EURASIAN EXPERIMENT JOURNAL OF PUBLIC HEALTH (EEJPH) ISSN: 2992-4081
©EEJPH Publications Volume 4 Issue 2 2023

Factors Influencing the Prevalence of Malaria in Children below the Age of 5 Years in Hoima Regional Referral Hospital Hoima District Uganda

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ABSTRACT

World Health Organization (WHO) defines malaria as a life-threatening parasitic disease caused by a bite of an infected Anopheles mosquito. Malaria can kill within 24 hours of the onset of symptoms and whereas it affects all the people, most affected are children under the age of 5 years. Malaria is the most killer parasitic disease globally that affects mainly children less than 5 years old because of their low immunity. This study was aimed at determining the factors influencing the prevalence of malaria in children below the age of 5 years in Hoima Regional Referral Hospital, Hoima District, Uganda. This was a descriptive cross-sectional study of the outpatient department of the Hoima Regional Referral Hospital. Simple random sampling was used to get the study participants (caretakers of children under five years of age with their children). Data was collected using an interview questionnaire and children were tested for malaria using microscopy and MRDT. Data was analyzed using SPSS version 20.00. The prevalence of malaria in under five years was found to be 48.6 %. The environmental factors were associated with the occurrence of malaria in under five years. The prevalence of malaria in under five years was high and garbage heaps in the environment were significantly associated with its occurrence.

Keywords: Malaria, parasitic disease, Anopheles mosquito, infant mortality, Caretakers.

INTRODUCTION

World Health Organization (WHO) defines malaria as a life-threatening parasitic disease caused by a bite of an infected female anopheles mosquito [1]. Malaria can kill within 24 hours of the onset of symptoms and it affects all the people but most affected are children under the age of 5 years [2]. Malaria is the most killer parasitic disease globally that affects children less than 5 years old because of their low immunity. Malaria is an entirely preventable and treatable mosquito-borne illness [3, 4]. Globally, over 95 countries and territories have ongoing malaria transmission with an estimated 3.2 billion people at risk of getting infected [5]. According to WHO [6], malaria prevalence depends on the possible environmental factors related to parasites, vectors, the human host, 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 in a mosquito increasing the transmission and therefore high prevalence of malaria. 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 andhigh always in rainy seasons and immediately after the rainy season. More transmissions and epidemics can occur in people who have little or no immunity to malaria [7]. Malaria remains a major cause of morbidity in children in sub-Saharan Africa under the age of 5 years and one child dies every 2 minutes [8]. Malaria increases children's risk of severe anemia and this heightens child mortality and morbidity [9-11]. As one of the most serious and complex public health problems, malaria is identified as the disease most likely to be affected by climate change and this allows the spread to newer areas together with the prevailing socio-economic conditions. In Uganda, malaria is still a major public health problem associated with slow economic development and poverty and is the most frequently reported disease in both public and private health facilities in Uganda. It accounts for 30 - 50% of outpatient visits at health facilities and 15 -20% of patients or hospital admissions. Malaria accounts for 27.7% of deaths among children under five [12]. Uganda ranked third in the total number of malaria cases in sub-Saharan Africa [8]. 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 [13]. In Hoima district, where the study area is located, malaria is the most common cause of death in children and the district suffers the highest malaria burden in the country [14]. This creates a reason to find out the prevalence of malaria and the associated factors in children below the age of five years. Thus, this study was designed to assess the factors influencing the prevalence of malaria in children below the age of 5 years in Hoima Regional Referral Hospital, Hoima District, Uganda.

METHODOLOGY

Research design

The study was quantitative using the cross-sectional survey design because the design allowed data to be collected on the prevalence of malaria and associated factors simultaneously at a particular point in time.

Area of Study

The study was carried out in Hoima Regional Referral Hospital the outpatient department pediatric, it's a government-owned hospital located in Hoima district.

