International Journal of Healthcare Sciences ISSN 2348-5728 (Online)
Vol. 14, Issue 1, pp: (372-384), Month: April 2026 - September 2026, Available at: www.researchpublish.com

Factors Influencing the Utilization of Malaria Preventive Measures among Caregivers of Children Under Five Years in Rusizi District, Rwanda, 2025

[1]Juvenal NISHIMWE, [2]Dr. HABIMANA Amos, [3]Dr. Clemence NISHIMWE

[1]Author, [2,3]Co-authors

[1](School of Public Health, Mount Kigali University)

[2,3] (School of Public Health, Mount Kigali university)

DOI: https://doi.org/10.5281/zenodo.21095257

Published Date: 30-June-2026

Abstract: **Malaria remains a major cause of morbidity and mortality among children under five years in Sub-Saharan Africa, including Rwanda. Despite nationwide interventions such as long-lasting insecticidal nets (LLINs) and indoor residual spraying (IRS), utilization of malaria preventive measures remains inadequate in some high-burden areas. Rusizi District, characterized by wetlands and irrigated agriculture, continues to experience persistent malaria transmission. Understanding factors influencing caregivers' utilization of malaria preventive measures is essential for designing context-specific interventions to reduce malaria incidence and improve child health outcomes. This study assessed factors influencing the utilization of malaria preventive measures among caregivers of children under five years in Rusizi District, Rwanda, in 2025. Specifically, it examined the level of utilization, socio-demographic determinants, caregivers' knowledge of malaria prevention, and environmental and household factors associated with preventive practices. A cross-sectional descriptive study design was employed among caregivers of children under five years who had resided in Rusizi District for at least six months. A multistage sampling technique was used to select** 384 participants **from selected sectors and villages. Data were collected using structured interviewer-administered questionnaires and analyzed using** SPSS version 25**. Descriptive statistics summarized utilization and knowledge levels, while bivariate and multivariate logistic regression analyses identified factors associated with utilization. Statistical significance was determined at** $p < .05$**. Findings were presented using tables and graphs. High utilization of malaria preventive measures was reported in** 24.7% **of households. Ownership of at least one mosquito net was** 99%**, while** 97.7% **of children under five reportedly slept under mosquito nets regularly. Chi-square analysis showed significant associations between utilization and caregivers' age, marital status, education level, occupation, household size, presence of stagnant water nearby, house wall type, screened windows or doors, and participation in community health education sessions. Multivariate logistic regression revealed that education level, occupation, household size, and environmental factors were independent predictors of high utilization (**$p < .05$**). The model explained** 44.6% **of the variance in utilization (**Nagelkerke $R^2 = .446$**). Although mosquito net ownership is nearly universal, effective utilization of malaria preventive measures remains low. Strengthening caregiver education, environmental management, and community health education is necessary to enhance malaria prevention among households with children under five years in Rusizi District.**

Keywords: **Malaria, Preventive Measures, Caregivers, Children, Under Five Years, Rusizi District, Rwanda.**

1. INTRODUCTION

Malaria remains one of the leading causes of illness and death worldwide despite decades of sustained control efforts. In 2022, the World Health Organization (WHO) estimated approximately 249 million malaria cases and more than 600,000 deaths globally, with children under five accounting for nearly 80% of fatalities (WHO, 2023). Although interventions such as long-lasting insecticidal nets (LLINs), indoor residual spraying (IRS), and improved diagnostic and treatment services have significantly reduced malaria burden over the years, progress has recently plateaued in many endemic areas. Challenges such as insecticide and drug resistance, climate variability, and health system limitations continue to drive persistent transmission (WHO, 2023).

In 2022, the WHO African Region reported 233 million malaria cases, accounting for 94% of the global total slightly lower than the 234 million cases in 2021. Similarly, the region recorded 580,000 malaria deaths (95% of the global total) compared to 593,000 in 2021 (WHO, 2023). Sub-Saharan Africa continues to bear the heaviest malaria burden, contributing about 95% of global cases and deaths. Transmission patterns vary geographically, with areas such as wetlands, lakesides, and irrigated farmlands sustaining high and stable transmission. Despite extensive investments in prevention strategies including mass LLIN distribution and IRS uneven usage, socio-economic inequalities, behavioral barriers, and environmental factors limit their effectiveness. These realities highlight the importance of locally tailored, community-centered approaches (PMI, 2023).

In East Africa, countries such as Rwanda, Uganda, Kenya, and Tanzania remain heavily affected, especially among children under five. Transmission intensity is shaped by environmental conditions, land-use practices, and climate variability (PMI, 2023). Integrated vector management approaches combining LLINs, IRS, larval source management, and community education have been widely implemented. However, studies show a gap between net ownership and actual nightly usage, with barriers such as Caregivers knowledge, beliefs, discomfort with net use, and competing household priorities reducing effectiveness (Hakizimana et al., 2022; Niyibizi et al., 2023). Acceptance of IRS has also faced challenges due to safety concerns, misconceptions, and logistical constraints.

