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Knowledge-Attitudes-Practices about Malaria among Communities in Southern Benin

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ABSTRACT

Malaria still remains the main public health problem in Benin. We explored the determinants that influenced malaria treatment as well as protective behaviors, to generate a framework of useful ideas as alternative strategies against malaria. A cross-sectional survey of the knowledge, attitudes and practices (KAP) was conducted at Hozin, Vakon and Agblangandan districts in southern region of Benin. Descriptive statistics were computed and mixed logistic regression helped evaluating the relationship between frequency of each category of severity of malaria and sex group, educational level, treatment, means of self-protection against mosquitoes and identification of the cause of malaria. A significant proportion 750 (81.3%) ($p<0.001$) of participants stated that malaria was caused by mosquitoes. The respondents who mentioned sun as the cause of malaria, have trivialized more malaria in a proportion of about 59.30% (OR=2.67 [95% CI 1.61-4.44]) followed by those who have reported the cause of body weakness (43.68%) (OR=2.97 [95% CI 1.68-5.28]). Poor knowledge justifies the trivialization of the disease and poor management of malaria control means. National Malaria Control Programs should improve access to education, especially for women and could help improving prevention and control behaviours against malaria in communities.

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1. INTRODUCTION

Malaria is the most debilitating diseases in Africa and has a high negative socioeconomic impact on the continent [1]. It is the main public health problem in Benin, where the entire population is affected by high malaria endemicity. Malaria affects about 21.3% of children under five years and 69.2% of those five years and above. In 2015, the number of deaths due to Plasmodium vivax was between 1400 and 14 900 in sub-Saharan Africa, and between 1400 and 12 900 in others parts of the world [2]. Since 2007, several methods have been introduced and are currently used in Benin to control malaria through the President's Malaria Initiative (PMI), a program of the United States Agency for International Development. This initiative includes the use of control strategies targeting the parasite as well as the vector and the diagnostic tests of malaria. Despite these efforts, malaria is still a major public health problem in Benin. In 2013, the number of reported confirmed cases of malaria in Benin was 1 044 235 and the number of reported deaths

was 1869 [2]. Recent studies conducted in southern Benin indicate that misconception concerning the cause of malaria is high (70%) among heads of household [3].

Other potential factors such as the age of women, high level of instruction, material means of the household, the distance from shopping centers to households, season and weather were reported as important factors of use LLINs [4]. Moreover, the use of malaria vector control tools for other purposes has hampered the fight against the disease. Nevertheless, the Beninese government is still committed to its fight against malaria and has developed a five-year plan 2011-2015. However, getting people to regularly use the LLINs was one of its greatest challenges. A study reported a link between socio-economic and behavioral factors, community knowledge, attitudes and practices with malaria [5], but in Benin, there is a lack of information on the relationship between the perception of the cause of malaria and malaria treatment as well as malaria prevention. An understanding of keys factors that impact malaria treatment and prevention behaviors during epidemics is an important step in the design and realization of better control strategies of the malaria epidemic. We, therefore, investigated the perception of the cause and severity of malaria and factors that influenced protective behaviours against malaria and treatment of malaria among people in southern Benin

2. RESEARCH METHOD

The study area includes three districts; Hozin, Vakon, and Agblangandan, of the Oueme region in Benin (West Africa). These districts have 64,799 households with 62,890 children less than 5 years old across 174 villages [3]. The incidence of malaria in the Oueme region in 2006 was 143.8 cases/1,000 persons, making this region the second highest in the country [6]. The study area is characterized by a sub-equatorial climate, with 2 rainy seasons (April to July and October to November) and 2 dry seasons (August to September and December to March). The average temperatures per month are between 26 to 31°C. Each district has two ecological zones: a plateau area and a swampy zone where mosquito-breeding sites are particularly abundant during the rainy seasons.

