ADDIS ABABA UNIVERSITY
FACULTY OF MEDICINE
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ASSESSMENT OF THE PREVALENCE OF INTESTINAL PARASITIC INFECTIONS AMONG SCHOOL CHILDREN AND THEIR KNOWLEDGE AND PRACTICE OF HYGIENE AND SANITATION IN PRIMARY SECOND CYCLE SCHOOLS, DEBIREBRHAN TOWN.

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TABLE OF CONTENTS

LIST OF TABLES page

LIST OF FIGURES page

LIST OF ACRONYMS

AOR	Adjusted Odds Ratio
COR	Crude Odds Ratio
AAU	Addis Ababa University
IPI	Intestinal Parasitic Infection
MDG	Millennium Development Goal
PHASE	Personal Hygiene and Sanitation Education
PSI	Population Service International
SPH	School of Public Health
SSHE	School Sanitation and Hygiene Education
UNICEF	United Nation Children's Fund
WHO	World Health Organization

Abstract

Background: *Poor sanitation in schools can cause parasitic infection among school children that can result in impaired children's growth and development. It also increases student's absenteeism from school and affects student's academic performance. Due to poor sanitation, about 40% of the world's 400 million school age children are infected with intestinal worms.*

Objectives: *To assess the prevalence of intestinal parasitic infection among school children and their knowledge and practice on hygiene and sanitation in Debrebrihan town second cycle schools.*

Methods: *A cross-sectional study on prevalence of intestinal parasite infection and their knowledge and practice among school children were conducted in March 9 to April 5, 2010. A stool sample was taken from school children and examined using formol-ether concentration technique for parasite. The data on socio-demography and hygiene sanitation knowledge and practice variables, and sanitary survey of schools were collected using structured questionnaire and observational check-list respectively. The data were entered and cleaned using Epi-info window version 3.5 and analyzed by SPSS version 11. To assure the data quality, training for data collectors and supervisors was given and supervisors were checking the data consistency and completeness.*

Result: *Of the total 721 study participants, 308 were males and 413 females. According to the findings of this study, 405 of the study participants were knowledgeable on hygiene and sanitation. More than half (56.4%) of the participants had a better hygiene and sanitation practice. The overall prevalence of at least one intestinal parasitic infection was 41.3%. Six species of intestinal parasites were identified. The predominant parasite was A.lubricoides with a prevalence of 12.3% followed by E.histolytica/dispar) and G.lambia. .Double intestinal parasitic infection rate was found to be 1.2 %(only 2 out of 165 Children).*

All the three schools do not meet the minimum required standard to the amount of water supply and latrine seats to students' ratio.

***Conclusions and Recommendations**: According to the findings, nearly more than half of the study participants had knowledge and practice on hygiene and sanitation.*

Relatively high prevalence of intestinal parasitic infection was seen among school children & schools lack basic sanitary facilities. Therefore, schools should improve basic sanitary facilities, knowledge and practice of students.

1. INTRODUCTION

1.1 Background

Globally, more than 2.3 billion people still live without access to sanitation facilities and are unable to practice basic hygiene such as washing hands with soap and water. Diseases related to poor sanitation and water availability cause many peoples to fall ill. Children are the most vulnerable to these health problems and consequently are affected the most. Some of the health problems are intestinal parasitic infections, diarrhea, trachoma, scabies and others .Although water and sanitation facilities are fundamental for children's well-being, in practice sanitary facilities in most schools are inadequate and even they may not available. On the other hand, if they are available, facilities are not adapted to the needs of the children and not sustainable. Also the motivation of teachers and head teachers to provide skills-based hygiene education is not assured (1).Such problems were happened in Ethiopian schools. Majority of the schools have no access to safe and adequate water supply and one latrine seat is used for 60-90 boys and 30-45 girls (2).

Experiences showed that, school children are potential agents of changes within their homes and communities through their knowledge on hygiene and sanitation practice learned at school. However, without mobilization and motivation of the community as a whole, the impact of school sanitation and hygiene promotion programs may remain limited (1).

Worldwide accepted school sanitation and hygiene education targets for 2015 (MDG) are to educate 80% of primary school children about hygiene and to equipped all schools with sanitary facilities. Nowadays, UNICEF together with its partners at global and country level is promoting right-based and child-friendly systems and schools. These child-friendly schools are promoting good health, child and youth participation and encourage school-parent community participation (1).

Intestinal parasitic infections are the common infectious worldwide. It is estimated that, some 3.5 billion people are affected and 450 million fall ill as a result of these infectious, the majority being children (3). Intestinal parasitic infections are more prevalent among the poorest segments of the population. They are closely associated with low household

income, poor personal and environmental sanitation, overcrowding and inaccess to safe and adequate water supply. Although intestinal parasitic infections are the top health problems in developing countries, amoebiasis, ascariasis, hookworm and giardiasis are among the ten most common infections(4). World health organization reported that, more than 980 million people are infected by A. lumbricoides which is the most common public health problem in Africa(5).

1.2 Statement of the problem

Of all the children between the ages of 5-14 years in the world, 87% live in developing countries. For these children, the risk of death is fourteen times higher than that for children of the same age in industrialized countries (6). Most of the time the sanitary conditions of schools in rural and urban areas in developing countries are such a poor environment that, they can create a health hazard and are unsafe for school children. These poor sanitation conditions in school can cause parasitic infection among school children that result in impairing children's growth and development. It also increase student's absenteeism from school and affect student's academic performance. A study done in Madagascar confirmed that lack of access to safe and adequate drinking water directly related to the percentage of children missing school. About 3.5 million school hours were lost each year due to lack of facilities in the school (7). Another study done in south Gondar shows that intestinal parasitic infection affects student's academic performance (8).

Different cross-sectional studies show school children have a chance of being infected with more than one type of intestinal parasite. This was reported by a Study done in Cambodia with a multiple infection rate of 16.7 %(9), and in Tanzania 37% (10). These multiple intestinal parasitic infections can cause anemia among school children. Studies revealed that children with double parasitic infection had lower hemoglobin level than those who had single parasitic infection (11, 12).

Routine and annual reports of the health office in the study area showed that, intestinal parasitic infection found to be among the ten top diseases that cause morbidity in the community in which school children were part of the community (13). In addition, there was no study done on school sanitation and intestinal parasitic infection among school children in the study area. Therefore, the purpose of this study was to assess the knowledge and practice of school children on hygiene

and sanitation and to determine the prevalence of intestinal parasite among school children in Debre Birhan.

1.3 Significance of the study

Findings of this study would serve as a base line data on the study area. In addition the study will identify problems related to poor school hygiene and sanitation and suggest possible solutions that would help policy makers, practitioners, health workers, teachers and management of education and health offices.

2. LITRATURE REVIEW

2.1 School sanitation facilities and hygiene practices

Provision of safe and adequate water supply for drinking and personal hygiene of students and staffs is one of the major components of school hygiene and sanitation programs (2).

Ideally, water should be obtained from the local municipal system or alternatively, from ground water and spring sources with arrangements for systemic disinfection of the water. Expected water consumption varies from 15-30 liters per day per students in day schools. As a minimum, school students would manage, under difficult condition for a limited period of time, with an amount of at least five liters of water per day per student. Moreover, appropriate sanitation facilities at school are a basic need. In the absence of such facilities, there would be a risk of the occurrence of infectious diseases. To avoid such health problems, the optimal standards for latrine facilities at school would be one seat for 25 girls or for 100 boys and one urinal for 40-60 boys (14). A study done in Uganda in 2006 revealed that less than one in five primary schools met the standard five liters of safe water per day per pupil (15). In Somalia 59% of the school children have no access to safe water supply and 49% of schools have no adequate latrines per student ratio, it was above 1:150 (16). In India out of 1024996 schools, 45.9 % were with out latrines and 17.3% with out water supply (17). An assessment done on school sanitation and hygiene in Togo showed that 30% of the schools have latrines and 26% had access to drinking water. Open defecation was practiced in schools with out latrines (18).The condition of school sanitation facilities in south Africa can be classified as poor or unsatisfactory. It is estimated that 90% of rural and peri-urban schools lack well designed and appropriate sanitation facilities (19). According to 2005 Ethiopia demographic heath survey, about 65% of the households have no access to latrine facilities in Ethiopia at a community level (20).

Evidence suggested that improved hand washing can have a major impact on public health in any country and significantly reduce the transmission of communicable diseases such as parasitic infections. Hand washing with soap at critical times, however is not widely practiced. For instance, studies show that hand washing with soap after defecation in different countries is as low as 3% in Ghana, 6% in Peru and as high as 47% in England peri-urban area (21). An evaluation done in improving hygiene behavior and sanitation program in Ghana shows that, there was an over all 14.7% of students never or rarely used soap when washing hands after toilet in schools with hand washing facility with soap (22).

A survey done on hand washing behavior in Bogonta district school students of Colombia, only 33.6% of the students reported that they always or very often washing their hands with soap and clean water before eating and after using toilet. About 7% of students reported regular access to soap and clean water at school. Students with proper hand washing behavior were less likely to report gastrointestinal symptoms or school absenteeism (23).

2.2 School sanitation and hygiene education promotion

Hygiene is largely a matter of behavior, which is determined by social traditions, customs and culture. Active efforts are possible only with the proper mind-set and if there is a motivation to keep disease away. For modifying a life style and make it conducive to prevention of infectious diseases current styles of living should be studied in relation to hygienic practice (24).

Nowadays, programs for school water, sanitation and hygiene education are being carried out in more than 70 countries. In at least 30 countries, the program is scaling up and expanding nationwide with the support of UNICEF. The school sanitation and hygiene education program ranges in size from a few hundreds to tens of thousands. In the largest of these, the government of India is developing school sanitation and hygiene education in more than 600,000 schools nationwide (25). There is also another initiative which

focused on Personal Hygiene and Sanitation Education (PHASE) that expands its program globally and accepted by majority of developing countries. In 2003 in Peru, the ministry of health agreed to reproduce the personal hygiene and sanitation education materials and methodology at national level, reaching all 1200 primary schools in the country and it also adapted by Kenya and Zambia ministry of education (26). Such program also practiced in Ethiopia by PSI/Ethiopia. The organization developed a school based program to promote hygienic behavior and home water treatment skills among young children in 55 schools. And, results from 15 schools indicates a positive results including reports of lower school absenteeism, higher school attendance and improved health among pupils (15).

2.3 Transmission of intestinal parasites and their prevention methods

Both the helminthes and protozoan parasites can cause a health problem worldwide, especially in developing countries. Approximately 10 percent of the population in developing countries infected by ascariasis and every year it causes deaths to 60000, mostly children. Schistosomiasis, which is the second largest parasitic infection caused by helminthes. It is estimated that 600 million people are infected with schistosomiasis and or live in the contaminated area. About 120 million people have severed symptoms. Hook worm are common intestinal parasite, especially in the tropics. In warm and moist circumstances their eggs developed into larvae and that can penetrate by piercing human skin. And hook worm are extremely dangerous to small children. Transmission of parasites is caused by poor personal hygiene and environmental sanitation and can be prevented by improving the sanitation, especially in schools (27).

