Malaria in Pregnancy: Prevalence and Risk Factors in the Mamfe Health District, Cameroon

ABSTRACT

Background and aim: Malaria remains a major public health problem and a global threat to humanity especially in sub-Saharan Africa. In a bit to combat malaria in Cameroon, about 8 million Cameroonian received the insecticide treating nets (ITNs) in 2011. However, the hospital-based reported prevalence of malaria still remains high. Our objective was to determine the community-based prevalence and possible risk factors of malaria in pregnancy in the Mamfe health district, south-west region-Cameroon.
Method: This was a community-based cross-sectional study involving 269 pregnant women in the Mamfe health district of Cameroon. Three out of the 5 health areas were randomly selected and pregnant women were later sampled by convenience and an interviewer-administered questionnaire was done. Also, the rapid diagnostic test (RDT) for malaria was done for all the participants. Data were analysed using Epi info version 3.5.4 at a level of error of 5%
Results: Of the 269 pregnant women who took part in the study, 106 (39.6%) were positive for malaria. Risk factors associated with developing malaria among them were: presence of mosquito breeding sites (OR=0.001, 95%CI; 0.02-0.27, p-value=0.001), not sleeping under Insecticide-treated nets (ITNs) (OR=0.01, 95%CI; 0.01-0.03, p-value=0.001), bushes around houses (OR=0.24, 95%CI; 0.07-0.79, p-value=0.02) and not taking intermittent preventive treatment (IPT) (OR=0.08, 95%CI; 0.01-0.49 p-value=0.01). Majority of participant knew malaria can be prevented by sleeping under ITNs 75% (95%CI; 69.9-80.5) and uptake of IPT 23.8% (95%CI; 18.8-29.2).
Conclusion: Prevalence of malaria in pregnancy in the Mamfe health district is higher than reported by the regional delegation of public health for the south-west. Risk factors include mosquito breeding sites, bushes around the compound, not taking IPT and none use bed nets are known to pregnant women. Interventions to fight against malaria in pregnancy should target intensification of health education on environmental hygiene and use of ITNs.

Keywords: Malaria, pregnancy, prevalence, risk factors, Mamfe, Cameroon

1. INTRODUCTION

Malaria remains a major public health problem and a global threat to humanity, especially in sub-Saharan Africa. According to reports by the World Health Organisation (WHO), about 207 million cases of malaria were reported in 2012, accounting for 627.000 deaths. Of these, 80% of the cases and 90% of deaths occurred in Africa[1]. Globally, the prevalence of malaria is 80% for the Africa region, 13% for South East Asia and 6% for the Eastern Mediterranean region[1, 2]. In 2005, the WHO assembly set as a target the reduction of malaria morbidity and mortality by 75% in 2015. This major public health problem remains part of Millennium Development Goal (MDG6) which targets to halt by 2015 and begin to reverse the incidence of malaria and other major diseases, given that malaria accounted for 12% of post-neonatal child death globally in 2010 and 21.7% of the same deaths in Africa. It is also central to MDG 4, to achieve a 2/3 reduction in the mortality rate among children less than 5 years of age between 1990 to 2015. Malaria control is additionally expected to improve maternal health, MDG5 and MDG1 eradicating extreme poverty and hunger[1].

The situation is similar in Cameroon as malaria still remains a major public health problem in Cameroon affecting children and pregnant women. Cameroon is a country with diversified vegetation and topological landforms where the natural environment covers three ecological and epidemiological zones; the equatorial region in which malaria is endemic with transmissions throughout the year, the guinea savannah or tropical region in which transmission is seasonal between 3 to 6 months and the Sahel savannah where transmission is seasonal with durations less than three months [3]. In Cameroon, more than 930 000 cases were reported in 2005. According to the NMCP 2008 annual report, more than 1 650 749 cases were reported and this is most predominant amongst pregnant women and children below 5 years. The clinical morbidity rate is estimated at 41%, the mortality rate at 2.2%[4]. According to the World Health Organization (WHO)'s World Malaria Report 2011, the total population of all the 19.6 million Cameroonians are stand at risk of malaria, with 71% of them living in high transmission areas and over 1.8 million suspected cases of malaria were recorded countrywide in 2010, along with over 4,500 recorded malaria-attributed deaths[5].

