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Prevalence of Geohelminthes Infection and its Predisposing Factors among Treatments Seeking Patients at Jimma Town Health Centers Jimma Zone South West Ethiopia

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Abstract

Background: Geohelmenthes infections cause serious public health problem in Ethiopia. They were more prevalent among population with low income, poor personal hygiene and environmental sanitation, overcrowding and limited access to clean water. The Study Was aimed to estimating the prevalence of geohelmenthes infection and its predisposing factors among treatments seeking patients at Jimma health centers.

Methods: Cross sectional study was carried out to determine the prevalence of geohelmenthes infection and predisposing factors among treatments seeking patients from June to August 2018 at Jimma health centers Data collected analyzed by SPSS statistical software was used to analysis data. Association between variables was analyzed using uni-variation and multi-variation logistic regression and p-values. The result was presented with odd ratio. P-value < or =0.05 would take as the acceptable level significance.

Results: Regarding to respondents residential area, patients living in urban area had 2.290 times higher prevalence of geohelmenthes infection as compared to patients living in rural area. Respondents who had dirty materials in fingernails were 63.256 times highly contribute for geohelmenthes infection as compared to do not having dirty materials in fingernails .Regarding to unwashed or uncooked vegetable or fruit eating habits, respondents uses unwashed or uncooked vegetable or fruit had 79.16 times highly contribute for geohelmenthes infections as compared those do not uses unwashed or un cooked vegetable or fruit. The overall prevalence of geohelmenthes 21.8% such as *Ascaris lumbricoides* 55(14.3%), *T. trichiura* 16(4.2%), *Hookworm* 10(2.6%) and *strongyloides* 3(0.8%).

Conclusion and Recommendation: The prevalence of geohelminthic infection was 21.8% in this study. Different between geohelminthes infection and poor hand washing practice before meal and after latrine, eating uncooked or unwashed vegetables and fruit, Trimming finger nails, Place of residence, and shoe wearing practice, and all associated factors were statically significant. Therefore, health education and development in sanitary infrastructure could achieve long-term and sustainable reductions in helminthes prevalence.

Keywords: Geohelminthes Hygiene; Infections; Nematodes; Prevalence; Treatment

Introduction

Geohelmenthes infection was the major cause of public health problem thought the world [1]. The infection impairs physical development, causes malnourishment and decreases cognitive performances and school absenteeism, and school decrease performance in school-age children [2]. The relationship between malnutrition and Geohelminthes which has been well established was complex and depends on determinants economic and physical environments in which an individual lives. Geohelminthes affect the host's nutritional status through the intake, intestinal absorption, metabolism and excretion of nutrients [3]. Iron deficiency (anemia) during pregnancy lead to adverse maternal-foetal consequences including prematurity, low birth weight and impaired lactation [4]. In developing countries like Ethiopia geohementhes were known to cause major morbidity rate. Estimates of annual deaths of human being from soil-transmitted helminthes infections vary widely. From 12 000, [5] to as many as 135 000, individual [6] Apart from acute clinical disease, chronic helminthiasis can lead to insidious and debilitating disease especially in children and women of child-bearing age [7].

The degree of seriousness and transmission was highly dependent on socio economic status of the community and geographic condition Chronic Helminthes infections induce T-cell hypo responsiveness which may affect immune responses to other pathogens [8]. Soil-transmitted helminthes infections were widely distributed throughout the tropics and subtropics. Climate is an important determinant of transmission of these infections, with adequate moisture and warm temperature. Temperature, relative humidity and light affect the viability of eggs. Rainfall not only provides essential moisture for the development of eggs to larval stages but also contributes to dispersal of eggs throughout the domestic environment. Heavy rainfall causing run-off and erosion distributes eggs both horizontally (across wide areas) and vertically (into deeper soil layers and down steep slopes). Prost (1987) [9] suggested that horizontal transport leads to the concentration of eggs where puddles were formed. The eggs of *Ascaris lumbricoides* for example can remain viable for two to three years in temperate climates (10-15 °C) and for ten to twelve months in tropical climates(20-30 °C) [10]. Studies from West Africa suggest that minimum of 1400 mm annual rainfall was necessary for the prevalence of *Ascaris lumbricoides* to exceed 10% [11]. So Jimma has a warm and humid climate with daily average temperature of 20°C and mean annual rainfall varying between 400 and 1800 millimeters. There for the temperature and climates appropriate for the growth of *Ascaris lumbricoides* and for the other geohelminthes.

Soil-transmitted helminthes are a group of neglected tropical diseases that include hookworm (*Necator americanus* and *Ancylostoma duodenale*), roundworm (*Ascaris lumbricoides*), and whipworm (*Trichuris trichiura*). Geohelmenthes are endemic in at least 120 countries and are estimated to account for over 5 million disability-adjusted life years (DALY) [12] and substantial productivity loss [13]. In endemic countries [14] Hookworm is one of the most common chronic infections with an estimated 1.3 billion cases globally and directly accountable for 65,000 deaths annually [12]. In sub-Saharan Africa, about 866 million people are infected by Soil transmitted helminthes in 2012. *Hookworm, A. lumbricoides*, and *T. trichiura* accounted for 117 million (13.6%), 117 million (13.6%), and 100.8 million (11.6%) of the total infection respectively [15]. School children are the most vulnerable group at risk of Soil transmitted helminthes due to the habit of walking and playing barefoot, poor nutrition and poor awareness or education on the transmission pattern of the parasites.

