

DETECTION of *Schistosoma japonicum* in Humans and Snails in Selected Sitios of Barangay Gupitan, Kapalong, Davao Del Norte, PHILIPPINES

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ABSTRACT

Schistosomiasis remains a neglected tropical disease affecting millions globally. In the Philippines, despite ongoing surveillance, geographically isolated and disadvantaged areas (GIDAs), such as Barangay Gupitan—which has been reported as a potential focus of the parasite—are often overlooked. As the first schistosomiasis surveillance study conducted in the area, this study aimed to determine the prevalence of *Schistosoma japonicum* in both humans and snails and assess the community's knowledge, attitudes, and practices (KAP) regarding the disease. A quantitative cross-sectional design was employed, involving 124 respondents selected through quota-based stratified random sampling from four sitios: Gupitan (Sentro), Dugayan, Poiton/Langan, and Patel 4/Kimaisog. KAP data were collected through an adapted structured questionnaire, while stool samples were examined using the Kato-Katz and Formalin-Ethyl Acetate Concentration Technique (FECT). Malacology study employed snail crushing technique. Survey result showed low educational attainment and socioeconomic marginalization. While general awareness and positive attitude were present, significant knowledge and practice gaps exist. No human cases were detected; however, a 2.9% snail infection rate was observed in Patel 4/Kimaisog. Limited participation from this sitio may have led to an underestimation of human infection. These findings confirm active local transmission and highlight the need for targeted public health interventions.

KEYWORDS: *Schistosomiasis, Schistosoma japonicum, knowledge attitudes and practices, malacological survey, Philippines*

INTRODUCTION

Schistosomiasis remains a neglected tropical disease affecting millions of people worldwide, with transmission reported in 78 countries and endemicity in

51 countries (WHO, 2023). The disease is caused by blood-sucking trematodes of the genus *Schistosoma*, of which *Schistosoma haematobium*, *Schistosoma mansoni*, and the highly pathogenic *Schistosoma japonicum* account for most human infections (CDC, n.d.). Among these species, *S. japonicum* remains endemic in several countries in Southeast Asia, particularly China, Indonesia, and the Philippines (Tenorio et al., 2021; Tabilin et al., 2025).

In the Philippines, schistosomiasis continues to be a significant public health concern. Approximately 12.4 million individuals are at risk of infection, while 2.7 million are directly exposed to *S. japonicum*, the country's only endemic *Schistosoma* species (Leonardo et al., 2020; Tabilin et al., 2025). The disease remains endemic in 1,609 barangays across 12 regions, with an overall prevalence of 4% (Leonardo et al., 2020). Major endemic foci have been reported in Northern Samar, Eastern Samar, Western Samar, Northern Leyte, Oriental Mindoro, and Negros Occidental (Tenorio et al., 2021). In Mindanao, prevalence rates ranging from 1.5% to 3.7% have been documented in Davao de Oro and Davao del Norte (Belizario et al., 2024). Despite national efforts to reduce transmission, vulnerable populations, particularly Indigenous communities and economically disadvantaged groups, remain disproportionately affected due to limited access to healthcare, sanitation facilities, and other essential services (Delorino, 2021).

The transmission of *S. japonicum* is closely associated with the distribution and infection status of its intermediate host, *Oncomelania hupensis quadrasi*. Human infection occurs through contact with freshwater contaminated with cercariae released by infected snails, making environmental and behavioral factors critical determinants of disease transmission (Leonardo et al., 2020; Hagan et al., 2022). *O. h. quadrasi* has been reported in several provinces throughout the Philippines, including Quezon, Camarines Norte, Samar, Leyte, Bohol, Surigao del Norte, Davao del Norte, and North Cotabato (Recopuerto-Medina et al., 2023). Notably, approximately 80% of freshwater bodies harboring *O. h. quadrasi* are located in Mindanao (Manalo et al., 2024), and suitable snail habitats have been identified in Davao del Norte (Recopuerto-Medina et al., 2024). Previous malacological surveys have documented snail colonies in the municipalities of Kapalong, New Corella, Sto. Tomas, Braulio E. Dujali, and Carmen (Belizario et al., 2017). However, updated surveillance data on the presence and infection status of *O. h. quadrasi* in Barangay Gupitan remain limited.