The population of the Study

The target population was all children under five years in pediatric OPD, Hoima district. The accessible population included children under the age of five years who attended pediatric OPD, at Hoima Regional Referral Hospital. The study population included caregivers and children under the age of five years who met the inclusion criteria**.**

Inclusion criteria

Children under the age of five sought treatment at the health unit.Children with suspected signs and symptoms of malaria. Children who came with a fever of 38 degrees and above. Children with no history of anti-malaria drugs in the past 2 weeks. Children whose guardians consented to participate in the study.

Exclusion criteria

Any other population that didn't meet the inclusion criteria.

Sample size determination

The sample size was determined by calculations using the Kish Leslie [15] formula;

N = Z2 P (1-p) / E2

Where; N = Estimated minimum sample size required.

Z = a standardized normal deviation value that corresponds to the level of statistical significanceequal to 1.96.

P = estimate of the prevalence of malaria in children under age 5 years in Uganda which is 19.7% according to Roberts and Mathew [13] 2016 study on malaria prevalence in under 5 years.

E = margin of error set at 5%

N= (1.96)2 0.197(1-0.197) / (0.05)2

N = 243.

Sampling technique

This study employed a simple random sampling method to enroll all the caregivers of childrenbelow the age of five years to participate in the study. All the children below five years who came in OPD were first seen by the clinician and those who had the signs and symptoms of malaria were sent to the laboratory for testing using mRDT and microscopy. The caregivers of these children sent to the laboratory were requested to participate in the study and those willing were enrolled until when the sample size was reached. The children who tested positive were used to determine the sample size.

Data collection methods.

Source of data

Caretakers of children under 5 years and the children themselves were the primary sources of data in this study.

Study tool/ instrument

A structured questionnaire was used to collect raw information on social demographic factors, caregiver factors e.g. Knowledge about, the transmission and prevention of malaria, utilization and coverage of insecticide-treated nets, and environmental factors. This was administered to caretakers of the eligible participants where parents or guardians of children under the age of five years were interviewed. The questionnaire comprised both closedand open-ended questions in the English language.

Data analysis

The data from the interviews was carefully read and thereafter the responses were slightly edited for grammatical correctness, coherence, chronology and precision and presented as quotations so as to translate the data obtained through the administration of the open-ended questions which were quantitative in nature.

Validity and reliability of instruments

The pilot study enabled the researcher to assess the clarity of the questionnaire items so that those found to be vague or inadequate were modified to improve the quality ofthe research instrument thus increasing its reliability.

RESULTS

Demographic factors

Table 1: Demographic characteristics of 243 caretakers of children aged below 5years.