The illness is characterized by abdominal pain, nausea, vomiting, anorexia, fatigue and poor concentration. During heavy infections, each individual adult hookworm can cause up to 0.2 ml of blood loss per day, which leads to depletion of host iron and protein reserves, causing iron deficiency anemia and protein malnutrition. Plasma protein loss can impart kwashiorkor-like appearance in children. The processes of growth retardation and deficits in attention and intellectual development that occur during chronic heavy hookworm infections in childhood could be due to the development of a clinical iron deficiency. The first-stage larva of *T. trichiura* is liberated from the eggs upon passage into the small intestine. They then undergo multiple molting processes before maturation. The adult stage usually develops within 30-90 days of infection and mainly inhabits the cecum, where the anterior part of the worm burrows into the mucosal epithelium. The estimated life span of the adult *T. trichiura* is one to two years and the female worm lays around 2,000-30,000 eggs per day [16]. In heavy infections, adult worms may be present throughout the intestinal tract from the cecum to the rectum. They then remain throughout their parasitic existence in the large intestine, where they survive by creating epithelial tunnels. The tunnels are created by a process of host cell fusion in response to parasite-derived secreted proteins [17]. Eventually, the thickened posterior portion of the worm ruptures out of the epithelial tunnel to protrude into the lumen [18].

Geohelminthes (soil-transmitted helminthes) are group of nematode parasites with a essential phase of their asexual lifecycle in the soil. There is a period of persistence in the soil during which the infective stages are protected and preserved [19]. Geohelminthes infections were most prevalent in tropical and sub-tropical regions of the developing world, where adequate water, good personal hygiene and sanitation are lacking [20]. Intestinal helminthes parasitic infections are closely related to personal, public health and environmental conditions, especially *Ascaris and Trichuris*. These geohementhes, by fecal contamination of soil, foodstuff and water supplies, are considered as a health concern in Iran and in developing country [21,22]. Humans contract ascariasis by ingestion of embryonated eggs through feacal contamination. Because the eggs are invariably sticky, they may be found adhering to utensils, furniture, money, fruit, vegetables, door handles and fingers in endemic areas [23].

Of the 44 million people in South Africa, approximately 10% live in urban informal settlements implying that South Africa houses an informal settlement population of 4.4 million people. However, in reality, this Figure is likely to be much higher. Informal settlements, or slums as they are commonly referred to, are not limited to South Africa and, in fact, have become prominent features of most urban areas in developing countries and are increasing in the proportion of the world's population they house. Due to living conditions, informal settlements support high levels of geohelminthes transmission [24]. Five percent of the metropolitan area in the Derban city was occupied by informal housing [25]. As reported by *Deribe, et al.* [26] *Ascaris* and Trichuris commonly occur both in urban environments, especially urban slums, and in rural areas. In some instances the prevalence of *Ascaris* infection is actually greater in urban environments [27].

There are different factors associated with increased transmission of geohelmenthes among school age children in different parts of the world. Indigenous fruits and vegetables are known to play major role in the nutritional livelihood of the Nigerian population, especially in the rural areas where there is poor socio-economic condition [28]. Ethiopia, hookworm is estimated to infect 11 million people, thus Ethiopia bears 5.6% of the hookworm burden in Sub Saharan Africa (SSA) and is the country with the third highest burden in SSA. The nation [29] The prevalence of hookworm is estimated at 16% [30]. The prevalence of hookworm among school age children in Ethiopia was reported to be 38% in Jimma. Ethiopia has the second highest burden of ascariasis in SSA: 26 million people are infected, which is 15% of the overall burden in SSA [29]. The prevalence among school age children was recorded at 28.9% in northern Ethiopia [31]. Similarly, Ethiopia has the 4th highest burden of Trichuriasis, with 21 million people infected, which is 13% of the disease burden in SSA [29]. The national prevalence is estimated at 30% [30].

Adequate warmth and moisture are key features for each of the soil-transmitted helminthes. *Ascaris* and *Trichuris* eggs are hardier than hookworm L3 and therefore survive drier climates better. However, even for *Ascaris* and *Trichuris*, the rates of infection are low in arid climates. At low humidity (atmospheric saturation less than 80%), human Ascaris ova do not embryonate; there appears to be no upper lethal limit on relative humidity [11]. For hookworm, moisture is especially critical. The infective third-stage larvae (L3) migrate along films of moisture. The presence of moisture will therefore allow L3 to travel vertically in the soil, particularly at night. Since the presence of vegetation tends to prevent evaporation and conserve soil moisture, this feature has been used as a useful proxy measure of soil moisture [18]. It has been suggested that total rainfall in an area and its seasonal distribution may also help explain observed patterns of infection: wetter areas are usually associated with increased transmission of all three major soil transmitted helminthes infections. A study of the prevalence of helminthes infections along the coastal plains of South Africa found transmission of *A. lumbricoides* to correlate with variables based on annual data, particularly rainfall and temperature [32].

Materials and Methods

Study Area

This study was conducted in Jimma town, the Capital of Jimma Zone, found in southwest Ethiopia, 350 km from the capital city Addis Ababa. Its astronomical location is 7º 4' North Latitude and 36º 5' East Longitude. The town has a total area of 46.23 km2 (4623 hectares) with an average temperature ranging from 7.3 ºC to 31 ºC (JCASP, 2006). So Jimma has a warm and humid climate with daily average temperature of 200C and mean annual rainfall varying between 620 and 1400 millimeters. Cross Sectional study was undertaken to assess prevalence of geohelmenthes infection and predisposing factors among treatments seeking patients at Jimma health centers. It is founded in 1837 by Abba Jifar and has a town administration, municipality and 17 Kebeles (Kebelle is the smallest administrative unit in Ethiopia). According to the censes statically agency (Urban population projection values of 2015), Jimma is the largest town in south-western Ethiopia and the 9th most populous town next to Dese with an estimated total population of 177,943. The same report further indicates that 137,760 (64,432 male and 73,328 females) of the town population is age ten years and above, and 42,363 of male are employed and 4,041 are employed while 32,841 of female are unemployed and 8,881 are unemployed. The town has different health facilities including three hospitals among which one is referral and one private (Awetu primary hospital), four health centers and forty two primary, medium and higher private clinics.

