# Knowledge does not predict prevention: A cross-sectional analysis of the caregiver knowledge–practice gap for childhood intestinal parasitic infection in rural Rwanda

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**ABSTRACT**

This study examined awareness, knowledge, and prevention practices related to childhood parasitic infection among female carers of children under five in rural southern Rwanda and assessed whether knowledge predicted prevention after adjustment for socio-demographic and access-related factors. This article reports the quantitative component of a sequential explanatory mixed-methods study conducted in four rural districts of Southern Province, Rwanda. One health approach was used as an aspect of the theoretical framework to guide the study. The target population was found in four districts of the southern province, corresponding to 3.2 million, which involved carers and community health workers. The study involved 407 respondents. Data were collected using a structured questionnaire, a semi-structured interview guide and a household observation checklist. Descriptive statistics summarised awareness, knowledge, care-seeking, and prevention practices. Chi-square tests assessed bivariate associations. Logistic regression, robust ordinary least squares regression, and Firth logistic regression were used to model awareness, adequate knowledge, prevention practices score, good prevention practice, and missed appointments due to transport. The findings indicated that awareness of intestinal parasitic infection was high (94.35%), but the mean knowledge score was only 3.17 out of 10 (SD 1.95). The mean prevention practices score was 4.07 out of 10 (SD 1.32), and only 3.19% of carers met the threshold for good prevention practice. Education was the strongest and most consistent predictor of both knowledge and prevention. In contrast, the knowledge score was not significantly associated with either the continuous prevention practices score (β 0.00, 95% CI -0.08 to 0.08; p = 0.986) or the binary good-practice outcome. Safe water storage, water treatment, frequent handwashing, and toilet cleaning were uncommon. More than one third of carers reported having missed appointments because of transport barriers. The study concludes that awareness was high but not associated with prevention; education was the strongest predictor of the household practice. The study recommends that strategies to reduce childhood parasitic infections in rural Rwanda should move beyond awareness campaigns and prioritise practical behaviour support, household-level WASH-enabling conditions, and interventions that reduce access barriers.

**Keywords:** Caregivers, Intestinal Parasitic Infections, Knowledge-Practice Gap, Prevention Practices, Under-Five Children

## I. INTRODUCTION

Globally, intestinal parasitic infections remain an important cause of morbidity among children under five in low-resource settings, particularly where unsafe water, inadequate sanitation, environmental contamination, and delayed treatment coexist. In early childhood these infections contribute to diarrhoeal illness, undernutrition, poor growth, anaemia, repeated illness episodes, and impaired development, making them a continuing public health concern (Siddiqui et al., 2020). However, the assumption that knowledge naturally leads to practice is increasingly questioned. Public health and health-promotion research have shown that awareness is only one component of behaviour change. Knowledge may remain partial; practical skills may be weak; and even when knowledge is adequate, implementation can be interrupted by cost, time pressure, material scarcity, infrastructure limitations, social norms, and access barriers (Kalbarczyk et al., 2021). In this sense, the distinction between awareness, knowledge, and practice is analytically important. A caregiver may have heard about intestinal parasites, may identify some symptoms, yet still be unable to maintain routine preventive actions such as safe water treatment, safe storage, regular handwashing, or toilet sanitation.

Although studies from sub-Saharan Africa have highlighted the role of sanitation, hygiene, deworming, and health communication in reducing parasitic disease burden, there is still limited (Siddiqui et al., 2020). Existing studies often document general awareness or describe hygiene behaviours, but fewer examine the point at which knowledge fails to become routine action in the home. This gap matters programmatically because interventions based mainly on information transfer may overestimate what households can realistically implement under constrained conditions (Bloomfield & Ackerley, 2024).