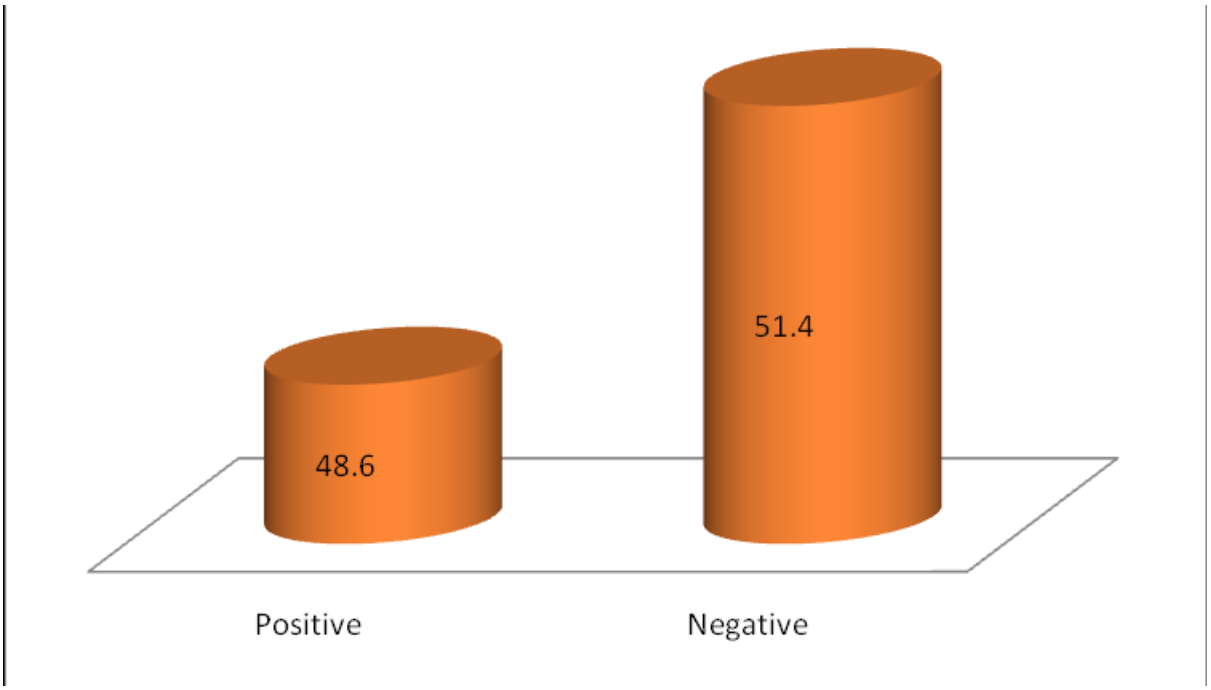
Pediatric outpatient clinic of Hoima Regional Referral Hospital Hoima district.

VARIABLE	CATEGORY	POSITIVE	PERCENTAGE (%)
GENDER	**FEMAL** **EMALE**	**187** **56**	**77.0** **23.0**
AGE	**15-24** **25-34** **35-44** **>45**	**55** **92** **74** **22**	**22.6** **37.9** **30.5** **9.1**
MARITAL STATUS	**SINGLE** **MARRIED** **SEPARATED** **WIDOWED**	**44** **145** **36** **18**	**18.1** **59.1** **14.8** **7.4**
LEVEL OF EDUCATION	**NONE** **PRIMARY** **SECONDARY** **TERTIARY**	**46** **81** **81** **35**	**18.9** **33.3** **33.3** **14.3**
LOCATION	**CLOSE TO THE SWAMP** **NOT CLOSE TO THE SWAMP**	**107** **136**	**44.0** **56.0**

The total number of participants was 243 Majority of 187(77.0%) were females, 94(37.9%) were between the ages of 25-34years, 145(59.1%) were married, most, 81(33.3%), had both primary and secondary level of education and 136(56.0%) did not stay close to a swamp as reflected in table 1.

Prevalence of malaria

Figure 1: Prevalence of malaria among 243 children below age 5 years in pediatric outpatient clinic of Hoima Regional Referral Hospital Hoima district.



A total number of 243 children below the age of 5 years who attended the pediatric outpatient clinic of Hoima Regional Referral Hospital Hoima district coming from different geographical locations of the town council were subjected to malaria diagnostic tests using both mRDT and blood smear for malaria parasites. Of the 243 children, 118(48.6%) tested positive as shown in figure 1.

Caretaker factors: part 1

Table 2: Caretaker factors (demographic) influencing the prevalence of malaria among 243 children below 5 years in the pediatric outpatient clinic of Hoima Regional Referral Hospital Hoima district.

Variable	Positive	Percentage(%)
Gender Female Male	 91 27	 77.1 22.9
Age 15-24 25-34 35-44 ≥45	 18 51 37 12	 15.3 43.2 31.4 10.2

Marital status Single Married Separated Divorced	 20 70 20 8	 16.9 59.3 16.9 6.8
Level of educationNone Primary SecondaryTertiary	 26 37 41 14	 22.0 31.4 34.7 11.9
Location Close to the swamp Not close to a swamp	 59 59	 50.0 50.0

All caretaker demographic factors indicated no statistically significant relationship with the prevalence of malaria among children below age 5 years as indicated in Table 2.

