PREVALENCE OF SOIL TRANSMITTED HELMINTHES INFECTIONS AND ITS DETERMINANTS AMONG PRIMARY SCHOOL CHILDREN IN GENA BOSSA WOREDA, ETHIOPIA: CROSS SECTIONAL STUDY

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ABSTRACT

BACKGROUND: Soil-Transmitted Helminthes (STH) infection is a major public health problem among school-aged children in developing countries. In Ethiopia, school aged children have been identified as high risk group of population to be infected with Soil Transmitted Helminthes. Effective prevention and control of STH infection requires identification of risk factors among high risk groups. Therefore, the aim of this study was to assess the prevalence and determinants of Soil Transmitted Helminthes infection among primary school children in Gena Bossa Woreda, Ethiopia.

METHODS: Cross-sectional study was conducted in Gena Bossa Woreda, Ethiopia. The data was collected using pre-tested and structured questionnaires. Simple random sampling technique was used. Data analysis was done by SPSS for Windows Version 20.0. Bivariate and Multivariate logistic regressions analyses were conducted. P-value <0.05 was used to declare statistically significant variables.

RESULT: About 303(97.7%) of the study subjects were participated in the study. Above one-third (38.3%) of the study participants were tested positive for at least one of the STH species. Lumbricoides (42.1%) was the predominant parasite followed by Hookworms (37.4%) and T. Trichiura (11.2%). Lack of private latrines (AOR= 4.12, 95% CI: 1.64, 3.37), not wearing shoes always (AOR=1.80, 95% CI: 1.01, 3.23), age of children (5 to 10 years) (AOR=2.43, 95%CI: 1.42, 4.16) and not knowing causative agents of STH infection (AOR=2.60, 95% CI: 1.37, 4.93) were found to be determinants of Soil Transmitted Helminthes Infections.

CONCLUSION: Lack of private latrines, not wearing shoes always, age of children (5 to 10 years) and not knowing causative agents of STH infections were found to be major determinants of STH Infections. Therefore; public health policy makers and stakeholders working in the area should focus their intervention against STH infections on integrated control programs including regular health education on children's shoes wearing habits, raising awareness of school children and their families on STH infections and promoting private latrines in every household.

KEYWORDS: Determinants**,** Soil-Transmitted Helminthes, Gena Bossa Woreda, Ethiopia

ABBREVIATIONS: ***AOR***- *Adjusted Odds Ratio,* ***SNNPR***- *Southern Nations Nationalities and Peoples' Region,* ***SPSS*** *– Statistical Package for Social Sciences,* ***STH***- *Soil Transmitted Helminthes.*

BACKGROUND

Soil-Transmitted Helminthes (STH) refers to a group of parasites that live in the soil in warm and humid climates and are transmitted to humans by faecally contaminated soil. Major STHs to humans are Ascaris lumbricoides (Roundworm), Trichuris Trichiura (Whipworm), and Hookworm (Necator americanus and Ancylostoma duodenale) (1, 2).

Globally, 2 billion people are infected with soil-transmitted helminthes. STH infections are most prevalent in tropical and sub-tropical regions of the developing world where adequate water and sanitation are lacking (1, 3). In Sub-Saharan Africa, STHs infects over 90 million school children (2, 4).

Children are important high risk group for soil transmitted helminthes. They are largely affected with STH infection which negatively affects their physical growth, intellectual development and resistance to other diseases that are contributing significantly to school absenteeism. Furthermore, a large proportion of school children are likely not to be aware of the need for good personal and environmental hygiene and are continuously being exposed to contaminated soil and water (2, 5, 6).