In Rwanda, this issue remains highly relevant in rural districts where agricultural livelihoods, close proximity to animals, dependence on local water sources, and uneven access to health services may all influence prevention

(Majyambere et al., 2024). These conditions are also consistent with a One Health perspective that links child health to human, animal, and environmental systems (Majyambere et al., 2024). Female caregivers play a central role in this landscape because they often manage food preparation, water handling, child hygiene, supervision, and treatment decisions. Prevention programmes therefore frequently target caregivers with health education, assuming that once women know the signs, causes, and preventive measures, they will be able to implement them consistently at household level (Majyambere et al., 2024).

The present study addresses this gap using quantitative data from a broader mixed-methods study of female caregivers of children under five in rural Southern Province, Rwanda (Dusingizimana et al., 2021). The article had four objectives: first, to describe levels of awareness, perceived seriousness, confidence, and knowledge related to childhood intestinal parasitic infection; second, to assess the extent to which recommended prevention practices were implemented at household level; third, to examine whether knowledge predicted prevention practices after adjustment for caregiver characteristics; and fourth, to situate these findings within the broader care-seeking and access environment. By focusing directly on the relationship between knowledge and practice, the study tests a core assumption that underpins many behaviour-change interventions (Dusingizimana et al., 2021). This article makes three contributions. It provides context-specific evidence from rural Rwanda on caregiver awareness, knowledge, and prevention practice; it demonstrates that education is a stronger and more consistent predictor of prevention than awareness or measured knowledge alone; and it shows that the main challenge in this setting is a knowledge-practice gap rather than a simple information deficit. These findings have direct relevance for designing public health strategies that move beyond awareness campaigns towards practical, context-sensitive prevention support.

### 1.1 Statement of the Problem

Children in low- and middle-income nations, such as Rwanda, are disproportionately affected by intestinal parasite infections, which continue to be a major global public health concern due to environmental, socioeconomic, and hygiene-related variables that enhance transmission (Ndahimana et al., 2025). According to recent data, the burden of IPIs endures despite continuous government initiatives like deworming programs and advancements in water, sanitation, and hygiene (WASH), with high prevalence rates documented in several regions of Rwanda (Ndahimana et al., 2025). This persistence raises the possibility that current preventative measures may not be completely successful or sufficiently translated into long-lasting behavioral change at the family level (Ndahimana et al., 2025). Through environmental cleanliness, food safety, and hygiene practices, caregivers are crucial in reducing childhood IPIs. According to research done in Rwanda, caregivers typically exhibit moderate to high awareness of intestinal parasite infections, including the ability to identify symptoms and infection sources (Rwamwejo et al., 2023). For example, more than 70% of caregivers are aware of important preventive actions including handwashing, using safe water, and maintaining sanitation. However, there are still gaps in the application of this knowledge in day-to-day practices, thus it does not always result in effective or long-lasting preventative behaviors (Rwamwejo et al., 2023).

Evidence also reveals a crucial knowledge and practice gap. In situations when caregivers may be knowledgeable but still encounter obstacles including poor sanitary infrastructure, cultural attitudes, restricted access to clean water, and financial limitations, all of which prevent the adoption of suitable preventative measures (Ntezimana et al., 2024). This disparity is often made worse by a lack of thorough knowledge of preventative techniques; over half of caregivers' express difficulties with knowledge and resource constraints. This discrepancy is in line with more general public health findings that indicate that, in the absence of favorable environmental and socioeconomic circumstances, information alone is insufficient to promote behavior change (Ntezimana et al., 2024). The extent to which caregiver knowledge predicts actual preventative measures in rural Rwanda is not been studied empirically, despite the gap being acknowledged. Without critically examining the discrepancy between caregivers' knowledge and practices, the majority of current research concentrates on knowledge, attitudes, and practices (KAP) separately (Habimana et al., 2025). The creation of targeted solutions that concurrently address behavioral and structural impediments is hampered by this lack of focused study. Therefore, by performing a cross-sectional investigation of the association between caregiver knowledge and preventive measures for childhood intestinal parasite infections in rural Rwanda, this study aims to close this crucial gap. Designing context-specific interventions that go beyond raising awareness in order to successfully lessen the burden of IPIs among children requires an understanding of why knowledge does not reliably predict prevention.

