

# Random Stool Screening for Soil-transmitted Helminth Infection (STHI) as Monitoring Tool for Community Public Health Status

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## ABSTRACT

Helminth infection is a condition that is associated with socioeconomic status and the community's ability to access clean water. This study aimed to use simple laboratory methods such as direct fecal examination to help assess the public health condition of Barangay Quilitisan, Calatagan, Batangas. A total of 26 stool samples from daycare students attending the daycare center were screened for intestinal parasites. A total of 4(15.38%) out of 26 daycare students were infected with *Ascaris lumbricoides* infection. Parallel testing of water samples in regards of physico chemical and microbiologic assay showed 2 out of three samples are free of coliform contamination. Further, 3(25%) of male respondent is positive for helminthic infection while only 1(7.69%) of females turned out positive for infection. Our results showed that routine screening of stool samples for intestinal parasites in a given population is an available simple tool to assess a community's access to clean water, the effectiveness of implemented health policies and effective waste management. This study presents data on the potential use of simple methods such as routine stool analysis as an effective tool to assess a community's public health status and effective health programs on sanitation. The results of the present study provided evidence that random stool sampling for soil transmitted helminth infections can be useful to assess efficiency of public health programs in a given population. Although the study involves a small population; we suggest that further testing and evaluation be done on a much larger population.

**Key words:** Ascariasis, Infection, Public health, Community services, Soil-transmitted helminth.

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## INTRODUCTION

Soil-Transmitted Helminth infections (STHI) are considered to be present-day challenges in the health sector due to the number of people infected across the globe.<sup>[1]</sup> Helminth infection can be caused by poor sanitation, inadequate access to clean water, sanitation and personal hygiene.<sup>[2]</sup> Among the soil-transmitted helminths, *Ascaris lumbricoides* infections are the most common to infect populations in both urban and rural

settings. The majority of the cases presented for ascariasis are mainly children whose ages range between 7 to 15 years of age.<sup>[3-5]</sup> Although not fatal, the morbidity rates and health impact to an individual is evident and should be taken into great concern. Aside from malnutrition and other digestive health concerns, ascariasis in children has been implicated to cause other medical conditions. Studies suggest, that ascariasis in children may affect the children's susceptibility in developing pulmonary conditions such as asthma.<sup>[6]</sup> Another study presents the possible relationship between ascariasis and behavioral disorders such as hyperactivity, tic disorders and nail-biting.<sup>[7]</sup> Further, studies suggest the possible link between ascariasis and the development of other severe health conditions such as haemobilia and Loeffler's pneumonia.<sup>[8]</sup>

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In the Philippines, the Department of Health (DOH) considered ascariasis as one of the major helminth infections found in the country alongside with trichuriasis and hookworm infection.<sup>[9]</sup> Their high infection rates are mainly due to inaccessibility to clean water, poor sanitation and hygiene. Although ascariasis in the Philippines is very much prevalent, the clinical picture may differ from the urban and rural standpoint. In a study conducted in residential institutions in Manila, only 36% of 172 respondents (street children aged 7 to 18 years old) were found to be infected with *Ascaris lumbricoides*.<sup>[10]</sup> In another study conducted in one of the provinces of the Philippines, 71.9% of the 384 respondents (preschool children) were tested positive for ascariasis.<sup>[11]</sup> Further, studies suggested that infection rates may vary depending on the geographical location of the community.<sup>[12]</sup> This small scale screening of daycare students in a rural community in the province of Batangas aims to provide evidence of using fecalysis as a tool to assess the overall public health status of a community.

## MATERIALS AND METHODS

St. Dominick Day Care Center, Barangay Quilitisan, Calatagan, Batangas Quilitisan is a barangay under the jurisdiction of the municipality of Calatagan; province of Batangas located approximately 13°C 88' 32"N, 120°C 62' 47"E in the Island of Luzon, Philippines. In the 2015 national census, the population was 2,176 people with the highest age bracket in age groups between 10 to 14 years of age.<sup>[13]</sup> Barangay Quilitisan was chosen by Far Eastern University Manila as one of 4 communities in its community extension programs whose main objective is to assist by formulating programs that will make the community self-sustaining. The main livelihood of the majority of the population is farming and fishing while a few are engaged in tourism and trade. The community is being served by a single daycare and barangay health care centers situated in the barangay hall. The daycare center enlists twenty-six students whose ages are between 2-8 years old. The main sources of the water supply of the barangay are deep well which serves many households in the community for daily water needs. The study was conducted on August 2019 under the supervision and assistance of the local government unit and barangay health worker of the locality.

### Stool specimen collection and processing

A total of 26 students attending the daycare center were qualified as participants for the study. In detail,

qualification was based on the premise that all students attending the daycare were automatically included in the study. Age variation was excluded in qualification criteria due to the small population of the study group. Stool specimens from students in the daycare center were collected and processed on 2<sup>nd</sup> of August. Before collection, informed consent letters as well as sterile plastic containers were provided to parents and instructions were given on the proper collection of stool samples the day before the analysis of stool specimens. Stool specimens were submitted in the morning of the day after containers were provided. Stool samples were processed immediately upon submission to the laboratory using light microscopic methods. Briefly, a pinch of stool samples was emulsified using Lugol's iodine in a glass slide and was observed using light microscopy (Nikon Eclipse E100) at 400x magnification. Microscopic results were validated by two medical technologists and a pathologist.

