8)	116 (35.0)	206 (31.5)
	Camels	168 (51.9)	96 (29.0)	264 (40.3)
	Donkey	103 (31.8)	41 (12.4)	144 (22)
	Oxen	7 (2.2)	33 (10.0)	40 (6.1)
	House	322 (99.4)	326 (98.5)	648 (98.9)
	Land	31 (9.6)	225 (68.0)	256 (39.1)
Wealth tertiles	Higher	108 (33.3)	110 (33.2)	218 (33.3)
	Middle	109 (33.6)	111 (33.5)	220 (33.6)
	Lower	107 (33.0)	110 (33.2)	217 (33.1)

Hygiene, sanitation and child health status

Concerning the availability of latrine 135(41.7%) of households in pastoral community and 203(61.3%) in agro-pastoral communities have latrine in their compound. Majority (83.6%) of pastoral and majority (87.6%) of agro-pastoral communities get drinking water from protected source.

Regarding hand washing practice 27(8.3%) and 43(13.0%) of the students from pastoral and agro-pastoral communities respectively washed their hands with soap after the last toilet attendance and 49(15.1%) and 59(17.8%) of the students from pastoral and agro-pastoral communities respectively washed their hands with soap before the last meal they had before coming to school. One hundred (30.9%) from pastoral and 84(25.4%) of agro-pastoral community children reported sickness in the past two weeks before the survey was conducted. The most prevalent illnesses in pastoral communities was diarrhea 41(12.7%), cough 39 (12.0%) and fever 21(6.5%) while in the agro-pastoral community was cough 43 (13.0%), fever 36 (10.9%) and diarrhea 33 (10.0%).

Table 2: Hygiene, sanitation and health status of the study participants in pastoral and agro-pastoral communities of Meiso Woreda, Shinile Zone, Somali Region, March to April 2014.

Characteristics (N=655)		Pastoral community (n=324)	Agro-pastorals community (n = 331)	Total N (%)
		N (%)	N (%)	
Source of drinking water	Protected	271 (83.6)	290 (87.6)	561(85.6)
	Unprotected	53 (16.4)	41 (12.4)	94(14.4)
Availability of Latrine at home	Yes	135 (41.7)	203 (61.3)	338(51.6)
	No	189 (58.3)	128 (38.7)	317(48.4)
wash your hands with soap after toilet	Yes	27 (8.3)	43 (13.0)	70(10.7)
	No	297 (91.7)	288 (87.0)	585(89.3)
wash your hands with soap before meal	Yes	49 (15.1)	59 (17.8)	108(16.5)
	No	275 (84.9)	272 (82.2)	545(83.5)
sickness in the last two weeks	Yes	100 (30.9)	84 (25.4)	184(28.1)
	No	224 (69.1)	247 (74.6)	471(71.9)
Diarrhea illness	Yes	41 (12.7)	33 (10.0)	581(88.7)
	No	283 (87.3)	298 (90.0)	74(11.3)
Fever illness	Yes	21 (6.5)	36 (10.9)	57(8.7)
	No	303 (93.5)	295 (89.1)	598(91.3)
Cough illness	Yes	39 (12.0)	43 (13.0)	82(12.5)
	No	285 (88.0)	288 (87.0)	573(87.5)
Other illness	Yes	8 (2.5)	8 (2.4)	16(2.4)
	No	316 (97.5)	323 (97.6)	639(97.6)

Feeding practices and food insecurity of the adolescents

About 101(31.2%) and 62(18.7%) of the children from pastoral and agro-pastoral communities respectively reported that they did not have breakfast before coming to school. From pastoral community study participant 237(73.1%) and 87(26.9%) had got three or more meals per day and two meals per day most of the time at this time of the year respectively. Whereas the agro-pastoral community study participant 264(79.8%) and 67(20.2%) had got three or more meals per day and two or less than two meals per day most of the time at this time of the year respectively.

Table 3: Children’s food consumption, meal frequency per day and adolescent food insecurity in pastoral and agro-pastoral communities of Meiso Woreda, Shinile Zone, Somali Region, March to April 2014.

Characteristics (N=655)		Pastoral community	Agro-pastoral community	Total N (%)
		N (%)	N (%)	
Breakfast before coming to school	Yes	223 (68.8)	269 (81.3)	492(75.1)
	No	101 (31.2)	62 (18.7)	163(24.9)
Meals per day	≥3 times	237 (71.3)	264 (79.8)	501(76.5)
	2 times	87 (26.9)	67 (20.2)	154(23.5)
Adolescents food insecurity	Food secure	83 (25.6)	100 (30.2)	183(27.9)
	Food insecure	241 (74.40)	231 (69.8)	472(72.1)

Child caring practices

Child domestic workload was obtained by asking adolescents on how many days per week they were spent at least 1 hour on a variety of tasks like caring for animals, working on farm activities, fetching water and fuel, washing clothes, cooking, child caring, pounding or grinding grain and engaging in heavy labor tasks. The variable treated as continuous variable so the mean workload pastoral adolescents were 2.72 with standard Deviation of 1.99 while the mean workload agro-pastoral adolescents were 2.66 with standard Deviation of 1.90.

Nutritional status

As shown in Figure-4 the prevalence of stunting in the pastoral and the agro pastoral communities were 27(8.3%) and 48(14.5%) respectively, giving an overall prevalence of stunting as 75(11.5%). For simple comparison we did crosstabs test, the prevalence of stunting was significantly higher in agro pastoral than in pastoral community ($X^2= 6.14$; $P=0.013$). Eighty five (26.2%) of the 324 students in the pastoral community and 65 (19.6%) of the 331 students in the agro-pastoral communities were wasted, giving an overall prevalence of thinness/wasting as 22.6%. The prevalence of wasting was significantly higher in pastoral than in agro pastoral community ($X^2= 4.04$; $P=0.045$).

