The Role of Community Health Promoters in Combating Malaria in Kenya: The Case of Nyakach Sub-County, Kisumu County

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ABSTRACT

About 250 million malaria cases are reported annually in the world. The disease disproportionately affects warm, humid regions, including many tropical countries such as Kenya. The Kenyan government has implemented measures to control malaria, including the deployment of community health promoters (CHPs). However, little is known about the effectiveness of CHPs in combating malaria cases in highly endemic areas like Nyakach Sub-County and Kisumu County. Specifically, the study assessed the impact of CHPs' in malaria surveillance. The study was underpinned by the health belief model. A cross-sectional descriptive study design was employed, with a mixed methods approach aimed at collecting both quantitative and qualitative data from households and CHPs in the Sub-County. Cluster sampling was employed for quantitative data collection, while snowball sampling was used for qualitative data, guided by data saturation. Thematic analysis was done for themes and contingency tables developed for categories, while a multiple regression analysis was conducted to determine the relationships among the independent variable (malaria surveillance), the moderating variable (motivation and willingness of CHPs), and the dependent variable (combating malaria cases). Findings reveal that regular visits by CHPs have been effective in identifying potential malaria cases in the community. At p value=0.000, there was a moderate positive relationship between combating of malaria cases and malaria surveillance activities conducted by CHPs (r = 0.507, n=277). The study recommends strengthening existing surveillance approaches used by the CHPs. The study further recommends regular training programs for CHPs to ensure they are well-equipped with the latest techniques and knowledge for effective malaria surveillance.

Keywords: Community Health Promoters (CHPs), Endemic Zones, Epidemiological Zones, Malaria Prevalence, Malaria Surveillance

I. INTRODUCTION

A recent study released by the World Health Organization (WHO) posited that despite substantial advancement achieved in boosting the availability of insecticide-treated nets and medications aimed at combating malaria in young children and pregnant women, there exists an increase in malaria incidences among the population (Dunning et al., 2022). Global cases of malaria reported in 2022 was 249 million, exceeding the pre-pandemic average of 233 million cases in 2019 by 16 million cases.

The World Malaria Report (2023) indicated that the behavior and survival of the Anopheles mosquito, which is known to spread malaria, may be influenced by variations in temperature, humidity, and rainfall. Amboko et al. (2021) noted that the transmission and disease burden may be directly affected by extreme weather events, such as heatwaves and floods. The occurrence of catastrophic floods in Pakistan in 2022 resulted in a significant rise in malaria cases within the nation, with a five-fold increase seen.

The impact of malaria extends beyond the realm of human suffering and mortality, encompassing significant economic costs and burdens on families, households, and national economies (Moh et al., 2022). Malaria has been found to impede economic growth and hinder development, thereby perpetuating the vicious cycle of poverty (Rosenthal, 2022). According to research conducted in Côte d'Ivoire, it was observed that cabbage farmers who were afflicted with malaria experienced an absence from work for a duration of 8-9 days in a month. This accounted for 58% of the total sick days, as compared to other illnesses (Aron et al., 2023). Malaria increases absenteeism, which reduces production and performance (Ishizumi et al., 2021). According to The Lancet, a 10% increase in malaria incidence lowers monthly salaries by 3.3%. Malaria costs households 1% of their overall income, a significant financial setback (The Lancet, 2022).

In Kenya, approximately 3.83 million malaria cases were confirmed in 2021 (Rogers et al., 2022). The disease remains one of the country's most significant health problems (Maniga et al., 2022). In 2022, Kenya recorded approximately 753 deaths from malaria (Kamer, 2023). Kenya is divided into four epidemiological zones based on malaria prevalence (WHO, 2021). Endemic zones are located around the Lake Victoria Basin and the Coast, with high incidences of infection throughout the year (Otambo et al., 2022).

The western highlands are a malaria-endemic area, while the low-risk areas are situated in the Central Kenyan Plateau. Malaria is endemic in Lake Victoria Basin Kisumu. In 2020, the endemic area had a prevalence of 19% compared to the 6% national average, as indicated by David et al. (2021).

Nyakach is classified as an endemic zone for malaria within Kisumu County. It has a 19% prevalence of malaria infections when compared to the national average of 6%. It is also within the Lake Victoria Basin, which has high prevalence rate for Malaria (David et al., 2021). Every year, billions of shillings are availed for the purpose of eradicating malaria. Policies and up to date strategies are formulated and enforced to eradicate and eliminate Malaria in developing countries. CHPs have been instrumental in malaria surveillance through the CCMm technique. Nonetheless, malaria is still responsible for a substantial number of morbidities and mortalities recorded in the country. This research intends to delve into whether these functions undertaken by CHPs are effective in combating malaria in Nyakach Sub County, Kisumu County.

1.1 Statement of the Problem

Malaria is a recognized public health concern in Kenya. This is noted by a significant prevalence of illness and mortality (Ishizumi et al., 2021). The Kenyan government has made efforts to enforce an array of measures in response to malaria control tactics and strategies. One technique which has been most notable is the introduction of CHPs within the models of the community health strategy. Previous research have depicted the critical function that CHPs perform, which entail health surveillance (Sunguya et al., 2017; Bagonza et al., 2018; Aron et al., 2023). However, no past research has assessed how these actions contribute to combating Malaria cases in highly endemic regions.

