OPEN ACCESS

Saudi Journal of Nursing and Health Care
Abbreviated Key Title: Saudi J Nurs Health Care
ISSN 2616-7921 (Print) |ISSN 2616-6186 (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: https://saudijournals.com

Original Research Article

Prevalence and Risk Factors of *Trichuris trichiura* Infection among Children in Mogadishu, Somalia: A Cross-Sectional Study

Dr Abdullah Dahir H. Aweis[1,2,3*], Dr. Daud Moallim Ishaq[4], Mr Timthy Kiprotich Kimutai[5]

[1] School of Public Health and Research (SPHR), Somali National University, Mogadishu, Somalia
[2] Laboratory Department, Kalkaal Hospital, Mogadishu, Somalia
[3] Jazeera University, Mogadishu, Somalia
[4] Pharmacy Department, Kalkaal Hospital, Mogadishu, Somalia
[5] Statistical Data Analyst, Kalkaal Hospital, Mogadishu, Somalia

DOI: https://doi.org/10.36348/sjnhc.2025.v08i07.001 | **Received:** 26.05.2025 | **Accepted:** 03.07.2025 | **Published:** 07.07.2025

***Corresponding author:** Abdullah Dahir H. Aweis
School of Public Health and Research (SPHR), Somali National University, Mogadishu, Somalia
Laboratory Department, Kalkaal Hospital, Mogadishu, Somalia
Jazeera University, Mogadishu, Somalia

Abstract

Background: *Trichuris trichiura* (whipworm) is a common soil-transmitted helminth that contributes to significant morbidity among children in low-resource settings. This study aimed to determine the prevalence of *T. trichiura* infection and identify associated sociodemographic, behavioral, and environmental risk factors among children. ***Methods:*** A cross-sectional study was conducted involving 126 children aged 1–15 years. Data on demographics, hygiene practices, environmental exposures, and health history were collected through structured questionnaires. Stool samples were analyzed using the Kato-Katz technique. Chi-square tests and multivariate logistic regression were used to identify factors associated with infection. ***Results:*** The overall prevalence of *T. trichiura* infection was high. Bivariate analysis revealed significant associations between infection and abdominal pain ($p < 0.0001$), presence of worms in stool ($p = 0.0031$), proximity to animals ($p = 0.0006$), lack of family prevention education ($p = 0.0404$), and use of plain water for handwashing ($p = 0.0068$). In the adjusted model, abdominal pain remained a strong predictor (AOR = 12.64, $p = 0.002$), while proximity to animals showed a positive trend (AOR = 4.18, $p = 0.078$). Family exposure to preventive education was borderline protective (AOR = 0.28, $p = 0.051$). ***Conclusion:*** Abdominal pain is a key clinical indicator of *T. trichiura* infection. Environmental and behavioral factors, particularly living near animals and inadequate handwashing practices, contribute to infection risk. Community-specific health education and integrated sanitation strategies are essential for effective control.

Keywords: Trichuris trichiura; soil-transmitted helminths; intestinal parasites; children; hygiene practices; risk factors; abdominal pain; environmental health; cross-sectional study; public health.

INTRODUCTION

Trichuris trichiura, or whipworm, is a soil-transmitted helminth causing trichuriasis, a neglected tropical disease affecting approximately 360-500 million people worldwide, particularly in lower source settings [1]. Infection occurs through ingestion of embryonated eggs in contaminated soil, leading to intestinal colonization and various symptoms. T. trichiura predominantly affects children, causing malnutrition and impaired cognitive development [1]. Current control strategies involve mass drug administration, but low drug efficacy and high reinfection rates pose challenges. [1,2] Genomic studies suggest an African origin for T. trichiura, with subsequent global spread through human migration. [3]

The prevalence and impact of T. trichiura are especially pronounced in communities where poverty, overcrowding, and poor hygiene practices prevail. School-aged children are at particularly high risk due to their frequent exposure to contaminated environments and often inadequate personal hygiene. Although mass drug administration (MDA) programs targeting soil transmitted helminths have been implemented in many endemic regions, reinfection rates remain high due to persistent environmental and behavioral risk factors.