Sampling was done based on socio-ecological characteristics of malaria prevention and management. Ten villages were randomly selected in each district to balance the micro-climates differences that be observed between the villages. We also conducted a random selection of houses where the survey has been conducted to overcome the selection bias. The sample size computed using (1) [7]:

$$N = \frac{t^2 \times p(1-p)}{M^2} \quad (1)$$

N=sample size estimated
t=95% confidence level using 1.9 as typical value
p= prevalence of malaria estimated at 12.1% in the area [8]
M= margin error of 5% using 0.05% as typical value

Hence, the computed sample size was N=154. By accounting for such contingencies as non-response and recording errors, 5%were added to the computed value. To account for the cluster effect, the resulting sample size was multiplied by 2 [9] thus, the final sample size was 308 individuals per district. Sample size calculation using appropriate methods that take into consideration inter clusters effect (inter villages effect) ensure the valid sample that represents as much as possible the population for inference purpose.

This cross-sectional survey was conducted over four weeks and included 923 adults (male and female) heads of household or representative adult household members (family unit). Questionnaires were administered to the respondent by trained interviewers. Before the administration of questionnaires, a verbal informed consent was obtained from the participants. This information obtained from participants remains confidential and is not accessible to non-members of the research team. The questionnaire included household demographics, common knowledge and health-seeking behavior related to malaria and the use of LLINs. The questionnaire also helps to collect information about knowledge of the cause, treatment, and prevention of malaria. Illiterate subjects were interviewed in “Ouémè”–the local language of the Oueme region. A focus group [10] involving opinion leaders (n=10) was organized in each village to understand people's behaviors related to malaria and mosquitoes

The data collected were counterchecked before entry into a computer using Microsoft Office Excel 2010 for windows. Descriptive statistics and cross-tabulations were estimated. The median-unbiased estimation and exact confidence interval with the mid-p test were used to estimate the odds ratio to detect variation in the response categories frequencies. We used the mixed logistic regression to assess the

relationship between the frequency of each category of severity of malaria and sex group, educational level, treatment, means of self-protection against mosquitoes and cause of malaria as predictors.

Use of generalized linear mixed regression was made to control any unconsidered factors that can mislead the relations observed. Use of multivariate analysis was made to control both possible confounding and effects modifier variables. All statistical analysis was performed with R 2.15.2 [11]. A 95% confidence interval and an alpha of 0.05 were chosen to indicate significance.

3. RESULTS

3.1. Knowledge about Malaria Gravity, Treatment, Means of Self-Protection And Cause Of Malaria

The study data in Table 1 shows that 923 participants were interviewed using a general questionnaire. Of these, 225(24.4%) were males, all heads of household were married (100%) while 545(59.0%) had no formal education (Table 1). Malaria as trivial disease was mentioned by 228 participants (24.7%) whereas 371 (40.2% and 324 (35.1%) recognized malaria as serious and potentially fatal disease respectively. Participants of the focus group considered malaria very dangerous, especially in households with children and identified malaria as a severe disease. The two major treatments available for any patient were traditional medicine and modern medicine. About 579(62.7%) participants use modern medicine whereas 344 (37.3%) use traditional medicine ($p<0.001$) as shown in Table 1. Focus group discussion showed that self-treatment was frequent. Reasons for self-medication included ability to recognize malaria and high treatment cost at health facilities. We found that various anti-malaria drugs such as chloroquine, quinine, (full meaning CTA) and antipyretics such as aspirin and paracetamol used to treat malaria were obtained from commercial pharmacies or drug stores in rural villages or cities. Alternative and/or herbal remedies used for treatment of malaria infusion of extracts from leaves and roots of the acacia plants, citrus, citronella, mangoes, papaya, eucalyptus and neem. Dosage of anti-malarial was decided based on people's experience. Heads of household usually administer antimalarial medication before to look for treatment in nearby health facilities in case of failure. Preference to start malaria treatment with alternative and /or herbal medicines before resorting to modern medicine was high among participant. Of the 923 respondents interviewed, a significant proportion of 622 (67.4%) respondents have insecticide-treated nets and 125 (13.5%) have ordinary nets ($p<0.001$). Despite the availability of mosquito nets in the area, only 136 (14.7%) respondents used insecticide-treated notes and sprays (double check this). About 40 (4.3%) stated that they used burning of local herbs to prevent mosquito bites. A significant proportion 750 (81.3%) ($p<0.001$) of participants stated that mosquitoes were the cause of malaria. However, 86 (9.3 %) and 87 (9.4%) attributed the cause of malaria to the sun and from body weakness respectively.