Choosing Nyakach Sub County is justified because of its status as an endemic zone, in close proximity to Lake Victoria. This geographical area has a short vector life cycle and a high incidence of vector survival. This is attributed to the favorable wet and humid climatic conditions. In a similar vein, disease transmission is consistently evident throughout the year in this area. Based on the Kenya Malaria Indicator Survey conducted in 2020, the Sub-County exhibits a malaria prevalence rate of 19%, which is notably higher than the national average of 6%. From an academic standpoint, the selection of this particular location as a study area is justified due to the scarcity of research conducted on the impact of Community Health Promoters (CHPs) in mitigating malaria cases within the Sub-County. Kisumu County exhibits high levels of malaria cases, with Nyakach Sub-County being notably impacted. Despite being an endemic area, no study has been carried out concerning the role of CHPs in malaria control in Nyakach Sub-County. Therefore, a study is needed to examine the effectiveness of these healthcare stakeholders in malaria surveillance in combating malaria cases in Nyakach Sub-County.

1.2 Research Objective

To investigate the effectiveness of malaria surveillance by CHPs in combating malaria cases in Nyakach Sub- County.

1.3 Research Hypothesis

H_0: Malaria Surveillance by CHPs has no statistically significant effect on combating malaria cases in Nyakach Sub-County

11. LITERATURE REVIEW

2.1 Theoretical Review

2.1.1 Health Belief Model

This model was advanced by Rosenstock in 1966. It was later refined by Becker et al. in the 1970s and 1980s. In accordance with HBM, the engagement in health-related behaviors is dependent on the corresponding presence of three elements. They are prevalence of sufficient motivation to prioritize health surveillance, the perception of individual exposure to adequate surveillance, and the notion that following a particular health suggestions would translate to benefits in combating the perceived risks (Lee et al., 2019; Elsawy et al., 2022).

Research assessing surveillance of health conduct as revealed by a study performed by Nepomuceno et al. (2021), has shown that the perception of hindrances plays a substantial function in determining a persons' chances of attending clinics. HBM alludes that people are more inclined to take part in preventive measures when they perceive a health issue as a threat, think themselves as vulnerable to it and view the suggested health behavior as advantageous in combating the perceived threat (Elsawy et al., 2022). In malaria context, sharing information with the population regarding surveillance e.g. checking for mosquito breeding sites has the capacity to encourage their active participation, driven mainly by their worry towards the disease.

MacArayan et al. (2020) asserted that the mechanism in which people interpret surveillance by health officials influence their health-related conduct. The HBM framework is relevant to this present research as it underpins the value of availing data regarding the consequences of non-compliance with CHPs' surveillance projects. This may lead to an increase in instances of malaria within a community. Interventions suggested by HBM model have the capacity to spur change in surveillance and combat cases of malaria. This can be attained by understanding and handling individuals' perceptions regarding the risk of malaria and the merits linked to preventive behaviors. The present investigation adopts the Health Belief Model as a framework to elucidate individuals' perceptions of the malaria risks and their values concerning the efficacy of surveillance by community health promoters. As such, this research adopts the HBM framework to offer evidence-based insights into CHPs efficacy.

2.2 Empirical Review

Incidences of Malaria morbidity and fatality were minimized by early diagnosis and treatment (WHO, 2020). Governments are predisposed to assess factors and elements that are responsible for causing malaria to persist in a certain region by examining data. This entails active surveillance to discover possible malaria risk variables (Paintain et al., 2014; Aron et al., 2023). WHO describes surveillance as the continuous, systematic gathering, analysis, and interpretation of data linked to malaria incidence. It also involves the application of data to assist in formulation, delivery, and assessment of malaria interventions. In the words of Chipukuma et al. (2020), routine adoption of surveillance data is expected to boost the effectiveness of malaria interventions and minimize malaria prevalence in endemic zones. In order to provide malaria testing, treatment, and disease surveillance, CHPs are crucial. To effectively evaluate impact and provide guidance for corrective action, information systems must have the capacity to monitor their performance and progress (Owek et al., 2017; Napier et al., 2021; Otambo et al., 2022).

Globally, majority of malaria surveillance systems utilize online and digital dashboards systems for measuring key indicators and patterns in Malaria prevalence (WHO, 2020). Data from the dashboard is collected from the community level by CHPs and health facilities and updated regularly to show the trends in malaria prevalence. This information guides the distribution of resources required to reduce malaria in a region. Malaria surveillance systems are changing as evidenced by moving from paper-based reporting systems that aggregate data to electronic systems that allow real-time case monitoring. Greater Mekong Subregion (GMS) malaria surveillance systems use mobile reporting due to the increasing development of smart phone ownership and mobile coverage. Assegaai & Schneider (2022) noted that this integration improves case reporting speed and accuracy.

Most countries in the Southern Africa region have identified elimination as an achievable immediate target without any mapped surveillance of malaria risk (WHO, 2020; Ishizumi et al., 2021). The prevalence of the disease has not been reduced by Nigeria's Benue State's Malaria Programs, and the burden of the disease in that region is still significant. Nkya et al. (2021) examined the Benue State malaria surveillance system in relation to malaria eradication goals and found that it is straightforward, practical, acceptable, and adaptable, but not timely or representative. Moreover, it has been shown that the burden of malaria will remain high without timely data. In line with Chipukuma et al. (2020) study, elements e.g. poor record keeping, lack of expertise, and poor compensation made it complex for CHPs to perform malaria monitoring in Zambia. Despite the fact that there is a need to resolve regulatory hindrances in local settings, Sunguya et al. (2017) allude that CHPs are paramount in malaria surveillance.