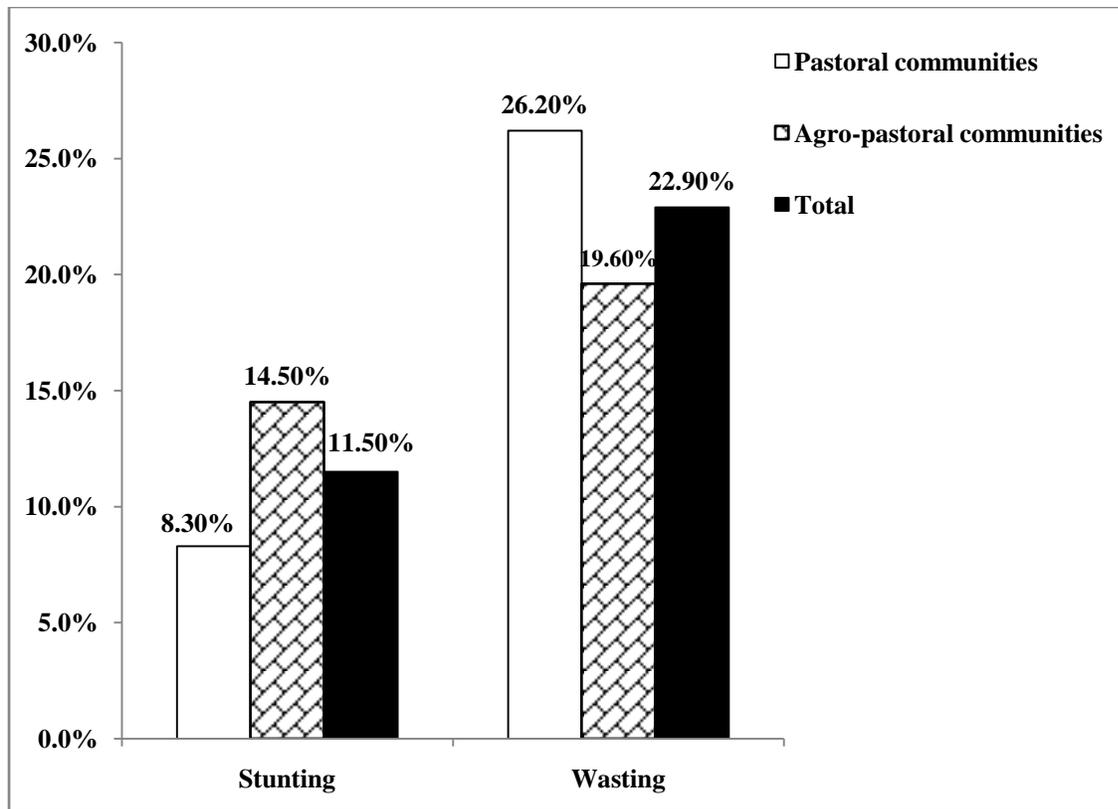


Figure 4: Prevalence of nutritional status among school children of pastoral and agro-pastoral

Determinants of Nutritional Status

Stunting and wasting

As bivariate analyses result showed in Table-4, there was an association ($p < 0.05$) between stunting with place of residence, sex, age, grade level, number of siblings, family size, source of drinking water, wealth tertiles, meals per day, cough illness, and adolescent food insecurity. However, factors found to have an association ($p < 0.05$) with thinness/wasting were place of residence, number of siblings, family size, main occupation of father, source of drinking water, availability of latrine, wealth tertiles, meals per day, hand washing after toilet, sickness in the last two weeks, diarrhea illness and adolescent food insecurity.

Table 4: Binary logistic regression for the nutritional status of school children of pastoral and agro-pastoral community of Meiso Woreda, Shinile Zone, Somali Region, March to April 2014.

Characteristics (N=655)		Stunting (75)					Thinness (150)				
		N	P-v	COR	95%CI		N	P-v	COR	95%CI	
Place of residence	Pastoral	27		1			85		1		
	Agro-pastoral	48	0.01	1.87	1.13	3.07	65	0.05	0.69	0.48	0.99
Sex of the child	Male	29		1			72		1		
	Female	46	0.01	1.93	1.18	3.15	78	0.16	1.30	0.90	1.87
Age category	10-14	30		1			115		1		
	15-18	45	0.00	6.71	4.04	11.14	35	0.93	1.02	0.66	1.57
Grade level	4 th	12		1			43		1		
	5 th	15	0.38	1.43	0.64	3.15	39	0.99	1.00	0.61	1.66
	6 th	16	0.12	1.88	0.86	4.13	28	0.49	0.82	0.48	1.42
	7 th	18	0.02	2.50	1.15	5.42	20	0.13	0.63	0.35	1.15
	8 th	14	0.07	2.10	0.93	4.75	20	0.28	0.72	0.40	1.31
Number of sibling	≤3	30		1			61		1		
	>3	45	0.04	1.68	1.03	2.73	89	0.00	1.74	1.21	2.53
Family size	≤5	25		1			53		1		
	>5	50	0.01	1.97	1.19	3.28	97	0.00	1.94	1.33	2.83
Sex of Head of the HH	Male	71		1			142		1		
	Female	4	0.23	1.99	0.65	6.11	8	0.07	2.32	0.93	5.77
Type of Family	Monogamy	68		1			133		1		
	Polygamy	6	0.43	0.70	0.29	1.68	15	0.76	0.91	0.50	1.66
Mother's education	Can't read and write	73		1			142		1		
	Can read and write	2	0.72	0.77	0.18	3.35	8	0.13	1.97	0.81	4.80
Father's education	Can't read and write	64		1			129		1		
	Can read and write	11	0.85	0.94	0.48	1.84	21	0.58	0.87	0.51	1.45
Main Occupation of mother	House wife	70		1			138		1		
	Others	5	0.45	0.70	0.27	1.80	12	0.62	0.85	0.44	1.64
Main Occupation of father	Farmer	59		1			115		1		
	Merchant	6	0.31	0.67	0.31	1.45	12	0.06	0.56	0.31	1.02
	Others	9	0.47	1.34	0.60	2.98	22	0.02	2.03	1.12	3.67
Source of drinking water	Protected	50		1			99		1		
	Unprotected	25	0.00	3.70	2.15	6.37	51	0.00	5.54	3.49	8.77
Availability	No	146		1			93		1		

