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Public Health Awareness and Risk Factors of Intestinal Parasitic Infections among School-Aged Children, Hirshabelle State, Somalia: A Cross-Sectional Survey

Zakariye Abdifatah Ahmed[1]*, Asmat Nawaz[2], Abdul Rehman Rafee[1], Hussein Mohamed Salah[3] and Guled Abdukadir Gelle[3]

[1]Department of Epidemiology and Public Health, University of Veterinary and Animal Sciences, Lahore, Pakistan

[2]Department of Parasitology, University of Veterinary and Animal Sciences, Lahore, Pakistan

[3]Department of Veterinary Medicine, Somali National University, Mogadishu, Somalia

***Corresponding Author:** Zakariye Abdifatah Ahmed, Department of Epidemiology and Public Health, University of Veterinary and Animal Sciences, Lahore, Pakistan.

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Abstract

Introduction

Intestinal parasitic infections (IPIs) are a major public health concern in low-resource settings, particularly among school-aged children. Poor sanitation, limited awareness, and weak preventive practices sustain transmission in Somalia.

Methods

A cross-sectional descriptive survey study was conducted from February to July 2025 in Jowhar and Jalalaqsi districts, Hirshabelle State, Somalia. A total of 400 parents, guardians, and teachers of school-aged children were selected using simple random sampling. Data were collected through structured questionnaires on socio-demographics, awareness, hygiene practices, and health-seeking behavior. Descriptive statistics was applied using SPSS.

Results

Among the respondents, 67% were parents, while 20.5% were guardians and 12.5% were teachers. While 77.5% had heard of intestinal parasites, only 57.5% correctly identified person-to-person transmission, and 22% were unsure. Commonly recognized symptoms were diarrhea (63%), abdominal pain (62%), and worms in stool (55%). Preventive awareness was relatively high, with 86% acknowledging preventability. Risk factors included open defecation (13.5%), barefoot walking (43.5%), and untreated drinking water use (49%). Nearly half of children (45.5%) experienced IPI-related symptoms in the past six months, with 82% seeking treatment—mainly at health centers. However, only one-third adhered to WHO-recommended deworming intervals. Trust in healthcare services was modest (58%). Encouragingly, 87.5% expressed willingness to attend free health education sessions.

Conclusion

Persistent risk factors such as poor sanitation, unsafe water, and inconsistent deworming sustain IPI transmission in Somali communities. Strengthening water and sanitation infrastructure, expanding school- and community-based health education, and improving routine deworming coverage are essential to reduce the burden among school-aged children.

Keywords: Intestinal Parasitic Diseases, Child, School Age, Risk Factors, Health KAP, Somalia.

Introduction

The global burden of disease is significantly influenced by intestinal parasitic infections (IPIs), especially in low- and middle-income nations [1]. Intestinal parasite infection is among the most common diseases worldwide. These illnesses affect an estimated 3.5 billion people, and 450 million of them, mostly children, become ill as a result [2]. Africa bearing a significant portion of this burden .The most susceptible population is school-aged children because of their higher exposure to contaminated environments, compromised immune systems, as well as limited access to preventive healthcare.

Hookworm infections, Ascaris lumbricoides, and Trichuris trichiura can cause anemia, malnourishment, impaired cognitive development, and poor academic performance [3]. These conditions can prolong poverty cycles and have detrimental health effects. Intestinal parasite infections, involving both helminths and protozoa, continue to pose a significant public health concern for school-age children throughout Africa. The epidemiology of IPIs in Africa is closely linked to environmental factors, sanitation problems, and socioeconomic inequality.

Approximately 25.8% of African school-aged children had intestinal protozoan parasites of one or more species in their fecal sample, according to a review of research of 20 years. Giardia spp. and E. histolytica were the most common species [4]. Studies from various regions of Africa, like Nigeria, Ethiopia, Tanzania, Kenya, and Sudan, have reported prevalence rates ranging from 17.1% to 78.1% in school-aged children [5-8]. Risk factors that have been repeatedly found include open defecation, walking barefoot, using untreated water sources, inadequate food hygiene, and inadequate sanitation facilities [9].

In many parts of Africa, climate factors like warm temperatures, seasonal rainfall, and sporadic flooding provide ideal circumstances for parasite survival and spread [10,11]. Public understanding of IPI symptoms, prevention strategies, transmission channels, and the value of prompt treatment is crucial for effective control. Research from Africa has shown that low awareness levels are linked to limited adoption of preventive activities, reliance on ineffective traditional medicines, and delayed healthcare-seeking behaviors. Targeted school-based health education and community outreach initiatives can greatly enhance hygiene practices and lower the prevalence of infections, according to studies conducted in Ethiopia and Nigeria [12,13].

