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Association between Household Sanitation Practices with Stunting Status Ofchildren Aged 2459 Months In Farta District, North West Ethiopia

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ASSOCIATION BETWEEN HOUSEHOLD SANITATION PRACTICES WITH STUNTING STATUS OF CHILDREN AGED 24-59 MONTHS IN FARTA DISTRICT, NORTH WEST ET

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I I I A C K N O W L E D G M E N T S

First and foremost, I would like to acknowledge my advisor Dr. Achenef Mesfin Mekonnen and Mr Girma Nega for their technical and moral support during the entire course of my thesis. I also like to thanks Bahir Dar University, school of food engineering for creating such a conducive learning environment and giving access to resources. Finally, I thank South Gondar Zone Health office and Farta District Health Department for their cooperation and provision of necessary information.

IV. ABSTRACT

Stunting is one of the most common causes of morbidity and mor especially in developing countries and is the underlying cause of one thi deaths each year before their fifth birthday. Similarly, it is a major pul health problems in Ethiopia, particularly affecting a significa most vulnerable group. Access to clean water and sanitation has b the major underlying determinants of wealth, nutrition status. under nutrition are diverse and could potentially change in s

To assess the association between household sanitation practices and stunting among children aged 24-59 months in Northwest Ethiopia, 2018.

Based on a cross-sectional study design was conducted in each of Farta distr children aged 24-59 months from March 9 to May 08, 2019 in Farta district ha a total of 201,500 catchment population and 614 study parti Simple random sampling technique was used for selection of study kebel systematic random sampling technique for study subjects selected kebeles. Data collection was including interviewer admin questionnaire. The data were coded and Data were entered into EPI and exporte SPSS version 20 for analysis. Binary logistic regression was used for anal

A total of 610 preschool children with response rate participated in th study. The overall stunting among preschool children was found to be 255 (study participants [95% CI: 37.4, 45.5] were reported that wealth status poorest [AOR=1.4(95% CI: 1.27, 7.31)] sanitation status, having good sanitation and poor practice sanitation [AOR=2.1(95% CI: 1.21, 9.43)], were factors associated with stunting.

Stunting among preschool children found to be sanitation practice wealth status factors associated with inappropriate nutrition education should be given.

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VIABBREVIATIONS AND ACRONYMS

ANC	Antenatal Care
CSA	Central Statistics Agency
EDHS	Ethiopia Demographic and Health S
FAO	Food and Agriculture Organization
HAZ	Height-for-Age
HHs	Households
JMP	Joint Monitoring Program
OR	Odds Ratio
PEM	Protein Energy Malnutrition
SD	Standard Deviations
SNNPR	Southern Nation Nationalities Peop
SPSS	Statistical Package For Social scie
UN	United Nations
UNICEF	United Nations Children s Fund
WAZ	Weight-for-Age
WASH	Water, Sanitation and Hygiene
WHO	World Health Organization
WHZ	Weight-for-Height

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1. INTRODUCTION

1.1 Background

Nutritional status is the result of complex interactions betwe
overall state of health (CARE, 2012). It encompasses structural and
functional integrity (Whitney J, Susan A, Aedin C, & Janet, 2009). The life cycle approach
to nutrition provides an opportunity to look at the individual
specific vulnerability throughout the life cycle (Shetty, 2012). Undernutrition
a major global health problem, especially in developing countries, contributing
morbidity, mortality, and impaired development (World Health Organization
2013) and Food and Agriculture Organization of the United Nations estimated 3
million people starving in the world and 1/3 of these are children
protein-energy malnutrition (PEM) (Tatia B, Jullyana F, Haroldo S, &
2009). Malnutrition remains one of the most common causes of
among children throughout the world and is the cause of one third of
million child deaths each year before their fifth birthday (Fekadu A, 2013).
developing countries are a major public health problem. In Sub-Saharan Africa,
41% of under-five children are malnourished (Ahmed A, Jacqueline U, Sia
& et al., 2012; Sinkayehu A, Dejene H, &). Whereas in Ethiopia approximately
21.9% of children are underweight (Amanda A, 2011). Globally, 1.8 billion people
Globally, 1.8 billion people use sources of drinking water that are contaminated
putting them at risk of infectious diseases like cholera, dysentery,
polio and others. Unsafe, poor sanitation caused an estimated 842,000 deaths
each year (WHO & UNICEF,). In the world, the main cause of the death of
million children is precarious sanitation environment and it is
deaths are due to diarrhea (WHO & UNICEF, 2017). Diarrhea can be considered as
the cause and the consequence (Norcross, 2013). The direct causes of these
diarrheas are due to the unavailability, low quantity and poor sanitation
services (WHO & UNICEF, 2017). In low-income countries, undernutrition
is likely to be a consequence of poverty, characterized as i

income, poor environment and housing, and inadequate ac
guidance and health care (Ukwuani & Suchindran, 2012
In Ethiopia, access to clean water and sanitation has been identif
underlying determinants of child malnutrition (Atlaw, Tiruneh
M, Subandoro A, & Lentz, 2011). In addition to this, only Six
Ethiopia use an improved and not shared toilet or latrine fa
households have no toilet facility at all. Similarly, in rural
latrine, about 3.9% used improved latrine facility and only 1.8%
shared latrine (EMoH, 2016). Concerning time of hand washing prac
of mothers reported that they washed hands at all critical time whereas
their hands in mixed practice and 14% mothers were witho
bush/backyard/ field for defecation (Negash, Endris & Getachew N, 2017
Risk of fecal transmission and the mortality rate of children
increase (Seifu A & Amy, 2011). Children living in such setting i
community have increased to pathogens (Ahmed, 2010). Infectious dis
Federal Government of Ethiopia has been working to reduce
through public education and providing nutritional supplem
vulnerable families. This study aims to assess the prevalence of
with nutritional status of children aged 6-59 months in Farta district, Northwest Ethiopia

1.2 Statement of problem

About 20 percent of the developing world's population over 780 from insufficient food intake and over 192 million children a energy malnutrition (FAO, IFAD & WHO, 2015). The 2012 World Health Organizat estimates that approximately 15 % of children under 5 years (1 in 20 children) in developing countries are underweight and stunted, respectiv 5 mortality is expected to increase in Africa and South Asia where the prevale childhood malnutrition is about 41% compared to other developing world regio (Ngondi J, Mbobda M, Tediosi F, Lautu D, Gyapong J, 2013). Malnutrition is the major public problem of developing countries in Asian and Sub-Saharan African countries including Ethiopia, contributing to the high (Desalegn A, Biftu A, Ayenew et al, 2016). Ethiopia is the seventh country among the ten most affect countries and the wide magnitudes of stunting (Alemayehu E Eskezyiaw A, Mohammed H, 2016). Under nutrition is still one of the major problems in Ethiopia (Alemayehu E & Eskezyiaw A, 2016). About 38.4 % of under five children suffer from chronic malnutrition (stunted malnourished (wasted), while 2.8% were severe. The prevalence of malnutrition Amhara Region was reported as 46% were stunted, 28.4% w were wasted of under five children (EDHS, 2016; MOH, 2016).

Malnutrition and Water, sanitation and hygiene are intricatel linked. First, inadequate WASH conditions are important malnutrition and intestinal parasitic infections (Savioni S, Sorge D, & 2016) and access to safe water and sanitation are important in r transmission (Ashbolt B, Tamene H, Kebede T, & Lemma, 2015). The from water, sanitation, and hygiene is estimated to be 4.0% of al disease burden (Amhara A & Ashenafi D, 2016).

In 2015, according to the WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation (JMP), 2.3 million still lack of basic sanita unimproved facilities. In Africa, 34 out of 38 countries or m not used basic hygiene facilities (UNICEF & WHO, 2012). This has

shown that water collection from unimproved sources and su
take over 30 minutes, representing a double burden and of t
20% of the national population uses lim- Standard service, and a
two are in Oromia (UNICEF & WHO, 2017). Childhood malnutrition is a
major problem in the water, sanitation and hygiene issue is remarkabl
current disease burden is attributable to poor sanitation (Yitalem Tesfaye, Kassahun Ali, & Dani
H, 2014). The EDHS report 2016, 35% of HHs obtained their dri
unimproved source and 45%(53% in rural HHs as compared
spend 30 minutes or more time to collect drinking water (EMoH, 2016).
Therefore, this study was carried out to assess the association between household sanitation
practices with among preschool children aged 24-59 months in the area of Farta
district, North West Ethiopia. The findings will provide relevant information for
future evaluation to see impact of program and modify the pu

1.3 Justification of the study

Under nutrition, Poor Sanitation practice and drinking water supp
problems of the developing countries including Amhara country
Region. Preschool children are among the most affected. Moreover,
the Farta district report showed that higher number of malnour
expected and number of beneficiary of different supplies r
common in this area. Similarly, district has poor access to basic sani
and basic drinking water. Additionally, lack of adequate household drinking water
handling and sanitation practices among households in children was no
studied in the study area. Previous studies in malnutrition focused mor
Prevalence of malnutrition and other remaining the relation of h
hold sanitation and Thus, little has been studied on the association
of household sanitation practices with nutritional status of preschool age children. Therefore, the current study was
conducted to determine the association of household sanitation practices with nutritional
status among preschool children in Farta district, Amhara Region, Ethiopia. This study
was provided important clues regarding the relationship among household sanitation
children and household practices in the study area.
Understanding of these factors and nutritional status of children will be
guiding local decision makers, researchers and other stakeholders to find the most cost-effective
way how to improve the health and nutritional status of children in resource-limited settings
politically, governmentally as well as locally acceptable way to achieve the
development goal regarding to child nutrition.