Study Design and Period

Cross Sectional study was undertaken to assess prevalence of geohelmenthes infection and predisposing factors among treatments seeking patients at Jimma health centers. The study was conducted at Jimma health centers from June-August, 2018. Structured questionnaire which comprises socio-demographic characteristic, availability of latrine, source of drinking water, personal hygiene, and presence of toilet, occupation, income and sanitation was used to record data. All the above necessary information was collected by short interviewing held with each patient according to questionnaire prepared. The stool samples were collected to test soil transmitted helminthes. The samples were examined microscopically both direct (wet mount) and formal ether concentration technique using 10x followed by 40x and the result were recorded on the format.

Population

Study Population

All patients who suspected for geohelminthes and attended for the treatment at Jimma town health centers during the study period were study populations.

Inclusion Criteria

All treatments seeking patients who have not taken anti helminthes drug for three month and who had the willingness to give stool and blood sample and respond to the interview.

Exclusion criteria

Patient who has taken anti helminthes drugs therapy three month before data collection and were who do not willing to respond the questionnaire and give stool and blood sample and pregnant women were excluded.

Variables of the Study

Dependent Variable

- Presence of Geohelminthes infection

Independent Variables

- Age
- Hand washing before meal and after defecation
- Trimming of finger nail
- Educational status
- Habit of eating uncooked or un washed vegetables& fruits
- Occupational status
- Presence of latrine
- Income
- Place of residence
- Source drinking water
- Shoe wearing habit

Data collection and Processing

Socio-demographic profile and predisposing factors were gathered among treatments seeking patient at Jimma health centers, south west Ethiopia by interviewing with each patients. The stool samples were collected using hard card or soft tissue paper using applicator stick to test soil transmitted helminthes for each patients The samples were examined microscopically both direct (wet mount) and formal ether concentration technique using 10x followed by 40x and the result were recorded on the format. The laboratory examination, for blood and stool sample weight and height measuring interviewing and all other processing done by medical laboratory technologist including me to ensure quality control examination of the stool specimens were done by two observers for the same prepared slide.

For direct smear 1gm of faeces collected with an applicator stick and emulsified with one drop of normal saline on a glass and would labeled appropriately. The preparation was covered with a clean cover slip, avoiding air bubbles. The slide was then mounted under stage of 10x and 40x objectives of the light microscope and examined for *A. lumbricoides T. trichiura* and *hookworm Ova* [33] and Formal concentration techniques was also done using a stick, emulsify about 1gm (pea size) of feces in about 4ml of 10% formal water. Then more 3-4ml formal water was added and mixed well by shaking and sieved into another tube made of glass, then 3-4ml of ether and mix for 1 min, loosen the stopper (there was pressure inside tube), centrifuge immediately at 1500 rpm for 2-5 min, Using a stick, loosen the layer of fecal debris from the side of the tube and discard the supernatant, the sediment remain. Allow the fluid from the side of the tube to drain to the bottom. Tap the bottom tube to re suspend and mix sediment, Transfer a small portion of the sediment to a slide and cover it, Examine the preparation first with 10X and then 40X objective to identify the *A. lumbricoides T. trichiura,* hookworm eggs [34].

BMI were determined using a weighing scale and height pole respectively and age was asked and Body mass index was determined as body weight (kg) / Height (m)^2 and then the result was categorized into, <18.5 under weight, 18.5-24.9 normal, 25-29.9 overweight. ni=nf ×Ni/N, where nf was sample size of the studies, Ni was annual health center plan and N was the sum of all annual health centers plan, annual plan of Ferenj arada bosa or kito kebele health center were 5000, annual plan of higher 2 Hermata mentina health center was 4576, annual plan of Bach Bore kebele health centers was 3200 and annual plan of mendera Koch kebele health center was 3360 according to the formula calculated from annual plan were 119 Ferenj arada ,109 higher 2 Hermata mentina kebele health center, 76 Bach Bore kebele health centers and 80 Mendera Koch health center sample taken each health center respectively.

Measurement of Height and Body Weight

Body weight and height were determined using a weighing scale and height pole respectively and age was asked. Body mass index was determined as body weight (kg) / Height (m)^2 and then the result was categorized into, <18.5 under weight, 18.5-24.9 normal, 25-29.9 overweight.

Determination of Hemoglobin Levels

Blood collection was done by finger prick using disposable lancet, and a sample of blood (about 100µl) was collected and used to measures venous Hemoglobin (Hb), in a HemoCue photometer (HemoCue, Angelholm, Sweden) [35]. The tip of middle finger or ring finger was cleaned with alcohol pads and then pricked with a blood lancet, and then two drops of blood were wiped away with dry cotton. The next drop of blood was used to fill the microcuvette by touching the micro-cuvette tip into the middle of the drop of blood until completely filled by avoiding air bubble. The filled micro-cuvette were then put on the holder and pushed into the HemoCue photometer. After approximately 30 seconds Hb value displayed in g/dl were recorded. Children found to had Hb level below <11g/dl were considered anaemic, with Hb concentrations of <7g/dl, 7.0 - 9.9g/dl, 10.0 - 10.9g/dl and ≥11g/dl indicating severe anaemia, moderate, mild and normal respectively [36]. Female found to had Hb <8g/dl, 8-10.9g/dl,11-10.9g/dl, and >12 considered as severe, moderate, mild aneamia and normal respectively. Men found to have Hb <8, 8-10.9, 11-12.9 >13 considered as severe, moderate mild aneamia and normal [37].

Data Analysis

The data collected through questionnaire were encoded processed and the primary data were entered by the principal investigator using, processed in the form of frequency distribution Table and percentage to summarize. SPSS statistical software was used to analysis data. Association between variables was analyzed using uni-variation and multi-variation logistic regression and p-values. The result was presented with odd ratio. P-value < or =0.05 take as the acceptable level significance.

Ethical Consideration

Jimma University College of natural science ethical committee gave the official clearance and the permission was assured from responsible authority of the Jimma town health centers. This permission was achieved by explaining the significance of the study and convincing the with Jimma town health centers directors. The result was kept confidential and the patients those positive for geohelminthes were advised to take ant-helminthes in collaboration with Jimma town health centers.

