

Malaria Prevalence and Associated Risk Factors among Children under Five Years Attending Kitwe Health Center IV in Ntungamo District

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ABSTRACT

Malaria is an acute febrile illness with the following symptoms; fever, headache, and chills. Malaria is caused by Plasmodium species, which is spread by female anopheles mosquito bites. This study aimed to assess the malaria prevalence and associated risk factors among children under five years attending Kitwe Health Center IV in Ntungamo District. This study employed a descriptive cross-sectional study design, 50 caregivers of children attending the children's ward of Kitwe Health Center IV were selected using simple random sampling techniques, and self-administered questionnaires were used to collect data collected data was analyzed using SPSS version 22.0, and presented as percentage and frequency in tables, figure, and charts. Of 50 participants, 14(28.0%) tested positive for malaria. However, the majority of the children 25(50.0%) were within the age bracket of 6-12 months 29(58.0%) were female 32(64.0%) came from rural settings 28(56.0%) had more than 4 children staying together in the same household, 33(66.0%) said they hadn't sprayed their houses with insecticide, 30(60.0%) knew that malaria can be transmitted through a mosquito bite, 36(72.0%) said they are sleeping under a treated mosquito, 30(60.0%) of the participants said they have stagnant water near their residential houses. Only 23(46.0%) of the participants said they have bushes around their homes. Malaria prevalence among children under-five years remains high at 28.0% which is slightly lower than the national standard findings of 30.2%. Factors such as age, number of children in the same households, education status of the caregivers, and their average monthly income greatly predisposed these children to malaria however other risk factors such as not spraying the household with insecticides and having stagnant water around the home were majorly reported by the caregivers.

Keywords: Malaria Prevalence, Associated Risk Factors, Children Under-Five years

INTRODUCTION

Malaria is an acute febrile illness with the following symptoms; fever, headache, and chills [1, 2]. Malaria is caused by Plasmodium species, which is spread by female anopheles mosquito bites [3]. It is primarily distributed in a tropical climate [4]. Human malaria is caused by five medically important Plasmodium spp which includes; *Plasmodium falciparum*, *Plasmodium vivax*, *Plasmodium malariae*, *Plasmodium ovale*, and *Plasmodium Knowlesi* [5]. Plasmodium, the causative organism for malaria in humans is transmitted through the bites of infected female Anopheles mosquitoes. If not treated within 24 hours, *P. falciparum* malaria can progress to severe illness, often leading to death and it accounts for 50% of all malaria infections globally and 75% in Sub-Saharan Africa among under-five children. [2]. Malaria accounts for the majority of morbidity and mortality in Sub-Saharan Africa, where the illness burden, disability, and death rates are particularly high in children under the age of five [6]. In 2021, about 80% of children under-five died of malaria deaths globally [1]. Malaria transmission in Uganda occurs throughout the year covering 95% of the country, while in the remaining 5% areas, transmission is unstable and epidemic-prone [7]. According to WHO, Uganda has the world's highest malaria incidence rate of 478 cases per 1,000 population per year. It is also the leading cause of sickness and death in Uganda. The malaria death rate in Uganda is estimated to be between 70,000 and 100,000 among children every year [1]. Children under the age of five years are among the most vulnerable to malaria infection as they have not yet developed any immunity to the disease [8]. Despite the following recommendations which had been implemented by WHO such as the use of long-lasting-insecticidal nets (LLINs), indoor residual spraying (IRS), and the use of chemotherapies [9, 10]. In addition,

since October 2021, broad use of the RTS, S/AS01 malaria vaccine. The vaccine has been shown to significantly reduce malaria prevalence among young children [11–13]. The majority of malaria illnesses in high-transmission locations affect young children rather than adults and cause mortality due to severe malaria, hypoglycemia, and cerebral malaria [8]. Despite the severity of the disease in children, the majority of research conducted in Uganda has focused on adult populations rather than children. As a result, knowing the malaria status of the children in the study area is crucial to designing successful intervention methods. Therefore, the primary objective of this study was to determine the malaria prevalence and risk factors among children under-five years in the study area.