2.4 Intestinal parasitic infection prevalence among school children

Children were more affected by intestinal parasites than other segment of the population. Studies done in school children show that, common parasites that affected children were A. lumbricoides, G. lambia, T. trichuria, hookworm, schistoma and others. According to

these studies, there were a prevalence of intestinal helminthes 0f 47.3% and protozoan 31.5% in Egypt (28).

Multiple species of parasites infection were identified in some studies. A study done in Asendabo and Babile town school children show that, ten and nine different species were identified respectively (29, 30). This indicates that, children have a chance to be infected with more than one parasite. According to a study done in Thailand, it revealed that a prevalence of double infection of 23.1% and a triple infection of 10.1 %(31). Study done in southern Ethiopia school children shows that, there were a double infection of 30%, triple infection of 9.3% and even quadruple infection of 1.4%(32).

Helminthes which are transmitted by contaminated soil, such as A. lumbricoide are the most common parasites identified among school children. A studies done in Wondogent zuria, Awassa and Asendabo show that, a high infection rate of A. lumbricoide of 75.2%, 76% and 56.4% respectively (29,33,34).

2.5 Situation of school health in Ethiopia

Like other developing countries, school health activities in Ethiopia are not satisfactory. Studies done in 2013 schools in different regions of the country revealed that, the sanitary facilities in schools do not met the minimum requirement. For example, students to latrine seat ratio were 1:170, safe water coverage of 32.5%, urinal provision of 2.4%, hand washing facilities of 4.4% (35).

Due to these poor sanitary facilities in schools, the prevalence of intestinal parasitic infection among Ethiopian school children in different places is high. Studies revealed that there were an over all prevalence of 69.4% in southern Ethiopia school children (32), 86.2% in Asendabo (29), 89.4% in Wondogent zuria (33) and 92.7% in Awassa (34). In addition, intestinal parasitic infection was leading among ten top diseases in Addis Ababa school children (36).

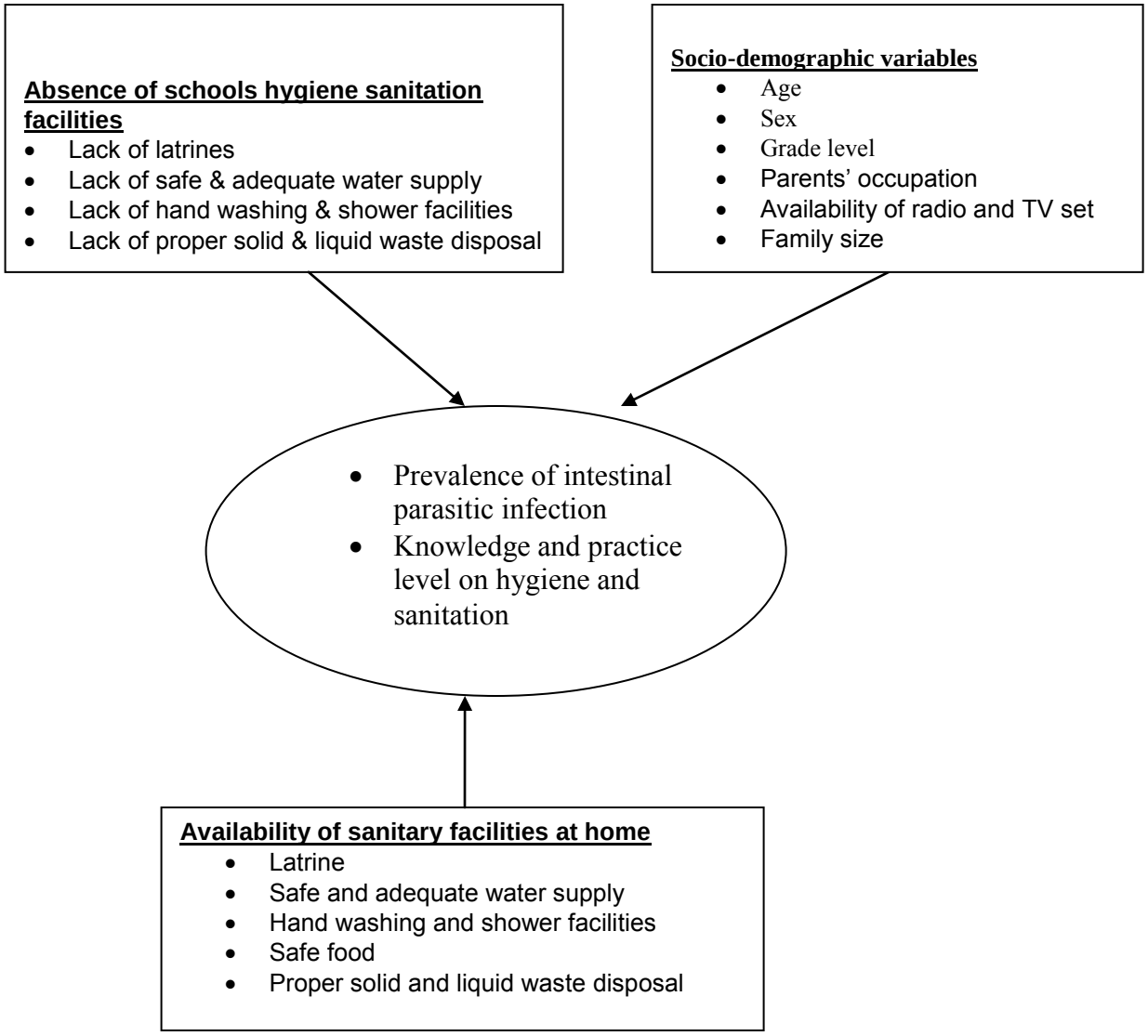

Fig 1. Conceptual framework

3. OBJECTIVES

3.1 General objectives

To assess the prevalence of intestinal parasitic infection among school children and their knowledge and practice of hygiene and sanitation, and assess the situation of sanitary facilities among primary second cycle schools in Debre Birhan town.

3.2 Specific objectives

1. To determine the intestinal parasitic infections prevalence among school children in Debre Birhan.

2. To assess the knowledge and practice of hygiene and sanitation among school children in Debre Birhan.

3. To assess the sanitary condition and facilities of primary second cycle schools in Debre Birhan.

4. METHODOLOGY

4.1 Study design

A cross-sectional study on the prevalence of intestinal parasitic infection among school children and their knowledge and practice of hygiene and sanitation was conducted in Debre Birhan from March 9, 2010 to April 5, 2010.

4.1 Study area

Debre Birhan is the largest town of North Shoa Zone of Amhara Region, which is located 130km northeast of Addis Ababa. It comprises of 9 kebeles with a total population of 94,829 of which 46,582 are males and 48,247 females. It is located at an altitude of 2,750m above sea level with a total area of 18018m^2. Its annual temperature ranges from 10^0c-28^0c. However, during September to December it reaches below 0^0c (37). There are 23 first cycle schools, 6 second cycle schools, 1 high school, 1preparatory School, 4 government and private health colleges, a teachers' college, a vocational college and a University. Anti helminthes treatment was given to under five children every six months.

4.3 Source population

The source population were all primary second cycle school children in Debre Birhan.

4.4 Study population

The study population were those school children who were selected systematically from the randomly sampled primary second cycle schools.

4.5 Sample size determination

Sample size was determined by taking 50% as a proportion (P) of intestinal parasitosis of school children with a margin of error (d) 5% and a 95% confidence interval (Zα/2) with design effect. A 10% of the calculated sample was added to the final sample size to replace non respondents.

The sample size (n) will be:

$$n = [\frac{(Z\alpha/2)^2 * P(1-P)}{(d)^2}]D = [\frac{(1.96)^2 * 0.5 (1-0.5)}{(.05)^2}] *2$$

Where,

n= Calculated sample size

n_1= Final sample size

Zα/2= Standard score

P = Proportion of intestinal parasitosis among school children.

d = Margin of error

D= Design effect

$$n= [\frac{3.8416* 0.5 * 0.5}{(.05)^2}]*2= 768$$

n_1= (10% of 768) + 768 = 845

Therefore, final sample size was 845.

4.6 Sampling procedure

A multistage sampling method was employed having three stages.

First stage:

Three out of the six primary second cycle schools in Debrebrihan town were selected by simple random sampling method.

Second stage

The total sample size (n=845) was allocated to the three selected schools proportionately.

Study subjects from each school were allocated to grade 5, 6, 7 and 8 proportionately.

Study subjects of grade 5, 6, 7 and 8 of each school were allocated to their sections proportionately.

Third stage

Using name list of students of each section as sample frame, every fourth students were selected by systemic random sampling method and the first student was selected by lottery method and students were called for interview from their class. Students who were absent during the data collection period were replaced by others listed next to them.

