COLLEGE OF HEALTH SCIENCES

DEPARTMENT OF FAMILY MEDICINE

Prevalence of helminthic infections and associated factor among pregnant women attending ANC in ALERT hospital, Addis Ababa

By : - Hawi Nugusu (MD, family medicine resident)

Advisor: -Dr Hermela Feyisa (MD, Assistant professor of family medicine

A Thesis submitted to the department of Family medicine, college of health sciences, Addis Ababa University in partial fulfillment of the requirements for the specialty in family medicine.

January, 2025,

Addis Ababa, Ethiopia

ADDIS ABABA UNIVERSITY

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Acknowledgement

First and foremost, I would like to thank the Almighty God who gave me the forte to work on this thesis. I would like to extend my heartfelt appreciation and gratitude to my advisor Dr. Hermela Feyisa for her instruction, guidance, intellectual feedback, and invaluable suggestions the time of proposal development till the final thesis. I would also like to thank Addis Ababa university for providing this great opportunity to develop this research. Lastly but not the least, I would like to show my gratitude to study participants and data collectors.

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Abbreviation and acronym

AAU Addis Ababa University

ALERT Africa Leprosy, Tuberculosis, Rehabilitation and Training

ANC Antenatal care

AOR Adjusted Odd Ratio

IPIs Intestinal parasitic infections

OR Odd Ratio

SDGs Sustainable Development Goals

SSA sub-Saharan Africa

STH Soil-transmitting helminth

Abstract

Background: - Intestinal parasitic infections are a major concern, mostly in developing countries, particularly in sub-Saharan Africa. Ethiopia has one of the lowest quality drinking water supply and latrine coverage in the world. Pregnant women are also at high risk of parasitic infection due to their close relationship with children. Infections with helminth were associated with a modest decrease in hemoglobin levels and indicators of poor nutritional status. Hookworm is the leading cause of pathologic blood loss in endemic. Anemia in these highly endemic regions is common among pregnant women and often multi-factorial. Anemia has a devastating effect on pregnant women and has been associated with stillbirth, prematurity and low birth weight.

Objective: - Assessment of the prevalence of helminthic infections among pregnant women attending ANC in ALERT hospital, Addis Ababa.

Methods: - Facility based cross-sectional study was employed in ALERT hospital. The study subjects were selected using systematic sampling method and 185 women were participated making a response rate of 89.4%. The data were collected by interviewed method. The data entered, cleaned and analyzed by SPSS version 25 and Logistic regression analyses was employed to identify factors associated with helminthic infection. Using 95% CI variables with a p-value <0.05 was identified as statistically significant factors.

Result: - The finding of was that the prevalence of helminthic infection among pregnant women was 28%. The determinant factor for helminthic infection were education level of illiterate (AOR=2.3, 95%CI=1.48, 10.87), rural in residency (AOR=3.1, 95%CI=1.88, 11.14), having water source of pipe water out of the compound (AOR=3.7, 95%CI=1.12, 12.23), didn't use soap or antiseptic while washing hands (AOR=7.1, 95%CI=2.26, 22.58), having an availability of water bodies in the vicinity (AOR=5.4, 95%CI=1.87, 15.83) and having exposure of bathing in the river (AOR=5.4, 95%CI=1.11, 11.57).

Recommendation: - To address the issue of helminthic infections in pregnancy a multi-faceted educational approach is essential. So, emphasize the importance of washing hands with soap and clean water, particularly after using the toilet, before handling food, and before eating.

1. Introduction

1.1 Background

Intestinal parasitic infections caused by protozoa and geohelminths are common problems in the human population, especially in resource-poor countries. Amoebiasis, ascariasis, hookworm infection, and trichiniasis are among the ten most common intestinal parasitic infections in the world (1). Globally, soil-transmitting helminth (STH) infections are the main intestinal parasitic infections. Approximately, 4.5 billion people are at risk, more than 1 billion people become infected, and 450 million are ill from STHs (2). High prevalence of STHs is mainly related to poverty, poor living conditions, personal and environmental hygiene, sanitation, and water supply facilities (3).

they are frequently transmitted via consumption of contaminated food, bathing, and wading through contaminated water as well as spread from person to person through fecal-oral contact. Intestinal parasitic infections are associated with socioeconomic and environment factors. They are therefore prevalent in areas where there is overcrowding, limited access to clean water, and poor personal hygiene (4-5).

In Sub-Saharan Africa, helminth infestation particularly hookworm infestation is an important contributor to severe anemia during pregnancy (6), partly as a result of occult or overt intestinal blood loss associated with mucosal or submucosal invasion (7). Additionally, the presence of large numbers of adult Ascaris worms in the small bowel can cause malabsorption of nutrients followed by nutritional deficiency and impaired growth (8).

Pregnant women, especially those in Africa, are at greater risk of intestinal parasitic infections (9). A recent study in Nigeria, it was observed that 18.2% pregnant women were living with intestinal parasitic infections (10). Data from previous studies in Ghana showed that intestinal parasitic infections among pregnant women were 41.2% and 49.6% (11-12). in Ethiopia found 70.6% pregnant women to be infected with intestinal parasites with helminths being the predominant species (13).

A systematic review in Ethiopia showed that the estimated pooled prevalence of Intestinal parasitic infections (IPIs) among pregnant women in Ethiopia is 27.32 %. the most prevalent type of intestinal parasite identified was Hookworm followed by Ascaris lumbricoides with a

prevalence of 11.12 % and 10.34; respectively. Oromia had the highest prevalence estimate accounting 29.78 % closely followed by Amhara region 29.63 %, Tigray region 27.74 % and SNNPR 24.23 and the determinant factor of IPIs were residence area, being bare footed, hand washing habit and eating uncooked/raw vegetables have significant association with the occurrence of IPIs among pregnant women. Pregnant women from rural areas were 6.3 more likely to develop IPIs when compared to urban dweller pregnant mothers (OR = 6.31) Likewise, barefooted women were 2.79 times more likely to be infected with IPIs than those who wore shoes (OR = 2.79). pregnant women who had no hand washing habit and who consumed uncooked/raw vegetables were more likely to be infected with intestinal parasites compared to their counterparts (OR = 3.02) and (OR = 1.24); respectively (14).

Worldwide, anemia is an important reproductive health problem because of its association with adverse pregnancy outcome such as increased rates of maternal and perinatal mortality, premature delivery, low birth weight (15). Intestinal helminths are among the most common and widespread of human infections, contributing to poor nutritional status, anemia and impaired growth (16). Intestinal helminthiases are also known to aggravate pre-existing anemia by decreasing appetite and thus food and iron intake (17-18).

STH infections are the major causes of morbidity and mortality among pregnant women since infected pregnant women develop malnutrition, maternal anemia, and increased vulnerability to other infections (19-20). STH infections during pregnancy may also be associated with adverse outcomes on the offspring including low birth weight, intrauterine fetal growth restriction, and perinatal mortality (20). STHs, especially hookworm parasite, cause total energy, protein, folate, and zinc loss in pregnant women (21). As a result, low pregnancy weight gain and intrauterine fetal growth restriction, followed by low birth weight and higher perinatal mortality rates happened in pregnant women (22).

