

Relationship between the timely delivery of malaria control services and malaria control outcome in Kamwenge district. A cross-sectional study.

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Page | 1 **Abstract**

Background

The study aims to assess the relationship between the timely delivery of malaria control services 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 and cleaned for Qualitative data analysis.

Results

The 26-35 years group is the largest, with 78 (37.7%), representing the most significant proportion of participants. Responses to the statement, "Malaria control services (e.g., bed nets, spraying, treatment) are delivered promptly," show that 30 respondents (14.5%) strongly agreed, 47 (22.7%) agreed, 38 (18.4%) were neutral, 55 (26.6%) disagreed, and 37 (17.9%) strongly disagreed. Responses to the statement, "Timely delivery of malaria control services contributes to a reduction in malaria prevalence in the district," reveal that 64 respondents (30.9%) strongly agreed, 78 (37.7%) agreed, 30 (14.5%) were neutral, 20 (9.7%) disagreed, and 15 (7.2%) strongly disagreed. The mean score of 3.75 indicates that the majority of respondents believe timely delivery plays a significant role in reducing malaria prevalence. The Pearson correlation coefficient between Timely Implementation and malaria control outcome is 0.675. Timely implementation has the strongest impact on reducing malaria prevalence ($\beta = 0.395$, $p = 0.000$).

Conclusion

Timely delivery of malaria control services, including bed net distribution, spraying, and treatment, is crucial for reducing malaria prevalence. Significant delays, often caused by logistical challenges, seasonal factors, and funding shortages, were observed, undermining the programme's effectiveness.

Recommendations

The study recommended ensuring the timely delivery of malaria control services as a crucial factor in reducing malaria prevalence.

Keywords: Malaria control services, Malaria control outcomes, Malaria prevalence, Kamwenge district

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Background

Prompt provision of malaria control measures has consistently demonstrated a crucial impact in diminishing malaria prevalence (Ansah, Moucheraud et al. 2022). The timely allocation of preventive and therapeutic measures guarantees that at-risk people have protection and treatment during crucial transmission phases, thus reducing the disease burden. In various Ugandan districts, the timely provision of insecticide-treated nets (ITNs), indoor residual spraying (IRS), and malaria treatment markedly decreased prevalence, especially in high-risk regions (Asiimwe and Kadubira 2025). Prolonged delays in these interventions were observed to perpetuate transmission, underscoring the imperative for effective logistics and coordination systems.

(Lee, Mancuso et al. 2022) Conducted a longitudinal study in rural Uganda and found that districts getting timely services witnessed more significant reductions in malaria cases than those with delayed delivery, highlighting the critical role of punctuality during peak transmission periods. In Kamwenge District, the postponement of ITN distribution and treatment was associated with elevated prevalence rates, whereas prompt interventions, particularly during the rainy season, diminished both morbidity and death (Li, Docile et al. 2024). Postponed distribution of ITNs and medications increased malaria prevalence, especially in remote regions with inadequate health infrastructure (Li, Docile et al. 2024). Comprehensive data from (Cheng, Htoo et al. 2021) confirmed that prompt distribution of ITNs, IRS, and medications significantly

reduced malaria prevalence among at-risk populations, including pregnant women and children under five. (Monroe, Williams et al. 2022) Determined that prompt service delivery is essential to avert malaria outbreaks during seasonal peaks, advocating for enhancements in logistics and worker training.

Rural regions derive the greatest advantage when malaria control services are administered immediately (Cairns, Ceesay et al. 2021). Findings emphasize that prompt ITN and IRS efforts, along with swift treatment responses, lead to enduring reductions in prevalence, while delays extend transmission cycles. Prompt delivery increases the efficacy of preventative initiatives, enhances treatment results, and reduces seasonal epidemics. Conversely, delays undermine program efficacy, prolong transmission, and exacerbate disease burden. Evidence continuously advocates for the enhancement of logistics, supply chains, and human resource capabilities to guarantee that malaria control programs effectively reach at-risk communities in a timely manner (Cairns, Ceesay et al. 2021). The study aims to assess the relationship between the timely delivery of malaria control services and malaria control outcomes in Kamwenge district

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.