Results

Association between Socio-Demographic Characteristics and Prevalence of Geo-Helmnthic Infections

Regarding the educational status of the participants 61(26.7%) out of 228 illiterate and 23(15. %) from 127 elementary school were affected by geohelmenthes. With respect to occupational status 27(27.3%) Out of these 99, house wives while 33(20.75%) out of 159 students, 3(4.5%) out of 66 gov't employees, 18(35.3%) out of 51 farmers and 3(33%) out of 9 merchants were positive for geohelmenthes. In addition, from the total of 384 participant's 335treatments seeking patient's monthly income was <1000 Ethiopian birr and 49 patients were with monthly of 1001-2000 Ethiopian birr. Among these, 81(24.2%) and 3(6.5%) were positive for geohelmenthes respectively. In this study those with monthly income greater or equal to 2001-3000 Ethiopian birr were negative for geohelmenths infection. Gender was examined as a possible variable associated with geohelmenthes. 37(31.1%) out of 119 males and 47 (17.7%) females 265 females were positive for geohelmenthes infection. With respect to residence, 266 patients were urban and 118 were rural dwellers, out of these 16(13.6%) from rural and 68(25.6 %) from urban areas were infected with geohelmenthes (Table 1).

Variable	Variable values	Geohelmenthes		Total
		Positive (%)	Negative (%)	
Education Level	Illiterate	61(26.7)	167(74.3%)	228(100%)
	Elementary S.c.	23(15.3%)	127(84.7%)	150(100 %)
	High School	-----	6(100%)	6 (100%)
Occupation	House Wife	27(27.3%)	72(72.7%)	99(100%)
	Students	33(20.75%)	126(79.24%)	159(100%)
	Employees	3(4.5 %)	63(95.5%)	66(100%)
	Farmer	18(35.3%)	33(64.7%)	51(100%)
	Merchants	3(33.3%)	6(66.7%)	9(100%)
Salary	< 1000	81(24.2%)	254(75.8%)	335(100%)
	1001-2000	3(6%)	46(94%)	49(100%)
	2001-3000	--	--	--
Age	>10	44(31.4%)	96(68.6%)	140(100 %)
	11-15	25(22.7%)	85(77.3%)	110(100%)
	16-20	4(17.4%)	19(82.6%)	23(100%)
	21-25	7(13.7%)	44(86.3%)	51(100%)
	>26	4(8.33%)	56(91.67%)	60(100%)
Sex	Male	37(31.1%)	82(69.9%)	119(100%)
	Female	47(17.7%)	218(82.3%)	265(100%)
Place of Residence	Urban	68(25.6%)	198(74.4%)	266(100%)
	Rural	16(13.6%)	102(87.3%)	118(100%)

Table 1: Socio-demographic and socio-economic characteristics among outpatients seeking medication at Jimma health centers, 2018

Association between Risk Factors and Prevalence of Geohelmnthic Infections

Among the 384 medication seeking patients 181 use tap water while 163, 32, and 8 uses spring, well and river water respectively. From the patients that use tap water for drinking, 32(17.7%) were positive for geohelmenthes while 46(28%), 2(6%) and 4(50%) that use spring, well and river were positive for geohelmethes. Regarding waste disposing, 140 treatment seeking patients dispose on field, while 157, 87 use well and burn. Among those patients dispose the waste on field, 39 (28%) were positive for geohelmenthes while 38(24.2) dispose in well and 7(8%) burn were positive for geohelmenthes infection. About 48(49%) out of 98 patients those did not use shoes, and 36(12.6%) patients out of 286 treatments seeking patients those uses shoes were positive for geohelmenthes infection. 26 (10.2%) out of 251 patients who wash their hands before meal and after latrine while 58(43.6%) out of one hundred thirty three who do not wash their hands before meal and after latrine. were positive for geohelmenthes. 51(28.8%) out of one hundred seventy seven patients had no latrine at their home and 33(16%) out of 207 patients had latrine were positive for geohelmenthes.

70(38.25%) out of one hundred eighty three patients had no habit of trimming their finger nail and 14(7%) patients out of 201 had the habit of trimming finger nail were infected by geohelmenthes. From 201 patients who trim their finger nail, 145 trim their finger nail regularly and 56 patients trim their finger nail irregularly. Out of these 6(4.13%) who trim finger nail regularly and 8(14.3%) who trim their finger nail irregularly were positive for geohelmenthes respectively. Visually observing the finger nails had shown that 201 had no dirty material in their fingernails at the time of visiting the health centers and 183 of the patients had dirty material in their finger nails. Among these 14(6.5%) without dirty material in their finger nail and 70(38.2%) dirt material in their finger nail were positive for geohelminthes respectively. From 111 patients eat unwashed or uncooked vegetables and fruit and 273 patients use washed or cooked vegetation or fruit. Among these, 69(62.2%) patients that use unwashed or uncooked vegetation and fruit and 14(5.13%) patients that uses washed or cooked vegetables or fruit were positive for geohelmenthes (Table 2).