Anemia in pregnancy has been associated with poor birth outcome, such as low birth weight7–10 and increased maternal morbidity and mortality (23-24). It has been reported that close to 500,000 maternal deaths occur every year, the vast majority taking place in the developing world. Anemia is thought to be the major contributory cause of death in 20–40% of these maternal deaths (25). In developing countries, both nutritional deficiencies and parasitic infection, specifically hookworm and malaria infection, contribute most to anemia. In fact,

hookworm infections are recognized as the leading cause of pathologic blood loss in tropical and subtropical countries (26). Hookworm infections contribute to anemia by causing blood loss directly through ingestion and mechanical damage of the mucosa, and indirectly, by affecting the supply of nutrients necessary for erythropoiesis (27).

1.2 Statement of the problem

Intestinal parasitic infections are a major concern, mostly in developing countries, particularly in sub-Saharan Africa (SSA) (28). Ethiopia has one of the lowest quality drinking water supply and latrine coverage in the world (29). Tens of millions of pregnant women as one of the segments of the community are affected by parasitic infection which directly or indirectly lead to a spectrum of adverse maternal and fetal/placental effects. Pregnant women often experience more severe infections than their non-pregnant counterparts (30). Parasitic infection could occur at any stage of the three trimesters during pregnancy, but infection during the first trimester is associated with more severe fetal and placental consequences than those occurring later in pregnancy. Furthermore, the infection becomes more severe in women who are pregnant for the first time (primigravida) compared with other gravidae (31).

Pregnant women are also at high risk of parasitic infection due to their close relationship with children [9]. Infections with helminth were associated with a modest decrease in hemoglobin levels and indicators of poor nutritional status. Helminthic infections, such as Hookworm, Trichuriasis, and Schistosomiasis, have been shown to directly contribute to severe anemia in patients through blood loss and micronutrient deficiencies (32).

Low hemoglobin level is associated within areas where with a high prevalence of Hookworm infection (33). Hookworm is the leading cause of pathologic blood loss in endemic areas (34). Anemia accounts 20% of maternal death globally (35). Anemia in these highly endemic regions is common among pregnant women and often multi-factorial. Anemia has a devastating effect on pregnant women and has been associated with stillbirth, prematurity and low birth weight (36).

A study done on Gastrointestinal Helminth Infection in Pregnancy showed that the differences in hemoglobin levels by age groups was statistically significant ($P < 0.05$). The contributory effect of gastrointestinal helminths in anemia showed that infected pregnant women had lower mean hemoglobin (8.60±0.22g/dl) than the uninfected (9.72±0.07g/dl). Significant difference (t-value = 5.660, $P<0.05$) was observed between the Hb of the infected and uninfected pregnant women. infected pregnant women had mean Packed Cell Volume (PCV)of 26.09±0.65% while the uninfected had 34.54±2.96%. The mean PCV of infected pregnant women was significantly different (t value= 0.013, $P<0.05$) from that of the uninfected (37).

Although there are a lot of factors that causes anemia, intestinal parasites like Hookworm, Trichuriasis trichuira and schistosoma are highly associated to cause anemia in pregnant women in endemic parts of Ethiopia. These parasites cause anemia directly by feeding the red blood cells or indirectly by causing bleeding, feeding the micronutrients and infiltrating the blood forming organs. The complication of intestinal parasitic infection during pregnancy leads to stillbirth, prematurity and low birth weight. To minimize the burden of parasitic infection during pregnancy, studying the prevalence of intestinal parasitic infections in pregnant women is mandatory. Therefore, the aims of this study were to determine the prevalence and determinants of intestinal helminth among pregnant women in ALERT hospital, Ethiopia.

1.3 Significancy of the study

Studying parasitic helminthes has the potential to make significant contributions to maternal and child health, public health policy, and scientific understanding of helminthic infections in pregnancy. So, understanding the prevalence of helminthic infections among pregnant women helps public health authorities assess the burden of these infections in a vulnerable population. This data is crucial for designing targeted interventions and allocating resources effectively. The study can inform the development of control programs, such as deworming initiatives and health education campaigns, aimed at reducing the burden of helminthic infections among pregnant women.

The findings can be used to enhance ANC programs by integrating routine screening and treatment for helminthic infections, thereby improving the overall health of pregnant women and their babies. Addressing helminthic infections in pregnant women contributes to achieving global health goals, such as reducing maternal and neonatal mortality, and improving maternal nutrition, as outlined in the Sustainable Development Goals (SDGs). By addressing these infections in pregnant women, the economic burden on families and healthcare systems can be reduced.

Reducing the prevalence of helminthic infections can lead to better health outcomes, improving the quality of life for pregnant women and their families. The study can provide baseline data for future research on helminthic infections, maternal health, and related areas. It can also contribute to the global body of knowledge on the epidemiology of helminthic infections in pregnancy.

2. Literature review

2.1 Prevalence of parasitic helminths in pregnant women

A study done Nigeria on Gastrointestinal Helminth Infection in Pregnancy showed that the forty-six (16.3%) subjects were infected with at least one helminth parasite; 24 (8.5%) hookworm, 14(5.0%) and 2(0.7%) A. lumbricoides and Trichuris trichiura infections respectively. Intestinal helminthiases in pregnant women were significantly associated with age ($P<0.05$). The prevalence of intestinal helminthiases by parity was also significantly different ($P<0.05$) with primigravidae having the highest infection rate (27.5%). Hematological assessment showed that the prevalence of anemia among the women was 58.9% (mean = 9.3 ± 1.0) (37). study done in , Atlanta, GA, USA showed that of 5,127 women, 76% were infected with one or more helminth species, 36% with hookworm, 59% with Ascaris lumbricoides and 28% with Trichuris trichiura (38).

A study done in Nigeria showed that prevalence of intestinal parasitic infection among tertiary institution pregnant women were 23.74 %. The parasites found in pregnant women were A. lumbricoides, hookworm, T.trichuria, Enterobious vermicularis, E. histolytica and G. lambia. A majority of the women (65%) were infected with Ascaris with heavy infection seen in some women (6.66%) (42). another study done in Mother and Child Hospital, Akure, Nigeria among 178 women, 31 (17.4%) had a helminth infestation (15 [8.4%] had ascariasis, 8 [4.5%] trichuriasis, and 25 [14.0%] hookworm infestation (43).

A study done on Schistosoma mansoni and Soil Transmitted Helminth (STH) Infections among Pregnant women revealed that the prevalence of soil transmitted helminths among the 120 pregnant women examined was 8.3% (10) for soil transmitted helminths (A. lumbricoides 7.5% (9); Hookworm (1) 0.83%) and 0.83% (1) for Schistosoma Manson while none was positive for

malaria infection. Only 40% of the pregnant women had knowledge of soil transmitted helminths out of which 8.3% were positive for infection. Of those walking bare footed and using shared toilet facilities, 60% and 12.8% were infected respectively. Despite the fact that all the infected pregnant women with STH had light infection, 50% of them were anemic which occurred in all age groups except 37 - 42 years age group while the only S. Manson infected pregnant woman had moderate infection and was also anemic. Anemia was significantly associated with infection in pregnant women ($P < 0.05$) (39).