METHODOLOGY

Study Design and Rationale

A descriptive cross-sectional study design was used employing the quantitative method of data collection. This design was used to study both the independent and dependent variables of the study at the same time in point and thus this design is the best in achieving the study aim also since there was limited time, a cross-sectional design helped the researcher to achieve the set objectives.

Study Setting and Rationale

This study was conducted from the children's ward of Kitwe Health Center IV which is located in Ntungamo district. Kitwe Health Center IV has a bed capacity of around 300 inpatient beds, offering a wide range of medical care in both inpatient and outpatient departments. The paediatric department has a capacity of 50 beds with high dependent units having 12 beds. The hospital has a well-equipped laboratory that offers both Rapid Diagnostic Tests and Blood smears for malaria parasites. This study setting was chosen based on the high admission rate of children and well-equipped diagnostic center, a very high prevalence rate of malaria which stands at 19.0%. (HIMS, 2023). Ntungamo district was created in 1993 from the two districts of Bushenyi and Mbarara. It is bordered to the north by Mitooma District, Sheema District, and Mbarara District, going from west to east. Isingiro District lies to the east, the Republic of Rwanda to the south, Kabale District to the southwest, and Rukungiri District to the northwest. Ntungamo district has a total land area of 2184 km² it has a population of 455,799 composed of 216,999 males and 238,800 females (as of February 2011).

Study Population and Rationale

The study population was children under-five years of age (0-59 months) attending Kitwe Health Center IV during the study period. Although the informants were their caregivers. This population was chosen because of their vulnerability to malaria infection as their immunity is still immature [8].

Sample Size Determination

The sample size was determined using Yamane formula [14]

$$n = \frac{N}{1 + N(e)^2}$$

N is the population size (approximately 55 children under 5 years attend Kitwe Health Center IV in two weeks)

e=the level of precision which is equal to 5%

Therefore, the sample size is

$$n = \frac{55}{1 + 55(0.05)^2}$$

n= 48.35 children

Therefore, the researcher used 50 children as the sample size

Sampling Procedure and Rationale

The researcher used a simple random sampling technique to collect data. The caregivers were given a piece of paper written either Yes or No and were asked to pick at random. Whoever picked Yes were included in the study and whoever picked No were not included, they were thanked and allowed to go home. This was continued until when the required sample size was achieved. This sampling technique helped the researcher to reduce on biasness

Inclusion Criteria

All children under-five years attending Kitwe health center IV and whose caregivers have offered their consent were included in the study.

Exclusion Criteria

Those children whose caregivers refused to consent to the study and those whose caregivers were not feeling fine and were mentally incapacitated to give valid information will be excluded from the study.

Dependent Variable

The prevalence of malaria

Independent Variables

Sociodemographic factors: Age, sex, place of residence, number of household members, income status of the family.

Risk factors: Presence of stagnant water, house sprayed with insecticides, knowledge of caregivers regarding malaria transmission, sleeping under the insecticides treated mosquitoes net, living around busy area and use of window net.

Data Collection Tools

An interviewer administered semi structured questionnaires was used to collect data. The questionnaires provided exhaustive options of responses from the participants selected. Both open and closed ended questions was used. The questionnaires were divided into three sections; section A: the sociodemographic factors, section B: malaria prevalence, and section C: risk factors for malaria. The questionnaires were written in English and were then translated into the local language by the researcher for the caregivers who did not know English. The questionnaires were pretested among five participants from Kampala International University Teaching Hospital to verify any ambiguous questions that had not been addressed. The results from the pretest were used to modify the content and consistency of the questionnaires.

Data Collection Procedures

Written permission to carry out the study at Kitwe Health Center IV was obtained from the KIU-SONs Research Ethical Committee (REC) and was presented to the in charge of Kitwe Health Center IV. Permission to participate in the study was obtained from the participants. Participants who consented to participate in the study were interviewed using the interviewer-administered questionnaire which was written in English but will be well translated by the researcher to the local language to favor those who didn't understand English. After completing, the participants were thanked for participating in the study and they were reassured that all the information provided would be kept confidential and safe. The process of data collection lasted for two weeks.