The danger of extensive IPI transmission in Somalia is increased by semi-arid and riverine regions as well as inadequate infrastructure. There are few community-based studies evaluating public health awareness and behavioral risk factors in the Somali population, despite Somalia's high susceptibility to IPI transmission. The majority of existing research concentrates on small-scale parasitological surveys or hospital-based prevalence, with less attention to the manner in which socio demographic characteristics like parental education, income, and whether a person lives in an urban or rural area interact with sanitation and hygiene practices to affect the risk of infection.

However, this study attempts to close this knowledge gap by evaluating public health awareness and identifying risk factors for intestinal parasite infections in school-aged children in the Jawhar and Jalalaqsi districts of Hirshabelle State, Somalia. The findings will help develop long-term solutions to reduce the prevalence of IPIs in Somalia and similar African contexts, as well as direct evidence-based, locally relevant health education programs and promote community involvement.

Methodology

This study employed a cross-sectional descriptive survey design to assess public health awareness and risk factors associated with intestinal parasitic infections among school-aged children in Jowhar and Jalalaqsi districts, Hirshabelle State, Somalia. The study population included parents, guardians, or teachers of school-aged children residing in selected households or schools within the target districts. A structured, pretested questionnaire was developed to collect data on socio-demographic characteristics, knowledge of intestinal parasites, hygiene and sanitation practices, and sources of health information. The questionnaire was administered through face-to-face interviews conducted by trained data collectors.

A total of 400 participants were selected using simple random sampling from the study population. The initial sample size of 384 was calculated using Cochran's formula (95% confidence level, 5% margin of error, and p = 0.05) [14]. To increase statistical power and account for non-response, the sample size was increased to 400 participants, which enhances the reliability of estimates and allows for more precise subgroup analysis [15].

$$n = \frac{Z^2 \cdot p \cdot (1-p)}{d^2}$$

$$n = \frac{(1.96)^2 \cdot 0.5 \cdot (1-0.5)}{(0.05)^2} = \frac{3.8416 \cdot 0.25}{0.0025} = \frac{0.9604}{0.0025} = 384.16$$

While n = required sample size, Z = Z-score for desired confidence level (1.96 for 95%), p = estimated proportion of population with the attribute (use 0.5 if unknown) and d = desired precision or margin of error (commonly 0.05).

Data were collected over six months period (February to July-2025), with verbal informed consent obtained from all participants prior to the interviews. The collected data were entered and cleaned using Microsoft Excel and analyzed using SPSS. Descriptive statistics such as frequencies and percentages were used to summarize the data. Ethical considerations, including confidentiality and voluntary participation, were strictly maintained throughout the study.

Description of Study area

This study was conducted in Jowhar and Jalalaqsi districts, Hirshabelle State, Somalia (Figure 1). Jowhar, the state capital, lies about 90 km north of Mogadishu and experiences a hot, semi-arid climate with seasonal variations in temperature and rainfall. Jalalaqsi District, situated in the south-central Hiiran region along the Shebelle River between Jowhar and Buuloburde (latitude 3.3851°N, longitude 45.5960°E), has brief, extremely hot summers and warm winters, with generally humid, dry, and windy conditions year-round. Temperatures in Jalalaqsi typically range from 70°F to 101°F, rarely falling below 67°F or exceeding 103°F [16].