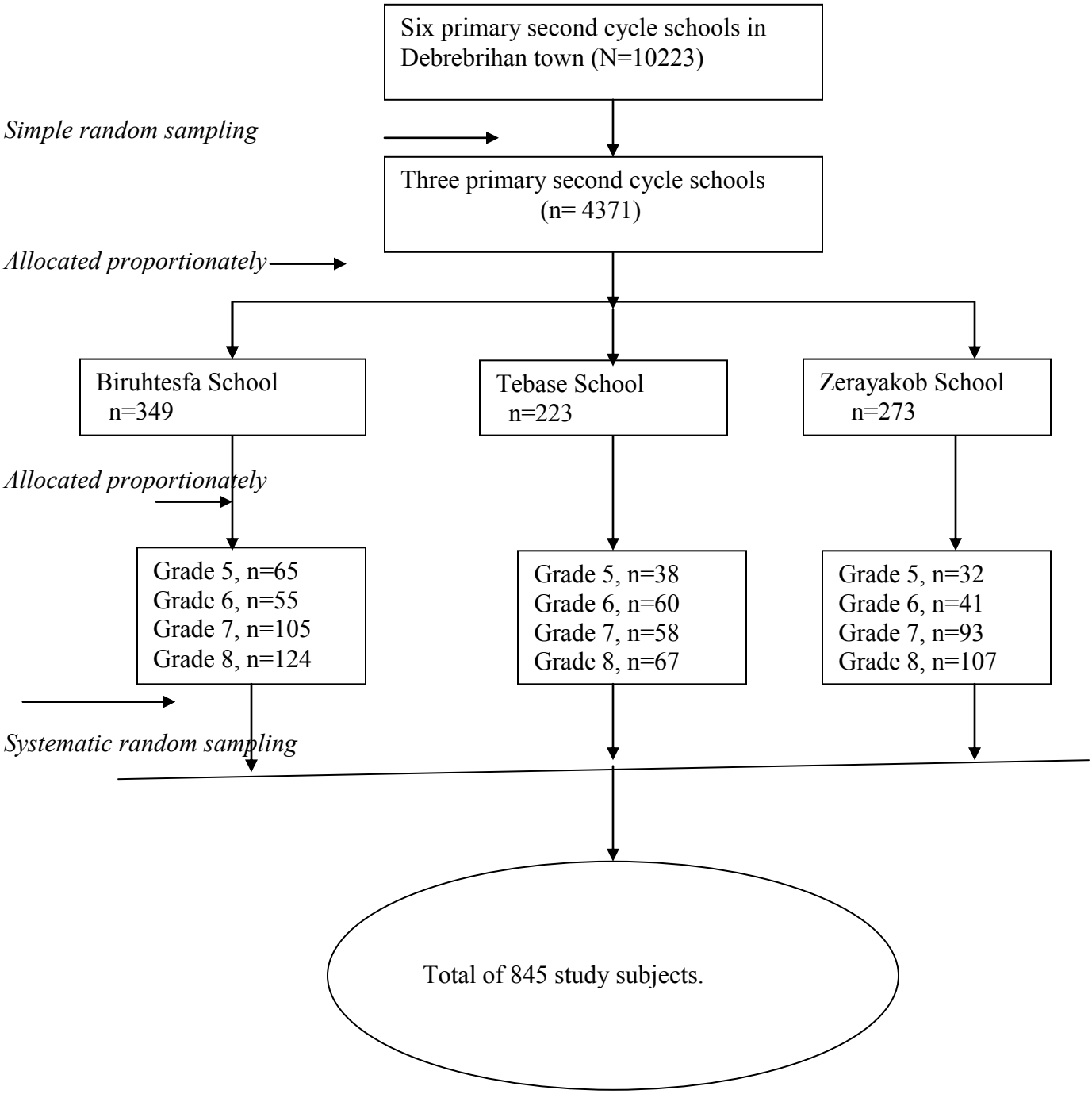

Fig 2. Schematic presentation of sampling procedure

Inclusion criteria:

Students who enrolled and attend in grade 5-8 during the 2009/10 academic year in the study area were included in the study.

4.7 Data collection procedure

Quantitative:

Using structured, closed ended and coded questionnaire with a few open ended questions were prepared in English and translated to Amharic, which is the local language of the study population for interviewing school children to assess their knowledge and practice on personal hygiene and sanitation. The data was collected by eight trained 10^{th} grade complete data collectors.

A check list was prepared to assess the school sanitary facilities. The data was collected prior to the actual interview done and this was carried out by environmental health professionals who were supervising the interviewer. The principal investigator arranged all the fertile grounds during the data collection period.

Stool samples were collected for intestinal parasites examination. To increase the validity, formol-ether concentration method was used. This was done by two laboratory technologist (procedure-annex 1).

4.8 Variables

Dependent variables:

- Knowledge on hygiene and sanitation
- Practice on hygiene and sanitation
- Intestinal parasite infection

Independent variables:

- Age of the child
- Grade level of the student
- Sex of the child

Family size

Occupation of parents

Availability of radio and television set

School hygiene and sanitation facilities

4.9 Operational definitions

1. School solid wastes: Wastes generated by the school community such as pieces of paper, plastics, rags, dirt, dust and litters.
2. School compound cleanliness

   Good: If there is no any solid and liquid waste in the school compound.

   Satisfactory: If there are harmless wastes such as rubbish.

   Bad: If there are solid and liquid wastes including human feces in the school compound.
3. Cleanliness of the class room

   Satisfactory: If the class room is free from dirt and dust

   Unsatisfactory: If the class room is full of dirt and or dust.

4. Regular sanitation program: Weekly school campus sanitation and daily class room cleaning.

5. Latrine cleanliness:

   Good: Latrine with no faeces, urine, cleansing materials on the slab and free of flies and have adequate water for cleaning with a container for collecting anal cleansing materials.

   Satisfactory: Latrines with no feaces, urine, and cleansing materials on the slab but have no dust bin.

   Bad: Latrine with feces, urine, cleansing materials on the slab or full of flies and has no adequate water for cleaning and container for collecting anal cleansing materials.

6. Condition of the latrine

   Good: A latrine with proper superstructure and slab, free of health hazard or accident and no need of maintenance or reconstruction.

Satisfactory: A latrine with a proper superstructure and slab, free of health hazard or accident but need of maintenance or reconstruction.

Bad: A latrine with out proper superstructure and slab that can cause accident and health problems and needs maintenance and reconstruction.

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7. Adequacy of latrine seats (14).

1seat for 100 boys

1seat for 25 girls

9. Adequate water supply for students in the school: If there is a minimum of 5 liters of water per student in a day in the school (14).

10. Safe water: Municipally treated pipe water, protected spring or well water.

11. Personal hygiene:

Poor personal hygiene: If an individual is not practice his/her body and clothes cleanliness.

Good personal hygiene: If an individual practices his/her body and clothes' cleanliness and hand washing habit.

12. Proper solid waste disposal system in the school: Solid wastes stored in a dust bin and disposed to refuse pit.

13. Proper liquid waste disposal system in the school: Waste water disposed in septic tank or seepage pit or to a sewer line.

14. Street foods: Foods sold in road side which is risk for health such as 'pasty', 'gelatin', bread etc.

15. Knowledge level of participants on hygiene and sanitation.

Knowledgeable: Respondents were considered knowledgeable if they scored greater than or equal to the mean score points to hygiene and sanitation knowledge questions.

Not knowledgeable: Respondents were considered less knowledgeable if they scored less than the mean score points to hygiene and sanitation knowledge questions.

16. Practice level of participants on hygiene and sanitation.

Good practice: Respondents were considered well practiced if they scored greater than or equal to the mean score points to hygiene and sanitation practice questions.

Bad practice: Respondents were considered less practiced if they scored less than the mean score points to hygiene and sanitation practice questions.

4.10 Data analysis procedure

For quantitative data, Epi-info windows version 3.5 was used to enter and clean the data which was later exported to SPSS statistical package version 11 for bivariate and multivariate analysis. The data was quantified using frequency distribution and percentages. Odds ratio with 95% CI and logistic regression were employed to describe the strength of association between dependent and independent variables by controlling for the effect of possible cofounders. The significance of statistical association was assured using 95 % CI or P-value.
The data was entered, cleaned and analyzed by the principal investigator.

4.11 Data quality management

To ensure the data quality, one day training on ethical issue, how to approach the respondents and how to administer the questionnaires was given to data collectors and supervisors. A sample (10%) of the Amharic version of the questionnaire was pre-tested for clarity, acceptability and flow among the non-study subjects and functioning of microscopy was done. Data collection process was checked by supervisors in a daily basis. The principal investigator had conducted meeting with data collectors and supervisors everyday after completion of the data to check data inconsistency and completeness. Systematic observation was carried out to control stool sample sharing among school children. The principal investigator was controlling the over all activities.

4.12 Ethical considerations

Ethical approval was obtained from Institutional Review Board (IRB) of Faculty of Medicine, Addis Ababa University prior to data collection. A written permission from Debre Birhan administration, Education Office, Health Office, and Zonal Health Department had been obtained. Study participants were asked for their permission using assent form. All the study subjects were informed about the purpose and benefits of the study along with their full right to refuse, withdraw or completely reject in participation. Study participants were briefed about the confidentiality of their responses and the importance of providing the right information increases the validity of the study. At the end of data collection, data collectors gave important information for each participant about the importance and advantage of better hygiene and sanitation practice to prevent communicable disease such as intestinal parasites. Study subject's name was not written to maintain confidentiality and the interview held in a separate room to keep privacy. Finally, by consulting health officer from Debre Birhan health centre, all school children who infected by helminthes were treated at their school. Albendazole was supplied by North Shoa Health Department.

4.13 Dissemination of results

Findings of the study will be disseminated to the Education Office, Health Office, the study schools and other concerned sectors. Hard and soft copy will be made available through the library of AAU, SPH for graduate students and the public. Attempt will be made to publicize findings through scientific journals and conferences.

5. RESULTS

From the total 845 study subjects, 768 were interviewed and 77 not interviewed due to resource limitation. Of 768 interviewed, 721 completed the interview and responded to all questions making the response rate 93.8%%. The remaining 47 were excluded because 19 refused to respond and 28 gave incomplete information. Four hundred ten (58.9%) school children were systematically selected for stool examination and only 400(97.6%) were able to provide proper and viable stool sample for intestinal parasite examination.

5.1 Socio-demographic characteristics of study subjects

From the total 721 study subjects, 308(42.7%) were males and 413(57.3%) females. The mean age was 13.5±1.6 years.

Grade 5-6 comprised 247(34.3%) of the study subjects and 474(65.7%) were from grade 7-8. Majority 691(95.9%) of the study participants were followers of Orthodox Christianity in their religion followed by Protestant 14(1.9%), Muslim 14(1.9%), and 2(0.3%) were followers of other religion (Table1).

Table1. Distribution of Socio-demographic variables among school children in Debre Birhan town March, 2010(n=721).

Variables		Frequency	Percent
	Sex		
	Male	308	42.7
	Female	413	57.3
	Age Group		
	10-13 yrs	357	49.5
	14-17 yrs	364	50.5
	Grade Level		
	5^{th}-6^{th}	247	34.3
	7^{th}-8^{th}	474	65.7
	Religion		
	Orthodox	691	95.8
	Others*	30	4.2

* = Protestant, Muslim, Catholic and Hawariat

5.2 Socio-economic status of parents of study participant

Study subjects were asked about the number of family members, their parents' occupation and availability of radio and television set in their home.

Study subjects with a family member of $\leq$5 were 432(59.9%).The mean number of family members was 5.3 $\pm$1.8 ranging from 1 to 14.

Concerning their father's occupation, 205(28.4%) of the study participants responded government employer, 276(38.3%) private business and 240(33.3%) unemployed. Majority 429(59.5%) of the study subjects' mother occupation was housewife followed by government employer 106(14.7%), merchant 90(12.5%), and 96(13.3%) had other income generating activities.

Five hundred ninety seven (82.8%) of the study subjects' parent had radio and 403(55.9%) had television set (Table2).

Table 2. Distribution of socio-economic status of parents of study participants in Debre Birhan town, March, 2010(n=721).

Variables	Frequency	Percent
Family Size		
≤ 5	432	59.9
>5	289	40.1
Father's Occupation		
Government employer	205	28.4
Private business	276	38.3
unemployed	240	33.3
Mother's occupation		
Housewife	429	59.5
Government employer	106	14.7
Merchant	90	12.5
Others	96	13.3
Availability of radio		
Yes	591	82.8
No	124	17.2
Availability of TV set		
Yes	403	55.9
No	318	44.1

5.3 Knowledge level of study participants on hygiene and sanitation

Eight key variables in relation to hygiene and sanitation were sorted out to assess study subjects' knowledge level on hygiene and sanitation. Moreover, summary score was calculated for knowledge of hygiene and sanitation among study participants based on 34 points and the mean score was found to be 15 $\pm$ 3.8(SD). Therefore, Study participants who scored greater than or equal to the mean score (15 points) were considered as knowledgeable and those who scored less than the mean score (15 points) were not knowledgeable to hygiene and sanitation.