Data Management

The completed data collection tools were checked for validity before leaving the data collection sites. Data were coded and entered correctly in the computer and backup was made for safe storage. The questionnaires were kept out of unauthorized persons by locking them into a cupboard and the softcopy was kept in a pass-warded computer.

Data Analysis

Data were analysed using Statistical Package for Social Sciences (SPSS) version 22.0. The data set was analysed and presented in figures, tables, and charts as percentages and frequency. Simple explanatory notes and conclusions will be made following the analysed data.

Ethical Considerations

Approval was sought from the Research Ethical Committee of KIU-SONs and concerns were addressed after defending the research proposal, restricted access to the data collection forms by persons other than the principal researcher was ensured, and no names or any identifying information was used in the study, the respondents were properly informed upon this research study aim and neither they be forced or influenced to answer any questions as per the researcher's interest. Verbal consent by the researcher was obtained from the respondents who were informed about the importance of the study. They were told that they had the right to withdraw at any moment they wished and their participation was entirely voluntary with no monetary benefit.

RESULTS

Sociodemographic Characteristics of the Participants

Table 1: Showing the sociodemographic characteristics of the participants (N=50)

CHARACTERISTICS	VARIABLES	FREQUENCY(N)	PERCENTAGE (%)
Age in months	Less than 6	9	18.0
	6-12	25	50.0
	13-24	9	18.0
	Above 24	7	14.0
Sex of the child	Male	21	42.0
	Female	29	58.0
Address	Urban	18	36.0
	Rural	32	64.0
Number of children in the household	Below 4	22	44.0
	4 and above	28	56.0

The study found that the majority of the children 25(50.0%) were within the age bracket of 6-12 months of age while the minority 7(14.0%) were above 24 months. From these more than half 29(58.0%) were female whereas 21(42.0%) were male. Most of them 32(64.0%) come from rural setting as compare to only 18(36.0%) who reside within urban area. Most of the families 28(56.0%) were having more than 4 children staying together in the same household, whereas only 22(44.0%) were having less than 4 children.

Table 2: Prevalence of Malaria Among Under-Five Children
Signs and symptoms the child is presenting with (N=50)

CHARACTERISTICS	VARIABLES	FREQUENCY(N)	PERCENTAGE (%)
Fever	Yes	35	70.0
	No	15	30.0
Vomiting	Yes	25	50.0
	No	25	50.0
Loss of appetite	Yes	24	48.0
	No	26	52.0
Convulsion	Yes	10	20.0
	No	40	80.0
Jaundice	Yes	1	2.0
	No	49	98.0
Anemia	Yes	1	2.0
	No	49	98.0

From this finding, the majority 35(70.0%) were presenting with fever as compared to only 15(30.0%) who had no fever, the study also found out that, the number of children who were vomiting was equal to the number of children who had no vomiting that at 25(50.0%). Most of the children 26(52.0%) had appetites whereas only 24(48.0%) had no appetites, most of the children 40(80.0%) were not convulsing whereas only 10(20.0%) had a convulsion. The majority of the children 49(98.0%) had no jaundice and anemia respectively and only 1(2.0%) was having jaundice and anemia respectively as shown in the table above.

History of Malaria Test (N=50)