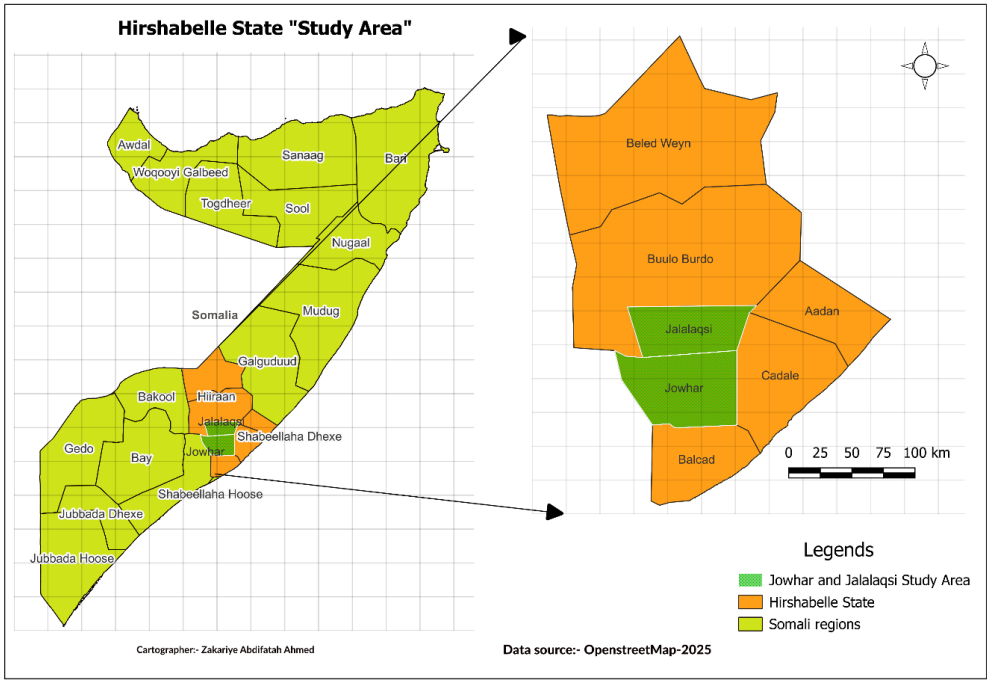

Figure 1: Map of the Study Area Showing Jowhar and Jalalaqsi Districts in Hirshabelle State, Somalia Data Source (OpenStreetmap, 2025)

Results and Interpretations

Variable	Category	Jowhar (n=200)	%	Jalalaqsi (n=200)	%
Gender	Male	92	46.0	100	50.0
	Female	108	54.0	100	50.0
Relationship to child	Parent	138	69.0	130	65.0
	Guardian	38	19.0	44	22.0
	Teacher	24	12.0	26	13.0
Education level	No formal education	40	20.0	36	18.0
	Primary	60	30.0	62	31.0
	Secondary	68	34.0	64	32.0
Residence Type	Urban	92	46.0	104	52.0
	Rural	108	54.0	96	48.0
Access to healthcare	Yes	130	65.0	120	60.0
	No	70	35.0	80	40.0
Monthly Income (USD)	< $100	40	20.0	36	18.0
	$ 100-200	90	45.0	98	49.0
	>200	70	35.0	66	33.0

Table 1: Socio-Demographic Information

In the Table (1) showed that the respondents were fairly balanced in gender distribution, with slightly more females (52%) than males (48%). Most respondents were parents (67%), followed by guardians (20.5%) and teachers (12.5%). Regarding education, a considerable portion had secondary education (33%), while 19% had no formal education. In terms of residence, half of the respondents (51%) lived in rural areas. This urban–rural split is important since access to healthcare was lower in rural areas; only 62.5% had access, which could hinder timely treatment of parasitic infections. Household income also showed that a majority lived below $100-200 per month

Question	Response	Jowhar	%	Jalalaqsi	%
Heard of intestinal parasites	Yes	160	80.0	150	75.0
	No	40	20.0	50	25.0
Knowledge sources	School	50	25.0	44	22.0
	Radio/TV	36	18.0	40	20.0
	Health worker	60	30.0	52	26.0
	Others	14	7.0	14	7.0
Transmission person-to-person	Yes	120	60.0	110	55.0
	No	40	20.0	42	21.0
	Not sure	40	20.0	48	24.0
Symptoms (multiple answers)	Diarrhea	130	65.0	122	61.0
	Abdominal pain	120	60.0	128	64.0
	Worms in stool	110	55.0	108	54.0
	Vomiting	78	39.0	82	41.0
	Itching	56	28.0	60	30.0
Belief in serious health effects	Yes	158	79.0	160	80.0
	No	42	21.0	40	20.0
Are children more at risk?	Yes	142	71.0	138	69.0
	No	32	16.0	30	15.0
	Not sure	26	13.0	32	16.0
Can be prevented?	Yes	170	85.0	174	87.0
	No	30	15.0	26	13.0

Table 2: Knowledge of Intestinal Parasitic Infections

The above (Table 2), Approximately 77.5% of respondents had heard of intestinal parasites, showing a moderate level of awareness. The most common sources of information were health workers (28%) and schools (23.5%), highlighting their critical roles in health education.

However, only 57.5% knew that parasites could be transmitted person-to-person, and 22% were not sure, indicating misconceptions about transmission pathways. Commonly recognized symptoms included diarrhea (63%), abdominal pain (62%), and worms in stool (54.5%).