2. OBJECTIVE

2.1 General Objective

To assess the association between household sanitation and hygiene practice among school children 24-59 months in Farta district, Northwest, Ethiopia.

2.2 Specific Objectives

- To determine status of sanitation and hygiene among children 24-59 months
- To determine association between sanitation and hygiene practice of children 24-59 months

3. Literature review

Adequate nutrition and improved sanitation is essential in early chil
healthy growth, proper organ formation and function, a str
neurological and cognitive development (Victora C, de Onis M, Hallal PC, Blossner M, & Shrimpton R, 2010; WHO, 2016). Children are at a greater vulnerable group in terms o
and morbidity (Maitay T & Yonas D, 2018). About 60% of total health problems
Ethiopia are associated due to nutritional problems (Tharaney M, Garoma S, & Seyoum L, 2016).

3.1 Magnitude of nutritional status of children

According to study that conducted in 22 countries of sub-Saharan Africa, 27% of children under
five years are stunted (Rutstein SO, 2015). The study in India about 51% of the
children under the age of five were underweight (SD) and 25% were stunted (he
stunted-SD) (Sanjit S, 2016). According to population based study in G
that 28.2% of children were moderately stunted, 13.3% were
8.4% were moderately wasted (Tesfaye M, Yemaneberhan A, Melaku YA, Belay HS, & Abebe Z, 2017). According to Egyptian
demographic and health survey, the stunting of children low
wasting were 8.4% and underweight were 5.1% (Ewerd C, Preckel F, & Marylan
2015). A comparative study that conducted at Hosanna town municip
overall prevalence of underweight, stunting and wasting in
5.7% respectively (Faith A, Prosper A, & Abdulai A, 2016).
The study conducted in Ethiopia at shinille woreda, Somalia
stunting of under five children was 33.4% and 22.4% were s
wasting of children was 8.20% were moderately wasted and
underweighting was 24.5% and of this 23.5% were moderately u
(Abdibari M, Dereje B, & Abebe, 2016). A study was conducted in the A
shows that overall prevalence of malnutrition of children i
23.5% and 13.8% of the study children were underweight and w
respectively (Wesyan L, Tayeh A, & Yesres H, 2016). A study conducted in Bure T
in Amhara region revealed that the overall prevalence of ma
lower than 5 year were 24.9%, 14.3% and 11.1% for stuntin
respectively & educational status of mothers associated (Dietsh malnutrition

al., 2014). Another cross-sectional that conducted in Ethiopia found th
of stunting among school aged children was 42.7% in rural areas and
areas, while the corresponding figures for (Zaim Hels, were 21.
S, Endalamaw G, &). eAcc ord2 0in1 g4 to the study conducted at
Ethiopia revealed that overall prevalence of underweight were 28.5%
and 17.7% for underweight, stunting and wasting respectiv
significantly associated with (Wehkinmeal E, u.t 2A0 1s3 tudy conducted in
Haramaya district Eastern Ethiopia found that prevalence
underweight were 45.8%,10.7% and 21% respectively and th
in low land kebeles, children having diarrhea, children whose m
visit, children of birth order 4 to 5 and unprotected sourc
associated with underweight and children residence and educ
association with stunting and lack of ANC follow up, family size
prelacteal feeding are associated with wasting (Hiwot Y, Tesfaye G, & Firehiwot
2015).

According to EDHS report, in Amhara Region the prevalence
and wasting among under five children was 46% (FMOH, 2018), 28.4% and
2016).

3.2 Overview of water and sanitation coverage

Safe drinking water and sanitation are important determina
wellbeing and have recently been declared a human right by t
Infants and children are particularly vulnerable to the lack
this increases their vulnerability to diseases because their
developed and may not be able to tolerate the effects of (Federal water
Democratic Republic of Ethiopia, 2004).

It is estimated that 1.2 billion people practice open defecat
(87 per cent) live in rural areas. In addition, 884 million p
unimproved water sources for drinking, bathing and other dom
activities and 84% of these live in rural areas (United Nations, 2009). Millenniu
development goals report that in developing regions, more than
dwellers used field, bush and backyard facilities (Lakew Y, Reda AA, & Tesfaye

conducted at Benin showed that 49% of households (HHs) u
water on daily basis, 87% of HHs had improved sanitation facilit
had improved hygiene behavior and 16% had permanent ava
This study revealed that the type of house as an indicator
identified as factor positively associated with improved sanit
of soap and the absence of hand washing were the main fa
sanitation (Rebeche C, Gratien B, Yves B, & et al, 2015).
According to study conducted SNNPR showed that the proportion of HHs had tra
was about 68%, and 18% of HHs had private latrine, 14% of HHs didn't have
facility at all and the result of study found that ethnicity, p
latrine, source and protection of source of water supply had
with sanitation (Spears A, 2017). Another study that conducte
Ethiopia Gondar revealed that 42.9% of HHs have unimproved water s
have unimproved sanitation status and 51.7% have poor hyg
showed that diarrhea with water status, educational status
sanitation status and household wealth was significantly associated with
affordability of soap with hygienic practice (Walelegn W,
Mamo W, Thomas E, & et al, 2017).
Preliminary report of EDHS 2016 also showed that about 46
Ethiopia have access to improved source of drinking water and 94% of house
use unimproved toilet (FMoH, 2016).

3.3 Associated factors of stunting status of chil

A case control study done in Malaysia among preschool age childre
the cases, family with four and more children, birth weight
mothers, autonomy of mother, household income and socioeconomic status were
with malnutrition (Hui J, Foong M, & Sulo C, 2014). A community based cross
sectional survey was done among under five year children in Ibadan, Nigeria, showed that maternal weight significantly associated with
educational status of mothers, educational status of child
occupation and not associated with position of stool, significantly
associated with age of children, sex of children, educatio

givers/, maternal occupation and it was not associated with occupation of father. Also the study showed that wasting was associated with age of children, educational status of mother/care taker occupation of mother & it was not associated with sex of children, occupation of father, (Berhe K, Kidanu A, Berhe Y, Asefa A, et al, 2015) a cross sectional survey conducted among less than five years children in Sudan, revealed that household income and educational level of mother with nutritional status of children (Elsheikh A, Kamal A, Sharafeldeen I, & et al, 2015). A household survey conducted in community among preschool children result showed that age of children and educational level of mothers was wasting. Similarly, age of children and maternal education was underweight and the age of children associated with stunting (Martorell R, Yarbrough C, Yarbrough S, Martinez C, & Lechtig A, Carmen N, & et al, 2007).

A study done among preschool aged children in Bangladesh showed that birth weight, presence of upper respiratory tract infection, number of births and home delivery were risk factors for underweight, weight and maternal age at the time of birth were risk factors for stunting (Alexandre A, Gisela M, Rosa A M, & et al, 1998). A descriptive cross sectional study conducted in Dal Kavre District of Nepal among under five children result revealed that (Chhetri J & Khanal K, 2016).

A community based cross sectional survey was done in Bamenda health district in the result of the study showed that malnutrition was associated with age, sex, socioeconomic status, (Harsha, Varsha C, Hari S, & Aeloor, 2016). A cross sectional study was done among children in Akinyele local government area in Nigeria, showed that between malnutrition and socioeconomic factors (Adebayo, Abiodun T, Beatrice O, et al, 2015).

In Ethiopia, a community based cross sectional study was done in Debre Berhan District among children 6-59 months, revealed that the age of children and higher family monthly income were significantly associated

stunting & prelacteal feeding and giving the first birth befo
associated with higher odds of stunting. Vitamin A supplementation in the past
months, type of prelacteal food given, and household water
associated with wasting (Wagaye B, Mamo W, & Assefa N, 2016). A community
cross sectional study conducted among children under five in Tigray region E
the result showed that stunting was associated with family size and family mo
income; paternal education, parity and modern family planni
be associated factors for underweight. The predictor of wasti
of diarrhea during last two weeks before the survey (Mekonnen W, Belachew E,
& Semaw F, 2015).
Another cross sectional study done in Addis Ababa showed among s
that being male, higher birth order (> 2), lower family size (6
times) in a day prior to the survey and mud floor house were
under nutrition. Similarly, the risk of underweight increas
increase in age, birth order, family size, washing of vegetables
The odd of under nutrition was lower in children born 30 minutes 2
compared to those born to mothers (Dawud F, Abraham D, & Abebe A, 2015). A survey that conducted among under five children
showed that associated with age of children, mother's age a
status (Assebsibe T & Yimer A, 2014). A study extracted data from 2014 EDHS among
rural Ethiopia showed that it was found age of the child,
maternal education, and economic status of the household
associated with nutritional status (Nigussie E, Henok A, & Lamessa D, 20
A community based cross sectional study conducted among children
Somalia region, showed that most of children significantly associa
and age of child, marital status, maternal education, mont
making, having of livestock, presence of ARI, total number o
status during pregnancy, hygiene practice, mode of feeding, access
and type of floor in the household (Shelmoune D & Asmare W, 2013).

