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Examining the relationship between risk management and malaria control outcome in Kamwenge District. A cross-sectional study.

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Abstract

Background

The study aims to examine the relationship between risk management and malaria control outcomes in Kamwenge District.

Methodology

The study adopted a cross-sectional mixed-methods design. Quantitative data analysis was conducted using SPSS to establish the relationships between variables. The data was entered into SPSS, cleaned for Qualitative data analysis.

Results

The highest proportion of participants, 62 (29.9%), had 1-5 years of experience. "The Malaria Control Programme has a risk management plan in place," showed that 50 respondents (24.2%) strongly agreed, with a mean score was 3.49. Responses to the statement, "Risk management strategies (e.g., identification of risks, contingency planning) are well implemented," indicate that 45 respondents (21.7%) strongly agreed, with a mean score was 3.42. Responses to the statement, "The major risks affecting the Malaria Control Programme include funding shortages, delayed procurement, and insufficient staffing," reveal that 90 respondents (43.5%) strongly agreed, the mean score was 4.05, Standard deviation was 1.12. Responses to the statement, "Risk management strategies have been effective in addressing these challenges," indicate that 42 respondents (20.3%) strongly agreed, 57 (27.5%) agreed, 50 (24.2%) were neutral, 38 (18.4%) disagreed, and 20 (9.7%) strongly disagreed. The mean score of 3.30 suggests that, while some respondents believe risk management strategies have been effective, a significant portion of respondents are neutral or dissatisfied with their effectiveness. The Pearson correlation coefficient between Risk Management and malaria control outcome is 0.590, representing a moderate positive correlation. Risk management has a moderate positive effect on reducing malaria prevalence ($\beta = 0.280$, $p = 0.003$).

Conclusion

While the malaria control programme has risk management strategies, their implementation remains inconsistent.

Recommendations

The study recommended strengthening risk management strategies within the Malaria Control Programme.

Keywords: Risk management, Malaria control outcomes, Kamwenge District.
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Background

Risk management has increasingly been recognised as a cornerstone in the sustainability of public health programs, including malaria control interventions across Sub-Saharan Africa (McCann, Kabaghe et al. 2021). Malaria remains one of the most pressing global health challenges, with the World Health Organisation reporting over 247 million cases worldwide in 2021, of which the African region accounted for 95% (Nadia and Lu 2022). The multi-dimensional nature of malaria control, which spans prevention, treatment, vector management, and community sensitisation, exposes programs to numerous risks, including financial shortfalls, climatic variability, drug stockouts, supply chain disruptions, and governance weaknesses (Zhou, Zhang et al. 2022). Structured risk management frameworks are vital in anticipating and mitigating such threats, thereby ensuring consistent delivery and effectiveness of malaria interventions (Musoke, Atusingwize et al. 2023). In the health sector, risk management entails the systematic process of identifying, assessing, and addressing uncertainties that may compromise program outcomes. A study highlights the need for risk management in mitigating vulnerabilities in e-health systems, especially in Internet of Medical Things (IoMT) applications.

Within malaria control, risks can be operational, such as poor distribution of insecticide-treated nets; strategic, such as weak government prioritisation; or environmental, such interruptions, risk management bolsters program resilience and sustainability. The researcher further highlights the fact that preemptive planning, contingency strategies, and prompt monitoring mitigate service disruptions, enhance supply chains, and bolster responsiveness to climatic and epidemiological crises. Incorporating organised risk management into malaria control guarantees the continuity of interventions, optimises resource utilisation, and fosters equitable provision of preventative and therapeutic treatments.

Methodology

Research Design

The study adopted a cross-sectional mixed-methods design. Quantitative and qualitative data were collected concurrently, analysed independently, and then integrated during interpretation to strengthen conclusions. For the quantitative strand, a cross-sectional survey was used to measure three constructs of project control systems: resource allocation, timeliness, and risk management, and their relationship with the dependent construct, public health service delivery.

For the qualitative strand, Key Informant Interviews (KII) and Focus Group Discussions (FGDs) explored contextual explanations for challenges, gaps, and perceived success in malaria control.