Knowledge about transmission routes was strong, with most participants identifying contaminated water, unwashed vegetables, open defecation, and walking barefoot as risk factors. Additionally, 79.5% recognized the potential for serious health effects, and 70% acknowledged children as being more at risk, reflecting good awareness of susceptibility. Encouragingly, 86% believed these infections are preventable, which could support the success of behavior change interventions.

Question	Response	Jowhar	%	Jalalaqsi	%
Toilet type	Flush toilet	40	20.0	52	26.0
	Pit latrine	130	65.0	124	62.0
	Open defecation	30	15.0	24	12.0
Hand washing after toilet	Always	118	59.0	124	62.0
	Sometimes	60	30.0	56	28.0
	Never	22	11.0	20	10.0
What used for hand washing	Water only	80	40.0	74	37.0
	Soap and water	110	55.0	112	56.0
	Ash and water	10	5.0	14	7.0
Child walks barefoot	Yes	84	42.0	90	45.0
	No	116	58.0	110	55.0
Drinking water source	Tap	30	15.0	36	18.0
	Borehole	70	35.0	66	33.0
	River	50	25.0	42	21.0
	Tanker/truck	38	19.0	44	22.0
	Other	12	6.0	12	6.0
Drinking water treated	Yes	108	54.0	96	48.0
	No	92	46.0	104	52.0
Food storage	Covered	160	80.0	154	77.0
	Uncovered	24	12.0	26	13.0
	Thrown away	16	8.0	20	10.0

	No	96	48.0	92	46.0

Table 3: Hygiene and Sanitation Practices

In (Table 3) showed that the dominant form of sanitation was the pit latrine (63.5%), with 13.5% still practicing open defecation. Although 60.5% of children always washed hands after toilet use, 10.5% never did, indicating gaps in hygiene practices. Only 55.5% used soap and water, while 38.5% used water only, suggesting that effective hand hygiene is not universal. 43.5% of children walked barefoot outdoors, which increases the risk of soil-transmitted helminthes. Drinking water sources varied, with 34% depending on boreholes and 23% on rivers. Notably, 49% did not treat their drinking water, and 9% did not store food properly, exposing children to further risk. Waste disposal services were lacking for nearly 47% of respondents, indicating environmental sanitation challenges that could perpetuate parasitic infection cycles.

Question	Response	Jowhar	%	Jalalaqsi	%
Child experienced symptoms					
(past 6 months)	Yes	88	44.0	94	47.0
	No	112	56.0	106	53.0
If yes, sought treatment	Yes	72	81.8	78	83.0
	No	16	18.2	16	17.0
Where treatment was sought	Health center	50	69.4	58	74.4
	Pharmacy	14	19.4	12	15.4
	Traditional healer	6	8.3	6	7.7
	Did not seek	2	2.8	2	2.6
Do you deworm your child regularly?	Yes	132	66.0	138	69.0
	No	68	34.0	62	31.0
If yes, how often?	Every 3 months	42	31.8	48	34.8
	Every 6 months	62	47.0	60	43.5
	Once a year	28	21.2	30	21.7
Trust healthcare services	Yes	120	60.0	112	56.0
	No	42	21.0	50	25.0
	Not sure	38	19.0	38	19.0

Table 4: Health-Seeking Behavior

Almost half of the respondents (45.5%) reported that their child had experienced symptoms suggestive of intestinal parasites in the past six months (Table 4). Of these, over 82% sought treatment, with 72% preferring health centers. While 67.5% reported regularly deworming their children, the frequency varied, and only 33.3% did it every three months, which is the WHO-recommended interval in high-risk settings. This suggests that while treatment-seeking behavior is relatively strong, preventive practices like regular deworming need reinforcement. Only 58% trusted healthcare services, and 19% were unsure, highlighting a need to build community confidence in the formal health system.

Question	Response	Jowhar	%	Jalalaqsi	%
Received health education	Yes	88	44.0	80	40.0
	No	112	56.0	120	60.0
Who provided information	Health worker	44	50.0	36	45.0
	School	24	27.3	22	27.5
	NGO	12	13.6	14	17.5
	Media	8	9.1	8	10.0
More awareness needed in community?	Yes	166	83.0	172	86.0
	No	34	17.0	28	14.0
Would attend free health education session	Yes	172	86.0	178	89.0
	No	28	14.0	22	11.0
Most effective education method	Schools	46	23.0	48	24.0
	Community meetings	44	22.0	40	20.0
	Radio/TV	50	25.0	48	24.0
	Health campaigns	38	19.0	42	21.0
	Religious leaders	22	11.0	22	11.0
Schools should teach about hygiene/infections	Yes	186	93.0	192	96.0
	No	14	7.0	8	4.0