A matched case control study that done among under five ch
Ethiopia, revealed that wasting significantly associated with

educational status socfu smsoth emsa,kdin g status of mothers in hou
status of diarrhea, optimal frequency of breast feeding,
complementary feeding, status of institutional visit during c
onset of symptoms, hamndc wasfh imngthers, maternal parity, pare
birth, antenatal care/ANC/ follow up a(Mnebiayuwa Da,y 2 0
Unmatched Case control study conducted at machakel wored
revealed that source of drinking water, education of father,
using latrine, diarrhea frequency episodes, vtahcecinisat on sta
breast milk, and decision m(Baakretrmoen uGs,e mBeehyaeuvlew JW, & D
2 0 1 4).
A community based cross sectional study conducted at Wons
SNNPR, showed that prevalence of underweight among chil
child sex and immunization status. But famoilyd,siVzeit,aimth ord
A supplementation, place of delivery and source of drinking
associa(Rtaehdel G, Tsegaye D, &). AMhcaeAtly,2 0 1 7other cross sec
study was done among preschool aged children at Hawassazu
found out that household sanitation practice was significan
stunting and u(nSdiemrtwaeyeighut A e).Aacl.r,o s2s0 1 4sectional study conduct
Bencdistrict in southern Ethiopia among under five childre
children, birth interval and age of complementary feeding w
and birth order of child and educational st(aMtuesk afmuaBr,er wer
hamid Y, Amanu K, &). Aetcahl,m2 0 1 6y based cross sectional s
conducted among 398 c5h9ildrmenthasgeind 6the Dsamtis tSrNictNPR, d
revealed that age of child, sex of children, birth interval, si
weeks, health status of children,ANC follow up, maternal
washing by soap, occupation of mothearts,ingafrieqcuteurnacy hanmdd
presence of diarrhea were associated (wsihmoonal A,uTtaritkuu D,ch
& Tariku L), 2017

A facility based cross sectional study done in Ethiopia Wes
among under five children, result showed that the magnitud

and wasting were about 38.3%, 49.2% and 25.2 %, respectively
mother was associated with stunting; child age and complem
with underweight of children. It also showed that age of chi
were not associated with stunting and educational status of m
with underweight (Zegeye Y, Tsigereda B, Alemu A, & Mitiku, 2017
based cross-sectional study conducted at Bule Hora District in Or
that Presence of diarrhea in the past two weeks, sex of child, feeding
and number of siblings were associated with underweight and
past two weeks, sex of child and feeding were associated with
Similarly, presence of diarrhea, age at complementary feed
started and not using family planning methods were associat
availability of latrine, maternal formal education were not
associated with underweight and stunting, ANC follow up, fami
planning use, availability of latrine, family size and amount
per day were not associated with stunting (Mastewal A, Moges W,
Mohammed T, & et al, 2015

A cross-sectional study conducted among orphans and vulnerable
Ethiopia, showed that prevalence of stunting, underweight
27.8% and 9.9% respectively. The main factors in this study
children, caregiver's education, household size, supplementation and two
weeks period diarrheal disease (Tesfamariam G, Endalkew S, & Girum
2014)
This analysis added suggestive evidence on effect of household
status of school aged children, only because study done at country as
global level respect to interest study. So further evidence is needed
collaborate the finding, as causes and determinants of child
interrelated and multifactorial and these determinants can change in pl
Strength the evidence base information on the linkages b
sanitation in rural Ethiopia will help to support the informed
guidelines that inform programmatic strategies, actions and

Therefore, this study was conducted to determine association between household food insecurity and stunting status of preschool aged children. Specifically, the study was conducted to determine the association between household food insecurity and stunting status of preschool children using multivariable logistic regression analysis

3.4 Conceptual frame work

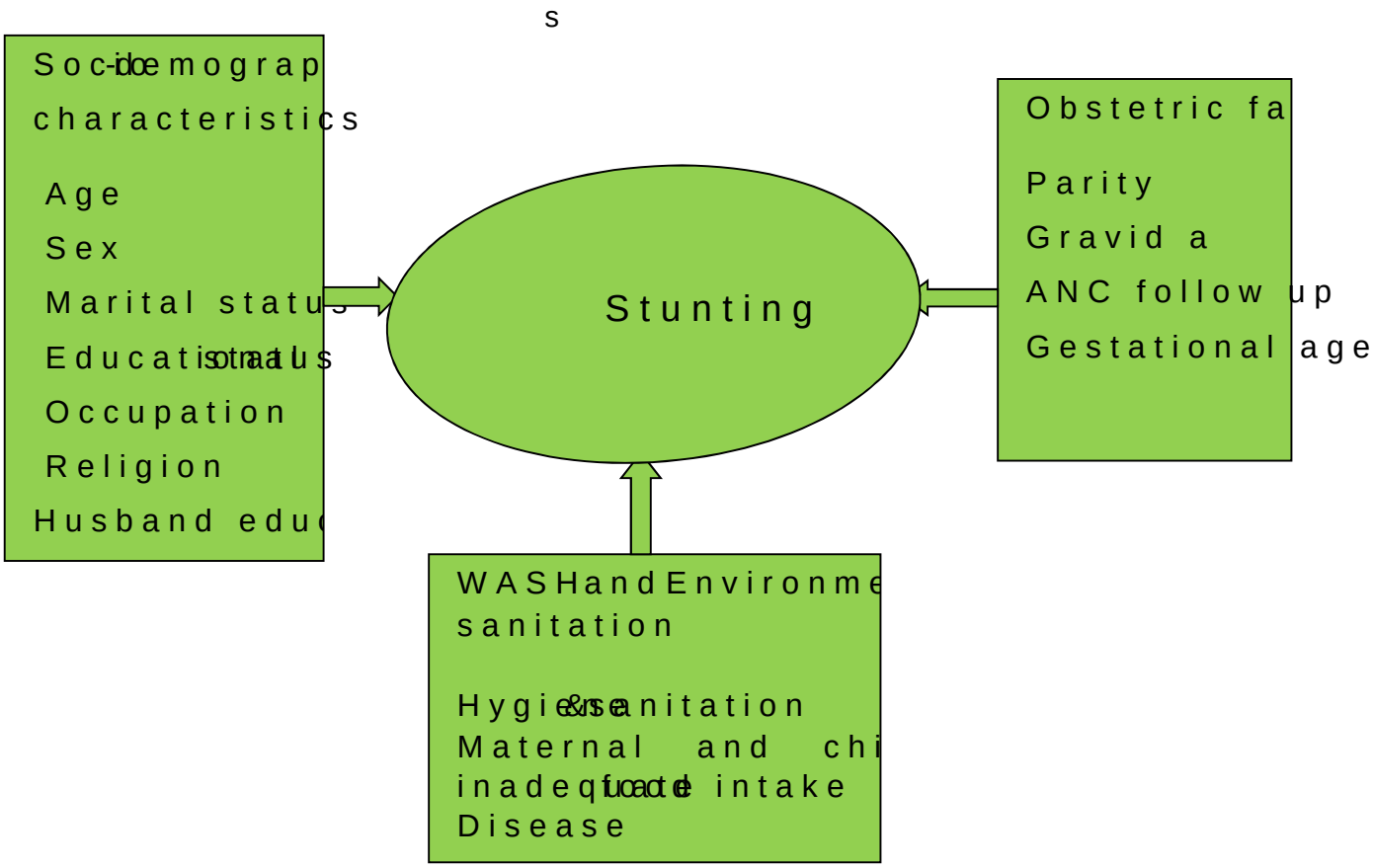

Figure 1: Conceptual framework sanitation practice and nutritio
children in Farta district, North West Ethiopia, 2018

Source: UNICEF, Alive & Thrive Baseline Survey Report, Eth

4. METHODOLOGY

4.1. Study area and Period

Farta District is one of the 15 rural districts of South Gondar Zone. Farta district is found in the town which is around 100 K.M from B 665K.M from Addis Ababa and has a latitude and longitude of 11°51' 11.083°N 37.867°E respectively with an altitude of 2,736 (8,976 feet) above sea level. This study was conducted between March 2018 to May

The weather condition is categorized in the Woyna Dega zone. It is bordered on the south by Fogera and Dera districts, on the east by Ebinat district, on the west by some part of Libo Kemkem and on the north by Fogera.