In the Kenyan setting, CHPs have been actively engaging in malaria case surveillance by regularly visiting homes to observe and report possible cases of the disease. To actively track malaria, health workers must note illness trends and inform the public about health policy. At the same time, they must have access to evidence-based suggestions for local case management and malaria treatment (Otambo et al., 2023). CHPs undertake community-level surveillance of malaria cases as the initial phase of country wide malaria surveillance (Nkya et al., 2021). The Kenya Health Information System (KHIS) welcomes reports from the CHPs on monthly intervals. By considering updated data, these reports align with national malaria control programs (Marita et al., 2021). As such, CHPs' active malaria surveillance in the country has boosted malaria intervention in decision-making. The prevalence rates per Sub-County are taken into consideration while apportioning resources by Kisumu County.

There are knowledge gaps that demand additional research after reviewing literature linked to Community health promoters (CHPs) function in malaria surveillance. To begin with, it's imperative to assess how adequately CHPs perform in regard to prompt and reliable data delivery for malaria surveillance. Notwithstanding research depicting that CHPs are paramount for active case identification and reporting, issues such as inadequate record-keeping, a lack of expertise, and insufficient compensation may affect standards and representativeness of data. By filling in these gaps, future research can improve decision-making for malaria control and elimination efforts while also boosting malaria surveillance systems.

III. METHODOLOGY

3.1 Study Area

The study was carried out in Nyakach Sub-County. It is one of the administration units in Kisumu County. Nyakach is a rural set-up and has rich ethnic, racial, and cultural diversity. The Sub County has five wards with a population of 150,319 people (KNBS, 2019). The Sub County borders Homa Bay, Nyamira and Kericho Counties as well as Nyando and Muhoroni Sub Counties. The main economic activity in the Sub-County is fishing. The Sub-County has a diverse background hosting the predominant Luo community and other tribes including Kalenjin, Luhya and Gusii communities. The Sub County has two regions that is upper Nyakach and Lower Nyakach. Upper Nyakach as the name reads is found on the Nyabondo plateau and covers two wards. River Sondu Miriu passes through the plateau and drains to Lake Victoria in the lower area. Lower Nyakach is found adjacent to Lake Victoria.

3.2 Research Design

Cross-sectional design was used for this study. Cross-sectional research design is implemented at a specific moment in time to ascertain the prevalence of the desired outcome within a specific cohort. This methodology enabled the researcher to simultaneously examine multiple characteristics and conduct investigations into the associations between various factors and the desired outcome (Wang & Cheng, 2020). Through a cross-sectional research design, the researcher was able to examine the role of CHPs surveillance in reducing malaria cases in Nyakach Sub-County.

3.3 Target Population

The target population was households in Nyakach Sub-County. According to the 2019 census, the sub county has 35,553 households with a total population of 150,319 people. Besides, there are 390 CHPs in the area. The purpose of targeting this population is because they are all situated in the endemic region and the researcher is interested to find out whether the role CHPs play is significant in reducing the number of cases in this region.

Table 1

Target Population

Category	Population
Households in Nyakach Sub-County	35, 553

3.4 Sample Size and Sampling Procedure for Respondents

In order to ensure the statistical robustness and generalizability of the study, it was imperative that the sample size for the quantitative aspect is sufficiently large and representative of the target population. According to the research conducted by Mugenda and Mugenda (2013), it has been determined that a sample size of 384 is considered sufficient when the population exceeds 10,000. This sample size is deemed appropriate for achieving a 95% confidence level and a precision of 5%.

Table 2

Sample Size

Category	Population	Sample size
Households in Nyakach sub-county	35,553	384

The cluster sampling method was used to select a representative sample from the population. The households were the unit of measurement. Cluster sampling is often used to study large, geographically dispersed populations. The study selected this time- and cost-efficient sampling approach for Nyakach widely distributed population, which would be difficult to survey otherwise. South East Nyakach, South West Nyakach, Central Nyakach, West Nyakach, and North Nyakach were the five clusters the researcher assigned to the population. The sample size determined for each cluster was proportional to the cluster's population size.

Table 3
Distribution of Sample Across the Clusters

Cluster	Number of Households	Sample size
North Nyakach	8,263	89
Central Nyakach	4,492	49
West Nyakach	12,434	134
South East Nyakach	6,628	72
South West Nyakach	3,736	40
Total	**35,553**	**384**

In each cluster, sample households were distributed proportionately based on the number of households in the entire ward. The households visited in each ward were randomly selected using simple random sampling method. Simple random method ensured that each household had an equal chance of being selected. In each household the enumerator interviewed the head of the household and if we are not present, the enumerator interviewed the spouse at the head or any other adult aged over 18 years in the household. In case adult members of a selected household were absent or they declined to take part in the study, the nearest neighboring household was visited. Households were identified using random walk method developed by UNICEF/WHO (Oribhabor & Anyanwu, 2019). The center of each ward was the starting point for the ward, and it was be determined by the help of community guides. A pen was spun, and the direction of movement was determined by the tip of the pen and the household nearest to the tip of the pen was the first one selected and subsequent households followed the selected direction. The enumerators used a skip pattern to select the next household. The skip pattern was determined by dividing the total number of households by the sample size. In case the enumerator ended up in a place where was hard to continue in same direction, the enumerator spun a pen again to develop a new starting point, and then continue in the same way until the required number of households was reached.