According to the Cameroon Demographic Health Surveys 2004, Malaria Indicator Cluster Survey (MICS) 2006 and the National Malaria Control Program (NMCP) 2008 annual report, malaria accounts for 35 to 43% of all deaths in health units, 50 to 56% of morbidity among children under the age of five, 40 to 45% of medical consultations and between 30% to 47% of hospitalisations. It is also the cause of 26% of absences in the workplace and 40% of the health expenditure of households [3, 4].

Plasmodium falciparum malaria is particularly dangerous in pregnancy and can have significant adverse consequences for both the mother and the developing foetus like stillbirth, abortion, low birth weight (LBW), maternal anaemia and death. Malaria is responsible for 49% consultations and 59% of hospitalisations during pregnancy leading to abortions, premature labour and deliveries as well as low birth weight, which exposes babies to early deaths and mothers during delivery [4, 6].

In a bit to combat malaria in Cameroon, about 8 million Cameroonian received the long lasting insecticide nets in 2011. In order for these nets to actually save a life, it needs to be used correctly and consistently. Malaria is transmitted by the bite of an infected female Anopheles mosquito. The mosquitoes find favourable breeding grounds made up of a pool of clean stagnant water usually in old motor tyres, open tins, potholes, dishes and waterlogging plants such as cocoyam and plantains. Environmental factors play a key role in the prevalence of malaria. It has also been documented that people who live in poorly constructed houses with bushes around and stagnant water stand a higher risk of acquiring malaria infection and are more at risk[7]. Consequently, considering the attributes of malaria in pregnancy and its risk to both the foetus and mother, it is therefore imperative to identify other possible factors which can be linked to the prevalence of malaria in pregnant women.

In spite of the above interventions, malaria in pregnancy (MIP) still remains a challenge and an important public health problem to public health authorities as the incidence of malaria in pregnancy is still high. In the South West Region, the prevalence of malaria in pregnancy stands at 22% and 21% in Mamfe health district[8]. It is possible that other factors contribute to the prevalence of malaria in pregnancy. Studies on the prevalence of malaria in pregnancy (MIP) carried out in Cameroon have been mostly clinic based [3, 9, 10].

As a result of this, the study is aimed to understanding the associated factors of the prevalence of malaria in pregnancy in Mamfe health district in order to generate information that would be used by the Malaria control unit (MCU) to improve on the malaria control interventions especially among pregnant women in Mamfe health district.

2. MATERIAL AND METHODS

2.1. Study design

This was a community based cross-sectional study conducted in three randomly selected health areas out of the five health areas of the Mamfe Health District. The study targeted all pregnant women who accepted through a written concern to be part of the study were included.

2.2. Sample size:

The sample size was determined using a single proportion for a cross-sectional survey[11, 12]. This study estimated that prevalence of malaria in pregnancy was 22% [13] in the South West Region (Regional Malaria Control Unit-South West) with 5% precision; with a 95% level of confidence and a design effect of 1.0 [13]. After accounting for 10% of non-respondents, the total sample size was 290 participants.

$$n = \frac{Deffect \times Z^2 pq}{d^2}$$

Where: n= sample size of the study, Z = standard normal deviate of 1.96, P= estimate of the prevalence of malaria in pregnancy, d= margin of error, q= (1-P) = 1- 0.22=0.78 and D_{efect} =1.0

To determine the number of pregnant women to be sampled in each health area, we used probability proportionate to the size as shown in table 1

Table 1: Determination of PW to be sample based on probability proportionate to the size

Health area	Population of PW	The proportion of the population of PW	Proportion sample
Kajifu	485	0.18	49
Kendem	401	0.15	40
Mamfe	1741	0.66	175
Total	2627	1	264

2.3. Study procedure

In the health area, a bottle spinning model was done to decide on the directional line. Convenient sampling was used at the final stage to select pregnant women. An interviewer-administered questionnaire was used to collect data from the pregnant women and a rapid diagnostic test (RDT) done for each participant by the interviewers who were all nurses. The questionnaire was pre-tested in Bachuo-Akagbe health area by the principal investigator to ensure its reliability and validity before it can be used in the study. Thick and thin films were prepared by the laboratory technician and examine microscopically for quality control. The microscopic results validated the results of RDT, those who were tested negative or positive by RDT were confirmed by microscopic examination.

2.4. Data analysis

Data was entered into Epi-info version 3.5.4 for statistical analysis and the level of error was set at 5%. Statistical significant association at the bivariate level were put in a multiple regression model to adjust for any possible confounders and results presented in the form of tables, pie-charts and graphs.

