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PREVALENCE OF SOIL-TRANSMITTED HELMINTHS (STH) INFECTIONS AMONG PRIMARY SCHOOL CHILDREN IN SELECTED GEOGRAPHICALLY ISOLATED DISADVANTAGED AREAS (GIDA): BASIS FOR SCHOOL-BASED STH PREVENTION AND CONTROL PROGRAM

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ABSTRACT

This study determined the prevalence of soil-transmitted helminthes (STH) infection among primary school children in selected geographically isolated and disadvantaged areas (GIDA) in Northern Samar. It also determined the intensity threshold level of infection, occurrence of single or multiple infection, identify which age group show highest in prevalence and intensities. The outcome was significant in formulating a school-based soil-transmitted helminthes prevention and control program. It was found out that the prevalence rate of the STH infection among the primary school age children was significantly high. However, in terms of intensity threshold level of infection among the (STH) species, majority had a light infection predominated by trichuris, and followed by ascaris while hookworm species caused low level of infection. A majority had single infection, followed by double and triple infection, in that order. Single infection was highest among trichuris species as observed, double infection appeared with ascaris and trichuris species and the least was the triple infection where the three STH species were present. It also proved that a school-based soil-transmitted helminthiasis control and prevention program specific to the locality is necessary in order to address its public health concern specifically among school children.

Keywords
soil-transmittedhelminthes, GIDA, trichuris, public health

Introduction

The problem of helminthic parasitism has not gone away. At present, soil-transmitted helminth infections (STH) are among the most common infections worldwide and affect the poorest and most deprived communities. More than 1.5 billion people, or 24% of the world's population, are infected, 270 million are preschool-age children and over 600 million are school-aged (WHO, 2011).

The Philippines is one of the many developing countries in East Asia afflicted with these diseases. It is a persistent problem that affects not only the adult population but also the school children that harbor the greatest load of infection and are significant sources of transmission (Gesmundo, 2010).

In a more recent study conducted by Papier (2014) on childhood malnutrition and parasitic helminth interactions to 693 school-age children from 5 schistosomiasis endemic area in the province results showed that the proportion of children infected with hookworm is 22.0%, but were significantly lower among children who met the recommended energy and nutrient intake (RENI) for total calories. *Trichuristrichiuria* is 74.10% and was highest among children who did not meet the RENI for energy.

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Considering the recent data at hand, the occurrence of parasitism still remains lingering and threatening the health of the people in our province. Undoubtedly, this is a pressing problem and a major concern that needs to be continually addressed particularly by the health sector, which the researcher is a part of.

While there is a long list of parasitic species of helminthes, only few are recognized to cause havoc to human health. They cause physical ill-health, retard physical and mental development, impair cognitive development resulting to poor performance of children in schools and reduces manpower capability to do fruitful works among adults. As a whole, effects of these few but pathogenic parasites can impair socio-economic development (Belizario*et al*, 2014).

Of major STH parasitic concern to humans are the roundworm, *Ascarislumbricoides*; the whipworm, *Trichuristrichiura*; and the hookworms, *Necatoramericanus* and *Ancylostomaduodenale*(Tarafder*et al,* 2006).

Transmission is of several ways through ingestion of fecally-contaminated vegetable, drinking water, raw or undercooked meats and soil contaminated with feces and/or skin penetration of larvae (Hotez*et al*, 2006).

According to WHO (1998) an assessment reflecting the epidemiologic status of STH infections is vital in order to determine the appropriate intervention for a community. The latest form the WHO (2012) strategic plan for eliminating STHs as a public health problem in children puts the emphasis on school-age children.

This study is aimed to establish baseline epidemiological information on STH infections among primary school children in selected GIDA in Northern Samar. This is where community's population are marginalized and socio-economically separated from mainstream society. They are isolated due to distance, transportation difficulties (island, upland, lowland or landlocked), hard to reach and underserved or unserved communities. The place is high in poverty incidence and with the presence of the vulnerable sectors of the society, the school-age children.

It is hoped that this study would provide a sound basis for evaluating the present status and the need for intervention in the population. The information may also be a good data as basis for monitoring and evaluation of the impact of the STH control program in Northern Samar. More importantly, results of this study would produce essential data to guide the researcher in the development of school-based SHTs control program specific to the locality.

