# Association between knowledge and actual practices of family member caregivers of low-income families on the prevention and control of soil-transmitted helminthiasis in an urban barangay: An analytical cross-sectional study

Maria Eliza S. Pascual, RMT[1]*; Thereese Maeann C. Patron, RMT[1]; Rydni B. Pastor, DMD[1]; Maria Francel Charlyn N. Tan, DMD[1]; Ranee Coeline B. Tongco, PTRP[1]; Josel R. Tanciongco[1]; Patrick Joshua C. Pascual, RN[1]; Januario E. Sia-Cunco, MD, MHSE, FPASMAP[1,2]; and Ramon Jason M. Javier, MD, MSTM, FPAFP[1,3]

## Abstract

***Introduction*** Soil-transmitted helminthiasis (STH) remains to be highly prevalent in the Philippines, despite the implementation of school-based bi-annual mass drug administration and other preventive measures under the Garantisadong Pambata Program by the Department of Health (DOH).

***Methods*** This analytical cross-sectional study determined the association between the level of knowledge and the actual practices of family care givers in the prevention of STH among school-age children belonging to low-income families in an urban barangay.

***Results*** Among 193 respondents, 97.93% had good level of knowledge of STH prevention and control, 83.42% had good hand hygiene practices, but only 39.90% adhered to the recommended bi-annual anti-helminthic prophylaxis for their school-aged children. A positive association was noted between level of knowledge and actual hand hygiene practices, but this was not statistically significant (i.e., prevalence odds ratio = 5.3, p = 0.129). Among those who did not comply with the bi-annual anti-helminthic administration, there was a prevalence odds ratio (POR) of 0.66 that the family care giver was knowledgeable on STH prevention and control, and this negative association was not statistically significant (i.e., p = 0.529).

***Conclusion***: Level of knowledge on STH prevention was positively associated with hand hygiene practices but was negatively associated with compliance with the bi-annual deworming prophylaxis. But these associations were not statistically significant.

***Key words***: soil-transmitted helminthiasis, hand hygiene, deworming prophylaxis

Correspondence: Maria Eliza S. Pascual, RMT, College of Medicine, University of the East Ramon Magsaysay Memorial Medical Center, Quezon City, Philippines
Email: pascualm0975@uerm.edu.ph
[1]College of Medicine, University of the East Ramon Magsaysay Memorial Medical Center, Inc. Quezon City, Philippines
[2]Department of Microbiology and Parasitology, College of Medicine, University of the East Ramon Magsaysay Memorial Medical Center Inc., Quezon City, Philippines
[3]Department of Preventive and Community Medicine, College of Medicine, University of the East Ramon Magsaysay Memorial Medical Center Inc., Quezon City, Philippines

Soil-transmitted helminth (STH) infections, commonly caused by Ascaris lumbricoides, Trichuris trichiuria, Necator americanus, and Anyclostoma duodenale, are part of the neglected tropical diseases (NTD) and are among the most common global communicable diseases that adversely plague low-income areas and the most deprived communities.[1] Infections caused by STH continue to have a major impact on the nutritional status, physical, and cognitive development of preschool-age toddlers,

school-age children[2], and women of childbearing age.[3,4]

School-age children experience the heaviest burden of disease due to their increased nutritional needs for development, and their lack of awareness of STH prevention and control. As the most vulnerable group, they function as the most important carriers and sources of transmission of STH infections.[5] Coupled with the endemicity of STH, the prevalence of STH infections is seen as of national concern.[6] Currently, the national government has initiatives to address the problem for STH infections, namely the Garantisadong Pambata Program (A.O. 36, s2010) and the Integrated Helminth Control Program by the Department of Health (DOH), including the implementation of the school-based bi-annual mass drug administration (MDA). However, despite the decade-long implementation of the programs, sub-optimal MDA coverage, limitations in water, sanitation, and hygiene (WASH), and public health education projects continue to make these public health endeavors more challenging to implement.[7,8,2]

Given the current dilemma presented by STH infections and the setbacks experienced by the government program made to address the issue, this study determined the association between the level of knowledge of family member caregivers on STH prevention and control, and the actual practice of hand hygiene and administration of anti-helminthic agents to school-age children under the *Garantisadong Pambata* Program of the DOH inan urban Barangay using an analytical cross-sectional study. This epidemiologic investigation could potentially aid in the alleviation of the STH burden in the Philippines by recognizing the relevant factors contributing to the gap in the knowledge and practice for STH prevention and control.