Variable values	Variable values	Geohelmenthes		Total
		Positive (%)	Negative (%)	
Water source	Pipe	32(17.7%)	149(82.3%)	181(100%)
	Spring	46(28%)	117(72%)	163(100%)
	Well	2(6%)	30(94%)	32(100%)
	River	4(50%)	4(50%)	8(100%)
West disposing pit	On field	39(28%)	101(72%)	140(100%)
	Well	38(24.2%)	119(75.8%)	157(100)
	Burn	7(8%)	80(92)	87 (100%)
Shoe wearing habit	No	48(49%)	50(51%)	
		36(12.6%)	250(87.4%)	98(100%)
	Yes			286(100%)
Habit of hand washing before meal and after latrine	No	58(43.6%)	75(66.4%)	133(100%)
	Yes	26(10.4%)	225(89.6%)	251(100%)
Wash hand before meal after latrine	Same times	20(18.2%)	90(81.8%)	133(100%)
	Always	6(5%)	112(97.4%)	251(100%)
Latrine status at home	No	51(28.8%)	126(71.2%)	177(100%)
	Yes	33(16%)	174(84%)	207(100%)
Trim finger nails	No	70(38.25%)	113(61.75%)	183(100%)
	Yes	14(7%)	187(93.5%)	201(100%)
Frequency of trimming finger nails	Some times	8(14.3%)	48(85.7%)	56(100%)
	Always	6(4.13%)	139(96.55%)	145(100%)
Dirty material in the finger nail	No	14 (7.5%)	187 (92.5%)	201(100%)
	Yes	70 (38%)	113 (62%)	183(100%)
Eat unwashed uncooked vegetable or fruit	No	15(5.5%)	258(94.5%)	273(100%)
	Yes	69(25.3%)	42(74.7%)	111(100%)
House hold Family Size	3	2(18.2%)	9(81.8%)	11(100%)
	4	3(5.2%)	55(94.8%)	58(100%)
	5	15(14.8%)	86(85.2%)	101(100%)
	6	29(23.2%)	96(67.8%)	125(100%)
	>7	35(39%)	55(62.8%)	89(100%)

Table 2: Risk factors identified among treatments seeking patients at Jimma health centers, 2017

Prevalence of Geohelmenthes Infection among Medication Seeking Patients

Accordingly, some variable were remained independent predictors for prevalence of geohelmenth infection after controlling other factors. From these, sex, age, occupational status, monthly income, and residential area were statistically significant variables, but the education level house hold latrine status and source water for drinking of variables were not significant (Table 3). This study shows that males' respondents had 2.702 times higher prevalence of geohelmenthes infection than females (AOR=2.702; 95% CI: 1.473, 4.958). Similarly patients age greater than 26 had11.5% less prevalence of geohelmenthes infestation as compared to age of patents less than 10 years old (AOR=0.115; 95% CI:0.035,0.380). Regarding to occupational status government employees had 7.4% less prevalence of Geohelminthes infections as compared to house wife (AOR=0.074, 95%CI: 0.019, 0.284).On the other hand monthly income of respondents earn between 1001- 2000 had 24.6% less prevalence of geohelmenthes infection as compared to those respondents their monthly income less than 1000 (AOR=0.246, 95%CI:.068, .890). Regarding to respondents residential area, patients living in urban area had 2.290 times higher prevalence of geohelmenthes infection as compared to patients living in rural area (AOR: 2.290; 95%CI: 1.142, 4.588) (Table 3).

Variable values	Categories	Geohelmenthes		COR	95%CI	P-Value	AOR	95%CI	P-Value
		Yes	No						
Sex of the respondent	Female	47(17.8)	218(82.2%)						
	Male	37(30.1%)	82(69%)	2.036	(1.232,3.367)	.006	2.702	(1.473, 4.958)	.001*
Age of the respondents	<10	44(31.4%)	96(68.6%)						
	11-15	25(22.7%)	85(86.3%)	.616,	(.346, 1.097)	.100	.609	(.315, 1.180)	.142
	16-20	4(17.4%)	19(82.6%)	.459	(.148, 1.430)	.179	.380	(.106, 1.370)	.139
	21-25	7(13.7%)	44(86.3%)	.347	(.145, .8320	.018	.294	(.103, .840)	.022*
	>26	4(8.3%)	56(91.7%)	.156	(.053, .457)	.001	.115	(.035,.380)	.000*
Educational Level of the respondents	Illiterate	61(26.7)	167(74.3%)						
	Elementary	23(15.3%)	127(84.7)	.474	(.277, 0.813)	.007	52.52	.000	.999
	high school	---	6(100)	.000	.000	.999	6.422	.000	.999
Occupation Status of the respondents	House Wife	27(27.3%	72(72.7%)						
	Student	33(21%)	126(79%)	.725	(.402, 1.308)	.286	.372	(.178, .778)	.009
	Gov't employ	3(4.5 %)	63(95.5%)	.132	(.038, .457)	.001	.074	(.019, .284)	.000*
	Farmer	18(35.3%)	33(64.7%)	1.510	(.729, 3.130)	.267	.986	(.419, 2.317)	.974
	Merchant	3(33.3%)	6(33.3%)	1.385	(.323, 5.942)	.661	.939	(.185, 4.779)	.940
Monthly income the respondents	<1000	81(24.2%)	254(75.8%)						
	1001-2000	3(6%)	46(94%)	.207	(.063,.684)	.010	.246	(.068, .890)	.032*
Family size	≤3	26(15%)	146(85%)						
	>3	58(27.4%)	15(82.6%)	2.078	(1.240, 3.482)	.005	1.568	(.856, 2.872)	.145
Residential Area	Rural	16(28%)	102(72%)						
	Urban	68(25.6%)	198(74.4%)	2.335	(1.271, 4.289)	.006	2.290	(1.142, 4.588)	.020*

*indicates statistically significant (P-value < 0.05 or 95%CI doesn't include 1)

Table 3: Association between Socio-demographic characteristics and prevalence of geo-helmnthic infections among outpatients seeking medication at Jimma Health centers, 2018

Predisposing Factors for Geohelminthes Infections among Patients

Associations between independent and dependent variables were analyzed first using bivariate binary logistic regression. Then variables that had p<0.25 on bivariate binary logistic regression were considered to be candidates for multivariable binary. To identify the contributing factor for Geohelmenthes infection among patients treated at Jimma Health Centers a multivariate logistic regression model was fitted and P-value < 0.05 were considered as a contributing factor for Geohelmenthes infection among patients. Accordingly some variable were remained independent predictors for contributing factors after controlling other factors. From these, washing habits before meal and after latrine, dirty materials in fingernails, habit of using unwashed or un cooked vegetable or fruit, and Anemia were statistically significant variables, but the source of water variables were not significant (p-value 0.181) from (Table 4). This study shows that respondents washing habits before meal and after latrine had 3% less contribute for geohelmenthes infection as compared to never washing habits before meal and after latrine (AOR=0.03, 95%CI:000, .280).