of Latrine	Yes	212	0.51	0.85	0.53	1.38	57	0.00	0.49	0.34	0.71
Household Wealth (tertiles)	Higher	14			1		34		1		
	Middle	25	0.07	1.87	0.94	3.70	56	0.01	1.85	1.15	2.97
	Lower	36	0.00	2.90	1.52	5.55	60	0.00	2.07	1.29	3.31
Breakfast	No	22			1		46		1		
	Yes	53	0.35	0.77	0.46	1.32	104	0.06	0.68	0.46	1.02
Meals per day	≥3 times	45			1		100		1		
	2 times	30	0.00	2.45	1.48	4.05	50	0.00	1.93	1.29	2.88
Hand washing after toilet	No	343			1		143		1		
	Yes	29	0.06	0.32	0.10	1.04	7	0.01	0.34	0.15	0.77
Hands washing before meal	No	30			1		131		1		
	Yes	45	0.08	0.49	0.22	1.09	19	0.15	0.68	0.40	1.16
Sickness in the last two weeks	No	47			1		97		1		
	Yes	28	0.06	1.62	0.98	2.68	53	0.03	1.56	1.06	2.30
Diarrhea illness	No	63			1		117		1		
	Yes	12	0.18	1.59	0.81	3.11	33	0.00	3.19	1.93	5.27
Fever illness	No	66			1		135		1		
	Yes	9	0.29	1.51	0.71	3.22	15	0.52	1.23	0.66	2.28
Cough illness	No	57			1		126		1		
	Yes	18	0.00	2.55	1.41	4.59	24	0.14	1.47	0.87	2.46
Other illness	No	74			1		147		1		
	Yes	1	0.52	0.51	0.07	3.91	3	0.69	0.77	0.22	2.75
Adolescent food insecurity	Food secure	12			1		27		1		
	Food insecure	63	0.02	2.20	1.15	4.17	123	0.00	2.04	1.29	3.22
Number of days in a week the adolescent has to work for at least 1 hour ⁺		2.8 (1.8)	0.64	1.03	0.91	1.16	2.9 (1.9)	0.16	1.07	0.98	1.17

The bold values have a p-value<0.05

P-v means P-value

⁺Means with standard deviations in brackets are shown, unless otherwise indicated.

The multivariable analysis showed that, stunting was significantly associated with place of residence, sex, age, family size, source of drinking water, wealth tertiles and adolescent food insecurity (Table-5). While grade level, number of siblings, meals per day, and cough illness were not showed a significant association in multivariable analysis.

The likelihood of being stunted was nearly 3 times more likely in agro pastoral communities than that of pastoral communities (AOR: 2.52, CI: 1.36-4.67). Females were 2.4 times more likely to be stunted than males (AOR: 2.36, CI: 1.29-4.33). Individuals in the age range of 15-18 were nearly 11 times more likely to be stunted than those aged 10-14 (AOR: 10.85, CI: 4.82-24.41). The likelihood of being stunted was more likely among higher family size communities; 5 and more family members (AOR: 1.92, CI: 1.03-3.57). The likelihood of being stunted was 4 times more likely among individuals who used unprotected water source for drinking than the counterpart (AOR: 3.59, CI: 1.79-7.20). Those who were classified as lower household wealth tertile was 3 times more likely to be stunted than the higher tertile (AOR: 3.19, CI: 1.47-6.94). Those adolescents who are food insecure were nearly 3 times more likely to be stunted than food secured adolescents (AOR: 2.57, CI: 1.35-4.88).

Table 5: Multivariable logistic regression of factors associated with stunting of school children of pastoral and agro-pastoral community of Meiso Woreda, Shinile Zone, Somali Region, March to April 2014.

Characteristics (N=655)	Stunting (n=75 (11.5%)) N (%)	Crude			Adjusted			
		COR	95%CI	AOR	95%CI			
Place of residence	Pastoral	27 (8.3)			1			
	Agro-pastoral	48 (14.5)	1.87	1.13	3.07	2.52	1.36	4.67
Sex of the child	Male	29 (8.4)			1			
	Female	46 (14.9)	1.93	1.18	3.15	2.36	1.29	4.33
Age category	10-14	30 (6.0)			1			
	15-18	45 (29.8)	6.71	4.04	11.14	10.85	4.82	24.41
Grade level	4 th	12 (7.2)			1			
	5 th	15 (9.9)	1.43	0.64	3.15	2.04	0.83	5.03
	6 th	16 (12.7)	1.88	0.86	4.13	1.80	0.72	4.51
	7 th	18 (16.2)	2.50	1.15	5.42	0.92	0.33	2.59
	8 th	14 (14.0)	2.10	0.93	4.75	2.38	0.77	7.36
Number of sibling	≤3	30 (8.9)			1			
	>3	45 (14.1)	1.68	1.03	2.73	1.19	0.36	3.90
Family size	≤5	25 (8.0)			1			
	>5	50 (14.6)	1.97	1.19	3.28	1.92	1.03	3.57
Source of drinking water	Protected	50 (8.9)			1			
	Unprotected	25 (26.6)	3.70	2.15	6.37	3.59	1.79	7.20
Household Wealth (tertiles)	Higher	14 (6.4)			1			
	Middle	25 (11.4)	1.87	0.94	3.70	1.67	0.99	2.81
	Lower	36 (16.6)	2.90	1.52	5.55	3.19	1.47	6.94
Meals per day	≥3 times	45 (9.0)			1			

	2 times	30 (19.5)	2.45	1.48	4.05	1.24	0.47	3.28
Cough illness	No	57 (9.9)				1		
	Yes	18 (22.0)	2.55	1.41	4.59	2.00	0.96	4.12
Adolescent food insecurity	Food secure	12 (6.6)				1		
	Food insecure	63 (13.3)	2.20	1.15	4.17	2.57	1.35	4.88

The bold values have a p-value<0.05

The Hosmer and Lemeshow's goodness-of-fit test was found to be a chi-square of 9.93 with p-value of 0.27. Hence, the p-value was (>0.05) the model is good.

Moreover, a number of factors found to have an association with wasting in multivariable analysis. Family size, the source of drinking water, availability of latrine, household wealth tertiles, hand washing with soap after toilet, diarrhea illness and adolescent food insecurity were significantly associated with wasting. While, place of residence, number of siblings, main occupation of father, meals per day, sickness in the last two weeks were not showed a significant association in multivariable analysis.

The likelihood of being wasting was more likely among higher family size communities; 5 and more family members (AOR: 1.71 CI: 1.13 - 2.58). The likelihood of being thin/wasted was nearly 4 times more likely among individuals who used unprotected water source for drinking than the counterpart (AOR: 3.64, CI: 2.14-6.18). Those individuals who had latrine at home were less likely to be wasted than who do not have a latrine at home (AOR: 0.63, CI: 0.41-0.98). Those individuals who had hand washing practice after toilet was less likely to be wasted than whom do not (AOR: 0.18, CI: 0.04-0.860).The likelihood of being wasted was 3 times higher among who had experienced diarrhea in the last two weeks than who do not (AOR: 3.05, CI: 1.37-6.79).Those who were classified as Middle and lower household wealth tertile was 1.70 and 1.88 times more likely to be wasted than the higher tertile (AOR: 1.88, CI: 1.10-3.22), (AOR: 1.70, CI: 1.01-2.86) respectively. Those adolescents who are food insecure were nearly 2 times more likely to be wasted than food secured adolescents (AOR: 2.04, CI: 1.24 -3.34) (Table - 6).