METHODOLOGY

A cross-sectional descriptive-evaluative study using the purposive-proportionate sampling technique was used to establish the prevalence and intensity of soil transmitted helminthiasis among primary school children in GIDA of Northern Samar. It described the status of the selected areas of the cross-sectional group of primary school-age children and evaluate its status in terms of the prevalence and intensity of STH infections. The outcome of the process was made an input in drafting a school-based soil-transmitted helminthes prevention and control program for school-age children specific to the locality.

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Determination of the prevalence of STHs. This was done by fecal examination of the school-age children being investigated. This was expressed in percentage and refers to the number of school children infected with helminthes. Prevalence of infections gives information on the number of infected people in a population.

Determination of the intensity of STH infections. This was the measurement on the amount of parasite burden in an infected child measured by the number of eggs per gram of feces categorized as low, moderate and heavy intensity.

Determination of the presence of multiple infection. This refers to the occurrence of multiple parasitic infections in an individual respondent categorized whether it is single, double or triple infection.

It is expected that output of the study was a comprehensive plan or design of a school-based soil-transmitted helminthiasis prevention and control program made specific to the primary school-age children in the locality.

Population and sampling of the study

The study population compose of primary school-age children from elementary schools located in geographically isolated and disadvantaged barangays. The parents of the children who participated in this study were also considered as part of the population considering that in some aspects of the profile on human factors some information or data were also derived from them. Primary school-age children participants were those who were present during the actual collection of fecal samples and with consent of their respective parents.

Considering time, funds, personnel and objectives of the study and considering further that the province of Northern Samar if clustered into three areas have in each geographic location, ecology, soil, and temperature. The WHO recommends a minimal sample size of 200 - 250 school children from the elementary schools. The WHO recommendation further states that a sample of eight (8) randomly selected classes of thirty (30) children would provide sufficient data to plan appropriate control measures against soil transmitted parasites. Since the end point intent of this study based on its expected results was to formulate appropriate, effective and sustainable control program for the management of commonly occurring soil transmitted helminthes causing helminthiasis among school-age children, this study followed this recommendation.

With the above premise and in order to satisfactorily answer the objectives and the general intent of the study, the province was then represented by three GIDA municipalities taken from the three geographical areas of the province clustered or categorized into island, lowland and highland areas. Thus, the municipality of Biri, Northern Samar represented the island areas, Pambujan, Northern Samar for the lowland areas and Lope de Vega, Northern Samar for the highland areas. From each chosen municipality GIDA barangays with elementary schools were purposively chosen. Three (3) municipalities and the corresponding barangays were chosen based on the criterion that samples taken for STH prevalence should come from subjects who did not take any anti-helminthic drugs for the last three (3) months.

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Since most of the GIDA municipalities have implemented the mass filariasis treatment, most of the population were given the anti-filariasis drugs plus a dewormer, except for few barangays, which were the chosen areas as samples of this study.

Scoring and Interpretation

Numerical values were assigned in measuring the variables for statistical computation and subsequent analysis. The scoring and interpretation of this study was as follows:

A. The respondents' profile in terms of human and hygiene/sanitation-related and behavioral factors in STH infection raw scores were encoded for statistical computations.

B. To determine prevalence of intestinal helminthes infections, multiple infection and conditions, the formula below was used:

PREVALENCE OF INFECTION

$$Prevalence\ (\%) = \frac{Total\ No.of\ Infected\ Samples}{Total\ No.of\ Samples\ Examined} \times 100$$

Using the above formula, the computed frequency of infection for school-age children who turned to be positive for STH infection were determined. Results were then categorized using a scale recommended by the WHO as "high prevalence", "moderate prevalence" and "low prevalence". The scaling corresponds to prevalence category of 51-100% 21-50% and 0-20%, respectively.