A study done in School of Public Health; University of Ghana showed that the overall prevalence of intestinal parasites was 14.3%. Entamoeba histolytica (5.0%) was the most predominant parasite species identified followed by Ascaris lumbricoides (4.3%), Giardia lamblia (2.3%), Trichuris trichiura (1.3%), Schistosoma mansoni (0.3%), Hookworm (0.3%), Hymenolepis nana (0.3%), and Isospora belli (0.3%) (40). Another study done in Kitale District Hospital; Kenya revealed that the overall prevalence of infection was 21 (13.8%). Ascariasis was the most prevalent 10 (6.5%), hookworm infection was 6 (3.9%), and trichuriasis was 2 (1.3%) (41).

A study done in Tanzania on parasitic infections and associations with pregnancy complications and outcomes indicates that the most prevalent parasitic infection recorded was malaria (17.0 %), while helminths and amebiasis were infrequently recorded (0.6 % vs. 0.7 %, respectively) (44).

A systematic review and meta-analysis on intestinal parasitic infections and associated factors among pregnant women in Ethiopia revealed that the estimated pooled prevalence of Intestinal parasitic infections (IPIs) among pregnant women in Ethiopia is 27.32 %. the most prevalent type of intestinal parasite identified was Hookworm followed by Ascaris lumbricoides with a prevalence of 11.12 % and 10.34; respectively. Oromia had the highest prevalence estimate accounting 29.78 % closely followed by Amhara region 29.63 %, Tigray region 27.74 % and SNNPR 24.23 (14).

College of Medicine and Health Sciences, Bahir Dar University found that the determinants of Helminths were the overall prevalence of intestinal parasitosis was 277 (37.3%). The prevalence of hookworm 138 (18.6%) was the leading cause of intestinal parasitosis followed by E. histolytica/dispar 113 (15.2%) (45).

A study done in center at Felege Hiwot Referral Hospital, northwest Ethiopia on prevalence of intestinal parasitic infections among pregnant women attending antenatal care was 31.5 % intestinal parasite infections was recorded. Eight different species of intestinal parasites were found: two protozoan and six helminth species. The highest prevalence was due to Giardia lamblia (13.3 %) followed by Entamoeba histolytica/dispar (7.8 %), hookworm (5.5 %), Ascaris lumbricoides (2.9 %), Schistosoma mansoni (2.9 %), Strongyloides stercoralis (1.6 %), Taenia spp. (0.8 %), and Hymenolepis nana (0.3 %) (46).

Another study done in Mecha district; Northwest Ethiopia indicates that the prevalence of helminthic infections among pregnant women was 70.6%. Ascaris lumbricoides (32.7%) was the predominant intestinal parasite species (47).

A study done in Wondo Genet district, Southern Ethiopia Prevalence of intestinal parasitic infection among pregnant women indicates that the overall prevalence of intestinal parasitic infection was 38.7% (95% CI: 33.6–43.8%). One-tenth (9.7%) of the pregnant women were infected with poly-parasites. Ascaris lumbricoides was the predominant infection encountered in 24.9% of the women. The other infections identified were hookworms (11.2%), Giardia lamblia (5.4%), Entamoeba histolytica (3.4%), Trichuris trichiura (2.9%) and Schistosoma mansoni (2.3%). The mean (± standard deviation) hemoglobin concentration was 12.3 (±1.9) g/dl and 31.5% women were anemic (hemoglobin < 11 g/dl) (48).

2.2 Determinant factor of parasitic helminths in pregnant women

study done in Atlanta, GA, USA showed There was nation based wide helminthic survey in Vietnam, showed significant rates of infection in reproductive-age women. In the country as a whole, 76% of women were infected with one or more helminthic species, 59% with A. lumbricoides, 36% with hookworm and 28% with T. trichiura. Another recent survey in northern Vietnam still showed a very high prevalence of helminth infections: hookworm (52%), T. trichiura (50%) and A. lumbricoides (45%) (Verle et al, 2003).(49) that Hookworm infection was associated with farming [Odd ratio (OR)=2.1] and lack of a closed latrine (OR=2.0), A. lumbricoides with use of untreated feces as fertilizer (OR=1.2) and coinfection with T. trichiura (OR=2.1) and T. trichiura with A. lumbricoides co-infection (OR=2.1(38).

School of Public Health, University of Ghana showed that the determinant factor of the parasites were Age > 30 years (AOR = 0.17), multigravidity (AOR= 0.43), and 2nd and 3rd trimesters (AOR = 4.73) were independently associated with intestinal parasitic infections among pregnant women (40). Another study done in Kitale District Hospital, Kenya revealed that Pregnant women aged below 29 years (OR = 3.63) and those with primary level of education (OR = 3.21) were at a higher risk of infection compared to those aged ≥ 29 years with secondary level of education. Hand washing was significantly associated with reduced likelihood of infection (OR = 0.18) (41).

College of Medicine and Health Sciences, Bahir Dar University found that the determinants of Helminths were dwelling in rural area (AOR: 2.9), being a farmer (AOR: 1.91), eating raw vegetables (AOR: 1.45), lack of proper use of latrine (AOR: 2.89), poor environmental sanitation (AOR: 0.19), habit of soil eating (AOR: 0.42), having irrigation practice (AOR: 0.47), and lack of health education (AOR: 0.32) were significantly associated with intestinal parasitic infections (45).

A study done in Tanzania on parasitic infections and associations with pregnancy complications and outcomes indicates that the women who had malaria during pregnancy had 13 % increased odds of having a preterm delivery (OR = 1.13) as compared to those who were not infected. They also had 33 % increased odds of getting maternal anemia (OR = 1.33). Likewise, pregnant women who were recorded with helminths infections had 29 % increased odds of having maternal anemia as compared to those who had no helminths infection (OR = 1.29). Moreover, pregnant women who were recorded to have amebiasis had 79 % increased odds of having a preterm delivery as compared to those who had no ameba infection (OR = 1.79) (44).

A systematic review and meta-analysis on intestinal parasitic infections and associated factors among pregnant women in Ethiopia revealed that the residence area, being bare footed, hand washing habit and eating uncooked/raw vegetables have significant association with the occurrence of IPIs among pregnant women. Pregnant women from rural areas were 6.3 more likely to develop IPIs when compared to urban dweller pregnant mothers (OR = 6.31) Likewise, barefooted women were 2.79 times more likely to be infected with IPIs than those who wore shoes (OR = 2.79). pregnant women who had no hand washing habit and who consumed

uncooked/raw vegetables were more likely to be infected with intestinal parasites compared to their counterparts (OR = 3.02) and (OR = 1.24); respectively (14).