Table 6: Multivariable logistic regression of factors associated with Thinness of school children of pastoral and agro-pastoral community of Meiso Woreda, Shinile Zone, Somali Region, March to April 2014.

Characteristics (N=655)		Thinness (n=150(22.9%))	Crude			Adjusted		
		N (%)	COR	95%CI	AOR	95%CI		
Place of residence	Pastoral	85 (26.2)				1		
	Agro-pastoral	65 (19.6)	0.69	0.48	0.99	0.83	0.54	1.28
Number of sibling	≤3	61 (18.2)				1		
	>3	89 (27.9)	1.74	1.21	2.53	1.11	0.42	2.92
Family size	≤5	53 (16.9)				1		
	>5	97 (28.4)	1.94	1.31	2.83	1.71	1.13	2.58
Main Occupation of father	Farmer	115 (23.0)				1		
	Merchant/trade	12 (14.3)	0.56	0.31	1.02	0.57	0.29	1.13
	Others	22 (37.7)	2.03	1.12	3.67	1.30	0.63	2.71
Source of drinking water	Protected	99 (17.6)				1		
	Unprotected	51 (54.3)	5.54	3.49	8.77	3.64	2.14	6.18
Availability of Latrine at home	No	93 (29.3)				1		
	Yes	57 (16.9)	0.49	0.34	0.71	0.63	0.41	0.98
Household Wealth (tertiles)	Higher	34 (15.6)				1		
	Middle	56 (25.5)	1.85	1.15	2.97	1.70	1.01	2.86
	Lower	60 (27.6)	2.07	1.29	3.31	1.88	1.10	3.22
Meals per day	≥3 times	100 (20.0)				1		
	2 times	50 (32.5)	1.93	1.29	2.88	1.56	0.99	2.47
Hand washing with soap after the last toilet	No	143 (24.4)				1		
	Yes	7 (10.0)	0.34	0.15	0.77	0.18	0.04	0.86
Sickness in the last two weeks	No	97 (20.6)				1		
	Yes	53 28.8	1.56	1.06	2.30	0.82	0.45	1.52
Diarrhea illness	No	117 (20.1)				1		
	Yes	33 (44.6)	3.19	1.93	5.27	3.05	1.37	6.79
Adolescent food insecurity	Food secure	27 (14.8)				1		
	Food insecure	123 (26.1)	2.04	1.29	3.22	2.04	1.24	3.34

The bold values have a p-value<0.05

Generally goodness-of-fit test model is good hence, the p- value was (>0.05).The Hosmer and Lemeshow's goodness-of-fit test was found to be a chi-square of 6.67with p-value of 0.57.

CHAPTER SIX: DISCUSSION

Stunting prevalence was found to be higher in agro pastoral as compared to pastoral communities 14.5% and 8.3% respectively. Meanwhile the prevalence of thinness was higher in pastoral community than agro-pastoral which was 26.2% and 19.6% respectively. These differences in nutritional status among pastoral and agro-pastoral communities showed an association ($p < 0.05$). But, after controlling for other confounding variables place of residence showed a significant association with only stunting. The likelihood of being stunted was more in agro pastoral communities than that of pastoral communities (AOR: 2.52, CI: 1.36-4.67). As there has not been any research directly comparable to the present study among children of similar age groups. However it is in agreement with a study conducted in Shinile zone somali region Ethiopia on 6-36 month children (47). It is thus most likely due to the differences in their main staple foods.

The overall prevalence of stunting and wasting was 11.5% and 22.6%. The overall prevalence of stunting was lower than from the studies conducted in Northwest Ethiopia 15%-30.7% in different areas (37-39) and another study conducted in Ashanti region of Ghana which was 56.7% (44) the difference with these studies could be due to the differences in their animal product foods consumption and the food culture difference.

The overall prevalence of thinness 22.6% was much higher than the studies conducted in Adama town Ethiopia which was 1.4% (35), Gondar Ethiopia which was 8.9% (37), study conducted in Kenya which was 4.5% (41) and another study conducted in Eastern Uganda which was 10.1% (43) Since, acute malnutrition (wasting) reflects the nutritional deficiency of recent incidence caused by inadequate food intake and infections (6). The highest value could be attributed as the study was conducted at dry season March – April where pasture and water could be a problem and it may indicate that food shortage and infection were the major problem during the period of survey.

Gender differential in the study of nutritional status of children in the less developed countries has frequently reported that boys were favored in that they were breast-fed longer, received better quality diet, child care time, health treatment and had better nutritional status (49). The findings in this study showed significant difference of stunting with sex. Females were 2.4 times more likely to be stunted than males (AOR: 2.36, CI: 1.29-4.33). It was not in agreement with

other studies conducted in Morocco (52) where females were less likely to be stunted than males (AOR: 0.41, CI: 0.94 -0.03) and in Uganda (43) which showed that boys are more vulnerable to malnutrition compared to girls (AOR: 0.96, CI: 0.56–1.66).

The finding showed stunting was significantly associated with age; it showed that 15-18 age adolescents had higher odds to be stunted compared with 10-14 age groups. Many studies show that the severity and prevalence of stunting have been found to increase with age, with older children diverging further from the reference medians for height until puberty (45).

It was in agreement with the study done Iseyin area of Oyo State, Nigeria (40), Baghdad Iraq (48) and a study conducted in Uganda (43) were malnutrition increases with the increasing age of the child. The possible explanation is that the older children may be stunted because they were not got the required nutrient intake during adolescents' faster growth period. It is, therefore, important that the nutrient intake during this period must match the requirements for growth; otherwise there will face growth retardation.

While it was expected that parental occupation appears to be one of the household factors that can influence the nutritional status of children, in this study, both mothers and fathers occupational status did not show significant difference on their children's nutritional status. This may be due to the fact that almost all mothers were housewife and the majority of father's occupation was farmers. This result has made it difficult to make a comparison between type's parental occupation and nutritional status or nutritional status and parents who have occupation or not. In addition, since the information was obtained from children's it may have limitations.

Stunting and wasting was more likely among higher family size groups and it was in line with a study done in Pakistan 2002 (42) and Jimma Ethiopia (45). Their income is limited; if family have many children so year by year there are more members to share on limited income that the poor are permitted to use.