Table 1. Demographic Characteristics and Respondents' Knowledge and Practices about Malaria Measures

Variables	Agblangandan (%) (N=307)	Hozin (%) (N=308)	Vakon (%) (N=308)	Total (%) (N=923)	P-value
Sex group					
Female	232(75.6)	233(75.6)	233(75.6)	698(75.6)	<0.001
Male	75(24.4)	75(24.4)	75(24.4)	225(24.4)	
Educational level					
No	185(60.3)	180(58.4)	180(58.4)	545(59.0)	<0.001
Yes	122(39.7)	128(41.6)	128(41.6)	378(41.0)	
Marital status					
Married	307(100)	308(100)	308(100)	923(100)	
Malaria gravity					
Trivial	78(25.4)	76(24.7)	74(24)	228(24.7)	
Serious	125 (40.7)	123(39.9)	123 (40)	371 (40.2)	<0.001
Fatal	104(33.9)	109(35.4)	111(36)	324(35.1)	
Treatment					
Moderne medicine	201(65.5)	206(66.9)	172(55.8)	579(62.7)	<0.001
Traditional medicine	106(34.5)	102(33.1)	136(44.2)	344(37.3)	
Means of self protection against mosquitoes					
Burn local herbs	14(4.6)	12(3.9)	14(4.5)	40(4.3)	
ITN	205(66.8)	209(67.9)	208(67.5)	622(67.4)	<0.001
Ordinary Nets	43(14)	41(13.3)	41(13.3)	125(13.5)	
Insecticide sprays	45(14.7)	46(14.9)	45(14.6)	136(14.7)	
Cause of malaria					
Mosquitoe	256(83.4)	237(76.9)	257(83.4)	750(81.3)	
Sun	23(7.5)	46(14.9)	17(5.5)	86(9.3)	<0.001
Weakness	28(9.1)	25(8.1)	34(11.0)	87(9.4)	

ITN=Insecticide-treated nets

3.2. Associations between Trivial Perception of Malaria and Sex Group, Educational Level, Treatment, Means of Self-Protection and Cause of Malaria

Women have trivialized the disease in a proportion of about 31.95% against 2.22% for men (p<0.0001) shown in Table 2. It was observed that participants with formal educated were 20 times less likely to trivialize the disease compared to the non-educated. The proportion of the trivialization of the disease among the educated is about 2.65% versus 40% among uneducated (p<0.0001) shown in Table 2. Among those who consider malaria as a trivial disease, there was no difference between them in terms of the use of modern or traditional medical treatments (p=0.061). Those who reported using spray (OR=1.38 [95% CI 0.57-3.31]) as a means to fight against mosquito bites were those who trivialize malaria the most, followed by those who use local plants. Participants who use ordinary mosquito nets (OR=0.31 [95% CI 0.12-0.80]) and impregnated nets (OR=0.60 [95% CI 0.27-1.32]) were less likely to trivialize the disease shown in Table 2. Trivialization of malaria was high among respondents who mentioned the sun as the cause of malaria, 59.30% (OR=2.67 [95% CI 1.61-4.44]) followed by those who have reported body weakness as the cause of malaria (43.68%) (OR=2.97 [95% CI 1.68-5.28]).

Table 2. Associations of Trivial Perception of Malaria

Variables	N	Total	Trivial perception (%)	Ajust. OR	CI-95%(OR)	Pr (Wald test)	Pr (LR test)
Sex group							
Female	223	698	31.95	1.00	-	-	<0.0001
Male	5	225	2.22	0.06	[0.02-0.16]	<0.0001	
Educational level							
No	218	545	40.00	1.00	-	-	<0.0001
Yes	10	378	2.65	0.05	[0.03-0.11]	<0.0001	
Treatment							
Moderne medicine	142	579	24.53	1.00	-	-	0.061156
Traditional medicine	86	344	25.00	1.46	[0.98-2.17]	0.06115	
Means of self protection against mosquitoes							
Burn local herbs	14	40	35.00	1.00	-	-	
ITN	140	622	22.51	0.60	[0.27-1.32]	0.20344	0.000239
Ordinary Nets	22	125	17.60	0.31	[0.12-0.80]	0.01.546	
Insecticide sprays	52	136	38.24	1.38	[0.57-3.31]	0.47682	
Cause of malaria							
Mosquitoe	139	750	18.53	1.00	-	-	<0.0001
Sun	51	86	59.30	2.67	[1.61-4.44]	0.000147	
Weakness	38	87	43.68	2.97	[1.68-5.28]	0.000198	