3.5 Qualitative Sampling and Selection of Respondents

The researcher used purposeful sampling to identify CHPs to participate in the study. Purposive sampling was used to select respondents that were most likely to yield appropriate and useful information. Purposeful sampling is used in qualitative research for the identification and selection of information-rich cases related to the phenomenon of interest (Mugenda and Mugenda, 2013). The method helped the researcher select CHPs who were actively engaged in Malaria programs in Nyakach Sub County. The researcher only interviewed CHPs who were actively engaged in Malaria programs in Nyakach Sub County. All the five wards in Nyakach have CHPs who are engaged in different programs.

3.6 Pilot Testing

This study used pilot testing to check the reliability and validity of the questionnaire. The Seme Sub County of Kisumu County hosted the pilot research. As noted by Kubai (2019), the sample size for the pilot should be at least 10% of the expected sample size for the actual study.

3.6.1 Validity and Reliability of Research Instruments

In research, validity refers to the extent to which the data collection tool successfully assesses what it intends to measure (Taherdoost, 2016). The construct, content, and criteria validity of the data gathering instruments was assessed. Construct validity was used to assess if the instruments captured the concepts they were intended to capture. Kubai (2019) describes instrument reliability as the degree of consistency revealed by a data gathering tool in measuring the specific variables it is designed to assess. The primary focus of content validity was the assessment of the instruments' representativeness in measuring the research objectives. The construction of the data collection instruments was designed to comprehensively address all relevant aspects of the study's objectives, ensuring generation of valid outcomes through adoption of content validity. Tools were refined where irrelevant questions pointed out in the pilot study were discarded, and logical questions substituted instead.

Cronbach's Alpha, a statistical measure of internal consistency that determines the extent to which the items on a scale measure similar underlying construct, was adopted to determine the reliability of the research tools. An acceptable level of efficiency is considered to be one with a Cronbach's Alpha coefficient of 0.7 or above. Pilot data indicated Cronbach’s Alpha coefficient of 0.935. This means that the study instruments are internally consistent and therefore reliable in measuring the study outcomes.

3.7 Data Collection Instruments

Research instruments are the tools that are used to gather data. When doing research, scientists want to use methods that allow them to generalize and explore with high accuracy, at a low cost, quickly, with few management needs, and with administrative ease. The main tool for data collection used in the study was the questionnaire. Interview guide was used to collect qualitative data from CHPs.

3.8 Data Analysis and Presentation

3.8.1 Quantitative Data Analysis

The data obtained through questionnaires was coded, entered into SPSS version 26 and analyzed descriptively and inferentially. Tables were used to present numerical data with interpretations. A correlation table was presented to understand the relationships between the independent variables and the dependent variable. The study conducted regression analysis with the model: -

$$Y = \alpha + \beta 1X1 + \beta 2X2 + \beta 3X3 + \beta 4MX4 + \varepsilon$$

Where:

Y is the dependent variable (reducing malaria cases),
α is a constant,
(βi; i=1, 2, 3) are the beta coefficients of the independent variables,
X1 is malaria surveillance, X2 is case management, and X3 is health education.
β4 is the beta coefficient of the moderator,
M is the moderator (motivation and willingness of CHPs), and
X4 is the interaction term between the moderator M and the independent variables.
Correlation coefficient was used to assess the direction and strength of the association between the variables.

3.8.2 Qualitative Data Analysis

The analysis of the interviews began upon reaching saturation, which is defined as the point at which additional interviews do not contribute any novel information. The data was analyzed using a thematic analysis approach in order to derive meaning from it.

3.9 Ethical Considerations

Ethics is defined as a branch of philosophy that deals with human behavior and serves as a guide for human behavior (Mugenda & Mugenda, 2013). Subsequently, ethical clearance was sought from the Jaramogi Oginga Odinga Teaching and Referral Hospital Institutional Research Ethics Committee (JOOTRH-ISERC). This clearance was essential to ensure that the research adheres to ethical guidelines set by the JOOTRH-ISERC in Kisumu County and safeguards the rights, privacy, and well-being of the participants involved in the study.

The researcher similarly sought permission from the National Commission for Science, Technology, and Innovation (NACOSTI). This regulatory body oversees research activities in the country and ensures compliance with national laws and regulations governing research ethics and conduct.

Respondents were provided with clear information about the purpose of the research, their rights as participants, the voluntary nature of their participation, and the measures taken to ensure confidentiality and anonymity of their responses.

IV. FINDINGS & DISCUSSIONS

4.1 Respondents' Background Characteristics

4.1.1 Sex of Respondents by Age

As depicted in Table 4.1, a total of 398 household members responded to the questionnaire. 70% (n=279) of females participated in the questionnaire compared to 30% (n=119) of their male counterparts. In terms of ward, North Nyakach (28%, n=78) had the highest proportion of female participants with West Nyakach (11%, n=31) having the least. As for males, West Nyakach Ward (36%, n=43) had the highest proportion of male participants with Central Nyakach with the least (12%, n=14). As such it was important to categorize the respondents by gender since women are the most affected by malaria compared to their male counterparts.