Table 1. Interpretation of prevalence rate

PREVALENCE RATE	INTERPRETATION
51%-100%	"High Prevalence"
21%-50%	"Moderate Prevalence"
0-20%	"Low Prevalence"

INTENSITY OF INFECTION

To determine degree of parasite burden in an infected child, helminth egg load according to species were counted per gram of feces (EPG) examined in the Kato-Katz procedure. The EPG was determined by multiplying with a standard conversion factor. The infection status of an infected individual (light/moderate/heavy) developed and recommended by Montresor (2002) of WHO was used. The arithmetic mean egg intensity for each species of parasite was calculated using the formula below:

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$$Arithmetic\ Mean = \frac{\sum egg}{n}$$

Where$\sum egg$ = Sum of each individual egg
n = the number of subjects investigated

Table 2. Intensity thresholds for Soil transmitted helminthes

Helminthes *(Species)*	**Intensity Threshold**		
	Light	**Moderate**	**Heavy**
Ascarislumbricoides	1 – 4999 *epg*	5000 -49999 *epg*	≥50000 *epg*
Trichuristrichura	1 – 999 *epg*	1000 – 9999 *epg*	≥10000 *epg*
Ancylostomaduodenale A. intestinalis	1 – 1999 *epg*	2000 – 3999 *epg*	≥4000 *epg*

Data Gathering Procedure

Before the actual data gathering the researcher sought permission through a letter from the Schools Division Superintendent of Northern Samar to allow the researcher to conduct the study in the selected elementary schools under GIDA municipalities of the province, stating the purpose and intent of the study.

Hiring of two enumerators, qualified for the job (Registered nurses), was done before the actual conduct of the study. They took charge of the collection using the survey form as well as conducted the parasitological assessment. Orientation and training were done both for the administration of survey form and the laboratory component of the study. Specifically, they were trained in stool collection and processing using the Kato Katz technique for parasitological determination of STH infection.

Data collection was divided into two (2) parts. Part 1 was on the documentation of the respondents' profile. Part 2 was on the parasitological assessment to determine the prevalence, intensity and multiple nematodal occurrence of STH.

In the final selection of the study's participants, they were asked of a history of being clinically ill and/or having taken anthelminthic drug of any kind within a period of three months. Those who reported to have been ill or have taken a kind of dewormer were not included in the study. Further, the parents of children who signified willingness were contacted and informed about the written consent explaining to them the content and details for their approval. School-age children study participants were those present in the actual collection of fecal samples.

Laboratory samples were taken only from those children whose parents or guardians signed on the consent form. No other investigation was done on the samples except those needed for the study objectives that were described and explained in the consent form. Any information obtained during the study are kept confidential.

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Collection of stool specimen

A day prior to the actual collection of stool specimen, the researcher together with the two enumerators and with the approved letter from the Schools Division Superintendent explained the intent of the study to the teachers and the randomly selected primary school-age children participants.

A short lecture and slide showing about soil-transmitted helminthiasis, was made to the primary school-age pupils so as to make them understand what is the study all about. Then after the lecture and a show, each selected child was provided with labeled clean plastic container, a piece of applicator stick, a plain paper for the fecal sample. The plastic container was appropriately coded with the name of the child and properly recorded in a record notebook. After the distribution, the children were instructed that once they get home, they should defecate on the piece of paper provided for to avoid contamination of the feces with any material and using the applicator stick, pick up a portion (approximately a size of a thumb) of the feces and place it on the plastic container provided and cover it and then come to school with it.

On the day of collection, children were called by names one after the other and the coded plastic containers was checked to avoid accidental exchange of specimens among the children. Immediately after the collection is over it was brought to the College of Nursing laboratory for processing.

Helminthes identification
Parasitological work was done at the College of Nursing Laboratory. Following the standard operating procedures, the preserved stool specimen was processed using Kato-Katz technique employing a 50 mg template. To ensure quality control and obtain higher efficiency of the technique on morphological identification of the helminth eggs, examination and/or reading of the prepared slides was done by two observers.

RESULTS AND DISCUSSION

Data on hygiene/sanitation-related factors reflects the table 3. For the personal hygiene factors, out of the 200 respondents, 99.50% reported that they practiced hand washing before and after eating and after toilet use. Only 1.54% do not practice hand washing before and after eating and after toilet use. The reason mentioned for not doing hand washing before eating and after toilet use was the lack of soap and water. This indicates that the respondents are conscious of the importance of washing hands. This behavior if done properly and always could prevent them from contaminating with parasites.

A total of 97% claimed that they trim or cut short their fingernails when already long. However, 3% of them did not trim or cut short their long finger nails for reasons that they do not have nail cutters. The data indicate that children recognize the importance of maintaining short fingernails which is a good hygienic practice.

It is just surprising to note that there were still children who do not cut short their fingernails due to lack of nail cutters. Long fingernails especially when not cleaned can harbor ova of the STH parasites that can be transferred into the mouth when eating with bare hands.