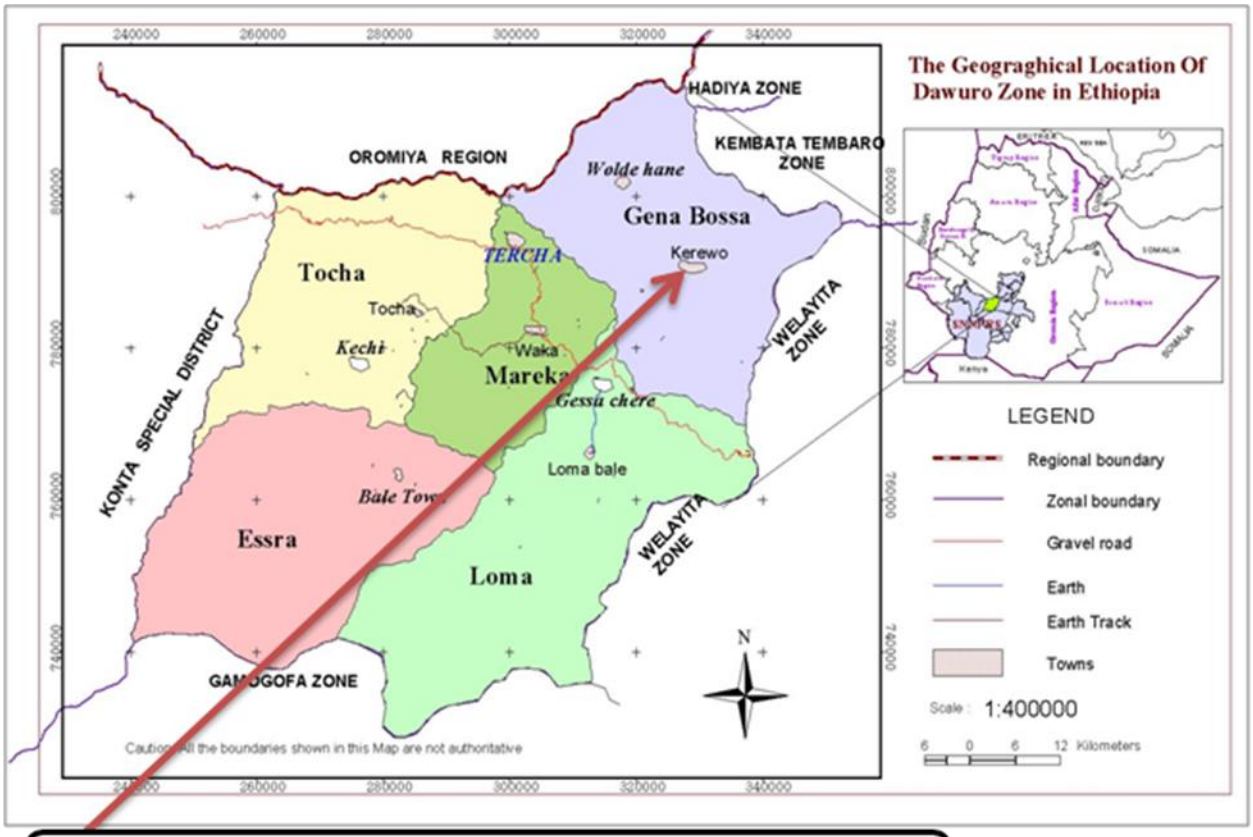
A national school health and nutrition survey done in 2005-2006 revealed that overall national prevalence of any soil transmitted helminthes infection was 29.8% with variable degree of prevalence among regions. Accordingly, SNNPR and Gambella Region contributed the highest prevalence of STH infections i.e. 51% each. Infection of Ascaris lumbricoides was the most prevalent (23.2%), followed by Hookworms (9.1%) and Trichuris Trichiura (7.4%) (7).

There was no prior research conducted in the study area on STH infections. Due to lack of data about STH infection in the study area there has not been deworming program in Gena Bossa Woreda. Therefore, it is important to assess the prevalence and determinants of STH infection in Gena Bossa Woreda, Ethiopia.

Methods and Materials

Study area and period: The study was conducted in Gena Bossa Woreda from Aug 05/2018 to Aug 28/2018. Gena Bossa Woreda is found in Dawuro Zone, Ethiopia & it is located 578 KM Southwest of Addis Ababa. It has one functional health center and two health posts. There are four governmental primary schools with total of 3262 school children and 49 teaching sections

within a four compound. The total estimated number of population was 17,891 (Projected from 2015 National Census).



Figurel: Location of Karawo town in Gena Bosa woreda, Dawro Zone

Source:DZWUD 2007

Study design: Cross sectional study was conducted.