According to projections based on 2007 G.C population and housing census of Ethiopia and district level population profile, the total population for 2019 estimated to 201,500 and the majority of the ethnic group and dominant religion is orthodox. Concerning health service, there are treatment centers and 32 functional health posts. Map of study area as.

Map of Farta District

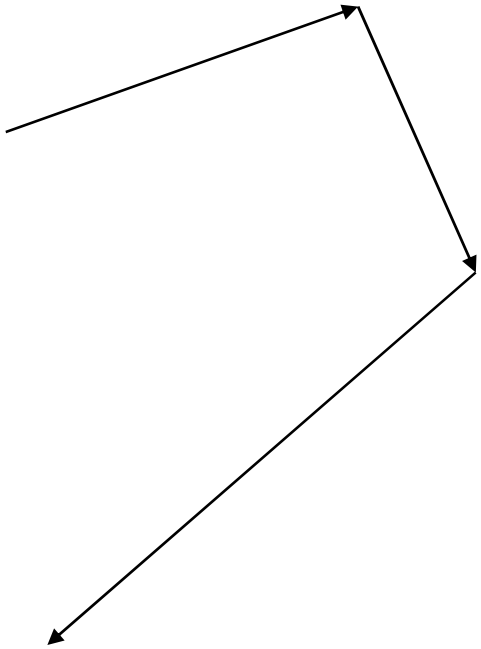

Figure 2: Administrative map of Farta district (study area), Amhara, Ethiopia, 2018

4.2 Study design

Community based cross sectional study was conducted using interview administered pre-tested questionnaires to collect the data.

4.3 Source population

All children aged 59 months (0-4 years) with their mothers/caregivers who permanently live in Farta District at the study period.

4.4 Study population

Children aged 59 months with their caregivers who permanently living and were selected for participation in the study during the time of data collection.

4.5 Inclusion criteria

All children aged 59 months who permanent residents of the study minimum of six months

4.6 Sample size determination

Sample size (n) calculation was done according to the study proper and representative sample size. It is calculated for ea

- Confidence interval = 95%
- Marginal error = 5% and
- Design effect of 1.5 was used to calculate sample size adopting procedure
- N = 15,394 number of children found in 24 Farta district

1. Sample size for first objective

Sample size calculation for stunting was determined by single population proportion formula, where p is the prevalence of stunting (41

59 months from a study done in Hawassa (Sinazu et al., Ethiopia, 2014).

$$n = \frac{(z_{1-\alpha/2})^2 p(1-p)}{d^2} + \frac{(1.96)^2 * 0.597 * (0.403)}{(0.05)^2} = 370$$

Using design effect 1.5 and 10% non-response rate, the final sample size was 611.

Total sample size was taken as 611.

2. Sample size for the second objective

Table 1. Sample size factors

Variable	N	% outcome in exposed group	% outcome in unexposed group	AOR	N
Women Education		52.5	23.5	2.59	10
Knowledge		53.14	25.5	2.32	11
Nutrition information		45.54	20.63	2.39	12
Monthly Income		50.4	26	1.59	14

Then, by comparing the two objectives (presence of the outcome) and sample size factors, the final sample size for the study was 644.

4.7. Sampling procedure and Technique

In Farta District, there are 36 rural and seven urban kebeles. Out of 43 kebeles, 10 kebeles were selected by using simple random sampling technique. The selection of sampling unit, the participants employed was across each selected kebeles. The list of registered households within kebeles obtained from registration performed by Health extension selection of households. Each child-mother pairs were recruited and all sample were collected by using of systematic random sampling technique value of K (N/n) from sampling frame. At the time of data collection, from one eligible child was selected. If there is one child in one household unit, one mother was selected randomly. If there is twin children aged 24 months, one was selected by lottery method. Even if parents present at home, the data collectors visit day to collect the information

To select study participants, the following sample size proportional a
formula was used, where n = total sample size, N = total population, ni = total pre school children in each kebele

$$n_i = (N_i * n) / N$$

Where ni = sample for each kebele, Ni = total population of pre school children in each kebele

n = required sample size, N = total population

4.8 Sampling procedures

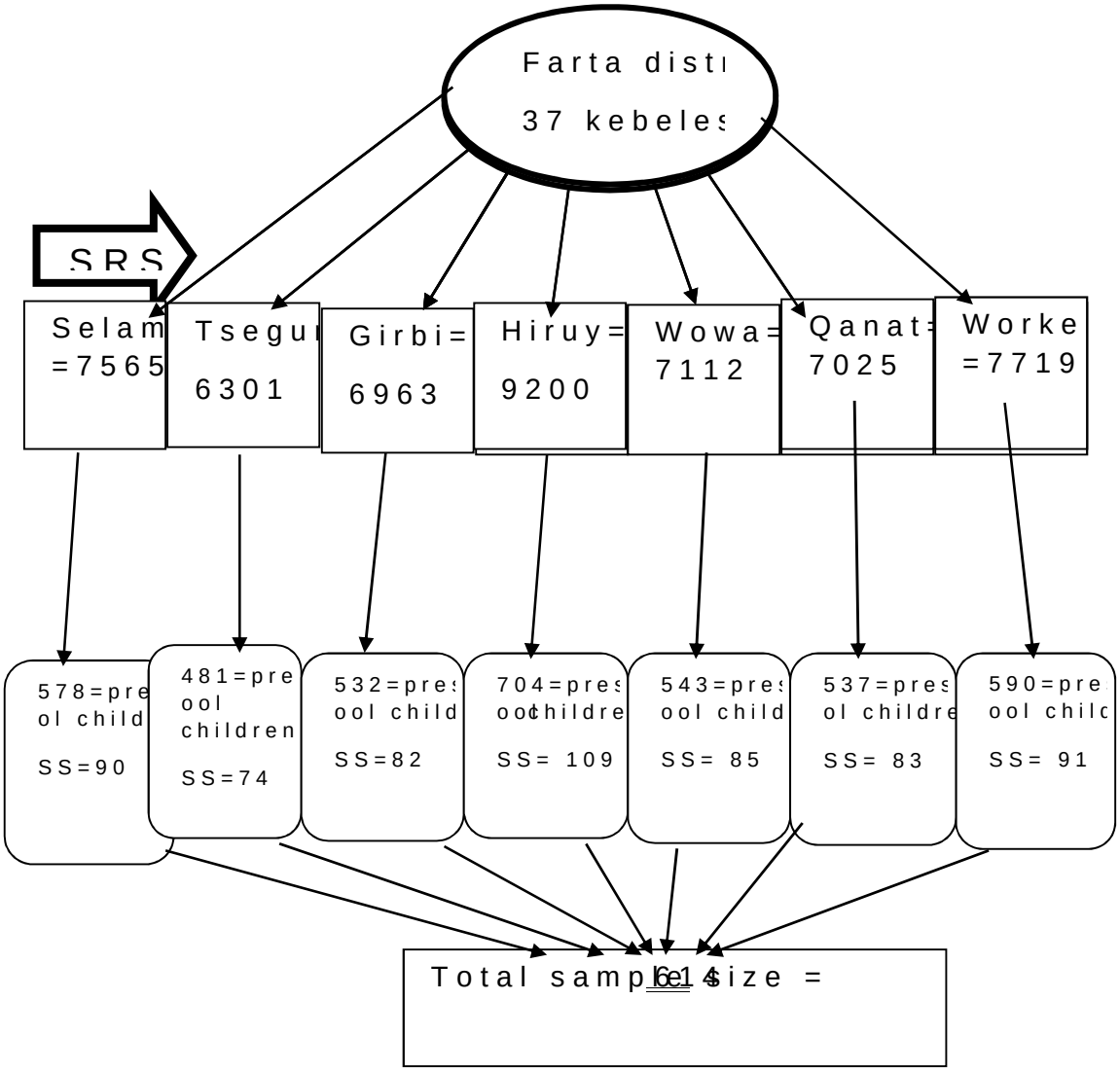

Figure 3: Schematic presentation of sampling procedure to study Farta Woreda, South Gondar Zone, Amhara Region, Ethiopia, 2018

4.9 Study variables

4.9.1 Dependent variables

Nutritional status (Stunting)

4.9.2 Independent variables

Socio-demographic variables, household conditions and sanit
water source, hand washing practices, child characteristics
caring practices and wealth index

4.10 Operational definition

Sanitation practice: availability and utilization of both toilet and
and includes safe disposal of human excreta, liquid and solid
Water handling-practice: proper handling of drinking and domes
the source of water up to consumption at household level.
Hygiene: includes practices related to personal hygiene (e.g. hand washing),
hygiene (e.g. keeping water supplies safe), domestic hygiene
environmental hygiene (e.g. keeping household environment
waste).