In addition to environmental factors, human behavior plays a critical role in sustaining schistosomiasis transmission. Studies have shown that cultural beliefs, misconceptions regarding the disease, poor compliance with mass drug administration (MDA), open defecation practices, and reluctance to seek treatment contribute to continued transmission in endemic communities (Mothapo et al., 2023; Abdissa et al., 2024; Mugabi et al., 2024; Odoi et al., 2025). These challenges are often compounded by inadequate sanitation facilities, limited access to safe water, and insufficient health education, particularly in geographically isolated and disadvantaged communities (Ekhoragbon et al., 2024; Mudavanhu et al., 2024). To address these concerns, the Department of Health (DOH) implements the Schistosomiasis Control and Elimination Program (SCEP), which includes mass drug administration, snail control, health education, and improvements in water, sanitation, and hygiene (WASH) infrastructure (Leonardo et al., 2024; Reyes et al., 2025). In Kapalong, MDA coverage reached 85.6% in 2024 across endemic barangays, while 76% of households gained access to safe water through the Access to Clean Water and Sanitation Program. Despite these efforts, persistent service gaps continue to place some communities at risk of schistosomiasis transmission.

Barangay Gupitan, a geographically isolated and disadvantaged area in Kapalong, Davao del Norte, was identified by the Municipal Health Office as a potential hotspot for schistosomiasis following the incidental detection of *S. japonicum* among 12 school-aged children (MHO Kapalong, 2024). However, despite this finding, there remains a paucity of data regarding the prevalence of *S. japonicum* among residents, the occurrence and infection status of *O. h. quadrasi*, and the community's knowledge, attitudes, and practices (KAP) related to schistosomiasis prevention and control. The lack of comprehensive baseline information limits evidence-based planning, targeted intervention development, and resource allocation for local disease control programs.

Therefore, this study aimed to determine the prevalence of *Schistosoma japonicum* among residents and freshwater snails in selected sitios of Barangay Gupitan, Kapalong, Davao del Norte, and to assess the community's knowledge, attitudes, and practices related to schistosomiasis. The findings provide baseline epidemiologic, environmental, and behavioral data that may support local surveillance efforts, guide public health interventions, and contribute to ongoing schistosomiasis control and elimination initiatives in the Philippines. Furthermore, the study aligns with the MSMT Research Agenda on re-emerging and emerging diseases and supports Sustainable Development Goal (SDG) 3

(Good Health and Well-being) and SDG 6 (Clean Water and Sanitation) through the generation of evidence that informs disease prevention and control strategies.

Statement of the Problem

1. What is the sociodemographic profile of participants in terms of: a. Sex; Age; Sitio; Educational attainment; Economic status; and Ethnic group?
2. What is the Knowledge, Attitudes, and Practices (KAP) of barangay residents regarding *S. japonicum* prevention and control?
3. What is the density of *O. h. quadrasi* snails present in four selected sitios?
4. What is the prevalence of *S. japonicum* cercariae in *O. h. quadrasi* snails?
5. What is the Schistosoma infection status in humans based on: prevalence, and intensity of infection?
6. Do the sociodemographic profile, knowledge, attitudes, practices, *O. h. quadrasi* density and prevalence of *S. japonicum* cercariae in *O. h. quadrasi* significantly influence the prevalence of *S. japonicum* infection among the residents?
7. Do the sociodemographic profile, knowledge, attitudes, practices, *O. h. quadrasi* density and prevalence of *S. japonicum*'s cercariae in *O. h. quadrasi* significantly influence the intensity of infection?

METHODOLOGY

Study Design. A quantitative, descriptive, cross-sectional research design was employed to investigate the epidemiological and malacological landscape of *Schistosoma japonicum* in the target area. The study integrated a behavioral component—assessing community knowledge, attitudes, and practices (KAP) using a structured survey questionnaire adapted from Francisco et al. (2019)—with parasitological and malacological surveillance.