2.5. Ethical approval

Ethical approval was obtained from the institutional review board of the University of Buea to carry out the study in the Mamfe Health District. Administrative clearance was obtained from the Regional Delegation of Public Health for the South West Region and the District Medical Officer of Mamfe Health District. Participation in the study was voluntary and written informed consent was obtained from the pregnant woman before the administration of the questionnaire.

3. RESULT AND DISCUSSION

3.1. Results

3.1.1. Socio-demographic characteristics of the study population

A total of 290 pregnant women were recruited in the study, 269 questionnaires were completed and retained giving a response rate of 92.8%. One hundred and seventy-five 175(65.1%) of the participant were from Mamfe health area, 49(18.2%) from Kajifu and 45(16.7%) from quarters in Kendem health area. The mean age of 27.6 (Standard Deviation SD= 6.1) years. Majority of the respondent 170(63.2%) are living with a partner (cohabiting or married). One hundred and thirty-two, 132(49.1%) have attained secondary school, 112(41.6%) primary, 13(4.8%) university and 12(4.5%) have never been to school (table 2).

Table 2: Socio-demographic characteristics of the study population

Characteristics	**Frequency (%)**
Age	
15-20	57(21.2)
21-35	196 (72.9)
36 years plus	16 (5.9)
Health area	
Kajifu	49 (18.2)
Kendem	45 (16.7)
Mamfe	175 (65.1)
Marital status	
Cohabiting	64 (23.8)
Divorce	2 (0.7)
Married	106 (39.4)
Separated	8 (3.0)
Single	85 (31.5)
Widow	4 (1.5)
Educational level	
Non	12 (4.5)
Primary	112 (41.6)
Secondary	132 (49.1)
University	13 (4.8)

Occupation	
Civil service	16 (59)
Farming	108 (40.1)
None	79 (29.4)
Trading	12 (4.5)
Others	54 (20.1)
Religion	
Christian	265 (98.5)
Muslim	4 (1.5)

3.1.2. Prevalence of malaria in pregnancy

One hundred and six (39.41%), of pregnant women in Mamfe health district, were found to have *Plasmodium*. This gave the prevalence of malaria among pregnant women in Mamfe health district of 39.4% as demonstrated in figure 1.

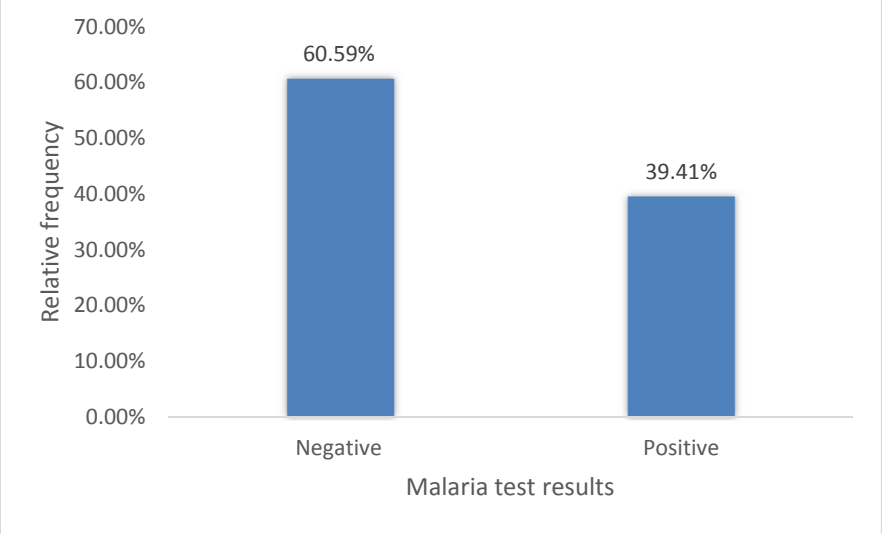

Figure 1: Prevalence of malaria in the Mamfe Health District

3.1.3. Risk factors to malaria in pregnancy

Age of the woman, state of the building, state of the compound, presence of mosquitoes breeding sites, possession of bed nets, and sleeping under Insecticides Treated Nets (ITNs) among others were seen to be statistically significant contributors to the development of malaria in pregnancy at the bivariate analysis (Table 3).