Respondents were asked about what personal hygiene mean. Majority 655(90.8%) of the respondent answered as bathing, 496(68.8%) hand washing, 532(72.5%) cloth washing and few numbers 213(29.5%) fingernail cutting. They were also asked about the major health problems due to poor hygiene and sanitation. One hundred seventy seven (24.5%) of the respondents responded as skin diseases, diarrhea 452 (62.7%), intestinal parasitic infection 263(36.5%) and trachoma 385(53.4%).

Most of the study subjects 559(77.5%) knew that human faeces could transmit diseases (Table 3). They were also asked how to prevent disease transmission due to human feces. Four hundred eighty eight (67.7%) of them answered use latrine, 157(21.8%) hand washing after toilet visit and 213(29.5%) keeping latrine clean.

Concerning the methods to make water safe for drinking, 540 (74.9 %) of the respondents acknowledged by boiling, 418(66.7%) using chemicals (wuha agar), and 238(33%) by filtering.

School children were asked to respond about the sources of solid wastes in the school. Majority 700(97.1%) of study participants respond as pieces of paper, 32(4.4%) plastic, 112(15.5%) chalk dust and 257(35.6%) grass and leaves. And, the respondent also asked about the methods for proper solid wastes disposal in and out side the school. Three

hundred two (41.9%) of the study subjects answered collecting wastes in dust bin, 622(86.3%) collect and burn in refuse pit and 475(65.9%) burying solid wastes.

Respondents were asked to mention major problems due to improper solid waste disposal. Most 616(85.4%) of the study participants answered as health problem, 200(27.7%) favorable to fly breeding, 60(8.3%) rat will breed, 308(42.7%) create bad smelling and 446(61.9%) unsightly.

Finally, study participants were asked on whether they have got health information on hygiene and sanitation or not. Five hundred twenty nine (73.4%) acknowledged that they have got health information on hygiene and sanitation. And, their major sources of information were: teachers 473(65.6%), health professionals 84(11.7%), mass media 59(8.2%), family members 251(34.8%) and others 68 (9.4%) like peers and friends.

Of the total 34 hygiene and sanitation knowledge points, Four hundred five (56.2%) of the study participants scored more than or equal to the mean score (15 points) and these were considered as knowledgeable on hygiene and sanitation. While 316(43.8%) of the respondents scored less than the mean score (15 points) and considered as not knowledgeable on hygiene and sanitation.

Table3.Knowledge level on hygiene and sanitation among school children in Debre Birhan town, March, 2010 (n= 721).

Variables	Frequency	Percent
Do human faeces transmit disease?		
Yes	559	77.5
No	162	22.5
How do you prevent diseases transmitted by faeces?		
Use latrine	488	67.7
Wash hands after toilet visit	157	21.8
Keep latrines clean	213	29.5
Common sources of solid wastes in school		
Pieces of paper	700	97.1
Plastics	32	4.4
Chalk dust	112	15.5
Grass and leaves	257	35.6
How do you dispose solid wastes?		
Store in dust bin/receptacles	302	41.9
Burn in refuse pit	622	86.3
Burying	475	65.9
Do you get information on hygiene and sanitation?		
Yes	529	73.4
No	192	26.6
Who are the sources of information?		
Teachers	473	65.6
Health professionals	84	11.7
Mass media	59	8.2
Parents/family members	251	34.8

**= may exceed n=721 due to multiple responses

5.4 Association between socio-demographic variables and knowledge level on hygiene and sanitation.

A crude analysis was done using multiple binary logistic regressions to assess any association between the socio-demographic variables and level of knowledge on hygiene and sanitation. Sex and availability of radio showed significant association with level of knowledge (p-value <0.05). However, age, grade level , number of family members father's occupation and availability of television set were not significantly associated with knowledge level of children (P-value >0.05).

Females were 1.6 times more knowledgeable than males [COR: 1.6, 95% CI: (1.18, 2.15)] and Study participants whose families had owned radio were less likely knowledgeable to hygiene and sanitation than those who had not. [COR: 0.66, 95% CI :(0.44, 0.97)]. However, after controlling for confounding variables through multivariate regression analysis, participants who had radio were more likely knowledgeable than who had not [AOR: 1.50, 95% CI: (1.01, 2.23)] .

Table4. Association of Socio-demographic variables and hygiene and sanitation knowledge level among school children in Debre Birhan town, March, 2010(n=721).

Variables	Knowledge level: Knowledgeable	Knowledge level: Not Knowledgeable	COR (95% CI)	AOR (95% CI)
Sex				
Male	193(26.8%)	115(15.9%)	1.00	1.00
Female	212(29.4%)	201(27.9%)	**1.6(1.18, 2.15)***	**1.61(1.18, 2.18)***
Age group				
10-13 years	192 (26.6%)	165(22.9%)	1.00	1.00
14-17 years	213(29.6%)	151(20.9%)	0.83(0.61, 1.10)	1.16(0.81, 1.64)
Grade				
5^{th}- 6^{th}	129(17.9%)	118(16.4%)	1.00	1.00
7^{th} – 8^{th}	276(38.3%)	198(27.4%)	0.78(0.57, 1.06)	1.139(0.79, 1.63)
Family size				
≤ 5	245(34%)	187(25.9%)	1.00	1.00
> 5	160(22.2%)	129(17.9%)	0.94(0.70, 1.27)	0.967(0.71, 1.31)
Father's occupation				
Gov't employer	108(14.9%)	97(13.5%)	1.24(0.84, 1.79)	0.71(0.47, 1.05)
Private business	158(21.9%)	118(16.4%)	1.03(0.72, 1.45)	0.92(0.63, 1.31)
Unemployed	139(19.3%)	101(14%)	1.00	1.00
Availability of radio				
Yes	346(48%)	251(34.8%)	**0.66(0.44, 0.97)***	**1.50(1.01, 2.23)***
No	59(8.2%)	65(9%))	1.00	1.00
Availability of TV				
Yes	236(32.7)	167(23.2%)	1.25(0.92, 1.67)	0.78 (0.56, 1.07)
No	169(23.4%)	149(20.7%)	1.00	1.00

* = Significantly associated, P-Value <0.05.

5.5 Study participants hygiene and sanitation practice

Nine variables pertaining to hygiene and sanitation practice were selected, to assess the practice of study subjects on hygiene and sanitation. Of these variables, eight of them were dichotomous. A total of 13 score points were taken for sum of scores of the nine variables. The mean practice score for hygiene and sanitation found to be seven points. Participants who scored more than or equal to the mean score (7 points) were considered that, they had good practice while those scored less than the mean score (7 points) poor practice on personal hygiene and environmental sanitation.

Five hundred sixty nine (78.9%) of the study participants respond that, they use soap during hand washing. Majority 453(62.8%) of the respondents take bath once a week, 178(24.7%) take bath twice a week, 46(6.4%) take bath three times a week,27(3.7%) take bath more than three times a week and 17(2.4%) take bath once every two weeks (Table5).

Regarding fingernail cutting, 455(63.1%) of the respondents cut their fingernail. Six hundred seventy eight (94%) of the study subjects wear shoe always.

Concerning the utilization of latrines, 493(68.4%) use latrine while 228(31.6%) defecate in the open field. And, 406(56.3%) keep latrine clean.

Four hundred thirty seven (60.6%) of the study subjects respond that, they disposed solid waste properly in and out side the school. Moreover, 456(63.3%) of the study participants participate in the school sanitation campaign.

It was reported that only fifty five (7.6%) of the respondents use cup for drinking water during school time. Majority 682(94.6%) of the respondents drink water with their hands and 23(3.2%) drink directly by mouth. About 273 of study participants answered that they buy and eat street foods which are exposed to contamination.

Based on the above responses, study participants practice on hygiene and sanitation was scored in 13 points. This study showed that, 407(56.4%) of the respondents scored more than or equal to the mean score (7 points) and had a good practice on hygiene and sanitation activities. However, 314(43.6%) of the study participants scored less than the mean score (7 points) and had poor practice in hygiene and sanitation activities.

Table 5. Hygiene and sanitation practice among school children in Debre Birhan town, March, 2010 (n=721)

Variables	Frequency	Percent
Do you use soap with water during hand washing?		
Yes	569	78.9
No	152	21.1
How frequent do you take bath in a week?		
Once	453	62.8
Twice	178	24.7
Three times	46	6.4
More than three times	27	3.7
Others	17	2.4
Do you cut/clean your finger nails?		
Yes	455	63.1
No	266	36.9
Where do you defecate?		
Use latrine	493	68.4
Open field	228	31.6
Do you dispose solid wastes properly?		
Yes	437	60.6
No	284	39.4
Do you buy and use street foods?		
Yes	273	37.9
No	448	62.1

* = Take bath once every two weeks.

5.6 Association between socio-demographic variables and Practice level on hygiene and sanitation.

There was no any association between socio demographic variables and practice of school children on hygiene and sanitation (P-value > 0.05).

Table 6. Association of Socio-demographic variables and hygiene and sanitation practice level among school children in Debre Birhan town, March, 2010(n=721).

	Practice Level			
Variables	Good Practice	Poor Practice	COR (95% CI)	AOR (95% CI)
Sex				
Male	177(24.5%)	131(18.2%)	1.00	1.00
Female	230(32%)	183(25.3%)	0.93(0.69, 1.25)	1.07(0.79,1.45)
Age group				
10-13 years	204 (28.3%)	153(21.2%)	1.00	1.00
14-17 years	203(28.2%)	161(22.3%)	1.06(0.79, 1.42)	0.89(0.62, 1.26)
Grade				
5^{th}- 6^{th}	139(19.3%)	108(14.9%)	1.00	1.00
7^{th} – 8^{th}	268(37.2%)	206(28.6%)	0.99(0.73, 1.35)	1.08(0.76, 1.55)
Family size				
≤ 5	242(33.6%)	190(26.4%)	0.96(0.71,1.29)	1.04(0.77,1.41)
> 5	165(22.9%)	124(17.1%)	1.00	1.00
Father's occupation				
Gov't employer	110(15.3%)	95(13.2%)	1.7(0.8, 1.7)	1.15(0.78, 1.72)
Private business	159(22.1%)	117(16.2%)	0.99(0.70, 1.41)	1.16(0.79, 1.73)
Unemployed	138(19.1%)	102(14.1%)	1.00	1.00
Availability of radio				
Yes	339(47%)	258(35.8%)	0.92(0.63, 1.36)	0.92(0.62, 1.36)
No	68(9.4%)	56(7.8%)	1.00	1.00
Availability of TV				
Yes	221(30.7)	182(25.2%)	1.16(0.86, 1.16)	0.88 (0.64, 1.21)
No	186(25.8%)	132(18.3%)	1.00	1.00

5.7 The relationship between knowledge and practice level

Two hundred thirty two study participants were knowledgeable with good practice, 173 knowledgeable with poor practice,175 not knowledgeable but had good practice and 141 not knowledgeable with poor practice on hygiene and sanitation.

