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Original article

FACTORS CONTRIBUTING TO THE PREVALENCE OF MALARIA AMONG CHILDREN UNDER FIVE YEARS ATTENDING HEALTH CARE AT ST ELIZABETH MAGALE HEALTH CENTER IV, NAMISINDWA DISTRICT. A CROSS-SECTIONAL STUDY.

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Abstract

Introduction:

Malaria remains a major public health problem associated with slow economic development and it accounts for 27.7% of deaths among children under the age of five in Uganda (MOH, NMCP 2014 - 2020). The study, therefore, seeks to determine the factors contributing to the prevalence of malaria among children under five years attending Health care at St Elizabeth Magale Health Centre IV, Namisindwa district.

Methodology:

A cross-sectional study was carried out among 100 caregivers of children below five years in St Elizabeth Magale health center IV from December 2022 to January 2023. A self-administered questionnaire was completed and data were analyzed.

Results:

The prevalence of malaria was high 39(39%) and the factors that were significant with malaria prevalence included: caregivers with little 5% knowledge about other signs/symptoms like convulsions, loss of appetite, and body weakness, 71% were unemployed. Almost half did not own ITNs and environmental factors showed 56% of garbage heaps presence and 54% reported wet /rainy season to be associated with increased cases of malaria among children below five years.

Conclusion:

The prevalence of malaria was high and it was influenced by caregivers' knowledge about malaria signs and symptoms, level of education, employment status, ownership of ITNs, garbage heaps, and season of the environment.

Recommendations:

The study recommends the need for more awareness campaigns on malaria spread, clinical features, prevention through mass media (electronic and print media), markets, house-to-house sensitization, and traditional and religious leaders.

The people should translate their good awareness of malaria into good preventive practices.

Furthermore, the study recommends more initiatives to be taken toward income-generating activities among people. This will potentially improve access to interventions and proper timely treatment of malaria among children under five years.

Keywords: Morbidity, Mortality, Endemic, Environment, Prevalence, Caregiver, Fever, Malaria
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1. Background to the study

According to World Health Organization, malaria is defined as a life-threatening parasitic disease caused by a bite of an infected female anopheles mosquito (WHO 2021). According to WHO 2021, five malaria species cause malaria in humans, and 2 of these species plasmodium falciparum and plasmodium vivax pose the greatest threat. Plasmodium falciparum is the deadliest malaria parasite and the most prevalent on the African Continent, Plasmodium vivax is the most dominant malaria parasite contributing to 2% (4.5 million cases in 2020) in most countries outside of the sub – Saharan Africa (WHO, 2021). The first symptoms to appear are fever, headache and chills usually appearing 10-15 days after the bite, and may be mild and difficult to recognize as malaria. If left untreated, Plasmodium falciparum malaria can progress to severe illness and death can occur within 24 hours, whereas it affects all people the most affected are children under five years of age (WHO, 2021).

Malaria has been and continues to be the number one parasitic killer disease globally that affects children mainly less than five years due to their loss of maternal immunity and they have not yet developed specific immunity against infections. Malaria is an entirely preventable and curable mosquito-borne illness (WHO, 2016).

According to WHO, in 2021, Globally, nearly half of the world's population (approximately 3.4 billion people) was at risk of malaria with an estimated 241 million malaria cases in 2020 increasing from 227 million cases in 2019 and deaths increased by 12% compared with 2019 to an estimated 627,000; an estimated 47,000 (68%) of the additional 69000 deaths were due to service disruptions during the COVID-19 pandemic. The percentage of total malaria deaths in children under five years was 77% in 2020 (World Health Organization, 2021).

According to UNICEF, Malaria remains a major public health priority in the 85 endemic countries and territories, its costs of treatment trap families in a cycle of illness, suffering, and poverty, and total funding for malaria control and elimination reached an estimated US$ 3 billion and contributions from the government of endemic countries amounted to US$ 900 million, representing 31% of total funding (UNICEF, 2019).

According to World Health Organization, malaria prevalence depends on the possible environmental factors related to vectors, parasites, human hosts, and the environment. The transmission is also observed more in places where the life span of the mosquito is longer favoring the parasite to develop completely and therefore high prevalence of malaria. According to WHO, 2017 The climate conditions such as rainfall patterns, temperature, and humidity also affect the number and survival of mosquitoes and in many places, transmission is seasonal and high always in rainy seasons and immediately after the rainy season. More transmissions and epidemics can occur in people who have less immunity to malaria.

The World Health Organization African Region with an estimated 228 million cases in 2020 accounted for about 95% of all malaria cases and 96% of deaths, children under 5 years of age accounted for about 80% of all malaria deaths in the region. In Sub-Saharan- Africa a new cause of death methodology was applied to 32 countries that showed about 93% of all malaria deaths globally. Applying the methodology revealed that malaria was taken a considerably higher toll on African children every year since 2000 than previously thought. Malaria remains a major cause of morbidity in children in sub-Saharan Africa under the age of 5 years and one child dies after every 2 minutes (World Health Organization, 2021). The East African region accounts for 88% of the malaria cases in Africa, and 10% of the cases occur in the south Eastern region (WHO, 2015).

In Uganda, malaria remains a major public health problem associated with slow economic development and poverty and is the most frequently reported disease at both public and private health facilities in Uganda. It accounts for 30 - 50% of outpatient visits at health facilities and 15 -20% of inpatients or hospital admissions. Malaria accounts for 27.7% of deaths among chil-

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dren under the age of five (MOH, NMCP 2014 - 2020). Uganda ranked third in the total number of malaria cases in sub-Saharan Africa (WHO, 2015). Malaria is the leading cause of morbidity in Uganda with 90 - 95%of the population at risk and contributing approximately 13% of the under-five mortality (Daniel Roberts and Glenda Mathews, 2016).

In Namisindwa district where the study area is located, malaria is among the most causes of death in the under-five children, this creates the reason to find out the factors contributing to the prevalence of malaria in among the under-five children attending health care at St Elizabeth health center IV.

2. METHODOLOGY

2.1. Study design.

The study design was a cross-sectional study design using quantitative data because this design is to allow data to be collected on factors contributing to the prevalence of malaria simultaneously at a particular point in time and within the shortest time possible.

2.2. Study area

The study was conducted at St Elizabeth Magale health center IV in Magale sub-county, Namisindwa district Eastern part of Uganda. St Elizabeth Health Center VI is located in Mission Ward, Magale town council. The Health Cen- ter offers Outpatient, Inpatient, Maternity, Immunization, outreaches, laboratory, MCH, and HIV/TB services to the community and the turn up was always well.