Sample Size

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

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

Study Population

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.

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.

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 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 analysed 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.

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.

$$CVI = \frac{\sum CVI_i}{n} = 0.871$$

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.

Where:

N is the number of items in the test,
is the variance of each item, and
is the variance of the total score.

- $N=27$ (number of items),
- $\sum\sigma^2=150$ (sum of the variances of individual items),
- $=1000$ (variance of the total score).

Now, using the formula for Cronbach's alpha:

$$\alpha=1.038 \times 0.15$$

$$\alpha=0.882$$

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 was entered into SPSS, cleaned for accuracy, and descriptive statistics (mean, standard deviation, frequencies, and percentages) were calculated to summarise 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 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, analysing, 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.

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 unauthorised 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 emphasised during the consent process to ensure participants were fully aware of their right to choose whether or not to participate.

steps to ensure that participants felt comfortable sharing their experiences and opinions.

Non-maleficence and Beneficence

The study was designed to minimise 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

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.

Results
Response Rate

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%

Page | 7 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.

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

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.

Timeliness of Malaria Control Services and Malaria Control

Table 4: Showing descriptive statistics on the Timeliness of Malaria Control Services and Malaria Control outcomes

Statement	Strongly Agree (5)	Agree (4)	Neutral (3)	Disagree (2)	Strongly Disagree (1)	Mean Score	Std. Dev.
Malaria control services (e.g., bed nets, spraying, treatment) are delivered in a timely manner.	30 (14.5%)	47 (22.7%)	38 (18.4%)	55 (26.6%)	37 (17.9%)	2.89	1.33
Timely delivery of malaria control services contributes to a reduction in malaria prevalence in the district.	64 (30.9%)	78 (37.7%)	30 (14.5%)	20 (9.7%)	15 (7.2%)	3.75	1.20

Delays in malaria control services (e.g., delayed distribution of bed nets, late spraying) have contributed to high malaria cases in the district.	85 (41.1%)	72 (34.8%)	25 (12.1%)	15 (7.2%)	10 (4.8%)	4.00	1.12
There are specific times in the year when malaria control services experience delays.	75 (36.2%)	80 (38.6%)	27 (13.0%)	15 (7.2%)	10 (4.8%)	3.94	1.10
The timeliness of malaria control services should be improved to reduce malaria prevalence.	100 (48.3%)	60 (29.0%)	20 (9.7%)	15 (7.2%)	12 (5.8%)	4.07	1.18

Table 4 presents responses on the timeliness of malaria control services and their impact on malaria control in Kamwenge district, utilizing a five-point Likert scale. The results provide insights into the respondents' views on the efficiency and effectiveness of malaria control services in reducing malaria cases. Each statement is analyzed in terms of frequency distribution, mean score, and standard deviation. Responses to the statement, "Malaria control services (e.g., bed nets, spraying, treatment) are delivered in a timely manner," show that 30 respondents (14.5%) strongly agreed, 47 (22.7%) agreed, 38 (18.4%) were neutral, 55 (26.6%) disagreed, and 37 (17.9%) strongly disagreed. The mean score of 2.89 suggests a somewhat negative perception of the timeliness of malaria control services, as more respondents disagreed or strongly disagreed than agreed. The standard deviation of 1.33 indicates moderate variability in responses, suggesting that while some respondents feel services are timely, a substantial number believe there are delivery delays. Responses to the statement, "Timely delivery of malaria control services contributes to a reduction in malaria prevalence in the district," reveal that 64 respondents (30.9%) strongly agreed, 78 (37.7%) agreed, 30 (14.5%) were neutral, 20 (9.7%) disagreed, and 15 (7.2%) strongly disagreed. The mean score of 3.75 indicates that the majority of respondents believe timely delivery plays a significant role in reducing malaria prevalence. The standard deviation of 1.20 reflects moderate variability, showing that there is a general consensus on the positive impact of timely services, although some respondents remain neutral or disagree. Responses on the statement, "Delays in malaria control services (e.g., delayed distribution of bed nets, late spraying) have contributed to high malaria cases in the district," indicate that 85 respondents (41.1%) strongly agreed, 72 (34.8%) agreed, 25 (12.1%) were neutral, 15 (7.2%) disagreed, and 10 (4.8%) strongly disagreed. The mean score of 4.00 suggests strong agreement that delays in