Table 5: Awareness and Sources of Information

Awareness and Sources of Information are indicated in (Table 5) that only 42% had ever received health education on intestinal parasites, but there was a strong willingness (87.5%) to attend free education sessions, showing a clear demand for health promotion. The most effective perceived sources of health education were schools (23.5%), radio/ TV (24.5%), and community meetings (21%), indicating the value of multi-channel interventions. Importantly, 94.5% agreed that schools should play a larger role in educating children about hygiene and parasitic infections.

Discussion

The goal of the current study was to determine risk factors for intestinal parasite infections (IPIs) and evaluate public health knowledge among school-age children in the Jowhar and Jalalaqsi districts of Hirshabelle State, Somalia. The outcomes of this cross-sectional survey show how awareness levels, sanitation habits, socio demographic characteristics, and treatment-seeking behaviors interact to reveal the ongoing prevalence of parasitic illnesses in Somali communities. The findings show both common epidemiological patterns and context-specific issues that influence the incidence of IPIs in Somalia when compared to research done in nearby African nations.

In (Table 2), In both districts, over four out of five respondents (77.5%) had heard about intestinal parasites, with the most common information sources being schools (23.5%) and health workers (28%) in both districts. Although this awareness level is moderate, it is not ubiquitous, and there are still clear misconceptions. In Somalia, for example, only 57.5% of districts correctly identified person-to-person transmission, while 20.5% were unclear. These results are consistent with past findings from Ethiopia and Nigeria, which showed that while awareness of IPIs was low in rural regions with little outreach, it was higher in urban schools with organized health education [6,13].

Comparitively, studies conducted in Sudan and Kenya, revealed a greater understanding of common symptoms such as diarrhea and stomach discomfort, but they also observed a general dependence on informal communication channels and traditional healers. Although Somalia's reliance on health professionals and schools as reliable information sources is positive, there is still a sizable knowledge gap due to the lack of widely accepted organized health education [16,17]. The finding that 87.5% of participants expressed willingness to attend free health education sessions indicates strong community demand for structured interventions.

Significant hygienic and sanitation deficiencies that promote the spread of parasites were found during the survey .While 63.5% of households relied on pit latrines, 13.5% still practiced open defecation (Table 3) and a figure comparable to reports from rural Ethiopia [6]. Although 60.5% of children always washed their hands after using the toilet, 10.5% said they never did so, and approximately 38.5% utilized just water without soap, revealing uneven hand hygiene practices. Protozoan and helminthic diseases thrive in such environments, supporting previous studies that showed how important soap is in lowering fecal-oral transmission. According to data from Ethiopian cholera epidemics, one of the main causes of the spread of fecal–oral diseases is insufficient soap usage [9].Children were more likely to be exposed to soil-transmitted helminths such hookworms and Ascaris lumbricoides since a sizable percentage of them 43.5% (Table 3) went outside barefoot. Similarly, barefoot walking was found to be a statistically significant risk factor for STH infection in school-aged children in Nigeria [18].

The risk of protozoan infections, particularly Giardia and Entamoeba species, was further increased by the prevalence of using rivers and boreholes without adequate filtration and the reliance on untreated drinking water sources (49% of households). These results are in line with reports from northern Kenya and Ethiopia that showed a strong correlation between childhood diarrheal illnesses and contamination of surface and groundwater sources [4,19].Therefore, these findings suggest that unsafe water practices remain a key transmission pathway in Hirshabelle State.

One of the main factors influencing risk is socioeconomic vulnerability. Hirshabelle State is characterized by widespread poverty, as evidenced by the majority of households surveyed living on less than $200 per month (Table 1). The transmission of intestinal parasites is known to be influenced by poverty because it restricts access to timely medical care, clean water, and sanitary conditions [20].Education levels were also influential: nearly 19% (Table 1) of respondents had no formal education, which likely contributed to the misconceptions and inconsistent adoption of preventive practices observed.

There were noticeable differences between urban and rural areas. Only 62.5% of rural households had worse access to healthcare than their urban counterparts (Table 1), which is consistent with findings from other Somali regions where town and district centers are the main hubs for health services. As found in Ghana, rural children are typically at greater risk of parasitic infections due to inadequate infrastructure, poor waste disposal, and higher reliance on untreated water sources [21].