### 1.2 Research Objective

The purpose of this paper was examining awareness, knowledge, and prevention practices related to childhood parasitic infection among female caregivers of children under five in rural Southern Rwanda.

### 1.3 Research Question

What is the awareness, knowledge, and prevention practices related to childhood parasitic infection among female caregivers of children under five in rural Southern Rwanda?

## II. LITERATURE REVIEW

### 2.1 Theoretical Review

The proposed study, "Female Caregivers' Knowledge, Perceptions, and Practices in Mitigating Parasitic Infections among Children under 5 Years Old in the Rural Southern Province of Rwanda," builds on the One Health theoretical framework. This concept is an interprofessional and collaborative approach that highlights the interconnectedness of human, animal, and environmental health, highlighting how zoonotic diseases (ZD) can impact all three. Thus, exploring the role of the zoonotic premise in the Rwandan countryside, where animals and people have a diverse environment and causes the occurrence of parasitic disease transmission, falls at the heart of the one health concept. Thus, a sample of female caregivers was chosen to emphasize the importance of the adoption of health practices that can reduce zoonotic disease risks in children under five, who are especially vulnerable.

Also, the framework uses the concepts from behavioral health to estimate the caregivers' knowledge, perceptions, and practices shaping their prevention. By combining these concepts with One Health, the research will not only quantify and describe the level of zoonotic diseases but also determine the role of education and cultural practices toward disease prevention. This approach fills a research void in modeling the human-animal-environment system and its impact on child health in Rwanda. It provides learning that may inform ways to avert parasitic infections among children. Finally, this theoretical framework is derived to design aspect-specific intervention strategies for communities to obtain improved health.

#### 2.1.1 Intestinal parasitic infection

One of the most common neglected tropical diseases, intestinal parasite infections (IPIs) mostly affect children in low- and middle-income nations. Helminths like Ascaris lumbricoides and Trichuris trichiura, as well as hookworms and protozoa like Giardia lamblia and Entamoeba histolytica, are the main causes of these infections. They are spread by contaminated food, water, soil, and poor hygiene practices (Chen et al., 2024). IPIs are particularly dangerous for rural communities because they are intimately linked to poor water, sanitation, and hygiene (WASH) conditions. According to recent estimates, millions of children worldwide are still at danger, with sub-Saharan Africa carrying a heavy burden because of socioeconomic and environmental issues (Chen et al., 2024).

IPIs have significant and varied negative effects on children's health, ranging from minor gastrointestinal issues to serious repercussions like malnourishment, anemia, delayed cognitive development, and poor academic performance (Setegn et al., 2023). Chronic infections can influence a child's general growth and development by impairing immune responses and aggravating other medical issues. According to recent research, recurrent exposure to parasite infections prolongs cycles of poverty and poor health outcomes in endemic areas and contributes to long-term developmental abnormalities (Hotez et al., 2020; Setegn et al., 2023). Reinfection rates are still high despite widespread deworming efforts, suggesting that biological strategies are ineffective on their own without addressing underlying behavioral and environmental factors.

Theoretically, ecological and behavioral health models which highlight the interplay between social behaviors, environmental factors, and human knowledge can account for the persistence of IPIs. Although caregivers are frequently aware of transmission and prevention strategies, behavioral theories like the Health Belief Model contend that information by itself does not always result in preventative action unless it is combined with perceived risk, self-efficacy, and enabling circumstances. The adoption of preventative behaviors is severely hampered by obstacles like poverty, cultural norms, and restricted access to sanitary facilities, which perpetuates transmission cycles, according to recent research (Freeman et al., 2017 & Anim-Baidoo et al., 2024). This emphasizes the necessity of integrated interventions that incorporate both structural improvements in living conditions and health education.