Study Site and Participants. The study was conducted in four selected sitios of Barangay Gupitan (Figure 1) within the Municipality of Kapalong, Davao del Norte, Philippines. This area is recognized by local health authorities as a potential hotspot for *S. japonicum* transmission. The specific study localities included Sitio Gupitan (Sentro), Sitio Dugayan, Sitio Langan-Poiton, and Sitio Patel 4–Kimaigog. To ensure geographical representativeness, a stratified random sampling approach with a set quota per stratum (sitio) was utilized. The global target sample size was initially calculated using the Raosoft online sample size calculator, assuming a 95% confidence level, a 5% margin of error. Inclusion and

exclusion criteria were applied, and all participants provided informed consent prior to data collection.

Sociodemographic profile and KAP survey. Sociodemographic profiling and Knowledge, Attitudes, and Practices (KAP) assessment were conducted using a structured questionnaire adapted from Francisco et al. (2019). The first section gathered sociodemographic data, while the second assessed community knowledge, attitudes, and practices related to schistosomiasis through a standardized tool designed for administration within 30 minutes. To ensure comprehension, the questionnaire was translated into *Binisaya*. Questionnaires were administered on the same day as stool sample collection. Respondents completed the survey under the direct supervision of the researcher and barangay health workers to ensure accuracy and clarify concerns.

Human Stool Sample Collection and Processing. From the target number of respondents, a total of 124 stool samples were collected from the four selected sitios for microscopic examination. The samples were processed using the Kato-Katz method in accordance with WHO protocols. For each stool specimen, two aliquots were prepared, processed, and examined microscopically. Infection intensities were classified as light, moderate, or heavy, based on the number of helminth ova observed, following WHO classification standards. Remaining stool samples were preserved in 10% formalin for further analysis using the Formalin-Ethyl Acetate Concentration Technique (FECT) in the laboratory. Microscopic examinations were conducted under 100x and 400x total magnification for counting and identification of parasite's ova.

*Malacology Study on *Oncomelania hupensis quadrasi* snail.* Potential snail sites based on *O. h. quadrasi* usual habitat were searched in the area. Presence of snails was checked on every potential snail habitat. Snail collection was carried out using timed-search sampling for one hour along a predetermined transect line. Snails were collected with forceps, placed into properly labeled containers, and transported to the testing site. Specimens were identified based on shell morphology, sorted into adult and juvenile categories, and counted prior to examination. For cercarial detection, three equidistant aliquots of distilled water were placed on each glass slide. Snails were gently crushed in the water droplets, and the tissues were teased apart using the edge of the slide to release sporocysts and cercariae, which were then examined microscopically. In addition, a voucher specimen was submitted to the Medical Zoology Laboratory of the Schistosomiasis Research and Training Center in Palo, Leyte for species

confirmation.

Ethical Considerations. The study protocol was reviewed and formally approved by the University of the Immaculate Conception – Research Ethics Committee. Official permissions were secured from the Municipal Health Office (MHO) of Kapalong, local barangay officials, and tribal leaders prior to field deployment. Written informed consent was obtained from all adult participants before data collection commenced. For participants under the age of legal majority (minors), written informed consent was obtained from their parents or legal guardians.

RESULTS AND DISCUSSION

Sociodemographic Profile of Participants

Table 1 shows the sociodemographic profile of the 124 respondents. Most were female (66.9%), which is consistent with rural trends where women are more active in community life (Francisco et al., 2019; Riaz et al., 2023). Most were children aged 6–10 years (21.8%), unlike studies in Uganda and Brazil, which found more young adults (Anyolitho et al., 2022; Santos et al., 2023). Nearly half (46%) were from Poiton/Langan, suggesting better access to health initiatives, while Patel/Kimaisog had lower participation, indicating possible barriers. A quarter (25%) had lived in the area for 6–10 years, showing moderate population stability. Education levels were low, with 55.6% having only elementary education, and 21.8 percent having none, similar to other rural areas (Alemu et al., 2024). Economically, 52.4 percent earned under ₱2,000, and 59.7 percent relied on farming, linking low income with agricultural dependence (Alemu et al., 2024).

