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BAHIR DAR UNIVERSITY

COLLEGE OF MEDICINE AND HEALTH SCIENCES

SCHOOL OF PUBLIC HEALTH

PREVALENCE OF HOOK WORM INFECTION AND ITS ASSOCIATED FACTORS AMONG ADULT OUTPATIENT ATTENDANTS IN PUBLIC HEALTH FACILITIES OF NORTH MECHA DISTRICT, NORTH WEST ETHIOPIA.

BY: - MULLUALEM ASMARE (BSC)

ATHESIS RESEARCH SUBMITTED TO DEPARTMENT OF HEALTH SERVICE MANAGEMENT AND HEALTH ECONOMICS, SCHOOL OF PUBLIC HEALTH, COLLEGE OF MEDICINE AND HEALTH SCIENCES IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTERS IN GENERAL PUBLIC HEALTH

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BAHIR DAR, ETHIOPIA

BAHIR DAR UNIVERSITY COLLEGE OF MEDICINE AND HEALTH SCIENCES SCHOOL OF PUBLIC HEALTH DEPARTMENT OF HEALTH SERVICE MANAGEMENTAND HEALTH ECONOMICS

PREVALENCE OF HOOK WORM INFECTION AND ITS ASSOCIATED FACTORS AMONG ADULT OUTPATIENT ATTENDANTS IN PUBLIC HEALTH FACILITIES OF NORTH MECHA DISTRICT, NORTH WEST ETHIOPIA.

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Abstract

Background: - Human hookworm is a soil-transmitted helminth infection caused by either Necator americanus or Anclystoma duodenale.Globally it is a major cause of morbidity and predominantly affects the poorest population. Transmitted primarily by larval invasion of exposed skin, the adults inhabit the host small intestine, where they consume host blood. The resultant chronic iron deficiency anemia can lead to stunted growth and cognitive deficits in children, reduced work capacity in adults, and a variety of pregnancy complications. **Objective:-**To assess prevalence of hook worm infection &its associated factors among adult outpatient attendants in health facilities of North Mecha District, North West Ethiopia 2020/2021.

Method: - Afacility based cross-sectional study was conducted from December 10/2020 to January 8/2021. Six out of 11 Health facilities were selected by Lottery method& study participants were selected by systematic random sampling technique. Data collectors and supervisors were trained. Pre tested Amharic version questionnaire was used to collect data using face to face interview technique and stool sample was examined in the Laboratory. Data was coded and entered into SPSS version 23 software. A total of 539 samples were included in Analysis.Bivariable logistic regression analysis was used to identify factors associated with prevalence of hook worm infection.Those variables <0.2 p-value were entered into multivariable logistic regression analysis to identify statistically significant independent factors when the effect of other variables were adjusted. Adjusted odd ratio at 95% CIand p-value< 0.05 was presented.

Result: - The prevalence of hookworm infection was 20%. Habit of walking in barefoot in outdoor (AOR=6.49, 95% CI ;(2.753-15.302)), fingernails hygienic status (AOR=2.534, 95% CI (1.354-4.74)) and information about hookworm infection (AOR=6.013, 95%CI (2.625-13.776)) were significantly associated with hookworm infection.

Conclusion: - The prevalence of hookworm infection is high. Had habit of walking in barefoot ,had dirty fingernails and had no information about hookworm infection were positively associated with hookworm infection.Giving targeted health education, regular shoe wearing and behavioral change communication to reduce habit of walking in barefoot are essential to reduce prevalence of hookworm infection among adults.

Keywords: - Hook worm infection, Associated factors, Adult Outpatient attendant and North Mecha district.

ABBREVIATIONS

A.caninum: Ancylostoma caninum

A.cyelanicum: Ancylostoma cyelanicum

A.duodenale: Ancylostoma duodenale

CSA: Central Statistics Agency

DWMM: Direct Wet Mount Microscopy

Fig: Figure

G.C.: Gregorian calendar

H.C.: Health center

MRN: Medical Registration Number

N.Americanus: Necator americanus

PI: Principal Investigator

OPD: Out Patient Department

SOP: Standard Operating Procedure

STH: Soil Transmitted Helminthes

VHV: Village Health Volunteer

$: Dollar

YLD: Years Lived With Disability

AOR: Adjusted Odds Ratio

CI: Confidence Interval

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1. INTRODUCTION

1.1. Background

Hookworm is a soil transmitted helminth and one of the neglected tropical diseases listed by World Health Organization (WHO) (1). Hookworms are parasitic worms that can infect the human intestine (2). Walking barefooted in warm climates where sanitation is poor, contaminated soil, contaminated food and water in parts of the world with poor sanitation, lack of hygiene and open defecation are important risk factors for the transmission of hookworm infection(4). Transmission of hookworm infection is occurring either by fecal-oral route or by skin penetration (3). The main way people become infected with hookworm's larva is through direct skin contact with contaminated soil when walking on barefoot (9).

Humans are infected with hookworm's third stage filarial-form larvae. The larva in soil penetrates through the skin particularly into area such as unprotected feet (5). After penetrating the epithelial barrier, hookworms attach to a host's intestinal mucosa, using sharp teeth to lacerate small blood vessels for feeding (7).Once infected, the filarial-form larva migrates into blood circulation. They break out of the pulmonary blood vessels into alveoli, then crawl up the trachea and are swallowed with saliva to re-enter the intestinal tract. They attach themselves to the mucous membrane of the small intestine to mature into adults. The female adult releases eggs Necator Americanus (N.Americanus) about 9000-10,000 eggs per day and Ancylostoma Duodenale (A.duodenale) 25000-34000 eggs per day) which are passed in the faces of the human host.These eggs hatch in the environment within several days and cycle starts anew (5).Hookworm is characterized by the presence of teeth or cutting plates lining the buccal capsule of adult (6). The adult worms are roughly 1 cm long and attach to the host's mucosa where they feed on blood, up to roughly 30 µL per day per worm (8).

Hookworm infection is characterized by abdominal pain, nausea, vomiting, anorexia, fatigue, dyspnea, pallor, pale sclera, melena and poor academic performance. During heavy infections, an adult hookworm can consume up to 0.2 ml of the blood per day causing iron deficiency anemia and malnutrition (11, 12).

Diagnosis of hookworm infection can be achieved through clinical, parasitological, molecular and immunological diagnostics techniques (13). Necator americanus has been found to be more predominant worldwide than A. duodenale. In addition animal hookworms of dogs and cats,

Ancylostoma Ceylanicum (A. ceylanicum) and Ancylostoma Caninum (A. caninum) have been occasionally reported in humans. N. americanus is the predominant hookworm of Sub-Saharan Africa, Southeast Asia, and the Americas while Ancylostma duodenale is endemic in China and India (14). N. americanus is the predominant etiologic agent for hookworm infection in Ethiopia and in Amhara region (15).

Treatment with anthelminthic drugs with a single dose of Albendazole (400mg/day) is a feasible, effective, and low cost approach to control hookworm infection (16).

1.2. Statement of the problem

Hookworm disease is caused by chronic infection with Ancylostoma duodenale or Necator americanus and is of considerable public health importance in low and middle-income countries in the tropics and subtropics (14).

Hookworm infection affects about 740 million people worldwide with 80 million people severely infected (17).It is among the most common infections worldwide and affects most poor communities. It occurs in sub Saharan Africa, The America, china and East Asia. About one third of the world's hookworm infections occur in the Sub Saharan Africa, with the greatest number of cases occurring in Nigeria (38 million cases), Democratic Republic of Congo (31 million cases), followed by Angola, Ethiopia (30 million) and Côte d'Ivore (10-11 million cases)(13). Climate and soil structure in Sub Saharan Africa regions appear to be crucial determinants of hookworm infection, with the high temperatures and moist environments ideal for larvae growth outside a host (7).

The economic burden caused by hookworm infection is high. Among those infected with intestinal nematodes, hookworm infections are associated with the greatest years lived with disability (YLDs), with recent estimates indicating that human hookworm disease is associated with 4.1 million disability-adjusted life years Worldwide. Beyond its health impact, the anemia it induces is linked to a moderate economic burden ranging up to $139 billion each year globally (19). Anemia due to hookworm infection costs $20.9 billion worldwide. It also resulted in $11.0 billion in productivity losses in Africa (20). Majority of infected individuals live in poverty stricken areas with poor environmental sanitation (21). Women and young children have the lowest iron stores and are therefore most vulnerable to chronic blood loss as the result of hookworm infection (22, 23). Young children are reported to be disproportionately affected by

hookworm infection compared to adults due to increased nutritional requirements and less developed immune system. Hookworm infection in this age group has been linked with significant reduced growth and increased risk for protein-energy malnutrition (24); including growth stunting, iron deficiency anemia, intellectual retardation, cognitive and educational deficit (25).

Hookworm's hematophagous habits cause pathogenesis of anemia and malnutrition. However, actual blood loss can be significantly greater, the worms change, their feeding sites several times a day, and the secretion of anticoagulants or proteins means that the vacated sites continues to bleed, contributing greatly to blood loss (26,27).

Most of the physical signs of chronic hookworm infection reflect the presence of iron-deficiency anemia. In addition, anasarca from extensive plasma hyper proteinemia is associated with edema of the face and lower limbs. The skin becomes waxy and acquires a sickly yellowish color (a feature of tropical chlorosis) (28). Other than hypochromic microcytic anemia, the most prominent laboratory finding is eosinophilia which can be detected in30 to 60% of cases (29). Eosinophilia peaks at five to nine weeks after the onset of infection, a period that coincides with the appearance of adult hookworms in the intestine Patients with a light hookworm burden are usually asymptomatic; however, some patients report subjective clinical improvement after treatment (30).

A moderate or heavy hookworm burden results in recurrent epigastric pain and tenderness, nausea, exertional dyspnea, pain in the lower extremities, palpitations, joint and sternal pain, headache, fatigue, and impotence(31). Some patients crave bulky substances and ingest dirt (pica). In adults, the capacity for work may be adversely affected, and many report an inability to work (32).