Another study done in Mecha district, Northwest Ethiopia indicates that the prevalence of helminthic infections and determinant factors among pregnant women showed that the intestinal parasitic infection were 2.94 folds higher in the absence of latrine (AOR: 2.94). Absence of regular hand washing habit increase the odds of infection by 3.33 folds higher (AOR: 3.33). Not wearing shoe increased the odds of helminthic infection by 6.87 folds higher (AOR: 6.87). Illiteracy increases the odds of intestinal parasitic infection by 2.32 folds higher (AOR: 2.32). Ingestion of raw vegetables increases the odds of intestinal parasitic infection by 2.65 folds higher (AOR: 2.65). The odds of intestinal parasitic infection were higher in rural areas (AOR: 2). Intestinal parasitic infection was higher in women aged less than 21 years (AOR: 6.48) (48).

2.3 Conceptual framework

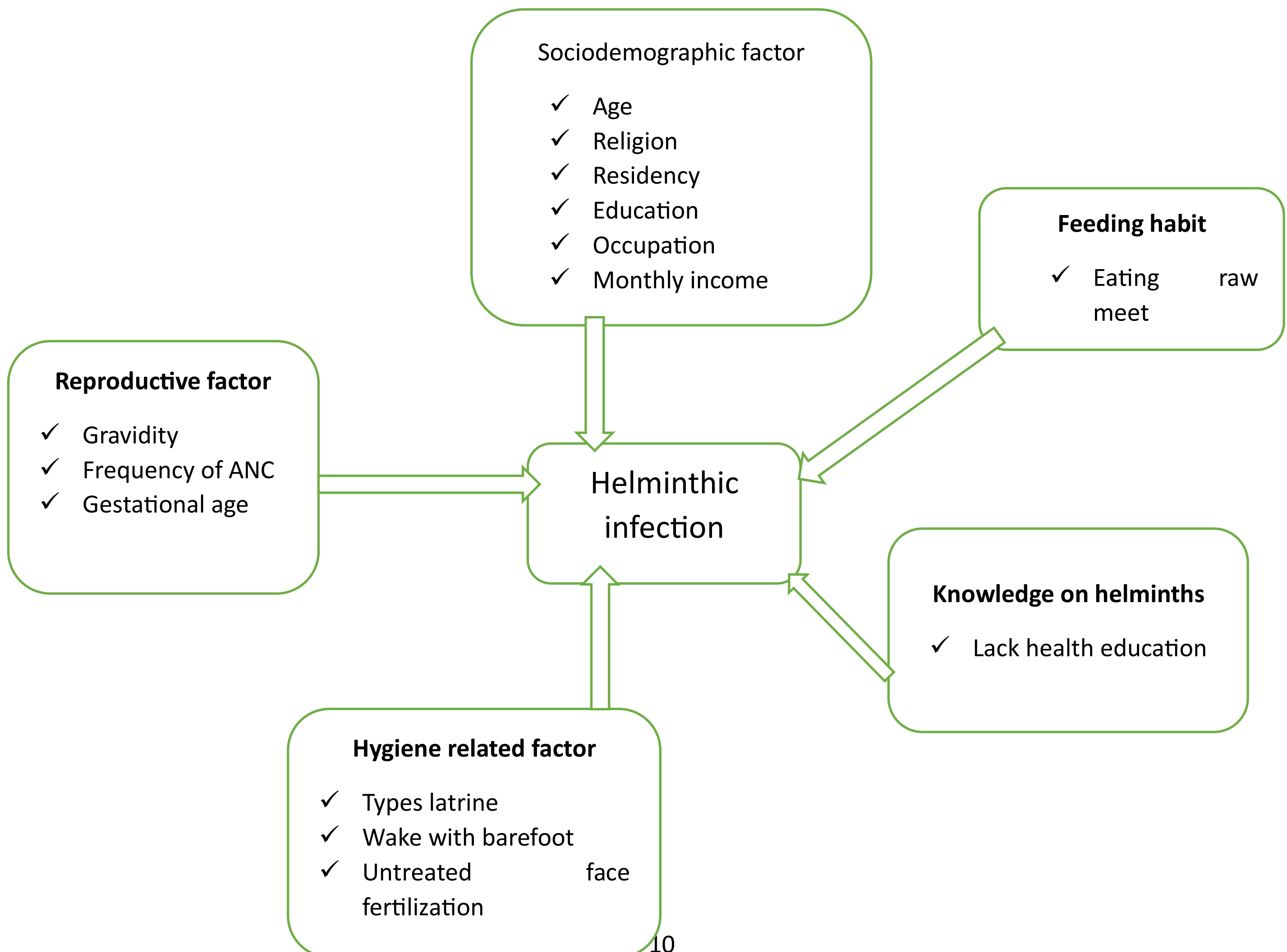

Table 1.The conceptual framework adopted from the literature

3. Objective

3.1 General objective

- Assessment of prevalence of helminthic infections among pregnant women attending ANC in ALERT hospital, Addis Ababa

3.2 Specific objective

To determine the prevalence of helminthic infections among pregnant women attending ANC in ALERT hospital, Addis Ababa

To identify the associated factor of helminthic infections among pregnant women attending ANC in ALERT hospital, Addis Ababa

4. Methods and Materials

4.1. Study area and period

The study was done in Addis Ababa, the capital city of Ethiopia, as of 2024 the city had estimated 5 million inhabitants. Currently the city has more than 13 public, 27 private Hospitals and more than 100 health centers, 35 health posts and more than 500 clinics. Of the 12 public Hospitals one of them are purposely selected and included in the study. These are ALERT referral hospital. this study was conducted from November 25, 2024 to January 10 for 45 days.

4.2. Study Design

An institution based cross-sectional study design was used.

4.3 Population

4.3.1 Source Population

All pregnant women who will attending ANC services in ALERT hospital

4.3.2 Study Population

pregnant women aged 15-49 years who were attend the Antenatal Clinic in ALERT hospital.

4.4 Inclusion and Exclusion Criteria

4.4.1 Inclusion Criteria

pregnant women attending the ANC service in ALERT hospital in reproductive age group (15-49) and who agreed to participate in the study

4.4.2 Exclusion Criteria

Pregnant women who were come to the facility seeking health care other than helminthic infection, women who will be already included into the study during a previous ANC visit, or who was have difficulty of completing the interview like in the case of mental health problems or other critical illness.

4.5 Sample Size Determination

In this study, sample size was determined by using the single population proportion formula. Taking 14.3% helminthic infection from University of Ghana (41), during pregnancy to obtain the maximum sample size with 5% marginal error, 95% CI.

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

Samples size by dietary practice (n1) = $(1.96)^2 * 0.143(1-0.143)/0.05)^2 = 188$

So, then after adding 10% none response rate the final sample size will be **207.**

4.6 Sampling Techniques and Procedures

The sample was proportionally allocated to the respected months and the sample were picked randomly using systematic sampling after calculating k- value by using lottery methods until the final sample size achieved during the study period.