Table 1
Sociodemographic Profile of the Participants

Characteristic		Frequency	Percent
Sex	Male	41	33.1
	Female	83	66.9
Age	0-5 years	5	4.0
	6-10 years	27	21.8
	11-20 years	11	8.9
	21-30 years	24	19.4
	31-40 years	15	12.1

	41-50 years	13	10.5
	51-60 years	18	14.5
	61 years and above	11	8.9
Place of Birth			
Sitio			
	Gupitan Sentro	27	21.8
	Dugayan	16	12.9
	Kima-isog/ Patel	9	7.3
	Poiton/ Langan	57	46.0
	Others	15	12.1
Barangay			
	Gupitan	109	87.9
	Others	15	12.1
Municipality			
	Kapalong	111	89.5
	Others	13	12.1
Province			
	Davao del Norte	116	93.5
	Others	8	6.5
Years of Residency			
	0-5 years	9	7.3
	6-10 years	31	25.0
	11-20 years	13	10.5
	21-30 years	24	19.4
	31-40 years	14	11.3
	41-50 years	11	8.9
	51-60 years	15	12.1
	61 years and above	7	5.6
Educational Attainment			
	Primary/ Elementary	69	55.6
	Secondary	26	21.0
	College/ Tertiary	1	0.8
	Technical School	1	0.8
	Graduate School	0	0
	None	27	21.8
Economic Status			
Monthly Income			
	0-2,000 php	65	52.4
	2,001-4,000 php	25	20.2
	4,001-6,000 php	4	3.2
	6,001-8,000 php	3	2.4
	8,001-10,000 php	2	1.6
	>10,000 php	2	1.6
	Not applicable	23	18.5
Source of Income			

	Farming	74	59.7
	Employed/ Government	15	12.1
	Not Applicable	35	28.2
Domestic Animals			
	Cow	0	0.0
	Dog	69	55.6
	Goat	7	5.6
	Chicken	47	37.9
	Pig	9	7.3
	Carabao	9	7.3
	Cat	8	6.5
	Others	1	0.8
Usage of Domestic Animals			
	Meat	44	35.5
	Milk	7	5.6
	Eggs	52	41.9
	Pet	7	5.6
	Work	9	7.3
	Others	4	3.2
Ethnic Group			
	Dibabawon	44	35.5
	Ata-Manobo	61	49.2
	Non-ethnic	19	15.3

This increases exposure to water sources that may host infected snails (Fornillos et al., 2019; Tabilin et al., 2025) while limiting healthcare access (Lazar et al., 2018). Ethnically, most identified as Ata-Manobo (49.2%) and Dibabawon (35.5%), reflecting indigenous groups whose traditional beliefs may influence health behaviors (Chen et al., 2019; Rondilla et al., 2021).

Knowledge, Attitudes, and Practices (KAP) of barangay residents regarding *S. japonicum* prevention and control

Most respondents are aware of schistosomiasis, though fewer recognize its local prevalence. The majority of the respondents identified the correct source of infection however, a substantial proportion did not. In terms of modes of human transmission and symptoms of infection, many respondents failed to identify correct answers. In terms of zoonoses transmission, more than half knew that animals can get Schistosomiasis and can infect humans. A substantial proportion of the respondents gained awareness in health centers (69.3%) while only 7.3 percent learned it from school.

Awareness and Commonality of Infection. As indicated, respondents exhibited general awareness of *S. japonicum*, with most are aware of the disease,

though fewer believed the parasite is prevalent and present in the area.