2.3. Study population

Data was collected from caregivers of children under five years and the children under five years were inclusive and caregivers who fully consent for the study were the ones who participated. The study was conducted for one month that is from 19th December 2022 to 19th January 2023.

2.4. Sample size determination.

The sample size was determined by using the formula Kish and Leslie 1965.

$N= Z^2P(1-P) / D^2$

Was the sample size (total number of subjects required in the sample

Was standardized normal deviation values that correspond to the level of significance

P was estimation of prevalence of malaria in children under five years in Uganda on malaria prevalence in children under five which was 16.9% (UBOS, 2018-19). Was a margin of error (0.05)

P=16.9%, D=0.05, Z=1.96

$N = (1.96)^2 \times 0.169(1-0.169)$

$(0.05)^2$

N= 216

N=216 caregivers of the children under the age of five years old

Therefore, due to financial issues the Researcher used 100 respondents in the study.

2.5. Sampling technique

A simple random sampling technique was used in the study for every caregiver of the children under the age of five who had equal chances of participating in the study.

2.6. Sampling procedure.

Respondents were randomly selected using the list of children under five and their caregivers who came to the health center every day for a period of 3weeks, where the name or outpatient number was written on small pieces of paper and folded. Then the folded pieces of paper were put in a box and shaken, the participants were asked to pick the paper without replacement to find out participants of that day, and a researcher-administered questionnaire was used to collect data from the Caregivers of the children under five years who consented, and this took place every day from Monday to Friday for 3weeks.

2.7. Study variables

The study variables were independent and dependent.

2.7.1. Dependent variable

The dependent variable was the prevalence of malaria among children under five years.

2.7.2. Independent variable

The independent variables included were Caregivers, Socioeconomic, and Environmental related factors contributing to the prevalence of malaria among children under five years attending health care at St Elizabeth Magale Health Center IV, Namisindwa district.

2.8. Selection criteria

The selection criteria for the study were inclusive and exclusive

2.8.1. Inclusive criteria

The persons that took part in the study were caregivers and children under five years available and with a sound state of mind at the time of consent and data collection, those that attended Health care at St Elizabeth Magale Health Center IV, Namisindwa district.

2.8.2. Exclusive criteria

The study excluded all children who were above 5 years of age, children whose caregivers refused consent, children with comorbidities like typhoid and pneumonia plus those who were critically ill.

2.9. Data collection

This included the data collection method, collection tool, and data collection procedure

2.9.1. Data collection method

Data was collected using a researcher self-administered questionnaire where respondents were given questions and immediately responded to the questions and were recorded.

2.9.2. Data collection tool.

A structured questionnaire was used to collect raw information on the social demographic, caregiver, and environmental-related factors, pens were also used for recording responses, for clarity, and for illiterates, questions were translated into the local language for proper responses to the questions.

2.9.3. Data collection procedure.

The questionnaires with closed-ended questions were used to collect quantitative data. The questionnaire was used for literate respondents to fill in the self-administered questionnaire to those who were able to read and write the answers since it was less expensive for data collection. The respondents recorded their answers within closely defined alternatives. In this study, the questionnaires were hand-delivered to the respondents that is to say caregivers of children under five years who were among the selected respondents in the sample field to fill. The technique was appropriate for the investigation of the researcher's needs, expectations, perspectives, priorities, and preferences. Questions were asked using researcher-administered questionnaires and responses were recorded until 100 respondents were interviewed.

2.10. Piloting the study.

The questionnaires were pretested in Magale HANS Health Center III in Magale sub-county, Namisindwa district with 10 Caregivers of children under the age of five to assess the reliability and validity of the questionnaires.

2.11. Quality control

The research tools were pretested in the mufutu parish with the help of two research assistants who were trained for two days and a pilot study was carried out in Magale town council in Namisindwa district, a simple random sample of twenty people to pretest its efficiencies and poorly constructed questions were to be corrected.

2.12. Data analysis and presentation

Data collected was manually made using foolscaps and information was analyzed statistically using Microsoft Excel and presented information in the form of pie charts, bar graphs percentages, frequency, and distribution tables.

2.13. Data management.

The research assistants were supervised by the researcher during the data collection procedure, and data were checked for completeness and kept

under a lock and key system. Then data were entered in a computer using Microsoft Word and Microsoft Excel. After data analysis, the questionnaires were to be kept securely for future reference which only authorized persons could access for confidentiality.

2.14. Ethical consideration

An introductory letter was obtained from the research ethics committee of Medicare Health Professionals College, which introduced the researcher to the District Health Officer, the local council chairperson of Magale sub county and the in charge of St Elizabeth Health Centre IV. The information obtained from questionnaires was confidential and only for academic purposes not any other reason.

3. RESULTS

Table 1 shows that out of 100 caregivers of children aged five years and below were assessed, out of which majority were female 72/100(72%) and minority were male 28/100(28%). The respondent most of which were aged 16-24years 34/100(34%), closely followed by 25-34yaers 24/100(24%) and followed by 35-44years and >45years were 22/100(22%) and 20/100(20%) respectively. The respondents were also assessed for the level of education they had attain and almost a half attained primary education 38/100(38%), secondary level attainders were 26/100(26%), tertiary and university attainders were 18/100(18%), and those who never went to school were only 18/100(18%). Most of the participants 70/100(70%) were married and the others (not married) were the least 04/100(04%).

Figure 1 shows the two diagnostic tests of malaria among children under five years who took part in the study, out of 100 who participated 27/100(27%) were positive and 42/100(42%) were negative by MRDT and 12/100(12%) malaria parasites seen and 19/100(19%) no malaria parasites seen under a microscopy.

Figure 2 shows the number of participant and the level of educational attained as those who never went to school were 18/100, primary level was 38/100, secondary level were 26/100 and those who went to tertiary and university were 18/100.

Caregivers related factors to the prevalence of malaria among children under five years attending health care at St Elizabeth Health centre IV.

Out of 100, majority 92(92%) had heard about malaria in children and minority 8(8%) had not.

Among the 92 respondents who had heard about malaria, 38(41%), 36(39%), 12(13%) and 6(7%) heard from health centre, radio, others and newspapers respectively.