#### 2.1.2 Caregiver Knowledge and Practices Associated with Parasitic Infection

Intestinal parasite infections (IPIs) can be prevented and controlled with caregiver education, especially in children who are more susceptible to infection. According to Animut et al. (2024), knowledge includes caregivers' comprehension of symptoms, transmission mechanisms, and preventive measures such handwashing, safe food handling, and good sanitation. Children whose caretakers were ignorant of parasite transmission, for example, were more than three times more likely to be infected, according to a study conducted in Ethiopia, demonstrating the clear correlation between knowledge and the occurrence of disease (Gena et al., 2026). This indicates that lowering exposure and susceptibility to IPIs is mostly dependent on information.

Nevertheless, as a variety of contextual factors affect how information is translated into behavior, knowledge by itself does not ensure adequate preventative practices (Animut et al., 2024). Research from Rwanda demonstrates that although many caregivers are aware of important preventive measures including handwashing, using clean water, and maintaining sanitation, there are still discernible gaps in the regular implementation of these practices in day-to-day life. For instance, more than 70% of caregivers are aware of the importance of preventive measures, yet there are still differences in environmental management and real hygiene practices (Ntezimana et al., 2024).

Additionally, theoretical and empirical research indicates that socioeconomic, environmental, and behavioral factors influence caregiver practices in addition to knowledge (Abaka-Yawson et al., 2025). The ability of caregivers to carry out advised preventive measures is frequently hampered by elements like poverty, restricted access to clean water, poor sanitation facilities, and cultural beliefs. Due to institutional constraints, even knowledgeable caregivers may be unable to maintain good hygiene in many low-income settings, which perpetuates transmission cycles. Furthermore, research highlights the substantial correlation between higher infection rates and poor hygiene habits, such as untrimmed fingernails and improper food handling (Abaka-Yawson et al., 2025). Consequently, an integrated approach that takes into account both personal awareness and the larger environmental context impacting behavior is necessary to comprehend caregiver knowledge and actions.

### 2.2 Empirical Review

#### 2.2.1 Awareness, knowledge, and prevention practices related to childhood parasitic infection

In many low- and middle-income settings, caregivers' awareness and knowledge of intestinal parasite infections (IPIs) are quite high, but there are still significant gaps in certain areas of knowledge (Hakizimana, et al., 2023). For instance, a cross-sectional study carried out in Rwanda revealed that more than 70% of caregivers understood important preventive measures including handwashing, safe water use, and sanitation practices, and more than 80% of caregivers were aware of common symptoms like diarrhea and vomiting. In a similar vein, research conducted in Ethiopia revealed that although parents were generally aware of helminth diseases, they frequently lacked complete preventative methods and extensive knowledge about transmission channels, especially among groups with lower levels of education (Animut et al., 2024). These results imply that while awareness is broad, it is frequently insufficient and may not sufficiently support effective disease prevention.

Empirical data on preventative practices shows conflicting results, with some caregivers exhibiting hygienic behaviors while others persist in high-risk behaviors (Ntezimana et al., 2024). According to studies, a sizable percentage of caregivers say they wash their hands and handle food safely, but their efficacy is limited by inconsistent application and contextual factors. For example, despite great awareness, only a small percentage of caregivers regularly implemented suggested preventive measures in daily routines, according to research conducted in Rwanda (Ntezimana et al., 2024). Similarly, research in sub-Saharan Africa shows that habits like poor sanitation, hazardous waste disposal, and drinking tainted water are still common.

Additionally, empirical research highlights how broader socioeconomic and environmental factors impact practices and awareness (Martins et al., 2024). Regardless of caregiver knowledge levels, children who live in places with inadequate sanitation, restricted access to clean water, and low household income are at a much-increased risk of infection, according to evidence from recent research. Furthermore, especially in endemic areas, parasite infections continue to have a negative impact on children's health, including growth retardation and cognitive impairment. These results demonstrate that raising awareness on its own is not enough for successful prevention; integrated treatments that incorporate health education with better living conditions, infrastructure, and community-based behavioral change initiatives are necessary.