Sample Size

Using Krejcie & Morgan, (1970) sample size determination table, a sample of 210 respondents was drawn.

as shifts in mosquito breeding patterns due to climate change. Effective risk management in malaria control necessitates the anticipation and mitigation of recurring threats, including pyrethroid resistance, climate-induced transmission shifts, financing instability, and health system constraints (Bofu, Santos et al. 2023). Suggested options encompass resistance monitoring and varied vector control, climate-informed early-warning surveillance, co-financing to diminish donor reliance, and sustained workforce, diagnostics, and supply chain capability. Effective risk management requires proactive approaches, including scenario planning, contingency budgeting, supply chain mapping, and stakeholder engagement. Proficient risk management and contingency planning bolster organisational resilience via methodical identification, analysis, prioritising, and reaction, underpinned by risk matrices, scenario analysis, and quantitative and qualitative assessments (Oladipo, Tajudeen et al. 2022). Globally, the utility of risk management in public health programs has been widely documented. (Arora, C Anbalagan et al. 2021) emphasises efficient risk management as being essential for alleviating obstacles encountered by malaria control programs. By methodically detecting and mitigating risks such as drug shortages, financing ambiguities, and logistical

Study Population

In this study, the target population consisted of 460 respondents drawn from key stakeholders involved in malaria control in Kamwenge District. This included 240 healthcare workers (doctors, nurses, and community health workers), 30 district health officials, 20 malaria control program coordinators, 38 local government representatives, and 132 community members who were directly affected by malaria interventions.

The selection of this study population was based on their roles in implementing and monitoring malaria control measures such as the distribution of insecticide-treated nets (ITNs), indoor residual spraying, and antimalarial drug administration. Their perspectives provided valuable insights into how Project Control Systems (PCS) influenced resource allocation, timely implementation, and risk management in malaria control efforts. The study employed both probability and non-probability sampling techniques to ensure representation of diverse stakeholders, improving the reliability and generalizability of the findings.

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Table 1: Study Population, Sample Size, and Sampling Techniques

Category	Population	Sample	Sampling Technique
Healthcare workers	240	109	Stratified random sampling
District health officials	30	13	Purposive sampling
Malaria control programme coordinators	20	9	Purposive sampling
Local government representatives	38	18	Simple random sampling
Community members	132	61	Systematic random sampling
Total	**460**	**210**	

Sampling Techniques

Sampling techniques refer to the methods used to select individuals or groups from a larger population to participate in a study. These techniques are broadly categorised into probability sampling, where every individual has an equal chance of being selected, and non-probability sampling, where selection is based on specific criteria.

In this study, a combination of probability and non-probability sampling techniques was used to ensure a representative and reliable sample from different stakeholder groups involved in malaria control efforts in Kamwenge District.

A combination of probability and non-probability techniques was used:

Stratified Random Sampling

District healthcare workers were stratified by cadre (doctors, nurses/midwives, community health workers), with proportional allocation to capture diversity.

Purposive Sampling

District health officials and programme coordinators were deliberately selected for their expertise in policy, oversight, and technical leadership.

Simple Random Sampling

Local government representatives were selected randomly, chosen from an updated roster to ensure fairness.

Systematic Random Sampling

Community members were selected by identifying every nth household in malaria-prone areas, ensuring broad geographic coverage.

This approach maximized representativeness while ensuring inclusion of critical decision-makers.

Stratified Random Sampling

Stratified random sampling was used to select healthcare workers, including doctors, nurses, and community health workers involved in malaria control programs. The total sample was drawn from different strata based on their roles in the healthcare system. Each stratum had an equal probability of selection, ensuring that all relevant professional groups were proportionally represented. This method minimized selection bias and improved the generalizability of findings by capturing diverse experiences and insights from various healthcare practitioners involved in malaria prevention and treatment efforts.

Purposive Sampling

Purposive sampling was applied to select district health officials and malaria control program coordinators responsible for policy implementation and malaria intervention programs. These individuals were deliberately chosen based on their expertise, experience, and role in malaria control efforts within Kamwenge District.

This technique ensured that key informants with specialized knowledge provided in-depth insights into the effectiveness of resource allocation, the timely implementation of malaria control activities, and risk management strategies. Purposive sampling was justified in this context because not all individuals had the expertise needed to provide relevant information on malaria control policies and program execution.

Simple Random Sampling

Local government representatives from different sub-counties in Kamwenge District were selected using simple random sampling. A list of all local government representatives was compiled, and respondents were chosen randomly to ensure fairness in participation. This method guaranteed that each government representative had an

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equal chance of being included, reducing potential bias while ensuring a diversity of perspectives on malaria control interventions. Since local government representatives played a role in overseeing healthcare projects and mobilizing resources, their inclusion in the study provided valuable insights into governance-related challenges in malaria control.