Permanent residency: subject who lived in the area for more than si
months. Good sanitation practice: is considered to have goo
practice if household correctly answered 7 of the total 11 related
questions. Poor sanitation practice: is considered as having poor sa
practice if fulfilled less than or equal to 7 of the total 11 sanitation related questions

4.11 Data collection tools

The data was collected using pretested, interviewer administered questionnaires. The questionnaires had a section on socio-demographics, hygiene and sanitation and anthropometric measurements. Anthropometric measurements were taken in duplicate. The weight of child was measured to 0.1kg nearest using electronic beam balance with Kilogram without shoes and in light clothes. The height of the child was also measured to nearest 0.1cm using 2m extensible measuring board. Shoes, caps and hair clips were removed before measurement. The mean of the two measurements was recorded as the final weight. Each measurement was taken in duplicate and if there is any high variation between measurements a third measurement was taken. About 10% of the sampling questionnaires were pre-tested within the study setting to the actual data collectors, principal investigators and two supervisors. Data collectors who were health extension workers and two supervisors underwent a two day training given for them. Regular daily supervision including checking of the completeness and accuracy of the collected data was done by the principal investigator.

4.11.1 Anthropometric Measurements

Anthropometric measurement (height) was done for all children and taken by the principal investigator and data recorder who was assistant. Height was taken for children above two years in centimeters and recorded to the nearest 1 cm. This measurement was taken three times for each child and the mean was taken for analysis. During measurements shoes and hair clips were removed before measurement.

The nutritional indicators were compared with reference data of WHO growth references. -2 SD was considered as the cut-off point below which the median was considered to represent moderate stunting, while values below -3 SD were considered to indicate severe stunting.

4.12 Data quality control and management

The questionnaire was prepared in English and then translated into the local language Amharic and the latter version was back translated to English to ensure its consistency. Data were checked for completeness and consistency by the supervisor and data collectors on a daily basis and incomplete data were sorted out from the entry. Then the coded and cleaned data was entered in to Epi Info version 3.1 and the cleaned data was exported to SPSS version 20 for analysis.

Wealth index: The composite indicator of socio economic status, which was constructed by the application of principal component analysis (PCA). Initially, all the necessary variables were prepared for analysis. Before the PCA, using frequencies, categorical variables that can discriminate households were selected to reduce number of variables. Then all selected variables were recoded to dummy variables. After data preparation, variables were standardized to make the variables change variables to the same scale for the comparisons, which have mean of zero and standard deviation of 1.

A total of 17 variables were considered for wealth index construction. Finally, 4 variables were dropped from the analysis because their communalities/factor scores were less than 50%. These variables, including number of cattle's in the household, number of goats in the household, having commercial bank account, presence of agricultural land, and type of latrine to the household were dropped for wealth index construction.

In PCA, the sum of components with Eigen values greater than one and explaining at least 60% of the total variance is considered as the final cut off point (Lisanu Habtamu Astatkie M, Amit W, Lin & Heitstuman, 2017). Accordingly, the components used explained 70.6% of the total variance, which was above the recommended minimum value (Lisanu Habtamu et al., 2017). Finally, 17 index values were calculated by summing up the scores for the five components. Finally, categorizing the sum of scores into five equal parts and the parts were ranked from the poorest to the wealthiest quintile.

4.13 Data processing and analysis

The collected data was coded and entered into Epi Data version 3.1 and cleaned. Data cleaned data set was exported to SPSS Version 20 software for analysis. Descriptive participants stunting, demographic, socio-economic characteristics and other variables were presented using relevant summary statistics. Under bivariate analysis was done at 25% level of significance to screen out potential confounding variables. Binary Logistic Regression were performed to see the relationship between dependent variable and independent variables. The adequacy of the model was checked using hosmer Goodness of fit test. All assumptions of Binary Logistic Regression such as linearity, multicollinearity were checked. For Binary Regression 95% confidence interval was calculated and a p-value of 0.05 was considered as statistically significant with the outcome variable (stunting).

5. Ethical consideration

Ethical clearance was obtained from the research ethical review committee of Bahir Dar University, college of medicine and health science. Then after a formal letter was written from the research institute after taking supportive letter from Bahir Dar University, college of medicine and health science. The purpose of this study was explained to Health office and administrative of Fogera district. Then after permission for the study was obtained from the respective bodies, the study participants or caregivers of each child were informed about the objectives, benefits, risks and their rights. Then written consent after the objectives and benefits of the study was explained was taken from each caregivers. To ensure confidentiality, the collected data was kept confidential and used only for the research purpose. Data collected from each child and no name was revealed.

6. RESULTS

6.1 Socio-demographic characteristics

A total of 610 participants were included in the study making the response rate 99.4%. The mean (± Standard deviation) age of the participants was 40.8 (± 10.3) years. Around (90%) were Amhara and more than half participants (61.8%) were in the age range of 35 to 59 years. More than two third (78.5%) study participants had poor or very poor wealth status. Vast majority of the respondents were married (92%) and orthodox Christian (97.7%) religion follower.

Forty percent of the respondents could read and write education. Female headed households and 7 wives. Concerning the household head education and occupation, 84.3% of the 84.1% were farmers. Regarding wealth status, 616 (61.4%) of the households were poorer.

6.2 Household Sanitation Practices

Most of the households (94.8%) used water from unprotected sources as drinking water for drinking purpose. Only one-third (21.5%) of the households had access to improved sanitation with a minority (8.5%) practicing poor sanitation practice. Out of the 610 households interviewed, 585 (95.9%) had toilet facilities, 408 (66.9%) had functional and located within 15 the house and 350 (57.4%) households had observed the latrine (Table 3). Regarding the solid waste management, 428 (70%) burned, 242 (39.7%) composting and the remaining used refuse disposal pit. Similarly, 394 (64.6%) of the respondents disposed their waste into dug pits and (35.4%) disposed inside the farmlands (Table 2).

Table 2: Socio-demographic characteristics of respondents children and households Farta district, 2018 (n=)

Variables		Frequency	Percent (%)
Sanitation practi	Poor sanitation pra	479	78.5
	Good sanitation pra	131	21.5
Marital status	Married	565	92.6
	single	23	3.8
	windowed	14	2.3
	divorced	8	1.3
Educational statu	Cannot read and wr	152	24.9
	Can read and write	244	40
	Grade 1-8	138	22.6
	Grade 9-12	76	12.5
Husband educatio	Cannot read and wr	97	15.9
	Can read and write	169	27.7
	Grade 1-8	268	43.9
	Grade 9-12	30	4.9
	Diploma and above	46	7.5
Husband occupati	Farmer	513	84.1
	Government employee	52	8.5
	Merchant	34	5.6
	Daily laborer	11	1.8
Wealth index	Richest	96	15.7
	Rich	158	25.9
	Middle	88	14.4
	Poorer	161	26.4
	Poorest	107	17.5
Ethnicity	Amhara	592	97
	Tigre	11	1.8
	Oromo	7	1.2
Child age in mont	24-36	233	38.2
	37-59	377	61.8

Table 3: Households' sanitation Practices in Kebele 18 (n=621).

Characteristics		Frequen	Percen
Does households has toilet	1. y	582	95.4
	2. n	28	4.6
Distance of toilet from the house	1. > 1	489	80.2
	2.<=1	121	19.8
Toilet condition	1. funct	480	82.5
	2. not fun	102	17.5
Is hand washing facility available with so	1. y	350	57.4
	2. n	260	42.6
source of drinking/ cooking water for memb	1.tap/stan	116	19
	2.spring/Unp	494	81
How long does it take to go there to get wa	1. 15 m	152	24.9
	2. more than	458	75.1
What type of solid waste disposal system do you	1.Pit prepar	85	13.9
	2.Burn	285	46.7
	3.Compo	240	39.3
Where do you dispose liquid wastes?	1.Out of th	216	35.4
	2.Pit prepar	394	64.6

6.3. Nutritional status of preschool children

Majority, 355 (58.2%; 95% CI: 54.2, 62.1) of study participants were not stunted and around 255 (41.8%; 95% CI: 37.4, 45.6) of study participants reported that (Table 4).

Table 4. Nutritional status of preschool children at Farta district, 2018 (n=6

Variables	Frequency	Percent (%
Nutritional status: Not	355	58.2
Stunt	255	41.8

6.4. Obstetric and eating characteristics of mothers

Four hundred seventy (68.9%) of study participants were primipara and 586 (96%) were attending antenatal care follow up. Only one participant had history of stillbirth and 601 (98.5%) did not have any history of stillbirth and abortion. While family planning, 556 (91.1%) had taken family planning during the time of data collection and 535 (87.7%) were consuming extra food during pregnancy (Table 5).