4.7. Variables

4.7.1. Dependent variables

Helminthic infection

4.7.2. Independent variables:

Sociodemographic factor

- ✓ Age
- ✓ Religion
- ✓ Residency
- ✓ Education
- ✓ Occupation
- ✓ Monthly income

Feeding habit

- ✓ Eating raw meet

Hygiene related factor

- ✓ Types latrine
- ✓ Wake with barefoot
- ✓ Untreated face fertilization

Reproductive factor

- ✓ Gravidity
- ✓ Frequency of ANC
- ✓ Gestational age

Knowledge on helminths

- ✓ Lack health education

4.8 Data Quality Control

The questionnaire was prepared first in English and translated in to Amharic and back translated to English by different qualified individuals to keep consistency of the data. Two-day training was given for data collectors on how to fill the questionnaire and overall data collection process before the actual time of data collection. pretest was conducted in 5% of sample size at similar population in Addis Ababa. which was not include in the study. And correction was done as necessary. Data were checked daily for completeness and consistency during data collection

4.9 Data Collection instrument and Procedure

Structured questionnaire was used to collect data using interviewer administered technique which is developed after reviewing related studies. The questionnaire has three sections that were used to obtain socio-demographic information, personal, and environmental characteristics. Questionnaires were prepared in English and translated into Amharic and translated back into English to check its consistency. The Amharic version was used for data collection after pretesting on 10% of the actual sample size at health center which is not actual data collection site and before the data collection period. Some clarifications and other corrections on the questionnaire were made after pre-testing.

Unique code was given for each questionnaire and on the laboratory request format which is placed at lab. The participant after interview was requested to give stool sample by giving a code which relates the questionnaire and the laboratory request format.

Parasitological examination

Source of Specimens and Collection

Clinical specimens of stool from pregnant women attending antenatal clinic at ALERT Hospital, was used for parasitological examination. The selected subjects were given a dry clean bottle. Subjects were instructed to collect stool sample.

Macroscopic Examination

All specimens were examined for the presence of adult worms, or segment, the consistency, color, presence of mucus and blood.

Microscopic Examination (Saline Preparation)

It was carried out on the faecal sample collected using wet preparation. A drop of fresh physiological saline was placed on a clean slide. Using an applicator stick, a small amount of stool specimen was emulsified in saline solution. The preparation was covered with cover slip and examined under the microscope for the presence or absence of intestinal parasite, larvae or ova. The preparation was observed under the microscope.

Concentration technique

Formol-ether concentration: 1g of stool was emulsified in 7ml of 10% formol saline and it was kept for 10 minutes for fixation. Straining through wire gauze, the filtrate will be added to 3 ml of ether and centrifuged at 2000 rpm for 2 minutes. It was allowed to settle. The supernatant was removed and a wet mount made of the deposit used to look for parasites.

4.10 Data Analysis and Interpretation

Data were cleaned, entered analyzed using SPSS version 25 for analysis. Summary statistics of mean and percentages were used to describe the study. The fitted bivariate logistic regression models to assess the association between each of the study outcomes (helminthic infection) and the different potential risk-factors. Then, multivariable logistic models were fitted to identify independent determinants. For the multivariable regression modeling, the covariates were included in a model which was selected based on their bivariate association with the outcome where variables with P-value< 0.25 were included. Adequacy of the models to predict the outcome variables were checked using the Hosmer–Lem show test. The strength of association

between the different risk factors and the study outcomes were reported using crude and adjusted odd ratios and the presence of statistically significant association will be considered at p-value less than 0.05.

4.11 Ethical consideration

Ethical clearance will be obtained from the Institutional Research Review Board of Addis Ababa University collage of health science department of family medicine and submitted to ALERT hospital. Prior to the start of data collection, verbal consent will be requested from each of the study participants after information provided about the nature and objective of the study. Participants were informed that they have the right not to participate in the study or can withdraw at any time point with no repercussion on the quality of ANC or other services they receive.

4.12 Operational Definition

helminthic infection refers to an infestation by parasitic worms, also known as helminthes, in the human body.

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4.13 Dissemination of the Results

Based on the work plan after data will be collected and analyzed conclusion will be drowning and discussion will be made and public defense will be done at AAU department of family medicine. After accommodating the examiner comment, and after getting permission from the concerned authority, information will be disseminated for the concerned body and to the public and publication of the findings will be considered.

5. Result

5.1 Sociodemographic characteristics of the study participants

In this study 185 study participants were involved and majority (35.1%) were in the age group of 30-34 years with mean and SD of 29.5±4.87. Eighty-three percent of the participants were married and fifty three percent of them were an education level of secondary and above. eighty-nin percent of the study participants were urban in residency and 42.2% were house wife. Ninety-one percent of the study participants had corrugated sheet house and 42.2% had their own house.

Table 2. The sociodemographic characteristics of the study participants among pregnant women attending ANC in ALERT hospital, Addis Ababa, 2024.

Variable	frequency	Percent
Age in years		
19-24	35	18.9
25-29	57	30.8
30-34	65	35.1
≥35	28	15.1
Marital status		
Single	20	10.8
Married	153	82.7
Divorced	12	6.5
Education level		
Illiterate (cannot read and write)	18	9.7
Primary (grade 1-6)	29	15.7
Junior (7&8)	40	21.6
Secondary (9-12) and above	98	53.0
Religion		

protestant	24	13.0
Muslim	89	48.1
orthodox	63	34.1
catholic	9	4.9
Place of residency		
Urban	165	89.2
Rural	20	10.8
Occupation		
house wife	78	42.2
employed	64	34.6
student	6	3.2
self-employee/merchant	27	14.6
daily laborer	10	5.4
Occupation of husband		
Employee (GO/NGO)	64	38.8
Self-employee/merchant	76	46.1
Daily worker	18	10.9
other	7	4.2
Family size		
<4	108	58.4
>=4	77	41.6
Type of house		
Thatched house	17	9.2
corrugated sheet	168	90.8
Home owner ship		
Yes	78	42.2
no	107	57.8
TV/radio ownership		
Yes	161	87
No	24	13

5.2 characteristics of intermediate risks for helminthic infection

seventy-one percent of the study participants were in the 3rd trimester pregnancy and 65.4% were history of pregnancy. From those of having pregnancy history, 47.1% had 2-4 pregnancy and 54.5% had two and above live births. Seventy-seven percent of the participants had pipe water inside the compound and 41.6% of the participants had chronic disease.

Table 3. Characteristics of intermediate risks for helminthic infection

Variable	frequency	Percent
Gestational age in weeks		
2nd trimester	53	28.6
3rd trimester	132	71.4
Ever pregnant before		

Yes	121	65.4
no	64	34.6
Number of pregnancies (n=121)		
One	55	45.5
2-4	57	47.1
≥5	9	7.4
Number of live births(n=121)		
one	55	45.5
Two and above	66	54.5
Number of children(n=121)		
≤2	83	68.6
>2	38	31.4
Water source		
Pipe water Inside compound	143	77.3
pipe water Outside compound	30	16.2
Well, /stream/rain	12	6.5
presence of other Chronic disease		
yes	77	41.6
no	108	58.4

5.3 The characteristics of proximate risk factors for Helminthic infections

Ninety percent of the study participants had toilet facilities and 83.8% were washed their hands after toilet. Only forty-eight percent of the study participants were washed their hands before preparing hand and 21.6% of the participants had an availability of water body in the vicinity. Seventeen percent of the study participants had an exposure on exposure to lake or rivers through swimming or bathing. 79.5% of the study participants were wearing sandals frequently and 75.7% of the participants were burned the household waste disposal.