Respondents who had dirty materials in fingernails were 63.256 times highly contribute for geohelmenthes infection as compared to never having dirty materials in fingernails (AOR=63.25,95%CI: 6.155, 50.076). Regarding to habit of eating unwashed of uncooked vegetable or fruit, respondents eating vegetable had 79.169 times highly contribute for geohelmenthes infections as compared to eating washed vegetable or fruit (AOR=79.169, 95%CI: 7.57, 97.74). Regarding to wearing habits, those do not wear shoe patients when compared to those patients wear shoes 1.620 times highly contribute for geohelminthes infections as compared to those who were not wearing shoes(AOR=1.620, 95%CI: 1.147, 17.881). On the other hand respondents uses waste disposing place on well had 0.964 times less contribute for geohelmenthes infections as compared to waste disposing place on field (AOR=0.964, 95% CI: 2.417, 59.123).BMI of respondents how were found underweight had 22.216time highly contribute for geohelmenthes infections as compared to respondents who were found normal weight (AOR=22.216, 95%CI: (0.463, 569.55) Patients their anima status had 21.70 times highly contribute for geohelmenthes infections as compared to normal (AOR=, 21.70%CI: (2.086, 225.81) (Table 4).

	Categories	Geohelmenthes		COR	95%CI	P-Value	AOR	95%CI	P-Value
		Yes	No						
Water drinking sources	Pipe	32(17.7%)	149(82.3)						
	Spring	46(28%)	117(72%)	1.89	(1.128, 3.165)	0.016	0.028	(.000, 5.316)	0.181
	Well	2(6%)	30(94%)	0.32	(.073, 1.411)	0.132	0	0	0.999
	River	4(100%)	4(100%)	4.806	(1.140, 20.264)	0.032	40.58	0	0.999
Household latrine status at home	No	51(28.8%)	126(71.2%)						
	Yes	33(16%)	174(84%)	0.478	(.291,.785)	0.004	0.212	(.010, 4.381)	0.316
Washing habits before meal and after latrine	No	58(43.6%)	75(66.4%)						
	Yes	26(10.4%)	225(89.6%)	0.144	(.084, .246)	0	0.03	(.000, .280)	.012*
Trimming finger nail status	No	70(38.%)	113(62%)						
	Yes	14(7.5%)	187(92.5%)	0.112	(.059, .212)	0	0.067	(.004, 1.019)	.052*
Dirty materials in fingernails	No	14(7.5%)	187(92.5%)						
	Yes	70(38%)	113(62%)	8.911	(4.716, 16.837)	0	63.25	(6.155, 50.076)	.000*
Wearing habits of shoeless	No	48(49%)	50(51%)						
	Yes	36(12.6%)	250(87.4%)	0.153	(.090, .260)	0	1.62	(1.147, 17.881)	.016*
Disposing place	On field	39(28%)	101(72. %)						
	Well	38(24.2%)	119(75.8%)	0.805	(.478,1.357)	0.416	0.964	(2.417, 59.123)	.025*
	Burn	7(8%)	80(92%)	0.227	(.096,.534)	0.001	0.568	(.030, 10.598)	0.705
Eat unwashed or uncooked Vegetable or fruit	No	15(5.5%)	258(94.5%)						
	Yes	69(25.3%)	42(74.7%)	30.27	(15.638, 58.61)	0	79.16	(7.57, 97.74)	.003*
BMI	Normal	24	261						
	under weight	59	39	0.061	(0.052, 8.669)	0	22.22	(1.463, 569.55)	.072*
Anemia	Normal	24	254						
	Anemia	59	46	13.57	(4.119,15.99)	0	21.7	(2.086, 225.81)	0.01*

*indicates statistically significant (P-value < 0.05 or 95%CI doesn't include 1)

Table 4: Association between risk factors and prevalence of geohelmnthic infections among outpatients seeking medication at Jimma Health centers, 2018

Prevalence and Intensity of Geohelmenthes

The overall prevalence of geohelminthes infection in four health centers sampled found to be 21.8%. Among 384 patients who brought stool sample 84 were positive for geohelmenthes infection. Specifically *A. lumbricoides* 55(14.3), *T.trichuriasis* 16(4.2%) *Hookworm* 10(2.6%) and *Strongloides* 3(0.8%), Intensity of *A. lumbricoides T.trichiuria, Hookworm* and *Strongloidis* egg per gram of stool were between , which was light intensity (Table 5).

Helminthes infection	*A. lumbricoides*	*T. trichuria*	*Hookworm*	*Strongloides*	Total
Infected	55	16	10	3	84
EPG	1320	384	240	72	-
Prevalence	14.30%	4.20%	2.60%	0.80%	21.70%
Intensity	Light	Light	Light	--	-
Intensity threshold	1-4999epg	1-1999epg	1-9999epg	----	--

Table 5: Prevalence and Intensity of geohelminthes among patients seeking medical at Jimma health centers, 2018

Anemia versus Geohelmenthes Infection among Seeking Medication at Jimma Health Patients Centers, 2018

84 patients were positive for geohelmenthes, among these 60 patients were anemic. Out of these 49 and 11 patients were with mild and moderate anemia respectively. With regard to age, among patients majority of anemia were >10 years old, 29(69%), 4(9.6%) were with mild and moderate anemia While patients of the age 11-15, 16-20, were 11(61%), 6(54.5%), mild anemia and 4(22.2%), 3(27.3%) moderate anemia. The difference between prevalence of geohelmenthes and anemia was statically significant (p=0.01*) (Table 6).