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On the aspect of the presence of hygienic and sanitation facilities, the table revealed that out of the 200 respondents, 84.50% had toilet at home while the remaining 15.50% had no toilet facilities at home.

Out of the 31 respondents who do not have toilet at home claimed that they dug hole in the soil to defecate. Others used their neighbor's toilet or the public toilet in the barangay. There are reports that 9% of the respondents who do not have toilet at home defecate openly by the seashore and or in the open canal. This indiscriminate open field defecation is unhygienic and unsanitary. It poses hazard to human health and can be a cause of the transmission of STH.

As to the presence of toilet, facilities in the school it can be gleaned from the table that 94.50% had toilet facilities in the school while 5.5% stated that they had no toilet facilities. This means that there were still schools that lack toilet facilities. This condition can predispose the children to open field defecation which is a risk factor for the transmission of STH parasites.

In the same table, data showed that 20.50%, reported that they have a water source at home while a majority (79.50%) had no water source at home. They got their water for drinking and domestic use from public faucet, spring or "jetmatic" pump. The data indicate that majority of the respondents do not have their own sources of water at home and that they got water from outside sources. There is the danger of unsafe water contaminated with STH parasites having it taken from open sources like open spring.

The above cited data was affirmed by the study of Abera who conducted a cross-sectional study in 12 primary schools in Kenya. Stool samples were randomly selected from 778 children and were microscopically examined using Kato-Katz and formal-ether concentration methods. Results showed that the overall prevalence of intestinal helminths was 51.5%. Hookworm spp., infected children had lower haematocrit values than non-infected children. Lack of footwear was positively associated with intestinal helminthes infection in rural schools, and having dirty fingernails and untrimmed fingernails were positively associated with the prevalence of intestinal helminths in urban samples.

Another study that supports the above findings is the work of Belizario (2014), that explained the findings on still high cumulative prevalence of STH among school children could be due to plausible reasons that include possible reversion to open defecation, non-utilization of sanitary facilities, and rejection to mass drug administration (MDA) coverage. In order to achieve effective control of STH, the researchers recommended deeper collaboration between the water, sanitation and hygiene (WASH) and STH sectors where partners can work together in the area of monitoring and evaluation that may include improved parasitological and nutritional status in high-risk groups, as well as sustainable behavior change as outcome indicators.

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Table 3. Hygiene/Sanitation-related Factors

Personal Hygiene Practices/ Hygienic and Sanitation Facilities	Present		Not Present	
	F	%	F	%
Handwashing before and after eating	199	99.50	1	0.50
Trimming of fingernails	194	97.00	3	6.0
Handwashing with soap and water after toilet use	199	99.50	1	0.50
Presence of toilet facilities at home	169	84.50	31	15.50
Presence of toilet facilities in the school	189	94.50	11	5.50
Open field defecation	18	9.0	182	91.00
Presence of water supply at home	41	20.50	159	79.50
Presence of water supply in the school	33	16.50	167	83.50

The table presented below (Table 4) is the behavioral factors associated with STH infection. It can be noted that almost all of the respondents 99.50% washed fruits and vegetables before eating or cooking. This practice can prevent ingestion of food contaminated with parasites. Furthermore, 98.50% of the total 200 respondents reported that they wear shoes or slippers when going outdoors. The remaining 1.5% said they always forgot to wear their slippers. The data indicate that school children give importance on wearing a protection to their feet. This practice could eliminate the transfer of STH parasite by avoiding contamination with human and animal excreta from which are possible sources of infection.

Also shown in the table below is pet ownership which had a high total number reported. One hundred fifty-three (76.50%) signified they owned pets such as cats and/or dogs while 47 or 23.50% do not.

This means that majority of the school children families are own pets. Pets can relieve stress if they are clean and taken care of properly. But if they are astray and allowed to defecate anywhere it could be a source of STH parasites transmission. The data showed that children living in crowded family were more susceptible to infection. Also, these infected children took care of animals in their houses. It was known that this helps in the transmission of parasite infections as there was a significant relationship between that association and rates of parasite infections. The prevalence of infection was also much more common in those students whose parents were less educated.