Table 4. The characteristics of proximate risk factors for Helminthic infections

Variable	frequency	Percent
Presence of Toilet facilities		
yes	166	89.7
no	19	10.3
Do you wash your hands after toilet		
yes	155	83.8
no	30	16.2
Do you use soap or any antiseptic while washing your hands?		
yes	138	74.6
no	47	25.4
frequency of wash (n=138)		
daily	127	92.0
at least once a week	10	7.2

Less frequent than once a week	1	.7
Do you wash your hands before preparing food?		
yes	89	48.1
no	96	51.9
availability of water bodies in the vicinity		
yes	40	21.6
no	145	78.4
exposure to lake or rivers through swimming or bathing		
yes	32	17.3
no	153	82.7
taken traditional medicines for intestinal helminths during your pregnancy		
yes	32	17.3
no	153	82.7
Animal spend the night inside		
Yes	68	36.8
no	117	63.2
Do you have habit of walking barefoot		
Yes	88	47.6
no	97	52.4
Do you wear sandals frequently		
Yes	147	79.5
No	38	20.5
Household waste disposal		
Buried/Burned	140	75.7
Open field	48	24.3

5.4 Prevalence of helminthic infection

The figure below shows that 28% of the study participants had helminthic infection, while 72% of them haven't any helminthic infection..

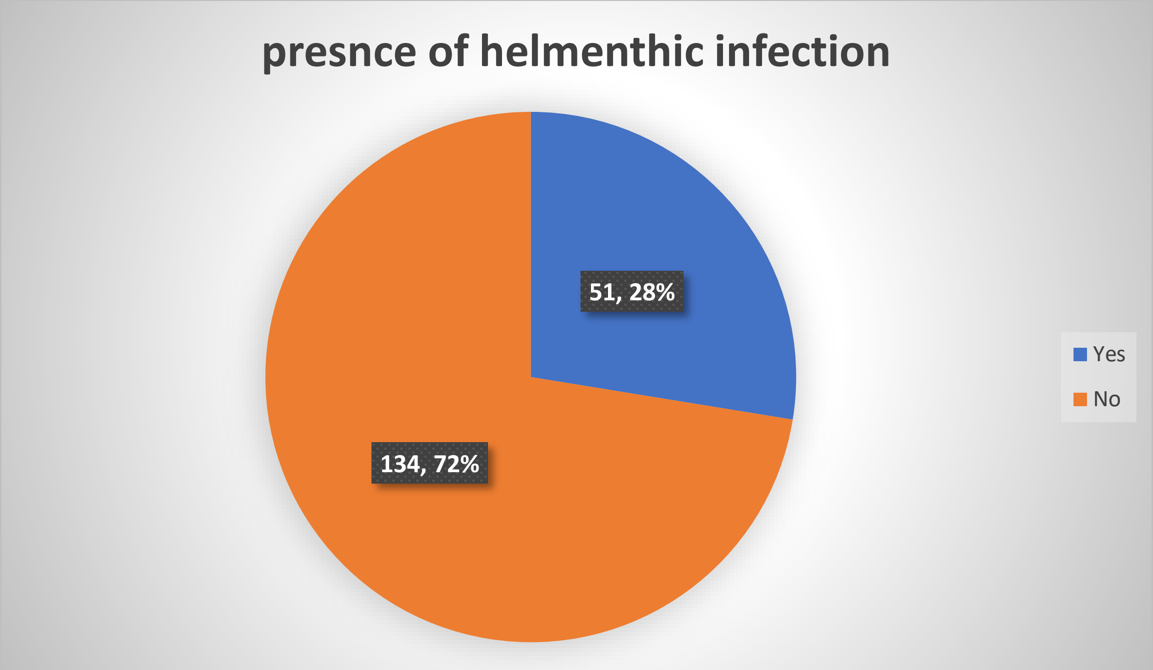

Figure 1. The prevalence of helminthic infection among pregnant women attending ANC in ALERT hospital, Addis Ababa, 2024.

5.5 The pattern of helminthic infection

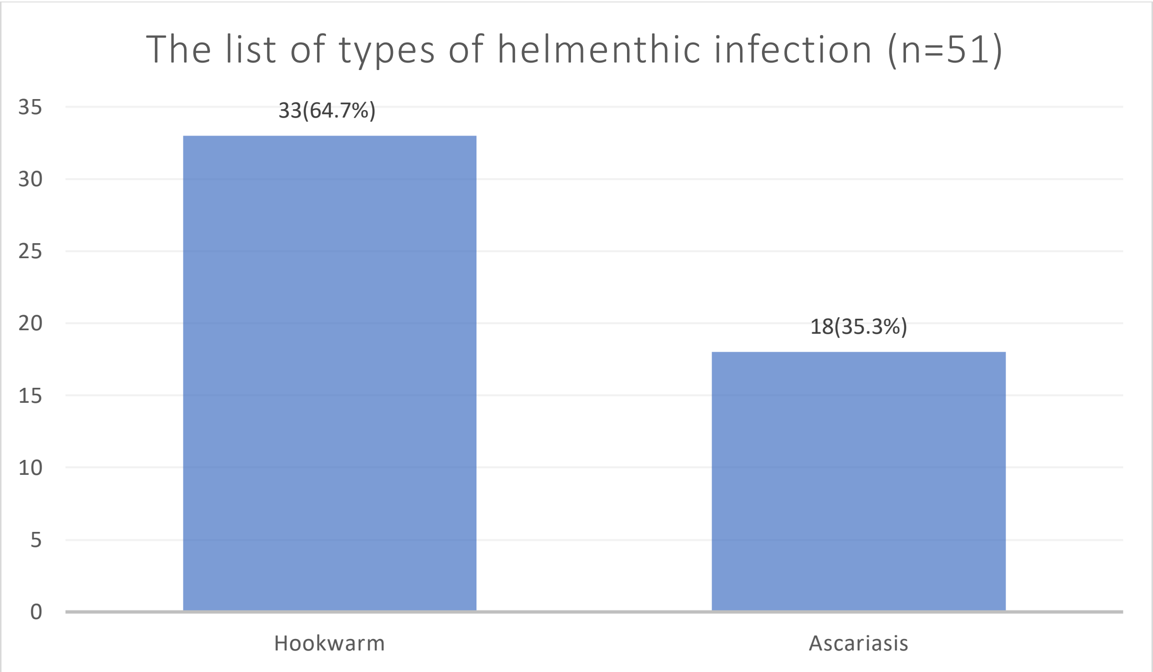

Figure 2, The patterns of helminthic infection.