Rwanda has made remarkable progress in reducing malaria incidence and mortality over the past two decades through its comprehensive national malaria control strategy. This includes nationwide LLIN mass distribution campaigns, targeted IRS in high-risk districts, improved diagnostic and treatment services, and robust community health education (RBC, 2023). Household surveys consistently report LLIN ownership rates above 80% nationwide (RBC, 2023). However, consistent nightly use, particularly among children under five, remains below target levels in some communities. Preventive practices are influenced by factors such as Caregivers knowledge, socio-economic status, household conditions, and perceived malaria risk. Additionally, Rwanda's ecological diversity results in varying transmission levels across districts, underscoring the need for context-specific and adaptive control strategies.

Rusizi District, situated in Rwanda's Western Province, presents unique challenges for malaria control due to its diverse geography, which includes lowlands, wetlands, lakeshores, and irrigated farmland. These ecological features create ideal breeding habitats for malaria vectors. Data from the Rwanda Biomedical Centre highlight that Rusizi remains one of the country's districts with sustained high malaria transmission despite overall national progress (RBC, 2023). IRS is conducted in selected sectors, and LLIN distribution campaigns have reached a large share of households, yet malaria incidence among children under five remains a major concern. There is limited research specifically examining the factors influencing Caregivers use of malaria preventive measures in Rusizi District. Evidence from other parts of Rwanda indicates that even with high LLIN ownership, consistent use can be constrained by gaps in caregivers' knowledge, perceptions about malaria risk, socio-economic barriers, and environmental factors such as proximity to breeding sites (Hakizimana et al., 2022; Niyibizi et al., 2023). Identifying these context-specific barriers and facilitators is critical to designing effective strategies to reduce malaria transmission among under-five children in Rusizi. In Rusizi District, during fiscal year 2024-2025 there are 1115 malaria cases of under-five where 559 cases are in three sectors which are Bugarama, Gashonga and Mururu (HMIS, 2025).

2. METHODOLOGY

2.1 Study Design

This study was employing a cross-sectional descriptive design to assess the factors influencing the utilization of malaria preventive measures among Caregivers of children under five years in Rusizi District, Rwanda.

2.2 Location of the Study

The study was conducted in Rusizi District, located in the Western Province of Rwanda.

2.3 Study Population

The target population for this study comprises Caregivers of children under five years residing in Rusizi District for at least six months

2.4 Sampling Techniques

A multistage sampling technique, a purposive sampling method and simple random sampling technique were employed to select study participants.

2.5 Sample Size Calculation

The sample size was determined using Cochran's formula for cross-sectional studies: Assuming a 50% proportion of malaria preventive measures (since no previous study may have provided an estimate) and using a 95% confidence interval with a margin of error of 5% (National Center for Biotechnology Information, 2006), the sample size can be calculated as:

$$n^0 = \frac{Z^2\,pq}{e^2} = \frac{(1.96)^2 \text{ x } 0.5 \text{ x}(1-0.5)}{(0.05)^2} = 384$$

Where:

- Z = 1.96 (standard normal deviation corresponding to 95% confidence level)
- p = estimated proportion of malaria preventive measures (assumed to be 0.5 or 50%)
- e = margin of error (0.05 or 5%). To account for possible non-response or incomplete questionnaires, the sample size was adjusted by adding 10%, making it approximately 423 participants.

3. RESULTS

3.1 Socio-Demographic Details of Caregivers of Children Under Five in Rusizi District

A total of 384 caregivers responsible for children under the age of five were included in this study. Their socio-demographic characteristics were diverse, reflecting different backgrounds and living conditions that may influence how malaria prevention methods are adopted within households in Rusizi District. The ages of the next caregivers showed considerable variation. The dominant age group consisted of individuals between 35 and 44 years, numbering 167 participants (43.5%), indicating that middle-aged adults constitute the majority of primary caregivers. Another substantial portion of respondents, 148 individuals (38.5%), fell within the 25–34-year interval, suggesting significant caregiving roles among young adults. Only 26 respondents (6.8%) were between 15 and 24 years, pointing to a smaller proportion of very young guardians.

Additionally, 31 caregivers (8.1%) belonged to the 45–54 age category, while the smallest number, 12 participants (3.1%), were aged 55 years and above. These patterns show that caregiving is chiefly undertaken by adults in their productive years.

More than two-thirds of the study participants were women. Specifically, 283 caregivers (73.7%) were female, whereas 101 (26.3%) were male. This gender distribution aligns with cultural norms where women are typically responsible for childcare and household health-related activities, which may influence decisions concerning malaria prevention. A clear majority of those caring for children under five were mothers.

In total, 267 respondents (69.5%) identified themselves as the child's mother. Fathers represented 91 participants (23.7%), forming the second-largest group of caregivers. Extended family involvement was relatively minimal, with 14 grandparents (3.6%), 7 brothers (1.8%), 1 sister (0.3%), and 4 individuals (1.0%) who reported other forms of kinship. These findings reaffirm that biological parents, especially mothers, are the primary providers of care. Regarding marital status, most respondents were married, totaling 226 participants (58.9%), which may influence household cooperation in implementing malaria-preventive behaviors.

A notable proportion, 153 respondents (39.8%), were single, potentially facing fewer shared caregiving and economic responsibilities. Few respondents were divorced (2 individuals, 0.5%) or widowed (3 individuals, 0.8%), categories often associated with increased vulnerability. Education levels varied widely among respondents. Primary education was the most commonly reported level, with 261 participants (68.0%), suggesting that most caregivers had basic literacy. Secondary education was completed by 50 individuals (13.0%), while 30 respondents (7.8%) had attained tertiary-level qualifications.