Table 5. Obstetric and eating habits characteristics, 2018 of the mother (n=610)

Characteristics		Frequency	Percent
Parity	Para 1-2	193	31.7
	Para >=3	417	68.3
Number of ANC visit	<4	24	3.9
	1st	586	96.1
History of stillbirth	No	601	98.5
	Yes	9	1.5
History of abortion	No	601	98.5
	Yes	9	1.5
Family planning	Yes	556	91.1
	No	54	8.9
Extra food consumption during		535	87.7
	No	75	12.3

6.5. Child health, feeding and Caring Practice

Five hundred eighty nine (98.2) of children aged 6-59 months were fully immunized and 548 (89.8%) were ever practiced prelactation. Concerning dietary diversity and initiation of complementary feeding, 71 (11.6%) of study participants were meeting the minimum dietary diversity and 439 (72%) of study participants were starting to complement at 6 months. While, 476 (77.7%) of the study participants in health institutions and 114 (18.7) of participants were developed respiratory disease (Table 6).

Table 6 Child health, feeding Caring Practices of children at Farta district, 2018 (n=610)

Characteristics	Freque	Percer
Immunizatic nc	599 11	98.2 1.8
Edema ye	603 7	98.9 1.1
Respiratory d ye	496 114	81.3 18.7
Prelactat ye	548 62	89.8 10.2
Complementary feeding 6month >6	439 162 9	72 26.5 1.5
Birth place heal hom	476 136	77.7 22.3

6.6. Factors associated with stunting

In the univariable analysis, seven independent variables studied namely; participation in nutrition program, mother's occupational status, sanitation practice, family size, immunization and water source had a p-value of less than 0.25. However, at 5% level of significance multivariable binary logistic analysis; only study participation in nutrition program, water source and sanitation practice were significantly and independently associated with stunting.

The odds of stunted children increased by 45.8% (AOR = 1.457 (95% CI: (1.12, 4.13)) in preschool children who were having poorer as compared to those participants were having better families.

6.7. Relationship between Nutritional Status of Preschool Household Sanitation Practices

Household sanitation practice was categorized as good and poor sanitary practice based on the operational definition. Study participants (households) who had poor sanitary practice were 1.21 times more likely to have stunted children compared to those who were having good sanitation (AOR = 1.21, 95% CI: 0.129, 1.343, P-Value = <0.001). Other factors associated with household sanitation practice associated stunting among preschool children were listed in Table 18.

Table 7: Associations of preschool children nutritional status and household sanitation practice in Farta district, Northwest Ethiopia, 2018 (n=610)

		Nutritional S				
		Stunt	Not Stu	COR(95%	AOR(95%	P-Value
Household Sanitation Practice	Good	97	34	1.00	1.00***	
	Poor	158	321	0.173(0.162,	1.21(11.1,11.3)	<0.001**

Table 3: Univariate and Multivariable analysis associated with stunting preschool aged children in Northwest Ethiopia, 2018 (n=

Nutritional status					
Variables	Stunted	Not Stunted	COR(95%CI)	AOR(95%CI)	P-Value
Child age 36-24 month	104	129	1.20(0.743, 2.261)	1.207(0.786, 1.679)	0.265
37-59 month	151	226	1.00	1.00***	
Sanitation Poor	158	321	0.170(0.112, 0.381)	1.211(0.129, 3)	<0.001
Good	97	34	1.00	1.00***	
Family size >=5	184	184	2.400(1.312, 4.39)	0.693(0.444, 1.	0.107
1-4	71	171	1.00	1.00***	
Education Not	94	58	3.117(2.168, 4.4)	1.837(0.900,)	3.74 0.095
Read	84	160	1.009(0.107, 1	0.570(0.281, 7), 1.	0.108
G 1-8	51	87	1.120(0.297, 1.7	0.601(0.306, 6), 1.	0.1137
G 9-12	26	50	1.00	1.00***	
Prelactation	28	34	1.160(0.589, 2.22)	1.592(0.894, 2.	0.114
no	227	321	1.00	1.00***	
Immunization	4	7	0.792(0.243, 3	0.992(0.242, 4.	0.991
ye	251	348	1.00	1.00***	
Wealth Index	65	93	0.937(0.418, 1.8	1.640(0.876,)	3.10 0.121
Midd	46	42	1.469(0.728, 2	2.150(0.820,)	2.55 0.202
Poor	68	93	0.981(0.611, .399)	1.451(0.127,)	4.13 0.021*
Poore	35	72	0.650(0.287, 1.47)	1.502(0.894,)	2.83 0.201
Riche	41	55	1.00	1.00***	

Note: COR, Crude odds ratio; AOR, Adjusted odds ratio; CI, C
Statistically significant at *** constant variables

7. DISCUSSION

Chronic malnutrition is the major public health problem for d
Asian and Sub-Saharan African countries, including Ethiopia, cont
al(Desalegne A et al., 2016). The current magnitude of stunting in this s
to be 41.8% lied at (95% CI: 37.4, 45.6).

The magnitude of stunting in the present study is considera
some developing countries, for instance in Pandapum VDC
Egypt (21.5%) and Hohoe (8.5%) (Hodza et al., 2015; Mehta M, Petwali D,
2015; Sanjit S; Theodros B & Seyoum, 2016). The magnitude of stunt
in Pandapum VDC, Ghana, Egypt and Hohoe could be at
consumption of extra food during pregnancy and the child ea
all study participants mothers in Hohoe and Egypt were well educa
sanitation practice and good income so that this may help th
The previous national studies reported that stunting covera
(FMOH, 2016) which is higher than recommended by WHO which is
this study finding is 41.8%; it may be due to large area the natio
which might be cover both urban and rural area due to that
educated, children may be fully immunized and small family
area is highly affected by diarrheal diseases, the lactation
household income is low and ANC coverage is low. Since the st
only, child's family may have not enough knowledge about u
The above listed possible points could explain the discrepan

The current study is lower than studies conducted in India (51%),
in rural Ethiopia (42.7%) of stunting .The possible justificati
family size, age of children, caregiver educational status,
supplementation and diarrheal diseases prior to study; Secon
poor sanitation practice and use of traditional latrine (Jose et al., Tekleab
2014).

The possible discrepancy for this study could be, participan
study were small in number which increases the chance of bias, the results of this study may not be
geographical difference and methodological variation.
The present study showed significantly higher magnitude o
previous studies conducted in Ethiopia; Amhara (24.9%), A
(33.4%) (Faith A et al., 2016; Kiros et al., 2015; Ngo Nlut, 2016; Abdu J et al., 2014), still the
figure is unacceptably high. This could be due to the low level of maternal education and
diversity practice is common in these areas. Another explanation co
in public awareness towards proper food utilization and hygiene and ti
difference between two study settings could describe this di
came up with the evidence that respondents sanitation prac
factors for preschool children. Preschool children were from family w
affected by stunting than who were richest. It has been obse
children were increased by 54.3% in preschool children who
as compared to those study participants from rich families. This may be due
low-income households which leads to inadequate access to f
care in rural area. This is supported by a study from Malaysia, Gond
Machakel in which to be poorer is responsible factor for th
(Fekadu A; Mekonnen A et al., 2015; Nebiyu D., 2014; Wale W et al., 2017).
could also be explained by the different level of educational statu
population and unable to access better sanitation materials.

Study participants (households) who had poor sanitation pra
likely to have stunted children as compared to those who were practicing good sanita
practice. This may be due to less awareness towards sanitation
environmental and food hygiene. This is in line with a study
Malaysia, Gondar, Sidama zone, Buhlewhich ran and Machakel is
responsible factor for the development (Fekadu A; Mekonnen A et al., 2015; Nebiyu D., 2014; Wale W et al., 2017; Zeleke Y et al., 2017) also
explained by the different level of educational status among
access better sanitation materials.

Good sanitation practice is important determinants of hum
Infants and children are particularly vulnerable to poo(Federal Democratic Republic of). Ethiopia, 2004 The magnitude of poor sa
practice in this study was 78.5%. The prevalence of diarr study showed signif
higher magnitude as compared to previous studies conduct
Gondar (67.7%) (Yimer C et al., 2015). The possible justification for this varia
diarrhea with water status, educational status and latrine av
and hand washing device availability and food hygiene practices as a
with hygienic (Wale Tegegn W et al., 2017).

Generally, the prevalence of malnutrition was high as compared
to the EDHS (Ethiopia, Mini Demographic, Health Survey., 2016). The
Stunting, however, was 38% of the preschool children in the study
higher than that of the national (38%) but lower than regional (46
stunting). This is alarming to increased risk of morbidity and dea
and it signifies chronic problem due to illness related to po
sanitation and poor families.