Those who were classified as lower household wealth tertile was 3.19 times more likely to be stunted than the higher tertile groups (AOR: 3.19, CI: 1.47-6.94). This is in agreement with a study done Jimma Ethiopia (45) were household income were positively associated with Height for Age z-score.

Wasting was more likely among the middle and lower household wealth tertile groups than the higher wealth classified groups and it is in agreement with a study done in Jimma Ethiopia (45) where household income show a positive association with BMI for age z score but the relationship was not statistically significant.

Those adolescents who were food insecure were nearly 3 times more likely to be stunted than food secured adolescents (AOR: 2.57, CI: 1.35-4.88). This may show the presence of chronic adolescent food insecurity in that area since stunting shows chronic malnutrition. This is in line with study done in Jimma Ethiopia (54) where Food insecurity is negatively associated with the linear growth of adolescents.

Wasting is an indicator of acute malnutrition and it is usually the result of acute or short-term insufficient food intake often combined with frequent illness (6). The result of this study revealed the above ideas, those adolescents who were food insecure were 2 times more likely to be wasted than food secured adolescents (AOR: 2.04, CI: 1.24 – 3.34).

The likelihood of being stunted (AOR: 3.59, CI: 1.79-7.20) and wasting (AOR: 3.64, CI: 2.14-6.18) was nearly 4 times more likely among individuals who used unprotected water source for drinking than the counterpart. This finding of the study supports the idea: unfavorable environment such as inadequate water and sanitation can increase the probability of infectious diseases and indirectly cause certain types of malnutrition. Those individuals who had latrine at home were less likely to be wasted than who do not have latrine at home (AOR: 0.63, CI: 0.41-0.98). It is consistent with the study done in Tigray Northern Ethiopia (50).

It is known that infection and under nutrition is interrelated. The finding of this study showed that the likelihood of being wasted was 3 times higher among individuals who had experienced diarrhea in the last two weeks than who do not (AOR: 3.05, CI: 1.37-6.79).

Poor hygienic practice is one of the causes of under nutrition or a contributory factor to aggravate undernutrition. In this study the practice of hand washing with soap both after use of toilet 10.7% and before eating meal 16.5% were very low. But only hand washing with soap after use of toilet show a significant association with wasting that is those individuals who had hand washing practice after toilet was less likely to be wasted than whom do not (AOR: 0.18, CI:

0.04-0.860). This weak practice of hand washing could be either due to lack of knowledge about its importance or lack of the services (soap and water).

Strength and limitation of the study

Strength

- The study has provided important new information on nutritional status of pastoral and agro-pastoral school adolescents in Meiso woreda, Shinile zone somali region, which scanty information exist.

Limitation

- Since the study is cross-sectional it cannot show cause and effect relationship between different factors with outcome variables
- The available research on adolescent malnutrition is limited in the in pastoral and agro-pastoral setting in Ethiopian and other parts of the world so, that we are unable to compare the findings of this study with other studies.
- Knowing the correct age of children: It was a challenge to obtain accurate birth date for the children. This was a major constraint for age dependent results such as stunting.
- Since household level information was obtained from children's it may have limitations.
- Since the study was conducted in only one season of the year it may have limitation in telling us the seasonal variation.
- Social desirability bias on issue of adolescents' food insecurity.

CHAPTER SEVEN: CONCLUSION AND RECOMMENDATION

7.1. Conclusion

Generally, the study revealed the prevalence of stunting was significantly higher in agro-pastorals than that of pastoral community adolescents and the prevalence of wasting was higher in pastoral than that of the agro-pastoral communities.

The finding of the research revealed that stunting exhibited significant association with place of residence, Sex, Age, family size, source of drinking water, wealth tertile and adolescent food insecurity where as wasting exhibited significant association with family size, source of drinking water, wealth tertile, adolescent food insecurity, availability of latrine, hand washing after toilet, diarrhea illness.

7.2. Recommendation

- The Somali regional state health bureau and Meiso woreda health office shall:
 - Design intervention which targets adolescents' malnutrition specific to pastoralist and agro-pastoral livelihood systems.
- Meiso woreda education and health office shall:
 - Provide health education, on personal hygiene, apart from the regular educational activities in the school.
- The woreda health office shall provide community education on family planning and environmental sanitation by the health extension workers (HEWs).
- The woreda health sectors shall focus on prevention and treatment of diarrhea to assist in combating malnutrition.
- The woreda water service office shall work on improving water supply as to decrease child morbidity.
- The woreda disaster prevention and preparedness commission (DPPC) and Other NGO's shall integrate interventions to ensure adolescents food security.
- Meiso woreda agriculture office shall work in improving household economy through broadening microfinance institution or other development activities so that dietary intake of adolescents will be improved.
- Finally, other related community based studies with different study design on adolescent malnutrition are encouraged.

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ANNEXES

Annex 1: English Version Consent forms and Questionnaires

Annex 1.1. Written consent form for students Parent/Guardia

Good morning/afternoon.

My name is: _____

Thank you for your time. I came from Jimma university college of Medical science and Public Health, a higher institution providing Master of Public Health Program. I am sending you this consent form to allow your child to participate to be questioned and assessed for the research purposes to assess the nutritional status of adolescent and contributing factors. Your child has been chosen to be included in the study. If you agree that your child to be interviewed and assessed, I will be asking him/her questions and assess about her/himself and your family in various issues. We are interested in finding out nutritional status and contributing factors in adolescent. This information will be used to help develop better health services for adolescent and to create a baseline data for the country.

If you decide that your child do not to participate in the study, now or at any time in the future, it will not affect the education of your child receive at the school now or in the future. While the results of this study may be published, you and your child privacy will be protected and you and your child will not be identified in any way. No one, including your child teacher and school, will know your child answers. You and your child opinion and experiences are important to us, so please be honest and truthful in giving consent. Your child answers will be confidential and secret. Are voluntary your child to participate in the study?

If your response is “Yes” Please write your name and put your signature.

Name of Guardian/mother/Father _____ signature _____

If your response is “No” thank you. Have a nice day

Annex 1.2. Verbal assent form before administering questionnaire for students

Good morning/afternoon.

My name is: _____

Thank you for taking the time to talk with me. I came from Jimma university college of Medical and Public Health, a higher institution providing Master of Public Health Program. I will ask and measure clients like you, and collecting data for the research purposes to assess the nutritional status of adolescent and contributing factors. This school has been chosen to be included in the study. If you agree to be interviewed and assessed, I will be asking you questions and assess about yourself and your family in various issues. We are interested in finding out nutritional status and contributing factors in adolescent. This information will be used to help develop better health services for adolescent and to create a baseline data for the country.