malaria control services have contributed to high malaria cases. The standard deviation of 1.12 indicates low variability in responses, showing a clear consensus among respondents that delays are a significant factor in the persistence of malaria.

Responses to the statement, "There are specific times in the year when malaria control services experience delays," show that 75 respondents (36.2%) strongly agreed, 80 (38.6%) agreed, 27 (13.0%) were neutral, 15 (7.2%) disagreed, and 10 (4.8%) strongly disagreed. The mean score of 3.94 suggests that most respondents agree there are periods when malaria control services are delayed, which may impact their effectiveness. The standard deviation of 1.10 indicates relatively low variability, highlighting that delays are recognized as a recurring issue during certain times of the year.

Responses to the statement, "The timeliness of malaria control services should be improved to reduce malaria prevalence," indicate that 100 respondents (48.3%) strongly agreed, 60 (29.0%) agreed, 20 (9.7%) were neutral, 15 (7.2%) disagreed, and 12 (5.8%) strongly disagreed. The mean score of 4.07 is the highest of all statements, indicating strong agreement that improving the timeliness of malaria control services would help reduce malaria prevalence. The standard deviation of 1.18 reflects moderate variability, but the results strongly suggest that most respondents believe improving service delivery time is essential for better malaria control outcomes.

The results suggest that the timeliness of malaria control services is a critical factor in reducing malaria prevalence. While many respondents acknowledge that timely services are essential for effective malaria control, they also highlight delays as a significant challenge. A majority of respondents agree that delays, such as in the distribution of bed nets and spraying, have contributed to high malaria cases. There is a strong consensus on the need to improve the timeliness of malaria control services to reduce malaria prevalence, with

most respondents agreeing that specific times of the year experience delays. These findings underscore the importance of addressing delays in service delivery to enhance the overall effectiveness of malaria control efforts in the district.

During interviews, the timeliness of malaria control services was identified as a critical factor in reducing malaria prevalence. Many respondents acknowledged that while there have been improvements, delays in drug supplies and inadequate staffing remain challenges. Healthcare workers shared:

- “We always aim to test and treat patients as soon as they come in, but when drugs or test kits run out, we have to refer them elsewhere”-P1.
- “Service delivery has improved, but we still face gaps in manpower. When staff are few, especially in busy seasons, patients spend long hours waiting, and that affects the effectiveness of malaria control interventions.”-P5.

Factors affecting service timeliness included supply chain inefficiencies, staff shortages, and financial constraints. One district health official explained:

- "Procurement processes are slow, and when funds are delayed, malaria control efforts suffer."P5

However, improvements in timeliness were noted, particularly due to the introduction of rapid diagnostic tests (RDTs) and community health worker involvement. A malaria program coordinator stated:

- "With RDTs, we diagnose malaria faster, and community health workers help reach remote areas quickly."-P2

Despite progress, challenges such as delayed logistics and high patient loads in peak malaria seasons were frequently mentioned. Suggested solutions included streamlining procurement, increasing funding for malaria control, and hiring more health workers.

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 has 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 has 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 has 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 sensitised about malaria control, while 7% remained neutral and 27% disagreed with the statement that Many people have been sensitised 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 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.