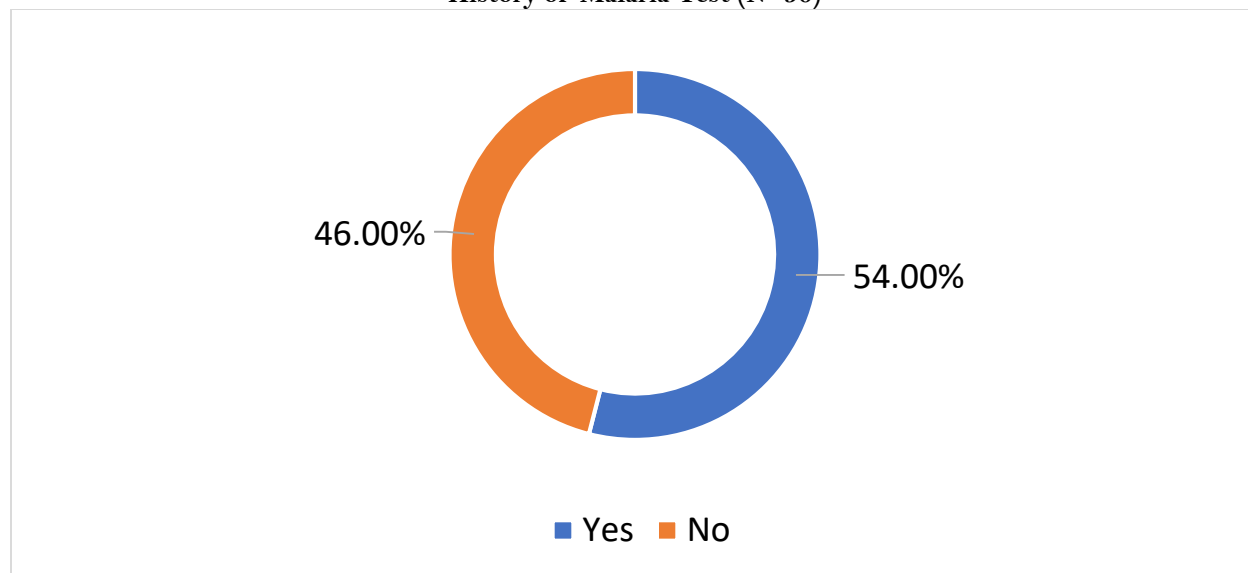


Figure 1: Showing the participant's History of malaria test

From the figure above, half 27(54.0%) of the children had already tested for malaria as compared to only 23(46.0%) of the children who had not tested for malaria

The Malaria Test Results (N=28)

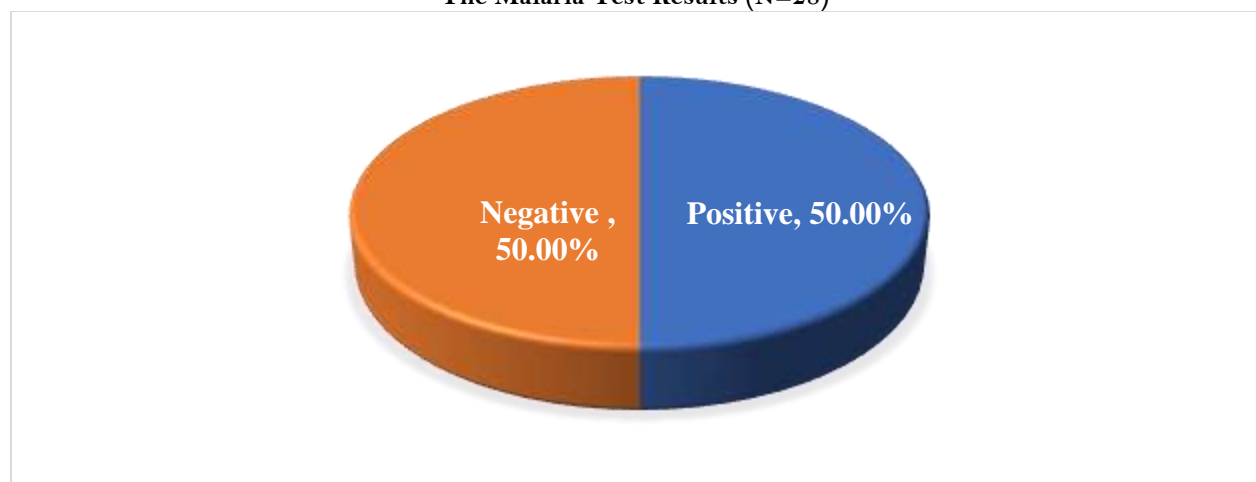


Figure 2: Showing the malaria test results
* Only those children who tested for malaria

From the study findings above, it showed that out of 28 children who tested 14(50.0%) turned positive for malaria parasites and also 14(50.0%) turned negative for malaria parasites. Then out of 50 children sampled, 14(28.0%) were positive for malaria parasites.