Furthermore, the data in Table 1.4 presents the distribution of the respondents with regard to visiting health centers for deworming practices. A majority (165 or 82.50%) visit the health center while the remaining 35 or 17.50% do not due to some reasons. They reasoned out that they rely on self-medication at home using herbal plants. Others stated that the health center was distantly located from their home and they can manage illnesses by self-medication with over-the-counter anthelminthic drugs and one even stated that he had no budget to buy medicines.

This indicates that most of the school children are brought to the health center for deworming purposes. Those who do not go to health centers manage to deworm their children with anthelminthic medicines at home.

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Table 4. Behavioral Factors Associated with STH Infection

Behavioral Factors	Practiced		Not Practiced	
	F	%	F	%
Washing fruits and vegetables before eating or cooking	199	99.50	1	0.50
Wearing of shoes and slippers	197	98.50	3	1.50
Pet ownership	153	76.50	47	23.50
Consultation with health care agencies for deworming	165	82.50	35	17.50

Table 5 show the distribution of school children from elementary schools infected with STH. Findings on stool examination of all sampled school children throughout the province disclosed a total number of 148 infected with soil-transmitted helminthes bringing forth to a prevalence rate of 74%. Based on the WHO standard classification, the scaling category in terms of prevalence as follows: 0-20% "for low prevalence"; 21-50% for "moderate prevalence"; and 51-100% interpreted as "high prevalence". The findings of 74% was therefore categorized as "high prevalence".

As observed, a greater number of school children infected with the STHs was from the municipality of Biri while the municipality of Lope De Vega had the lowest.
These findings suggest that STHs tend to be more prevalent in island towns, and less prevalent in highland towns.

This prevailing condition could be attributed to the resistance of the parasite infective form which is the second stage larva within the egg, being protected by its egg shell. The topography of the land may have some contribution to the dispersion of the infective egg or larvae in the ground. Highland areas easily drained after a heavy rain while whereas more water is retained in lowland and even sandy areas where the sub-soil is rocky and hard such as in the case of the municipality of Biri.

The findings of this study with high prevalence rate of STH infection is similar with the study conducted by Belizario (2014) on a cross sectional stool sample survey performed among children living in a garbage dump site in Metro Manila. The survey revealed a high prevalence rate of 96% for intestinal parasitism. In another Philippine community, children had also a high prevalence rate of 78.1%.

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Table 5. Prevalence of soil transmitted helminthsamong school age children in Northern Samar

School Age Children Investigated	No. of School Age Children Infected/Non-infected with STH		Interpretation
	F	%	
School children infected with STH	148	74	High Prevalence
School children not infected with STH	52	26	No Infection
Total	**200**	**100**	

The intensity threshold level of STH infection categorized as light moderate and heavy infection (Table 6) revealed that majority has a light level of infections (142 or 71%) predominated by *trichuris* species (100 or 50%) followed by, *ascaris* (42 or 21%) with zero or no light infection for hookworm species. Second highest in intensity threshold level of infection was found in moderate infection level (45 or 22.50%) with 24 or 12 percent for *ascaris*species, 18 or 9 percent for *trichuris*, and 3 or 1.5 percent for hookworm species. The least intensity threshold level of infection was found on heavy infections (21 or 10.5%) with *trichuris species* (14 or 7%) being the highest; 6 or 3% for *ascaris*species; and 1 or .50% for hookworm species.

The findings of this study were supported by the survey in a Philippine community conducted by Belizario (2014) which showed that *Trichuristrichura* and *Ascarislumbricoides* remained to be the most prevalent helminths. The infection rates of these helminths were around 40%. Hookworm infection, although common, had a prevalence lesser than 10%. It is further stated that hookworm prevalence for the Philippines, primarily an agricultural country, is surprisingly low compared to other STH endemic countries. The hand to mouth infection route for *A. lumbricoides* and *T. trichiura* had readily explains their high prevalence.

Table 6. Intensity level of STHs infections

Species	Light		Moderate		Heavy	
	F	%	F	%	F	%
Ascaris	42	21	24	12	14	7.0
Trichuris	100	50	18	9	6	3
Hookworm	0	-	3	1.5	1	.50

The prevalence of single and multiple parasitism of STH species infection among primary school children is shown in Table 7. It should be noted beforehand that the three species could have any one species for a single species infection, any two species of the three for the double species infection and all of the three species for the triple species infection.

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The overall prevalence of STH infection among primary school children in the province categorized as single, double and triple was 80 (40%); 63 (31.50%); and 5 (2.5%), respectively.