The bar graph above shows respondents perception on how malaria is spread. Out of 100 respondents, majority 91/100(91%) mentioned that it is spread by an infected mosquito. However, 6/100(6%) said through flies and other insects, 3/100(3%) that by rats and the least 1/100(1%) mentioned that it is spread by dogs.

Figure 4 shows respondents' knowledge about signs and symptoms where majority 76(76%) mentioned high body temperature followed by vomiting 12(12%), others and headache as 7(7%) and 5(5%) respectively.

socio-economic factors contributing to the prevalence of malaria among the under five children attending heath care at St Elizabeth Health centre IV.

Figure 5 shows that 71(71%) were unemployed while 29(29%) were employed.

The table 4 shows that out of 100, majority 54(54%) had semi-permanent/walls made of mud, 31(31%) had permanent/cemented walls and 15(15%) had temporary/grass thatched houses.

The table 5 shows that out of 100, 1-3 children in a single room had 87(87%) and ≥4 children had 13(13%).

The figure 6 shows the respondents' ownership of insecticide treated mosquito nets as one of the preventive measures of malaria among children under five years. Out of 100 respondents, 53(53%) had while 47(47%) did not have the ITNs because of nets being old and thrown away 17(17%), no access to nets 16(16%) and lastly ITNs being expensive to afford 12(12%).

The figure 7 shows that out of the 47 respon-

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Table 1: Demographic characteristics of the caregivers of children under five years (N=100).

Variables	Category	Frequency (N=100)	Percentage (%)
Gender	Male	28	28
	Female	72	72
	Total	**100**	**100**
Age	15-25	34	34
	26-36	24	24
	37-45	22	22
	≥45	20	20
	total	**100**	**100**
Education Level	Never went to school	18	18
	primary	38	38
	Secondary	26	26
	Tertiary and university	18	18
	total	**100**	**100**
Marital status	single	18	18
	Married	70	70
	Separated	08	08
	Others	04	04
	total	**100**	**100**

Primary source: (2022)

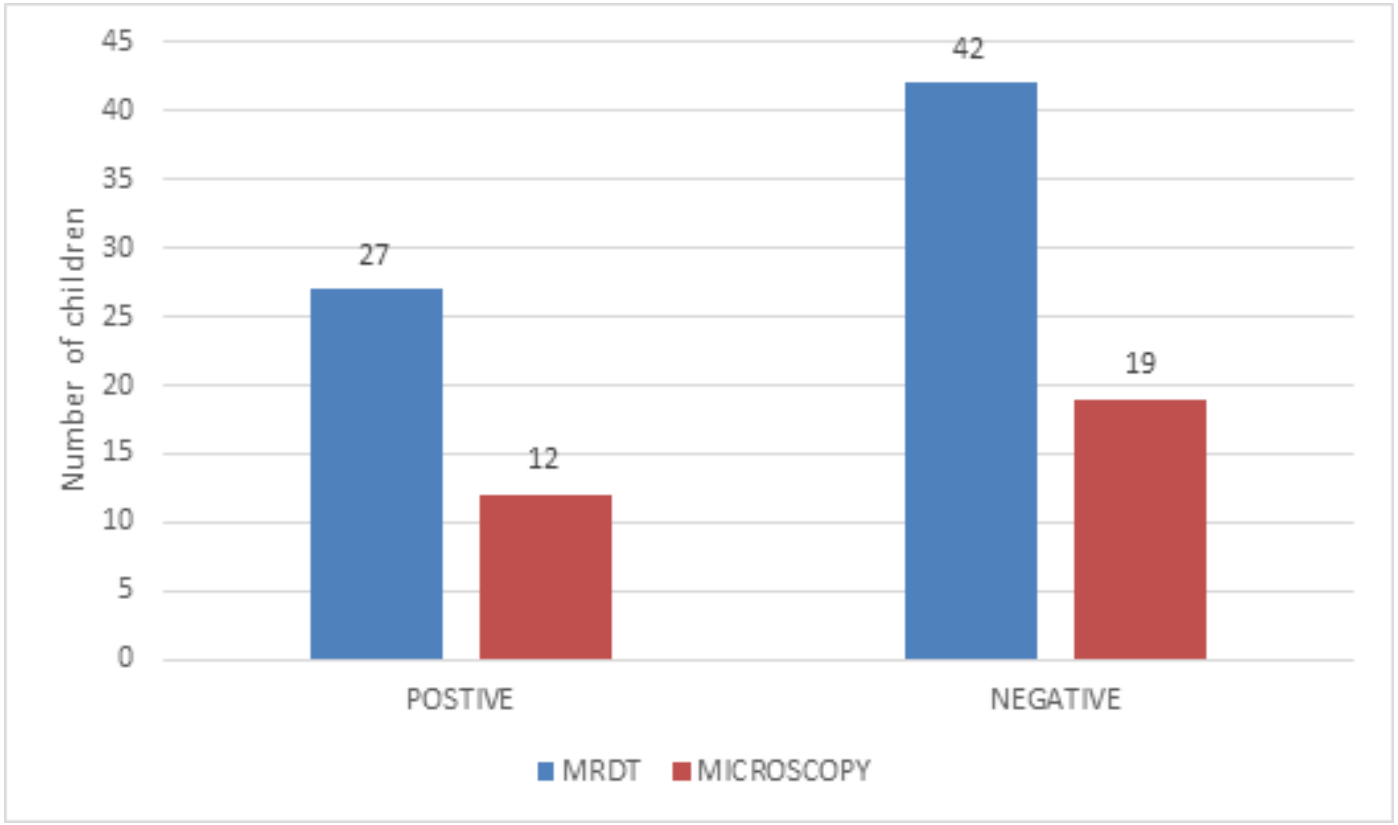

Figure 1: Distribution of malaria diagnosis by mRDT and microscopy (N=100).