Table7. Relationship between knowledge and practice level among school children in Debre Birhan, March, 2010(n=721)

	Practice level	
Knowledge level	Good	Poor
Knowledgeable	232	173
Not knowledgeable	407	314

5.8 Intestinal parasitic infection prevalence rate of the study subjects

Among the four hundred study participants who provided proper stool sample for stool examination, 165 of them had at least one parasite with overall prevalence of 41.3%.Of those who had parasite, 88(53.3%) were females and 77(46.7%) males (Table5).

Of 165 school children who had intestinal parasites, Ascaris lumbricoides was the predominant parasite which observed in 49 (30%) of the school children followed by Entameba histolytica 46(28%), Giardia lambia 41(25%), Taenia saginata 12(7%), Hookworm 12(7%) and Himenolopis nana 5(3%) (Fig3). According to this study, double intestinal parasite proportion was found to be 1.2% (2 out of 165 school children), which were infected with a combination of E.histolytic/dispar and H.nana. None of the children had a triple or above number of parasites.

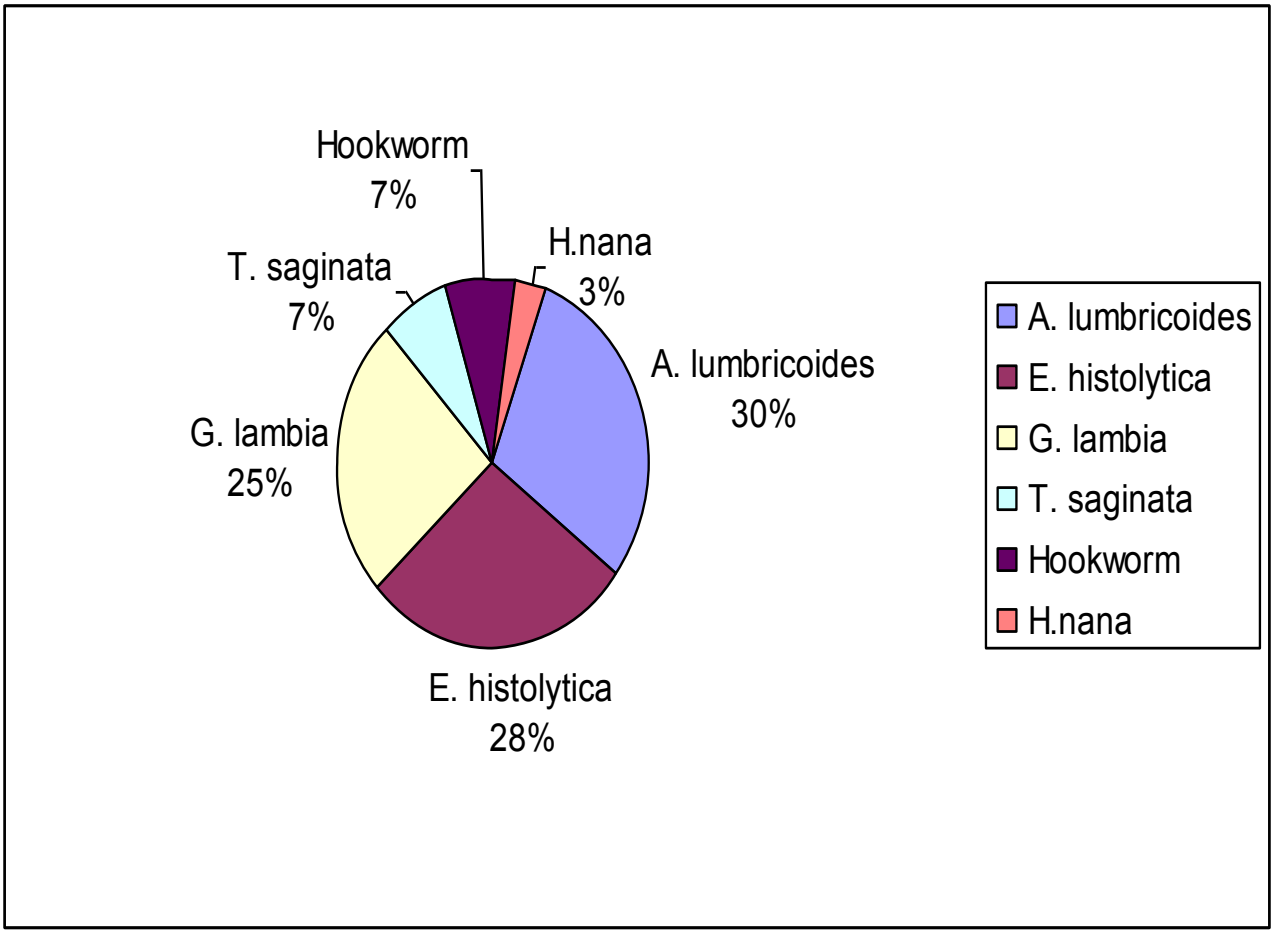

Fig 3. Distribution of intestinal parasites by species among School Children in Debre Birhan town, March, 2010

Table 8. Distribution of intestinal parasites among School Children by sex and age group in Debre Birhan town, March, 2010 (n =165)

	Sex		Age group	
	Male (n=77)	Female (n=88)	10-13 (n=92)	14-17 (n=73)
Types of parasites	No.(%)	No.(%)	No.(%)	No.(%)
E.histolytica	22(28.6)	24(27.3)	30(32.6)	16(21.9)
A.lumbricoides	22(28.6)	27(30.7)	32(34.8)	17(23.3)
G.lambia	20(25.9)	21(23.9)	16(17.4)	25(34.2)
T.saginata	5(6.5)	7(7.9)	3(3.3)	9(12.3)
Hookworm	8(10.4)	4(4.5)	6(6.5)	6(8.3)
H.nana	0(0)	5(5.7)	5(5.4)	0(0)
Total	77(46.7)	88(53.3	92(55.8)	73(44.2)

5.9 Association between socio-demographic variables and intestinal parasitic infection status of study participants.

There was no any association between socio demographic variables and parasitic infection status (P-value > 0.05).

Table9. Association of Socio-demographic variables and intestinal parasitic infection among school children in Debre Birhan town, March, 2010(n=721).

	Intestinal Parasitic Infection Status			
Variables	Yes	No	COR (95% CI)	AOR (95% CI)
Sex				
Male	77(19.3%)	103(25.8%)	0.89(0.59, 1.33)	0.9(0.59, 1.36)
Female	88(22%)	132(33%)	1.00	1.00
Age group				
10-13 years	92 (23%)	120(30%)	1.21(0.81, 1.8)	0.96(0.59, 1.56)
14-17 years	73(18.2%)	115(28.8%)	1.00	1.00
Grade				
5^{th}- 6^{th}	70(17.4%)	83(20.8%)	1.35(0.89, 2.03)	1.33(0.82,2.17)
7^{th} – 8^{th}	95(23.8%)	152(38%)	1.00	1.00
Family size				
≤ 5	102(25.4%)	140(35%)	1.00	1.00
> 5	63(15.8%)	95(23.8%)	0.91(0.60, 1.37)	0.92(0.61, 1.39)
Father's occupation				
Gov't employer	51(12.8%)	62(15.5%)	0.95(0.58, 1.57)	1.12(0.67, 1.88)
Private business	52(13%)	94(23.4%)	1.42(0.88, 2.28)	0.72(0.44, 1.19)
Unemployed	62(15.5%)	79(19.8%)	1.00	1.00
Availability of radio				
Yes	135(33.8%)	197(49.2%)	1.00	1.00
No	30(7.5%)	38(9.5%)	1.15(0.68, 1.95)	1.08(0.63, 1.87)
Availability of TV				
Yes	87(21.8%)	125(31.2%)	1.00	1.00
No	78(19.5%)	110(27.5%)	0.98(0.66, 1.46)	0.89(0.58, 1.38)

5.10 Sanitary survey of schools

A sanitary survey on the availability of sanitary facilities for school children was done using observation checklist. The survey was carried out in the three schools, namely Tabase, Biruhetesefa and Zerayakob primary second cycle schools.

According to this survey, three of the schools had a pipe water source. Concerning to the quantity of water supply, there were 5 tapes functioning for 1806 students in Beruehtesefa, 4 tapes for 1152 students in Tebase and 3 tapes for 1413 students in Zerayakob. Therefore, the amount of water was not adequate compared to the number of school children in each of the schools. Although the source was from the municipal water supply, the water did not assure for its quality periodically. None of the schools had hand washing facilities for school children. Moreover, there was no shower in each of the schools.

Regarding latrine availability, all of the three schools had latrines with separated rooms for males and females. However, the number of seats does not match with the number of children. The proportion of one seat for school children was 1: 249 males and 1: 353 females in Biruhetesefa, 1:57 males and 1: 70 females in Tebase and 1: 75 males and 1: 102 females in Zerayakob. Although three of the schools did not meet the standards, Tebase School had a better seat proportion than the others.

Concerning the cleanliness of the latrines, the slab inside the latrine and outside the latrine was full of human feces. This showed that, children were not using the latrines properly and their teachers did not give attention for cleanliness of the latrine. Latrines were built with block and the slab in each of the schools was in a better condition that, it was free of accident for children.

Each of the three schools kept their school compound fairly clean. Though none of the schools had a dust bin for solid waste collection, they had a refuse pit for solid waste disposal. There were sanitation campaign program once per week in each of the schools.

And, the class rooms were fairly clean. There was neither septic tank nor seepage pit for liquid waste disposal in each of the schools

6. DISCUSSIONS

Hygiene is not just about cleanliness, but also about conditions, activities and practice which protect health and prevent diseases. The convention of the right of child, which has been ratified by most countries of the world states that children have the right to safe environment for enhancing learning, health and development of good citizens. In the contrary, majority of developing countries do not practice this convention due to various reasons.

The overall prevalence of intestinal parasitic infection in this study was 41.3%. This was relatively higher than the study done among school children in Babile town which was 27.2% (30). And, it was lower than a previous study done in Thailand school children that indicate 75.1 %(31).

Proportion of double parasitic infection was found to be 1.2 % in this study. This prevalence was lower than the prevalence in Thailand and a study done in Ethiopia reported by Erosie and Y. Ashiko with a prevalence of 23.1% and 30% respectively (31,32).Whereas, the rate was almost similar to a study done in Babile town which was 4.1 % (30).