The age range with the highest proportion of respondents was 28-37 that had 29% (n=116) followed by 38-47 with 28% (n=113). The age range with the lowest proportion of respondents was 78-87 that had 1% (n=5). The study targeted the age range (28-47) that is most affected by malaria.

Table 4

Proportion of Respondents by Age and Gender (N=398)

Age range	Female		Male		Total	
	n	%	n	%	n	%
18-27	49	88	8	12	56	14
28-37	91	78	25	22	116	29
38-47	77	68	36	38	113	28
48-57	32	46	37	54	69	18
58-67	19	76	6	24	25	6
68-77	7	50	7	50	14	4
78-87	5	100	0	0	5	1
Total	**279**	**70**	**119**	**30**	**398**	**100**

4.1.2 Proportion of Households with Children Under 5 Years

Figure 1 indicates that 40% (n=158) of the households stated that they had children under 5 years old. Among the households that had children under 5, the average was 1.27 (SD .557) with the highest having 4 children and lowest with one child. A study conducted by Rosenthal (2022) indicated that children under five accounted for over two-thirds of all malaria deaths in sub-Saharan Africa (SSA). This reveals the importance this study accorded children under five years.

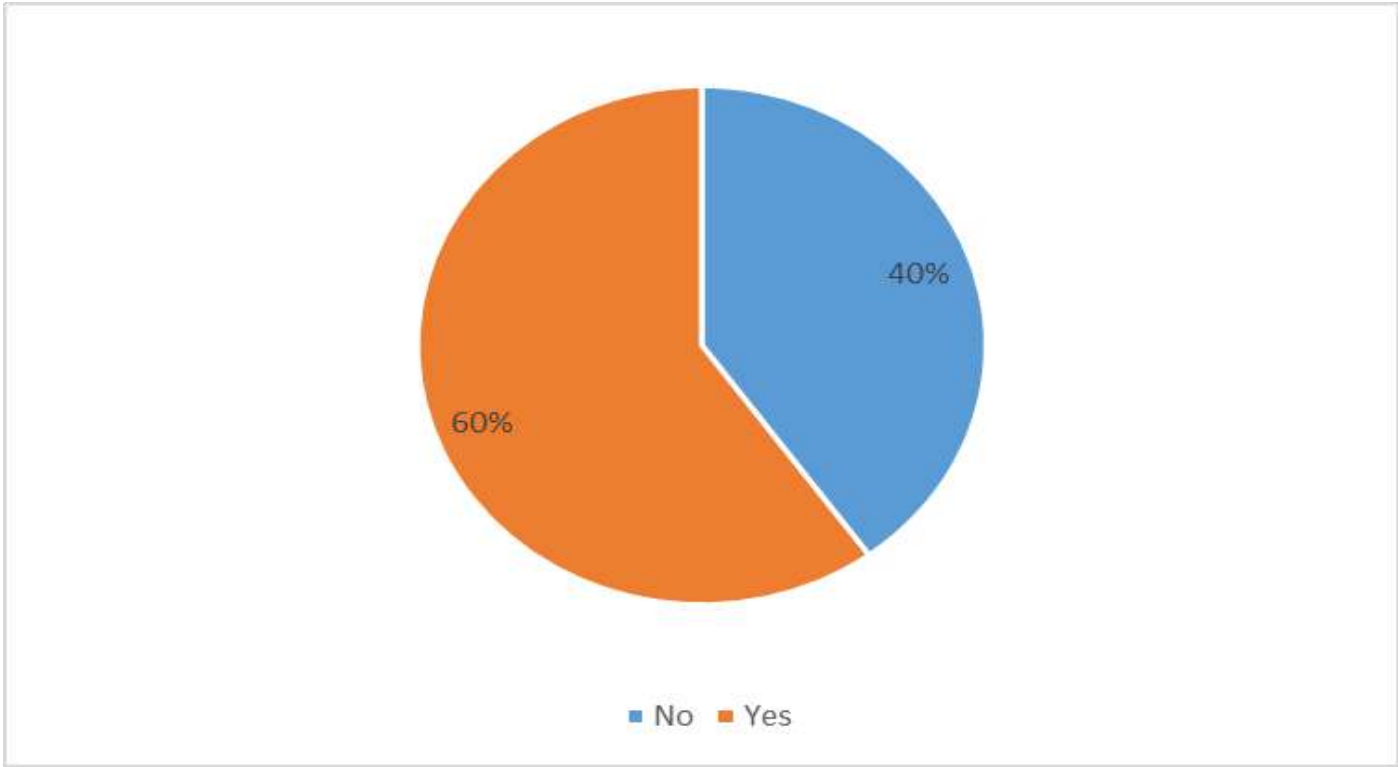

Figure 1

Proportion of Households with Children Under 5 Years

4.1.3 Marital Status of the Respondents

As depicted in Table 5, 82% (p value=0.028, n=327) of the respondents were married, followed by widows at 10%, n=41, with those who were single at 5%, n=20. Based on the Chi-square test, the research concludes that there was no significant difference between the marital statuses of the respondents. Those who were widowers and divorced were the least at 1%, n=5 each. North Nyakach Ward (24%, n=80) had the highest proportion of married respondents with West Nyakach having the least proportion of married respondents at 18%, n=58.