Despite the known burden of T. trichiura, localized data on infection patterns, associated risk factors, and effectiveness of preventive behaviors in specific communities remain limited. Understanding these local dynamics is essential for informing targeted control measures that go beyond pharmaceutical interventions to include environmental sanitation, hygiene education, and behavioral change.

This study was conducted to assess the prevalence of *T. trichiura* infection and identify associated sociodemographic, behavioral, and environmental risk factors among children in a resource constrained setting. By identifying the key predictors of infection, this study aims to provide evidence to guide more effective, community-specific public health interventions for the control and prevention of soil-transmitted helminths.

METHODS

Study Design and Setting

This was a cross-sectional analytical study conducted to assess the prevalence and risk factors associated with *Trichuris trichiura* infection among children in a selected community. The study was carried out in [insert location, e.g., urban settlements or rural communities in XYZ region], an area characterized by limited sanitation infrastructure, poor access to clean water, and high environmental exposure to potential sources of parasitic infection.

Study Population and Sampling

The study population comprised children aged 1 to 15 years residing in the study area. A total of 126 participants were selected using a convenience sampling method based on availability and willingness to participate. Inclusion criteria included residence in the community for at least six months and provision of informed consent by parents or guardians. Children with severe illness requiring immediate medical care were excluded.

Data Collection Tools and Procedures

Data were collected using a structured interviewer-administered questionnaire designed to capture:

- Sociodemographic information (age, sex, school attendance, household employment)
- Behavioral practices (handwashing habits, hygiene materials used, contact with animals)
- Environmental exposures (access to clean water, proximity to animals)
- Health-related symptoms (abdominal pain, history of parasitic infection, observation of worms in stool)
- Preventive health measures received by the family

The questionnaire was developed in English, translated into the local language, and pre-tested in a similar setting to ensure clarity and cultural relevance.

Parasitological Examination

Stool samples were collected from each participant and examined microscopically for the presence of *Trichuris trichiura* ova using the Kato-Katz technique, a standardized method for quantifying helminth egg burden. Infections were recorded as positive or negative based on the identification of *T. trichiura* eggs.

Ethical Considerations

The study received ethical approval from the [insert name of ethical review board or institution], and permission to conduct the study was obtained from local health authorities. Written informed consent was obtained from all parents or guardians of participating children. All children found to be infected were referred for treatment in accordance with national deworming guidelines.

Data Management and Statistical Analysis

Data were entered, cleaned, and analyzed using [insert software, e.g., SPSS version 25 / Stata / R]. Descriptive statistics were used to summarize participant characteristics. Associations between categorical variables and infection status were assessed using chi-square (χ^2) tests.

Multivariate logistic regression was performed to identify independent predictors of *T. trichiura* infection. Variables included in the model were those that were statistically significant in bivariate analysis or were considered theoretically relevant. Adjusted odds ratios (AORs), 95% confidence intervals (CIs), and p-values were reported. Statistical significance was set at $p < 0.05$.

RESULTS

Descriptive Statistics

A total of 126 participants were surveyed. Table 1 presents the sociodemographic, environmental, and behavioral characteristics of the respondents. A total of 126 respondents participated in the study. The gender distribution was 52 females and 74 males. The majority of participants were children aged 6–10 years (n=30), followed by those aged 1–5 (n=85) and 11–15 years (n=11). The household head's employment status revealed that 116 respondents came from households led by unemployed individuals, while only 10 had employed heads.

School attendance was relatively low, with only 20 respondents (15.9%) reporting current attendance, while 106 (84.1%) did not attend school. Regarding health-related symptoms, 47 participants (37.3%) reported experiencing abdominal pain in the preceding months, while 79 (62.7%) did not. Additionally, 22 individuals (17.5%) had a prior diagnosis of *Trichuris trichiura* infection.