CI=Confidence Intervals, Ajust. OR= Adjusted Odds ratio and ITN=Insecticide-treated nets

3.3. Associations between Perception Serious of Malaria and Sex Group, Educational Level, Treatment, Means of Self-Protection and Cause of Malaria

A participant's sex was not a deciding factor in the recognition of malaria as a serious illness (p=0.63631). It was observed that literate respondents considered more malaria as a serious disease compared to illiterate respondents with a proportion of 44.59% versus 33.86% (p<0.0001) shown in Table 3. Those who reported using modern medicine to treat malaria were more likely to recognize malaria as a serious disease 43.70% compared to 34.30% of those who used traditional medicine (OR=0.71 [0.53-0.95] p=0.021). Those who use the spray as a preventive measure against mosquito bites were less likely to recognize malaria as a severe disease (OR=0.46 [0.30-0.71] p=0.0004.13) compared to those who used insecticides treated nets shown in Table 3. The cause, which encourages recognition of malaria as severe in respondents is one that identifies the mosquito as the vector of malaria transmission in a proportion of 41.60%, against sun tracking 37.21% (OR=0.60 [0.37-0.97], p=0.0387794) and body weakness 31.03% (OR=0.53 [0.32-0.88], p=0.0143490).

Table 3. Associations of Serious Perception of Malaria

Variables	N	Total	Serious perception (%)	Ajust.OR	CI-95%(OR)	Pr (Wald test)	Pr (LR test)
Sex group							
Female	291	698	41.69	1.00	-	-	0.63631
Male	80	225	35.56	0.92	[0.65-1.30]	0.63631	
Educational level							
No	243	545	44.59	1.00	-	-	<0.0001
Yes	128	378	33.86	0.54	[0.40-0.72]	<0.0001	
Treatment							
Moderne medicine	253	579	43.70	1.00	-	-	0.02186
Traditional medicine	118	344	34.30	0.71	[0.53-0.95]	0.021860	
Means of self protection against mosquitoes							
Burn local herbs	15	40	37.50	0.81	[0.41-1.59]	0.532630	
ITN	258	622	41.48	1.00	-	-	0.00031
Ordinary Nets	62	125	49.60	1.44	[0.96-2.15]	0.074278	
Insecticide sprays	36	136	26.47	0.46	[0.30-0.71]	0.0004.13	
Cause of malaria							
Mosquitoe	312	750	41.60	1.00	-	-	
Sun	32	86	37.21	0.60	[0.37-0.97]	0.0387794	0.01048
Weakness	27	87	31.03	0.53	[0.32-0.88]	0.0143490	

CI = Confidence Intervals, Ajust. OR= Adjusted Odds ratio and ITN=Insecticide-treated nets

3.4. Associations between Perception Fatal of Malaria and Sex Group, Educational Level, Treatment, Means of Self-Protection and Cause of Malaria

More men (62.22%) recognized malaria as a fatal disease than women (26.36%) ($p < 0.0001$) shown in Table 4. The level of education was a factor favoring the recognition of malaria as a fatal disease in respondents. A proportion of 63.49% (OR=8.44 [5.97 to 11.93] $p<0.0001$) educated participants admitted that malaria is a fatal disease compared to a proportion of 15.41% for non educated participants. Medicinal practices and malaria treatment means were not decisive in the recognition of malaria as a fatal disease in the study populations ($p>0.05$). Those who pointed the mosquitos as the cause of malaria (39.87%) are more likely to recognize that malaria is a fatal disease. In contrast, those that do not recognize malaria as a fatal disease associated malaria transmission with the sun 3.49% (OR=0.18 [0.05 to 0.59] $p<0.004763$).