Inclusion and Exclusion criteria

Inclusion criteria: Primary school children from age 5 to14 years old were included in the study.

Exclusion criteria: Children who were clinically ill and treated with anti-helminthes drugs within the last 2 weeks before the study were excluded from the study.

Sample size determination

The sample size was calculated using single population proportion formula. The prevalence of STH Infections 27.9% among primary school children of Libo-Kemkem District, Northwest Ethiopia (8), 5% margin of error, 95% confidence level were considered. For the source

population was < 10,000, the population Correction formula was applied. Finally, 10% non-response rate was considered. Hence, the total sample size was calculated to be 310.

Data quality control

Questionnaires were prepared in English and translated into the local language (*Dawurot'uwa*) & vice versa. Pre-test was conducted on 5% of the sample. Data collectors were given short training on data collection methods. Close supervision was conducted throughout the data collection. Data entry and analysis was conducted carefully.

Data collection tools and procedures

Data was collected using structured questionnaires. Three BSc degree holder public health professionals and three nurses were participated in the data collection. Two supervisors participated in the data collection. Short orientation was given to the data collectors and supervisors.

Data processing and analysis

Data were analyzed by SPSS windows version 20. Frequencies and percentages of different variables were computed to summarize the data. Bivariate logistic regression model was fitted as a primary method of analysis. Finally, P-Value $\leq$ 0.05 in multivariate analysis was used to declare statistically significant variables.

Ethical approval and consent to participate

The Institutional Review Board (IRB) of Jimma University approved this study. The participants were well informed about the purposes of the study, and oral consents were obtained accordingly. The participants' rights to refuse or withdraw from participating in the study and confidentiality issues were considered.

Definition of terms

Neglected tropical diseases: a group of diseases that historically has been overlooked.

Soil-transmitted helminthes: is a term referring to a group of parasitic diseases caused by nematode worms that are transmitted to humans by faecally contaminated soil.

School-age children: Children aged from 5 to 14 years who may or may not be enrolled in School.

School children: Children aged from 5 to 14 years who are enrolled in school.

School-based deworming: Periodic drug treatment for children in schools based on prevalence to tackle STH infections (2).

RESULT

Socio-demographic characteristics

Out of 310 sampled primary school children, 303 students participated in the study with the overall response rate of 97.7%. Majority of them, 176(58.1%), were females and 7 participants were excluded from analysis due to insufficient stool samples obtained.

The children's age ranges from a minimum of 5 years to 14 years with mean age of 10(±2.6) years. Two hundred thirty (75.9%) of children's care givers were females. Among the care givers 130(42.9%) were housewives followed by government workers 51(16.8%), merchants 41(13.5%) and private employed 36(11.9%) (Table1).

Table 1: Socio-demographic characteristics of school children, Gena Bossa Woreda, Ethiopia, Aug 2018

Characteristics (n=303)	Frequency	Percent (%)
Sex of children		
Female	176	58.1
Male	127	41.9
Age of child		
5 to 10	167	55.1
11 to 14	136	44.9
Child school grade		
1 to 4	142	46.9
5 to 6	90	29.7
7 to 8	71	23.4
Sex of child care givers		
Female	230	75.9
Male	73	24.1

Educational level of child care givers		
Primary education completed	153	50.5
Secondary education completed	91	30
College/university	**40**	**13.2**
No education	19	6.3
Occupation of care givers		
House wife	130	42.9
Government employee	51	16.8
Merchant	41	13.5
Private/NGO employed	36	11.9
Home servant	19	6.3
Farmer	18	5.9
Others	8	2.7
Annual household income in ETB		
14400 to 28099	104	34.3
≥28100	101	33.3
< 14400	98	32.3
Family size		
4 to 6	194	64
s≤3	73	24.1
≥ 7	36	11.9

Prevalence of STH infection

One hundred sixteen **(**38.3%) of the children became positive for at least one of the soil transmitted helminthes species. Besides, A. lumbricoides was the predominant parasite (38.8%) followed by T. trichiura (34.5%). Female children were more infected by STH infections (Fig1).