Variable	Normal	Anemia			p-value
Age	Non-anemia	Mild	Moderate	Total	
<10	9(21.4%)	29(69%)	4(9.6%)	42(100%)	0.01*
11-15	3(16.7%)	11(61%)	4(22.2%)	18(100%)	
16-20	2(18.2%)	6(54.5%)	3(27.3%)	11(100%)	
21-25	5(71.4%)	2(28.6%)	--	7(100%)	
>26	5(100%)	1(16.7%)	--	6(100%)	

Table 6: Anemia versus geohelmenthes infection

The Relationship between Geohelmenthes Infection and Body Mass Index

From the total of 384 patients, 84 patients were positive for geohelmenthes. Among these 60 patients were underweight. Among major patients anemia from age >10 years, 33(78.6%) were underweight while those patients of age 11-15, 16-20 and 21-25 years old, 15(83.3%), 9(81.8%) and 2(28.6%) and >26 1(16.7%) were underweight respectively (Table 7).

Body mass index among infected patients				
Age	**Normal**	**underweight**	**Total**	**p-value**
<10	9(21.4%)	33(78.6%)	42(100%)	0.02*
15-Nov	3(16.7%)	15(83.3%)	18(100%)	
16-20	2(18.2%)	9(81.8%)	11(100%)	
21-25	5(71.4%)	2(28.6%)	7(100%)	
>26	5(100%)	1(16.7%)	6(100%)	
Total	24(29%)	60(71.4%)	84(100%)	

Table 7: The relationship between geohelmenthes infection and body mass index among treatments seeking patients in Jimma health centers, 2017

Discussion

In the presents study the overall prevalence of geohelmithes infection was found to be 21.8% this results was somewhat similar with prevalence 23.3% recorded from a study conducted at Butajira primary school age children [38]. The prevalence of geohelmenthes infection in this study somewhat lower than that of 24.5% of infection in primary school and 28.5% in Secondary schools but higher than 13.6% infection in Nursery schools of Cameroon. The global atlas of soil transmitted infection project collected results from 127 surveys of Soil transmitted helminthes implemented in India between 1999 and 2007 and computed a national estimate to about 21% prevalence, which agreements to the result of the presents study. This might be due to sanitation personal hygiene and unsafe environmental sanitation. Among the geohelmenths, 14.3% was *Ascars lumbricoides*, 4.16% *T. trichiuras*, 2.6% *Hook worm* and *strongloides* 0.8%. *A. lumbricoides* was the most prevalent species of geohelminthes while, *hookworms* and *strongloides* had the lowest prevalence this agree with global data [39].

The prevalence of *A. lumbricoides* was relatively higher in the present study and this may be attributable to high environmental contamination resulting from the large number of infected people [40]. Because the eggs are in variably sticky, they may be found adhering to tools, furniture, money, fruit, vegetables, door handles and fingers in endemic areas [23]. In addition the durability of *Ascaris* eggs under varying environmental conditions, the high fecundity as well as the sticky nature of the shell of *Ascaris* egg, which aids its attachment on human hands, fruits and vegetables [41,42]. *T. trichiura* was the second most frequently encountered parasite in this study with a prevalence rate of 4.2 %. This prevalence was less than the prevalence obtained in, South Gondar Zone 9.5%, [31]. This might be due to less febrile soil for the growth of T.richiura in Jimma town.

The current study has shown high prevalence of geohelmenthes among different age group this study shows age >26 years old at risk was about 8.33% while the age patients <10 years old 31.4%. So age of patient's greater than 26 had 11.5% less vulnerable geohelmenthes infestation as compared to age of patents less than 10 years old. Similarly the prevalence of 40.5% and 40.7% among preschool age children and school age children, respectively, was reported in Kenya [43]. However, the prevalence of helminthes infestation in the current study was relatively higher than other studies conducted in children in the Ashanti region (11.1%) of Ghana [44].This might be due to children plays on the soil or on the ground and the study based on the all age group makes the result difference. Regarding to unwashed or uncooked vegetable or fruit eating habits, respondents eat unwashed or uncooked vegetable or fruit had 79.16 times highly vulnerable for geohelmenthes infections as compared to those do not uses unwashed or uncooked vegetable or fruit. The other study shown in Lumame town had intestinal helminthes among children who eat unwashed or undercooked vegetables in the stool of the children were about six times higher than those who eat washed or cooked vegetables or fruit [3].

This might be due to the unwashed or undercooked vegetables and fruits may create a favorable media to eggs of these helminthes to infect children. In regarding to washing habits before meal and after latrine had 3% contribute for geohelmenthes infection as compared to do not washing habits before meal and after latrine. That was also in line with the study by *Umar, et al.* [45] stated that the children which not washing their hand before eating and after latrine could leads to infecting by geohelminthes. To prevent new infection or re-infection, it was needed to improve personal hygiene practice and environment sanitation. Respondents who had dirty materials in fingernails were 63.256 times highly vulnerable to geohelmenthes infection as compared to do those not having dirty materials in fingernails. This might be due to untrimmed finger nail that could carry many dust particles plus germ and other micro-organism, so it was media for transmitting the geohelmenthes. Regarding to occupational status government employees had 7.4% less prevalence of Geohelminthes infections as compared to house wife. This might be due to government employees keeps their personal hygiene compared to house wife.

On the other hand monthly income of respondents earn between 1001-2000 had 24.6% less prevalence of geohelmenthes infection as compared to those respondents their monthly income less than 1000. This might be due to life style and living environments of the low socioeconomic status of the community may promote the geohelmenthes infection. Regarding to respondents residential area, patients living in urban area had 2.290 times higher prevalence of geohelmenthes infection as compared to patients living in rural area. This might be due to crowded area of living style and very high density population in urban area than the rural and living in crowded area facilitate transmission and problem of properly using waste container contributes the dispersal of geohelminthes.