8. CONCLUTIONS AND RECOMENDATIONS

8.1 Conclusions

The magnitude of intestinal parasitic infection among preschool children in Hadiya zone was found to be high. Participation in pre-school was found to be statistically significant with under-5 children age groups

8.2 Recommendations

Local decision makers

- Sanitation based education should be given for the community
- It would be better if special attention is given for income generating activities for creating wealth

For researchers

- It will be better to study design such as cohort and RCT is conducted

For households

- Maximize additional income generating activities such as irrigation
- Sanitation practice is exercised in every daily activities

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10 ANNEXES

Annex 1: Consent Form

Hello, my name is _____ and I' m from Ethiopian Hun
College of medicine and Health Science, Bahir Dar Universit
about relation between household sanitation and nutritiona
children in Farta woreda as partial fulfillment of a study. I
questions regarding to handling of drinking water, househol
would very much appreciate your participation in this survey
to assess the relation of house hold sanitation and nutritional status of children.
The information will help Zonal Health Department and distr
governmental-gonvermmental organizations to control childrer
well as other communicable diseases. The interview process takes about 25 to 35
minutes to complete. Whatever you tell me will be kept strictly confidentia
and will not be shown to other person. Participation in this stud
choose not to answer any individual questions or to withdraw from the interview at any time. However, we h
that you will participate fully in this survey since your views
any questions about the study?

May I begin the interview now? [ ] Yes, Go to the

[ ] No, Thank them

Instructions:

1) Interview children parents' attained in house hold
2) Ask respondents who will volunteer to participate in the s
5 years of old through parents consent.
3) Try to circle the answers or write in the space provided.

ID NO. Of interviewer _____

Signature_____

Date_____

For comments/questions please contact Samuel Kehali (0
principal investigator of this study.

Thankyou for your willingness to participate in this study

Annex 1x02: English Version Questionnaire

Bahir Dar University College Medicine and Health Science
Environmental Health Questionnaire developed to assess
sanitation practice with nutritional status of preschool chil
Farta district, Northwest Ethiopia, 2018

001. ID. Number: ----------

002. Address: -kebele: -Got: ---------Home numbe-----

Part one: Socio-demographic Characteristics of the Respondents

Code No._____

S.No	Questions	Alternatives	Skip
101	Age	--------years	
102	Sex of household head	1. Male 2. Female	
103	Number of family memb	----------	
104	Religion	1. Orthodox 2. Muslim 3. Protestant 4. Catholic 5. Others specify_____	
105	Ethnicity	1. Amhara 2. Oromo 3. Tigre 4. Others (specify)____	
106	Mother Educational status	1. Cannot read and wri 2. Can read and write 3. Grade 1-8 4. Grade 9-12 5. Diploma and above	
107	Mother Occupation	1. Government employe 2. Merchant 3. Farmer 4. House wife	

		5.Daily laborer 6.Student 7.Other specify	
108	Marital status	1.Married 2.Single 3.Divorced 4.Widowed	If yo answ is 2,3& Skip to Q11
109	If married what is the educational status?	1.Cannot read and wri 2.Can read and write 3.Grade 1-8 4.Grade 9-12 5.Diploma and above	
110	Father/Husband occupati	1.Government employe 2.Merchant 3.Farmer 4.Daily laborer 5.Student 6.Others (specify)____	

Part two: Maternal characteristics and questions about the child under study

S.No	Questions	Responses	Skip
111	Age of the mother	--------years	
112	Gestational age	_____w	
113	Gravidity (how many tim been pregnant?)	_____in	
114	Parity (how many times birth?)	_____numbe	
115	Number of ANC visit current one	_____in	
116	Is there any history of s	1.Yes 2.No	
117	If yes for Q No.122 how	_____ in	
118	Is there any history of a	1.Yes 2.No	
119	If yes for Q No.124 how	_____ i	
120	During pregnancy or la consume extra food?	1.yes 2. no	
121	Currently do you use fam	1.Yes 2.No	

Partthree Wealth index related characteristics

S.No	Questions	Alternatives
122	Ownership of the house	1. Private 2. Rented from in 3. Others (specify)_____
123	How many rooms are there in y	_____in nu
124	What is the main material of th	1. Earth / Sand 2. Cement 3. ceramic 4. Bamboo 5. Carpet 6 Others (specify)_____.
125	What is the main material of th	1. Iron corrugate 2. Wood 3. Thatch 4. Bamboo 5 Others (specify)_____.
126	What is the main material of th	1. Stone with mud 2. Wood with mud 3. Stone with cem 4. Others

		(specify)_____.
127	What type of fuel mainly us cooking? (multiple answer possible)	1.Electricity 2.Charcoal 3.Wood 4.Animal dung 5.Others (specify
128	Is the cooking usually done in a house, in a separate building, or outdoors?	1. In a separate as kitchen 2. Elsewhere in 3. In a separate 4. Other (specify)_____.
129	How many hector of agricultu irrigation land do you have?	_____
130	Annual total agricultural produ	_____kuir

131	Does your household have	Yes	No
	A.Electricity?	1	2
	B.A Radio?	1	2
	C.A Television?	1	2
	D.A Non-mobile telephone?	1	2
	E.A Refrigerator?	1	2
	F.Table?	1	2
	G.Chair?	1	2
	H.A bed with cotton/spring mat	1	2

132	Does any member of your house	Yes	No
	A.A watch?	1	2
	B.A mobile phone?	1	2
	C.A bicycle?	1	2
	D.A Bajaj?	1	2
	E.Animal drawn cart?	1	2
	F.Car?	1	2

133	Does this household own cattle, or any farm animals, or poultry?	1.Yes 2.No
134	How many of the following anim have? (if Q137 answer is 2 skip	
1.	A.Cattle, milk cows, bulls?	_____in num
2.	B.Horses, Donkeys, or mules?	_____in num
3.	C.Goats?	_____in num
4.	D.Sheep?	_____in num
5.	E.Chickens?	_____in num
6.	F.Beehives?	_____in num
135	Do you have Bank account or saving institution?	1. Yes 2. No
136	If yes Q139, how much money bank or Amhara credit and savi	_____ET

Part four Child feeding and Caring Practice

S/N	Questions	Choice of respon	Skip
137	When did you start initiation	1.Immediately aft 2.After 1to 24 ho 3.After a day 4.Don t know/not	
138	For how many months do you	1.Less than 6 mo 2.Six to 12 month 4.More than two 3.One to two yea	
139	Did you give the child any liquid	1.Yes 2.No, skip to 141	
140	What did you give him/her?	1.Water 2.Suger dissolve 3.Butter 4.Milk 5.Other (specify)	
141	Did you squeeze out and thro	1.Yes 2.No	
142	At what month of the chil complementary feeding	1.At 6 month 2. After 6 month 3.Before 6th mo	
143	What do you give when you s	1.Animal product	

		2.Cereal based p 3.Fruit/vegetable	
144	Frequency of supplementary f	1.1-2 times per day 2.3-4 times per day 3.More than 4 tim	
145	What do you use to feed the c	1.Bottle 2.Cup 3.Spoon 4.Other, specify--	
146	Who is usually taking care of	1.Mother 2.Sister 3.House maid 4.Other, specify-	

Part IV: Anthropometry of the child

S/N	Measurements	Reading 1	Reading 2	Average
147	Weight(Kg)			
148	Height(cm)			
149	MUAC(cm)			

Pastix Child Characteristics

S/N	Questions	Choice of respo	Skip t
150	Age of the child(months	----------	
151	Sex of the child	1.Male 2.Female	
152	Birth order of the child	1.First 2.Second 3.Third 4.Fourth & abov	
153	Gestational age at birt	1.Less than 9 m 2.At 9 months 3.Greater than 9 4.Do not know/	
154	Place of birth	1.Home 2.Health institu 3.Other(specify)	
155	Does the child e immunized?(see card)	1.Yes 2.No	If n skip156
	Penta	1.Yes 2.No	
	PCV	1.Yes 2.No	
	Rota	1.Yes 2.No	
	Measles	1.Yes 2.No	
156	Why did not childvacci	1.Time shortage 2.Lack of knowl 3.Unavailable o 4.Fear of side e	

		5.Other(specify)	
157	Did the child take dev	1.Yes 2.No	
158	Did child take Vit. A s	1.Yes 2.No	
159	Has the child has diar	1.Yes 2.No	
160	How frequently the chi	1.Once 2.Twice 3.3-4 times 4.> 5 times	
161	Has the child ill with fe	1.Yes 2.No	
162	Presence of respirator	1.Yes 2.No	
163	Has the child get sick	1.Yes 2.No	
164	Presence of edema	1.Yes 2.No	

Part seven: Household Condition and Sanitation service

S/N	Questions	Choice of responses	Skip to
165	Do you have latrine?	1.Yes 2.No, skip to No. 173	
166	Ownership of the latrine	1.Privately owned 2.Shared with neighbo	
167	What is the current stat	1.Functional 2.Not functional	
168	How far is the latrine fr	1.Far from the house(> 2.Near to the house(<=	
169	Is the latrine well covered?	1.Yes 2.No	
170	Is faeces seen in and around the house (on floor)? Observe	1.Yes 2.No	
171	Is hand washing facility with soap near latrine facility?	1.Yes 2.No	
172	What was done to dispose youngest child?	1.Child used toilet 2.Thrown into garbage 3.Left in the open	
173	Do you wash your hands with soap/ash after handling the stool of the younges	1.Yes 2.No	
174	Did excreta of children cause diseases?	1.Yes 2.No	
175	If the family has no latrine, where they defecate?	1.open field 2.Bush 3.Back yard	