The disease burden and the public health importance of Hookworm and other soil transmitted helminthes are still concerns in developing countries like Ethiopia (33).Moreover, Efforts like Launching and implementing Health Extension Package, Mass Drug Administration of School Age Deworming and Enhancing Outreach service with Periodic Deworming of 24-59 months old children, has been done Hookworm Remains Public Health Problem in Ethiopia.

As far as few Recent Literatures available on Prevalence and Risk factors of Hookworm, Hookworm prevalence and its associated factors among adult population is not well known in the study area & also in North West Ethiopia. Due to lack of such studies in the study area, this study will be conducted to determine prevalence and factors which may contribute to hookworm infection in adults. Different Electronic Search Engines like Google, Google scholar, PubMed, science direct, BMC Medical were used to Review Available Literatures.

1.3. Significance of the study

The results of this study has contributions for Health care providers and District and zonal level Health Officials to increase hook worm screening chance for their patients and to take effective prevention and control mechanisms for their catchment population by updating their knowledge about hookworm prevalence and associated factors in the study area.The results of this study will also help Educators to increase and/or update local knowledge about the prevalence and risk factors of hookworm in Adults in North West Ethiopia so as to teach their students.Policy makers will use this result as an additional Input to assess hookworm magnitude and Risk factors that are prevalent in North West Ethiopia and to take evidence based decision to improve or strengthen policies in prevention and control of Hook worm for the community at large.Finally, information obtained from this study will add to the existing body of knowledge about the prevalence and associated factors of hook worm in adults and help Researchers to generate Hypothesis for further Research.

2. LITERATURE REVIEW

2.1. Magnitude of hookworm infection

Across sectional study done in 3371 participants of Southern Lao People's Democratic Republic Reveals that the overall prevalence of hookworm infection was 48.8% (2); and in Preah Vihear Province, Cambodia Of the 2576 participants included in the study, 49% were infected with hookworm (34). Another cross-sectional study conducted between January to April 2016 among village health volunteers (VHVs) from four sub-districts of Nopphitam District, Nakhon Si Thammarat Province, southern Thailand A total of 324 VHVs were enrolled and The prevalence of hookworm was 8%(35). In across sectional study done on hookworm infection among patients attending usmanu danfodiyo university clinic, main campus, sokoto, sokoto state, Nigeria Out of 100 study participants, overall prevalence of hookworm infection was 71 %. (36).And cross sectional study conducted among participants of 2years and older in the house hold survey in Kwale County, Kenya Reveals that Prevalence of hookworm infection was 19.1% (37).Where as a community based cross sectional study done in Ashanti region Ghana with724 study participants of those age greater than 6 years revealed that prevalence of hook worm was 5.6% and varied by community (38).Higher rate observed in study conducted among pregnant women attending antenatal care in Maytsebri primary hospital, North Ethiopia, 179Out of the total 448 pregnant women were positive for Hookworm with the prevalence rateof 40%(39).In another cross sectional study conducted among pregnant women attending antenatal care at public health facilities in Lalo Kile district, Oromia, Western Ethiopia Revealed that 106 out of 315 respondents were positive for Hook worm with the prevalence of 33.7%(40). A study conducted Over 306 participants on hookworm infection and associated factors among pregnant women attending antenatal care at governmental health centers in Dembecha district, North West Ethiopia, showed that the prevalence of hookworm infection was 32%(9).Astudy conducted in Dera District, South Gondar Ethiopia Among the total 464 study participants' shows that Hookworm prevalence was 14.7% (41).

2.2. Determinants of hook worm infection

2.2.1. Socio demographic factors

Sex

The overall prevalence and intensity of hookworm infection are higher in males than in females, in part because males have greater exposure to infection (22). In A study conducted in Southern Lao People's Democratic Republic, Females showed lower prevalence and intensity of hookworm infection than males, except women aged 50years and above, who were the most heavily infected (2).Also a study conducted in University of Calabar Staff School, Calabar, Nigeria showed that the frequency of hookworm infection was more in males, 11.3% than in females, 6.8% (25).In across sectional study done among patients attending usmanu danfodiyo university clinic, main campus, sokoto, sokoto state, Nigeria Out of 100 study participants, Gender specific prevalence of hookworm infection revealed that males (73.2%) were more infected than females (68.2%)(36).Whereas across sectional study done in Ashanti region, Ghana, among study participants the odds of infection among females were 1.72 the odds of males even if it is not statistically significant (38).In a study conducted among Rural communities of South west Ethiopia, Based on the analysis males were1.67times more often get infection than females (42).

Age

Compared to other soil transmitted helminthes (STH) infections and schistosomiasis, hookworm infection exhibits a unique age-intensity profile. Hookworm intensity usually either steadily raises in intensity with age or plateau in adulthood (18).In a study conducted in Southern Lao People's Democratic Republic showed that Preschool-aged children had the lowest infection levels (2). In A study conducted in Ashanti region, Ghana, The majority of cases of hook worm occurred in adults over the age of 30 years, and the distribution of cases by age was found to be similar between communities included in this study (38).Another community based cross sectional study conducted among study participants of 2years and older in the house holds of Kwale County, Kenya Reveals that 12.5% in less than Five years, 17.4% in 5–14 years and 20.7% in adults; from the total of 19.1% hook worm positives (37). A study conducted in Dera District, South Gondar ,Ethiopia showed that clients with age group greater than 15years old had 5.26 times more to have hookworm infection(19%) compared to clients below15years (3.8%)(41).

Job and Residence

In across sectional study done among patients attending usmanu danfodiyo university clinic, main campus, sokoto, sokoto state, Nigeria Out of 100 study participants, the occurrence of hookworm infection was highest among patients that engage in farming 11(90.9%) while civil servants had the least prevalence of hookworm infection 9(55.5%)(36).In A study conducted in Ashanti region, Ghana, the infection with hookworm was associated with farming OR=14.1& the activity of irrigated culture significantly predicts hookworm infection OR=3.23(38).

Income

In a community level study conducted on the coast of Kenya; the prevalence of Hook worm is associated with low socio-economic status (37).In a study conducted among pregnant women of Dembecha District, North west Ethiopia, pregnant women whose monthly income less than or equal to 1500 Ethiopian birr were 3.7 times more likely to be infected by hookworm than pregnant women whose monthly family income greater than 1500 Ethiopian birr (9).

Level of Education

In A study conducted in Ashanti region, Ghana, A decreasing trend of Hookworm was observed in rates of infection with increased level of education (38) and Hookworm infection was associated with not attending school in a community level study conducted on the coast of Kenya (37).

2.2.2. Personal factors

Personal hygiene

In a study conducted on hookworm infection among patients attending usmanu danfodiyo university clinic, main campus, sokoto, sokoto state, Nigeria Out of 100 study participants, patients with dirty finger nails were the highest infected 55(89.1%) while those with clean finger nails had the lowest prevalence 45(48.9%)(36). In a study conducted at sokoto state Nigeria The occurrence of hookworm infection among Patients not washing hands after toilet was 2.4 times more likely as compared to washing their hands (36). In a study conducted among pregnant women of Dembecha District, North west Ethiopia, The result showed that pregnant women who had not habit of hand washing were 3.4 times more likely to be infected by hookworm than those who had habit of hand washing before meal(9).

Wearing shoes

In a study conducted on hookworm infection among patients attending usmanu danfodiyo university clinic, main campus, sokoto, sokoto state, Nigeria Out of 100 study participants, who walk barefooted were the highest infected 10(80%) while those who always wear shoes were the least infected 59(66.1%) (36).And Ashanti region, Ghana, A higher percentage of individuals who experienced hookworm infections did not wear sandals (17.4%) than those who did (7.4%). Daily shoe use was found to be a protective factor against hookworm infection (38).Another study conducted on the coast of Kenya; shoe-wearing was significantly associated with higher rates of Hook Worm Infection (37).

In across sectional study conducted among pregnant women attending antenatal care at public health facilities in Lalo Kile district, Oromia, Western Ethiopia Showed that pregnant women with a habit of walking barefoot were six times more likely infected by hookworm than who wear shoe regularly (40).Whereas in Dera District, South Gondar, Ethiopia The 17.6% of hook worm infections found among patients walking in barefoot was 2.21 times higher compared to those who worn shoes (7.9%) (41).Another study conducted among pregnant women at Dembecha District ,North west Ethiopia showed that pregnant women with habit of barefoot had almost 4.3 times more likely to be infected by hookworm than those who did not the habit(9).

Awareness

In a study conducted at sokoto state Nigeria Patients unaware of hookworm infection had the highest infection rate (89.9%) while those who had prior knowledge of hookworm infection recorded the lowest prevalence (48.9%) (36).

2.2.3. Environmental factors

In a study conducted on the coast of Kenya; hook worm Infection was associated with individual and household water, sanitation and hygiene (WASH) characteristics and behaviors (37).

Source of water

In a study conducted at sokoto state, Nigeria, The occurrence of hookworm infection significantly associated with well and river as sources of drinking water, as patients who used well as source of drinking water had the highest prevalence (87.2%), while those who used tap recorded the least prevalence of hookworm infection (33.8%)(36).

Availability of latrine

In an Institutional based cross sectional study conducted among pregnant women at Dembecha District ,North west Ethiopia showed Pregnant women who lived in household that have not toilet facility had almost 2.2 times more likely to be infected by hookworm than pregnant women who lived in households that have toilet facility(9).

More over, Literatures showing prevalence and associated factors of hookworm infection in the Adult population representing both sex and Adult age profile in Northwest Ethiopia, and all over Ethiopia are very limited.