As shown in the table, a greater number (80 or 40%) of school children were infected with single species of the STH group of parasites. It is around 12.83% (19/148) higher than the double species occurrence of infection. Likewise, there were 63 (31.5%) who harbored double species of STH group of parasites. This category is around 37.83% (56/148) higher than the triple species which category had only 5 or 2.5% school children infected with STH group of parasites.

Moreover, it was observed that the highest occurrence of single and double species infection was much higher in the municipality of Biri.

With the results herein presented, it is highly suggestive that prevalence either with single or double species in occurrence could be much higher in probability to occur in island and lowland areas than in highland areas in the province. In view of the results presented in Table 4, a greater possibility exists that the single and the double species categories are dominated by *trichuris* and *ascaris* species as causes of the infection among infected school children. This could be attributed to their similar mode of transmission. The occurrence of a double infection could pose more hazard to the health of the school-age children.

The findings of this study conform that of Wabo (2012) on the prevalence and intensity of infections of three neglected tropical diseases in patients consulted at a traditional health care centre in Dschang West Cameroon. In their order of occurrence, the intestinal nematode species found were *Trichuristrichiura* (19.2%), *Ascarislumbricoides* (13.4%), and hookworm (10.7%). These parasites occurred as single (19.2%) or multiple infections (10.3%). The mean fecal eggs count of all feces examined was 3722±672, 875±462, and 563±283 for *A. lumbricoides*, hookworm and *T. trichiura* respectively. These findings prompted the researchers to recommend the necessity of deworming and other suitable measures which are aimed at reducing the extent of intestinal helminthes.

Moreover, many researchers had the similar experience of encountering helminthiasis among pre-school and school children to have been caused by more than one species. According to Alemu (2011) of northwest Ethiopia, for instance, found 45.5%, 43.7% and 10.8% of the school children evaluated for helminthiasis to have harbored single, double, and triple infection with different species of helminthes respectively. This is also similar to the findings of this study.

Table 7. Occurrence of STH Infections

No. of Infected Children	**Category of Infection**					
	Single		**Double**		**Triple**	
	F	**%**	**F**	**%**	**F**	**%**
148	80	40	63	31.50	5	2.50

Table 8 show the distribution of prevalence rate among age group of children respondents. The highest prevalence rate appeared among 8-10 age bracket with 98 or 49% frequency of

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prevalence. It was followed by 5-7 years old bracket (38 or 19%) and the lowest age group in terms of prevalence was among 11-13 years old bracket. This indicates that the common age group that the STH parasites would harbor were the 8-10 age bracket. In particular, the findings of this study are directly opposite to the study of Mazigo (2010) which firmly observed that among the major intestinal helminthes, the hookworm infection was observed to have increased with age among primary school children, reaching maximum prevalence rate at 44.8% in the 14-16 years age group.

Another study directly opposite to the findings of this study was that of Wabo (2012). The study was conducted to evaluate the prevalence and intensity of STH infections. A parasitological investigation of feces was carried out in 223 stools of persons visiting the centre of phytomedecine. Using three techniques (direct examination, concentration method of Willis, and McMaster technique). Results showed a prevalence of 45.3%. Though parasitism occurs from early age (1-10 years) reaching 4.5%., the most infected age group was 21-30 years (31%). About 28.3% more females were infected more than males, 15.2% only.

Table 8. Distribution of Age Group with Highest Prevalence of STH Infection among Primary School-Aged Children

Age Group	**Prevalence**	
	F	**%**
5 – 7	38	19
8 – 10	98	49
11 – 13	12	6.0
Total	**148**	**74.0**

The purpose of this control program is to reduce worm loads and keep them low. Children will become re-infected, but repeated treatment will ensure that, most of the time, they will have few worms, and this will improve their chances of growing and learning.
The WHO recommends that schools be the venue for MDA to insure efficient, cost- effective delivery of service (WHO, 2002). Schools have an existing infrastructure in close contact with the community, and a workforce that can assist in program delivery (Satoto*et al,* 2003). Teachers can be trained to deliver anthelminthic drugs to their students (Albonico, 2008).

CONCLUSION

The results revealed that hygiene and sanitation, 199 or 99.50% reported that they practiced handwashing before and after eating and after toilet use. This is a good indication of sanitation and hygiene that could prevent the spread and transfer of STH infection. However, as reflected in the data a high degree of prevalence indicates that they may not have practiced the proper technique of handwashing. Children should be reinforced with correct method by the parents or teachers.