Worms in stool were reported by 52 participants (41.3%), whereas 74 (58.7%) had not noticed any. About 54 respondents (42.9%) reported consistent handwashing after defecation, compared to 72 (57.1%) who did not.

Environmental and behavioral data showed that 31 respondents (24.6%) lived near animals, while 95 (75.4%) did not. Access to clean drinking water was reported by 37 participants (29.4%), and 89 (70.6%) lacked such access. Notably, 29 (23.0%) indicated that their family members had received health prevention measures for parasitic infections. Regarding handwashing methods, the most common was the use of plain water (n=81, 64.3%), followed by water and soap (n=34, 27.0%), and water and soil (n=11, 8.7%).

Table 1: Descriptive Characteristics of Study Participants (N = 126)

Variable	Category	Frequency (n)	Percentage (%)
Gender	Female	52	41.3%
	Male	74	58.7%
Age Group (years)	1–5	85	67.5%
	6–10	30	23.8%
	11–15	11	8.7%
Occupation of Household Head	Employed	10	7.9%
	Unemployed	116	92.1%
School Attendance	Yes	20	15.9%
	No	106	84.1%
Experienced Abdominal Pain (past few months)	Yes	47	37.3%
	No	79	62.7%
Previously Diagnosed with *T. trichiura*	Yes	22	17.5%
	No	104	82.5%
Noticed Worms in Stool	Yes	52	41.3%
	No	74	58.7%
Always Wash Hands After Defecation	Yes	54	42.9%
	No	72	57.1%
Live Near Animals	Yes	31	24.6%
	No	95	75.4%
Access to Clean Drinking Water	Yes	37	29.4%
	No	89	70.6%
Family Received Parasitic Prevention Measures	Yes	29	23.0%
	No	97	77.0%
Handwashing Method	Water and Soap	34	27.0%
	Plain Water	81	64.3%
	Water and Soil	11	8.7%

Bivariate Analysis: Chi-square tests were performed to evaluate associations between potential risk factors and *Trichuris trichiura* infection. Table 2 summarizes the results. Chi-square tests were conducted to examine the association between *Trichuris trichiura* infection and selected behavioral and environmental variables:

School Attendance: There was no statistically significant association between school attendance and infection status ($\chi^2(1)=0.273$, $p=0.6002$).

Abdominal Pain Symptoms: A significant association was found between reported abdominal pain and infection status ($\chi^2(1)=19.704$, $p<0.0001$). Among those who experienced symptoms, 43 were positive compared to only 4 negative, suggesting a strong link between symptoms and infection.

Previous Diagnosis: There was no significant relationship between previous diagnosis and current infection status ($\chi^2(1)=0.116$, $p=0.7318$).

Worms in Stool: A statistically significant association was observed ($\chi^2(1)=8.745$, $p=0.0031$), with 41 of those who noticed worms in their stool testing positive.

Handwashing After Defecation: No significant relationship was found between consistent handwashing and infection ($\chi^2(1)=0.057$, $p=0.8109$).

Proximity to Animals: A strong significant association was detected between living near animals and infection ($\chi^2(1)=11.962$, $p=0.0006$). Among those living near animals, 28 tested positive compared to only 3 negative.

Access to Clean Water: The association between access to clean drinking water and infection was not statistically significant ($\chi^2(1)=0.863$, $p=0.3519$).

Family Health Prevention Measures: A significant association was found ($\chi^2(1)=4.228$, $p=0.0404$), where a higher proportion of those without health prevention exposure were infected (n=66) compared to those with exposure (n=13).

Handwashing Method: There was a significant association between handwashing method and infection ($\chi^2(2)=10.032$, $p=0.0068$). The majority of those using only plain water (n=59) tested positive, in contrast to fewer infections among those using water and soap (n=15).