Associated Risk Factors for Malaria

Sociodemographic Characteristics of the Participants' Caregivers

Table 3: Showing sociodemographic characteristics of the participants' caregivers (N=50)

Characteristics	Variables	Frequency(n)	Percentage (%)
Age of the caregivers in years	Less than 29	13	26.0
	29-34	16	32.0
	35 and above	21	42.0
Education status	None	9	18.0
	Primary	17	34.0
	Secondary	15	30.0
	Tertiary	9	18.0
Average monthly income of the caregivers	Less than 50,000=	22	44.0
	50,000-100,000=	20	40.0
	Above 100,000=	8	16.0

From the table above, it was found that nearly half 21(42.0%) of the caregivers were 35 years and above, and only 13(26.0%) were below 29 years. The majority of the caregivers 17(34.0%) had attained a primary level of education as well as only 9(18.0%) had not attained any formal education and only 9(18.0%) had attained a tertiary level of education. The majority of the caregivers 22(44.0%) had less than 50,000= as their average monthly income whereas only 8(16.0%) had more than 100,000= as an average monthly income.

Difference Ways Through Which Malaria Can Be Spreaded

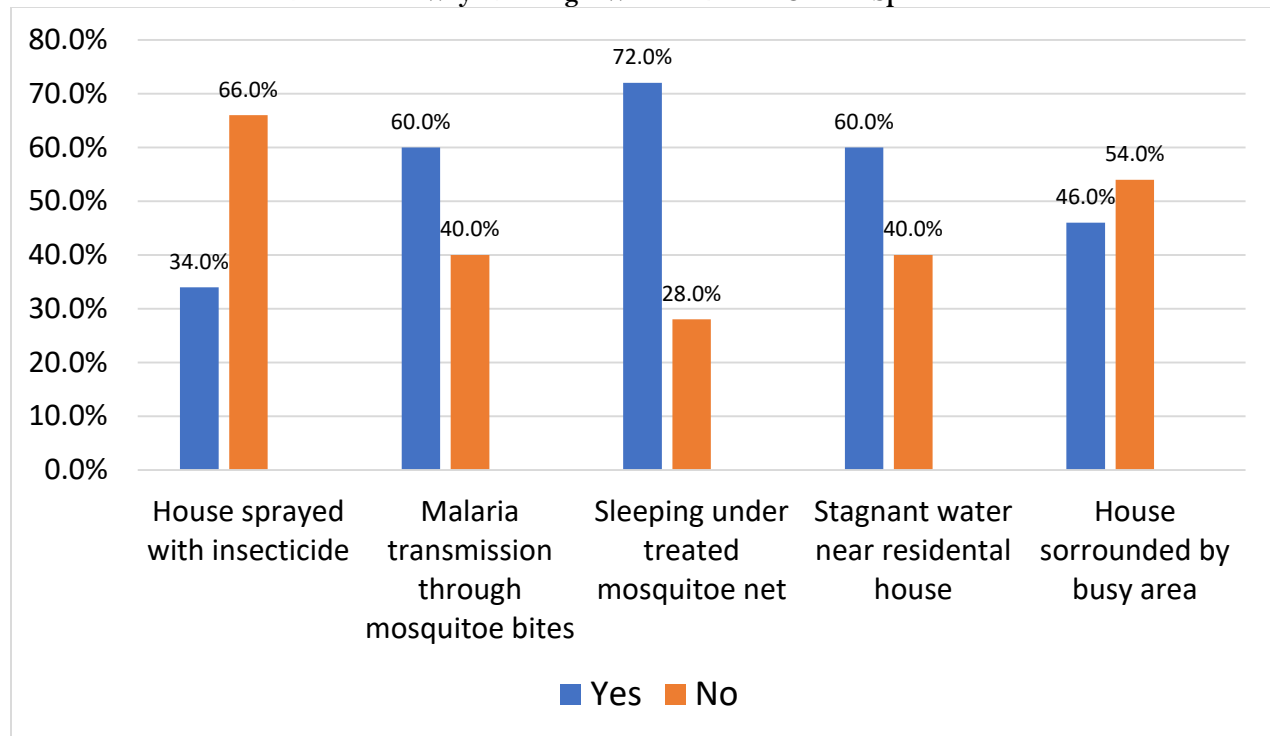


Figure 3: Showing different ways through which malaria can be spread

From the figure above, it was found out that majority of the participants 33(66.0%) said they haven't sprayed their houses with insecticide in comparison to only 17(34.0%) whose houses were sprayed. About 30(60.0%) knew that malaria can be transmitted through mosquito bites as compared to only 20(40.0%) who didn't know, most of the participants 36(72.0%) said they were sleeping under a treated mosquito net whereas 14(28.0%) said they are not using a mosquito net, about 30(60.0%) of the participants said they have stagnant water near their residential houses while only 20(40.0%) said they don't have stagnant water near their residential houses. Only 23(46.0%) of the participants said they have bushes around their homes whereas the majority 27(54.0%) said they don't have bushes near their households.

DISCUSSION