If you decide not to participate in the study, or at any time in the future, it will not affect the education you receive at the school now or in the future. While the results of this study may be published, your privacy will be protected and you will not be identified in any way. No one, including your teacher and school, will know your answers. Your opinion and experiences are important to us, so please be honest and truthful in answering our questions. Your answers will be confidential and secret. Do you want to participate in the study?

1. Yes 2. No

If the response is “Yes” proceeds to the next page.

If the response is “No” thank the respondent and stop here

Interviewer signature _____

Annex 1.3. English version Questionnaires

To assess the nutritional status and its associated factors among pastoral and agro-pastoral communities school children of Meiso woreda, Shinile zone, Somali Regional State, Ethiopia, 2014.

Section-1: Identification

- 001. Questionnaire ID _____
- 002. Woreda _____
- 003. Kebele _____
- 004. School name _____
- 005. Name of the student (code number) _____
- 006. Type of the School: 1. Public
2. Private
- 007. Place of the school: 1. Pastoral area
2. Agro-pastoral area
- 008. Date of interview ____/____/____
- Name of Interviewer _____
- Supervisor’s code: _____

Section-2: Socio- socioeconomic and demographic and profile of Respondent/study subject

No.	Questions	Response and coding category	Skip to
201	Sex of the child (name)	1. Male 2. Female	
202	How old are you?	Age of in year _____	
203	In what grade are you?	_____ grade	
204	What is your birth order in the family	Rank _____	
205	How Many Siblings do you have?	Size in number _____	
206	Family size	Size in number _____	
207	The family place of residence	1. Pastoral area 2. Agro-pastoral area	
208	What is the sex of household head?	1. Male 2. Female	
209	Ethnicity?	1. Somali 2. Oromo 3. Afar 4. Amhara 5. Tigray	

		6. Gurage 7. Harari Other (specify_____)	
210	Religion	1. Muslim 2. Orthodox 3. Protestant 4. Catholic Others (specify_____)	
211	Type of family	1. Monopoly 2. Polygamy	
212	Educational level of the mother	0. cannot read and write 1. can read and write 2. Formal education (Grade)_____	
213	Educational level of the father	0. cannot read and write 1. can read and write 2. Formal education (Grade)_____	
214	Main occupation of mother	1. House wife 2. Merchant/trade 3. Farmer 4. Daily laborer 5. Government/private employee 6. Others (specify_____)	
215	Main Occupation of father	1. Merchant/trade 2. Farmer 3. Daily laborer 4. Government/private employee 5. Unemployed 6. Others (specify_____)	
216	What is your area main staple food? <i>(Do not read out)</i> <i>(Only single response is allowed)</i>	1. Sorghum 2. Wheat 3. Maize 4. Milk 5. Meat 6. Rice 7. Spaghetti Other (specify _____)	
217	Source of drinking water for the household	1. Piped water 2. protected Well/spring water 3. unprotected well/Spring/River water Others specify_____	
218	Do you have latrine in your home?	0. No 1. Yes	
219	Does your household have any of the following animals?	If Yes.....1 No.....0	If Yes How many?

	1. Shoats (Goats/Sheep)			
	2. Cattles			
	3. Camels			
	4. Donkey			
	5. Oxen			
220	Does your family have their own house?	0. No 1. Yes		
221	Do your family own farming land	0. No 1. Yes		
222	If yes how many hectare of land?	____:____hectare		

Section- 3: Child Related factors

No	Questions	Response and coding category	Skip to
301	Did you have breakfast before coming to school?	0.No 1. Yes	
302	How many meals per day you are getting most of the time at this time of the year?	_____times	
303	Did you wash your hands with soap after the last toilet you used?	0. No 1. Yes	
304	Did you wash your hands with soap before you eat the last meal before coming to school?	0. No 1. Yes	
305	Was the child (Name) sick in the last two weeks?	0. No 1. Ye	If your answer is 0 jump to Q 312
306	What was your illness? (multiple response is allowed)	1. Diarrhea 2. Fever 3. Cough 4. Other	
307	During the last 3 months did you ever worry that you would run out of food or not have enough money to buy food?	0. No 1. Yes	
308	During the last 3 months did you ever had to reduce the number of meals eaten in a day, because of shortages of food or money to buy food?	0. No 1. Yes	
309	During the last 3 months did you had to spend the whole day without eating, because of shortages of food or money to buy food?	0. No 1. Yes	
310	During the last 3 months did you ever had to ask for food or money to buy food (beg)	0. No 1. Yes	

	because there wasn't enough food or money to buy food?		
311	How many days per week did you spent at least 1 hour on tasks like: caring for animals, working on farm activities, fetching water & fuel, washing clothes, cooking, child care, pounding & grinding grains, heavy labor	_____days per week	

Section-4: Anthropometry

No	Measurements	Reading
401	Height (to nearest 0.1Cm)	_____:____cm
402	Weight (to nearest 0.1kg)	_____:____kg

Annex 2: Somali version Consent Forms and Questionnaires

Annex 2.1. foomka ogeysinta ogolaansho oo qoyska ardeyga ee qoraalka ah

Aniga oo ardeyga jamacadda jimma heer mastered qeybta caafimadka shacabka ee guud ee qabanaya daraasad aan kuguuleysta heerka waxbarashadeyda. Kuna sameynaya daraasadkani ardeyda dugsiiga hoose (4 - 8) ee degmada miesso kuwaso da'adoodu eey tahay 10-18 sano jir. Ujedada daraasadkani waa mid lagu ogaan doono heerka cuntada iyo waxyaabaha la xidhiidha taasoo lagusaleynayo xaga kobcinta heerka cuntada ee ardeyda dugsiiga hoose ee degmada miesso. Ilmahaaga wuxuuka mid yahay ardeyda la doortay, marka waxaan jeclaan lahaa ogolaanshadada inuu ilmahaagu kaqeybqaata daraasadkani. Inankaaga/inantaada su'aalo yaroo dhinaca shaqada qoyska, heerka wax barasho waxyaaba la hidhiidha cunada, ayaan idin weydiin doona. Dheerarka iyo culeyska ilmahaagana waancabiridoona. Waxaan kuu ballanqaadaya inaan ilaalineyna sirtaada, sidaa darteedna magacaaga iyo magacailmahaagana midna la qorimaayo. Sidoo kale markasta oo aad dontids u'aalaha inaad joojisid ama inaad siiwadatid go'aankaaga ayey kuxidhantahay. Hadii aad su'aal leeydahay markaad doonto inaad weydisid waad u madax banaantahay.