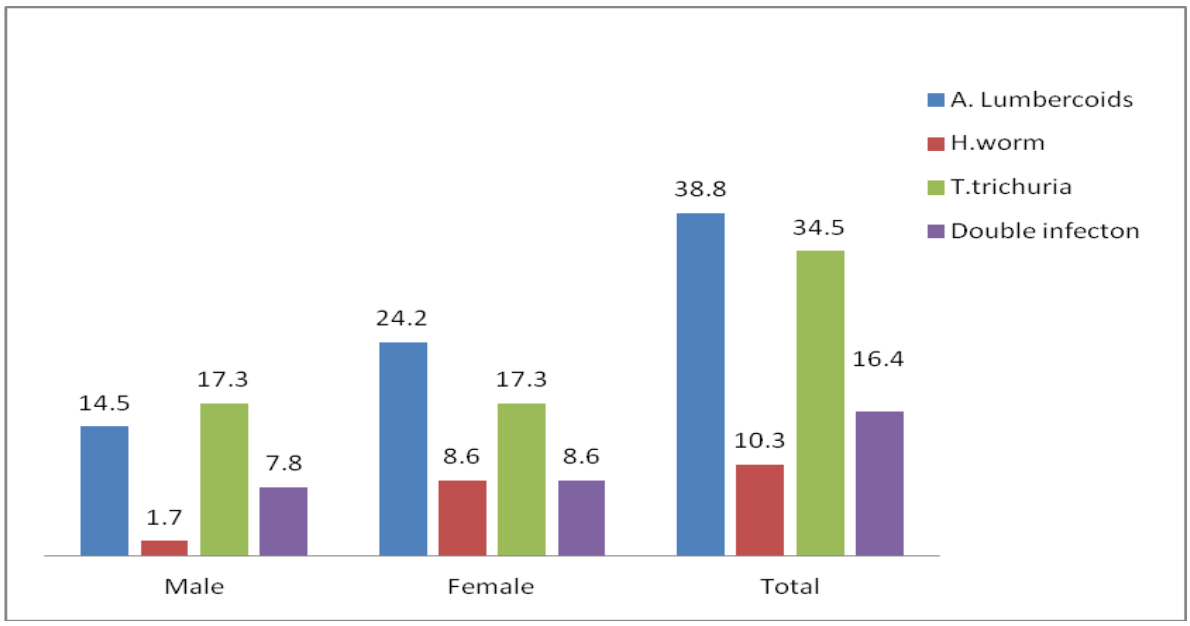


Figure 1: Prevalence of STH among school children, Gena Bossa Woreda, Ethiopia, Aug 2018

Factors associated with STH infection

Multivariate logistic regression analysis revealed that lack of private latrines, not wearing shoes always, age of children (5 to 10 years) and not knowing causative agents of STH infections were found to be major determinants of STH Infections.

School children aged 5 to 10 years old were 2.4 times (AOR=2.43, 95% CI=1.42, 4.16) more likely to have STH infections than those aged 11 to 14 years old. Besides, school children who wear shoes sometimes/not at all wear/ were nearly two times (AOR=1.80, 95% CI= 1.01, 3.23) more likely to be infected with STH than children who wear shoes always.

Furthermore, school children who do not have a private latrine were four times (AOR= 4.12, 95% CI = 1.64, 3.37) more likely to have STH infection as compared to those who have private latrines (Table 2).

Figure 2: Factors associated with STH infection among school children, Gena Bossa Woreda, Ethiopia, Aug 2018