A further 43 participants (11.2%) had never attended school, a factor that may limit access to health information and understanding of malaria prevention strategies. The dominant occupation among respondents was farming, reported by 331 caregivers (86.2%), which mirrors the rural context of Rusizi District. Other respondents were involved in business activities (13 individuals, 3.4%), were formally employed (20 individuals, 5.2%), were unemployed (8 individuals, 2.1%), or belonged to other occupational groups (12 individuals, 3.1%). These figures reveal limited employment diversity and a heavy reliance on agriculture. Income distribution showed that most respondents lived with limited financial means. Almost half, 182 households (47.4%), reported monthly incomes of 20,000 RWF or less. Another 127 participants (33.1%) earned between 20,001 and 50,000 RWF, confirming the prevalence of low-income households. Only 30 respondents (7.8%) earned 50,001–100,000 RWF, 35 participants (9.1%) reported incomes of 100,001–200,000 RWF, and 10 respondents

(2.6%) earned above 200,001 RWF. These trends suggest that financial resources may constrain access to some malaria prevention tools.

Household composition also varied. The largest share of respondents, 147 caregivers (38.3%), lived in households consisting of four to five people. Another major cluster, 135 households (35.2%), comprised six to seven members, suggesting that large families are common. Additionally, 57 respondents (14.8%) belonged to households with eight or more members, raising concerns about overcrowding, which can increase malaria exposure. Only 45 participants (11.7%) reported small households of three members or fewer.

The number of young children per household was generally low. Most caregivers, 369 participants (96.1%), had two or fewer children under the age of five. Only 15 respondents (3.9%) were caring for three or more young children. This distribution indicates that in most cases, families may have adequate capacity to ensure malaria prevention resources, such as bed nets, are used effectively among children.

Table 1: Socio-Demographic Characteristics of caregivers of Children Under Five in Rusizi District

Variable	Category	Frequency	Percent
Age of caregivers (years)	15–24	26	6.8
	25–34	148	38.5
	35–44	167	43.5
	45–54	31	8.1
	55 and above	12	3.1
	Total	**384**	**100.0**
Sex of Caregivers	Male	101	26.3
	Female	283	73.7
	Total	**384**	**100.0**
Relationship to Child Under Five	Mother	267	69.5
	Father	91	23.7
	Grandparent	14	3.6
	Brother	7	1.8
	Sister	1	0.3
	Others	4	1.0
	Total	**384**	**100.0**
Marital Status	Single	153	39.8
	Married	226	58.9
	Divorced	2	0.5
	Widowed	3	0.8
	Total	**384**	**100.0**
Highest Education Level	No formal education	43	11.2
	Primary education	261	68.0
	Secondary education	50	13.0
	Tertiary education	30	7.8
	Total	**384**	**100.0**
Occupation	Farmer	331	86.2
	Business	13	3.4
	Employed	20	5.2
	Unemployed	8	2.1
	Others	12	3.1
	Total	**384**	**100.0**
Household Monthly Income (RWF)	≤ 20,000	182	47.4
	20,001–50,000	127	33.1
	50,001–100,000	30	7.8
	100,001–200,000	35	9.1
	≥ 200,001	10	2.6

	Total	**384**	**100.0**
Household Size	≤ 3	45	11.7
	4–5	147	38.3
	6–7	135	35.2
	≥ 8	57	14.8
	Total	**384**	**100.0**
Number of Children Under Five	≤ 2	369	96.1
	≥ 3	15	3.9
	Total	**384**	**100.0**

3.2 Findings

3.2.1 Utilization of Malaria Preventive Measures among Households in Rusizi District (n = 384)

The study examined the use of malaria preventive measures among households with children under five. Results showed that mosquito net ownership was nearly universal, with 380 households (99.0%) reporting that they had at least one mosquito net, while only 4 households (1.0%) did not own any. Regarding the number of mosquito nets per household, more than half of the households (217, 56.5%) had two or fewer nets, 153 households (39.8%) had between three and four nets, and a small proportion (14 households, 3.6%) possessed five or more nets.

This distribution suggests that although ownership is high, the number of nets may still be insufficient for larger families. In terms of actual use, 378 children (98.4%) slept under a mosquito net the previous night, demonstrating strong adherence to recommended practices, whereas 6 children (1.6%) did not. When assessing routine use, 375 respondents (97.7%) reported that their children used nets every night. Only a few guardians admitted that their children used nets occasionally (2, 0.5%), rarely (4, 1.0%), or never (3, 0.8%).

Indoor residual spraying (IRS) coverage varied. Most households (225, 58.6%) had received IRS within the past 12 months. A minority reported receiving spraying over a year ago (4, 1.0%), had never been sprayed (151, 39.3%), or were unsure (4, 1.0%). Despite these variations, acceptance of IRS was high, with 375 households (97.7%) allowing spraying when offered, and only 9 households (2.3%) refusing. Overall, these findings indicate a high level of utilization of malaria preventive tools, particularly mosquito nets, though gaps remain in the number of nets available per household and in coverage of IRS. These results highlight both the successes and the areas requiring further public health interventions to ensure comprehensive malaria protection.