5.6 The determinant factor of helminthic infection

In this study age, education level, type of housing, type of water source, toilet facility, use soap or antiseptic while washing hand, Availability of water bodies in the vicinity, Exposure of bathing in rivers and mechanism of house hold waste disposal was an association with helminthic infection by bivariate logistic regression. The multivariate logistic regression revealed that study participants whose education level of illiterate were 2.3 folds increase their helminthic infection compared to those of education level of secondary and above (AOR=2.3, 95%CI=1.48, 10.87) a nd study participants who were frum rural compartment were 3.1 times increase its helminthic infection compared to those of from urban area (AOR=3.1, 95%CI=1.88, 11.14).

Study participant having water source of pipe water out of the compound had 3.7 folds increase its helminthic infection compared to those of having water source with in the compound (AOR=3.7, 95%CI=1.12, 12.23) and study participant who didn't use soap or antiseptic while washing hands had 7.1 times increase its helminthic infection compared to its opposite compartment (AOR=7.1, 95%CI=2.26, 22.58).

Study participants having an availability of water bodies in the vicinity had 5.4 folds increase its helminthic infection compared to those of its opposite compartment (AOR=5.4, 95%CI=1.87, 15.83) and study participant having exposure of bathing in the river had 3.6 folds increase its helminthic infection compared to those of an opposite compartment (AOR=5.4, 95%CI=1.11, 11.57).

Table 5.The bivariate and multivariate logistic regression of association between independent variable and helminthic infection among pregnant women attending ANC in ALERT hospital, Addis Ababa, 2024.

Variable	Helminthic infection		p-value	COR with 95%CI	P-value	AOR with 95%CI
	yes	No				
Age in years						
19-24	17	18	0.030	3.5(1.13, 10.61)	0.241	2.41(0.09, 6.84)
25-29	14	43	0.749	1.2(0.40, 3.54)	0.254	1.4(0.09, 3.86)
30-34	14	51	0.991	1.1(0.34, 2.96)	0.130	0.35(0.09, 1.37)
≥35	6	22	1		1	
Education level						
Illiterate	12	6	0.000	9.5(3.14, 28.94)	0.003	**2.3(1.48, 10.87)**
Primary	13	16	0.003	3.9(1.57, 9.52)	0.723	1.3(0.35, 4.64)

Junior	9	31	0.484	1.4(0.56, 3.43)	0.784	1.2(0.37, 3.72)
secondary	17	81	1		1	
Place of residency						
Urban	43	122	1		1	
rural	8	12	0.193	1.9(0.72, 4.94)	0.048	**3.1(1.88, 11.14)**
Types of housing						
Thatched house	10	7	0.005	4.4(1.58, 12.37)	0.415	1.9(0.39, 9.96)
Corrugated house	41	127	1		1	
Types of water source						
Pipe water inside the compound	29	114	1		1	
Pipe water outside the compound	16	14	0.000	4.5(1.97, 10.25)	0.031	**3.7(1.12, 12.23)**
Well/stream/rain	6	6	0.026	3.9(1.18, 13.09)	0.246	0.29(0.04, 2.36)
Have toilet facility						
Yes	41	125	1		1	
No	10	9	0.013	3.4(1.29, 8.91)	0.905	1.1(0.24, 4.92)
Use soap or antiseptic while washing hand						
Yes	25	113	1		1	
No	26	21	0.000	5.6(2.72, 11.49)	0.001	**7.1(2.26, 22.58)**
Availability of water bodies in the vicinity						
Yes	18	22	0.006	2.8(1.33, 5.79)	0.002	**5.4(1.87, 15.83)**
No	33	112	1		1	
Exposure of bathing in rivers						
Yes	14	18	0.027	2.4(1.11, 5.38)	0.033	**3.6(1.11, 11.57)**
No	37	116	1		1	
House hold waste disposal						
Buried/burned	28	112	1		1	
Open field	23	22	0.000	4.2(2.04, 8.56)	0.057	2.8(0.97, 7.93)

6. Discussion

The finding of this study found that the prevalence of helminthic infection among pregnant women were 28%. This finding was in line with the study done in Nigeria (23.7%), A systematic review and meta-analysis in Ethiopia (27.3%), Felege Hiwot Referral Hospital, northwest Ethiopia (31.5%) (14, 42, 46). This finding was lower than the study done in Atlanta, GA, USA (76%), College of Medicine and Health Sciences, Bahir Dar University (37.3%), Mecha district; Northwest Ethiopia (70.6%) and Wondo Genet district, Southern Ethiopia (38.7%) (38, 45, 47, 48). This also finding was higher than the study done in Nigeria (16.3%), University of Ghana (14.3%), Kitale District Hospital; Kenya (13.8%) (37, 40, 41. This difference was may be due to

environmental conditions such as climate, sanitation, and local health practices. The other difference was limited access to clean water, inadequate sanitation, and lack of health education. Difference in sample size, diagnostic techniques, and the timing of data collection) can lead to varying results.

study participants whose education level of illiterate were 2.3 folds increase their helminthic infection compared to those of education level of secondary and above (AOR=2.3, 95%CI=1.48, 10.87). this finding was in line with the study done in Kitale District Hospital, Kenya, Mecha district, Northwest Ethiopia (41, 48). This was may be due to illiterate individuals may have limited access to health education, making it difficult for them to understand the risks associated with helminthic infections and the preventive measures they can take, such as proper sanitation and hygiene practices. They may not be aware of the importance of handwashing, cooking food properly, or avoiding contaminated water sources.

study participants who were frum rural compartment were 3.1 times increase its helminthic infection compared to those of from urban area (AOR=3.1, 95%CI=1.88, 11.14). this finding was congruent with the study done in College of Medicine and Health Sciences, Bahir Dar University, this finding was supported by the study done in Mecha district, Northwest Ethiopia (45, 48). This was may be due to rural areas often have inadequate infrastructure for clean water supply and sanitation. Poor or nonexistent sewage systems increase the risk of contamination of drinking water and food, both of which are common sources of helminth infections. The use of contaminated water for drinking, cooking, or bathing can expose individuals to parasitic eggs and larvae.

Study participant having water source of pipe water out of the compound had 3.7 folds increase its helminthic infection compared to those of having water source within the compound (AOR=3.7, 95%CI=1.12, 12.23). this finding was supported by the study done in Mecha district, Northwest Ethiopia (48). This was may be due to when water is fetched from an external source and stored within the household, the water can become contaminated if it is not properly covered or stored. If water containers are not hygienically maintained, they can become breeding grounds for parasites.

study participant who didn’t use soap or antiseptic while washing hands had 7.1 times increase its helminthic infection compared to its opposite compartment (AOR=7.1, 95%CI=2.26, 22.58).

this finding was in line with the study done in Kitale District Hospital, Kenya (41). This was may be due to many helminths, particularly soil-transmitted helminths like hookworms, roundworms, and whipworms, are transmitted through the fecal-oral route. If a person doesn't wash their hands with soap after using the toilet or handling contaminated items, they can ingest parasite eggs that are still present on their hands.