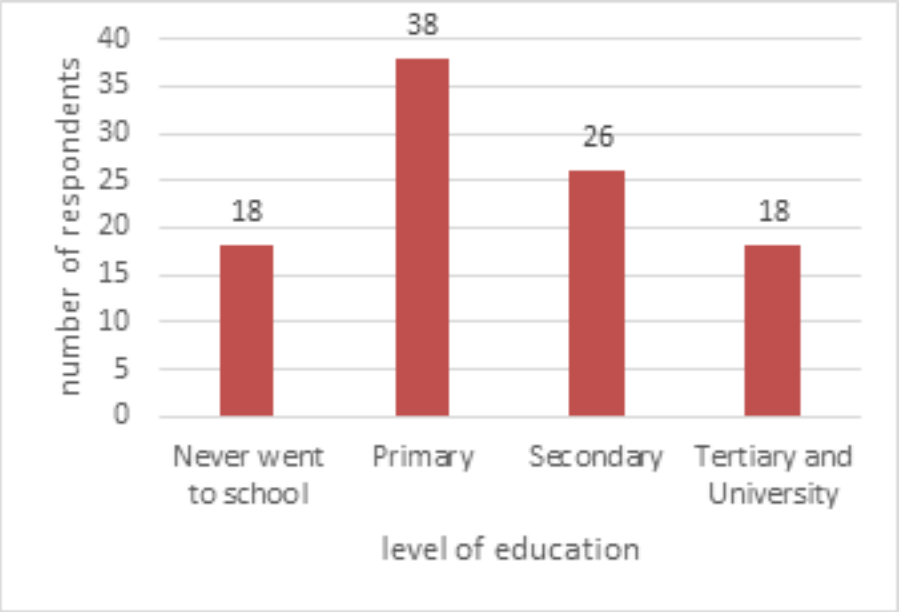

Figure 2: Respondents' level of education (N=100).

Table 2: Respondents who have ever had of malaria (N=100)

Variables and attributes	Frequency	Percentage %
Ever heard of malaria		
Yes	92	92
No	08	08
Total	**100**	**100**

Table 3: Sources where respondents heard information from (N=92).

Variables and attributes	Frequency	Percentage %
Heard from		
Radio	36	39
Newspaper	6	7
Health center	38	41
Others	12	13
Total	**92**	**100**

Primary source: (2022)

Table 4: The type of house the children live in (N=100).

Variable and attribute	Frequency	Percentage (%)
Type of house		
Permanent/ cemented walls	31	31
Semi-permanent/walls of mud	54	54
temporary/grass thatched	15	15
Total	**100**	**100**

Primary source: (2022)

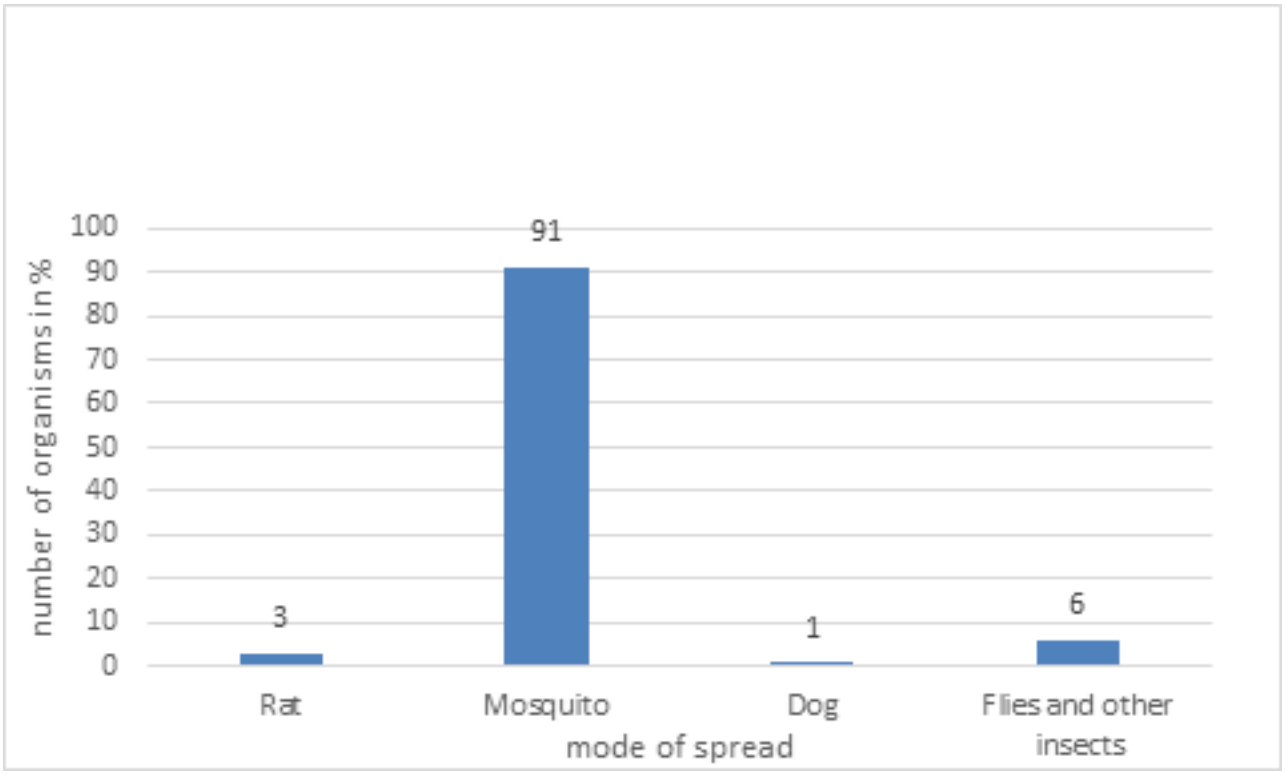

Figure 3: Respondents perception on how malaria is spread (N=100)