Table 2: Utilization of Malaria Preventive Measures among Households in Rusizi District (n = 384)

Variable / Question	Response	Frequency (n)	Percent (%)
Does your household own at least one mosquito net?	Yes	380	99.0
	No	4	1.0
How many mosquito nets do you have?	≤2	217	56.5
	3–4	153	39.8
	≥5	14	3.6
Did your child sleep under a mosquito net last night?	Yes	378	98.4
	No	6	1.6
How often does your child under five use a mosquito net?	Every night	375	97.7
	Some nights	2	0.5
	Rarely	4	1.0
	Never	3	0.8
When did your house last receive indoor residual spraying?	Within past 12 months	225	58.6
	Over 12 months ago	4	1.0
	Never	151	39.3
	Don't know	4	1.0
Do you allow spraying when offered?	Yes	375	97.7
	No	9	2.3

3.2.2 Utilization Level of Malaria Preventive Measures among Households in Rusizi District (n = 384)

The study assessed the overall utilization of malaria preventive measures among households with children under five in Rusizi District. Analysis of the data revealed that a minority of households demonstrated high utilization of preventive strategies. Specifically, 95 households, representing 24.7% of the sample, scored between 9 and 13, reflecting consistent and comprehensive adoption of malaria prevention practices such as regular use of mosquito nets and allowing indoor residual spraying. The majority of households, 289 in number (75.3%), fell into the low utilization category, with scores ranging from 6 to 8. These households exhibited less consistent use of malaria preventive measures, indicating potential gaps in behavior or access to resources necessary for full protection.

The findings suggest that while a subset of households effectively implements preventive measures, a substantial proportion still requires targeted interventions and reinforcement of malaria prevention practices to achieve optimal coverage and reduce the risk of malaria among children under five.

3.2.3 Knowledge of Malaria among Next of caregivers of Children Under Five in Rusizi District, (n = 384)

The knowledge of malaria among Caregivers or guardians of children under five in Rusizi District, Rwanda, was generally high. Almost all respondents (383, 99.7%) reported having heard of malaria, while only 1 participant (0.3%) had not. Regarding the causes of malaria, most participants correctly identified mosquito bites (332, 86.5%). However, some misconceptions were noted: 77 participants (20.1%) associated malaria with witchcraft, 65 (16.9%) with dirty water, 58 (15.1%) with cold weather, and 39 (10.2%) mentioned other unspecified causes. A similar number, 58 participants (15.1%), reported that they did not know the cause.

On malaria transmission, 277 respondents (72.1%) correctly indicated mosquito bites as the primary route, while 65 (16.9%) believed malaria could spread through person-to-person contact. Nineteen participants (4.9%) were unsure, and 23 (6.0%) cited other transmission modes. Knowledge of malaria prevention was also high, with 359 participants (93.5%) acknowledging that malaria can be prevented.

Seventeen participants (4.4%) believed it cannot be prevented, and 8 (2.1%) did not know. Specific preventive measures reported included sleeping under mosquito nets (342, 89.1%), indoor residual spraying (167, 43.5%), eliminating stagnant water (158, 41.1%), taking herbal medicine (149, 38.8%), and using mosquito coils or repellents (143, 37.2%). Additionally, 148 participants (38.5%) reported not knowing any preventive methods, while 118 (30.7%) mentioned other strategies. In terms of malaria symptoms, fever was the most commonly recognized symptom (335, 87.2%), followed by headache (316, 82.3%) and vomiting (312, 81.3%). Body pains were reported by 297 participants (77.3%), and other unspecified symptoms by 300 (78.1%). Chills were less frequently mentioned, with 97 participants (25.3%) reporting them, while 296 (77.1%) admitted not knowing some symptoms.

Overall, while awareness of malaria and its prevention is high among guardians of children under five in Rusizi District, misconceptions regarding causes, transmission, and symptoms remain. These findings highlight the need for focused health education interventions to improve accurate knowledge and encourage effective malaria prevention practices.

Table 3: Knowledge of Malaria among caregivers of Children Under Five in Rusizi District, (n = 384)

Variable / Question	Response	Frequency (n)	Percent (%)
Have you ever heard of malaria?	Yes	383	99.7
	No	1	0.3
What causes malaria?	Mosquito bites	332	86.5
	Dirty water	65	16.9
	Cold weather	58	15.1
	Witchcraft	77	20.1
	Don’t know	58	15.1
	Other (specify)	39	10.2
How is malaria transmitted?	Mosquito bite	277	72.1
	Person-to-person contact	65	16.9
	Don’t know	19	4.9
	Other	23	6.0
Can malaria be prevented?	Yes	359	93.5
	No	17	4.4

	Don't know	8	2.1
Methods to prevent malaria	Sleeping under mosquito nets	342	89.1
	Indoor residual spraying	167	43.5
	Eliminating stagnant water	158	41.1
	Taking herbal medicine	149	38.8
	Using mosquito coils/repellents	143	37.2
	Don't know	148	38.5
	Other (specify)	118	30.7
Common symptoms of malaria	Fever	335	87.2
	Chills	97	25.3
	Headache	316	82.3
	Vomiting	312	81.3
	Body pains	297	77.3
	Don't know	296	77.1
	Other symptoms	300	78.1

3.2.4 Distribution of Knowledge Levels on Malaria among caregivers of Children Under Five in Rusizi District (n = 384)

The assessment of knowledge among respondents revealed varying levels of understanding regarding malaria. Out of the 384 participants, 103 individuals, corresponding to 26.8%, demonstrated high knowledge, with scores ranging from 36 to 42. This indicates a strong awareness and understanding of malaria-related information among this group.