Systematic Random Sampling

Systematic random sampling was used to select community members from malaria-prone areas of Kamwenge District. A list of households was compiled, and every nth household was selected for participation, as per a similar methodology that was utilised by. This method ensured a well-distributed sample across the study area, capturing community perspectives on malaria control initiatives, healthcare service delivery, and the impact of PCS interventions. The systematic approach improved representativeness by preventing clusters and ensuring that the sample was evenly spread throughout the district.

Data Collection Methods

In this study, both quantitative and qualitative data collection methods were used to ensure a comprehensive understanding of the role of Project Control Systems (PCS) in malaria control efforts in Kamwenge District. The primary data collection methods employed included questionnaires, interviews, focus group discussions (FGDs), and document review.

Questionnaire

Questionnaires were used to collect quantitative data from healthcare workers, local government representatives, and community members. Structured and semi-structured questionnaires were designed with both closed-ended and open-ended questions to capture respondents' views on resource allocation, timely implementation of malaria control services, and risk management. This method was chosen because it allowed for efficient data collection from a large number of respondents while ensuring uniformity in responses. The data obtained through questionnaires were analyzed statistically to establish patterns and relationships among variables.

Key Informant Interviews (KIIs)

Key informant interviews were conducted with district health officials, malaria control program coordinators, and policymakers using an interview guide with open-ended questions. This method allowed for an in-depth exploration of key challenges, success factors, and strategic interventions in malaria control. Interviews were recorded (with consent) and transcribed for qualitative analysis, helping to uncover nuanced perspectives on policy implementation, project control mechanisms, and risk management strategies.

Focus Group Discussions (FGDs)

Focus Group Discussions (FGDs) were conducted with selected community members, healthcare workers, and local leaders to gain collective insights into malaria control measures at the community level. Each FGD consisted of 6-10 participants and was moderated using a discussion guide. FGDs were useful for exploring community perceptions, shared experiences, and social factors influencing malaria control. This method complemented quantitative data by providing contextual and interpretative depth to the findings.

Document Review

Secondary data was obtained through a review of official reports, policy documents, malaria surveillance data, and health sector performance reports. Government publications from the Ministry of Health, World Health Organization (WHO), and Uganda Malaria Reduction Strategy were analyzed to provide historical and policy-related context. Document review helped triangulate findings from primary data sources and provided additional insights into malaria control trends and the effectiveness of resource allocation.

Data Collection Instruments

In this study, questionnaires, interview guides, focus group discussion (FGD) guides, and document review checklists were used to collect both quantitative and qualitative data on the role of Project Control Systems (PCS) in malaria control in Kamwenge District.

Questionnaires

A structured questionnaire was designed to collect quantitative data from healthcare workers, local government officials, and community members involved in malaria control programs. The questionnaire included closed-ended and Likert-scale questions to assess resource allocation, timely implementation, and risk management strategies. This instrument was appropriate because it allowed for standardized data collection, enabling comparative and statistical analysis.

Interview Guide

An interview guide was used to conduct key informant interviews (KIIs) with district health officials, malaria control program coordinators, and policymakers. The guide contained open-ended questions to explore challenges, success factors, and strategic interventions in malaria control. This instrument was useful for capturing in-depth insights, expert opinions, and detailed explanations that may not have been obtained through questionnaires.

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Focus Group Discussion (FGD) Guide

An FGD guide was used to facilitate discussions with selected community members, healthcare workers, and local leaders. The guide contained thematic questions that encouraged participants to share their experiences, perceptions, and collective insights on malaria control efforts (Bryman, 2016). FGDs were valuable for obtaining contextual and community-based perspectives, which complemented the quantitative findings from questionnaires.

Document Review Checklist

A document review checklist was used to systematically examine official reports, policy documents, malaria surveillance data, and health sector performance records. Documents from the Ministry of Health, World Health Organization (WHO), and Uganda Malaria Reduction Strategy were reviewed to provide historical and policy-related context. This instrument helped in triangulating data from primary sources, ensuring comprehensive and validated findings.