Study participants having an availability of water bodies in the vicinity had 5.4 folds increase its helminthic infection compared to those of its opposite compartment (AOR=5.4, 95%CI=1.87, 15.83) and study participant having exposure of bathing in the river had 3.6 folds increase its helminthic infection compared to those of an opposite compartment (AOR=5.4, 95%CI=1.11, 11.57). this finding was supported by the study done in Mecha district, Northwest Ethiopia (48). This was may be due to water bodies are often prone to contamination from human or animal waste, particularly in areas where sanitation facilities are inadequate.

7. Conclusion

The finding of the study found that the prevalence of helminthic infection among pregnant women was high. The determinant factor for helminthic infection were education level of illiterate, rural in residency, having water source of pipe water out of the compound, didn't use soap or antiseptic while washing hands, having an availability of water bodies in the vicinity and having exposure of bathing in the river.

8. Recommendation

To address the issue of helminthic infections in pregnancy a multi-faceted educational approach is essential. So, the recommendations with this finding were: -

Basic Hygiene Education

- ✓ Emphasize the importance of washing hands with soap and clean water, particularly after using the toilet, before handling food, and before eating.
- ✓ Teach the significance of using soap for washing, as it helps remove contaminants more effectively than just water.

Improved Sanitation Practices

- ✓ Encourage building latrines and proper waste disposal systems to avoid open defecation, which is a common route for helminth infections.
- ✓ Ensure that water used for drinking, cooking, and washing is from safe, clean sources
- ✓ Educate on the importance of filtering or boiling water if the pipe water system is unreliable.

Environmental and Personal Hygiene

- ✓ Educate on the potential dangers of bathing in rivers, where water may be contaminated with parasites or waste. Encourage using designated clean water sources for bathing if possible.

Helminth Prevention during Pregnancy

- ✓ Provide information about safe deworming treatments for pregnant women (typically recommended in the second trimester) to reduce the risk of helminth infections.
- ✓ Educate on the importance of maintaining good nutrition, as a strong immune system can help reduce the likelihood of infection.

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ANNEXES

ANNEX I: English Version of the Questionnaire

Addis Ababa university College of Medical and health science, Department of family medicine Questionnaire for Data Collection on intestinal helminthiases and associated factors among pregnant women attending antenatal clinic of ALERT hospital, Addis Ababa Ethiopia.

Verbal consent form before conducting interview

Greeting: Hello, my name is ______________. I am working with Dr_______________.

The objective of this study is to determine the prevalence and associated risk factors of intestinal helminthic infection among pregnant. The outcomes of the findings can help in the evidence-based decision to develop control intervention strategies to improve the health status of the pregnant women. I would like to ask you a few questions about intestinal helminthiases and associated factors. Also, you requested to provide stool sample for investigation.

Your cooperation and willingness for the interview is helpful in identifying problems related to the subject matter. Your name will not be written in this form. All information that you give will be kept strictly confidential. Your participation is voluntary and you are not obliged to answer any question you do not wish to answer. If you are not still comfortable with the interview, please feel free to drop it any time you want. Do I have your permission to continue?

1. If yes, continue to the next page.

2. If no, skip to the next participant.

Interviewer name and code _______________________ signature ____________

Supervisors name ___________________ signature ___________________

Annex II. General instruction

Almost all of the questions do have a pre coded response. So, it is important to follow the following instructions while you are interviewing the respondents and recording their responses.

- ➢ Ask each question exactly as written on the questionnaire
- ➢ Circle the responses that best match with the answer of the respondent
- ➢ Do not read the pre coded responses for the respondents, listen only the response of the respondents.

Part I. Socio-economic and demographic characteristics

1. Age in years ________________
2. What is your marital status?

I. Single
II. Married
III. Divorced
IV. Widowed

3. What is your educational level?

I. Illiterate (cannot read and write)
II. Primary (grade 1-6)
III. Junior (7&8)
IV. Secondary (9-12) and above

4. What is your religion?

I. Protestant
II. Muslim
III. Orthodox
IV. Catholic
V. Others

5. Where is your usual place of residence?
   I. Urban
   II. Rural
6. What is your main occupation?
   I. Employed (GO/NGO)
   II. House wife
   III. Student
   IV. Self-employee/merchant
   V. Daily worker
   VI. Others____________________(specify)
7. What is your husband"s occupation?
   I. Employee (GO/NGO)
   II. Student
   III. Self-employee/merchant
   IV. Daily worker
   V. Others____________________(specify)
8. What is your family size ______________?
9. What is your source of income ____________?
10. What is your monthly income in birr______________?
11. Type of house. Living in thatched house vs. corrugated sheet
    I. Thatched house
    II. Corrugated sheet
12. Home ownership
    I. yes
    II. no
13. TV/Radio ownership
    I. yes
    II. no

part II. Intermediate risk factors for helminth infection

14. Gestational age in weeks ________________
15. Have you had any pregnancy before?

I. Yes
II. No

16. If yes to ques.15 how many pregnancies have you had_____________?
17. How many live births have you had_______________?
18. How many live children do you have now______________?
19. Type of water source

I. Pipe water Inside compound
II. pipe water Outside compound
III. Well,/stream/rain
IV. River

20. presence of other Chronic disease

I. yes
II. no

part III. Proximate risk factors for Helminthic infections

21. Do you have Toilet facilities

I. yes
II. no

22. Do you wash your hands after toilet?

I. yes
II. no

23. Do you use soap or any antiseptic while washing your hands?

I. yes
II. no

24. If yes to Q 23, how frequent?

I. Daily
II. At least once a wks
III. Less frequent than once a week

25. Do you wash your hands before preparing food?

I. yes
II. no

26. availability of lake or other water bodies in the vicinity

I. yes

II. no

27. If yes proximity to lake in meters estimated_______________

28. exposure to lake or rivers through swimming or bathing

I. yes

II. no

29. Have you taken traditional medicines for intestinal helminths during your pregnancy

I. yes

II. no

30. Animal spend the night inside

I. yes

II. no

31. Do you have habit of walking barefoot

I. yes

II. no

32. Do you wear sandals frequently

I. yes

II. no

33. Household waste disposal

Buried/Burned

Open field

Used as fertilizers

Annex IV: Laboratory Requesting and Recording Format

1. 1 Age ___________________________

1.3 Address ________________________

1.4 Date of sample collection___________________________

2. Laboratory data

   I. Consistency of the stool

   II. Formed

   III. Soft

   IV. Semi-formed

V. Watery diarrhea

VI. Bloody diarrhea

3. Appearance of stool

   I. Blood stained

   II. Mucus

   III. Normal

4. If macroscopic worm is present, type of the worm_____________________

5. Microscopic examination

   I. Direct microscopic examination

   II. No ova or parasite seen

6. If O/P seen, Types of ova parasite seen__________-

7. Other intestinal protozoa _______________________

8. Concentration technique

9. No ova or parasite seen

10. Types of ova/ parasite seen (fill no from above code)____________

11. Other intestinal protozoa seen

12. Name of investigator ___________________________________

13. Signature _______________ Date