Table 5

Marital Status of Respondents

Ward	Divorced		Married		Single		Widow		Widower	
	n	%	n	%	n	%	n	%	n	%
Central	0	0	65	20	1	5	6	15	0	0
North Nyakach	0	0	80	24	10	50	7	17	0	0
South East Nyakach	2	40	59	18	5	25	11	27	3	60
South West Nyakach	0	0	65	20	1	5	8	20	1	20
West Nyakach	3	60	58	18	3	15	9	22	1	20
Total	**5**	**100**	**327**	**100**	**20**	**100**	**41**	**100**	**5**	**100**

4.1.4 Proportion of Respondents Visited for Malaria Surveillance

As depicted in Table 6, 71% (p value=0.000) of the respondents (n=281) indicated that they had been visited by a community health worker (CHP), for malaria surveillance activities in the last six months. Based on the Chi-square test it can be concluded that there was a significant difference between the respondents who had been visited and those who had not been visited by CHP for malaria surveillance activities in the past six months. In terms of Wards, South East Nyakach had the highest proportion (80%, n=60) of respondents indicating that they had been visited by a CHP for malaria surveillance in the past six months. 75% (n=210) of the respondents stated that the CHPs visited their households monthly to conduct malaria surveillance activities.

Table 6

Proportion of Respondents Visited by CHPs for Malaria Surveillance.

Have you been visited by a community health worker (CHP) for malaria surveillance activities in the past six months?												
Response	**Central Nyakach**		**North Nyakach**		**South East Nyakach**		**South West Nyakach**		**West Nyakach**		**Total**	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Yes	2	3	30	31	18	23	60	80	7	9	117	29
No	70	97	67	69	62	77	15	20	67	91	281	71
Total	72	100	97	100	80	100	75	100	74	100	398	100

4.1.5 Type of Malaria Surveillance Activity Conducted

As shown in Figure 2, 36% (p value=0.000, n=188) of the respondents stated that the CHPs had visited them to Diagnose and Treat Malaria using community case management (CCMm). 29% (p value=0.000, n=152) of the respondents had been visited by CHPs for distribution of mosquito nets. 17% (p value=0.000, n=90) of the respondents stated that they had been visited by CHPs for the purpose of recording malaria cases within the household.10% (p value=0.000, n=50) had been visited by CHPs to create awareness on malaria (Health education). 8% (p value=0.000) had been visited by CHPs for identification of mosquito breeding sites. Based on the Chi-square tests conducted was concluded that there was a significant difference between the households that had been visited by a CHP for malaria surveillance and those that had not been visited.

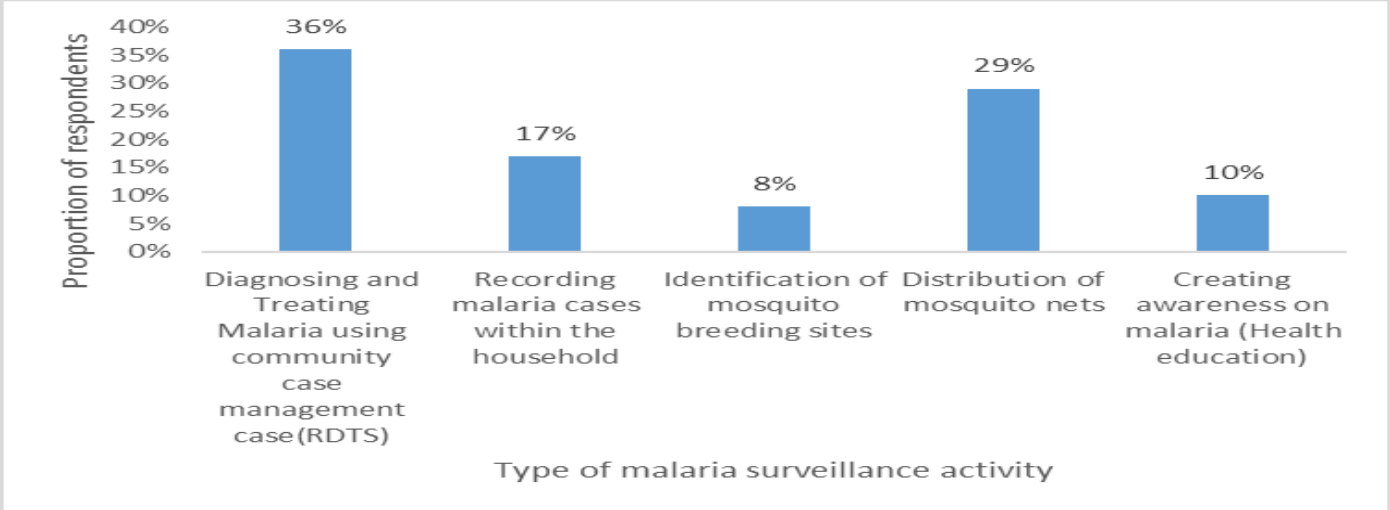

Figure 2

Type of Malaria Surveillance Activity Conducted by CHPs during Surveillance Visits

4.1.6 Effectiveness of Malaria Surveillance Activities by CHPs

Table 7 shows the respondents' perception on the effectiveness of malaria surveillance activities conducted by CHPs. 43% (p value=0.000, n=121) of the respondents strongly agree that CHPs regularly visit households in this community to find out the prevalence of malaria. 44% (p value=0.000, n= 124) of the respondents strongly agree that the regular visits by CHPs have been effective in identifying potential malaria cases in the community. In addition, 43% (p value=0.000, n=121) of the respondents strongly agree that Malaria surveillance conducted by CHPs during their visits helps in early prevention and treatment of Malaria. Further, 40% (p value=0.000, n=111) of the respondents strongly agree that CHPs' regular Malaria surveillance contributes to a better understanding of the Malaria situation in their community. Based on the chi-square tests it is concluded that there was significant difference between the respondents' perceptions on the effectiveness of CHW's role in malaria surveillance.