## III. METHODOLOGY

### 3.1 Research Design

This study involves the quantitative component of a sequential explanatory mixed-method. This was taken as a research design that guided the study. Sequential explanatory mixed-method helped to deeper understanding of the study findings. This involved understanding both qualitative and quantitative findings which also help to express the relationship between variables.

### 3.2 Study area

The research was carried out in four rural districts of the Southern Province of Rwanda, namely, Gisagara, Nyanza, Nyamagabe, and Nyaruguru. The selection of these districts was based on the similarity of environmental and socioeconomic conditions related to the spread of parasitic and zoonotic diseases, such as subsistence agriculture dependency, inadequate sanitation systems, and close human-animal contact.

### 3.3 Target Population

The target population was found in four districts of southern province corresponding 3.2 million. This involved caregivers and community health corkers.

### 3.4 Sampling and Sample Size

The study employed a multi-stage and systematic random sampling techniques to have access to the respondents including caregivers while purposive sampling was used to access to community health workers in the corresponding villages. The sample size involved 407 respondents.

### 3.5 Data Collection Tools and Procedure

During data collection, the data were collected using a structured questionnaire which was given to caregivers and a household observation checklist. During data collection the research personal went for data collection. Semi-structured interview guide was also used to identify caregivers. However, quantitative phase data was collected by the researcher assisted by four research assistants.

### 3.6 Data Analysis

The quantitative data is analyzed using statistical software to identify trends and correlations. This method identifies trends in knowledge, attitudes, and practices concerning zoonotic diseases within specific population groups or regions. The viability data from interviews are valuable in integrating the research and generating information on themes that the quantitative estimates, giving added richness and context. For Quantitative side, descriptive statistics summarized awareness, knowledge, care-seeking, and prevention practices. Chi-square tests assessed bivariate associations. Logistic regression, robust ordinary least squares regression, and Firth logistic regression were used to model awareness, good knowledge, prevention practices score, good prevention practice, and missed appointments due to transport.

### 3.7 Ethical Consideration

The date was collected with ethical approval of from the University Research Ethics Committee and subsequently authorized by the Rwanda National Ethics Committee. Prior to data collection, field preparation was made to operationalize approvals and confirm field logistics.

## IV. FINDINGS & DISCUSSION

This study examined the awareness, knowledge, and prevention practices related to childhood parasitic infections among female caregivers of children under five in rural Southern Rwanda, and assessed whether knowledge predicted prevention practices after adjusting for socio-demographic and access-related factors.

### 4.1 Participant Characteristics

**Table 1**

*Participant Characteristics (N = 407)*

| Characteristic | n / value | % |
|---|---|---|
| Age, mean (SD) | 35.97 (11.10) | |
| Age, median (IQR) | 36 (27-45) | |
| Number of children, mean (SD) | 3.67 (1.82) | |
| Education: Primary | 86 | 21.13 |
| Education: Secondary | 302 | 74.20 |
| Education: Higher | 19 | 4.67 |
| Livelihood: Farming | 327 | 80.34 |
| Livelihood: Small business | 62 | 15.23 |
| Livelihood: Formal employment/other | 18 | 4.42 |
| Index child under five is last-born | 217 | 53.32 |

The study included 407 respondents. Mean caregiver age was 35.97 years (SD 11.10), and the median age was 36 years. The mean number of children per caregiver was 3.67 (SD 1.82). Most respondents had secondary education (74.20%), one fifth had primary education (21.13%), and only 4.67% had higher education. Farming was the dominant livelihood (80.34%), reflecting the rural agricultural character of the study area. More than half of index children were reported as the last-born child under five in the household.