3. CONCEPTUAL FRAME WORK ON FACTORS OF HOOK WORM

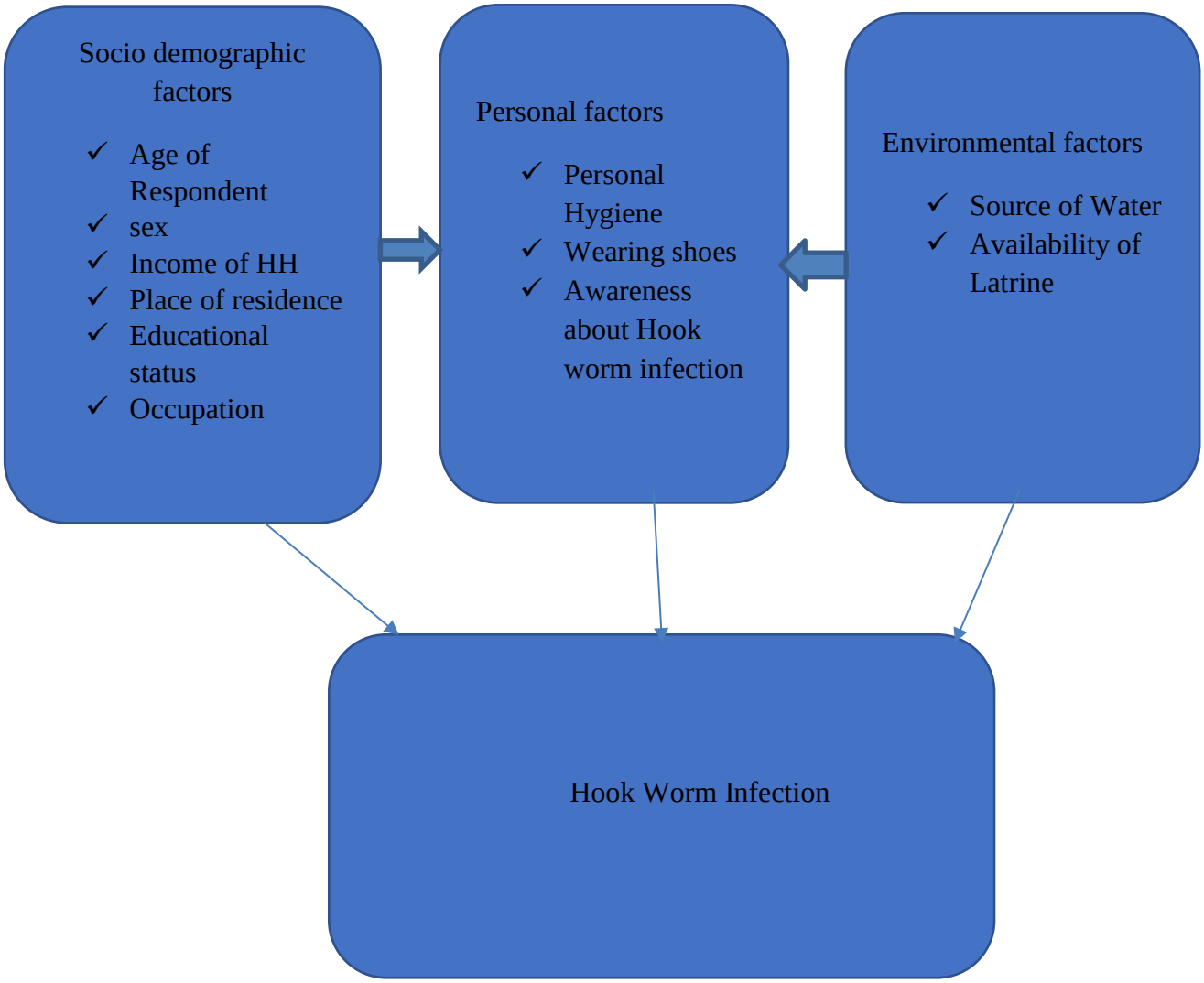

Figure 1 Conceptual framework on associated factors of hookworm Infection

4. OBJECTIVE OF THE STUDY

4.1. General Objective

To assess prevalence of hook worm infection &associated factors among adult outpatient attendants in north mecha district health facilities, North West Ethiopia 2020/ 2021.

4.2. Specific Objective

1. To describe prevalence of hook worm infection among adult outpatient attendants in north mecha district health facilities.

2. To identify factors associated with hook worm infection among adult outpatient attendants that are prevalent in north mecha district health facilities.

5. METHOD

5.1. Study design and period

Institutional based cross sectional study was conducted to determine prevalence of hookworm infection and factors associated with it from December 10/2020 to January 8/2021 G.C**.**

5.2. Study settings

The study was conducted in North Mecha District, Northwest Ethiopia. North Mecha is one of the Districts found in west gojjam Zone of the Amhara Region. North Mecha is bordered on the southwest South Mecha district, on the west by Awi zone and South Achefer district, on the north by North Achefer district, on the South east by Yilmana Densa district and on the east by Bahir Dar zuria district. The administrative city of North Mecha is Merawi which is located 508 km far away from Addis Ababa, capital city of Ethiopia and 34 km from Bahir Dar which is the capital city of Amhara region. The district has an Area of 768.83 Square Kilometers(44) and its Weather condition is 19°C Room temperature, 91% Humidity &, Wind at 13 kilometer/hour in August Month (45).

Based on the 2007 national census conducted by the Central Statistical Agency of Ethiopia (CSA), this district has a total population of 311,498, of whom 157,306(50.5%) of them were female and 154,192 (49.5%) of them were male; 38,937 or 12.5% are urban inhabitants (44). With an area of 768.83 square kilometers, In North Mecha district there is one government hospital, 10 health centers, 38 health posts and 2 medium private clinics and 4 pharmacies (46). In the district the district hospital and 10 health centers provide primary health care service with investigation and treatment of intestinal parasites including Hookworm infection.Although several methods such as Duplicated Katokatz smear, polymerase chain reaction tests and Microscopical tests used for hookworm diagnosis direct wet mount microscopy of stool sample was the only diagnostic test in the district.This test was routine test and available in all health centers and hospital in the disrict.

5.3. Population

5.3.1. Source population

All Adults aged 15years & older who attended health institutions and were permanent residents in North mecha district.

5.3.2. Study population

All adult outpatient attendants in north mecha district of the selected health facilities were the study population.

5.3.3 Study unit

Adult Patient/client who visited an Outpatient Department of Respective Health facility from December 10/2020 to January 8/2021 G.C. were selected.

5.4. Sample size determination and sampling procedure

5.4.1. Sample size determination

Sample size for Objective One

The sample size was determined by using single population proportion formula by taking 32% Hookworm prevalence or p from previous literature done in Dembecha district North West Ethiopia(9). Therefore, by taking p=0.32% and in the assumption that Confidence interval (CI) 95%, α=0.05(5%), 95% confidence level (Zα/2 =1.96), 10% non-response rate and absolute precision or margin of error to be 5 %(d=0.05).

The minimum sample size was calculated using single population proportion estimate that is;

$n = \frac{(z\alpha/2)^2 p.q}{d^2}$ where

n = Minimum sample size

Zα/2 = Z value at 95% CI (1.96)

p = 32% (0.32)

q=1-p=0.68

d = Margin of error 5% (0.05)

$$n = \frac{Z\alpha/2)^2 p\,(1-p)}{d^2}$$

$$= (1.96)^2 x\ (0.32(1-0.32))/\ (0.05*0.05) = 334.37$$

Then by calculating 10% non-response rate from the initial sample size, 334.37*10%=33.43.

So the final sample size will be the sum of 334.37+33.43 =367.8 ~ 368.

Sample size for Objective two

Study Population =12401 (Adult outpatients from selected health facilities visited during December 2012E.C.).

S. no	Independent Variables	Exposed in no	Non Exposed In no	Proportion	Adjusted odds Ratio	Calculated Sample size by Epi info.7	Calculated sample +10% non-response	Reference
1	Sex	Female =265	Male=269	265/2390 *100 =11.08%	1.31	150	165	47
2	Walking barefoot	Yes =57	No=11	57/464 *100 =12.28%	2.21	163	180	41
3	Availability of Latrine	No=66	Yes=30	66/300 *100 =22%	2.2	258	284	9

Table 1Table showing Sample size Determination by using associated factors of Hookworm.

As shown above the Sample size estimated from Objective two is less than Objective one.

As the Study was used Multi stage sampling the sample size needs Design Effect; so by adding adesigneffect i.e. Objective one times 1.5 =368*1.5=552.

The total sample size of the study was 552 of which from Objective One.

5.4.2. Sampling procedure

There is 1 primary hospital with 10 cluster health centers in the District; the data were collected from 6 health facilities. Multi stage sampling technique was used.First of all Simple random sampling technique was used to select 6 out of 11 health facilities before data collection. Merawi primary Hospital, Brakat H.c., Dagi H.c., Abiyotfana H.c.,Tagelwodefit H.c&,Ambomesk H.c.were selected by alottery method. The estimated number of Adult OPD attendants during data collection period prior to data collection had taken from each of the Health centers and Hospital. Annual 2012 fiscal year Report and December month 2012 Report was used. According to North Mecha district Health office and Merawi Primary Hospital Annual 2012 fiscal year report there were a total of 291,544 Adult Outpatient attendances; and the December Month visit of total Adult OPD attendants of 15years&older in the selected 6 health facilities in North Mecha district were 12401(48, 49). The required number of sample was selected from selected health facilities using systematic random sampling technique and sampling Interval/K value was calculated from the December 2012 E.C.monthly Report.