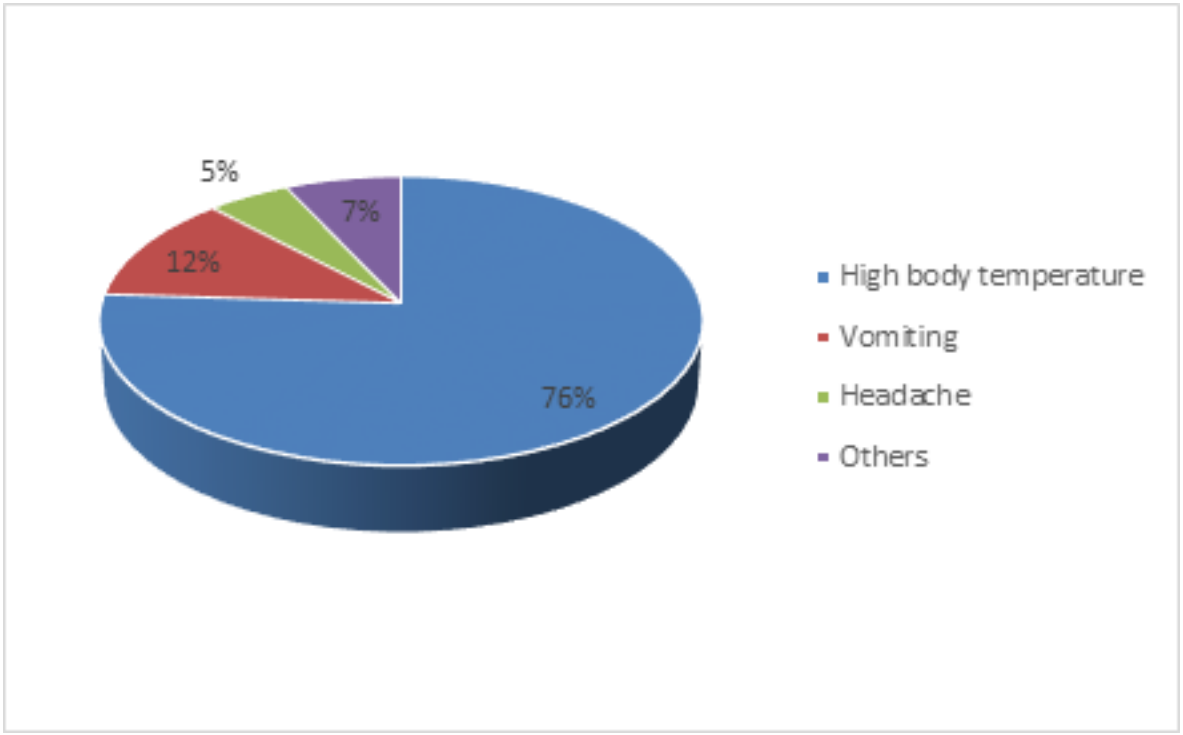

Figure 4: Signs and symptoms of a child with malaria.(N=100).

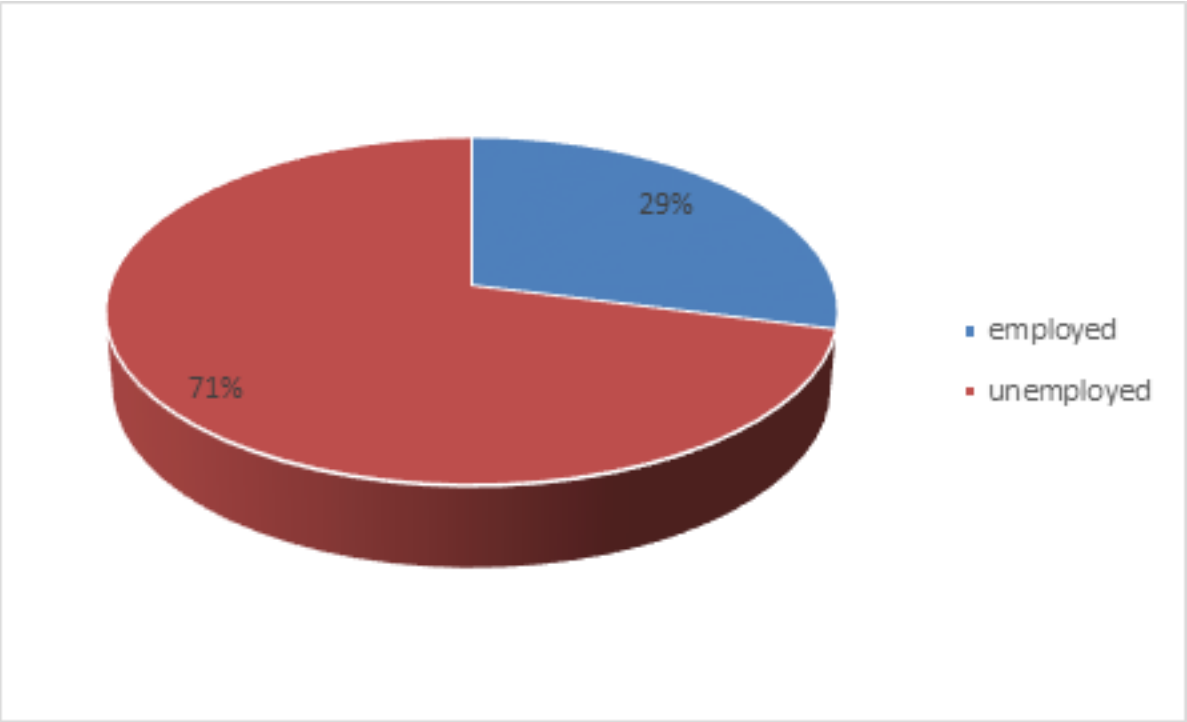

Figure 5: Respondents employment status (N=100)

Table 5: Number of children sleeping in a single room (N=100).

Variable and attribute	Frequency	Percentage (%)
Number of children sleeping in a single room		
1-3	87	87
≥4	13	13
Total	**100**	**100**

Primary source: (2022)

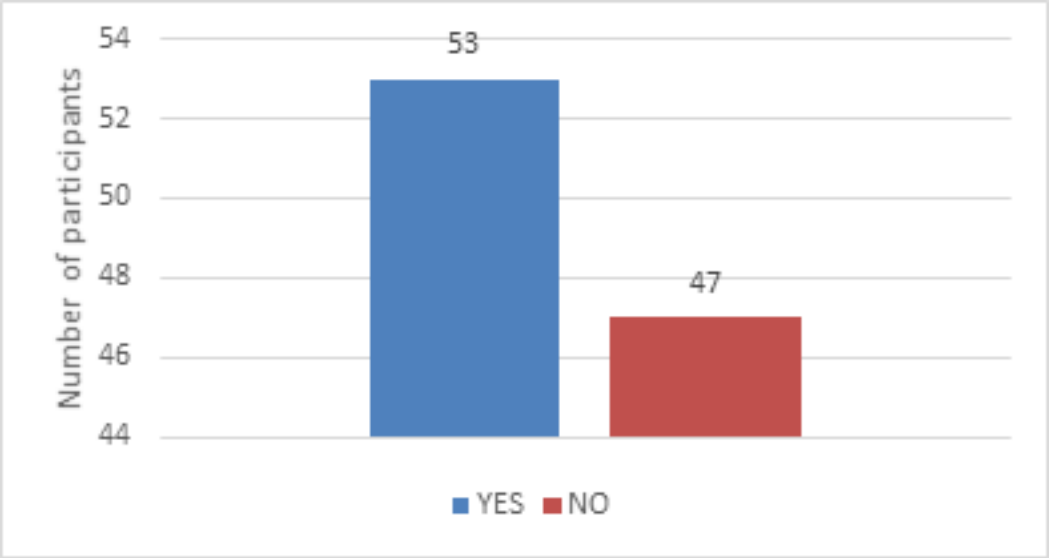

Figure 6: Ownership of ITN as one of the preventive measures (N=100).