### 4.2 Awareness, Knowledge, and Prevention Profile

**Table 2**
*Summary of awareness, knowledge, prevention, and access-related indicators*

| Indicator | Category / summary | n / value | % |
|---|---|---|---|
| Awareness | Heard about parasites | 384 | 94.35 |
| Perceived seriousness | Somewhat serious | 333 | 81.82 |
| Confidence | Very confident | 16 | 3.93 |
| Knowledge score | Mean (SD) | 3.17 (1.95) | |
| Knowledge classification | Good knowledge (≥ median) | 297 | 72.97 |
| Prevention score | Mean (SD) | 4.07 (1.32) | |
| Good prevention practice | ≥8 of 10 actions | 13 | 3.19 |
| Missed appointment due to transport | Yes | 142 | 34.89 |

Reported awareness of intestinal parasitic infection was very high. 94.35% of caregivers had heard about intestinal parasites in children. However, most described infection as only somewhat serious, and very few were very confident in their ability to protect a child. Knowledge scores remained modest, especially for causes and transmission pathways. The mean knowledge score was 3.17 out of 10 (SD 1.95), while the mean prevention score was 4.07 out of 10 (SD 1.32). Only 13 caregivers (3.19%) met the threshold for good prevention practice. These findings indicate that familiarity with the issue was not matched by strong household implementation of preventive actions. Kalweit et al. (2020) indicated that the awareness of a health or safety issue does not automatically translate into effective protective measures at the household or individual level.

### 4.3 Pattern of Household Prevention Practices

**Table 3**
*Item-level distribution of selected household prevention practices*

| Preventive action meeting criterion | n | % |
|---|---|---|
| Always washes hands before preparing food | 23 | 5.65 |
| Always washes hands after toilet use | 14 | 3.44 |
| Has access to clean water | 263 | 64.62 |
| Stores water safely | 36 | 8.85 |
| Treats water | 19 | 4.67 |
| Always washes fruits/vegetables before eating | 339 | 83.29 |
| Stores leftovers safely | 118 | 28.99 |
| Cleans toilet weekly or daily | 68 | 16.71 |

Item-level results showed that prevention was uneven and partial rather than comprehensive. Washing fruits and vegetables before eating, cleaning raw meat with water, and frequent surface cleaning were comparatively common. In contrast, high-frequency handwashing, safe water storage, water treatment, and toilet cleaning were uncommon. The weakest items were those most directly linked to WASH resources and sustained routine effort. Pascual-Sanz et al. (2024) supported that the weakest components of Water, Sanitation, and Hygiene programs are typically those that require consistent, long-term effort and localized resources, rather than one-time capital investment.

4.4 Education predicted knowledge and prevention, but knowledge did not predict prevention

**Table 4**
*Key adjusted models for knowledge and prevention outcomes*

| Outcome/model | Predictor | Estimate | 95% CI | p-value |
|---|---|---|---|---|
| Good knowledge (logistic) | Secondary vs primary education | aOR 69.71 | 31.76-152.99 | <0.001 |
| Good knowledge (logistic) | Age (per year) | aOR 1.00 | 0.94-1.07 | 0.984 |
| Good prevention practice (Firth logistic) | Higher vs primary education | aOR 447.42 | 14.40-13,898.02 | <0.001 |
| Good prevention practice (Firth logistic) | Services unavailable: yes vs no | aOR 13.27 | 0.63-277.46 | 0.096 |
| Practice score (robust OLS) | Secondary vs primary education | β 0.47 | 0.18-0.75 | 0.001 |
| Practice score (robust OLS) | Higher vs primary education | β 4.60 | 3.66-5.53 | <0.001 |
| Practice score (robust OLS) | Knowledge score (per point) | β 0.00 | -0.08 to 0.08 | 0.986 |

Education showed a very strong relationship with knowledge and prevention outcomes. In adjusted models, secondary education was strongly associated with higher odds of good knowledge compared with primary education, while higher education perfectly predicted good knowledge in the logistic model. In models predicting prevention, higher education remained strongly associated with both the rare good-prevention-practice outcome and the continuous prevention score. By contrast, the knowledge score itself was not significantly associated with prevention. In the robust OLS model, each one-point increase in knowledge score was associated with no meaningful change in prevention score (β 0.00, 95% CI -0.08 to 0.08; p = 0.986). Olsen et al. (2023) highlighted a strong, positive gradient between educational attainment and health-related knowledge, where higher levels of education are strongly associated with better understanding and preventative health behaviors.