The present study revealed that, school children were more infected by protozoan (21.7%) than helminthes (19.5%). A study done in Egypt indicate that a higher rate with a prevalence of 31.5% protozoan and 47.3% helminthes (28).

A.lumbricoides, E.histolytica and G.lambia were the dominant species identified in this study. These findings were similar to a study done in Gaza strip with a prevalence of 11.3% A. lumbricoides(12), in Ethiopia reported by L. Mengistu and E. Brihane with a rate of 12.7% E. histolytica (40) and in Guatemala reported by C. David and etal with a prevalence of 10.9% of G. lambia (41).

The inconsistency in prevalence of intestinal parasitic infection among different studies might happen due to sample size determination, methods employed and geographical and/or economical/ social differences in the study subjects.
Majority (77.5%) of the respondents in this study knew that human feces could transmit diseases. This finding was comparable with a study done in Awassa school children which was 92.4 %(39).

The three schools in this study have latrines for school children with a separate room for males and females. However, the proportion of seats per number of students does not meet the standard 1: 100 boys and 1: 25 girls in the present study (14). These findings were similar to previous study done in Somalia and India, which show that 59% and 45% of the schools in Somalia and India had no adequate latrines seats per students ratio respectively (16,17). Another study done in a number of schools in different regions of Ethiopia indicate that sanitary facilities in school do not meet the minimum requirement (35). The possible reasons for inadequacy of latrines in schools might be lack of budget to construct additional latrines and less attention is given to the problem by concerned bodies including stakeholders.

Regarding utilization of latrines and keeping latrines clean, 68.4% and 56.3% of the respondents in the current study use latrine and clean latrines respectively. These findings were consistent with the earlier study done in Awassa which was 51.2% and 51.7% of the school children use and clean latrines respectively (39).

Although the source of water in the schools was pipe water, the amount does not meet the standard which is a minimum of five liters of water per student in school (14).Study done in Uganda revealed that less than one in five primary schools met the standard five liters of safe water per day per pupil, and thus supports the present finding (15).
A study done in Awassa revealed that, boiling was considered as a method of water treatment at home level by three fourth of the respondents (39). This also supported by the current study which was 74.9% of the study subjects respond boiling as method.

Only few number (7.6%) of school children use cup for drinking water during school times in the present study. However a study done in Awassa revealed that, more than half (59.4%) of school children use cup (39). The possible explanation for the better utilization of cups in Awassa study might be their knowledge on disease transmission through improper hand washing during water drinking was better than respondents of this study.

According to the present study, none of the schools had hand washing and shower facilities for school children. Earlier findings done in South Africa reported similar result with the current findings. The report in South Africa indicate that 90% of the schools lack a well designed and appropriate sanitation facilities like hand washing and shower(19). This is because of scarcity of budget and lack of recognition to these facilities in the school management.

Majority of study participants in this study agreed that, body bath and cloth washing were considered as personal hygiene. This finding was harmonious with the findings of Awassa study but hand washing and finger nail cutting were well recognized by the respondents of this study. On the other hand, respondents of Awassa study take bath more frequently per week than this study (39). This might be due to the cold weather made the respondents uncomfortable to take bath frequently in the present study.

Concerning the source of solid wastes in schools, pieces of paper was the major source. Whereas, plastics were recognized as a source by few respondents. In this study, 97.1% of the respondents mentioned pieces of paper as a major source and plastic was recognized only by 4.4% of the respondents. This was in line with a study done in Awassa, that was 84.1% and 2.6% of the respondents recognized piece of paper and plastics were sources of solid wastes in schools respectively (39).

Regarding the methods of proper solid wastes management, burning was better recognized by study subjects compare to composting in the current study. This finding shows similarity with the study done in Awassa (39). This might be due to the fact that,

solid wastes generated in schools were combustible and most schools dispose solid wastes by burning. However, compost should be considered for its importance as a fertilizer to school gardens. In addition to this, respondents (91.2%) of Awassa study disposed solid wastes better than the current study respondents which were 60.6%.

Nearly three fourth of participants in this study have got information on hygiene and sanitation better than participants (26.1%) of Awassa study. The major sources of information for both studies were teachers. However, sources from health professionals and mass media were very low in both studies (39). The possible explanation is that, health workers from the health sector did not give attention to school health activities, especially on hygiene and sanitation.

7. STRENGTHS AND LIMITATIONS

Strengths

- The study used multiple tools to look for consistency of findings
- Formol-ether concentration method was used for stool examination to increase validity

Limitations

- Because of resource scarcity, all interviewed respondents were not sampled to intestinal parasite examination.
- It would have been better if observation method was used for hygiene and sanitation practice of school children rather than interviewing so as to minimize the effect of social desirability bias.

8. CONCLUSIONS AND RECOMMENDATIONS

Conclusions:

According to the findings of this study, the following conclusions are forwarded:

- There was high prevalence of intestinal parasitic infection among school children.
- Despite more than half of the respondents were knowledgeable and had practiced to hygiene and sanitation, the percentage of those with less knowledge and practice are high.
- Sex and availability of radio in the household were significantly associated with knowledge level.
- The amount of water per student and the number of latrines per student ratio does not meet the required standards.
- Cleanliness of latrines is bad, which is conducive to diseases transmission.
- There is a fair solid waste disposal system in the schools.
- Generally, schools in Debre Birhan lack sanitary facilities.

Recommendations:

- Education and health sectors, school heads and staffs and stakeholders should provide a life skill based health and hygiene education to increase the current knowledge and practice of hygiene and sanitation among school children.
- Education sector along with school community should encourage school parent and /or community partnership to participate actively on school hygiene and sanitation programs.
- Schools need to establish school hygiene and sanitation club to coordinate school hygiene and sanitation activities.
- Improve the amount of water supply by increasing the number of taps.
- Adequate numbers of pit latrines are needed.
- Schools should provide sanitary facilities like hand washing.
- Schools should arrange program to keep latrines clean and use latrines properly by school children.
- Periodic (every six month) deworming with albendazole for helminthes should be given to school children in collaboration with the health sector and other stakeholders.

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10. ANNEXES

Annex1. **Stool examination for parasite procedure (38)**

1. Using a rod or stick, emulsify an estimated 1g (pea-size) of feces in about 4ml of 10% formol water contained in a screw-cup bottle or tube.

Note: Include in the sample, feces from the surface and several places in the specimen.

2. Add a further 3-4 ml of 10% v/v formol water, cap the bottle, and mix well by shaking.
3. Sieve the emulsified feces, collecting the sieved suspension in a beaker.

4. Transfer the suspension to a conical (centrifuge) tube made of strong glass, copolymer, or polypropylene. Add 3-4ml of diethyl ether or ethyl acetate.

Caution: Ether is highly flammable and ethyl acetate is flammable, therefore use well away from an open flame, and e.g. flame from the burner of a gas refrigerator, Bunsen burner, or spirit lamp. Ether vapor is unaesthetic; therefore make sure the laboratory is well ventilated.

5. Stopper* the tube and mix for 1 minute. If using a vortex mixer leave the tube unstoppered and mix for about 15 seconds (it is best to use a boiling tube)

***** Do not use a rubber bung or a cap with a rubber liner because ether attacks rubber.

6. with a tissue or pieces of clothe wrapped around the stop of the tube, loosen the stopper (considerable pressure will have built up inside the tube)

7. Centrifuge immediately at 750-1000g (approx. 300rpm)

After centrifuging, the parasite will have sediment to the bottom of the tube and the fecal debris will have collected in a layer between the ether and formol water.

8. Using a stick or the stem of a plastic tube pipette, loosen the layer of the fecal debris from the side of the tube and invert the tube to discard the ether, fecal debris , and formol water. The sediment will remain.

9. Return the tube to its upright position and allow the fluid from the side of the tube to drain to the bottom. Tap the bottom of the tube to resuspend and mix the sediment. Transfer the sediment to a slide, and cover with a cover glass.

10. Examine the preparation microscopically using 10 X objective with the condenser iris closed sufficiently to give good contrast. Use the 40 X objective to examine small cysts and eggs. To assist in the identification of cysts, run a small drop of iodine under the cover glass Although the motility of strongyloides larvae will not be seen, the non motile larvae can be easily recognized.

11. If required, count the number of each species of egg in the entire preparation. This will give the approximate number per gram of faeces.

Annex2 .Voluntary information sheet and assent form for school children under eighteen years old (English version)

Section I. Voluntary information sheet for school children under eighteen years old.

.**Greeting!**

Hello**!** I am_____ I am working in the research Team of the Addis Ababa University, Faculty of Medicine, School of Public Health. I would like to ask you a few questions about your hygiene and sanitation knowledge and practice in and out side the school and socio economic background of your parents.

In addition, we need a sample of your stool for parasite examination. Your genuine response for the questions will help us to improve the health of school children. Your name will not be written in this form and will never be used in connection with any information you tell us. All information given by you will be kept strictly confidential. Your participation is voluntary and you are not obligate to answer any question you do not wish to answer. If you feel discomfort with the interview, it is your right to drop it any time you want. This interview will take about 25 minutes. Could I have your permission to continue?

1. If yes, go to the assent form and continue the interview.
2. If no, skip to the next participant by writing reasons for his/her refusal.

_____

Section II. Informed assent form:

Based on the above information, I agreed to participate in the study.