The largest proportion of respondents, 202 participants (52.6%), fell within the moderate knowledge category, scoring between 31 and 35. This suggests that while over half of the participants possess a fair understanding of malaria, there is still room for improvement in their comprehension of its causes, transmission, prevention, and symptoms. A smaller group of 79 respondents, representing 20.6% of the sample, exhibited low knowledge with scores between 25 and 30. This indicates that one-fifth of the respondents have limited awareness and may benefit from targeted educational interventions to enhance their understanding of malaria and its preventive measures. Overall, these findings highlight that although a significant proportion of guardians and caregivers demonstrate moderate to high knowledge about malaria, there remains a notable segment with insufficient knowledge, underscoring the importance of continuous health education initiatives to strengthen malaria awareness and promote effective preventive practices.

3.2.5 Attitude towards Malaria Prevention among caregivers of Children Under Five in Rusizi District (n = 384)

The assessment of attitudes towards malaria prevention among caregivers and guardians of children under five in Rusizi District revealed generally positive perceptions. The vast majority of respondents, 358 out of 384 (93.2%), believed that their child was at risk of contracting malaria, while 16 participants (4.2%) disagreed and 10 (2.6%) were uncertain. When asked about the seriousness of malaria in young children, almost all participants (361, 94.0%) considered it very serious, 18 respondents (4.7%) viewed it as moderately serious, and a small minority of 5 participants (1.3%) perceived it as not serious. Regarding preventive measures, nearly all participants (383, 99.7%) agreed that using mosquito nets every night helps prevent malaria, with only 1 respondent (0.3%) expressing disagreement. Despite this high awareness, several barriers to regular mosquito net use were reported. The most frequently cited challenges included insufficient nets (338, 88.0%), torn or damaged nets (316, 82.3%), and discomfort due to heat or inconvenience (300, 78.1%). Other reasons mentioned were the child refusing to sleep under the net (288, 75.0%), the perception that nets were unnecessary or that the child was not at risk (296, 77.1%), disbelief in the effectiveness of nets (291, 75.8%), and other unspecified reasons (298, 77.6%).

Attitudes toward indoor residual spraying (IRS) were predominantly positive, with 372 participants (96.9%) describing it as safe and helpful. A few respondents expressed concerns: 5 participants (1.3%) felt IRS was unsafe, 2 (0.5%) believed it was ineffective, and 5 (1.3%) were unsure. For those who refused IRS, the main reasons included health or safety concerns (302, 78.6%), privacy issues (302, 78.6%), and the unpleasant smell of the chemicals (296, 77.1%). Cultural beliefs were reported by 275 participants (71.6%), and 267 respondents (69.5%) cited other unspecified reasons for refusal. Overall, the findings indicate that while guardians of children under five in Rusizi District generally hold positive attitudes toward malaria prevention measures, practical barriers and personal beliefs may limit consistent use of interventions such as mosquito nets and IRS. These results highlight the importance of addressing both behavioral and structural factors to enhance the effectiveness of malaria prevention strategies in the community.

Table 4: Attitude towards Malaria Prevention among caregivers of Children Under Five in Rusizi District (n = 384)

Variable / Question	Response	Frequency (n)	Percent (%)
Do you think your child is at risk of getting malaria?	Yes	358	93.2
	No	16	4.2
	Not sure	10	2.6
How serious do you consider malaria for children under five?	Not serious	5	1.3
	Moderate serious	18	4.7
	Very serious	361	94.0
Do you think using mosquito nets every night prevents malaria?	Yes	383	99.7
	No	1	0.3
Reasons for not using a mosquito net every night	Too hot/uncomfortable	300	78.1
	Torn or damaged	316	82.3
	Not enough nets	338	88.0
	Child refuses	288	75.0
	No need / not at risk	296	77.1
	Don't believe in its effectiveness	291	75.8
	Others	298	77.6
How do you feel about indoor residual spraying (IRS)?	Safe and helpful	372	96.9
	Unsafe / health concerns	5	1.3
	Not effective	2	0.5
	Don't know	5	1.3
Reasons for refusing IRS (if applicable)	Health/safety concerns	302	78.6
	Bad smell	296	77.1
	Privacy issues	302	78.6
	Cultural beliefs	275	71.6
	Other (specify)	267	69.5

3.2.6 Distribution of Attitude Levels toward Malaria Prevention among caregivers of Children Under Five in Rusizi District (n = 384)

The evaluation of attitudes toward malaria prevention among the guardians of children under five revealed that a large majority exhibited negative perceptions. Specifically, 283 participants, representing 73.7% of the sample, scored 20 or below, placing them in the negative attitude category. This indicates that most respondents held unfavorable views or were reluctant to consistently adopt malaria preventive measures. A smaller segment of 23 respondents (6.0%) fell into the neutral attitude category, with scores ranging from 21 to 27. These individuals showed moderate attitudes, reflecting some awareness and acceptance of preventive practices but with limited consistency or confidence in their effectiveness. Meanwhile, 78 participants (20.3%) demonstrated a positive attitude, scoring between 28 and 31. This group appeared to have a favorable perception of malaria prevention measures, likely supporting consistent use of interventions such as mosquito nets and indoor residual spraying. Overall, the findings suggest that while a minority of guardians possess a positive outlook toward malaria prevention, the majority display negative or neutral attitudes. This highlights the need for targeted behavioral interventions and awareness campaigns to strengthen favorable attitudes and promote effective malaria control practices among caregivers.