Variables	STH infection		COR (95% CI)	AOR (95% CI)
	Yes	No		
	No (%)	No (%)		
Child age category				
5 to 10	75(44.9)	92(55.1)	1.88(1.17-3.04)*	2.43(1.42-4.16)**
11 to 14	41(30.1)	95(69.9)	1	1
Educational level of child care givers				
No education	9(47.4)	10(52.6)	2.10(0.68-6.47)	0.94(0.25-3.54)
Primary education completed	67(43.8)	86(56.2)	1.81(0.86-3.84)	1.00(0.42-2.40)
Secondary education completed	28(30.8)	63(69.2)	1.03(0.46-2.33)	0.75(0.30-1.85)
College/university	12(30.0)	28(70.0)	1	1
Annual household income in ETB				
< 14400	39(39.8)	59(60.2)	1.64(0.90-2.96)	1.48(0.74-2.97)
14400 to 28099	48(46.2)	56(53.8)	2.12(1.19-3.79)	1.75(0.90-3.38)
≥28100	29(28.7)	72(71.3)	1	1
Family size				
≤3	33(45.2)	40(54.8)	1	1
4 to 6	63(32.5)	131(67.5)	0.58(0.33-1.01)	0.70(0.37-1.31)
≥ 7	20(55.6)	16(44.4)	1.51(0.67-3.38)	1.69(0.69-4.16)
Availability of private latrine				
Yes	99(35.9)	177(64.1)	1	1
No	17(63.0)	10(37.0)	3.09(1.34-6.89)*	4.12(1.64-3.37)**
Child shoes wearing habit				
Always	55(29.9)	129(70.1)	1	1
Sometimes/ not at all	61(51.3)	58(48.7)	2.46(1.52-3.98)*	1.80(1.01-3.23)**
Short & clean finger				
Yes	70(34.3)	134(65.7)	1	1
No	46(46.5)	53(53.5)	1.66(1.01-2.71)	1.17(0.65-2.11)
Hear about STH				
Yes	89(76.3)	156(63.7)	1	1
No	27(46.6)	31(53.4)	1.52(0.85-2.72)	0.71(0.35-1.45)
Know causative agents of STH infection				
Yes	66(30.8)	148(69.2)	1	1
No	50(56.2)	39(43.8)	2.87(1.72-4.78)*	2.60(1.37-4.93)**

**Significant at P-Value≤0.05

DISCUSSION

The current study revealed that the prevalence of STH infections among school children was 38.3%. This finding was larger as compared to the study findings from Libo-Kemkem District, Northwest Ethiopia (9) and Umolante District, SNNPR Ethiopia (8). In contrast, the overall prevalence in the current study was lower than the findings of studies conducted in Jimma Zone, Ethiopia (10) and in Nigeria (11). The differences among the study findings might be due to differences in living standards and socio-demographic characteristics of the populations.

School children whose family did not have private latrine were four times more likely to be infected by STH infections when compared to those whose families possess private latrines. This finding was in agreement with findings of other studies in Jimma Zone, Ethiopia (12). Here, the absence of latrines in both setups might have exposed school children to parasites because of the existing improper defecation system.

Besides, children who did not wear shoes always were two times more likely to be infected with STH than their counter parts. This finding is similar with the study finding from Motta Town, Ethiopia (10). The possible reason may be the similarity of the existing socioeconomic status of the population in the two settings.

Moreover, children whose care givers did not know the causative agents for STH infections were about three times more likely to be infected with STH infection than those whose families were aware about the same. This finding was similar with the study findings from Nigeria and Ethiopia (4, 10). This implies that knowledge about the agents and transmission mechanisms of the STH infection may contribute to the prevention of STH infection.

CONCLUSION

The study revealed that lack of private latrines, not wearing shoes always, age of children (5 to 10 years) and not knowing causative agents of STH infections were found to be major determinants of STH Infections.

RECOMMENDATION

Ethiopian Federal Ministry of Health in collaboration with other stakeholders should focus their intervention against STH infections on integrated control programs including regular health education on children's shoes wearing habits, raising awareness of school children and their

families on STH infections and promoting private latrines in every household. Dawro Zonal Health Department and Gena Bossa District Health Office should also give due attention to accessibility and proper utilization of private latrines.

DECLARATIONS

Ethical approval

Ethical clearance letter was received from Jimma University. Parents were asked to sign the assent forms if they agreed on their children to be involved in the study. Permission to collect stool sample from pupils was sought from the head teachers of the schools involved in the study and informed verbal consent was obtained from the pupils themselves. Confidentiality issues were considered. School children who were tested positive for STH infection were treated.

Consent to publish: Not applicable

Availability of data and materials: All data included in the Article.

Competing interests: Authors' declare that they have no competing interests.

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Authors' contribution

AD developed the proposal, supervised the data collection and conducted the data analysis. TE participated in data analysis, conducted the report writing and drafted the manuscript. Both authors critically reviewed and approved the final manuscript.

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