Signature_____ Date: _____

Interviewer:

Name_____ signature_____

Date of interview _____Time started _____Time completed_____

Result of interview: 1. Completed 2. Respondent not available 3.Refused

4. Partially completed

Supervisor's Name _____

Signature _____

Annex 3. Questionnaire (English version)

Name of the school _____

Identification number _____

I. Socio-demography

Sr. No.	Questions	Responses	Code	Skip to
101	Grade and section	_____, _____		
102	Age	_____ years		
103	Sex	1. Male 2. Female		
104	What is your religion**?**	1. Orthodox Christian 2. Protestant 3. Muslim 99. Other(specify)_____		
105	Family size	_____		
106	What is yours father's occupation**?**	1. Government employee 2. Private business 3. Unemployed 99. Others (specify) _____		
107	What is yours mother's occupation**?**	1. House wife 2. Government employee 3. Merchant 99. Other (specify) _____		
108	Is there radio in your house**?**	1. Yes 2. No		
109	Is there TV set in your house**?**	1. Yes 2. No		

II. Knowledge of school children on hygiene and sanitation

Sr. No.	Questions	Responses	Code	Skip to
201	What is personal hygiene mean**?** (Don't read the responses)	1. Washing clothes 2. Bathing 3. Hand washing 4. Cutting finger nails 99. Others(specify)_____		
202	Which diseases can occur due to poor personal hygiene and sanitation**?** (Don't read the responses)	1. Skin diseases 2. Diarrhea 3. Intestinal parasite 4. Trachoma 99. Others(specify)_____		
203	Do you think human feces transmit diseases**?**	1.Yes 2. No		205
204	If the answer for Q203 is Yes, how do prevent diseases transmitted by human feces (Don't read the responses)	1. Use latrines 2. Wash hands after visit latrines 3. Keep latrines clean 99. Others(specify)_____		
205	What are the methods for safe drinking water**?** (Don't read the responses)	1. Boiling 2. Use chemicals 3. Filtering 99. Others(specify)_____		

206	What are the common solid wastes generated in school**?** (Don't read the responses)	1. Paper 2. Plastics 3. Chalk dusts 4. Grasses 99. Others(specify)_____		
207	What are the methods for proper disposal of solid wastes**?** (Don't read the responses)	1. Collect in dust bin/receptacles 2. Burn in refuse pit 3. Buried 99. Others(specify)_____		
208	What happens if solid wastes don't disposed properly**?** (Don't read the responses)	1. Flies can breed 2. Rats can breed 3. Smell 4. Unsightly environment 5. Health problems 99. Others(specify)_____		
209	Do you get hygiene and sanitation education**?**	1.Yes 2. No		
210	If the answer for Q209 is Yes, where do you get the information (Don't read the responses)	1. From teachers 2. From health professionals 3. From mass media 4. From parents 99. Others(specify)_____		

III. Hygiene and sanitation practice of school children

Sr. No.	Question	Responses	Code	Skip to
301	When do you wash your hands**?** (Don't read the responses)	1. I do not wash 2. Before eating 3. After eating 4. After visiting toile 99. others (specify)_____		303
302	Do you use soap when you wash your hands**?**	1. Yes 2. No		
303	How frequent do you take a bath**?** (Don't read the responses)	1. Once a week 2. Twice a week 3. Three times a week 4. More than three times 99. Others(specify)_____		
304	Do you cut/clean your finger nails**?**	1. Yes 2. No		
305	Do you always wear shoes**?**	1. Yes 2. No		
306	Is there latrine in your living house**?**	1. Yes 2. No		
307	Where do you defecate your feces in and out of school**?** (Don't read the responses)	1. Use latrine 2. 0pen field defecation 99. Others(specify)_____		
308	Do you always keep latrine clean**?**	1. Yes 2. No		
309	Do you dispose solid wastes properly**?**	1. Yes 2. No		
310	Do you participate in school sanitation and class room cleaning**?**	1. Yes 2. No		

311	For what purpose do use the water in the school (Don't read the responses)	1. No water available 2. For drinking 3. For hand washing 4. For bathing 99. Others(specify)_____		313
312	How do you draw water for drinking in the school? (Don't read the responses)	1. Use cup 2. By hands 3. Directly by mouth 99. Others(specify)_____		
313	Do you buy street foods and eat**?**	1. Yes 2. No		

IV. Observational check list

Name of the school _____

Sr.No.	Questions	Responses	Code	Skip to
401	Is there water for school children in the school**?**	1. Yes 2. No		407
402	If the answer for Q.401 is yes, what is the source	1.Pipe 2. Spring 3. Hand dug well 4. Roof catchments 99. Others(specify)_____		
403	Is the water source adequate for the school children**?**	1. Yes 2. No		
404	Are there hand washing facilities for students**?**	1.Yes 2. No		
405	Is there a shower facility for student n the school**?**	1.Yes 2. No		
406	Is the water tested for its safeness**?**	1.Yes 2. No		
407	Is there latrine in the school**?**	1. Yes 2. No		413
408	Is there a separate latrine for boys and girls**?**	1. Yes 2. No		
409	Is the number of seats adequate to the school children**?**	1. Yes 2. No		
410	If the answer for Q 409 is No, the proportion will be	1seat : _____ for boys 1seat : _____ for girls		

411	Cleanliness of the inside part of latrine	1. Good 2. Satisfactory 3. Bad		
412	Condition or status of the latrine	1.Good 2. Satisfactory 3. Bad		
413	School compound cleanliness	1. Good 2. Satisfactory 3. Bad		
414	Cleanliness of the class room	1. Satisfactory 2. Unsatisfactory		
415	Is there regular school sanitation and class room cleaning program**?**	1. Yes 2. No		
416	Are there dust bin/receptacles for solid waste storage in the school**?**	3. Yes 4. No		
417	Is there proper solid waste disposal system in the school**?**	1. Yes 2. No		419
418	If the answer for Q417 is Yes, how the solid waste stored and disposed in the school	1. Stored and burn in the refuse pit 2. Stored and Burying 3. Stored and burn in closed incinerator 99. Others (specify)_____		
419	Is there proper liquid waste disposal system in the school**?**	1. Yes 2. No		
420	If the answer for Q 419 is Yes, how the liquid waste is disposed	1. Use septic tank 2. Use seepage pit 99. Others(specify)_____		

Name of data collector ---------- Signature---------- Date----------

Supervised by:

Name: ---------- Signature---------- Date----------

Annex 4. (Amharic version)

እድሜቸው ከ አስራስምንት ዓመት በታች ለሆኑ ተሚዎች የሚጃ መኪጫ የበጎ ፈቃደኝነት ሚረጋገጫ ቅጽ

ክፍል አንድ፡ እድሜቸው ከ አስራስምንት ዓመት በታች ለሆኑ ተሚዎች የሚጃ መኪጫ ቅጽ

ጤና ይስጥልኝ! የእኔ ስም---------- ይባላል፡፡ አዲስ አበባ ዩኒቨርስቲ ህክምና ፋካሊቲ የህ/ሰብ ጤ አጠባበቅ ት/ቤት በሚደርገው በዚህ ጥናት ተሳታፊ ስሆን በግልና በአካባቢ ንጽህና ያለህን/ያለሽን ግንዛቤና እንዴት በተግባር እንደምታውለው/ይው ቃለ ማከይቅ ለሜድረግና እንዲሁም በንጽህና ጉድለት ምክኒያት ጥገኛ የአንጀት ወስጥ ትላትሎች እንዳለብህ/እንዳለብሽ ለሚጋገጥ ሀለት ግራም የሚሆን የዐይነ ምድር ናሙና ለመዉሰድ አስበናል፡፡በተጨማሪም ስለ ቤተሰብህ/ሽ የተወሰኑ ጥያቄዎችን እናቀርባለን፡፡

የዚህ ጥናት ዓላማ የአንተን/የአንቺን እና የት/ቤት ጓደኞችህ/ሽ የጤ ሁኔታ ለማሻሻል ስለሆነ ትክክለኛወን ሚጃ መኪጠት ጠቀሜታው የጎላ በመሆኑ ያአንተን/ያአንችን ትብብር በጣም እንሻለን፡፡ ስምህ/ሽ እና አድራሻህ/ሽ በማከይቁ ወስጥ አይካተትም እንዲሁም የአንተ/የአንቺ ማንነትም ሆነ የሰጠኸው/ሽው ምላሽ የአንተ/የአንቺ ስለሚሆኑ በምንም ዐይነት ሁኔታ አይገለጽም፡፡ በዚህ ጥናት ለመሳተፍ የአንተ/የአንቺ ሙሉ ፈቃደኝነት ስንጠይቅ ያለምንም አስገዳጅነት ሲሆን ፈቃደኛ ካልሆንክ/ሽ በጥናቱ አለመሳተፍና መሳተፍ ብትጀምር/ሪም ካልተመቸህ/ሽ በማንኛውም ሰዐት ለማቋረጥ ሙሉ መበት አለህ/ሽ፡፡ ማከይቁ ሃያ አምስት ደቂቃ ይወስዳል፡፡

በጥናቱ ለመሳተፍ ፈቃደኛ ነህ/ሽ ?

1.ተሚው ፈቃደኛ ሚሆኑ ካረጋገጡ ወደ ስምምነት ሚጋገጫ ፎርመን በመሞላት ቃለ ማከይቁን ይጀምሩ

2.ተሚው ፈቃደኛ ካልሆነ /ች ምክኒያቱ ይገለጽ

ክፍል ሀለት፡ እድሜቸው ከአስራስምንት ዓመት በታች ለሆኑ ተሚዎች የበጎ ፈቃደኝነት ሚረጋጫ ቅጽ

ከላይ በተሰጠኝ ማብራሪያ መሰረት በጥናቱ ለመሳተፍ ተስማምቻለሁ

ፊርማ _____ ቀን_____

የሚጃ ሰብሳቢው ሥም _____ ፊርማ_____

ማከይቁ የተደረገበት ቀን_____ ማከይቁ የተጀመረበት ሰዐት_____

ማከይቁ የተጠቀቀበት ሰዐት_____

የማከይቁ ሁኔታ 1. ሙሉ ለሙሉ ተሞልቷል 2. ሚጃ ሰጪው አልተገኘም

3. ሚጃ ሰጪው ፈቃደኛ አይደለም 4. ሚጃው በከፊል ተሞላተል

ያረጋገጠው ሱፐርቫይዘር ሥም_____ ፊርማ_____

Annex5. **ማከይቅ**

የት/ቤቱ ስም_____

የተሚው መለያ ቁጥር_____

I, ስለተሚወኖ ቤተሰቡ ማህበራዊና ኢኮኖሚዊ ሁኔታ

ተ.ቁ	ጥያቄ	መልስ	ኮድ	ወደ ሞጥለው ይለፉ
101	ክፍልና ሴክሽን	_____, _____		
102	እድሜ	_____ ዓመት		
103	ጾታ	1. ወንድ 2. ሴት		
104	ሃይኖትህ/ሽ ምንድን ነው	1. አርቶዶክስ 2. ፕሮቴስታንት 3. ሙስሊም 99. ሌላ ካለ ይጠቁስ_____		
105	የቤተሰብ ብዛት	_____		
106	ያባትህ/ሽ ሥራ ምንድን ነው	1. የመንግስት ሰራተኛ 2. **የግል ሥራ** 3. **ሥራ አጥ** 99. ሌላ ካለ ይጠቁስ _____		
107	የእናትህ/ሽ ሥራ ምንድን ነው	1.የቤት እመቤት 2. የመንግስት ሰራተኛ 3. ነጋዴ 99. ሌላ ካለ ይጠቁስ _____		
108	ቤታችሁ ወስጥ ቴሌቭዥን አለ	1 አለ 2. የለም		
109	ቤታችሁ ወስጥ ሬዲዩ አለ	1. አለ 2. የለም		

II. ተሜው በሃይጂንና ሳኒቴሽን ያለው ግንዛቤ በተመለከተ

ተ.ቁ	ጥያቄ	መልስ	ኮድ	ወደ ሞጥለው ይለፉ
201	የግል ንጽህና ሚለት ምን ሚለት ነው (የመልስ አሜራጮችን አይግለፁ)	1. ገላ መታተብ 2. እጅ መትጠበ		