These findings concur with a study conducted by Chipukuma et al. (2020) that observed that routine use of surveillance data is anticipated to enhance the effectiveness of malaria interventions and lower malaria prevalence in endemic areas. This is further corroborated by The Global Technical Strategy for malaria, developed by the WHO, which emphasized the significance of malaria surveillance as a crucial component in the pursuit of malaria elimination. In addition, the study findings confirms Napier et al. (2021), that concluded that robust malaria surveillance systems play a crucial role in enabling countries to develop efficient health interventions and assess the effectiveness of their malaria control initiatives.

Table 7

Effectiveness of Malaria Surveillance Activities Conducted by CHPs

Question	Strongly agree		agree		Not sure		Disagree	
	n	%	n	%	n	%	n	%
To what extent do you agree that CHPs regularly visit households in this community to find out the prevalence of malaria?								
	121	43	147	53	9	3	2	1
To what extent do you agree that the regular visits by CHPs have been effective in identifying potential malaria cases in the community?								
	124	44	141	51	13	5	1	0
To what extent do you agree that Malaria surveillance conducted by CHPs during their visits helps in early prevention and treatment of Malaria?								
	121	43	149	53	11	4		
To what extent do you believe that CHPs' regular Malaria surveillance contributes to a better understanding of the Malaria situation in your community?								
	111	40	158	57	10	4		

4.1.7 Satisfaction with Malaria Surveillance Activities Conducted by CHPs

Respondents were asked about their level of satisfaction with CHPs' malaria surveillance activities. As shown in Figure 3, 37% (p value=0.000, n=106) of the respondents were very satisfied with the malaria surveillance activities conducted by CHPs. Similarly, 59% (n=164) and 4% (n=10) of the respondents were satisfied and dissatisfied respectively. Based on Chi-square test, the study concluded that there was a significant difference between the levels of satisfaction on the malaria surveillance activities conducted by CHPs.

For those who were not satisfied the following reasons were mentioned.

Because their visits are not frequent, CHPs visited once when they were registering for bed nets, unfortunately he did not get a net, and she didn't come back. The responder stated that he did not see them visiting him. He also indicated that they are not frequent. CHPs visited rarely when there was a programme from the ministry and that they rarely visited and came only when called.

Collectively, the sentiments depict a pattern of infrequent visits by Community Health Promoters (CHPs) in the area. This highlights a substantial gap in the delivery of regular health services. The responders experiences hint that CHP visits are irregular and mostly connected to particular health initiatives started by the Ministry, instead of being part of a consistent, continuous engagement. The irregular visits has contributed to missed opportunities for community members to get essential health resources e.g. bed nets (Rogers et al., 2022). The general implication of these outcomes is that the anticipated health interventions may not reach the target population. As a result, it may lead to ignoring the main objective of the health programs. The infrequent visits similarly hint a disconnect between needs of community's health and the prevailing service delivery framework, raising interest regarding the sustainability and effect of such programs.