Table 6: Correlation between timely Implementation and malaria control outcome

Variable	Timely Implementation	Malaria Control
Timely Implementation	1	.675**
		.000
	207	207

The Pearson correlation coefficient between Timely Implementation and malaria control outcome is 0.675, which is also a strong positive correlation. This indicates that the timely implementation of malaria control activities and services positively impacts the overall malaria control

outcomes. The significance level of 0.000 ($p < 0.05$) shows that this relationship is statistically significant, reinforcing the idea that ensuring services are delivered on time is critical for malaria control.

Regression of project control systems and malaria control

Table 7: Regression Results of the project control system and malaria control.

Variable	Malaria Prevalence	Treatment Efficacy	Healthcare Infrastructure	Staffing Levels and Training
Timely Implementation	0.395** ($p = 0.000$)	0.345** ($p = 0.000$)	0.265** ($p = 0.004$)	0.280** ($p = 0.002$)

Timely implementation has the strongest impact on reducing malaria prevalence ($\beta = 0.395$, $p = 0.000$), indicating that delivering malaria control interventions on time significantly lowers malaria cases. Similarly, it has a strong effect on treatment efficacy ($\beta = 0.345$, $p = 0.000$), showing that timely access to malaria treatment improves patient outcomes.

The impact of timely implementation on healthcare infrastructure is also significant ($\beta = 0.265$, $p = 0.004$), suggesting that efficiently executed projects improve healthcare facilities supporting malaria control. Moreover, timely implementation positively affects staffing levels and

training ($\beta = 0.280$, $p = 0.002$), ensuring that personnel receive the necessary training and are available when needed.

Discussion

The study found that there is a general concern regarding the timeliness of malaria control services, with many respondents indicating that interventions such as bed net distribution, spraying, and treatment are not always delivered on time. This dissatisfaction reflects the importance of timely service delivery for effective malaria control. The study found that respondents strongly believe

that the timely delivery of malaria control services is crucial for reducing malaria prevalence. When interventions like spraying and bed net distribution are carried out on time, malaria cases decrease significantly. The study also found that some respondents remained neutral or disagreed with the statement, possibly due to regional variations in the delivery of services. The study found that delays in malaria control services have significantly contributed to high malaria cases in the district, with late distribution of bed nets, delays in spraying, and interruptions in treatment availability reducing the effectiveness of malaria control. The study found that malaria control services often experience delays during specific times of the year, possibly due to changes in weather, logistical difficulties, or budgetary constraints. These seasonal patterns of delays can reduce the effectiveness of malaria interventions, particularly during peak transmission periods. The study found a strong consensus on the need to improve the timeliness of malaria control services to reduce malaria prevalence. Respondents suggested better coordination, increased funding, and improved monitoring of service delivery schedules. The study found that delays in malaria service delivery remain a major challenge despite ongoing malaria control efforts. The persistence of delays, particularly during certain times of the year, underscores the need for better planning, funding, and logistical support.

Conclusion

The study concluded that resource allocation is a key factor in malaria control in Kamwenge District. However, challenges such as inconsistent funding, delays in procurement, and unequal distribution of resources were found to hinder the programme's effectiveness. While some areas were adequately resourced, others were underfunded, resulting in gaps in malaria control interventions.

Recommendations

The study recommended ensuring the timely delivery of malaria control services as a crucial factor in reducing malaria prevalence. Delays in key services, such as bed net distribution, spraying, and treatment, were identified as major challenges.

The study advises health authorities to enhance coordination and logistics management to ensure that interventions are delivered on time, especially during peak malaria transmission periods. This can be achieved through better forecasting, planning, and addressing seasonal variations and funding shortages, along with regular monitoring to ensure that service delivery schedules are met.

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

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List of Abbreviations

FGD	Focus Group Discussion
MCP	Malaria Control Programme
WHO	World Health Organisation
SPSS	Statistical Package for Social Sciences

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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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