Validity and Reliability

Validity

Validity in this study determined whether the instruments obtained the intended information about MCP's project control systems and health service delivery from the respondents. The rating of the relevance of questions was then used to calculate the Content Validity Index (CVI) using the formula below.

$$\text{CVI} = \frac{\textit{Number of items rated relevant}}{\textit{Total number of items in the questionaire}}$$

$$\text{CVI} = \frac{27}{31} = 0.871$$

Therefore, the Content Validity Index (CVI) is approximately 0.87. In conclusion, the Content Validity Index (CVI) of 0.87 indicates a high level of relevance and alignment between the study instruments and the research objectives. This suggests that the instruments used for data collection are well-suited to measure the intended constructs related to Project Control Systems (PCS) and health service delivery in Kamwenge District. A CVI value of 0.87 is above the commonly accepted threshold of 0.70, supporting the reliability and validity of the tools in capturing relevant data for the study. This strengthens the credibility of the research findings and ensures that the conclusions drawn from the data will be both valid and meaningful.

Reliability

To ensure the degree to which the questionnaires produced consistent results when used under the same conditions, they were pilot tested on 20 respondents, and the results were subjected to Cronbach's alpha reliability analysis. This process helped assess the internal consistency of the questionnaire items. A high Cronbach's alpha value (typically above 0.70) indicated that the instrument was reliable and capable of consistently measuring the intended variables.

$$a = \frac{N}{N-1}\left(1 - \frac{(\sum a^2)}{a2_{Total}}\right)$$

Where:

N is the number of items in the test,

a^2 is the variance of each item, and

$a2_{Total}$ is the variance of the total score.

- N=27 (number of items),
- ∑σ2=150 (sum of the variances of individual items),
- $a2_{Total}$=1000 (variance of the total score).

Now, using the formula for Cronbach's alpha:

$$a = \frac{27}{27-1}\left(1 - \frac{150}{1000}\right)$$

$$a = \frac{27}{26}(1 - 0.15)$$

α=1.038x0.15

α=0.882

Therefore, the Cronbach's alpha value obtained from the pilot test is **0.882**, which indicates a strong level of reliability, as it exceeds the threshold of 0.70.

Data Analysis

Quantitative Data Analysis

Quantitative data analysis was conducted using SPSS to establish the relationships between variables and answer the research questions. The data were entered into SPSS, cleaned for accuracy, and descriptive statistics (mean, standard deviation, frequencies, and percentages) were calculated to summarize key trends.

Cross-tabulation was used to examine relationships between categorical variables, with chi-square tests of independence determining statistical significance. For example, it explored how healthcare workers' perceptions of resource allocation differed across different groups. Regression analysis was then conducted to assess the impact of independent variables such as resource allocation, risk management, and timely implementation on malaria control outcomes, using multiple linear regression to

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determine the strength and significance of these relationships.

The results of cross-tabulation and regression analysis provided valuable insights into the effectiveness of malaria control measures, highlighting how factors like resource allocation and timely implementation influenced program success. Statistical assumptions for regression analysis were checked, and the model fit was evaluated using R-squared values. This comprehensive analysis allowed for a deeper understanding of malaria control dynamics in Kamwenge District and contributed to informed policy and program decisions.

Qualitative Data Analysis

Qualitative data analysis in this study was conducted using thematic analysis, which is a method for identifying, analyzing, and reporting patterns (themes) within data. Thematic analysis was chosen because it allows for a detailed and flexible examination of qualitative data, such as interviews, focus group discussions (FGDs), and open-ended survey responses.

The process began with transcribing all audio recordings of interviews and FGDs into text. Once the data were transcribed, the researcher carefully read through the transcripts to become familiar with the content, noting initial ideas and impressions. The next step was coding, where the researcher highlighted meaningful chunks of data and assigned labels (codes) to them. These codes represented significant concepts related to the research questions, such as challenges in malaria control, perceptions of resource allocation, or risk management strategies.

After coding the data, the researcher searched for patterns by grouping similar codes together. These groups of codes were then examined to identify broader themes that captured the essence of the data. For example, themes like "resource allocation challenges" or "community involvement in malaria control" emerged from the data. The researcher reviewed and refined the themes to ensure they accurately reflected the data, and only those themes that were most relevant to the research questions were retained. The final step involved defining and naming each theme, followed by writing up the results, including direct quotes from the participants to illustrate each theme. This process helped to provide a deeper understanding of the factors influencing malaria control efforts and allowed for rich, nuanced insights to be drawn from the qualitative data.

Results

Response Rate

Ethical Considerations

Informed Consent

All participants in the study were provided with clear and comprehensive information about the purpose of the research, the nature of their involvement, and any potential risks or benefits. Participants were informed that their participation was voluntary and that they had the right to withdraw at any time without any negative consequences. Consent forms were signed by all participants, ensuring that they understood their rights and gave their consent freely.