Associations found to be significant in the bivariate analysis (P-value <0.05) were included in the multivariate analysis to determine which factors best explained or predicted developing malaria in pregnancy. Table 4 shows that only presence of mosquito breathing sites,

sleeping under ITNs, the existence of bushes around houses and taking IPT were all found to be statistically associated with developing malaria in pregnancy.

Table 3: Risk factors to malaria in pregnancy in a bivariate analysis in the Mamfe Health District

Characteristics	**OR 95%CI**	**Positive No. (%)**	**Negative No.(%)**	**Chi-square (X^2)**	**P-Value**
Age					
<20 years		37(64.9)	20(35.1)	19.72	0.0001
21-35 years	3.82(2.05-7.09)	64(32.7)	132(67.3)		
36-50	4.07(1.24-13.36)	5(31.3)	11(68.7)		
Total		**106(39.4%)**	**163(60.6%)**		
Marital status					
Married	0.61(0.36-1.01)	60(35.1)	111(64.9)	3.18	0.074
Others		46(46.9)	52(53.1)		
Total		**106(39.4)**	**163(60.6)**		
Occupation					
Civil service/trading	1.59(0.89-2.84)	84(42.2)	115(57.8)	2.09	0.15
None/farming/others		22(31.4)	48(68.6)		
Total		**106(39.4)**	**163(60.6)**		
Educational level					
None/primary	0.95(0.58 -1.55)	48(38.7)	76(61.3)	0.001	0.927
Secondary/university		58(40.0)	87(60.0)		
Total		**106(36.4)**	**163(60.6)**		
Age of current pregnancy					
1st trimester		12(63.2)	7(36.8)	4.84	0.088
2nd trimester	2.79(1.03-7.61)	46(38.0)	75(62.0)		
3rd trimester	2.89(1.67-7.85)	48(37.2)	81(62.8)		
Total		**106(39.4)**	**163(60.6)**		

Characteristics	OR 95%CI	Positive No. (%)	Negative No.(%)	Chi-square (X^2)	P-Value
Number of pregnancies					
One		47(46.1)	55(53.9)	3.17	0.205
Two	1.67(0.89-3.16)	23(33.8)	45(66.2)		
Three and above	1.49(0.85-2.63)	36(36.4)	63(63.6)		
Total		**106(39.4)**	**163(60.6)**		
State of building					
Bad condition	3.48(1.99-6.06)	83(50.0)	83(50.0)	19.24	0.0001
Good condition		23(22.3)	80(77.7)		
Total		**106(39.4)**	**163(60.6)**		
State of compound					
Bushes around	3.83(2.28-6.44)	34(24.5)	105(75.5)	29.9	0.0001
No bushes around		72(55.4)	58(44.6)		
Total		**106(39.4)**	**163(60.6)**		
Presence of mosquito breeding sites					
Yes	6.82(3.88-12.01)	61(69.3)	27(30.7)	47.17	0.0001
No		45(24.3)	136(75.1)		
Total		**106(39.4)**	**163(60.6)**		
Possession of bed net					
Yes		64(29.8)	151(70.2)	39.68	0.0001
No	0.12(0.059-0.245)	42(77.8)	12(22.2)		
Total		**106(39.4)**	**163(60.6)**		
Sleep under ITNs					
Yes		9(6.3)	135(93.8)	116.09	0.0001
No	0.018(0.007-	58(78.4)	16(21.6)		

Characteristics	OR 95%CI	Positive No. (%)	Negative No.(%)	Chi-square (X^2)	P-Value
	0.044)				
Total		**67(30.7)**	**151(69.3)**		
Start ANC					
Yes		42(25.1)	125(74.9)	35.93	0.0001
No	0.199(0.12-0.34)	64(62.7)	38(37.3)		
Total		**106(39.4)**	**163(60.6)**		
Distance from health facility as a hindrance					
Yes	2.89(1.74-4.80)	61(54.0)	52(46.0)	16.3	0.0001
No		45(28.8)	111(71.2)		
Total		**106(39.4)**	**163(60.6)**		
IPT					
Yes		32(20.5)	124(79.5)	54.71	0.0001
No	0.132(0.08-0.23)	74(66.1)	38(33.9)		
Total		**106(39.6)**	**162(60.4)**		

Table 4: Covariates of developing malaria in pregnancy in a multivariate analysis in the Mamfe Health District