Table 2: Association Between Selected Variables and *T. trichiura* Infection (Chi-square Test Results)

Variable	Category	Negative (n)	Positive (n)	χ^2	*p*-value	Significant?
Do you attend school?	Yes	9	11	0.273	0.6002	No
	No	38	68			
Experienced abdominal pain?	Yes	4	43	19.704	<0.0001	Yes
	No	43	36			
Previously diagnosed with *T. trichiura*?	Yes	7	15	0.116	0.7318	No
	No	40	64			
Noticed worms in stool?	Yes	11	41	8.745	0.0031	Yes
	No	36	38			
Always wash hands after defecation?	Yes	19	35	0.057	0.8109	No
	No	28	44			
Animals near home?	Yes	3	28	11.962	0.0006	Yes
	No	44	51			
Access to clean water?	Yes	11	26	0.863	0.3519	No
	No	36	53			
Family received prevention measures?	Yes	16	13	4.228	0.0404	Yes
	No	31	66			
What do you use to wash hands?	Water and Soap	19	15	10.032	0.0068	Yes
	Plain Water	22	59			
	Water and Soil	6	5			

These results demonstrate significant associations between *T. trichiura* infection and reported abdominal pain, presence of worms in stool, animal proximity, family prevention education, and handwashing methods, suggesting both environmental and behavioral risk factors. Conversely, variables like school attendance, prior diagnosis, and clean water access did not show statistically significant associations.

Multivariate Logistic Regression

To identify independent predictors of *Trichuris trichiura* infection, a multivariate logistic regression was conducted (Table 3). The model included variables that were significant in bivariate analysis or had theoretical relevance. Adjusted odds ratios (AORs), 95% confidence intervals (CI), and *p*-values were reported.

Table 3: Multivariate Logistic Regression Predicting *T. trichiura* Infection

Variable	Adjusted OR (AOR)	95% CI (Lower–Upper)	*p*-value	Significant?
Intercept	0.59	0.13 – 2.64	0.491	No
Experienced abdominal pain (Yes vs No)	12.64	2.44 – 65.49	0.002	Yes
Noticed worms in stool (Yes vs No)	0.91	0.23 – 3.58	0.893	No
Animals near home (Yes vs No)	4.18	0.85 – 20.45	0.078	Trend
Family received prevention (Yes vs No)	0.28	0.08 – 1.00	0.051	Borderline
Use water & soap vs plain water for handwashing	2.66	0.82 – 8.63	0.104	No
Use water & soil vs plain water for handwashing	0.96	0.14 – 6.32	0.962	No
School attendance (Yes vs No)	0.32	0.05 – 2.09	0.232	No
Access to clean water (Yes vs No)	1.78	0.48 – 6.53	0.388	No
Always wash hands after defecation (Yes vs No)	1.44	0.52 – 3.94	0.480	No
Previously diagnosed with *T. trichiura* (Yes vs No)	0.62	0.15 – 2.56	0.507	No
Age group 6–10 vs 1–5 years	0.69	0.19 – 2.47	0.569	No
Age group 11–15 vs 1–5 years	1.07	0.14 – 8.03	0.949	No
Gender (Male vs Female)	0.80	0.30 – 2.11	0.647	No
Household head unemployed vs employed	1.04	0.13 – 8.63	0.969	No

Interpretation

After adjusting for confounders, reporting abdominal pain in the past few months remained a strong and statistically significant predictor of *T. trichiura* infection (AOR = 12.64; *p* = 0.002). Living near animals showed a positive trend (AOR = 4.18; *p* = 0.078), and having family members who had received parasitic prevention was borderline protective (AOR = 0.28; *p* = 0.051).

Other variables that were significant in bivariate analysis—such as noticing worms in stool and handwashing method—did not retain significance in the adjusted model. Factors such as gender, age group, school attendance, water access, and prior diagnosis were also not significant predictors.

DISCUSSION

This study investigated the prevalence and determinants of *Trichuris trichiura* infection among children in a resource-limited setting, focusing on sociodemographic, behavioral, and environmental factors. Our findings reveal a multifaceted interplay of symptoms, hygiene practices, and environmental exposures contributing to infection risk.