Diyaar maadtahay inuu ilmahaaga kaqeyb gala?

A. Haa B. Mayo

Mahadsanid

Saxiixa kaqeybqaataha _____

Magaca xogururiyaha _____ saxiixa _____

Annex 2.2. Foomka ogeysinta ogolaansho oo ardeyga su'aalaha kahor

Salaan

Seetahay, aniga oo magaceyga _____, kana ahay xogururiye daraasadkani. Waxaan jeclaan lahaa inaan su'aala yaroo xaga dhinacaaga, qaabka cunada iyo inaad ogoshahay cabirka dheerarka iyo culeyskaaga. Ujedada daraasadkani waa mid lagu ogaan doono heerka cuntada iyo waxyaabaha la xidhiidha taasoo lagu saleynayo xaga kobcinta heerka cuntada ee ardeyda dugsiiga hoose ee degmada miesso. Waxaan kuu ballanqaadaya inaan ilaalineyna sirtaada, sidaa darteedna magacaaga la qorimaayo. Sidoo kale markasta oo aad dontid su'aalaha inaad joojisid ama inaad sii wadatid go'aankaaga ayey kuxidhantahay. Hadii aad su'aal leeydahay markaad doonto inaad weydisid waad u madaxbanaantahay. Su'aaluhu wexeey qaadan karaan illaa 20 daqiiqadood.

Diyaar maadtahay inaad ka qeybgasha?

1. haa, hadey tahay siiwada su'aalaha
2. maya, ka qeybqaataha kale u gudub

Xaqiijiye ogeysinta ogolaansho

Xog ururiye: magaca _____ saxiixa _____.

Annex 2.3. Su'aalaha

Darasadka Xalada Nafaqada iyo Xidhidka ama Sameynta laxidhidho Ardayida yeryer ee Dugsiga Schoolka Muli ee Degmada Ma'ayso Gobolka Sitii ee Deganka Soomalida Ithiopia ee 2014 TG

Qeybta-1: Sharaxaada

- 001. Su'aalaha ID_____
- 002. Degmada_____
- 003. Qabaleega_____
- 004. Magaca Skoolka_____
- 005. Magaca Ardayga /No Kodka/ _____
- 006. Cida Jawabkabixineysa ee xidhiidh la leh ardayga
 - 1. Hoyo
 - 2. Abo
 - 3. Awow/Macoy
 - 4. Agoon
 - Iyo WLM _____
- 007. Nooca Dugsiga:
 - 1. Ku Shacabka
 - 2. Ku Shaqsi
- 008. Goobta Duugsiga :
 - 1. Bulshada xoladhaqatada ah
 - 2. Bulshada Xoladhaqato beraleyi
- 009. Malinta Warayisuga ____/____/____
 Magaca Wareystaha _____
 Kodhka Kormeraha _____

Qeybta-2: Xaladaha Deegaanka Iyo Bulsho Dhaqameed

SN	Suaalaha	Jawabta iyo Qeybta kodhka	Ugudub su'asha kale
201	Sinjiga ilmaha	1. Lab 2. Dhidhig	
202	Taarikhda Dhalashada ilmaha (Magaca)	____/____/____/dd/mm/yy/ Da'ada Ilmaha _____	
203	Fasalka Ardayiga /ilmaha/	Fasalka _____	
204	Qofki imisaad baadtahay sided ukala wayntihin caruurtina	Imisaad _____	
205	Walalaha ladhashay cunuga waa imsa cadadka)	Tiro ahan _____	

206	Tirada (cadadka) Qoyiska	Tiro (cadadka)ahaan _____	
207	Deeganka qoyiska (Gobta ee daganyin)	1. Xoladhaqato 2. Xoladhaqato Beraley	
208	Sinjiga qoyiska madaxa u ah	1. Lab 2. Dhidig	
209	Qabiilka	1. Somali 2. Oromo 3. Canfar 4. Amxaar 5. Tigre 6. Gurad 7. Harari Iyo WLM _____	
210	Dinta	1. Muslim 2. Orthodox 3. Masixi 4. Catholic Iyo WLM _____	
211	Nuuco Qoyska	1. Ka koban Hoyo, Abo iyo carurtod 2. Ka koban hoyo, abo iyo qorabo kale	
212	Heerka Waxbarashada Hoyada	0. Maqorto mana akhrido 1. Way akhrida wayna qorta 2. Waxbarasha toska aha(fasalka)___	
213	Heerka Waxbarashada Abaha	0. Maqorto mana akhrido 1. Way akhrida wayna qorta 2. Waxbarasha toska aha(fasalka)___	
214	Kalinta Hoyada	1. Marwo Guri 2. Ganacsato 3. Beraleyi /Xoladhaqato/ 4. Shaqaale malinta aha 5. Shaqale Dawladed shirkada shaqsiyed 6. Shomeerac (mashaqayisto) IWLM (Another)_____	
215	Kalinta Abaha	1. Ganacsato 2. Beraleyi /Xoladhaqato/ 3. Shaqaale malinta aha 4. Shaqale Dawladed shirkada shaqsiyed 5. Shomeerac (mashaqayisto) IWLM (Another)_____	
216	Maxay tahy cuntada muhiika idin ah wakhti xadiirkan iyo sanadkan (labada ugu muhimsan (sheeg ama qor)) 1. Hadhudh	Cunada 1. _____ Cunada 2. _____	

	2. Qamadin 3. Baqol(gadhleyi) 4. Cano 5. Hilib 6. Baris 7. Basto IWLM _____		
217	Ilaha Cabitaanka Biyaha ee qoyska	1. Qasabada /Bonbada/ 2. Birkhadha Hagogan 3. Birkhadaha (Haraha) Banaan IWLM (ANother)_____	
218	Guriginu Musqul (Kabne)Maleyahay	1. Haa 0. Maya	
219	Maledyhi qoysikani xolaha hose ku qoran	Hadaytahay, Haa ----- 1 Maya ---- 0	Imiisa tiro ahan
	1. Adhi (Riyo/idoba)		
	2. Lo'		
	3. Geel		
	4. Demer		
	5. Dibi		
220	Qoyiskani guuri hanti ah maleyihin	1. Haa 0. Maya	
221	Qoyisku maleyahyi Dhul Bereed	1. Haa 0. Maya	
222	Hadi ay tahyi haa imisa hektaar oo beer ah ayu leyahiin qoysku	____:____Hektar	