Part eight: Water source

S/N	Questions	Choice of responses	Skip to
176	What is main sou drinking for memb your household	1. public tap/standpipe 2. spring protected/unprotected 3. river/lake/pond/	
177	What is main sou water use your hous for purpo cooking hand was	1. public tap/standpipe 2. spring protected/unprotected 3. river/lake/pond/	
178	Where is water s located?	1. In own dwelling 2. In own yard/plot 3. Elsewhere	
179	How long it take t there to water, come bac	1. 15 minute 2. More than 15 minute	
180	Who usu goes to source to the wate your household	1. Adult man/woman 2. Adult man 3. Female child under 15 years 4. Male child under 15 years	

181	What typ container you use collect from sour	1.Clay pot 2.Jerri can 3.Pails (bucket) 4.Other(specify)----------	
182	What is primary container use for s water?(O the w container	1.Plastic bucket container 2.Jerri cane 3.Clay jars 4.Metal container 5Other (specify)	
183	Does container covered? Observe container	1.Yes 2.No	
184	Is there separate taking dr water fro storage container the mothe taker to you)	1.Yes 2.No	
185	How do withdraw from container	1.Dipping 2.Pouring	
186	Do you	1.Yes	If n

	anything water to it safer drink?	2.No	skip to Q189
187	When did treat water?	1.Today 2.Yesterday 3.Before three days 4.Before one week	
188	What do usually d make the safer to d	1.Boil 2.Add bleach /chlorine 3.Water guard/pur/ 4.Strain through a cloth 5.Other(specify) 6.Don t know	
189	If do practice home trea method, w	1.Lack of money 2.lack of knowledge 3.Other(specify)	

Part IV: Hand washing practice

S/N	Questions	Choice of responses	Ski to
190	When you wash your hands with bar of soap? Do not re answer(circle all th	1.Washing hands after 2. Washing hands afte 3. Washing hands b children(including bre 4.Washing hands befo 5. Washing hands afte 6. Washing hands be food 7.Other, specify-	

191	What type of solid w system do you use? system	1.Pit prepared for it 2.Burning 3.Composting 4.Other, ~~specify~~	
192	Where do you dis wastes?	1.Out of the house 2.Pit prepared for it 3.Othes, ~~specify~~	
193	Do you have waste waste?	1.Yes 2.No	
194	How many times do the house per week?	------~~times~~ per week	

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183	Ì ¨ +@ ëÌ Eóu è ë #3 (í ¨q)	1.È 2è Í	
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Annex 1x04: Result Tables

Table 9: Socio-demographic characteristics of school children and households at Far district, 2018 (n=610)

Variables		Frequency	Percent (%)
Sanitation practice	Poor sanitation practice	479	78.5
	Good sanitation practice	131	21.5
Marital status	Married	565	92.6
	single	23	3.8
	windowed	14	2.3
	divorced	8	1.3
Religion	Orthodox	596	97.7
	Muslim	14	2.3
Educational status	Cannot read and write	152	24.9
	Can read and write	244	40
	Grade 1-8	138	22.6
	Grade 9-12	76	12.5
Occupation	House wife	485	79.5
	farmer	55	9.0
	Governmental employee	52	8.5
	Merchant	18	3.0
Husband education	Cannot read and write	97	15.9
	Can read and write	169	27.7
	Grad 1-8	268	43.9
	Grad 9-12	30	4.9
	Diploma and above	46	7.5
Husband occupation	Farmer	513	84.1
	Government employee	52	8.5

	Merchant	34	5.6
	Daily laborer	11	1.8
Wealth index	Richest	96	15.7
	Rich	158	25.9
	Middle	88	14.4
	Poorer	161	26.4
	Poorest	107	17.5
Ethnicity	Amhara	592	97
	Tigre	11	1.8
	Oromo	7	1.2
Maternal age	15-24	9	1.5
	25-35	400	65.5
	>=36	201	33.0
Child age in months	24-36	233	38.2
	37-59	377	61.8
Sex of the child	Male	299	49
	Female	311	51

Table 10 Households' sanitation practice in Hantra district, 2018 (n=610).

Characteristics		Frequenc	Percent
Does households has toilet	1. yes	582	95.4
	2. no	28	4.6
Distance of toilet from the house	1. > 15m	489	80.2
	2.<=14m	121	19.8
Toilet condition	1. functional	480	82.5
	2. not functional	102	17.5
Have latrine covered	1. yes	271	44.4
	2. no	339	55.6
Is hand washing facility available with soa	1. yes	350	57.4
	2. no	260	42.6
Is faeces seen around the pit	1. yes	484	79.3
	2. no	126	20.7
source of drinking/ cooking water for memb	1.tap/standpipe	116	19

	2.spring/Unprotected	494	81
How long does it take to go there to get wa	1. 15 minute	152	24.9
	2. more than 15 minute	458	75.1
Container type to collect water	1. Clay pot	21	3.4
	2.Jerri can	534	87.5
	3.Pails (bucket)	55	9.1
Does container has cover	1. yes	585	95.9
	2. no	25	4.1
Do u do make water to safe	1. yes	289	47.4
	2. no	321	52.6
What do you usually do to make the water s	1.Boil	24	3.9
	2.Add bleach /chlorine	59	9.7
	3.Water guard/pur/	69	11.3
	4.Strain through a cloth	156	25.6
	5. others	302	49.5
What type of solid waste disposal system d	1.Pit prepared for it	85	13.9
	2.Burning	285	46.7
	3.Composting	240	39.3
Where do you dispose liquid wastes?	1.Out of the house	216	35.4
	2.Pit prepared for it	394	64.6
Do you have waste bin for solid waste?	1. yes	57	9.3
	2. no	553	90.7

Table 4.1 Obstetric and eating habits characteristics, 2018 the mothersat (n = 610)

Characteristics		Frequency	Percent
Parity	-2	193	31.7
	para >=3	417	68.3
Number of ANC nd visit	>=2	24	3.9
	1st	586	96.1
History of still birth	No	601	98.5
	Yes	9	1.5
History of abortion		601	98.5

Yes	9	1.5
Family planing	556	91.1
No	54	8.9
Extra food consumption during pregna	535	87.7
No	75	12.3

Table 12 Child health feeding and Caring Practice of children at Farta district, (n=610)

Characteristics	Frequen	Percent
Immunization yes	599	98.2
No	11	1.8
Diarrhoea	496	81
Yes	116	19
Measles vaccinationno	0	0
Yes	610	100
Fever no	429	70.3
Yes	181	29.7
Edema no	603	98.9
Yes	7	1.1
Respiratory disease	496	81.3
Yes	114	18.7
Prelacteating	548	89.8
Yes	62	10.2
Complementary feeding st	439	72
At 6month	162	26.5
>6month	9	1.5
Colostrums yes	584	95.7
No	26	4.3
Birth place health institu	476	77.7
Home	136	22.3
Deworming yes	545	89.3
No	65	10.7
VitA. Supplementation ye	604	99
No	6	1
Care taker of the child m	569	93.3
House maid	41	6.7

Table 3 Univariate and Multivariable analysis for factors associated
preschooled children at Farta district, Northwest Ethiopia, 2018 (n=

Nutritional status				
Variables	Stunted	Not Stunted	COR(95%	AOR(95%	Value
Child age 24-36 month	104	129	1.207(0.145, 10.026)	1.207(0.867, 1.	0.265
37-59 month	151	226	1.00	1.00***	
Sanitation Poor	158	321	0.173(0.162, 0	1.211(0.129, 1.	<0.001*
Good	97	34	1.00	1.00***	
Family size >=5	184	184	2.408(0.131, 3	0.693(0.444, 1.	0.107
1-4	71	171	1.00	1.00***	
Education mother Not	94	58	3.117(2.163, 4.493)	1.837(0.900, 3.	0.095
Read	84	160	1.009(0.107, 1	0.570(0.281, 1.	0.108
G1-8	51	87	1.128(0.297, 1.7	0.601(0.306, 1.	0.1137
G9-12	26	50	1.00	1.00***	
Prelactation yes	28	34	1.165(0.289, 4.702)	1.592(0.894, 2.	0.114
no	227	321	1.00	1.00***	
Immunization no	4	7	0.792(0.243, 3	0.992(0.242, 4.	0991
yes	251	348	1.00	1.00***	

Wealth Index	Richer	65	93	0.937(0.418, 1.8	1.649(0.876, 3. 0.121
	Middle	46	42	1.469(0.728, 4), 2	2.157(0.820, 2. 0.202
	Poorer	68	93	0.981(1.176, 0.19)	3 1.457(1.127, 4. 0.020*
	Poorest	35	72	0.652(0.817, 0.47)	2 1.592(0.894, 2. 0201
	Richest	41	55	1.00	1.00***

Note: COR, Crude odds ratio; AOR, Adjusted odds ratio; CI, Confidence interval; *, Statistically significant and 1.00*** constant variables