Caretaker factors: part 2.

Table 3: Caretaker factors (Knowledge) on malaria transmission and prevention influencing the prevalence of malaria among 243 children below 5 years in the pediatric outpatient clinic of Hoima Regional Referral Hospital Hoima district.

Variable	Positive	Percentage (%)
Ever heard about malariaYes No	114 4	96.6 4.8
Mode of transmission mosquitoes fly/animals	101 17	85.6 14.4
Prevention of malariaSleeping under nets YesNo	113 95.8 5 4.2	
Wearing of long sleevedclothes Yes No	52 66	44.1 55.9
Spraying with insecticidesYes No	80 38	67.8 32.2
Destroying breeding placesYes No	100 18	84.7 15.3
Closing windows earlyYes No	84 34	71.2 28.8
Use repellantsYes No	29 89	24.6 75.4
Clearing bushes Yes	102	86.4

No	16	13.6
Time mosquito bitesDay time Night time Day and night I don't know	 7 64 45 2	 5.9 54.2 38.1 1.7

No caretaker factors on knowledge about the transmission and prevention of malaria were strongly related to the prevalence of malaria among children below the age of five years in the pediatric outpatient clinic of Hoima Regional Referral Hospital Hoima district as shown in Table 3.

Caregiver factors

Table 4: caretaker factors (knowledge) on signs and symptoms of malaria in children below 5 years in the pediatric outpatient clinic of Hoima Regional Referral Hospital Hoima district.

VariableMalaria symptoms	Positive	Percentage (%)
High temperatureYes No	 111 7	 94.1 5.9
Loss of energyYes No	 79 39	 66.9 33.1
VomitingYes No	 102 16	 86.4 13.6
SweatingYes No	 42 76	 35.6 64.4
HeadacheYes No	 75 43	 63.6 36.4
Joint painsYes No	 36 82	 30.5 69.5

Loss of appetiteYes No	102 16	86.4 13.6
Chills YesNo	74 44	62.7 37.3
ConvulsionsYes No	81 37 31.4	68.9

For caretakers who knew about the signs and symptoms of malaria, loss of energy was significantly associated with the prevalence of malaria in children below five years. However other factors were not significantly associated with malaria prevalence as shown in table 4.

Caregiver factors

Table 5: Caretaker factors (attitudes) influencing the prevalence of malaria among 243 children below 5 years in the pediatric outpatient clinic of Hoima Regional Referral Hospital Hoima district.

Variable	Positive	Percentage (%)
I think malaria is a serious and threatening disease Yes No	108 10	91.5 8.5
I think the best way to prevent myself from getting malaria is to avoid mosquito bites Yes No	92 26	78.0 22.0
I believe sleeping under a mosquito netduring the night is one of the ways to prevent myself from getting malaria Yes No	106 12	89.8 10.2
Am sure that I can treat the child if heor she gets malaria		44.9

Yes No	53 65	55.1
In my opinion, children and pregnant mothers are at greater risk of getting malaria Yes No	 99 19 16.1	83.9
I think that one can recover frommalaria without any treatment Yes No	 28 90	23.7 76.3
I think that it is dangerous if malariamedicine is not taken completely Yes No	 105 13	89.0 11.0
I think I should go to the health centre tohave my child's blood test Yes No	 112 6	94.9 5.1

Caretaker attitudes towards the prevention of malaria had no significant influence on the prevalence of malaria as presented in Table 5.

Environmental factors

Table 6: Environmental factors influencing the prevalence of malaria among children below 5 years in the pediatric outpatient clinic of Hoima Regional Referral Hospital Hoima district.