Qeybta-3: Sameynta Caruurta

SN	Suaalaha	Jawabta iyo Qeybta koddhka	Ugudub su'asha kale
301	Inta aanad iskoolka aad iman madso qurecata	1. Haa 0. Maya	
302	Imisa wakhtibad cunta malinki cuntada	1. Sadax Jeer 2. Laba Jeer 3. Marka aan ubahdoba IWLM (Another)_____	
303	Inta in lag ayaad ku maydhata samuunta cantata ka hor	1. Haa 0. Maya	
304	Inta in leg ayaad samunta isticmasha markad musqusha kaso baxdid	1. Haa 2. Maya	
305	Majira labadi todabad aan sodhafnanyi wax xanuunah oo ku dhacay unuga	1. Haa 0. Maya	Haday jawb tahay 0 kubod su'aalah 312

306	Xanuunkadis/kisu maxu aha	1. Shuban 2. Xumad	3. Qufac 4. IWLM	
307	Sadaxdi bilood ee laso dhafayi ma ka walwashayi cunto la'aan ama lacog la'aan aad cunto sisato	1. Haa 0. Maya		
308	Sadaxdi bilood ee laso dhafayi maadka dhintay cunto yinki kaladudwan qoyskas sababtun lacaag la'aan ey tahy	1. Haa 0. Maya		
309	Sadaxdi bilood ee laso dhafayi qoyiskogu ama carurta cunto kufilan la'aan maladaristay sababto ah lacag aad uugu iibiso amma cunto kufilan la'aan	1. Haa 0. Maya		
310	sadaxdi bilood ee lasodhafayi madarentay gajo lakin macuntayn sababtuna tahyi cunto la'aan ama lacoga la'aan cunto lasiisto	1. Haa 0. Maya		
311	<p>Todobadkii imisa malmood ayaad u qondy saa shaqoyin kaga ugu yaraan od ka shaqayisa malinka Hal (1) Sa'ac shaqoyinkasena yihin</p> <ul style="list-style-type: none"> - Xolaha Jirta (Racda) - Beeraha qodada - Dharkaga maydhata - Ciyaalka aad haysh - Shaqo xoga ah aad kashaqayis - Biyo dhan sata - Biyo xidhato /Hareyga/ 	_____ malin/Todobadki		

Qeybta-4: Anthropometry

SN	Cabirka	Akhirska (Halbega)
401	Dhararka(Ugu hosoyiso 0.1Cm)	_____ : _____ cm
402	Culeyska (Ugu hogayso 0.1kg)	_____ : _____ Kg

Annex 3: Interviewers Guide

ASSESSMENT OF NUTRITIONAL STATUS OF SCHOOL CHILDREN

INTERVIEWERS GUIDE

GENERAL RESPONSIBILITIES

- With the help of the researcher select an appropriate students/respondents
- Remind respondents-voluntary and confidentiality of the study
- Ensure privacy
- Use proper interview technique as discussed in the training
- Ask question with patience and without leading the respondent to answer
- Be sure for consistency of responses
- Do not comment positively or negatively about the respondent answer
- Record responses and measurement fully and legibly
- Measure weight and height as per the procedures discussed and given during the training.
Ensure to get the nearest exact age of the study child

INFORMED CONSENT

Before interviewing the child, you must get his/her consent to conduct the interview and take anthropometric measurement. Do read the introduction note exactly as it given in the training. This statement explains the purpose of the survey and the voluntary nature of the respondent's participation, then seeks their cooperation. If the child or parent does not agree to be interviewed or take part in the measurement, thank them for their time, and end the interview.

IDENTIFICATION

Information recorded in the identification box is: School ID number, Child ID number and name, date of the interview, sex of the child and date of birth. It is important that you record the necessary information before asking the child questions

THE QUESTIONNAIR

All the questions in the questionnaire are related to the index child parental situation and diet. All of the information that you will record is based upon answers directly provided by the child. It is very important that you ask each question exactly as it is written on the questionnaire.

MEASUREMENTS

INSTRUCTIONS FOR MEASURING HEIGHT AND WEIGHT OF CHILDREN

I. PROCEDURES AND PRECAUTIONS BEFORE MEASURING

A. Two Trained People Required for Height measurement

The height of each child will be measured to a nearest of 0.1 cm using a stadiometer. Two trained people are required to measure a child's height. The measurer holds the child and takes the measurements. The assistant helps hold the child and records the measurements on the questionnaire. Ask the child to remove the foot wear, and stand with heels together and head positioned so that the line of vision will perpendicular to the body.

Weight will be measured using a Seca digital scale. It should be standardized daily with a standardized weight. Ask the child to remove as much clothing as possible including heavy outer garments, shoes and any head gear. Weight will be recorded to the nearest 0.1kg. One person alone can take the weight of a child and record the results if an assistant is not available.

B. Measuring Board and Scale Placement

Be selective about where you place the measuring board and scale. It is best to measure outdoors during daylight hours. If it is cold, raining or if too many people congregate and interfere with the measurements, it may be more comfortable to weigh and measure indoors. Make sure there is adequate light.

C. Age Assessment

Before you measure, determine the child's age. Ask the child if he/her knows exact age. Otherwise the date of birth should be given by parents or recorded directly from school register.

D. When to Weigh and Measure

Weigh and measure after you have completed the questionnaire. This will allow you to become familiar with the study child. DO NOT weigh and measure at the beginning of the interview i.e., as soon as you identified the study child, which would be more of an upsetting intrusion.

E. Weigh and Measure One Child at a Time

Put the child in queue and complete the weighing and measuring of one child at a time. Then proceed with the next child. DO NOT weigh and measure all the children together. Otherwise measurements may get recorded in the wrong columns of the questionnaire. Return measuring equipment to their storage bags immediately after you complete the measurements for each school.

F. Strive for Improvement

You can be an expert measurer if you strive for improvement and follow every step of every procedure the same way every time. The quality and speed of your measurements will improve with practice. You will be required to weigh and measure many children.

Declaration:

I, **Abdulkadir Abdella**, declare that the work presented in this MPH thesis is original. It has not been presented to any other university or institution. Where, the work of other people has been used, reference has been provided. It is in this regard that I declare this work as original mine, and it is here by presented in partial fulfillment of the MPH Degree in General Public Health.

Name of the student _____

Signature _____

Name of the institution Jimma University

Date _____

Advisers:

1. Prof. Tefera Belachew (MD, MSc, DLSHTM, PhD)

Signature _____

Date _____

2. Mr. Habtamu Jarsso (BSc, MPH)

Signature _____

Date _____