Diagram showing Study population and Sample Size

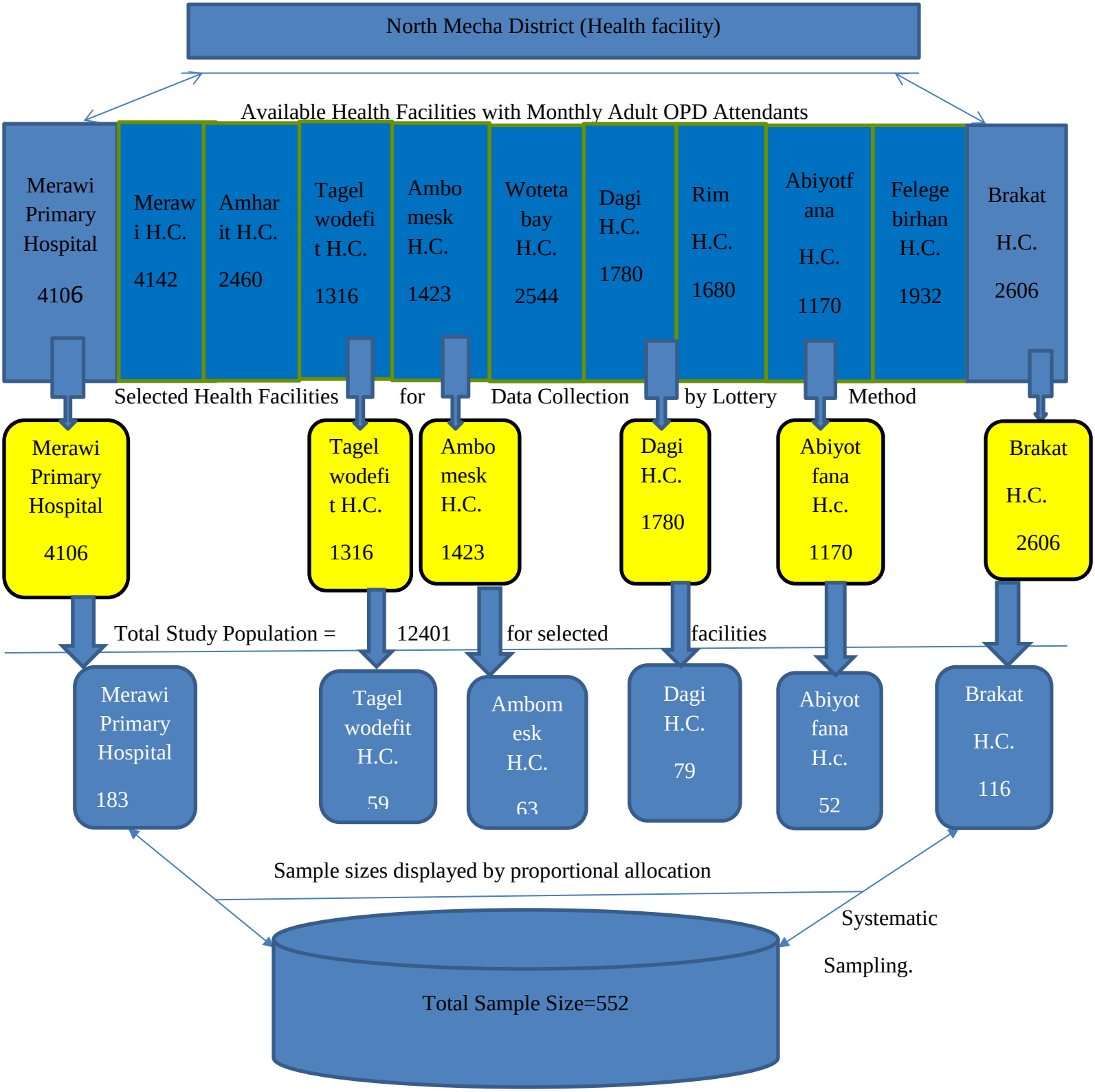

Figure 2.Schematic presentation of sampling procedures

As shown on the diagram above the total of 5 health centers and the primary hospital were selected by simple random sampling (Lottery) method in North Mecha district for the study.

To select each study unit multi-stage sampling technique was used. Therefore Adult outpatient Visits (N) in each of Health facilities divided by sample size (n) were the sample Interval (K-value) of the study. The study population after K- Value (sample interval) from Triage log book was the sample unit and the selected study participants were interviewed by using systematic random sampling method (K=N/n=12401/552=22.46~22) where

K=sample interval

N=total Adult OPD Attendants (study population)

n=total sample size.

Therefore, eligible study participants were interviewed by going in every K (22) OPD Attendants in each selected health facilities. To select first study unit a lottery method was used. For this study Triage log book /register of selected health facilities was used as sampling frame.The first case selected by lottery method was the 7^{th} Opd attendant from the logbook & then all others were interviewed by every 22 attendant's interval.

5.5. Eligibility criteria

5.5.1. Inclusion criteria

All Adult clients whose age greater than or equal to15 years visited an outpatient department of the selected health facilities for treatment and/or counseling service and who live in the study area for six months or more, were included in the study.

5.5.2. Exclusion criteria

An Adult outpatient attendant who had taken anti helminthic drug within 1month at the time of data collection,

An adult OPD attendant who was in critical emeregency situation was excluded from the study.

5.6. Study variables

5.6.1. Dependent variable

Hookworm infection (yes=1, no=0)

5.6.2. Independent variables

Socio demographic variables studied were age, sex, and monthly income of household, place of residence, educational status, occupation, marital status and religion of respondents.

Personal factors included in this study were personal hygiene, wearing shoes and information about hook worm infection.

Environmental factors studied were main source of drinking water and availability of latrine.

5.7. Operational definitions

Health Facility: A health center and/ or a hospital found in the district only, i.e. excluding health posts and Private clinics.

Hookworm Positive: Presence of hookworm ova of any species in a stool microscopy/direct wetmount microscopy regardless of Intensity.

Prevalence: aproportion of hookworm infection in afacility based study.

5.8. Data collection

5.8.1. Data collection technique

An Interviewer Administered questionnaire was originally developed in English and then translated into Amharic. The questionnaire included socio-demographic characteristics, personal factors, environmental factors and stool exam report of hookworm. Most of the items were adapted from existing literatures. The Amharic language questionnaire was used to collect data at all Health facilities during the study period. A pretested questionnaire was used and face to face interview with simple Observation was carried out. Then the Study participants were requested to give stool sample to the Laboratory Department of a health facility and to wait to know their Result.

An approximately 1gm or Head of Safety match size of stool required& collected for Laboratory Exam from each of study participants. Standard operating procedure (SOP) was implemented for laboratory procedures. The Trained Laboratory Technician/Technologist from the Respective Health Facility about this Research performed stool Exam by Direct Wet Mount Microscopy (DWMM) technique which was available in the health facilities. For DWMM the Participant's stool sample was adequately diluted with 0.9% Normal Saline solution and then Examined by 10x (10 times) magnification of the Microscope for presence of Hookworm or other Parasites for each study participant. The trained Laboratory technician or technologist had also notified the result to the data collector and/or the respective OPD, so that the client gets Appropriate Advice and/or Treatment by health proffesionals from the facility.

5.8.2. Data collectors and supervisors

The data was collected by interviewing the study participants, simple observation and by obtaining stool microscopy and result of hookworm after getting informed consent. The data was collected by 6 (2clinical&4BSc) nurses and 6 Laboratory (5Technicians and 1Technologist). Two Health Officers and1 Laboratory Technologist along with Principal Investigator lead (supervised) data collection process.

5.8.3. Data quality control

The questionnaire was translated from English to the local language (Amharic) and was re-translated back to English by another translator to check consistency of the questionnaire. It was also pretested from 5% (28) related participants in south mecha district before conducting the original one. One-day training on the data collection tools and collection procedures was given to data collectors and supervisors by the principal investigator on December 05/2020. Each day questionnaires were checked for completeness during data collection.

Close Supervision of data collectors and laboratories were made. Stool specimens were selected randomly and re-examined by Respective supervisor for cross checking the accuracy of laboratory results. The data collection process was supervised by the Principal investigator throughout the data collection period. The collected data was checked for the completeness, accuracy, clarity and Consistency and confusion on the data collection procedure and or responses were handled immediately (on spot).

5.8.4. Data processing and analysis

After data collection, the questionnaires were checked for completeness and consistency, retranslated to English from Amharic and then the data was coded manually& entered into SPSS version 23 statistical software for analysis&data cleaning was done. Descriptive statistics like frequencies and percentages were done to describe the study variables. Each independent variable was assessed for statistically significant association with the dependent variables in bivariable Logistic regression analysis at 95% confidence interval and p-value of <0.2. Those variables whose p-value less than 0.2 during the bivariable analysis were fitted to the final multiple logistic regression analysis to adjust for potential confounders. Goodness of fit of the final models was checked using Hosmer and Lemeshow test of goodness of fit and result is 0.22. Significant independent variables were declared by adjusted odds ratio at 95% confidence interval and P-value of less than 0.05.

5.9. Ethical considerations

Ethical clearance was obtained from Ethical review committee of Bahirdar University and in order to obtain permission letter I was communicated North mecha district Health office and selected health facilities. All the selected OPD Attendants were informed about the purpose of the study, the importance of their participation, with draw at any time and written/verbal consent was obtained prior to data collection. All the Necessary information was provided & informed consent was obtained from Surrogates for Study participants aged 15-18years. Privacy and confidentiality of information given by each respondent was keeping properly and names will not be recorded but Medical Registration Number (MRN) was recorded. For those whose stool exam was Positive for hookworm and/or other Intestinal parasites during the study period were linked to respective OPD for Counseling and /or Treatment service by health proffesionals from the facility. An incentive was considered or 25 birr per individual was given by principal investigator through data collectors for all study participants to cover Laboratory cost and treatment cost induced by this research.

6. RESULT

6.1. Socio- demographic characteristics of respondents.

A total of 539 Participants were interviewed& examined giving aresponse rate of 97.6% from 552 study participants. The mean age of the respondents was 32.38 (± 13.14 SD). The minimum and the maximum age of the respondents were 15 and 80 years respectively. Greater than half (56.8%) of the respondents were between the age of 25 and 49 years. Two hundred fourteen (39.7%) of respondents were Farmers& 330(61.2%) were Rural Residents. Number of respondents who had no formal education was 332(61.6%); as shown on table below.