Table 2.1
Knowledge of barangay residents towards S. japonicum prevention and control

Knowledge Parameter	Frequency	Percent
Awareness and Commonality of Infection		
Heard about Schistosomiasis		
No	46	37.1
Yes	78	62.9
Aware that Schistosomiasis is common in the area		
No	85	68.5
Yes	39	31.5
Knowledge on sources of infection, mode of transmission and symptoms of schistosomiasis		
Aware that the source of Schistosomiasis is		
Microbes	52	41.9
Snails	79	63.7
Aware that the mode of transmission is		
Working in rice fields	49	39.5
Urinating/ defecating near water source	52	41.9
Walking barefoot	25	20.2
Swimming/ playing in bodies of water	51	41.13
Washing clothes/ bathing in bodies of water	59	47.6
Aware that the symptoms of Schistosomiasis		
Leg pain	15	12.1
Paralysis	30	24.2
Rash/ skin spots	19	15.3
Cough	19	15.3
Stomach pain/swelling	83	66.9
Blood in urine/stool	55	44.4
Difficulty breathing	12	9.7
Diarrhea	50	40.3
Dizziness/ fainting	30	24.2
Knowledge on Zoonotic Transmission		
Knows that animals get schistosomiasis	79	63.7
Knows that humans get schistosomiasis from infected animals	75	50.5
Sources of Schistosomiasis Information		
Discussion in class	9	7.3
Stories from Neighbors	22	17.7
Read in newspapers	2	1.6

Heard in news outlets such as television and Radio	7	5.6
Discussed in the barangay, such as in the health Center	86	69.3
Mentioned by other people, such as doctors, nurses, and others	48	38.7
Others	0	0.0
Did not know	2	1.6

Note. N=124

Despite the absence of prior prevalence studies on *S. japonicum*, respondents demonstrated awareness of the infection—higher than levels reported among school-aged children and adults in Northwest Ethiopia (Alemu et al., 2024). In San Miguel, Surigao del Sur, similar findings were observed, with residents showing adequate knowledge (Bertulfo, 2021), likely attributed to the intensive information dissemination and educational campaign conducted by the DOH. Knowledge on sources of infection, mode of transmission and symptoms of schistosomiasis

Knowledge on Zoonotic Transmission. Half of the respondents were aware of animal-to-human schistosomiasis transmission, and two-thirds knew that animals can acquire the infection, indicating some understanding of its zoonotic nature. However, a significant proportion remained unaware, echoing the findings of Paler et al. (2024), where many respondents lacked knowledge on zoonotic transmission. Given the zoonotic nature of *S. japonicum*, involving multiple intermediate and reservoir hosts, control efforts are inherently complex (Yao et al., 2025). The parasite’s persistence in animal reservoirs further complicates human infection control (Tabilin et al., 2025).

Meanwhile, Table 2.2 presents the attitudes of barangay residents toward *S. japonicum* prevention and control. While 82.3 percent believed schistosomiasis is preventable, only 57.3 percent, 56.5 percent, 51.6 percent, and 40.3 percent correctly identified key preventive measures—using clean water, participating in Mass Drug Administration (MDA), avoiding contact with infected water, and wearing protective clothing, respectively. Despite gaps in specific knowledge, a substantial 96.0 percent expressed willingness to participate in MDA, and 99.2 percent were open to joining government-led awareness activities such as seminars and symposiums.

Table 2.2
Attitude of barangay residents towards S. japonicum prevention and control

Attitude Parameter	Frequency	Percent
Beliefs on Disease Preventability		
No	20	16.1
Yes	102	82.3
Did not know	2	1.6
Belief on Disease Seriousness		
Not serious at all	12	9.7
Not very serious	12	9.7
Very serious	0	0.0
Of some concern	61	49.2
Did not know	39	31.5
Beliefs on Prevention Methods		
Participate in mass drug administration [C]	70	56.5
Use clean water for drinking/washing [C]	71	57.3
Wear protective clothing in infected water [C]	50	40.3
Do not swim/bathe/walk in infected bodies of Water [C]	64	51.6
Wash hands after using the toilet	79	63.7
Take medicine from health center	88	71.0
Practice healthy eating	47	37.9
Take cough medicine ex: Robitussin	22	17.7
Willingness to Participate in Prevention and Control Programs		
Mass drug administration / MDA for schistosomiasis		
Definitely not	1	0.8
Probably not	0	0.0
Maybe	2	1.6
Probably	2	1.6
Definitely	119	96.0
Schistosomiasis awareness activities, such as seminars and symposiums, conducted by the government		
Definitely not	0	0.0
Probably not	0	0.0
Maybe	0	0.0
Probably	1	0.8
Definitely	123	99.2