### 4.5 Care-Seeking and Access Conditions

**Table 5**

*Selected Care-Seeking and Service-Access Indicators*

| Access-related variable | N | % |
|---|---|---|
| Facility distance 6-10 km | 307 | 75.43 |
| Facility open 24/7: no | 338 | 83.05 |
| Services unavailable when needed: yes | 70 | 17.20 |
| Transport to facility: walking | 399 | 98.03 |
| Missed appointment due to transport: yes | 142 | 34.89 |
| Health insurance: yes | 390 | 95.82 |

The descriptive profile of care-seeking and access provides context for the observed knowledge–practice gap. Most caregivers reported using traditional remedies regularly, while use of prescribed medicines was usually occasional rather than consistent. Most children were dewormed once a year rather than every six months. Distances to facilities were substantial: three quarters of respondents reported that the nearest facility was 6-10 km away, and 98.03% usually walked to care. More than one third of caregivers had missed an appointment because of transport. Panulo et al (2024) revealed that Interventions should therefore combine caregiver education with improvements in household WASH support, practical hygiene materials, deworming adherence support, and measures that reduce travel and access barriers. This would align more closely with a One Health and systems-oriented model of prevention.

**Table 6**

*Logistic Regression Predicting Missed Appointments Due To Transport*

| Predictor | Adjusted OR | 95% CI | p-value |
|---|---|---|---|
| Heard about parasites: yes vs no | 4.54 | 1.24-15.34 | 0.022 |
| Good knowledge: yes vs no | 0.14 | 0.03-1.21 | 0.135 |
| Services unavailable: yes vs no | 1.05 | 0.49-1.88 | 0.873 |
| Secondary-or-higher vs primary education | 0.69 | 0.26-1.88 | 0.233 |

In the adjusted logistic regression model, awareness of parasites was associated with higher odds of missing appointments because of transport, whereas good knowledge was not significant.

### 4.6 Discussion

This study examined whether caregiver knowledge translated into household prevention of childhood intestinal parasitic infection in rural Southern Rwanda. The main finding is that it did not. Awareness was widespread, knowledge remained shallow, comprehensive prevention was rare, and education was a more consistent predictor of prevention than measured knowledge. Taken together, these findings indicate that the core public health challenge in this setting is not simple lack of information but a persistent knowledge-practice gap operating within constrained household, environmental, and service contexts (Yang et al., 2026). The coexistence of high awareness and shallow knowledge is analytically important. Nearly all caregivers had heard about intestinal parasites, yet the average knowledge score remained low relative to the maximum possible score. Knowledge of symptoms was generally stronger than knowledge of causes and transmission pathways. This suggests that caregivers may be better equipped to recognize illness after it has occurred than to interrupt the environmental and behavioral routes through which infection and reinfection arise. From a programme perspective, this means that awareness indicators alone may overstate household readiness for prevention (Yang et al., 2026).

The weakness of comprehensive prevention practice was even more striking. The mean prevention score of 4.07 out of 10 indicates that most households implemented only a limited subset of recommended behaviors, and only 3.19% met the threshold for good prevention practice. This does not mean that caregivers were inactive; rather, it indicates that

prevention was fragmented. A household might wash fruits and vegetables but not treat water, or have access to clean water but store it unsafely, or clean surfaces frequently while neglecting toilet sanitation. Such partial prevention leaves multiple opportunities for continued exposure. Intestinal parasite prevention therefore needs to be understood as a package of mutually reinforcing routines rather than as a single practice (Siagian, 2025). The strongest analytical finding is that education consistently outperformed knowledge as a predictor of prevention. Education strongly predicted good knowledge, but it also remained the most stable predictor of prevention outcomes after adjustment. This suggests that education captures more than factual recall. It may reflect literacy, ability to interpret advice, self-efficacy, confidence in interacting with health services, and the organizational capacity needed to sustain household routines. Education may also correlate with broader socio-economic advantage, enabling some households to acquire containers, soap, fuel for boiling water, or time-saving resources that make prevention more feasible (Nabukwangwa et al., 2023).