Table 2 Socio-Demographic Characteristics of Respondents, North Mecha District, Northwest Ethiopia January 2021, (n = 539).

Variables	Number	Percentage
Sex of Respondent		
Female	303	56.2
Male	236	43.8
Age of respondents		
15-24 years	164	30.4
25-49 years	306	56.8
≥50 years	69	12.8
Residence of Respondent		
Urban	209	38.8
Rural	330	61.2
Marital Status of Respondent		
Single	137	25.4
Married	361	67
Divorced	24	4.5
Widowed	17	3.2
Religion of Respondent		
Orthodox	478	88.7
Muslim	50	9.3
Protestant	11	2.0
Educational status of respondent		
Have no formal education	332	61.6
Primary education	75	13.9
Secondary and above	132	24.5
Occupation of respondents		
Farmer	214	39.7
Employee	80	14.8
Businessman	77	14.3
Others	168	31.2

Monthly income of Respondents in birr		
≤1500	183	34
1500-3000	210	39
3000-4500	75	13.9
>4500	71	13.2

Key; Others=student, housewife and the like.

6.2. Environmental characteristics of Respondents.

Among the Respondents 424(78.7 %) of respondents have had Toilet in their Household and Almost all (99.1%) of them were using latrines. Among those who had Toilet in their household, 309(73.6%) of them were Always using the latrine.Threehundred fifty one out of 539 (65.1%) of the respondents were using Pipe water as main source of drinking water as shown on table3.

Table 3 Environmental characteristics of Respondents, North Mecha District, Northwest Ethiopia January 2021, (n = 539).

Variables	Number	Percentage
Latrine available in the Household		
No	115	21.3
Yes	424	78.7
Latrine use of Respondent (n=424)		
No	4	0.9
Yes	420	99.1
pattern of using the Latrine (n=420)		
Always	309	73.6
Most of the time	83	19.8
Sometimes	22	5.2
Rarely	6	1.4
Main source of drinking water		
Pipe water	351	65.1
Protected well/spring water	146	27.1
Unprotected water source	42	7.8

6.3. Personal characteristics of Respondents.

Among personal factors studied 50.5% of respondents wash hands always immediately after Toilet while others not always. Two hudred fourty three (45.6%) out of 533 respondents wash hands with water alone immediately after Toilet. All of respondents (100%) had habit of taking ashower.The percentage of respondents having dirty fingernails was 28.2 %(152).Twenty eight or 5.2% out of 539 respondents had no footwear/shoes; But 42.9 %(231) out of 539 Respondents had a habit of walking in bare foot Outside the home even if they have a shoes. Among 539

respondents Interviewed 337(62.5%) of them had had no information about hookworm infection as shown below.

Table 4 Personal characteristics of Respondents, North Mecha District, Northwest Ethiopia January 2021, (n = 539).

Variables	Number	Percentage
Frequency of hand washing before preparing food(n=303)		
Always	198	65.3
Most of the time	78	25.7
Some times	27	8.9
Frequency of handwashing before eating food		
Always	485	90
Most of the time	50	9.3
Sometimes	4	0.7
Frequency of hand washing after toilet		
Always	272	50.5
Most of the time	153	28.4
Sometimes	114	21.2
Frequency of handwashing after disposal of child's excreta (n=301)		
Always	181	60.1
Most of the time	89	29.6
Sometimes	18	6
Rarely	13	4.3
Type of hand washing materials used after toilet (n=533)		
Water andsoap	262	49.2
Water and ash	28	5.3
Water alone	243	45.6
Habit of taking bath or shower		
Yes	539	100
Frequency of taking bath or shower		
≥1 aweek	304	56.4
Once> aweek	106	19.7
1≥amonth	129	23.9
Fingernails hygienic status		
Dirty fingernails	152	28.2
Short and clean fingernails	387	71.8
Having afootwear or shoes		
No	28	5.2
Yes	511	94.8
Pattern of wearing shoes (n=511)		

Always	307	60.1
Mostly	140	27.4
Sometimes	51	10
Rarely	13	2.5
Habit of walking in barefoot		
No	308	57.1
Yes	231	42.9
Had Information about Hookworm Infection		
No	337	62.5
Yes	202	37.5

6.4. Respondents characteristics on Stool exam and recommended actions.

The overall percentage of hookworm infection in this research was 20 % (95%CI=16.7-23.4) based on Stool microscopy and all of them had received treatment for hookworm as shown on table 5.

Table 5 Respondents characteristics on results of Stool exam and recommended actions, North Mecha District, Northwest Ethiopia January 2021, (n = 539).

Variables	Number	Percentage
Stool Microscopy Performed for Respondents		
Yes	539	100
Result of stool microscopy for hookworm infection		
Negative	431	80
Positive	108	20
Participant Informed about his/her stool microscopy result		
Yes	539	100
Participant Linked to respective Opd for treatment and or Counseling service (n=108)		
Yes	108	100

6.5. Factors associated with hook worm infection of Adult OPD attendants.

In the bivariable logistic regression analysis, hookworm infection of adult OPD attendants was associated with age, residence, educational status, occupation, household monthly income, availability of latrine, main source of drinking water, frequency of hand washing immediately after toilet/defecation, frequency of taking bath or shower, fingernails hygienic status, habit of walking in barefoot (outdoor) and had information about hook worm infection.

In the multiple logistic regression analysis, Fingernails hygienic status (AOR=2.534, 95% CI (1.354-4.74)), habit of walking in barefoot in outdoor (AOR = 6.49, 95 % CI (2.753-15.302)) and had information about hook worm infection (AOR=6.013, 95% CI (2.625-13.776)) were significantly associated with hook worm infection of adult OPD attendants. The result is displayed on table 6.

Table 6 Bivariable Logistic Regression and Multivariable Logistic Regression analysis of factors associated with hookworm infection in North Mecha District,NorthWest Ethiopia, January 2021,(n=539)

Variable	Result ofhookworm infection		COR(95%CI)	AOR(95%CI)	P –value
	-ve (%)	+ve (%)			
Age					
15-24 years	150(91.5)	14(8.5)	0.187(0.089-.392)	0.464(0.172-1.249)	0.129
25-49 years	235(76.8)	71(23.2)	0.604(0.343-1.065)	1.089(0.536-2.213)	0.814
≥50 years	46(66.7)	23(33.3)	1	1	
Residence					
Urban	190(90.9)	19(9.1)	1	1	
Rural	241(73)	89(27)	3.693(2.172-6.278)	0.838(0.314-2.235)	0.724
Educational status					
Have no formal education	242(72.9)	90(27.1)	4.091(2.108-7.939)	0.667(0.224-1.984)	0.466
Primary education	68(90.7)	7(9.3)	1.132(0.419-3.057)	0.534(0.16-1.789)	0.309
Secondary and above	121(91.7)	11(8.3)	1	1	
Occupation					
Farmer	148(69.2)	66(30.8)	1	1	
Employee	73(91.3)	7(8.8)	0.215(0.094-0.492)	1.701(0.463-6.249)	0.424
Businessman	67(87)	10(13)	0.335(0.162-0.691)	1.652(0.567-4.811)	0.358
Others	143(85.1)	25(14.9)	0.392(0.234-0.656)	1.169(0.577-2.369)	0.665
Monthly income in birr					
≤1500	125(68.3)	58(31.7)	7.772(2.704-22.33)	2.503(0.755-8.299)	0.134
1500-3000	173(82.4)	37(17.6)	3.582(1.229-10.43)	1.845(0.565-6.029)	0.311
3000-4500	66(88)	9(12)	2.284(0.67-7.782)	1.654(0.429-6.375)	0.465
>4500	67(94.4)	4(5.6)	1	1	
Availablity of latrine					
No	69(60)	46(40)	3.892(2.457-6.167)	1.387(0.747-2.573)	0.300
Yes	362(85.4)	62(14.6)	1	1	
Main source of drinking water					
pipe water	302(86)	49(14)	1	1	
Protected well/spring water	106(72.6)	40(27.4)	2.326(1.450-3.731)	0.901(0.467-1.737)	0.755
Unprotected water source	23(54.8)	19(45.2)	5.091(2.583-10.03)	1.564(0.62-3.945)	0.344
Frequency of hand washing after toilet					
Always	233(85.7)	39(14.3)	1	1	
Most of the time	120(78.4)	33(21.6)	1.643(0.983-2.745)	0.735(0.383-1.41)	0.354

Sometimes	78(68.4)	36(31.6)	2.757(1.638-4.64)	0.483(0.21-1.112)	0.087
Frequency of taking bath					
≥1 aweek	264(86.8)	40(13.2)	1	1	
once> aweek	80(75.5)	26(24.5)	2.145(1.233-3.731)	0.57(0.269-1.209)	0.143
1≥amonth	87(67.4)	42(32.6)	3.186(1.940-5.233)	0.525(0.242-1.142)	0.104
Fingernails hygienic status					
Dirty fingernails	91(59.9)	61(40.1)	4.849(3.107-7.569)	2.534(1.354-4.74)	0.004*****
Short& clean fingernails	340(87.9)	47(12.1)	1	1	
Habit of walking in barefoot					
No	288(93.5)	20(6.5)	1	1	
Yes	143(61.9)	88(38.1)	8.862(5.241-14.98)	6.49(2.753-15.302)	<0.0001*****
Had information about hookworm infection					
No	237(70.3)	100(29.7)	10.232(4.86-21.55)	6.013(2.625-13.776)	<0.0001*****
Yes	194(96)	8(4)	1	1	

Keys *= Statisticaly Significant, COR=Crude odds Ratio, P=Level of Significance, AOR=Adjusted Odds Ratio.