Note. N=124

Beliefs on Disease Preventability and Disease Seriousness. Most

respondents believed schistosomiasis is preventable—a positive indicator for the success of future public health interventions and education campaigns, including efforts to address stigma (Bertulfo, 2021). This aligns with Alemu et al. (2024), who reported similar beliefs in rural communities. However, a notable proportion viewed the disease as unpreventable, signaling a gap in health education. Additionally, none perceived schistosomiasis as a serious disease, contrasting with findings in Surigao del Sur, where the majority acknowledged its severity (Bertulfo, 2021). This underestimation, along with beliefs about unpreventability in Barangay Gupitan, may affect health practices, health-seeking behavior, and compliance with control programs.

Beliefs on Prevention Methods. Many respondents perceived correct prevention methods, reflecting a generally positive attitude toward disease control. However, the presence of misinformation and contradictory beliefs highlights a significant gap. While several respondents cited health-promoting practices, these were often unrelated to schistosomiasis transmission and may hinder effective prevention (Santos et al., 2023; Yao et al., 2025).

Willingness to Participate in Control Programs. The study revealed a strong positive attitude toward future schistosomiasis control initiatives, despite evident gaps in knowledge and preventive practices. This high level of expressed willingness presents a valuable opportunity for public health programs to harness community engagement. Similar findings were reported by Alemu et al. (2024) in Ethiopia, where participants showed strong willingness to participate in MDA. Community support remains critical for the long-term success of such programs, especially in endemic areas requiring sustained MDA and behavior change.

Lastly, Table 2.3 presents the practices of barangay residents regarding *S. japonicum* prevention and control. The study showed that 52.4 percent used clean water for drinking and washing, 44.4 percent had participated in Mass Drug Administration (at least once), 29.4 percent avoided contact with potentially infected water bodies, and 23.4 percent wore protective clothing when exposed to risk areas. However, a notable number still practiced ineffective prevention measures. A majority (96.8%) reported regular contact with outdoor water sources, mainly for chores (71.8%), occupational tasks (47.6%), recreation (42.7%), and open urination/defecation near water (35.5%). Regarding exposure frequency, 42.7 percent had daily contact, 44.4 percent sometimes, 11.3 percent rarely, and only 1.6 percent reported no contact. All respondents used spring water for drinking and cooking. In terms of sanitation, 66.9 percent had access to

a working toilet, while 33.1 percent did not; among the latter, 15.3 percent defecated in water bodies, 2.4 percent on land, and 13.7 percent used both, highlighting the community’s open defecation practices.

Table 2.3
Practices of barangay residents towards S. japonicum prevention and control

Practices Parameters		
Actual Practiced Prevention Methods		
Participate in mass drug administration [C]	55	44.4
Use clean water for drinking/washing [C]	65	52.4
Wear protective clothing in infected water [C]	29	23.4
Do not swim/bathe/walk in infected bodies of Water [C]	37	29.4
Wash hands after using the toilet	66	53.2
Take medicine from health center	64	51.6
Practice healthy eating	41	33.1
Take cough medicine ex: Robitussin	13	10.5
Water Contact and Exposure		
Contact with water outdoors	120	96.8
Occupational (rice farming, fishing)	59	47.6
Chores (washing clothes, bathing)	89	71.8
Recreation (swimming, boating)	53	42.7
Urinating/defecating near or into water sources	44	35.5
Other	2	1.6
Did not know	0	0.0
How often do you contact water		
Never	2	1.6
Rarely	14	11.3
Sometimes	55	44.4
Everyday	53	42.7
Sources of Water		
Drinking Spring	124	100.0
Bathing Spring	85	68.5
Water system	39	31.5
Washing Clothes		
Spring	84	67.7
Water system	40	32.3
Washing Dishes		
Spring	95	76.6
Water system	29	23.4
Cooking Spring	124	100.0
Toilet Availability and Open Defecation		
have a working toilet		
No	41	33.1
Yes	83	66.9