Variable	Positive	Percentage (%)
Water drainageGood Bad	 66 52	 55.6 44.1
Clear stagnant watersYes No	 93 25	 78.8 21.2

Have bushes around thehouse Yes No	 62 56	 52.5 47.5
Have garbage heapsYes No	49 69	41.5 58.5
Monthly income ≤135000shs >135000shs	62 56	52.5 47.5

The prevalence of malaria among children below 5 years was strongly influenced by whethergarbage heaps in the environment were cleared or not as indicated in the table above.

DISCUSSION

Prevalence of malaria among children below the age of five years:

The findings of the study showed that generally half of the children were found to be sick withthe parasite causing malaria which showed a high prevalence of malaria among children below five years in the pediatric outpatient clinic of Hoima Regional Referral Hospital Hoima district which was the study area. This is almost three times a higher prevalence compared to the national prevalence of 19.7% in a study that was carried out in Uganda [13]. The most likely reason for the high prevalence is probably failure to effectively use preventive measures despite caregivers having good knowledge about the prevention and transmission of malaria. Measures like possession of insecticide-treated bed nets (ITNs) cannot determine how effectively it is used to prevent mosquito bites at night. Also, caregivers' knowledge of malaria does not determine their effective implementation of these measures and their attitudes toward their utilization. This could be another reason for the high prevalence of malaria in Hoima Regional Referral Hospital. Therefore, there is a need for further studies to assess the caregiver's knowledge of malaria in relation to the implementation of preventive measures as this was not investigated in this study. Comparing the sample size, the population, and the data obtained, the prevalence in the study area remained high compared to the national prevalence which is at 19.7% [13]. The high prevalence of malaria especially in the area of Hoima where the study was conducted has led to a high public expenditure both in the health system and the individual households on procurement of anti-malaria drugs, low productivity where caretakers are seen spending a lot of time attending to the sick children, high school dropouts, poverty, retardation among children and the increased morbidity and mortality due to severe anemia, hypoglycemia, and cerebral malaria as the common causes of death in children. Strategies like improving the general prevention and control measure of malaria infections by involving all the stakeholders in thecommunity and implementing the measures and not stopping at only having the knowledge on malaria by the community. Caretaker factors influence the prevalence of malaria. Based on the findings of the study on the caretaker's factors, demographic factors had no statistically significant relationship with malaria prevalence among children below the age of five years. Also, the caretaker's knowledge of malaria prevention; control, and transmission was not significantly associated with malaria prevalence among these children. The study findings are not different from the study that was done in Malawi which indicated an increase in prevalence in children below 5 years of age despite the caretaker's knowledge of prevention, transmission, and control of malaria infection [16]. Loss of appetite and loss of energy among the signs and symptoms of malaria were significantly related to high malaria prevalence. The caretaker's attitude toward the prevention of malaria was not significantly associated with malaria prevalence according to the study. This is contrary to the study carried out in Nigeria where caregivers did not have enough knowledge on how malaria is prevented, controlled, and even transmitted [17]. In another study that was carried out in Okomesi- Ekiti state by Oluwasago *et al.* [18], caregivers had good knowledge of 99.7% of the prevention and transmission of malaria. Though the caregivers had enough knowledge and good attitudes toward malaria prevention, it still showed that little was implemented on the side of preventive measures and this could be associated with the caretaker's socioeconomic status. This can be compared to a study that was done in