3.2.7 Source of the Information about Malaria

The study examined the various sources of information on malaria utilized by guardians of children under five in Rusizi District. Health workers were the most frequently cited source, with 82.6% of respondents (317 out of 384) reporting that they obtained most of their malaria-related information from them, while 17.4% (67 participants) did not. Radio broadcasts also played a prominent role, with 79.4% (305 participants) acknowledging it as a source of information and 20.6% (79

participants) indicating otherwise. Community meetings were moderately utilized, with 59.1% of respondents (227 participants) reporting attendance or receipt of malaria-related messages, compared to 40.9% (157 participants) who did not. Information obtained from family or friends was less common, with only 19.5% (75 participants) relying on these informal networks, whereas 80.5% (309 participants) did not. Printed materials such as posters and flyers were an important channel, with 78.6% of respondents (302 participants) indicating that they received information through these media, while 21.4% (82 participants) did not. Other miscellaneous sources, potentially including social media or personal observations, were mentioned by 21.4% of participants (82 respondents), with the majority, 78.6% (302 participants), not relying on these avenues. The findings indicate that health workers, radio, and printed materials serve as the primary channels for disseminating malaria prevention information to guardians, whereas informal networks and other sources appear to have a limited role in this context.

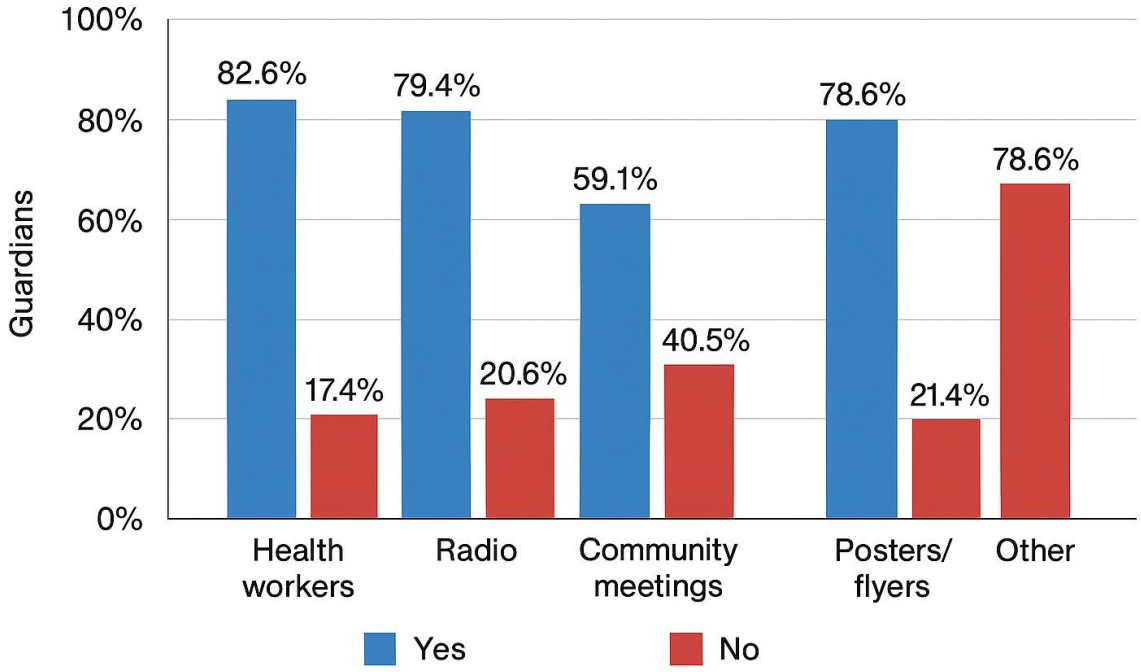


Figure 1: Source of the Information about Malaria

3.2.8 Environmental Factors Related to Malaria Prevention among Households in Rusizi District, (n = 384)

The assessment of environmental conditions related to malaria exposure among households in Rusizi District revealed several notable patterns. When asked about the presence of stagnant water near their homes, 143 households (37.2%) reported that stagnant water was present, whereas 240 households (62.5%) indicated no stagnant water, and only 1 household (0.3%) was unsure. Regarding proximity to wetlands or irrigation schemes, 221 respondents (57.6%) reported living near such areas, while 161 households (41.9%) were not near wetlands or irrigation zones, and 2 participants (0.5%) did not know.