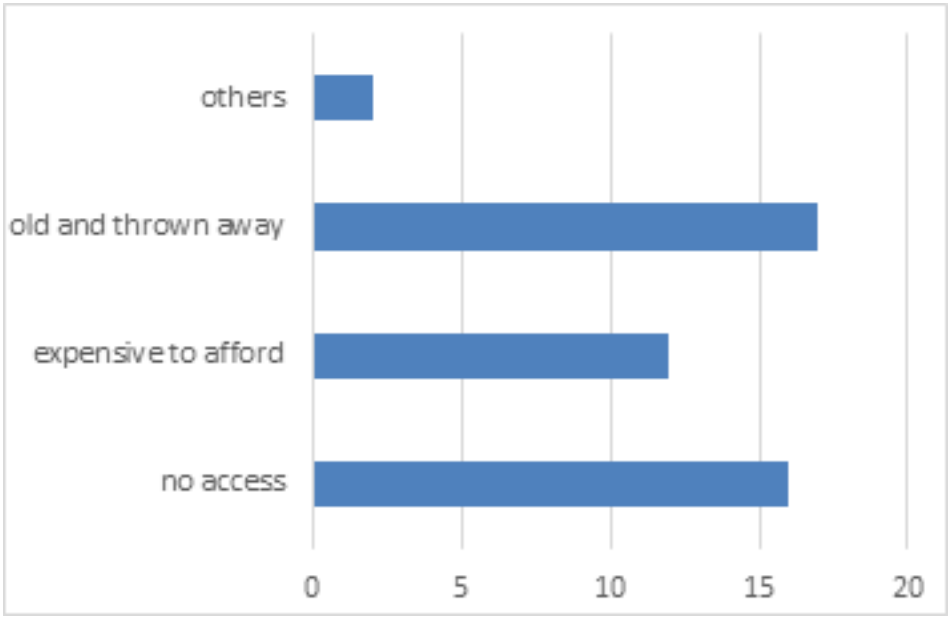

Figure 7: Reasons for not having an ITN (N=100).

dents who did not have ITNs, it were due to old and thrown away 17(36%), no access 16(34%), expensive to afford 12(26%) and others 2(4%).

The figure 8 shows that out of 100, 45 (45%) poured paraffin in stagnant water, 28(28%) used mosquito coils, 19(19%) put on long clothes and 8(8%) used insecticide as other preventive measures.

Environmental related factors contributing to the prevalence of malaria among the children under five years attending health care at St Elizabeth Health centre IV.

The table 6 shows environmental factors contributing to malaria prevalence of malaria among under five children whereby out of 100 respondents, majority 75 (75%) had cleared stagnant water around their houses and 25(25%) had not, minority 37(37%) had bushes around homes while most 63(63%) of them had no bushes. Out of 100, most 56(56%) mentioned that they had garbage heaps around their homes whereas the least 44(44%) did not have garbage heaps around their houses.

The figure 9 shows the caregivers views on seasons when most of the children suffer from malaria and out of 100, majority 54(54%) mentioned wet season, 35(35%) and 11(11%) mentioned dry and has no season respectively.

Figure 10 shows that 79(79%) of the respondents reside far away from swamps and lakes while 21(21%) reside close to swamps and lakes.

4. Discussion.

4.1. Caregiver-related factors contributing to the prevalence of malaria among under-five children attending health care at St Elizabeth Magale health center IV.

The study findings on caretaker's age, gender, sex, and marital status had no statistical significance to the prevalence of malaria among children under five years. This may be due to some knowledge sensitization about malaria. The findings are in agreement with a study done in Uganda by Edebuga E, (2022) which showed no significance of demographic factors on the prevalence of malaria.

It was also observed that most participants 92(92%) in the study had heard about malaria in children under five years and the majority 91(91%) were aware that mosquito bites cause malaria. The majority however admitted that their source of information was from health centres 38(41%) and radio 36(39%). Even though

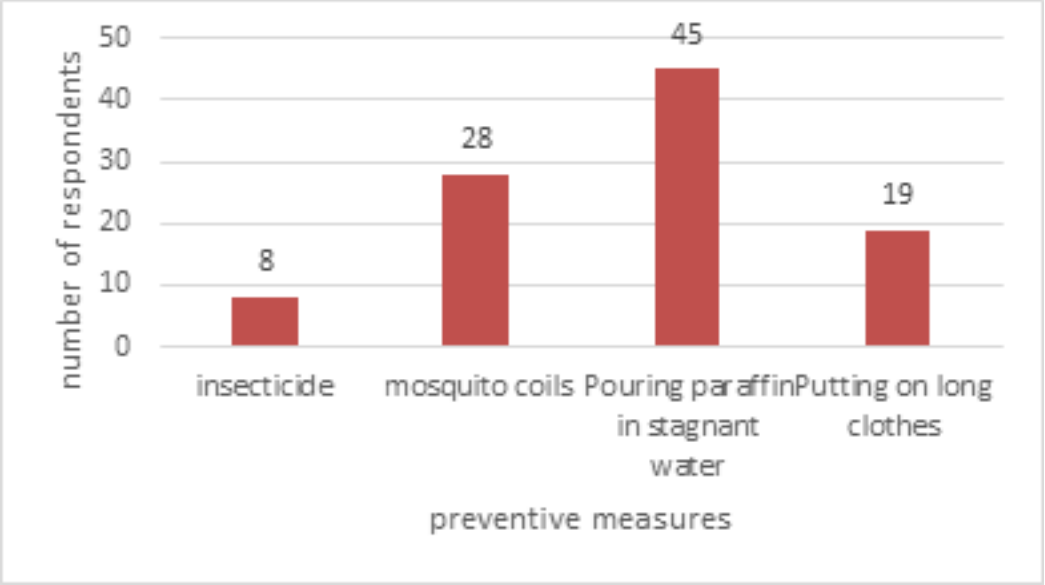

Figure 8: Other malaria preventive measures (N=100).

Table 6: Environmental related factors contributing to the prevalence of malaria among the children under five years attending health care at St Elizabeth Health centre IV (N=100).