According to this study, it was found that the prevalence of malaria among under-five children was 14(28.0%). This could be due to the little awareness about the malaria transmission mode as evidenced by very few caregivers having attained higher education. This is in line with a cross-sectional study in Arba Minch Zuria District, South Ethiopia which gave a prevalence of 22.1% (60/271) among febrile children [3] and also in another study done in Ziquala district, Northeast Ethiopia which demonstrated that malaria prevalence was at 24.6% [2]. But contradicts a study done in Rwanda where the results of a positive diagnostic test for malaria was 14.0%. This rate was higher among children aged 5-9 years old (15.6%), compared to other age groups. [15]. This study's results is slightly lower than the findings from the Uganda Demographic Health Survey [16]. It highlighted that malaria prevalence of malaria was 30.2% out of 2,350 children sampled. According to this finding, majority of the children were within 6-12 months. This could be because these children category are highly locomotive and are susceptible to malaria. This contradicts the findings from a study done by Abossie [3] in Arba Minch Zuria District, South Ethiopia where younger children had a low prevalence of Plasmodium parasite and also contradict the findings from Debash [17] where the prevalence of malaria was high at 31.8% among those children aged 48-59 months and was low at 19.8% among those aged 9-11 months. But it's in line with a study done among Batwa Indigenous People of Kanungu District in Southwestern Uganda which showed that malaria prevalence was high among children aged less than or equal to two years 5.42% (n = 57) [7]. This study also found out that 29(58.0%) of the children were female. This could be attributed to the nature of their physiological makeup. This study agrees with the findings from Debash [17] which highlighted that malaria prevalence was high at 31.5% among females as compared to males, a study was done in Nkonghombeng; a typical rural setting in the equatorial rainforest of the South West Region of Cameroon which indicated that malaria prevalence was high among male children at 14.9% and was low among female children at 9.5% [18]. This study also found out that 32(64.0%) of the children are from rural setting. This