The construction of houses also varied: the majority of homes (301, 78.4%) were built with mud walls, 66 houses (17.2%) had brick walls, and 17 houses (4.4%) were constructed with cement or plastered walls. Roof types were predominantly iron sheets, present in 380 houses (99.0%), with only 3 houses (0.8%) using tiles and a single house (0.3%) having a thatched roof. Screened windows or doors were present in 221 households (57.6%), while 163 households (42.4%) lacked these protective features. Information dissemination appeared widespread: nearly all respondents (379, 98.7%) had received malaria prevention guidance from health workers, leaving only 5 participants (1.3%) without such information. Attendance at community health education sessions was also high, with 368 respondents (95.8%) participating over the past year, compared to 16 (4.2%) who had not attended. These findings indicate that while most households in Rusizi District have iron-sheet roofs and receive health education on malaria, environmental risk factors such as proximity to wetlands or stagnant water remain relevant. Additionally, a considerable proportion of homes lack protective features like screened windows or doors, which may increase exposure to malaria vectors.

Table 5: Environmental Factors Related to Malaria Prevention among Households in Rusizi District, (n = 384)

Variable / Question	Response	Frequency (n)	Percent (%)
Does your household have stagnant water nearby?	Yes	143	37.2
	No	240	62.5
	Don't know	1	0.3
Is your house near wetlands or irrigation schemes?	Yes	221	57.6
	No	161	41.9
	Don't know	2	0.5
What type of walls does your house have?	Mud	301	78.4
	Brick	66	17.2
	Cement / Plastered	17	4.4
What type of roofing does your house have?	Thatched	1	0.3
	Iron sheets	380	99.0
	Tiles	3	0.8
Does your house have screened windows or doors?	Yes	221	57.6
	No	163	42.4
Have you received information about malaria prevention from health workers?	Yes	379	98.7
	No	5	1.3
Have you attended any community health education session on malaria in the past year?	Yes	368	95.8
	No	16	4.2

4. DISCUSSIONS ON RESEARCH FINDINGS

The purpose of this study was to assess the factors influencing the utilization of malaria preventive measures among caregivers of children under five years of age in Rusizi District, Rwanda, in 2025. The findings provide important insights into the level of adoption of malaria prevention interventions and the socio-demographic, environmental, and behavioral factors that influence their utilization. The discussion is organized according to the study objectives and interpreted in relation to existing literature and policy frameworks.

The study found high levels of utilization of key malaria preventive measures, particularly insecticide-treated nets (ITNs) and indoor residual spraying (IRS), among households with children under five years of age. These findings are largely consistent with national malaria control reports. The Rwanda Demographic and Health Survey (RDHS, 2024) reported that approximately 96% of households with young children owned at least one ITN and that 92% of children slept under a mosquito net the night preceding the survey. Similarly, the Rwanda Biomedical Centre (RBC, 2023) documented IRS coverage exceeding 60% in malaria-endemic districts, comparable to the 58.6% coverage observed in the present study. The consistency between these findings and national statistics suggests that Rwanda's malaria control initiatives have achieved substantial success in expanding access to preventive interventions. Nevertheless, the existence of households that do not consistently utilize available preventive measures indicates the need for targeted interventions focusing on vulnerable populations and high-risk environments.

The findings further revealed that knowledge of malaria prevention among caregivers was moderate and did not always translate into optimal utilization of preventive measures. This observation supports the Health Belief Model, which suggests that knowledge alone is insufficient to influence health behavior unless accompanied by perceived susceptibility, perceived benefits, and the ability to overcome barriers to action. Although many caregivers demonstrated awareness of malaria transmission and prevention methods, gaps remained in the consistent use of ITNs, acceptance of IRS, and environmental control practices. Similar findings have been reported in previous studies across sub-Saharan Africa, where awareness levels were relatively high but behavioral and structural barriers limited the adoption of preventive practices. This suggests that malaria control programs should move beyond information dissemination and focus on behavior change communication strategies that address misconceptions, cultural beliefs, and practical barriers to utilization.

Attitudes toward malaria prevention were also found to significantly influence the adoption of preventive measures. Households with positive attitudes toward malaria control interventions were more likely to consistently use ITNs and support IRS activities than those with neutral attitudes. This finding is consistent with studies conducted by Mukasa et al. (2021) and Uwizeye et al. (2022), which demonstrated that favorable perceptions of malaria prevention interventions increase adherence to recommended preventive practices. The findings imply that while positive attitudes facilitate malaria prevention efforts, a substantial proportion of caregivers may remain indifferent or insufficiently motivated to adopt preventive measures consistently. Therefore, health promotion campaigns should focus not only on increasing awareness but also on fostering positive perceptions and addressing misconceptions regarding the effectiveness and safety of malaria prevention interventions.

Socio-demographic characteristics emerged as important determinants of malaria preventive measure utilization. The study found that caregivers aged 35–44 years were more likely to utilize malaria prevention measures consistently compared to younger and older respondents. This finding may be attributed to greater life experience, increased health awareness, and enhanced decision-making capacity among middle-aged caregivers. Similar observations have been reported in the RDHS (2024), which highlighted age-related differences in health-seeking behavior and preventive health practices. Furthermore, married respondents demonstrated higher levels of preventive measure utilization than single, divorced, or widowed caregivers. This may reflect the advantages associated with shared household responsibilities, social support, and pooled financial resources, which facilitate access to and implementation of preventive measures.