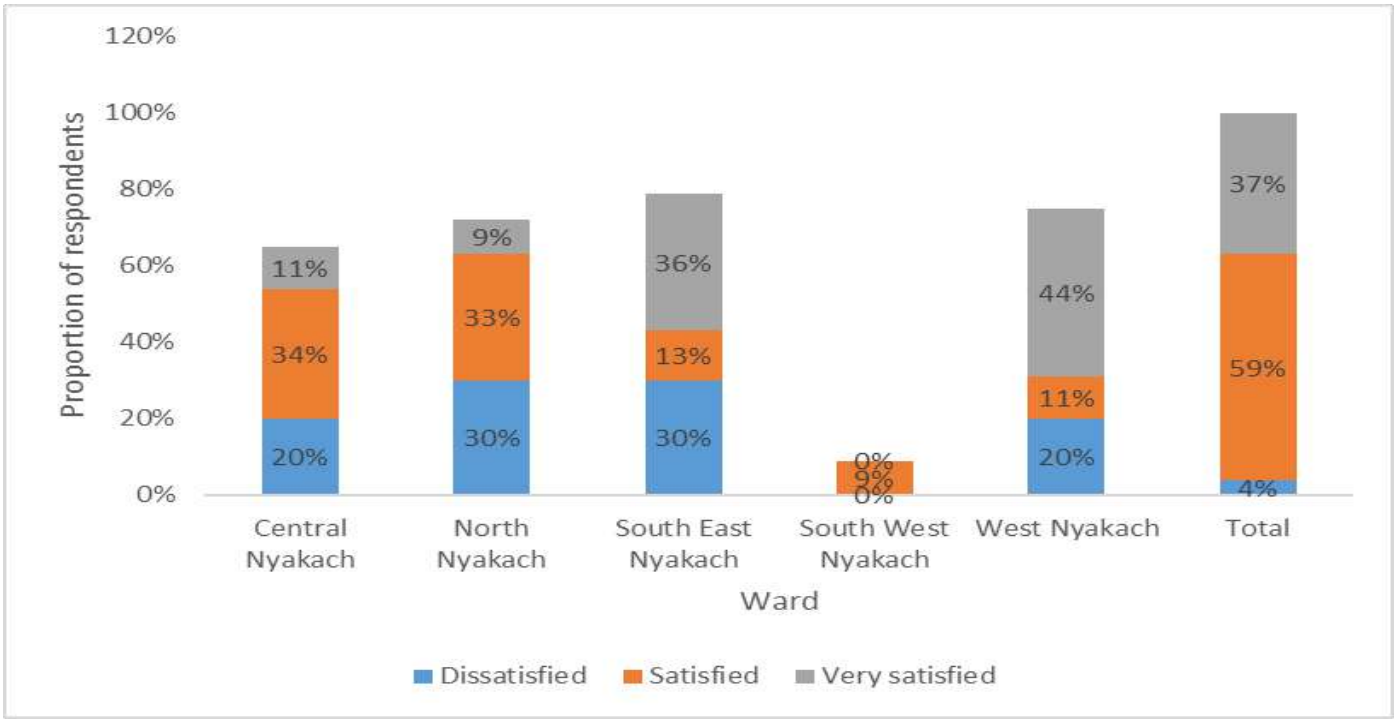

Figure 3
Level of Satisfaction with CHPs Malaria Surveillance Activities

4.2 Correlation between Combating in Malaria Cases and CHPs Community Interventions

As shown in Table 8, there is a significant low positive relationship between the decrease in the number of malaria cases and CHPs use of CCM kits to diagnose suspected malaria cases in the community, (r= 0.317, p=0.001).

There is a significant low positive relationship between the reduction in malaria cases and health education programs conducted by CHPs (r=0.442, p=0.001, n=207). In addition, there is a moderate positive relationship between the reduction in the number of malaria cases and malaria surveillance activities conducted by CHPs (r= 0.507, p=0.001, n=277). Further, there is a significant moderate positive relationship between reduction in malaria cases and community knowledge, attitude, and practice towards malaria (r =0.550, p=0.001, n=396).

Table 8
Correlations between Combating Malaria Cases and CHPs Interventions

	Malaria surveillance by CHPs.	Community Case Management by CHP's
Malaria surveillance by CHPs.	1	
Community Case Management by CHP's	.526**	1

4.3 Regression analysis

As shown in Table 9, the R Square value is 0.422, which means that our independent variable Malaria Surveillance conducted by CHPs, causes 42.2% change in the dependent variable combating malaria cases.

Table 9
Regression Analysis Results

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.649[a]	.422	.411	.475

Table 10
ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	25.847	3	8.616	38.175	.000[b]
	Residual	35.433	157	.226		
	Total	61.280	160			

a. Dependent variable: Combating malaria cases
b. Predictors (Constant): Malaria Surveillance

As indicated in Table 10, ANOVA results show that P value=0.000 which is less than 0.05 hence we conclude that there is a significant relationship between the independent variable i.e. Malaria surveillance and the dependent variable combating malaria cases.

Table 11

Coefficients [a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.628	.403		1.557	.121
	Malaria surveillance	.333	.097	.283	3.445	.001

a. Dependent Variable: Combating malaria cases

Table 11 shows the coefficient results. It is observed that for malaria surveillance beta value is 0.283 which means that a change in malaria surveillance by one unit will bring about the change in combating malaria cases by 0.283.

V. CONCLUSIONS & RECOMMENDATIONS

5.1 Conclusions

Findings reveal that a significant proportion of respondents affirm that CHPs regularly visit households in the community to find out the prevalence of malaria. It is also observed that the regular visits by CHPs have been effective in identifying potential malaria cases in the community. More importantly, Malaria surveillance conducted by CHPs during their visits helps in combating Malaria. This affirms that CHPs' regular Malaria surveillance contributes to a better understanding of the Malaria situation in Nyakach Sub County which is an endemic zone

5.2 Recommendations

This research suggests bolstering existing surveillance approaches employed by the CHPs. This should entail enhancing the number of surveillance activities in the sub county. It should expand coverage to very remote regions as well as adopting digital surveillance technologies including online health applications and geographic information systems. These tools will increase accuracy and efficiency of Malaria surveillance activities. Shifts in policy might include allowing regular surveillance in high-risk areas and combining surveillance metrics into public health performance assessments. The study also recommends the use of data-driven approaches.

The positive relationship shown by the data shows the importance of basing health policies and practices on solid empirical evidence. The study likewise suggests that communities should be incorporated in Malaria surveillance. Their support to CHPS surveillance efforts might improve the effectiveness and community acceptance of these activities.

The study recommends increasing resources that will ensure there is enough funds available when surveillance required. The study also recommends that the policy makers should include a continuous improvement process for community surveillance programs. This ought to entail constant monitoring and evaluation to ascertain that surveillance stay effective and align with shifting situations in Nyakach endemic zone

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