As shown in the above having dirty fingernails, had habit of walking in barefoot in outdoor and had no information about hook worm infection were positively associated with hook worm infection of adult OPD attendants;While others had no strong association in the multivariable logistic regression analysis in this study.

7. DISCUSSION

The Result from this facility based cross-sectional study showed that Prevalence of hookworm is 20% (95%CI=16.7-23.4).This result is higher than the study conducted in Nophitam nakohnsi thammarat Thailand 8% (35) and Dera district Northwest Ethiopia 14.7%(41). This might be due to socio demographic difference, lower deworming coverage in the adolescents& adults and also higher proportion of habit of walking in barefoot in the study area. This result is lower than the study conducted in Sokoto Sokoto State Nigeria (36) and Dembecha District North west Ethiopia (9) with the Prevalence of 71%& 32% respectively.This might be due to Improved environmental and socio economic factors.

In the Present Study Adult Outpatient attendants who had a habit of walking in barefoot had 6.4 times (AOR=6.49, 95% CI ;(2.753-15.302), P value<0.0001) more likely to be infected by hookworm than who do not have. This result is in line with the study conducted in Lalo kile District, Oromia, Ethiopia 6 times (40). Whereas this study is higher than the studies done in Sokoto,sokoto state Nigeria 1.31 times(36),Dera distict North west Ethiopia 2.2 times(41) and Dembecha District North west Ethiopia 4.3times(9). This might be due to low health education coverage& poor intervention of the healh task force.

The result of this study reveals that respondents who had no information about hookworm infection increases chance of hookworm infection by 6 times (AOR=6.013, 95% CI; (2.625-13.776), p value<0.0001). This result is greater than the study done in Sokoto Sokoto State Nigeria (36); Meaning that the Percentage of infected respondents who had no Information about hookworm in Nigeria is 69.1% whereas in my study is 92.6% (100). This might be due to low educational status and limited access to health education in the district.

The result of this study also revealed that respondents with dirty finger nails had 2.5 times greater chance to be infected by hookworm (AOR=2.534, 95% CI (1.354-4.74), p value; 0.004) as compared to respondents with short and clean fingernails. Whereas in study done Nigeria is 1.43 odds;The percentage of hookworm infected respondents with dirty finger nails is 56.5% (61) than with short and clean fingernails 43.5% (47).The result is lower than the study conducted in Sokoto, Sokoto State Nigeria meaning that percentage of Infected respondents

having dirty finger nails is 89.1%(36). This might be due to cultural & socio demographic difference.

8. LIMITATION OF THE STUDY

The Limitation of study is Direct Wet Mount Microscopy is less sensitive as compared to concentration diagnostic technique to detect light hookworm infection.

9. CONCLUSION

Hookworm infection among adult outpatient attendants in north mecha district was twenty percent which is low as compared to researches done previously. Hook worm infection among adult OPD attendants greater than 15 years were positively associated with habit of walking with barefoot, dirty fingernails and had no information about hookworm infection. Where as age, residence, education, occupation, monthly income, availability of latrine, main source of drinking water, frequency of hand washing after toilet and frequency of bathing were not significantly associated in multivariable analysis.

10. RECOMMENDATION

Health care providers

Health care providers should give an ongoing health education for their patients/clients on risks of walking in barefooted for hookworm infection, personal hygiene especially finger nails hygiene and about hookworm infection in general. Design and use agood model of communication to change habit of walking in barefoot for the public. Use of mass media communication is crucial. Should do hook worm screening in all service areas.

Government and policy makers

Government should monitor & evaluate health extension package performance emphasis on health education, hand hygiene/personal hygiene and regular shoe wearing.

Community

Should wear protective shoes always, stop walking in barefooted habit, Keeping fingernails hygienic, increase health seeking behavior & being informed about the disease and also implement health professional's advice.

Researchers

Awareness about hookworm infection and Atitude towards walking in barefoot should be studied. Large scale community based Study/research for additional body of knowledge is recommended.

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12. APPENDIX

I. Participant Consent Information Sheet in English

A. Participant Information Sheet

Greetings! My name is Mullualem Asmare from Bahirdar University, College of Medicine and Health sciences, School of Public Health, General Master of Public Health graduating Student and I want to conduct Research data collection among Adult Outpatient attendants about Prevalence of Hookworm Infection and associated factors. Human hookworm is a soil-transmitted helminth (STH) infection caused by either Necator americanus or Anclystoma duodenale.It is a major cause of morbidity globally and predominantly affects the world's poorest populations. Hookworm affects about 740 million people worldwide with 80 million people severely infected. The main Objective of this Study is to Assess Prevalence and Associated factors of Hookworm Infection among Adult Outpatient attendants in Health facilities of North Mecha District, NorthWest Ethiopia.The data collection will be from all Out patient attendants visiting health facilities during the study period.

You are selected to be one of the Participants in this study and you will help us by answering the question we ask you and by providing your stool sample to the laboratory department of health facility .In addition I ask you to know your stool Exam result and to get Treatment & Advice if needed; before leaving Health facility. We assure you that whatever answers you give us are kept strictly secret. We do not need your name and address. We also inform you that you have the full right to withdraw from study at any time and/or skip any questions that you don't want answer. You may find some of the questions or Activities difficult to respond; but your experience will be very helpful for other people. The Interview and sample provision takes approximately 20-30 minutes.

Do you have any question to ask?

Thank you very much!

Are you willing to participate in the study? A. Yes B. No

If yes go to next page.

B. Informed Consent agreement form

I, the undersigned have been informed that the purpose of this particular research project is to study Prevalence of Hookworm Infection and Associated Factors among Adult Outpatient attendants. I have been informed that I am going to respond to this question by answering What I know concerning the Issue and providing stool sample for exam .I have been informed that the information I give will be used only the purpose of this study; My Identity, the information I give will be treated confidentially, I have also been Informed that I can refuse to participate in the study or not to respond to questions/activities I am not interested. Furthermore, I have been informed that I can stop responding to the question/activity at the time in the process. Based on the above information I agree to participate in the research voluntarily with the hope of contributing (On behalf of one) to the effort of knowing prevalence and associated factors of hookworm among adults.

Signature: _____ Date: _____

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Bahirdar University

II. Questionnaire in English

Checklist for data collection on prevalence and associated factors of hookworm infection among adult outpatient attendants in public health facilities of North mecha district.

Hello, my name is _____ I am one of the data collectors on the study with the above topic. I would like to cooperate in answering the questions that follow. You have the right to refuse.

Name of Interviewer _____ Date _____

Starting time _____ End time _____

Interviewer agreement

I Certify that I have filled this questionnaire in accordance to the training I was given. I have checked this questionnaire and confirmed that the information in it is correct.

Signature _____ Date _____

Name of health Facility _____ Questionnaire code _____

MRN _____

Part 1. Information on Participant's Socio demographic characteristics			
No	Questions	Responses	Skip
101	Sex of respondent	Male Female	
102	What is your Age in years?	----------years	
103.	What is Your Marital status?	A. Single B. Married C. Divorced D. Widowed	
104.	What is Your Educational Status?	A. Unable read and write B. Able to read and write but no formal education C. Primary Education D. Secondary Education E. Higher Education.	
105	What is your Occupation?	A. Farmer B. Employee C. Businessman D. Housewife E. Student F. Other specify……..	
106	Where is your Residence?	A. Urban B. Rural	
107	What is your Religion?	A. Orthodox B. Muslim C. Catholic D. Protestant E. others specify……	
108	How much is your household monthly income in Ethiopian Birr?	----------birr	
Part II. Participant's Information on Environmental characteristics			
109	Do you have a latrine in your household?	A. Yes B. No	If "No" skip to Qno.112
110	If yes for Q no. 109, do you use the latrine?	A. yes B. no	
111	. If yes for Q no. 109, how often do you use the latrine?	A. Always B. Most of the time C. Sometimes D. Rarely	
112	What is the main source of drinking water for you & your household?	A. Pipe water B. protected Well C. Unprotected well	

		D. protected spring water E. Surface water F. Others specify……	
Part III. Participants Information on Personal factors.			
How frequently you wash your hands? (For Questions no. 113-116)			
113	Before preparing food?	A. Always B. Most of the time C. Sometimes D. Rarely E. not at all	
114	Immediately after toilet or after defecation?	A. Always B. Most of the time C. Sometimes D. Rarely E. not at all	
115	Before eating food?	A. Always B. Most of the time C. Sometimes D. Rarely E. not at all	
116	After disposal of child's excreta?	A. Always B. Most of the time C. Sometimes D. Rarely E. not at all	
117	What type of hand washing materials used after toilet?	A. Water and Soap B. Water and Ash C. Water alone D. Other specify……..	
118	Have you had a habit of taking bath/or shower?	A. Yes B. No	If "no" Que 120
119	If yes for Q.no 118, how often do you take?	A. >1 a week B. Once a week C. Once every 2 up to 3 weeks D. Once a month E. Other specify…….	
120	What is Your Fingernails Hygienic status? (By Interviewing and inspection of both hands)	A. Dirty fingernails B. Short and clean fingernails	
121	Have you had afoot wear/shoes?	A. Yes B. No	If "no" Que 123
122	If yes for Q no 121, do you wear a shoes?	A. Always B. Mostly C. Sometimes D. Rarely	

		E. Not at all	
123	Have you had a habit of Walking in barefoot (Out Door)?	A. Yes B. No	
124	Have you heared Information about Hookworm infection? (Main mode of transmission, Prevention &availability of treatment should be answered.)	A. Yes B. No	
Part IV. Participants Information on Stool exam and recommended actions.			
125	Do you able to provide Stool Sample?	A. Yes B. No.	
To be filled during and after Stool microscopy			
126	Stool Exam performed?	A. Yes B. No.	If "no" Stop here
127	Result of Stool Exam for hookworm?	A. Positive B. Negative.	
128	Result of Stool Exam other than hookworm?	No Observable parasite seen Positive, Any parasite seen (specify)……..	
129	Had the Participant Know his Stool Exam result?	A. Yes B. No.	
130	Had the Participant Linked to respective OPD for Treatment&/or Counseling service if answer is Positive for Questions no 127 &/or 128.	A. Yes B. No, Reason……	

Thank you!!