Variable and attribute	Frequency (N = 100)	Percentage (%)
Stagnant water clearance		
Yes	75	75
No	25	25
Total	100	100
Presence of bushes around the house		
Yes	**37**	**37**
No	63	63
Total	100	100
Garbage heaps close to house		
Yes	56	56
No	44	44
Total	100	100

Primary source: (2022)

most knew about malaria in children, it was analyzed that information was shallow because those that heard from radios admitted that they did not possess them at their homes but from one radio in Magale town where little concentration was paid to get all the information. This study is supported by a study done in Zambia by Jumbam et al, (2020) which revealed that 69 respondents (92%) knew about the disease as they reported their sources of information as 37(49%) knew from health centers/clinic, followed by the community health workers 26(35%) and via radio 29(39%).

Furthermore, it was observed that malaria cases were influenced by the level of education of the caregivers whereby the majority had ended in primary level 38(38%) and those who never went to school 18(18%). These findings indicate that most of the respondents had lower levels of education. This low level of education might be a barrier for

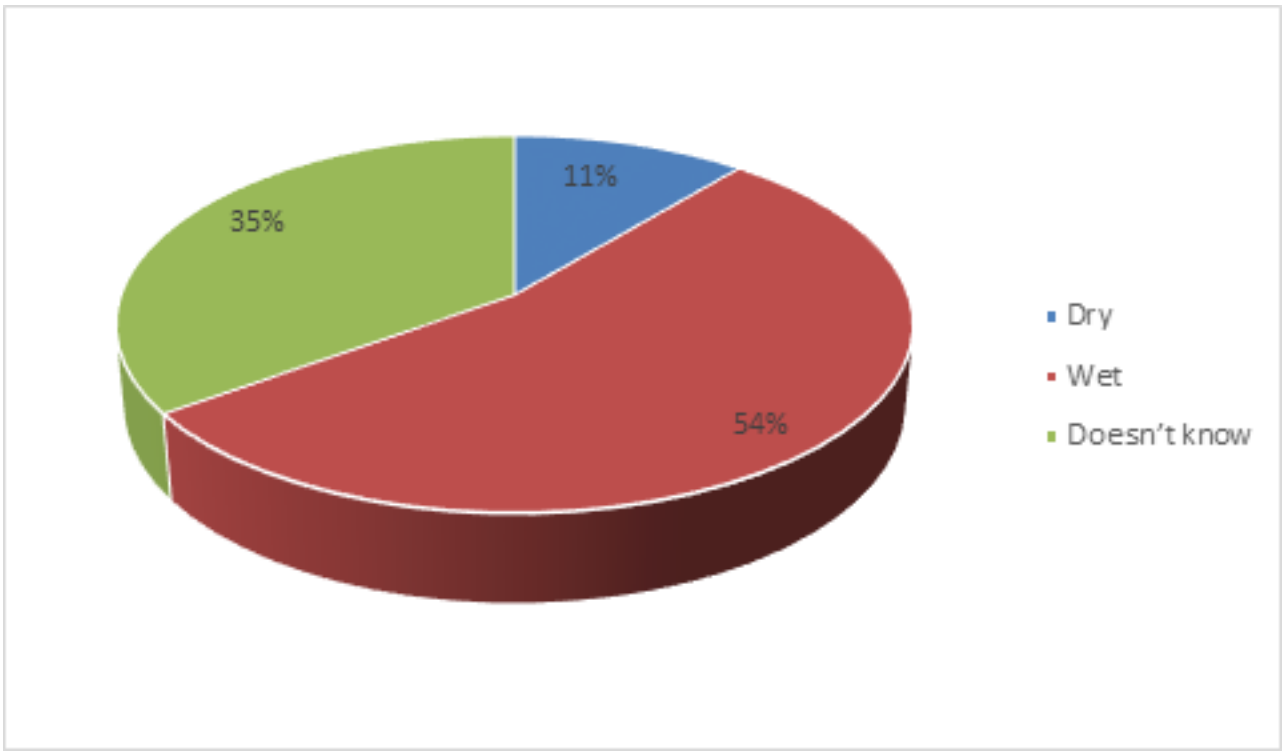

Figure 9: **Season when malaria affects children most (N=100).**

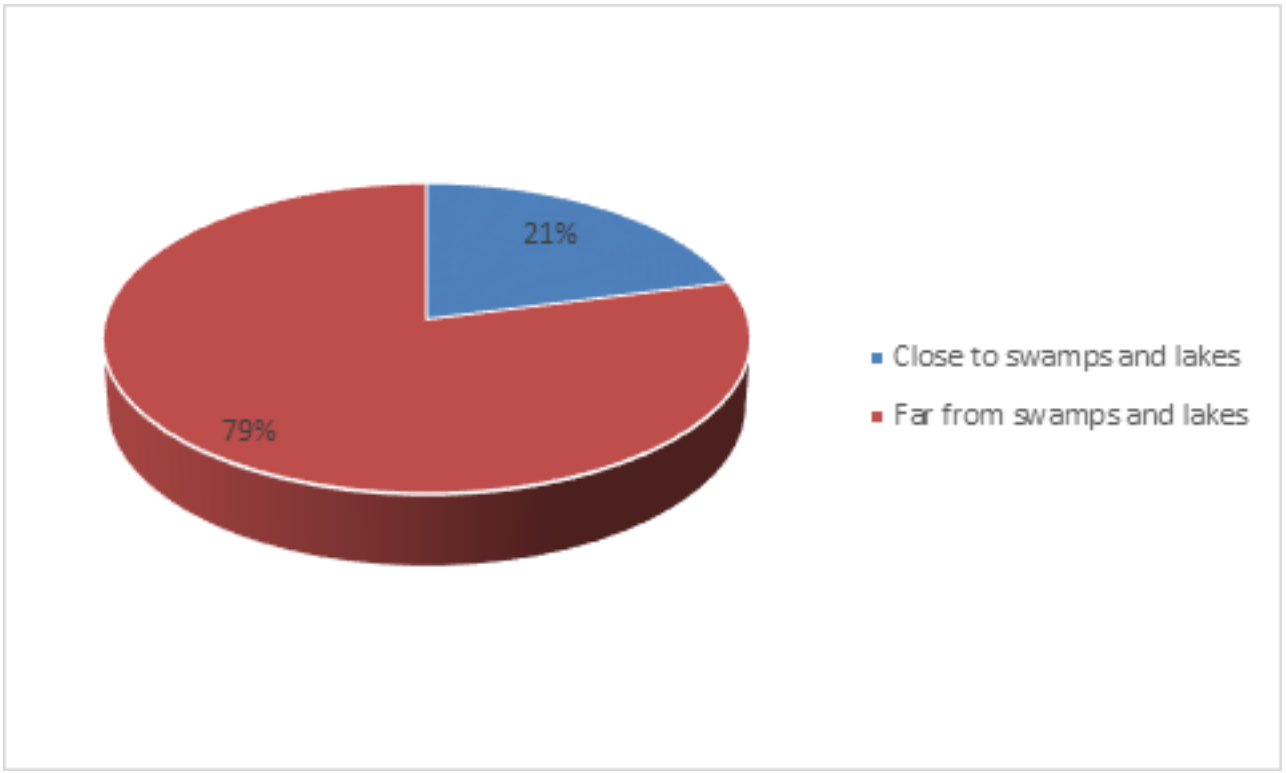

Figure 10: Home location (N=100).

the participant in a clear understanding of health-care services including free ones. It may also account for little knowledge (5%) about other signs and symptoms of malaria like convulsions, loss of appetite, and body weakness. This study is in agreement with a study done in Zambia by Jumbam et al, (2020) which reveals that 91% (68/75) of the respondents of children under five years who completed secondary school and above knew a lot of preventive measures and modes of transmission compared to those who attended primary education and below. This may be due to poverty among caregivers that could not enable them to acquire detailed information about malaria signs and symptoms and preventive measures.

4.2. Socio-economic factors contribute to the prevalence of malaria among the under-five children attending health care at St Elizabeth Magale Health Centre IV.

The study was to determine the socio-economic factors contributing to the prevalence of malaria among under-five children attending health care at St Elizabeth Magale health center IV. It revealed that unemployment 71(71%) was significantly associated with the prevalence of malaria. This means that the majority of the children from poor families were affected more than those from rich families. This may be due to low socio-economic status among the unemployed as they cannot afford malaria preventive measures like indoor residual spraying and others. The study is in agreement with the study conducted in rural Uganda by Tusting et al., (2016) which revealed the same results in which the poorest families were more affected with malaria compared to the richest.

Regarding ownership of INTs, the study showed that nearly half of the respondents 47% did not have ITNs. This means that there was an increased risk of malaria prevalence among children below five years that had no bed nets. Caregivers attributed this to nets being old and thrown away 17(36%), no access to ITNs 16(34%), expensive to afford 12(12%) and others 2(4%). The study is in agreement with the study done in Ghana by S.H Nyarko and Anastasia Cobblah, (2014) which reported children from households that owned a mosquito net were 0.694($p<0.05$) times less likely to contract malaria than their counterparts who owned no mosquito net.

4.3. Environmental-related factors contribute to the prevalence of malaria among children under five years attending health care at St Elizabeth Magale Health Centre IV.