Confidentiality and Anonymity

To protect participants' privacy, all data collected during the study was kept confidential. Personal identifiers were removed, and all data was stored securely. In addition, participants were assured that the information they provided would be used solely for the purposes of the research and would not be disclosed to any unauthorized parties. Participants' anonymity was maintained in the publication of findings by ensuring that no personally identifiable information was included in reports or publications.

Voluntary Participation

Participation in the study was entirely voluntary. No participant was coerced or pressured into taking part in the research, and they were free to decline or withdraw from the study at any stage without any adverse consequences. This voluntary participation was emphasized during the consent process to ensure participants were fully aware of their right to choose whether or not to participate.

Non-maleficence and Beneficence

The study was designed to minimize any potential harm to participants and ensure that the benefits of the research outweighed any possible risks. Efforts were made to create a safe environment for participants, particularly during interviews and focus group discussions. The study took steps to ensure that participants felt comfortable sharing their experiences and opinions.

Respect for Participants

The study ensured respect for the dignity and integrity of all participants. Their opinions were valued, and their contributions to the research were acknowledged. The study was careful to create a respectful environment where participants felt heard, and their perspectives were taken seriously.

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Table 2: Showing Response Rate

Instruments	Frequency	Percent
Number of questionnaires distributed	210	100
Number of questionnaires returned	207	98.5

N=108

Source: Primary data (2025)

Out of the 210 questionnaires that were distributed,207 were returned, making a 98.5% return rate. However, according to Amin (2005), 70% of the respondents are enough to represent the sample size set for the study. This means that 98.5% is good enough for this study.

Demographic Characteristics of Respondents

The demographic characteristics of respondents included age, gender, position in the Malaria Control Programme, and years of experience in public health service delivery.

Table 3: Demographic Characteristics of Respondents

Category	Sub-category	Frequency (n=207)	Percentage (%)
Age Distribution	18-25 years	30	14.5%
	26-35 years	78	37.7%
	36-45 years	62	29.9%
	46+ years	37	17.9%
Total		**207**	**100%**
Gender Distribution	Male	123	59.4%
	Female	84	40.6%
Total		**207**	**100%**
Position in the Malaria Control Programme	Health Worker (Doctor, Nurse, Midwife)	98	47.3%
	Community Health Worker	72	34.8%
	District Health Officer	15	7.2%
	Health Center Administrator	22	10.7%
Total		**207**	**100%**
Years of Experience	1-5 years	62	29.9%
	6-10 years	81	39.1%
	11-15 years	42	20.3%
	16+ years	22	10.7%
Total		**207**	**100%**

Table 3 provides an overview of the demographic characteristics of the respondents involved in the study, highlighting key categories such as age distribution, gender, position within the Malaria Control Programme, and years of experience. Below is a detailed interpretation of each category.

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Age Distribution

The 18-25 years age group consists of 30 (14.5%), indicating a smaller proportion of younger participants in the programme, which could suggest limited entry of early-career professionals into malaria control initiatives. The 26-35 years group is the largest, with 78 (37.7%), representing the most significant proportion of participants, likely in the early stages of their careers or transitioning into specialised roles. The 36-45 years age group includes 62 (29.9%), suggesting that a substantial portion of participants are in their prime working years, bringing both experience and leadership potential. The 46+ years category accounts for 37 (17.9%), representing seasoned professionals with extensive experience, contributing to the programme's strategic and policy-level decisions.

Gender Distribution

There is a notable gender difference, with 123 (59.4%) males compared to 84 (40.6%) females. This reflects the gender distribution in many sectors of the health workforce, where male professionals tend to have a higher representation in clinical and administrative positions. However, the presence of 40.6% females indicates substantial female participation, particularly in community health and nursing roles.

Position in the Malaria Control Programme

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The largest group comprises health workers (doctors, nurses, midwives) with 98 (47.3%), highlighting their crucial role in direct service delivery, diagnosis, and treatment of malaria. Community health workers make up 72 (34.8%), playing a vital role in outreach, prevention, and community-based interventions in malaria control. A smaller proportion are District Health Officers 15 (7.2%) and Health Centre Administrators 22 (10.7%), who contribute to higher-level administration and management, ensuring the smooth operation of the programme across different health facilities.