## Methods

### *Study Design*

Using an analytical cross-sectional study, the associations between the level of knowledge of family primary caregivers and the actual practice of STH prevention and control were assessed. The actual practice of prevention and control included hand hygiene and administration of anti-helminthic agents to school-age children. The study was approved by the Ethics Review Committee of the UERMMMCI Research Institute for Health Sciences. The researchers collected information from family member caregivers of low-income families with school-aged children in an urban barangay.

Over 267 million preschool-age toddlers and over 568 million school-age children were documented to live in areas where STH infections had been transmitted intensively.[9] School-age children have been recognized as the most vulnerable group and the most susceptible to being infected by STH nationwide, especially in areas where sanitation is poor and enhanced by poor hygiene practices, the participants were gathered from a target population in an urban barangay, composed of family member caregivers to school-age children of 6 to 12 years old. In this study, family member caregivers were defined as the individuals who were responsible for primarily taking care of the school-age child in the household. Hence, data collection, through purposive sampling, was done from July 2023 to September 2023.

Inclusion criteria for the selection of the target population covered family member caregivers of school-age children (i.e., 6 to 12 years old) who resided in an urban barangay with a household monthly income that belonged to the low-income category of PhP 10,957.00 to PhP 21,194.00.[10] Excluded from the study were the transient residents, family member caregivers who could not or did not stay with the school-age child at home, participants who showed questionable and unstable mental status, family member caregivers who refused vaccinations or other prophylactic measures and medications for their children, and family member caregivers whose children exhibited hypersensitivity reactions towards anti-helminthic agents.

The researchers developed a new data collection tool in Filipino (Tagalog), based on two previous similar studies.[11,12] The content of the said questionnaire was reviewed by experts in the fields of Medical Parasitology, Tropical Medicine, as well as Preventive, Family and Community Medicine who did preliminary face validity of the said data collection tool. In addition, the investigators performed a series of pilot-testing of the new tool, one month prior to the actual data collection. After achieving an internal consistency (i.e., Cronbach's alpha) of at least 0.80 on all the variables used in the questionnaire, the researchers proceeded with the actual data collection.

The knowledge and practices of family member caregivers towards STH were studied using a structured questionnaire containing thirty-five (35) questions categorized into four (4) headings. The number of questions per heading was as follows: four (4) questions under *Demographic Profile*; eleven (11) questions under *Knowledge on Prevention and Control of Soil-Transmitted Helminthiasis*; fifteen (15) questions under *Practices on Prevention and Control of Soil-Transmitted Helminthiasis: Hand Hygiene*; one (1) question under *Practices on Prevention and Control of Soil-Transmitted Helminthiasis: Deworming*, and four (4) questions on *Other Practices on the Prevention and Control of Soil-Transmitted Helminthiasis*.

The researchers selected respondents using purposive sampling through a house-to-house circumnavigation of the *barangay* with the assistance of the volunteer *barangay* health workers.

The target population was 184 respondents, but the principal investigators were able to gather a total of 223 responses. The questionnaires were examined based on the completeness and reliability of data, and after careful screening, only 193 responses were accepted for encoding.