is due to the topography of the rural areas which might be bushy and harbor stagnant water hence predisposing these children to malaria. This was in line with the findings from a study conducted by Debash, [17] where the prevalence of malaria was high among children who were rural dwellers at 34.9% and was low among children who were urban dwellers at 11.5% [19]. However, it contradicts a study done by Assemie et al., [20] among children attending Health Institutions in South Gondar Zone, Northwest Ethiopia highlighted that 72.4% of children who were rural residents had moderate parasitemia compared to urban residents. According to my findings, it was showed that 28(56.0%) of the children come from a household having more than 4 children. This could be due to unawareness of family planning method among caregivers and since most of them lack high education standard. This agrees with the study findings from a study done in Rwanda which showed that for a family size of more than 4 members, the number of infected children in the family increased by 8.8% [4]. This study revealed that the majority 22(44.0%) of the caregivers had an average monthly income of less than 50,000= . This could be due to the fact that most of the caregivers are peasants which mainly dwell on subsistence farming and some small business scale. This is in line with the findings revealed that the likelihood of contracting malaria infection among children aged six months to 14 years in Rwanda reduced with increasing family wealth quintile [15]. Children from the poorest and poorest households were found to be more vulnerable to malaria than children from the richest households. It also agrees with the findings from a study done by [21] which revealed that having a low income seems to contribute the most to malaria prevalence in this study (18.7%). According to my study findings, it was found out that 30(60.0%) of the participants said have stagnant water near their residential houses. This could be due to unawareness about the breeding place of mosquitoes as it correspond to their low education status. This corresponds to the study findings from a study done by Karekezi et al [22] among patients visiting Mizan Tepi University Teaching Hospital, Southwest Ethiopia which indicated that children living in areas of stagnant water were more likely to get infected with the malaria parasite compared to those who live away from stagnant water. It also corresponds to a cross-sectional study in Arba Minch Zuria District, South Ethiopia which showed that children who reside near mosquito breeding sites were more likely to have positive test results for malaria infections as compared to those who live far from mosquito breeding sites [3]. This study found out that the majority of the participants 33(66.0%) said they hadn't sprayed their houses with insecticide. This could be due to a negative attitude regarding the chemicals and fear of their side effects. This is in line with the study findings from Duguma et al [23] on the malaria prevalence and risk factors among patients visiting Mizan Tepi University Teaching Hospital, Southwest Ethiopia which indicated that malaria prevalence was high among children living in houses not sprayed with insecticides. This study also found out that majority of the caregivers 30(60.0%) knew that malaria can be transmitted through mosquito bites. This corresponds to a study done by Abossie et al [24] , a cross-sectional study in Arba Minch Zuria District, South Ethiopia showed that 71.2% of the caregivers who knew about the mode of malaria transmission via mosquito bite, their children had less malaria prevalence as compared to those who didn't know the mode of transmission. This study also revealed that most of the participants 36(72.0%) said they were sleeping under a treated mosquito net. This could be due to increased awareness and free distribution of mosquito net. It correspond to a study done by Abossie et al., (2020) which revealed that children who slept under insecticide-treated mosquito nets (ITNs) were more likely to be protected from malaria infection than those did not sleep under an ITNs. This also contradicts a finding from a study done in Nkonghombeng; an atypical rural setting in the equatorial rainforest of the South West Region of Cameroon which showed that the prevalence of malaria was higher among those sleeping under LLINs (12.56%) than those not sleeping under LLINs (8.97%), though the difference was not significant [18]. Another study done by [21] on the prevalence of malaria and associated risk factors among the community of Mizan-Aman Town and its catchment Area in Southwest Ethiopia revealed that more than three-quarters of them lacked access to insecticide-treated bed nets (ITNs), which contributes to increased prevalence of malaria. This study also found out that majority of the caregivers 27(54.0%) said they don't have bushes near their households. This could be due to the increased awareness about how danger keeping bush around home is. This correspond to a findings by a study done in Nkonghombeng; atypical rural setting in the equatorial rainforest of the South West Region of Cameroon highlighted that malaria prevalence was higher among those living around bushy area (12.29%) compared to those not living around busy areas (11.59%) though it was not significant (p =0.814) [18].

CONCLUSION

Malaria prevalence among children under-five years still remains high at 28.0% which is slightly lower than the national standard findings 30.2%. factors such as age, number of children in the same households, education status of the caregivers and their average monthly income greatly predisposed these children to malaria however other risk factors such as not spraying the household with insecticides and having stagnant water around home was majorly reported by the caregivers.

Recommendations

There should be a general public goal-oriented sensitizations concerning complicated malaria especially among caretakers to address the issues concerning knowledge gaps especially the red flags or danger signs among plasmodium infected children and to bridge those who reached low level of education to those that attained tertiary education since higher education level of the care givers is protective against transmission of malaria. Stake holders, health workers and health facility should ensure that caretakers with children positive of malaria parasites especially those from far places are attended to early enough to minimize the duration between infection and antimalarial treatment which significantly affect the possibility of transmission of malaria to non-infected ones. The community leaders should put in place laws governing the clearing of bushes and draining of stagnant water around households so that to diminish the mosquitoes' habitat.

The government and its support bodies such as UNICEF among others NGOs should not only distribute the free mosquito nets but also offer treatment services cater for those who are in malaria endemic area so as to offer secondary prevention against malaria parasites prevalence.

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