If no, where do you go to the bathroom		
Water bodies (river)	19	15.3
Land	3	2.4
Both	17	13.7

Note. N=124

Actual Practiced Prevention Methods. The results reveal a clear disparity between beliefs and actual practices. While 29.4 percent claimed to avoid contact with infected water (Table 2.2), a substantial 96.8 percent reported frequent exposure, largely due to daily activities, livelihood, and lifestyle. This highlights how preventive practices are influenced by sociodemographic factors, particularly subsistence needs. Such belief–practice gaps are not unique; a KAP study in Gambia similarly found that fewer than half of respondents engaged in effective prevention despite high awareness (Barrow et al., 2020). Alemu et al. (2024) suggested that disparities in access to clean water contribute to this inconsistency.

Water Contact and Exposure. An overwhelming 96.8 percent of respondents reported exposure to outdoor water sources, and all (100%) used spring water for drinking and cooking. Notably, no household in Barangay Gupitan accessed safely managed drinking water, with 90 percent relying on level 2 water sources (MHO Kapalong, 2024). This indicates that residents, lacking access to safe water, are compelled to use what is locally available—posing a significant risk for schistosomiasis transmission.

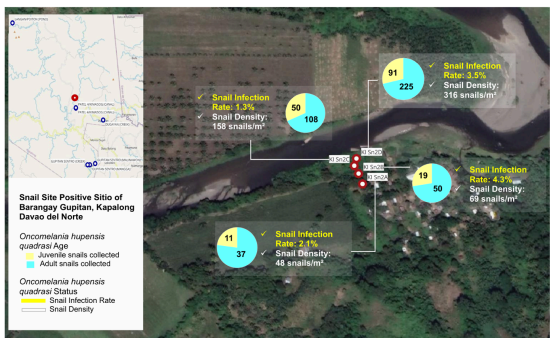
Toilet Availability and Open Defecation Practices. Sanitation indicators further complicate the situation. One-third of respondents lacked access to a toilet and practiced open defecation, with the majority using water bodies—highlighting a critical transmission pathway for *S. japonicum*. Toilet unavailability remains a persistent issue in rural communities; over 3 percent of households in endemic areas in the Philippines lack toilet facilities and resort to open defecation (PSA, 2020).

Density of *Oncomelania hupensis quadrasi* and Prevalence of *S. japonicum cercariae* in *Oncomelania hupensis quadrasi* snails in four selected sitios

Figure 1 presents the density and prevalence of *Oncomelania hupensis quadrasi* snails in four selected sitios; however, active snail sites were found only in Patel 4/Kimaisog. The site, located along the Kimaisog canal, was divided into four collection areas using an established transect line. KI Sn2A and Sn2B recorded lower densities at 48 and 69 snails/m², respectively, yet still confirmed

active snail populations. KI Sn2C showed a higher density at 158 snails/m², while KI Sn2D had the highest at 316 snails/m², marking it as a high-risk area for *Schistosoma japonicum* transmission. Of the 591 snails collected, 420 were adults (71%) and 171 juveniles (29%), indicating ongoing reproduction and a sustained population. In terms of infection, KI Sn2B had the highest prevalence of *S. japonicum* cercariae at 4.3 percent, followed by KI Sn2D at 3.5 percent, KI Sn2A at 2.1 percent, and KI Sn2C at 1.3 percent. The overall infection rate across all sites was 2.9 percent, underscoring active transmission potential in the area.

Figure 1
Oncomelania hupensis quadrasi snail Status in Snail Site Positive Sitio



The results revealed an increasing trend in snail density from KI Sn2A to KI Sn2D, likely influenced by proximity to households and levels of environmental disturbance. KI Sn2A, being closest to human settlement, had the lowest density, while KI Sn2D, the farthest and least disturbed, exhibited the highest at 316 snails/m².