Demographic information, knowledge, and practices results were the subjects of the descriptive analyses. The knowledge score was defined as the percentage of correct responses. Scores ≥ 80% were considered "good," while scores below 80% were considered "poor."[13]

Practices for hand hygiene were measured using an ordinal scale in Filipino which were designated with a score of 1, 2, 3, and 4, respectively. The percentages of the scores per respondent were determined. "Good hand hygiene practice" was defined to be those who scored above the median value (96%) while "poor hand hygiene practice" was those who scored below.[12]

Adherence to the administration of anti-helminthic agents was assessed by determining the number of times the school-age child underwent anti-helminthic administration in the past year. Responses were classified as "good compliance" if their child was able to adhere to the recommended bi-annual administration, while responses stating that their child was administered only once or not at all were classified as "poor compliance."[12]

For statistical analysis, the IBM Statistical Package for Social Sciences (SPSS) Statistics version 29.0.1.0 (171) software was utilized. Pearson chi-square test was applied to determine the one-tailed p-value between the variables (p-value < 0.05). The prevalence odds ratio (POR) was used for the factors influencing knowledge and practices.

## Results

*Demographics*

A total of 193 participants participated in the study and their socio-demographic profile had been summarized in Table 1. The majority of surveyed participants (35.80%) were between the ages of 31 and 40 years old. It also showed a significant gender imbalance, with 87% of study participants being female and 13% being male.

**Table 1.** Characteristics of study participants (N=193).

| Characteristics | Frequency | Percentage (%) |
|---|---|---|
| Age (years) | | |
| 21-30 | 44 | 22.80 |
| 31-40 | 69 | 35.80 |
| 41-50 | 39 | 20.20 |
| 51-60 | 28 | 14.50 |
| 61 pataas | 13 | 6.70 |
| Sex | | |
| Female | 168 | 87.00 |
| Male | 25 | 13.00 |
| Educational Attainment | | |
| No Formal Education | 2 | 1.00 |
| Elementary Level / Graduate | 20 | 10.40 |
| Secondary Level / Graduate | 76 | 39.40 |
| Vocational Course | 16 | 8.30 |
| Tertiary Level / Graduate | 46 | 23.80 |
| Graduate School | 26 | 13.50 |
| Incomplete Education | 7 | 3.60 |
| Civil Status | | |
| Single* | 90 | 46.60 |
| Married | 85 | 44.00 |
| Separated / Annulled | 9 | 4.70 |
| Widowed | 9 | 4.70 |

*with or without a live-in partner

*Assessment of Knowledge on the Prevention and Control of Soil-Transmitted Helminthiasis*

A total of 189 (97.93%) study participants garnered a score ≥80%, whereas only four (2.07%) study participants scored <80%, with the lowest score of 59.09%.

*Assessment of Actual Practices of Hand Hygiene*

It was identified that 161 (83.42%) of the study participants alleged "good hand hygiene practices," while 32 (16.58%) of the study participants reported "poor hand hygiene practices."

*Frequency of Anti-Helminthic Administration*

A total of 77 (39.90%) completed the two-dose anti-helminthic prophylaxis, while 89 (46.10%) study participants answered that their school-age children received a single dose of the anti-helminthic prophylaxis. Lastly, 27 (14.00%) reported that their school-age child had not received any anti-helminthic prophylaxis. Only 77 (39.90%) were classified as having "good compliance", while 116 (60.10%) were designated as having "poor compliance".

*Association Between Knowledge and Practices*

The association between knowledge and hand hygiene practices, as determined by the prevalence odds ratio (POR) of 5.3 (p = 0.129), suggested a positive association but was not statistically significant (Table 2). On the other hand, the association between knowledge and anti-helminthic administration (i.e., POR = 0.66, p = 0.529) revealed a negative association that was also not statistically significant (Table 3).