Gambia which showed that children from families with low socioeconomic status were more likely to suffer from malaria compared to those with a high socioeconomic status [19]. There could be new breeding sites that have not been identified for example congested rooms, under chairs, in bathrooms. In the case of self-contained houses or houses that have bathrooms near residents with stagnant waters may act as breeding sites for mosquitos. The other suspected reason maybe the lack of a boosting method of prevention like indoor residue spray (IRS) which had not been implemented in the study area as in other areas where similar studies have been done. For example, in Botswana, significant progress has been noticed in the reduction of malaria prevalencein children below the age of five through a sustained provision of both LLINs and IRS [20-27]. There is a need for the implementation of IRS in Hoima households as this is one of the recommended WHO strategies for eliminating malaria infection. Other reasons for the caretaker factors that could be influencing the prevalence of malaria in children below five years would include long distances to the health units, sharing of drugs among sick children, use of local herbs, and delay in seeking medical treatment. This is related to a study in Nigeria where 37% of caregivers preferred using herbs and only 17% could visit the dispensary for treatment of malaria [18-24]. It is worth noting that the use of herbs in the treatment of diseases is generally accepted globally. However, precaution is advised to avoid overdose and its accompanying complications [21, 28-30]. Caretaker's lack of knowledge on signs like loss of energy and loss of appetite as signs of malaria can affect proper diagnosis and treatment seeking for children who might present with no signs other than these two signs and this can lead to severe disease of complicated malaria increasing on hospital admissions and even mortality rates [29-32]. There is a need for proper and intense health education programs on the signs and symptoms of malaria.

Environmental factors influencing the prevalence of malaria in children below the age of five years

The environmental factor influencing malaria prevalence was garbage heaps which were seen to be significantly associated with malaria prevalence among children below the age of five years. A lot needs to be done as this has been proved in other studies as being a breeding site of mosquitoes. For example, in a study that was carried out in the Bata district, Equatorial Guinea, caregivers (24.77%) responded that garbage was a breeding site for mosquitoes in both urban and rural [23]. A similar study which was done in Bolifamba–Cameroon also proved that garbage heaps among other environmental factors like stagnant waters, and swampy/bushy surroundings were highly associated with malariainfection [24]. Apart from being a mosquito breeding site, indiscriminate garbage disposal can also be a breeding site for harmful bacteria that cause several intestinal disorders, especially in children [25-32]. There is a need for an organized system of environmental control programs to improve garbage disposal by the city council team and households should be sensitized on storage before it is disposed to a specified destination. Proper use of preventive measures like sleeping under bed nets is another strategy to avoid mosquito bites in children.

Household factors influencing malaria prevalence in children below the of age five years

Malaria prevalence in children below the age of five years in Hoima Regional Referral Hospital changed significantly over the different types of sources of light used in the individual households as presented earlier in the results. This probably is due to the failure of caretakers to utilize the preventive measures available with a misconception that mosquitoes don't bite when there is light and they do bite only in the dark. This is contrary to the study done in Uganda where children in households without electricity were more than one and a half times more likely to have malaria than those children in households with electricity [13]. Caretakers should beeducated to use preventive measures despite the type of source of light they use in their households. They should ensure that the children sleep under the mosquito nets despite the available type of source of light used in the household.

CONCLUSION

The prevalence of malaria among children below age five was high with half of the sample size of children testing positive. Knowledge about symptoms of malaria like loss of energy and loss of appetite were the caretaker factors that influenced the prevalence of malaria. Source of light was the only household factor that significantly influenced the prevalence of malaria among children below five years.

RECOMMENDATIONS

Enforcement of communication strategies and information dissemination to alter individual and community behavior and attitudes towards the control and prevention of malaria and insist that they should not only have knowledge of the transmission and control but also put it in practice or implement the acquired knowledge practically both individually and as a community at large. This should be delivered by well and appropriately trained community health workers, VHTs, and health unit staff in the local languages that are most understood and mainly to vulnerable households. Efforts should be made for these caretakers to know and understand every sign and symptom of malariaespecially those that significantly contributed to the high prevalence of malaria, for example, loss of appetite and loss of energy which are serious signs of severe malaria. The city council administrators should find a way to dispose of garbage to avoid heaps around the households and also find and strategize a way of involving the entire city council communityand the surrounding communities on how to avoid garbage in their households as this is another suitable breeding site for mosquitoes. The city council authorities should corroborate with the district

officials to lobby for electricity as a better source of light in the house as a variant source of light was seen to be significantly influencing malaria prevalence in children below the age of five years.

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