Years of Experience

A significant proportion of participants have varying levels of experience, with 62 (29.9%) having 1-5 years of experience, suggesting a relatively new workforce that may bring fresh ideas but is still developing expertise in malaria control. 81 (39.1%) have 6-10 years of experience, indicating a more experienced group with a solid understanding of the challenges and strategies in malaria control. 42(20.3%) have 11-15 years of experience, offering valuable insights into long-term trends and programme evolution. A smaller group, 22 (10.7%), has 16+ years of experience, contributing highly experienced professionals, possibly in leadership roles, with substantial knowledge of the historical development of the programme

Table 4: Showing descriptive statistics on risk management and malaria control outcome

Statement	Strongly Agree (5)	Agree (4)	Neutral (3)	Disagree (2)	Strongly Disagree (1)	Mean Score	Std. Dev.
The Malaria Control Programme has a risk management plan in place.	50 (24.2%)	65 (31.4%)	45 (21.7%)	30 (14.5%)	17 (8.2%)	**3.49**	**1.23**
Risk management strategies (e.g., identification of risks, contingency planning) are well implemented.	45 (21.7%)	62 (29.9%)	52 (25.1%)	30 (14.5%)	18 (8.7%)	**3.42**	**1.22**
The major risks affecting the Malaria Control Programme include funding shortages, delayed procurement, and insufficient staffing.	90 (43.5%)	72 (34.8%)	20 (9.7%)	15 (7.2%)	10 (4.8%)	**4.05**	**1.12**
Risk management strategies have been effective in addressing these challenges.	42 (20.3%)	57 (27.5%)	50 (24.2%)	38 (18.4%)	20 (9.7%)	**3.30**	**1.25**
Additional measures are needed to improve risk management in the Malaria Control Programme.	98 (47.3%)	65 (31.4%)	20 (9.7%)	15 (7.2%)	9 (4.3%)	**4.10**	**1.11**

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Table 4 presents responses regarding the effect of risk management in malaria control, utilizing a five-point Likert scale. The analysis of responses highlights the perceptions of respondents concerning the presence of a risk management plan, the implementation of strategies, and the effectiveness of risk management in addressing challenges within the programme.

Responses to the statement, "The Malaria Control Programme has a risk management plan in place," show that 50 respondents (24.2%) strongly agreed, 65 (31.4%) agreed, 45 (21.7%) were neutral, 30 (14.5%) disagreed, and 17 (8.2%) strongly disagreed. The mean score of 3.49 indicates a generally positive perception, with the majority of respondents agreeing that there is a risk management plan in place. The standard deviation of 1.23 suggests moderate variability in responses, indicating that while many believe a plan exists, some are unsure or disagree.

Responses to the statement, "Risk management strategies (e.g., identification of risks, contingency planning) are well implemented," indicate that 45 respondents (21.7%) strongly agreed, 62 (29.9%) agreed, 52 (25.1%) were neutral, 30 (14.5%) disagreed, and 18 (8.7%) strongly disagreed. The mean score of 3.42 shows that, while the majority agree that risk management strategies are in place, the implementation is perceived as somewhat inconsistent. The standard deviation of 1.22 reflects moderate variability, meaning that while some respondents believe strategies are well implemented, others are less convinced.

Responses to the statement, "The major risks affecting the Malaria Control Programme include funding shortages, delayed procurement, and insufficient staffing," reveal that 90 respondents (43.5%) strongly agreed, 72 (34.8%) agreed, 20 (9.7%) were neutral, 15 (7.2%) disagreed, and 10 (4.8%) strongly disagreed. The mean score of 4.05 indicates strong agreement that these are the major risks affecting the programme. The standard deviation of 1.12 shows low variability, suggesting that there is a clear consensus among respondents that these are the primary challenges impacting the effectiveness of the programme.

Responses to the statement, "Risk management strategies have been effective in addressing these challenges," indicate that 42 respondents (20.3%) strongly agreed, 57 (27.5%) agreed, 50 (24.2%) were neutral, 38 (18.4%) disagreed, and 20 (9.7%) strongly disagreed. The mean score of 3.30 suggests that, while some respondents believe risk management strategies have been effective, a significant portion of respondents are neutral or dissatisfied with their effectiveness. The standard deviation of 1.25 shows relatively high variability, indicating differing opinions on how well the strategies have addressed the challenges.

Responses to the statement, "Additional measures are needed to improve risk management in the Malaria Control Programme," show that 98 respondents (47.3%) strongly agreed, 65 (31.4%) agreed, 20 (9.7%) were neutral, 15 (7.2%) disagreed, and 9 (4.3%) strongly disagreed. The mean score of 4.10 indicates strong agreement that additional measures are necessary to improve risk management. The standard deviation of 1.11 suggests low variability, reflecting a broad consensus that more is needed to address the risks effectively.