**Discussion**

In the Philippines, STH is one of the NTDs of public health concern. Various government programs have been established to combat the spread of the infection, such as the DOH's Garantisadong Pambata Program which has STH prevention as one of its agenda.[15] As children are dependent on their caretakers to provide assistance and guidance regarding their health, it is imperative that these family-member caregivers have adequate knowledge of common diseases, such as STH, and practices on how to prevent them. This comprehensive program covered integration of essential services that encompassed health, nutrition, and environmental sanitation with particular emphasis on the provision of micronutrient supplementation, such as vitamin A and iron for young children.[14,15] Under the program, health centers would continuously provide health care services for children daily and promote health behaviors that could be practiced at home, in school, in daycare centers, and in other settings where children are.[16] The strategy implemented by DOH in controlling STH infections in the Philippines included the implementation of a school-based bi-annual mass drug administration (MDA) with Albendazole or Mebendazole.[4] This program would be conducted mostly in public

**Table 2:** Association between level of knowledge and hand hygiene practices using POR.

| | Good Hand Hygiene Practice | Poor Hand Hygiene Practice | POR, p value |
|---|---|---|---|
| Good Level of Knowledge | 159 | 30 | 5.3 (p-value=0.129) |
| Poor Level of Knowledge | 2 | 2 | |

**Table 3.** Association between level of knowledge and compliance to anti-helminthic administration using POR.

| | Good Compliance | Poor Compliance | POR, p value |
|---|---|---|---|
| Good Level of Knowledge | 75 | 114 | 0.66 (p-value=0.529) |
| Poor Level of Knowledge | 2 | 2 | |

schools led by teachers under the supervision of healthcare workers. The DOH collaborated with the Department of Education (DepEd) to help target the most vulnerable group (i.e., school-age children) in the most cost-effective way. The program was based on the principle of preventive chemotherapy (PC) that focused on the integrated use of broad-spectrum drugs.[5] Aside from the implementation of MDA, the water, sanitation, and hygiene (WASH) program was also being taught in schools.[7] Between handwashing and deworming, the latter remained to be the better determinant for STH prevention and control as it was both a preventive and treatment measure beneficial to the most vulnerable group.[6,7]

*Demographics*

The study participants belonged to low-income families. STH infections were observed to be highly endemic among low-income communities due to limited access to safe potable water supply, inadequate sanitary facilities, and lack of knowledge on desired health behaviors.[7]

In this study, most of the family member caregivers who participated showed an educational attainment of secondary education (39.4%). In another epidemiologic investigation conducted in the Philippines, a lower level of educational attainment was found to be among the risk factors for human helminthiasis infections, specifically more likely among individuals with an elementary, high school, or vocational degree.[17]

Since some of the strategies implemented by the DOH in controlling STH infections in school-age children in the Philippines involved school-based bi-annual MDA and WASH program, the demographic characteristics of primary caregivers in our chosen community had little effect on the administration of STH control procedures on school-age children.

*Assessment of Knowledge*

This epidemiologic investigation revealed that the majority of the study participants (97.93%), demonstrated a good understanding of the subject, and effectively applied their knowledge on the questionnaire. These results were aligned with a prior study held in Guimaras, Philippines where the parents and teachers demonstrated adequate knowledge about STH control ( 93.7% and 98.7% respectively).[8] However, in comparison to a study in Ibadan, Southwestern Nigeria, 66.8% of the respondents have inadequate knowledge about prevention of STH transmission.[18] It was highlighted in that study that education campaigns should address misconceptions to decrease barriers to treatment and improve adherence to public health recommendations of MDA.[19]

*Assessment of Hand Hygiene Practices*

Proper hand hygiene practices have always been advocated to prevent the occurrence and transmission of several known diseases. In a study conducted in the district of Cumilla in Bangladesh, a significant portion of children failed to exhibit good practices against STH e.g., children not washing their hands with soap after defecation (64.8%), drinking from a deep tube well-water (91.1%), and not washing fruits before eating (43.7%).[20]

The previous study mentioned contrasts with the current study where it showed that the majority of the study participants (83.42%) adhered to good hand hygiene practices for the prevention of STH. Nonetheless, further intervention is necessary to improve the practices of respondents who exhibited poor hand hygiene. DOH implemented the expanded *Garantisadong Pambata* Program and incorporated WASH to improve hand hygiene to reduce STH burden in vulnerable groups. This followed the directive of the WHO in that achieving STH control was influenced by practices in water, sanitation, and hygiene (WASH).[2]

*Administration of Anti-Helminthics*

On the administration of anti-helminthics, the Garantisadong Pambata Program of the DOH requires that school-age children undergo deworming twice a year.[14] However, the results of the study showed that only 39.9% of the study participants complied with the bi-annual administration of anti-helminthics which showed poor compliance with the guidelines released in the *Garantisadong Pambata* Program of DOH.