In this study (Table 4), in the six months prior to the study, nearly half of the children who were surveyed (45.5%) had symptoms that were typical of parasitic infections. Health centers were the preferred source of care in 82% of those cases, which is encouraging. This differs from evidence in other African contexts—such as the multi-site childhood diarrhea study—where despite caregivers identifying danger signs, many first resort to herbal remedies or unregulated antibiotics, delaying formal care [22].

Similarly, during childhood illness episodes, almost half of caregivers in sub-Saharan Africa first sought care from unofficial sources (such as traditional healers) or did not seek care at all. This trend was particularly noticeable among caregivers with less education [23]. Nevertheless, about 17% of Somali families did not seek treatment, often due to cost, distance, or mistrust of healthcare services [2].

In fact, (Table 4), only 58% of respondents said they were confident in healthcare facilities, and 19% said they were unsure. This suggests that there is a need to improve the trust that exists between formal health systems and communities. Although there was limited adherence to WHO recommendations (https://www.who.int/tools/elena/interventions/deworming) for high-risk areas, regular deworming coverage was moderately high (67.5%).

The majority of families dewormed their children once or twice a year, but only one-third did so every three months. Similar implementation issues have been documented in Ethiopia, where ongoing delivery of school-based WASH and deworming programs was hampered by logistical issues [24]. In Somalia, insecurity, poor funding, and weak health governance likely contribute to these irregularities.

At roughly 58% (Table 4) trust in healthcare services was comparatively low, reflecting systemic problems typical in fragile environments. According to qualitative research conducted in Mogadishu, communities have become less trusting of formal medical providers as a result of decades of conflict, a disjointed private-led health system, a lack of regulation, and a high rate of subpar care [25].

The results from Somalia are consistent with larger African patterns of high parasite infection risk associated with poverty, poor sanitation, and low awareness. Somalia's prevalence estimates are lower than those of some Ethiopian regions where rates surpass 70%, but they are comparable to those of Nigeria (17–44%) and Sudan (30–40%) [4,6]. The variations might result from changes in the climate, environment, and deworming intervention coverage. Although protozoan parasites flourish in polluted water sources along the Shebelle River, Somalia's semi-arid climate might not allow helminths to persist as long as they would in wetter highland settings.

Surprisingly 86% of Somali parents and guardians (Table 2) showed a greater understanding of the preventable nature of IPIs. Despite high levels of awareness among caregivers, many people in Ghana continued to have fatalistic beliefs and preferred traditional healing methods to medical care. For instance, despite the fact that most people in the Ho Municipality, Volta Region, were aware of intestinal helminths, 85.7% of them chose not to take preventative measures because of ingrained beliefs and mistrust of formal medicine [26].

Similar trends were noted in Pakistan, where, even in areas where awareness campaigns have been implemented, a high prevalence of IPIs coexists with a low adoption of preventive measures, which is frequently ascribed to misunderstandings and cultural barriers [27].This positive perception provides a strong entry point for community-level preventive strategies.

Conclusion

The study's conclusions highlight Somalia's pressing need for integrated control measures against IPIs. Untreated water consumption, barefoot walking, poor hand hygiene, and open defecation all persist, highlighting systemic issues that cannot be resolved by changing individual behavior alone. Waste management, community sanitation, and safe water infrastructure investments are essential. Furthermore, it should be a top priority to increase routine deworming coverage to meet WHO-recommended intervals. Stronger collaborations between educational institutions, health facilities, and neighborhood associations are also necessary for this, in addition to better program financing and administration. Improving service quality, cutting costs, and actively interacting with local communities are all ways to boost public confidence in formal healthcare systems.

Limitations

Although this study offers insightful information, it should be noted that it has certain limitations. Causal inference between risk factors and infection outcomes is limited by the cross-sectional design. Furthermore, symptoms and self-reported awareness served as the foundation for analysis rather than parasitological confirmation of infection. Stool tests and awareness surveys should be combined in future research to give a more complete picture of infection prevalence. In order to assess seasonal differences in transmission and track the effects of interventions over time, longitudinal studies would also be beneficial.

Authors' Contribution

ZAA conceived and designed the study, supervised data collection, performed analysis, and drafted the manuscript.
AN provided methodological guidance, supervised data interpretation, and critically reviewed the manuscript.
ARR assisted in data analysis, literature review, and manuscript formatting.
HMS contributed to field coordination, data acquisition, and community mobilization.
GAG. assisted in questionnaire development, data verification, and manuscript revision.
All authors read and approved the final manuscript

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