		3. የእጅ ጥፍር መቁረጥ 4. ልብስ ማጠብ 99. ሌላ ካለ ይጠቅስ_____		
202	በግልና የአካባቢ ንጽህና ጉድለት የሚጥሉ በሽታዎችን ዘርዝር (የመልስ አማራጮችን አይግለፁ)	1.የቆዳ በሽታ 2.ተቅማጥ 3.የሆድ ወስጥ ትላትሎች 4.ትራኮማ 5.ሌላ ካለ ይጠቅስ_____		
203	የሰው ዐይነ ምድር በሽታ ያስተላልፋል ብለህ/ሽ ታምናለህ/ታምኛለሽ	1.ያስተላልፋል 2. አያስተላልፍም		
204	ለጥያቄ 203 መልስህ/ሽ አዎን ከሆነ እንዴት መከላከል ይቻላል (የመልስ አማራጮችን አይግለፁ)	1. መጸዳጃ ቤት መጠቀም 2. ሽንት ቤት ከተጠቀሙ በኃላ እጅን መታጠብ 3. የመጸዳጃ ቤት ንጽህና መጠበቅ 99. ሌላ ካለ ይጠቅስ_____		
205	ለማጠጥ የሚሆን ወሃን ንጽህና እንዴት ማጠበቅ ይቻላል (የመልስ አማራጮችን አይግለፁ)	1.ወሃወን በማፍላት 2.ኬሚክል በማጠቀም 3.ወሃወን በማጣራት 99. ሌላ ካለ ይጠቅስ_____		
206	በት/ቤት ዋና ዋና የደረቅ ቆሻሻ ምንጮች የትኞቹ ናቸው (የመልስ አማራጮችን አይግለፁ)	1.ቁርጥራጭ ወረቀቶች 2.ፕላስቲኮች 3.የኾክ ብናኞች 4.ሳርና ቅጠላቅጠል 99. ሌላ ካለ ይጠቅስ_____		
207	የደረቅ ቆሻሻ እንዴት ታስወግዳለህ/ሽ (የመልስ አማራጮችን አይግለፁ)	1.በደረቅ ቆሻሻ ማጠራቀሚያ በመጣል 2.በደረቅ ቆሻሻ መጣያ ጉድጓድ ወስጥ በማቃጠል		

		3.በመቅበር 99. ሌላ ካለ ይጠቀስ_____		
208	የደረቅ ቆሻሻ በአግባቡ ካልተወገደ ምን ችግር ያመጣል (የመልስ አማራጮችን አይግለፁ)	1.የዝንብ መራቢያ ይሆናል 2.የዐይጥ መራቢያ ይሆናል 3.መጥፎ ሽታ ይፈጥራል 4.አካባቢን ያቆሽሻል 5.የጤፍ ችግር ያመጣል 99. ሌላ ካለ ይጠቀስ_____		
209	ስለ ግልና አካባቢ ንጽህና ትምህርት አግኝተህ/ሽ ታውቃለህ/ታውቂያለሽ	1.አውቃለሁ 2. አላወቅም		
210	ለጥያቄ 209 መልስህ/ሽ አዎን ከሆነ ትምህርቱን ከየት አገኘኸው/አገኘሽው (የመልስ አማራጮችን አይግለፁ)	1.ከመምህራን 2.ከጤፍ ባለሙያ 3.ከመገናኛ ብዙሃን 4.ከቤተሰብ/ከወላጆች 99. ሌላ ካለ ይጠቀስ)_____		

III. ስለ ተሜወየግልና አካባቢ ንጽህና አተገባበር በተመለከተ

ተ.ቁ	ጥያቄ	መልስ	ኮድ	ወደ ሚቀጥለው ይለፉ
301	እጅህን/ሽን መቼ ትጣጠባለህ/ትታጠቢያለሽ (የመልስ አማራጮችን አይግለፁ)	1. አልታጠበም 2. ከምግብ በፊት 3. ከምግብ በኃላ 4. መጸዳጃ ቤት ከተጠቀሙ በኃላ 99. ሌላ ካለ ይጠቀስ_____		303

302	እጅህን/ሽን ስትታጠብ/ቢ ሳማ ትጠቀማለህ/ትጠቀሚለሽ	1. እጠቀማለሁ 2. አልጠቀምም		
303	ገላህን/ሽን በሳምንት ምን ያህል ጊዜ ትታጠብለህ/ትታጠቢያለሽ (የሚልስ አሜሬቾን አይግለፁ)	1. አንድ ጊዜ 2. ሁለት ጊዜ 3. ሶስት ጊዜ 4. ከሶስት ጊዜ በላይ 99. ሌለ ካለ ይጠቀስ_____		
304	ጥፍርህ ሲያደግ በወቅቱ ትቆርጣለህ/ታጸዳለህ	1. እቆርጣለሁ/አጸዳለሁ 2. አልቆርጥም/አላጸዳም		
305	ሁልጊዜ ጫማ ታደርጋለህ/ታደርጊያለሽ	1. አደርጋለሁ 2. አላደርግም		
306	በመኖሪያ ቤታችሁ መጸዳጃ ቤት አለ	1. አለ 2. የለም		
307	ዐይነ ምድርህን የት ትጸዳዳለህ/ትጸዳጂያለሽ (የሚልስ አሜሬቾን አይግለፁ)	1. መጸዳጃ ቤት እጠቀማለሁ 2. በየሜዳው 99. ሌለ ካለ ይጠቀስ_____		
308	የመጸዳጃ ቤት ንጽህና ትጠቢቃለህ/ትጠቢቃለሽ	1. እጠቢቃለሁ 2. አልጠበቅም		
309	የደረቅ ቆሻሻ በአግባቡ ታስወግዳለህ/ታስወጊያለሽ	1. አስወግዳለሁ 2. አላስወግድም		
310	በት/ቤት ወስጥ በጽዳት ዘመቻ ትሳተፋለህ/ትሳተፊያለሽ	1. እሳተፋለሁ 2. አልሳተፍም		
311	በት/ቤት ወስጥ ውሃን ለምን ለምን ትጠቀማለህ/ትጠቀሚለሽ (የሚልስ አሜሬቾን አይግለፁ)	1.ውሃ የለም 2.ለማጠጥ 3.ለእጅ መታጠቢያ 4.ለገላ መታጠቢያ 99.ሌለ ካለ ይጠቀስ_____		313
312	በት/ቤት ወስጥ ውሃ እንዴት	1. በውሃ ማጠጫ ዕቃ		

	ትጠላለህ/ትጠጪያለሽ (የሚልስ አሚራጮችን አይግለፁ)	2. በእጅ 3. በቀጥታ በአፍ 99. ሌላ ካለ ይጠቀስ_____		
313	በመንገድ ዳር የሚሸጡ ምግቦችን ትጠቀማለህ/ትጠቀሚያለሽ	1. እጠቀማለሁ 2. አልጠቀምም		

IV. የት/ቤቱ ሳኒቴሽን ሁኔታ አጠቃላይ ምልከታ

የት/ቤቱ ስም_____

ተ.ቁ	ጥያቄ	መልስ	ኮድ	ወደ ሚቀጥለው ይለፉ
401	በት/ቤቱ ወስጥ የወሃ አቅርቦት አለ	1. አለ 2. የለም		 407
402	ለጥያቄ 401 መልሱ አዎን ከሆነ ምንጩምንድን ነው	1.የቧንቧ ወሃ 2. የምንጭ ወሃ 3. የጉድጓድ ወሃ 4. የዝናብ ወሃ 99. ሌላ ካለ የጠቀስ_____		
403	የወሃው ማጠን ከተሚው ቁጥር ጋር የመጣጠፍል	1. ይመጣጠፍል 2. አይመጣጠንም		
404	ለተሚዎች የእጅ መታጠቢያ አለ	1. አለ 2. የለም		
405	በት/ቤቱ ወስጥ ለተሚዎች የገላ መታጠቢያ አለ	1. አለ 2. የለም		
406	የወሃው ጥራት በየጊዜው ይረጋገጣል	1. ይረጋገጣል 2. አይረጋገጥም		
407	በት/ቤቱ ወስጥ የመጻዳጃ ቤት አገልግሎት አለ	1. አለ 2. የለም		 413
408	ለወንዶችና ለሴቶች የተለየ መጻዳጃ ቤት አለ	1. አለ 2. የለም		
409	የመጻዳጃ ቤቱ መቀመጫ ቁጥር ከተሚው ቁጥር ጋር ይመጣጠፍል	1. ይመጣጠፍል 2. አይመጣጠንም		
410	የጥያቄ ቁጥር 409 መልስ አይመጣጠንም ከሆነ ምጥጥኑ ይገለጽ	1መቀመጫ _____ ወንዶች 1መቀመጫ _____ ሴቶች		
411	የመጻዳጃ ቤቱ የወስጥ ንጽህና ሁኔታ ምን ይመስላል	1. ጥሩ		

		2. በቂ (ደህና) 3. መጥፎ		
412	የመጸዳጃ ቤቱ አጠቃላይ ሁኔታ ምን የሚመስል	1.ጥሩ 2. በቂ (ደህና) 3. መጥፎ		
413	የት/ቤቱ ግቢ ንጽህና ሁኔታ ምን ይመስላል	1. ጥሩ 2. በቂ (ደህና) 3. መጥፎ		
414	የመማሪያ ክፍሎች ንጽህና ሁኔታ ምን ይመስላል	1. ጥሩ 2. መጥፎ		
415	በት/ቤቱ ቋሚ የጽዳት ዘመቻ አለ	1. አለ 2. የለም		
416	በት/ቤቱ ወስጥ የቆሻሻ መጣራቀሚያ አለ ወይ	1. አለ 2. የለም		
417	በት/ቤቱ ወስጥ ትክክለኛ የደረቅ ቆሻሻ አወጋገድ ስርዐት አለ	1. አለ 2. የለም		419
418	ለጥያቄ 417 መልስ አዎን ከሆነ የደረቅ የቆሻሻ አወጋገድ ምን ይመስላል	1. በደረቅ ቆሻሻ መጣያ ጉድጓድ ወስጥ ይቃጠላል 2. ይቀበራል 3. በእንሲኔሬቴር ይቃጠላል 99. ሌላ ካለ ይጠቀስ_____		
419	በት/ቤቱ ወስጥ ትክክለኛ የፍሳሽ ቆሻሻ አወጋገድ ስርዐት አለ	1. አለ 2. የለም		
420	ለጥያቄ 419 መልስ አዎን ከሆነ የፍሳሽ ቆሻሻ አወጋገድ ምን ይመስላል	1. ሴፕቲክ ታንክ ይጠቀማሉ 2. በፍሳሽ ሚረጊያ ጉድጓድ 99. ሌላ ካለ ይጠቀስ_____		

የሚጀመ ሰብሳቢው ሥም---------- ፊርማ----------
ቀን----------

ያረጋገጠው ሱፐርቫይዘር ሥም ---------- ፊርማ---------- ቀን----------