Consistent with previous literature, abdominal pain emerged as the most robust predictor of *T. trichiura* infection. Participants reporting recent episodes of abdominal discomfort were significantly more likely to be infected, even after adjusting for confounders (AOR = 12.64, p = 0.002). This symptom-based association highlights the clinical relevance of abdominal pain in identifying potential parasitic infections in community and clinical settings, particularly where diagnostic resources are scarce.

The presence of animals near the home was another notable factor. Although this variable did not reach conventional statistical significance in the multivariate model (AOR = 4.18, p = 0.078), it showed a clear positive trend, suggesting environmental exposure to animal feces or contaminated soil may be an important route of transmission. This aligns with prior studies in similar settings, where zoonotic and environmental pathways were implicated in helminth infections (Ngui *et al*., 2012; Jourdan *et al*., 2017).

Interestingly, while the visual observation of worms in stool and use of plain water for handwashing were significantly associated with infection in the bivariate analysis, these variables did not retain their predictive value in the adjusted model. This discrepancy may be attributed to confounding effects or reporting bias, especially in self-reported hygiene behaviors. Nonetheless, the significant bivariate association between handwashing methods and infection underscores the potential benefits of promoting soap use as part of public health hygiene campaigns. The protective trend for families who received parasitic prevention measures (AOR = 0.28, p = 0.051) supports this recommendation, highlighting the importance of targeted education and interventions.

Notably, traditional risk factors such as access to clean drinking water, school attendance, and prior diagnosis did not show significant associations with infection. The lack of association with clean water access may reflect challenges in accurately capturing water quality or behavioral use patterns, such as intermittent boiling or storage practices. Similarly, the absence of school attendance as a protective factor could be explained by the relatively low enrollment rates and the potential for school-based deworming programs to be inconsistently implemented or monitored.

Several sociodemographic factors—including gender, age group, and employment status of the household head—were not significantly associated with infection. While these findings may appear counterintuitive, they underscore the complex nature of *T. trichiura* transmission, which may be more strongly influenced by behavioral and environmental exposures than by static demographic characteristics.

This study has important implications for public health interventions. Programs aimed at reducing soil-transmitted helminth infections should prioritize behavioral change communication, particularly around consistent and effective hand hygiene and the risks of close proximity to animals. Furthermore, symptom-based screening—especially in settings with limited diagnostic infrastructure—can serve as a practical approach to identifying high-risk individuals.

Limitations

Some limitations should be noted. First, the cross-sectional nature of the study precludes causal inferences. Second, reliance on self-reported data for symptoms and behaviors may introduce recall or social desirability bias. Third, the relatively small sample size may have limited statistical power for detecting associations, particularly in multivariate analysis. Lastly, parasitological confirmation methods and intensity of infection were not detailed in this analysis, which may affect the interpretation of associations with milder or subclinical infections.

CONCLUSION

In conclusion, this study identifies abdominal pain as a strong independent predictor of *T. trichiura* infection and suggests that environmental exposures and preventive education play critical roles in infection risk. These findings reinforce the need for integrated control strategies combining hygiene promotion, environmental management, and community health education. Future studies with larger sample sizes, longitudinal follow-up, and parasite load quantification are recommended to further elucidate the dynamics of helminth transmission and control.

REFERRENCE

1. Hayon J, Weatherhead J, Hotez PJ, Bottazzi ME, Zhan B. Advances in vaccine development for human trichuriasis. Parasitology. 2021 Dec;148(14):1783–94.
2. Else KJ, Keiser J, Holland CV, Grencis RK, Sattelle DB, Fujiwara RT, *et al*. Whipworm and roundworm infections. Nat Rev Dis Primer. 2020 May 28;6(1):44.
3. Doyle SR, Søe MJ, Nejsum P, Betson M, Cooper PJ, Peng L, *et al*. Population genomics of ancient and modern Trichuris trichiura. Nat Commun. 2022 Jul 6;13(1):3888.