This supports Komiya's (1961) observation that *Oncomelania* snails prefer undisturbed, moist habitats. The high density in KI Sn2D identifies it as a high-risk area for schistosomiasis transmission, indicating a dense and active breeding site (Zhang et al., 2023). Although other sites had lower densities, they remain ecologically significant, reflecting ongoing reproduction and environmental suitability. These areas may represent early stages of population growth or slightly less favorable microhabitats. Moreover, among the 591 snails collected, the overall infection rate was 2.9 percent, confirming active local transmission.

Garba et al. (2024) noted that even a small number of heavily infected

snails can sustain transmission when human and animal exposure persists. Notably, 88 percent (15 out of 17) of infections occurred in adult snails, suggesting higher susceptibility or prolonged exposure. Anderson et al. (2021) emphasized that cercarial output correlates with snail age and size, reinforcing the role of adult snails in transmission. These findings highlight the need for targeted snail control strategies that consider both habitat density and population age structure.

Schistosoma Infection Status in Human Population

Table 3 shows the *S. japonicum* and other significant intestinal parasitic infection status in human population. Using both Kato-Katz and FECT method, no ova of the parasite *S. japonicum* is seen leading to zero cases infection. However, another result of the study showed high prevalence of Soil-Transmitted Helminths (STHs) [figure 4] particularly, *Ascaris lumbricoides* using Kato-Katz (34.7%) and FECT (37.1%), *Trichuris trichiura* (17.7% in both Kato-Katz and FECT), hookworm (1.6% in Kato-Katz) and (5.7% in FECT) and Heterophyid appeared in 4.8 percent using Kato-Katz and 1.6 percent using FECT of samples.

Table 3
Schistosoma infection status in human population.

	Kato-Katz		FECT	
	n positive samples	Prevalence (%)	n positive samples	Prevalence (%)
<i>S. japonicum</i>	0	0	0	0
<i>A. lumbricoides</i>	43	34.7	46	37.1
<i>T. trichiura</i>	22	17.7	22	17.7
Hookworm spp.	2	1.6	7	5.7
Others: Heterophyid	6	4.8	2	1.6

Note. N=124

Diagnostic results revealed zero cases of *S. japonicum* among the 124 individuals examined, contrasting with a surveillance study in Davao del Norte and Davao de Oro that reported low prevalence among school-aged children. However, findings on other soil-transmitted helminths were consistent with co-infection patterns observed in similar settings (Belizario et al., 2024). While the absence of *S. japonicum* cases might be a good indicator, it likely reflects sampling limitations—particularly in Sitio Kimaisog, where only one stool sample was collected despite the presence of infected *O. h. quadrasi* snails. This highlights a potential sampling artifact rather than true absence of infection. Low participation stemmed from community reluctance, suspicion, and disinterest,

behaviors often observed in underserved or culturally distinct populations (Tenorio & Molina, 2021; WHO, 2023). Geographic isolation further constrained follow-up and engagement. Despite the zero-case result, the detection of infected snails in Sitio Kimaisog confirms ongoing active local transmission.

Significant Influence of Sociodemographic Profiles, Knowledge, Attitudes and Practices (KAP) and *O. h. quadrasi* Snail Density and Prevalence of *S. japonicum cercariae*

Since no human participant tested positive for *S. japonicum* using the Kato-Katz and FECT diagnostic methods, no statistical analysis was performed to determine the impact of the sociodemographic profiles, knowledge, attitudes and practices (KAP) and *O. h. quadrasi* snail density and prevalence of *S. japonicum cercariae* on the prevalence and severity of infection of human Schistosomiasis. Inferential testing was not appropriate and could not be done because there was no variance in the dependent variable (no positive cases). Several possible reasons were discussed to understand the community's health-seeking behaviors. Hence, inferential analysis is not feasible in this study; therefore, a statistically significant correlation between *S. japonicum* and independent variables is not established. Due to cultural resistance, community non-compliance, and limited participation, particularly in the only high-risk sitio, *S. japonicum* infection was not detected.

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