Table 4. Associations of Fatal Perception of Malaria

Variables	N	Total	Fatal perception (%)	Ajust.OR	CI-95%(OR)	Pr (Wald test)	Pr (LR test)
Sex group							
Female	184	698	26.36	1.00	-	-	<0.0001
Male	140	225	62.22	2.73	[1.88-3.97]	<0.0001	
Educational level							
No	84	545	15.41	1.00	-	-	<0.0001
Yes	240	378	63.49	8.44	[5.97-11.93]	<0.0001	
Treatment							
Moderne medicine	184	579	31.78	1.00	-	-	0.06668
Traditional medicine	140	344	40.7	1.38	[0.98-1.95]	0.066681	
Means of self protection against mosquitoes							
Burn local herbs	11	40	27.5	1.00	-	-	
ITN	224	622	36.01	1.68	[0.48-2.5]	0.26553	0.34406
Ordinary Nets	41	125	32.8	1.09	[0.47-2.92]	0.83984	
Insecticide sprays	48	136	35.29	1.17	[0.67-4.21]	0.74099	
Cause of malaria							
Mosquitoe	299	750	39.87	1.00	-	-	
Sun	3	86	3.49	0.18	[0.05-0.59]	0.004763	0.01035
Weakness	22	87	25.29	0.69	[0.38-1.25]	0.221619	

CI = Confidence Intervals, Ajust. OR= Adjusted Odds ratio and ITN=Insecticide-treated nets

4. DISCUSSIONS

This study aimed to assess the perception of the cause and severity of malaria and factors that influenced protective behaviors against malaria and treatment of malaria among people in southern Benin. Our finding indicates that a majority of respondents were women (75.6%). Indeed, the female is considered the one that stays at home while the males remain in the field according to the mores in southern Benin. This finding could be explained by the role of women in staying home and providing care to children. Men were less present due to farm work.

The high level 695(75.3) of the respondents perceived severity and fatality of malaria in the present study, justify the rate of using ITN (80.9%). These findings are similar with other studies which showed that malaria was the most serious disease in the community with more impact than trypanosomiasis [12]. In Nigeria, another study reported malaria as a common health problem of pregnant women with low knowledge, attitude and management practice [13]. Otherwise, the present study showed that, self-treatment was common. This was consistent with findings of other studies in Togo [14], Tanzania [15] and India [16].

The low utilization of health facilities observed in this study may be associated with the absence of drugs or doctors, high treatment cost, poor staff attitude long waiting time and distance from home [17]. Another reason is the convulsive manifestations of malaria which makes people believe in a spiritual origin among household heads. Indeed, in Africa, convulsions are commonly treated as spiritual issues [18]. The traditional medicine characterized by the use of infusion of the leaves and roots of the acacia plants, citrus, citronella, mangoes, papaya, eucalyptus and neem in various combinations is facilitated by the free availability of these plants in the wild whose ecology favors their development. Others findings reported the contrast in Tanzania where health facilities were most used to treat malaria [19].

LLINs are one the most recognized methods against mosquitoes in the present and other studies in Benin [3]. The high level of knowledge of mosquito bite as malaria cause (81.3%) ($p < 0.001$), is consistent with that has been reported by other studies which have showed that people who know the mechanisms of malaria transmission would benefit from health education campaigns and vector control interventions [20]. However, misconceptions about malaria still exist among respondents in this study, according to results reported by previous studies [3, 21]. To be effective health communication should permanently be improved to increase community awareness about malaria. The strong trivialization of malaria seen in women (31.95%) more than in men (2.22%) ($p<0.0001$) could be justified by the high frequency of women with their sick children at the point where they are accustomed to the disease. Otherwise the instruction level of women is lower than men and may affect their capacity to identify the signs and symptoms of malaria and their knowledge of available treatment.