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It was found out that 194 or 97% trimmed their fingernails when already long. This implies a good practice on the part of the children since longer fingernails especially when not cleaned could harbor microorganisms like STH parasites.

As regards to the presence of hygienic and sanitation facilities, 169 or 84.50% reported that they have toilet facilities at home while 189 or 94.50% had also reported to have toilet facilities in the school. This means that there are still houses without toilets. More so, schools also lack toilet facilities. The absence of toilet facilities both at home and in the school resulted to indiscriminate open field defecation as reported by 18 or 9%. The inadequate sanitary practices, indiscriminate defecation, poor sanitary condition and where poverty exists are but some of the contributing factors to STH infection and transmission (Belizario*et al*, 2014).

Only forty-one or 20.50 percent reported that they have their water supply at home while 33 or 16.50 percent stated that they have water supply in the school. The lack of safe water supply could be a risk factor for STH infection. One way of transmission of STH is through ingestion of fecally contaminated soil or water. Water coming from unsafe sources had the risk of being contaminated with STH (Belizario*et al*, 2014).

Regarding the behavioral factors, 199 or 99.50% reported that they washed fruits and vegetables before cooking and eating. This means that school-age children are doing the right practice to prevent the spread of and acquiring microorganisms such as STH.

Having found out that that a majority (153 or 76.50%) owned pets means that the respondents' families are fond of pets. Pets are good provided they are domesticated and not allowed to roam around anywhere for they may cause a source of infection. Contaminated feces from pets can be a source of STH infection.

Out of the 200 respondents, 165 or 82.50 percent consulted health care agencies for deworming. This means that they are aware of the importance of eliminating worms from their body. This is also indicative of the health center's effort to reach out to the people to avail of the services particularly on the aspect of deworming.

In terms of the parasitologic assessment made, it was found to have a high degree of prevalence rate of 148 or 74% school-age children infected with STH. Having this data, the high degree of prevalence in the STH infection is alarming and needs to be addressed immediately by concerned agencies.

The intensity of infection based on its category for intensity threshold level is light only which consistently appeared in *ascaris*, and *trichuris* with *trichuris* having the highest with 100 or 50% followed by *ascaris* with 42 or 21% and hookworm being the lowest with 2 or 1% lightly infected. This means that although there is a high number of persons infected in terms of its prevalence rate the intensity of infection is only light. This means further that an immediate deworming can lessen or remove the burden of infection in terms of the number of ova found in the subject to prevent high degree of morbidity.

Having the highest occurrence of a single infection with trichuris and a double infection with ascaris and trichuris implies that a simple anthelminthic drug like Mebendazole or Abendazole as

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the drug of choice, is higly recommended as the main strategy for a short-term control. It is also important to note that improvements in sanitation, access to safe water and behavioral changes should be promoted to lessen if not to eliminate the degree of burden of the parasite.

With the highest frequency of prevalence and intensity level of infection occurring among 8-10 years school age group implies that this age group needs guidance on proper hygiene and sanitation practices. Their involvement in activities that predispose them to infection should be given emphasis to prevent or lessen degree of morbidity.

In the light of the findings of the study and with the analysis of the results, an integration on an effort for the prevention and control of STH is a practical solution to this problem. In order to address public health concern in the locality, the researcher formulated a school-based prevention and control program for the school-age children infected with the disease. The commitment of the stakeholders and community participation are vital for an effective implementation of the program. The parents and the school should help together in promoting hygiene and sanitation practices and a clean environmental condition to avoid exposure and contact with STH.

The parents and the teachers should help each other in monitoring the children's involvement in activities that would expose them to the risk of being contaminated with STH parasite. They should be informed that regardless of sex both male and female are prone to infection depending on their exposure to parasites. The school should endeavor to provide the pupils enough information about the disease not only on its nature and its effect to human health but also the possibility of having re-infection as well as the knowledge to prevent and control the infection. Hand washing practices should be reinforced in the school especially on the proper method and the use of soap to eliminate dirt and microorganisms such as STH. Despite almost all pupils practicing hand washing before eating and before and after toilet use, there are still a high prevalence rate of the disease. Proper method and technique should be taught and demonstrated in the school.

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