Educational attainment was another significant predictor of malaria prevention utilization. Caregivers with tertiary education were more likely to ensure regular ITN use, accept IRS interventions, and adopt environmental management practices than those with lower levels of education. This finding corroborates previous research conducted in Rwanda and other sub-Saharan African countries, which has consistently identified education as a key determinant of health behavior and preventive healthcare utilization (Uwizeye et al., 2022; RBC, 2023). Higher educational attainment enhances health literacy, improves access to health information, and increases individuals' ability to understand and implement disease prevention recommendations. These findings underscore the importance of designing targeted health education programs for caregivers with limited formal education to reduce disparities in malaria prevention practices.

The study also identified household and environmental factors as significant determinants of malaria prevention utilization. Larger households, particularly those with six to seven members, reported higher utilization of preventive measures. This may be explained by increased awareness of malaria risks in households with multiple children and greater motivation to protect family members from infection. Conversely, households located near stagnant water sources were less likely to utilize malaria preventive measures effectively. This finding is concerning because stagnant water provides breeding sites for mosquitoes and increases the risk of malaria transmission. Similar observations were reported in the RDHS (2024), which identified environmental conditions as critical determinants of malaria vulnerability and preventive behavior. These findings highlight the importance of integrating environmental management strategies into malaria control programs, including community clean-up campaigns, drainage improvement initiatives, and public education on eliminating mosquito breeding sites.

Housing conditions were also associated with the utilization of malaria preventive measures. Households constructed with mud walls were less likely to accept IRS interventions than those built with brick or cement materials. This may be due to concerns about the effectiveness of spraying in poorly constructed houses, limited awareness of IRS benefits, or socio-economic constraints associated with poorer housing conditions. Housing quality has been widely recognized as an important determinant of malaria risk, with improved housing structures reducing mosquito entry and enhancing the effectiveness of vector control interventions. Consequently, malaria prevention efforts should be integrated with broader community development initiatives aimed at improving housing standards and living conditions.

Participation in community health education programs was positively associated with the utilization of malaria preventive measures. Caregivers who had participated in health education sessions were more likely to use ITNs consistently and accept IRS interventions than those who had not participated. This finding supports evidence from the Rwanda Biomedical Centre (2023), which emphasizes the critical role of Community Health Workers (CHWs) in promoting malaria prevention and encouraging adherence to recommended practices. Community-based health education enhances knowledge, addresses misconceptions, and strengthens community engagement in malaria control efforts. Therefore, strengthening CHW-led outreach programs and expanding community mobilization activities could significantly improve the uptake and sustainability of malaria preventive measures.

The findings demonstrate that the utilization of malaria preventive measures among caregivers of under-five children in Rusizi District is influenced by a complex interaction of knowledge, attitudes, socio-demographic characteristics, environmental conditions, housing quality, and participation in community health education programs. While national malaria control interventions have achieved commendable coverage, persistent disparities in utilization indicate the need for targeted, multi-sectoral approaches. Such approaches should combine health education, behavioral change communication, environmental management, community engagement, and socio-economic support to enhance the consistent use of preventive measures. These recommendations are consistent with the objectives of Rwanda's National Malaria Strategic Plan (2022–2027), which advocates for universal access to and effective utilization of malaria prevention interventions, particularly among vulnerable populations such as children under five years of age.

5. CONCLUSION

This study assessed the factors influencing the utilization of malaria preventive measures among caregivers of children under five years of age in Rusizi District, Rwanda. The findings reveal that although ownership and availability of malaria prevention tools, particularly insecticide-treated nets (ITNs), are relatively high, consistent and appropriate utilization remains suboptimal among some households. This suggests that the availability of preventive interventions alone is insufficient to ensure effective protection against malaria among vulnerable children.

The study established that the utilization of malaria preventive measures is influenced by a combination of socio-demographic, household, environmental, and behavioral factors. Caregiver characteristics such as educational attainment, marital status, and occupation were found to significantly affect the adoption of preventive practices. Similarly, household factors including household size, housing conditions, and the presence of stagnant water near residences influenced the level of utilization. Caregivers with higher levels of education and those who participated in community health education programs demonstrated greater adherence to recommended malaria prevention practices, highlighting the importance of health literacy and community-based awareness initiatives.

Furthermore, while knowledge of malaria prevention was generally moderate to high among respondents, the findings indicate that knowledge alone does not automatically translate into consistent preventive behavior. This underscores the existence of other barriers, including environmental, socio-economic, and behavioral factors, that limit the effective use of malaria prevention measures. Multivariate logistic regression analysis confirmed that educational attainment, occupation, household size, and environmental conditions were significant predictors of malaria preventive measure utilization.

The study concludes that improving malaria prevention among children under five requires a comprehensive and integrated approach that goes beyond the distribution of preventive tools. Strengthening community health education, promoting behavior change communication, improving environmental sanitation, and targeting socio-economically vulnerable households are essential strategies for enhancing the utilization of malaria preventive measures. These findings support the objectives of Rwanda's malaria control efforts and provide evidence-based insights for policymakers, health practitioners, and community stakeholders seeking to reduce malaria morbidity and mortality among under-five children in malaria-endemic areas.

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