Covariates	AOR	95% CI	P-Value
Age (years)			
21-35			
Less than 20	0.39	0.08 - 1.98	0.26
36-50	8.9206	0.46 - 174.24	
Distance as a hindrance			
No			
Yes	0.8939	0.27 - 2.94	0.85
Possession of mosquito bed net			

Yes			
No	0.001	0.0001-1.000	0.97
Presence of mosquito breeding site			
No			
Yes	0.07	0.020- 0.270	0.0001
Sleeping under ITNs			
Yes			
No	0.01	0.001- 0.030	0.0001
Start ANC			
Yes			
No	0.067	0.103 - 4.390	0.680
State of building			
Good conditions of the building			
Bad conditions of the building	0.6349	0.192 - 2.099	0.457
State of compound			
No bushes around the compound			
Bushes around compound	0.2392	0.072 - 0.796	0.020
Take Fansidar (SP)			
Yes			
No	0.0670	0.009 - 0.495	0.01

3.2. Discussions

Malaria still remains a major public health problem. Several interventions have been put in place by public health authorities to fight malaria especially focusing on pregnant women and children less than five years who are the most vulnerable group. This study will help public health authorities and policymakers to link the interventions to combat this disease to the findings of this study.

3.2.1. Malaria prevalence

Results from this study found that the prevalence of malaria among pregnant women in Mamfe health district is 39.4%(95%CI; 33.5-45.5) which is higher than that reported in the district data 22.0% and 22.9% in a clinic-based study carried out in Sanaga-Maritime, Cameroon [8, 14]. However, a study conducted Ngali, a rural Cameroonian village with high transmission had a prevalence of 38%, which is similar to this study[15].

3.2.2. The risk factor associated with the development of malaria in pregnancy

Like several other studies, the results show that women age, gestational age, marital status, parity, level of education, family size, women occupation, can influence the risk of acquiring malaria among pregnant women.

3.2.2.1. State of the compound

Several studies have also justified that having houses surrounded by vegetation serves as a hiding ground for mosquitos. The study found that pregnant women living in houses surrounded with bushes have increased odds of having malaria. The findings are consistent with the findings of a study on individual and housing factors influencing the incidence of malaria in Ethiopia and in another study in Bomaka and Molyko in Cameroon[7, 16, 17].

3.2.2.2. Presence of mosquito breathing sites

The presence of breeding sites exerted a profound effect on malaria incidence among pregnant women in this study. The odds of having malaria was found to be high in pregnant women who have breeding closed to their residence compared to those without breeding sites (Adjusted OR=0.07, 96%CI; 0.02-0.27, p-value=0.001). The findings were endorsed by other studies in Uganda, Ethiopia, Cameroon and Sri Lanka. The studies found an increased risk of acquiring malaria among people living around mosquito breeding sites[7, 16–19].

3.2.2.3. Uptake of Intermittent Preventive Treatment (IPT)

In this study not taking Fansidar for IPT was found to be associated with the development of malaria among pregnant women. Pregnant women who did not take at least one dose of fansidar for IPT had increased odds of reporting that they had suffered from malaria compared to those who had swallowed at least one dose Fansidar for IPT. Similar findings were reported in a clinic-based study that the prevalence of malaria among pregnant women was associated with non- usage of Fansidar in pregnancy for IPT[20, 21]. The study also found that pregnant women who do not sleep under ITNs have a higher chance of acquiring malaria in pregnancy. The findings are similar to studies in Liberian children, this was also consistent with studies in Nigeria which reveal that only 10.4% of pregnant women sleep under ITNs with a risk of developing malaria among pregnant women[22, 23]

4. CONCLUSION

The study showed that the prevalence of malaria in pregnancy in Mamfe health district is higher than reported. Risk factors associated with developing malaria in pregnancy include: the presence of mosquito breeding sites, having bushes around the compound, not taking intermittent preventive treatment and not sleeping under insecticide-treated bed nets. The pregnant women know to sleep under insecticide-treated bed nets and the administration of intermittent preventive treatment as the methods of malaria prevention. A good number, however, did not know any method of malaria prevention in Mamfe health district.

CONSENT

Participation in the study was completely voluntary and a written informed consent was obtained from the pregnant woman before the administration of the questionnaire. For participants who are less than 21 years, consent and assent were obtained from the participant

ETHICAL APPROVAL

All authors hereby declare that the study has been examined and approved by the appropriate ethics committee and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki. Ethical approval was granted by the University of Buea Faculty of Health Science Ethical Review Board (FSH IRB).

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