Education plays an important role in malaria knowledge and adoption of serious measures of its control. Overall, mothers of children have very low levels of instruction in Benin. The Benin Ministry of Education leads a favorable struggle to promote the education of girls which will be the mothers of our children. It's the low enrollment rate observed among women who justify that 62.22% men recognize malaria as a fatal disease than women (26.36%) ($p<0.0001$). A study conducted in rural Ethiopia identified literacy as a significant factor for women to believe that malaria can be preventable [22]. Furthermore, the instruction of young girls who are future mothers is likely a key element to improve children health through direct teaching of health knowledge [23]. Moreover, these data show that educated were 20 times less likely to trivialize the disease than non-educated and those who use nets are those who trivialize the least disease. The level of education was a factor favoring the recognition of malaria as a fatal disease in respondents. A proportion of 63.49% (OR=8.44 [5.97 to 11.93] $p<0.0001$) educated admit that malaria is a fatal disease compared to a proportion of 15.41% among non-educated. Similarly, previous reports indicated that best malaria practices are directly associated with the level of instruction [24] and that the increasing level of instruction is a protective element against malaria morbidity [25].

In another study in Haiti, high level of knowledge on the role of vectors in malaria transmission and low ownership and use of LLINs were observed [26]. But in another study conducted in Mexico, around half of the population have linked malaria with mosquito bites even though the majority of villagers own and use ITNs during all the year [27]. In all instances the health education of children at an early age, would contribute favorably to the success of the fight against malaria. In the present study the respondents who mentioned sun as the cause of malaria, have trivialized more malaria (OR=2.67 [95% CI 1.61-4.44]) followed by those who have reported the cause of body weakness (OR=2.97 [95% CI 1.68-5.28]). But those who pointed the mosquitoes as the cause of malaria (39.87%) are those that best recognize malaria as a fatal disease. This finding was also observed in other studies that demonstrated that people do not take significant preventive measures against vectors even if their do not perceive the mosquito as the responsible of malaria transmission [22].

The importance given to the severity of the disease depends on the knowledge of this disease. Poor knowledge justifies the trivialization of the disease and increases malaria cases among the least educated. A study conducted in Mvomero district, Tanzania, by Mboera [28] reported that people with low knowledge on malaria have two times more malaria cases in their households compared to those with high knowledge. Moreover, the observations of the present study on treatment and prevention behavior, is similar with the results of other studies [29] that reported good knowledge about malaria as a precondition of an appropriate treatment and preventive measures Indeed, the respondents who reported using modern medicine to treat the disease increasingly recognized malaria as a serious disease in a proportion of 43.70% against 34.30% for those who used traditional medicine (OR=0.71 [0.53-0.95] p=0.021). It is important to recall that modern

medical practices observed in these respondents are self-medication. The drug sources are the street sellers. Self-treatment based on drugs from official stores has been reported by several authors in malaria-endemic countries [15]. Self-medication could be associated with the observed failure to control malaria despite several methods used by the National Malaria Control Program of Benin. Self-medication could also contribute to the development of drug resistance. However, self-medication cannot be completely incriminated, because it often contributes to saving lives. It has to be improved by educating the rural community on the correct use of drugs [30]. Potential limitations of this study include other possible determinants of malaria knowledge such as information systems, education, and communication, reasons for non-use of mosquito nets, the proportion of nets that hung and economic conditions of the population that were not assessed. In addition, the data were collected from households only. In fact, this study had specific goals, which is to show the relationship between the trivialization of malaria, illiteracy and control practices. Currently, a part of mosquito nets distributed to protect against malaria are unfortunately used for other purposes, such as fishing, protection of agricultural crops and it is important to have more information on knowledge, attitudes, and practices of people regarding malaria in order to propose efficient solutions for a good use of donated mosquito nets.

Our study revealed that mothers' education is fundamental to the success of the measures for malaria control. With global efforts to control malaria, programs should not only focus on delivering equipment but on their maintenance with messages of awareness for behavioral change conducive to the reduction of morbidity and mortality due to malaria. Promoting girls' education should be associated goal of malaria control programs. Practical preventive control and treatment of malaria are more likely to be effective when implemented by women with a better knowledge of malaria.

5. CONCLUSION

Despite high levels of knowledge about malaria among respondents, significant gaps relating to practices and misconceptions still remain. Poor knowledge justifies the trivialization of the disease and bad management of malaria control means. Based on the findings in this study, National Malaria Control Programs should improve access to education, especially for women and could help in improving preventive and control behavior against malaria amongst the communities.

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