### Water sample collection

A separate collection of water samples from deep well sources and electric pumps representing three households in different locations were conducted. Analysis of water samples is done in parallel to further support the results obtained from the routine fecalysis with daycare students. Water samples were collected in 1-liter collection containers. Water samples were sent to JEROCAS laboratories for microbiological and coli form assessment immediately after collection.

## RESULTS

### Light microscopy results

Light microscopic results revealed that 4 out of 26 (15.38%) daycare students were infected with *Ascaris lumbricoides* infection (Table 1). Whereas the rate of infection in males appears to be higher compared with females as observed from the results (Table 2). Aside from *Ascaris lumbricoides*, no other helminthic forms were seen from the stool samples submitted.

### Physico Chemical and Microbiological analysis of water samples

Table 3 shows that two out of three water samples passed the microbiological analysis with coliform levels not exceeding <1.1 (MPN/100 ml). Values provided for each test is expressed in Most Probable Number (MPN).

**Table 1: Microscopic results of stool samples of 26 daycare students showing the type of parasitic infection per student using the direct fecal analysis method.**

Patient no	Years	Gender	Helminth infection*
1	6	M	None
2	5	M	None
3	2	F	None
4	4	F	None
5	4	M	None
6	4	F	None
7	3	F	None
8	4	F	None
9	4	F	None
10	4	M	None
11	2	M	None
12	4	M	None
13	3	F	None
14	6	F	None
15	4	F	None
16	3	M	None
17	4	M	None
18	2	F	None
19	3	F	<i>Ascaris lumbricoides</i>
20	3	M	None
21	5	F	None
22	6	F	None
23	3	F	None
24	4	M	<i>Ascaris lumbricoides</i>
25	4	M	<i>Ascaris lumbricoides</i>
26	8	M	<i>Ascaris lumbricoides</i>

\*Observed using light microscopic analysis per coverslip

**Table 2: Rate of infection categorized by gender showing males has a higher frequency of infection.**

Gender	Population		Total
	Infected (%)	non-infected (%)	
Male	3 (25%)	9 (75%)	12
Female	1 (7.69%)	13 (92.31%)	14
Total	4 (15.38%)	22 (86.62%)	26

## DISCUSSION

Helminth infection, like ascariasis, is a condition that has been associated with the level of socio-economic status of an individual and collectively as a community. Also, a higher rate of incidence of infection in a community can provide a partial picture of the success of the implemented sanitation protocols

**Table 3: Microbiological analysis and coliform level results of sampled water from 3 households in Calatagan, Batangas.**

Household	Source	Results				Remarks
		Total coliforms *(MPN/100ml)	Cut off	Fecal Coliforms *(MPN/100ml)	Cut off	
1	Deep well	>8.0	<1.1	<1.1	<1.1	passed
2	Deep well	>8.0	<1.1	4.6	<1.1	failed
3	Deep well	<1.1	<1.1	<1.1	<1.1	passed

of a given community. In a nationwide study in the Philippines, results showed 54% of children are infected with STH,<sup>[14]</sup> the bulk of this number, however, are from rural areas.<sup>[11]</sup> Urban and rural rates have been significantly different, with the latter having higher rates, most probably due to the lack of access to clean water, garbage disposal system and limited access to established community health care facilities although this should be taken into perspective. In our study, the results have shown the low number of incidences of helminth infection, in particular, ascariasis. The reason for this may have been the result of the successful implementation of previous projects in the community that is directed towards health and sanitation. In line with this, it should be noted that only one water sample returned unsatisfactory results in microbiological assays, this generally tells us that the community is supplied with clean water for use. This may have been the reason, but not conclusive, of the low turnout of positive cases for helminth infection with our study group. Unfortunately, the exact geographical residence of those that turn out positive for ascariasis was not noted on the datasheet. This, however, further provides evidence of the direct role of water to the transmission of helminthic infection to humans<sup>[15,16]</sup> which still needed to be taken into consideration since potential infection can be acquired through accidental ingestion of water coming from deep well sources contaminated with soil which consequently contains not only infective helminth ova's but also protozoan forms. The number of infections caused by soil-transmitted helminths may have a direct reflection of a community's health condition in terms of access to clean water, hygiene practices and efficiency of health programs directed towards the prevention of such diseases. This means that the increase and decrease of infection rate in the population speak

of how health programs are effectively implemented and followed. Thus, routine screening of stool samples for intestinal parasites in a given population is an available simple tool to assess a community's access to clean water, the effectiveness of implemented health policies and effective waste management.

Lastly, results showed a higher incidence of the infection in males compared with female participants. Incidence rate of infection for males is at 1:3 while females have a rate of 1:4 when analyzed using MEDCALC statistical software (MEDICALC®). This tells us that males are more engaged in outdoor activities compared with females, thus males have a higher chance of being infected due to higher contact time with infection sources such as soil, which is the point of discussion of some studies.<sup>[17]</sup>

## CONCLUSION

This study presents data on the potential use of simple methods such as routine stool analysis as an effective tool to assess a community's public health status and effective health programs on sanitation. Although the study involves a small population, we suggest that further testing and evaluation be done on a much larger population.

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## CONFLICT OF INTEREST

The authors declare no conflict of interest.

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