ማጠይቅ

I.የ ተሳታፊዎች የ መረጃና ስምምነ ት ቅጽ

ሀ .መረጃ

ጠፍ ይስጥልኝ ስሜ ማሉአለም አስሚረ እባላለሁ! በባህርዳር ዩኒቨርስቲየ ህክምናና ጠፍ ሳይንስ ኮሌጅ ፣ በህ/ሰብ ጠፍ ትምህርት ቤት ስር፣ የ 2ኛ ዲግሪ የ ሚህበረሰብ ጠፍ ተመራቂ ተማሪ ነኝ ፡ ፡ በአሁኑ ሰዓት የ መንጠቆ ትል በሽታ ስርጭትና ተያያዥ ጉዳዮች በ ሜል ርዕስ በሰ/ሜጫ ወረዳ ባሉ ጠፍ ተቋማት ለ መ ልገ ል ከ ሚሞ ጡ ዕድሜ ቸው 15 ዓመትና በላይ ከሆና ቸው ተመላላሽ ታካሚዎች ጥና ት እያደረግሁ ነ ው ፡ ፡ የ መንጠቆ ትል በሽታ በዋና ነ ት የ ሚመጣው ወይ ኔካተር አ ሜሪካ ነ ስ አልያም አ ንሲሎስቶማ ዶደና ሌ በ ሚ ል ረቂቅ ጥገ ኛ ተህዋስያን አ ማካኝ ነ ት ነ ው ፡ ፡ በዓለም አቀፍ ደረጃ ወደ 740 ሚሊዮን የ ሚጠጉ ሰዎች በበሽታው ተጠቅተዋል ፡ ፡ የ ዚህ ጥና ት ዋና ዓላማ የ መንጠቆ ትል በሽታ ስርጭትና ተያያዥ ጉዳዮች ዓሀና ዊ ሁኔ ታ በሰሜን ሜጫወረዳ ባሉ የ መንግስት ጠፍ ተቋማት ወስጥ ለ መ ልገ ል ከ ሚሞጡ ዕድሜ ቸው 15 ዓመትና በላይ በሆና ቸው ተመላላሽ ታካሚዎች ምን እንደሚመስል ለ ማ ወቅ ነ ው ፡ ፡ መረጃው የ ሚሰበሰበው በጥና ቱ ወቅትና ቦታ ወደ ጠፍ ተቋማት ወስጥ ለ መ ልገ ል ከ ሚሞጡ ዕድሜ ቸው 15 ዓመትና በላይ ከሆና ቸው ተመላላሽ ታካሚዎች ነ ው ፡ ፡

እርስዎ በዚህ ጥና ት ተሳታፊዎች እንዲሆኑ ተመርጠዋል እና ም እኛ የ ጠየ ቅነ ውን ጥያቄ በመመለስ እና የ ሰገ ራ ናሙና ዎን ለ ጠፍ ተቋም ላቦራቶሪ ክፍል በማቅረብ ይረዱና ል ፡ ፡ በተጨማሪም የ ሰገ ራዎን የ ምርመራ ወጪት እንዲያወቁ እጠይቃለሁ ፡ ፡ በተጨማሪ ም የ ምርመራ ወጪትዎ ሕክምና የ ሚየ ስፈልገ ው ከሆነ የ ሕክምና እና/ወይም የ ምክር አ ገ ልግሎት አ ግኝተውእንዲሄዱ በትህትና አሳስባለሁ ፡ ፡ የ ሚሰጠ ማንኛውም መረጃ ሆነ የ ምርመራ ወጪት በምስጢር የ ተያዙ መሆና ቸውን እና ረጋግጥልዎታለን ፡ ፡ የ እርስዎ ስም እና የ መኖሪያ አድራሻ አይጠቀስም ፡ ፡ እንዲሁም በማንኛውም ጊዜ ጥና ቱን የ ማቹረጥ ወይም መመለስ የ ሚይፈልጉትን ማንኛውን ም ጥያቄ ለ መዘለል መሉ መበት እንዳሎት እና ሳወቅዎታለን ፡ ፡ አንዳንድ ጥያቄዎች ወይም ተግባራት ለመመለስ አስቸጋሪ ሊሆኖብዎት ይችላሉ ፡ ፡ ነ ገ ር ግን የ እርስዎ ተሳትፎ ለሌሎች ሰዎች በጣም አስፈላጊ ነ ው ፡ ፡ የ ቃለ ማጠይቁ እና የ ናሙና አቅርቦቱ በግምት ከ20-30 ደቂቃዎች ይወስዳል ፡ ፡

ጥያቄ አሉዎት?

በጣም አመሰግናለሁ!

በጥና ቱ ለመሳተፍ ፈቃደኛ ነ ዎት? ሀ. አዎ ለ. አይደለሁም

መልሱ አዎ ከሆነ ወደ ቀጣዩ ገ ጽ ይሂዱ።

ለ .የ ስምምነ ት ቅጽ

እኔ ከዚህ በታች የፈረምሁት የዚህ የምርምር ፕሮጀክት ዓላማየመንጠቆ ትል በሽታ ስርጭትና ተያያዥ ጉዳዮች ዓሁናዊ ሁኔታ በሰሜን ሜጫወረዳ ባሉየመንግስት ጠፍ ተቋማት ወስጥ ለመገልገል ከሚሞጡዕድሜቸው15 ዓመትና በላይ በሆናቸውተመላላሽ ታካሚዎች ጥናት ለሚድረግ እንደሆነ ተነግሮኛል፡፡ ጉዳዩን አስመልክቶ የሚወቀውን በመመለስ እና የሰገራ ናሙና እንደምሰጥ ተነግሮኛል ፡፡ የምሰጠውመረጃ ለዚህ ጥናት ዓላማብቻ እንደሚውል ተገልፆልኛል ፡፡ ማንነቴና የምሰጠውመረጃ በሚስጥር የሚተናገድ ነው፣ በጥናቱ ላይ ለመሳተፍም ሆነ ለመቹረጥ ብፈልግ በማንኛውምሰዓት ከጥናቱ መውጣት እንደምቸል ተነግሮኛል ፡፡ ከላይ በተጠቀሰውመረጃ ላይ በመሞኮዝ ለምርምሩ በፈቃደኝነት ለመሳተፍ እስማማለሁ፡፡

ፊርማ_____ ቀን_____

የጥናት አድራጊው ስም-መሉአለምአስማረ

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ባህርዳር ዩኒቨርሲቲ

በሰሜን ሜጫወረዳ በሚኙየመንግስት ጠፍ ተቋማት ወስጥ በአዋቂየተመላላሽ ህክምና ተገልጋዮች መካከል የመንጠቆ ትል በሽታስርጭትና ተያያዥጉዳዮች ላይ ሚጃ መሰብሰቢያ ቅጽ ፡፡

ጠፍ ይስጥልኝ ስሜ_____ ይባላል ፡፡ ከላይ ከተጠቀሰውርዕስ ጋር በጥናቱ ላይ ከሚ ኙት ሚጃ ሰብሳቢዎች አንዱነኝ ፡፡ ለምጠይቅዎት ጥያቄዎች ሜልስ በማጠት እንዲተባበሩኝ እፈልጋለሁ ፡፡ በጥናቱ ያለማተፍ መበት አለዎት ፡፡

የ ቃለ ማጠይቅ አድራጊውስም_____ ቀን _____

የ መ ሻ ጊዜ_____ የ ማበቂያ ጊዜ_____

የ ቃለ-ማጠይቅ ስምማ ት

በተሰጠኝ ስልጠና መሠረት ይህንን ማጠይቅ እንደሞላሁኝ አረጋግጣለሁ ፡፡ ይህንን ማጠይቅ አጣርቼ በወስጡ ያለውሚጃ ትክክል መሆኑን አረጋግጫለሁ ፡፡

ፊርማ_____ቀን _____

የ ጠፍ ተቋምስም_____ የ ማጠይቅ ኮድ_____

የ ተሳታፊውየ ህክምና ካርድ ቁጥር----------

ክፍል I. የ ተሳታፊወ/ዋ ሚህበራዊ-ስነ -ህዝብ ባህሪዎች ላይ ሚጃ			
ተ.ቁ	ጥያቄዎች	ምላሾች	ይዝለሉት
101	ጾታ	ሀ. ወንድ ለ. ሴት	