Considering the findings of the study on environmental factors, except the garbage heaps and seasons when malaria affects children most, the investigation of the covariates could not reveal any strong effects on the prevalence of malaria. It was found that more than half of 56(56%) of the respondents had garbage heaps around their homes. This indicates that the children under five years from these homes were at a high risk of malaria. This may be due to garbage heaps acting as breeding sites for mosquitoes. This study is not different from a study conducted in Equatorial Guinea by Maria Romay – Barja et al., (2016) which reported a close result where 24.77% of the caregivers responded that garbage heaps were a breeding site for mosquitoes.

Finally, the study found out that the sea- son where malaria affects children most was the wet/rainy season 54(54%). The findings indicate that malaria prevalence is high during the wet/rainy season. This is probably because, in rainy seasons, there is increased stagnation of water in ditches, broken bottles, and pots plus the rapid growth of the bushes, all these favor the breeding of mosquitoes which leads to an increased number of malaria parasites. This study is supported by a study done in Cameroon by Armand Seraphin Nkwescheu et al., (2015) that showed that the malaria parasite was prevalent throughout the year but was significantly higher in the rainy season at 50.1% (284/567).

5. Conclusion.

The prevalence of malaria among children under five years was high at 39%.

There was good awareness about malaria, its cause, and some preventive measures plus signs and symptoms. However, little knowledge was seen about other signs/symptoms like convulsions, loss of appetite, body weaknesses, and others due to a low level of education. Therefore more efforts are required in educating the people about various symptoms/signs and full preventive measures.

Unemployment and ownership of an ITN were the only socioeconomic factors that significantly influenced the prevalence of malaria among under five children.

The occurrence of malaria among children below five years was significantly influenced by the presence of garbage heaps and dry seasons in their environment.

6. Study limitations

The data set was cross-sectional and consequently could not address causality. It would have been ideal to have a longitudinal data set to study the change in factors and prevalence over time. The rainy season was anticipated to limit the study as the Caregivers because of desiring to stay indoors and scattered Caregivers in different villages of the Mufutu parish, the time limit that is to say the deadline for submitting the research report led to incomplete results and addition, no clear research about the prevalence of malaria in Magale town council had been made therefore no literature was evident.

6.1. Recommendation

The study recommends the need for more awareness campaigns on malaria spread, clinical features, prevention through mass media (electronic and print media), markets, house tohouse-to-housessensitizationioand nal and religious leaders.

The people should translate their good awareness of malaria into goodpreventive practices.

Furthermore, the study recommends more initiatives to be taken toward income-generating activities among people. This will potentially improve access to interventions and proper timely treatment of malaria among children under five years

7. Acknowledgment

Thanks to the Almighty God for my accomplishment of the research report, and special thanks to my father Mr. Mangeni Benjamin for the support, encouragement, and guidance that enabled me to make my report, I also extend my heartfelt gratitude to my supervisor Mrs. Anywar Lydia whose efforts made the success of my research report by dedicating her precious time in guiding me to meet the standards required of me in the research report, the entire research department of Medicare health professional college and my classmates for supporting me physically and spiritually.

8. List of abbreviations and acrynoms.

ACT: Artemisinin - based Combination Therapy

B/S: Blood smear

IPT: Intermittent Preventive Treatment

ITN: Insecticides Treated Net

MRDT: Malaria rapid diagnostic test

NGO: Non-Government Organization

UBOS: Uganda Bureau of Standards

U**NICEF:** United Nations Children Emergency Fund

WHO: World Health Organization

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