In comparison to the national percentage of compliance to deworming, as of 2019, only 60% and 59% of preschool-age toddlers and school-age children, respectively, had undergone full deworming

compliance. The present study's finding was still much lower than the national average, which was also much lower than the 80% required coverage by WHO.[2] However, it was also possible that the multiple controversies surrounding the use of anti-helminthics over the years and the COVID-19 pandemic might have played a role in the decreased compliance for deworming. As of 2020, the deworming strategy was moved from school-based administration to house-to-house visits for the deworming of children aged up to 18 years old due to the COVID-19 restrictions posed by DOH.[2]

*Association of Knowledge and Hand Hygiene Practices*

A study conducted in Bangladesh discovered that 81.5% held misconceptions about helminthiasis. The majority of the respondents were unaware of how STH could be transmitted via contaminated soil and unhygienic practices; as a result, their children were not participating in hygienic practices.[20] These findings would run contrary to this present investigation's findings, wherein a positive association between the level of knowledge on STH and hand hygiene practices, was seen such that study participants who practice proper hand hygiene were the ones who had higher level of knowledge. However, the association between the two variables was statistically insignificant.

*Association of Knowledge and Anti-Helminthic Administration*

In a Nigerian study, results showed that poor specific knowledge of the risks and burden of the infection resulted in poor coverage of periodic deworming for STH infections in preschool-age. There was a difference in the accurate knowledge of deworming frequency between mothers who periodically dewormed their pre-school-age children and those who did not (i.e., adjusted OR = 0.41, 95% CI: 0.18–0.90, p = 0.026).[19] The results of the Nigerian study varied with the findings of this current epidemiologic investigation (i.e., POR = 0.67, p = 0.529), such that even though the family caregivers had a high level of knowledge regarding STH prevention, there was still poor compliance on anti-helminthic administration. Poor compliance was shown to be associated with several predictors. One study concluded that it was not only ignorance that contributed to poor compliance, but also the lack of concern about parasitic infection among the primary caregivers and their untoward effects on children's health.[20]

In adherence to the latest program encompassing children aged up to 14 years old, the barangay health center had not yet devised a method for procuring data on whether children beyond the age range of 0-59 months would have access to healthcare services. The center was still adopting health practices pertinent to STH prevention. The findings indicated a need to enhance the involvement of the *barangay* and families in curbing STH infection, which could entail conducting needs for administering anti-helminthic treatment. This would serve as an educational tool not only for *barangay* health workers and residents, but also for individuals who were accountable for their families' well-being.

The current statistics of the chosen community for STH prevalence and prevention (i.e., bi-annual administration of anti-helminthics) had yet to be completed at the time of the study. Furthermore, the shift of strategy of MDA to house-to-house visits led to the lack of epidemiological information of schools on the subject matter.

The lack of statistical significance of the associations between variables led to the inability to generalize the results to other communities in the Philippines. One factor would include socioeconomic status which could affect the level of knowledge and practice of each community. In the National Capital Region (Metro Manila) in which the study was conducted, the socio-economic status was different, as compared to other cities outside of it in which there were less employment opportunities.[21] This difference might lead to diverse results in terms of knowledge and practice.

**Conclusion**

Based on the results, a high level of knowledge of family care-givers on STH prevention and control was positively associated with good hand hygiene among children, but negatively associated with administration of bi-annual anti-helminthic prophylaxis. However, neither associations were statistically significant.

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