By contrast, measured knowledge itself was not significantly associated with prevention outcomes in adjusted models. This should not be interpreted to mean that knowledge is irrelevant. A more plausible interpretation is that knowledge alone is insufficient under rural household conditions shaped by environmental constraint and practical trade-offs. Knowing that water should be treated does not ensure that a household has enough fuel, time, or storage capacity. Knowing that children should avoid contaminated play areas does not guarantee that such safe spaces are available. The absence of a strong knowledge-practice association therefore points to the limits of information-only interventions (Nabukwangwa et al., 2023). The findings support a stronger One Health interpretation than a purely individual behavioral reading would allow. Several of the weakest prevention domains - water treatment, safe storage, toilet cleaning, and prevention of child exposure to contaminated play environments - sit directly at the interface between human behavior, household environment, and surrounding ecological conditions. In this sense, prevention is not only a matter of caregiver motivation or knowledge recall; it is also shaped by environmental feasibility, material resources, and the degree to which households can maintain hygienic conditions over time (McGranahan et al., 2021).

The care-seeking findings reinforce this interpretation. More than one third of caregivers reported missing appointments because of transport, most respondents walked to facilities, and three quarters reported living 6-10 km from the nearest facility. In the adjusted model, awareness was associated with higher odds of missed appointments due to transport. This does not suggest that awareness is harmful; rather, it likely indicates that more aware caregivers are more likely to attempt care-seeking and therefore more likely to encounter transport constraints. The finding illustrates that awareness can increase perceived need without eliminating the structural barriers that prevent care completion (McGranahan, et al., 2021). From a programme perspective, the results suggest that prevention strategies based primarily on broad awareness campaigns are unlikely to achieve large behavioral gains. Educational content needs to move beyond generic messaging and become more concrete, practical, and context specific. Messages about safe water handling, food hygiene, sanitation maintenance, child play environments, and reinfection need to be translated into household actions that are feasible under local conditions. Demonstrations, home visits, repeated reinforcement, and visual communication tools may be more effective than one-off messages alone (Rutherford, et al., 2020).

The findings also support targeted support for caregivers with lower levels of schooling. This does not mean that less educated caregivers are unwilling to prevent infection; rather, they may require communication that is more practical, more repetitive, and less dependent on literacy. Community health workers could play an important role by translating prevention advice into manageable steps, helping households troubleshoot barriers, and linking health messaging with WASH-oriented support. Finally, the results indicate a need to strengthen the enabling environment. Several of the weakest practices depend on infrastructure and material support rather than on intention alone. Without regular access to water, containers, soap, fuel, and manageable service access, prevention recommendations may remain aspirational.

## V. CONCLUSION & RECOMMENDATION

### 5.1 Conclusion

In rural Southern Rwanda, female caregivers of children under five reported high awareness of intestinal parasitic infection, but this did not translate into strong household prevention. Knowledge was moderate, prevention was partial, and comprehensive implementation of preventive actions was rare. Education was the most consistent predictor of both knowledge and prevention, whereas awareness and measured knowledge alone were insufficient to explain better household practice. The central policy problem is therefore not low awareness, but the failure of awareness and partial knowledge to become routine, feasible prevention in daily household life. Programmes aimed at reducing childhood parasitic infection in rural Rwanda should move beyond information-only approaches. More effective strategies are likely to combine practical, repeated, and context-sensitive behaviour-change support with household-level WASH enabling conditions and measures that reduce transport and service-access barriers.

### 5.2 Recommendation

The study recommends that strategies to reduce childhood parasitic infection in rural Rwanda should move beyond awareness campaigns and prioritize practical behavior support, household-level WASH enabling conditions, and interventions that reduce access barriers.

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