102	ዕድሜዎ በዓመት ስንት ነ ው?	----------ዓመት	
103	የ ጋብቻ ሁኔ ታዎ ምንድን ነ ው?	ሀ.ያላገ ባ/ች ለ. ያገ ባ/ች ሐ. የ ፈታ/ች መ. የ ሞተባ ት/የ ሞተችበ ት	
104	የ ትምህር ት ሁኔ ታዎ ምንድን ነ ው?	ሀ.ማንበብ እና መጻ ፍ የ ማትችል/የ ሚችል ለ.ማንበብ እና መጻ ፍ የ ምትችል/ የ ሚቻል ሐ.የ መጀመሪ ያ ደረጃ ትምህር ት ያ ጠና ቀቀ/ች መ.የ ሁለተኛ ደረጃ ት/ት ያ ጠና ቀቀ/ች ሠ.ኮሌጅ እና ከዛ በላ ይ	
105	ስራዎት ምንድን ነ ው	ሀ.አርሶ አደር ለ. ተቀጣሪ ሐ. ነ ጋዴ መ.የ ቤት እመቤት ሠ. ተማሪ ረ. ሌሎች ካሉ ይግለጹ------	
106	የ መኖሪ ያ አድራሻ?	ሀ.ከተማ ለ.ገ ጠር	
107	እምነ ትዎ ምንድን ነ ው?	ሀ.አርቶዶክስ ተዋህዶ ለ.መቅሊም ሐ.ካቶሊክ መ.ፕሮቴስታንት ሠ.ሌላ ካለ ይገ ለጽ------	
108	.የ ቤተሰብዎ ወርሀ ዊ ገ ቢ ምን ያህል ነ ዉ?	_____ ብር	
ክፍል II. የ አካባቢያ ዊ ባህሪ ያትን በ ተመለከተ የ ተሳ ታፊዎች ሚጃ			
109	በቤተሰብዎ ወስጥ መጻ ዳጃ ቤት አለዎት?	ሀ. አዎ ለ. የ ለም	መልሱ' 'የ ለም'' ከሆነ ''112''
110	ለ ጥያቄ ቁጥር 109 መልስዎ አዎ ከሆነ የ መፀ ዳጃ ቤቱን ይጠቀማ ታል?	ሀ. አዎ ለ.የ ለም	
111	ለ ጥያቄ ቁጥር 109 መልስዎ አዎ ከሆነ የ መፀ ዳጃ ቤቱን ምን ያህል ጊዜ ይጠቀሙ?	ሀ. ሁል ጊዜ ለ. አብዛ ኛውን ጊዜ ሐ. አንዳንድ ጊዜ መ. አልፎ አልፎ	
112	ለ እርስዎ እና ለ ቤተሰብዎ ዋና ዉ የ ማጠጥ ወሃ ምን ጭምን ድን ነ ው?	ሀ የ ቧን ቧ ወሃ ለ. የ ተጠበቀ ጉድጓ ድ ወሃ	

		ሐ.ያልተጠበቀ ጉድጓድ ወሃ መየ ተጠበቀ የ ምን ጭውሃ ሠ. የ ገ ጸ ምድር ወሃ ረ . ሌሎች ካሉ ይግለጹ...	
ክፍል III. ተሳታፊዎች በግላዊ ሁኔታዎች ላይ ሚጀ.			
እጅዎን ምን ያክል ጊዜ ይታጠባሉ? (ለጥያቄዎች 113-117)			
113	ምግብ ከማዘጋጀትዎ በፊት?	ሀ/ሁል ጊዜ ለ/ አብዛኛዉን ጊዜ ሐ/ አንዳንድ ጊዜ መ/አልፎ አልፎ ሠ/በጭራሽአልታጠበም	
114	ወዲያወኑ ከመፀዳጃ ቤት ሜልስ ወይምከሰገራ በኋላ?	ሀ/ሁል ጊዜ ለ/ አብዛኛዉን ጊዜ ሐ/ አንዳንድ ጊዜ መ/አልፎ አልፎ ሠ/በጭራሽአልታጠበም	
115	ምግብ ከመበላትዎ በፊት?	ሀ/ሁል ጊዜ ለ/ አብዛኛዉን ጊዜ ሐ/ አንዳንድ ጊዜ መ/አልፎ አልፎ ሠ/በጭራሽአልታጠበም	
116	ልጆችን ካጸዳዱ በኋላ?	ሀ/ሁል ጊዜ ለ/ አብዛኛዉን ጊዜ ሐ/ አንዳንድ ጊዜ መ/አልፎ አልፎ ሠ/በጭራሽአልታጠበም	
117	ከመፀዳጃ ቤት በኋላ በምን ዓይነ ት የእጅ መታጠቢያ ቁሳቁሶች ይታጠባሉ?	ሀ/ በወሃ እና ሳሙና ለ/ በወሃ እና አመድ ሐ/ በወሃ ብቻ መ/ ሌሎች ካሉ ይግለጹ.....	
118	ገላዎን የ መታጠበ ልማድ አለዎት?	ሀ/አዎ ለ/ የ ለም	መልሱ ''የ ለም'' ከሆነ ''120''
119	ለጥያቄ ቁጥር 118 መልስዎ አዎ ከሆነ ስንት ጊዜ ይወስዳሉ?	ሀ በሳምንት ከአንድ ጊዜ በላይ። ለ/በሳምንት አንድ ጊዜ ሐ/አንዴበየ 2 እስከ 3 ሳምንታት	

		መ/በወር አንድ ጊዜ ሠ/ሌሎች ካሉ ይግለጹ	
120	የ ጥፍሮችዎ ንፅህና ሁኔታ ምንድን ይመስላል? (በ ቃለ ማጠይቅ እና ሁለቱንም እጆች በ ማየ ት)	ሀ/የ ቆሸሹ ጥፍሮች ለ/አጭር እና ንጹህ ጥፍሮች	
121	የ እግር ጫማ አለዎት?	ሀ/አዎ ለ/የ ለም	መልሱ' 'የ ለም'' ከሆነ ''123''
122	ለ ተራ ቁጥር 121 መልሱ አዎ ከሆነ ምን ያ ክል ጊዜ ጫማ ይለ ብሳ ሉ?	ሀ ሁል ጊዜ ለ.አ ብዛ ኛ ውን ጊዜ ሐ.አ ን ዳ ን ድ ጊዜ መ.አ ል ፎ አ ል ፎ ሠ.በ ጭራ ሽ አ ል ለ ብስ ም	
123	በ ባ ዶ እ ግ ር ዎ ት (ከ ቤ ት ው ጭ) የ መ ራ መ ድ ል ማ ድ አ ለ ዎ ት?	ሀ/አ ዎ ለ/ የ ለ ኝ ም	
124	ስ ለ መ ን ጠ ቆ ት ል ኢ ን ፌ ክ ሽ ን መ ረ ጃ ሰ ጥ ተ ዉ ያ ወ ቃ ሉ? (ዋ ና ው የ መ ተ ላ ለ ፍ ያ ዘ ዴ ፣ የ መ ከ ላ ከ ያ መ ን ገ ዱ ና ሕ ክ ም ና ስ ለ ሞ ሩ መ መ ላ ስ አ ለ በ ት ፡ ፡)	ሀ/አ ዎ ለ/አ ላ ወ ቅ ም	
ክ ፍ ል IV. የ ተ ሳ ታ ፊ ዎ ች የ ሰ ነ ራ ና ማ ኛ ላ ይ መ ረ ጃ እ ና የ ሚ ሞ ላ ሩ እ ር ም ጃ ዎ ች።			
125	የ ሰ ነ ራ ና ማ ኛ መ ሳ ጠ ት ይ ች ላ ሉ?	ሀ/ አ ዎ ለ/ አ ል ች ል ም	
በ ሰ ነ ራ ሚ ይ ክ ሮ ስ ኮ ፒ ወ ቅ ት እ ና በ ኋ ላ የ ሚ ሞ ሉ			
126	የ ሰ ነ ራ ም ር መ ራ ተ ደ ር ጓ ል	ሀ/አ ዎ ለ/ አ ል ተ ደ ረ ነ ም	መ ል ሱ' ' አ ል ተ ደ ረ ነ ም'' ከ ሆ ነ ''ያ ቁ ሙ'
127	የ መ ን ጠ ቆ ት ል የ ሰ ነ ራ ም ር መ ራ ወ ጪ?	ሀ/ሪ ዝ ቲ ቭ ለ/ነ ጌ ቲ ቭ።	
128	ከ መ ን ጠ ቆ ት ል ወ ጭ ሌ ላ የ ሰ ነ ራ ም ር መ ራ ወ ጪ?	ሀ/ተ ወ ሳ ክ አ ይ ታ ይ ም ለ/ ሪ ዝ ቲ ቭ ፣ ማ ን ኛ ዉ ም የ ታ የ ተ ወ ሳ ክ ካ ለ ይ ግ ለ ጹ	
129	ተ ሳ ታ ፊ ው የ ሰ ነ ራ ና ማ ኛ ወ ጪ ታ ቸ ው ን አ ዎ ቁ?	ሀ/ አ ዎ ለ/ አ ላ ወ ቁ ም	
130	ለ ጥ ያ ቄ ቁ ጥ ር 127 እ ና / ወ ይ ም 128 መ ል ሱ ሪ ዝ ቲ ቭ ከ ሆ ነ ተ ሳ ታ ፊ ው ከ ሚ ሞ ላ ከ ታ ቸ ው ም ር መ ራ /ሕ ክ ም ና	ሀ/ አ ዎ ለ/ የ ለ ም , ም ክ ን ያ ት	

	ክፍሎች ህክምና እና/ወይም የ ምክር አገ ልግሎት አግኝተዋል?	……	

ከልብ አመሰግናለሁ!!

DECLARATION

I, the under signed, declared that this is my original work, has never been presented in this or any other University, and that all the resources and materials used for the research, have been fully acknowledged.

Principal investigator

Name: _____

Signature: _____

Date: _____

APPROVAL OF THESIS RESULT FOR SUBMISSION

I hereby certify that I have supervised, read, and evaluated this final thesis titled "Prevalence of hook worm infection and its associated factors among adult outpatient attendants in public health facilities of North Mecha district, North west Ethiopia" by Mullualem Asmare. prepared under my guidance. I recommend this final thesis to be submitted to the department for evaluation.

Advisor

Name: _____

Signature: _____

Date: _____

Co-Advisor

Name: _____

Signature: _____

Date: _____

Department Head

Name: _____

Signature: _____

Date: _____

Approval of Thesis for Defense Result

We hereby certify that we have examined this thesis entitled “Prevalence of hook worm infection and its associated factors among adult outpatient attendants in public health facilities of North Mecha district, North west Ethiopia; a facility based cross-sectional study” by Mullualem Asmare. We recommend and approve the thesis a degree of “partial fulfillment of master in General Master of public Health”.

Board of Examiners

_____	_____	_____
External examiner’s name	Signature	Date
_____	_____	_____
Internal examiner’s name	Signature	Date
_____	_____	_____
Chair person’s name	Signature	Date