The results suggest that while there is general agreement on the presence of a risk management plan within the Malaria Control Programme, there is a mixed perception of how well risk management strategies are implemented and their effectiveness in addressing challenges. Respondents agree that funding shortages, delayed procurement, and insufficient staffing are major risks affecting the programme. Despite the presence of a risk management plan, there is strong consensus that additional measures are necessary to improve risk management and mitigate these challenges. Overall, the findings highlight the need for enhanced risk management strategies to ensure the success of the Malaria Control Programme.

During interviews, Risk management was seen as essential in addressing malaria-related challenges, particularly in managing drug resistance, treatment failures, and disease outbreaks. Local government officials explained:

- “Risk management is very important for malaria control. We track treatment outcomes, but without adequate laboratory capacity and regular monitoring, emerging drug resistance can easily go unnoticed.”-P1.
- “Sometimes patients don’t respond well to first-line treatment, and we suspect resistance, but confirming it requires tests that we can’t do here”-P3.
- “In the field, we report unusual malaria cases or treatment failures, but the follow-up is often slow”-p6

Key risk mitigation strategies included vector control measures such as indoor residual spraying, distribution of insecticide-treated nets (ITNs), and health education campaigns. However, some respondents felt that these efforts were not consistently applied across the district. One healthcare worker stated:

- "Some communities receive fewer mosquito nets or spraying interventions, making them more vulnerable."-P3

The effectiveness of risk management strategies varied, with some respondents highlighting the positive impact of community sensitization in reducing malaria cases. Nonetheless, they also noted barriers such as low community compliance, inadequate risk assessment, and resource constraints. One malaria control coordinator remarked:

- "Some people misuse mosquito nets for fishing or other purposes, reducing their effectiveness."-P2

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Challenges in implementing risk management included limited technical expertise, funding shortages, and weak coordination among stakeholders. Respondents recommended strengthening partnerships, increasing training for health workers, and improving data-driven decision-making to enhance malaria risk management.

Table 5: Findings on malaria control outcome in Kamwenge District

Items about health service delivery	SD	D	NS	A	SA	Total
Malaria prevalence has improved in the district	67 (33%)	41 (21%)	40 (19%)	30 (14%)	29 (13%)	207(100%)
Cases of malaria treatment have gone down	37 (17%)	62 (30%)	22 (11%)	29 (14%)	57 (28%)	207(100%)
There is reduced mortality due to malaria	21 (10%)	26(24%)	13(6%)	48(12%)	99(48%)	207(100%)
Many people have been sensitized about malaria control	21 (10%)	36 (17%)	14 (7%)	56(27%)	80 (39%)	207 (100%)
The number of people who receive mosquito nets has increased	19 (10%)	20 (10%)	4 (1%)	76 (37%)	87 (42%)	207 (100%)
There have been no complaints about mosquito net delivery to the beneficially	4 (02%)	40 (19%)	6 (02%)	65 (31%)	92 (46%)	207 (100%)
There has been no complaint about malaria drug delivery	13 (6%)	20 (10%)	3 (1%)	86 (42%)	85 (41%)	207 (100%)
There have been no complaints about malaria management	7 (4%)	33 (16%)	6 (3%)	91 (44%)	69 (33%)	207 (100%)
The prevalence of malaria has reduced	15 (7%)	24 (12%)	8 (4%)	76 (32%)	84 (45%)	207 (100%)
Malaria healthcare facilities have been improved in Kamwenge	10 (5%)	4 (2%)	8 (4%)	87 (42%)	98 (47%)	207 (100%)

***Source**: Data from respondents*

Key: SD = Strongly disagree, D = Disagree, NS = Not sure, A = Agree, SA = Strongly agree