As the current study shown, 177 patients had no latrine at their home and 207 had latrine.at their home Among these 51(28.8%) who had no latrine at their home and 33(16%) patients who had latrine at their home were positive for geohelmenthes infection respectively. So patients that had no latrine at their home were 1.76 times greater than those had latrine at their home. This showed that latrine ownership was still low, based on this condition maybe the respondents which had no latrine would perform defecation at field. Several studies showed that no latrine at their home can increased geohelmenthes infection incidence [46]. Regarding to wearing shoe, when compared to those does not use shoes 1.620 times highly vulnerable for geohelmenthes infections as compared to those who use shoes. This result was in line with the study by [47] stated that the children which not wearing a slipper regularly when they go out from their houses would had a tendency to be infected by hookworm because of hookworm transmission was by inserting to a skin when the children take a walk by bare foot.

This study shows that males' respondents had 2.702 times highly vulnerable geohelmenthes infection than females. As the study shown in India out of the 510 (252 males and 258 females) subjects examined 86.had helminthes infections .The males were more infected than the females (18.3% versus 15.5%) [48] so the study agreement with this study. As study shown in Bahr Dar boys were more infected (27%) than girls (24.2%) [49]. Study conducted in Nigeria showed overall prevalence of helminthes, from 300 participants (149 males & 151 females). A total of 134 males and 126 females were positive as parasites [50].Thus the result agreements with this study. According to the sex, the results show that boys are most infected than girls though none differences statistically significant was observed. These results corroborate those of [51] in Nigeria who think that, traditional education in Africa gives to boys and girls different activities permitting to the girls to be more responsible than boys who are free and play everywhere carrying parasites.

In this study might be due to the female had high relationship with health centers because of antenatal care follow up at this time they examine stool sample and if they were positive for geohelminthes they recommended to take anti-helminthes drug and they might keep their personal hygiene. Previous study had reported that there was no statistical significant difference between the prevalence of intestinal infestation across gender [52]. Both genders could be equally exposed to factors such as poor hand washing and presence of toilet facilities at home among other factors associated with helminths infestation.

With regard to infection intensity, intensity of *A. lumbricoides, T.trichiuria, Hookworm* and *Strongloidis* were 1320, 360, 240 And 72 eggs per gram of stool respectively, which was light intensity. This is agreeing with a report from Adwa in which all *Ascaris* infected patients were light infections. It could be explained by the fact that patients of Jimma and Adwa have less exposure to the parasite that can contribute to harboring less worm burden of *A. lumbricoides* [31]. Which is in disagreeing with the finding in Wondo Genet 7343 eggs per gram of stool [53]. Whereas, eggs per gram stool of *T.trichiuria*, *Hookworm* and *Strongloides* similarity was with Adama as well as Wondo Genet. This indicated that, all of the patients were with light infection by soil transmitted helminthes. But none of the patients were infected by heavy infection of *Ascaris, Trichuriasis* and *hookworms.*

However this study has observed with high prevalence of anemia which were 48(57.14%) patients with mild and 11(13.1%) moderate anemia, As study conducted in Paucartambo, Peru the prevalence of anemia (48.8%) when compared with age (3-4 versus 5-12 years old. [54], So study done in peru agree with this study. The overall prevalence of anemia (Hb < 11.0 g/dl) was 3.1%, Out of these 9(50%) had mild anemia (Hb 10 -10.9 g/dl) and another 9 had moderate anemia (Hb 7-9.9g/dl). None of the school children had severe anemia (Hb < 7 g/dl) as study conducted in Kilimanjaro Region in Tanzania [55] and less prevalence of anemia with this study when compared with mild anemia but some what they had similarity with moderate anemia so this might be due to the chronic helminthes, low socioeconomic status of the patients .As study shown in BMI of respondents how were found underweight had 2.141time highly contribute for geohelmenthes infections as compared to respondents who were found normal weight Patients. Study done in Sri Lanka Prevalence of under nutrition among children was 61.7%, 45% were under weight. However, no significant association was found between *Ascaris* infections status and under nutrition. The study was agreeing with this study but in case of this study the difference in geohelmenthes and malnutrition was statically significant. This might due to low socioeconomic status like low monthly income of the patients [56-74].

Conclusion and Recommendation

Conclusion

In this finding overall prevalence of geohelminthes infection recorded were 21.8%, among the geohelmenthes, 55(14.3%) *Ascars lumbricoidis*, 16(4.1.6%) *T. trichiuris*, 10(2.6%) *Hook worm* and *strongloides* 3(0.8%). This study has shown high prevalence of A. lumbricoid between geohelminthes infection among patients. Dirty materials in fingernails habit of eating unwashed and uncooked vegetable or fruit, occupational, monthly income were highly at risk for geohelmenthes infection in this study. This might be due to government employees keeps their personal hygiene compared to house wife. On the other hand monthly income of respondents earn between 1001- 2000 had 24.6% less prevalence of geohelmenthes infection as compared to those respondents their monthly income less than 1000.Both habit of eating unwashed or uncooked vegetable or fruit and dirty material in the finger nail were highly contributing for geohelmenthes infection. In addition, poor hand washing practice before meal and after latrine, eating uncooked or unwashed vegetables and fruit, Trim finger nails, Place of residence, Gender, dirty material in the finger nail and shoe wearing habit, age group of the patients were statically significant.

Recommendation

Based on the above finding the following recommendation forwarded

a. Health education using Jimma University students during CBTP, TTP, DTTP and FM 102.0 Medias very important to reduce the prevalence of geohelmenthes in Jimma town.
b. Provided that awareness on health information on the benefit of washing hands after defecation and on proper use of latrine should be taken into account to reduce the problem.
c. Health educations on shoe wearing practice and improvements in sanitary infrastructure could achieve long-term and sustainable reductions in helminthes.
d. Advice patients to trim their finger nail weekly which was effective reduced geohelminthes infection.
e. Parents who bring their children to the hospital must be educated on intestinal parasite infections.
f Set up of toilet facilities, clean drinking water, orientation on personal hygiene and improved hygienic habit would increase control measures.

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