The findings in Table 5 showed that 27% of the respondents agreed that Malaria prevalence has improved in the district, 19% were not sure whether Malaria prevalence has improved in the district, and 54% disagreed with the statement that Malaria prevalence has improved in Kamwenge district. The findings further showed that 42% of the respondents agreed that there is Many people have been sensitized about malaria control, 11% were not sure whether Many people have been sensitized about malaria control while 47% of the respondents disagreed with the statement.72% of the respondents admitted that, There is reduced mortality due to malaria contrary to the position of 22% who disagreed while 6% remained neutral. 66% of the respondents, on the other hand, agreed that Many people have been sensitized about malaria control, while 7% remained neutral and 27% disagreed with the statement that Many people have been sensitized about malaria control. 79% of the respondents confirmed that the number of people who receive mosquito nets has increased, while 20% disagreed, and only 1% was not sure whether the number of people who receive mosquito nets has increased. On the other hand,77% of the respondents confirmed that there have been no complaints about mosquito net delivery to the beneficially, a view contested by only 21% of the respondents, although only2% remained sure. 73% of the respondents, on the other hand, noted that there has been no complaint about malaria drug delivery, as contested by 16% while 1% remained undecided. In the views of 77% of the

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respondents, there have been no complaints about malaria management, although 40% disagreed, while 3% were not sure whether there have been no complaints about malaria management. 77% of the respondents had an opinion that the prevalence of malaria has reduced, contrary to the minority views of 39% and 4% who remained not sure whether the prevalence of malaria has reduced. In the opinion of 89% of the respondents, they agreed that Malaria healthcare facilities have been improved in Kamwenge, contrary to the views of 4% who remained not sure, and 7% who disagreed.

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Table 6: Correlation between the project control system and malaria control outcome

Variable	Risk Management	Malaria Control
Risk Management	1	.590**
		.002
	207	207
Malaria control	.590**	1
	.002	
	207	207

Table 6, The Pearson correlation coefficient between Risk Management and malaria control outcome is 0.590, representing a moderate positive correlation. This suggests that effective risk management strategies, such as identifying potential risks and planning contingencies, have a positive impact on malaria control. The significance level of 0.002 ($p < 0.05$) indicates that this relationship is statistically significant, suggesting that addressing risks contributes positively to malaria control in Kamwenge district.

Table 7: Regression Results of risk Management Systems and malaria control.

Variable	Malaria Prevalence	Treatment Efficacy
Risk Management	0.280** (p = 0.003)	0.180* (p = 0.04)

Risk management has a moderate positive effect on reducing malaria prevalence ($\beta = 0.280$, $p = 0.003$), meaning that identifying and mitigating risks contributes to lowering malaria cases. It also has a significant impact on treatment efficacy ($\beta = 0.180$, $p = 0.04$), indicating that risk management strategies improve malaria treatment outcomes.

Discussion

The study found that the Malaria Control Programme has a risk management plan in place, which was acknowledged by many respondents. However, a significant portion of respondents remained neutral or disagreed, indicating uncertainty about the existence or effectiveness of the plan. The study found that while risk management strategies, such as risk identification and contingency planning, are in place, their implementation appears inconsistent. Some respondents expressed confidence in these strategies, while others were neutral or disagreed, indicating gaps in execution. The study found that funding shortages, delayed procurement, and insufficient staffing are the major risks affecting the Malaria Control Programme. A large proportion of respondents strongly agreed that these challenges significantly impact the programme's effectiveness. The study found that the effectiveness of risk management strategies in addressing these challenges is mixed. While some respondents agreed that the strategies have been useful, a significant number were either neutral or dissatisfied with their effectiveness. The study found a strong consensus that additional measures are needed to improve risk management within the Malaria Control Programme. Many respondents emphasized the need for enhanced strategies, better resource allocation, and stronger implementation mechanisms.

Conclusion

While the malaria control programme has risk management strategies, their implementation remains inconsistent. Some respondents expressed confidence in these strategies, while others felt that they were not effectively executed. Identified risks such as funding shortages, delayed procurement, and insufficient staffing highlight the need for improved risk management to mitigate these challenges.

Recommendations

The study recommended strengthening risk management strategies within the Malaria Control Programme. Although risk management strategies exist, their implementation has

been inconsistent. The study recommends that these strategies be improved through comprehensive training for staff and the development of clear guidelines for their execution. Health authorities should conduct regular assessments of risk management practices to identify gaps and address challenges such as funding shortages, procurement delays, and staffing deficiencies. By implementing better risk management strategies, the programme can more effectively mitigate risks and improve outcomes.

List of Abbreviations

DHO	District Health Officer
FGD	Focus Group Discussion
MCP	Malaria Control Programme
WHO	World Health Organization
SPSS	Statistical Package for Social Sciences

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The study was not funded

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The author did not declare any conflict of interest

Data availability
Data is available upon request

Author contribution
John Okoth Nkwasiibwe collected data and drafted the manuscript of the study.
Dr Benard Nuwatuhaire supervised the study

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