



Assessment of Knowledge and Attitude Regarding Risk Factors of Malaria Among Caregivers of Under-Five Children in the Buea Health District, South West Region, Cameroon

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Authors' contributions

This work was carried out in collaboration among all authors. Author HN, conceived and designed of the study, coordinated, supervised the overall implementation of data collection. Author MAA, conceived, designed the study and the data collection author TTC, collected the data and overseed the methodology and survey composition ALWN, performed the data analysis and reviewed the manuscript. Author BT performed the data analysis and wrote the first draft of the manuscript. Author DSN designed the study and managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Aims: The study measured the level of knowledge and attitudes towards malaria and examined associated factors among caregivers of under-five children.

Study Design: The study was community-based, descriptive cross-sectional.

Place and Duration of Study: The study was carried out in Buea Health District (BHD) from February to June 2020.

Methodology: Data were obtained through face-to-face interviews with the caregivers of under-fives. The above mean scores were used to determine the level of knowledge. The attitude levels were measured by using 3-point Likert scales. Univariate and multivariate logistic regression analyses were performed to identify risk factors associated with knowledge and attitude. SPSS software version 20.0 was used for analysis.

Results: Out of the 390 respondents, 69.5% of them had a neutral attitude. Meanwhile, 27.7 % of participants carried a favorable attitude towards malaria and only 2.8 % of them had an unfavorable attitude, Caregivers of under-five children who scored below the mean score were 25.1 % which was considered having poor knowledge and above the mean score was 74.9% which was considered good knowledge. In the multivariable logistic analysis, caregivers with a primary school level of education were 4.1 times (AOR = 4.1, CI = 1.486-11.102) times more likely of receiving a high malaria knowledge score as compared to those with no formal education. Factors associated with caregiver's attitude level towards malaria risk were educational level and marital status which showed significant associations in the univariate analysis

Conclusion: Caregivers of under-fives displayed a good knowledge of malaria risk factors. However, in these endemic areas for malaria, caregiver attitude was found to be unenthusiastic and unresponsive, and this poses additional challenges in reaching the malaria elimination goal. Thus, suggesting that educational messages during the campaign should be contextual to reach out to local communities to trigger a positive behavioural change.

Keywords: Caregivers; malaria; knowledge; attitude; and under-five children.

1. INTRODUCTION

Malaria remains a scourge to the socio-economic development of sub-Saharan African countries. In 2019, there were an estimated 228 million cases of malaria worldwide which resulted in 409 000 deaths [1]. Approximately, 3.3 billion individuals are at the highest risk of acquiring malaria in the WHO Africa region. Children less than 5 years of age and pregnant women are the most vulnerable groups affected by the disease [2]. In 2018, under-five children accounted for 67% (272 000) of all malaria death worldwide [1] thus, the disease remains a major killer of children, taking the life of a child every 2 minutes [3]. In Africa, about 285 000 children died before their fifth birthdays in 2016. Globally, an estimated 1.5 billion malaria cases and 7.6 million malaria deaths have been averted in the period 2000–2019. This was a period of unprecedented success in malaria control that helped shape the global response to the disease over the last 2 decades [1].

Cameroon has an estimated 3% of all global malaria cases in 2018, with 18 million people (about over 90% of the population) being at risk of the infection. Cameroon has initiated measures to achieve malaria elimination through, early diagnosis, artemisinin-based combination(ACT) therapies at a subsidized cost for first-line treatment for uncomplicated malaria cases, intermittent preventive therapy with sulphadoxine-pyrimethamine (SP) for expectant

mothers, free distribution of LLITNs(Long Lasting Insecticide Treated Nets) to pregnant women and children under-five children and the subsidizing of the cost of LLITNs for other people [4]. Besides, diagnosis and treatment are free for under-five children with severe and uncomplicated malaria. Because the Far North and North Regions of Cameroon have a disproportionately higher number of malaria cases and deaths compared to the other Regions, the NMCC (National Malaria Control Committee) and its partners are now implementing seasonal malaria chemotherapy (SMC) in the aforementioned regions of the country [1]. As a result of all these efforts, the number of cases fell by 3% from 254 to 245 per 1000 of the population at risk. Likewise, the mortality rates also fell by 16% between 2015 to 2018 from 0.53 to 0.44 per 1000 of the population at risk [5].

Despite the considerable reduction in the prevalence of malaria in under-fives [6], the disease is still responsible for 26% of consultations, 46% of hospital admissions, and 53% of deaths among under-five children in Cameroon [7]. For instance, the study by Chiabi [8] revealed a significant burden of severe malaria (26.10%) among children at the Yaoundé Gynaeco-Obstetric and Paediatric hospital. Children under-fives are more predisposed to severe malaria due to their immature immune systems. In Cameroon it is now a national policy to offer free malaria treatment for children under

five years of age. However, recent reports indicated that 58% of caregivers surveyed were not aware per that national policy changed [9].

Home management of malaria is one of the cornerstones of malaria case management that falls within the frameworks of Roll Back Malaria (RBM) [10]. The RBM strategy aims to increase the capacity of caregivers to recognize malaria illness promptly and take early appropriate action. As recommended by the World Health Organization, one of the core tools of malaria control programs is training in the community health workers capable of managing uncomplicated malaria cases and providing adequate advice to families, thus, the success of such interventions depends largely on the knowledge and attitude of caregivers of young children regarding the disease. A delay in appropriate health-seeking from the onset of symptoms of uncomplicated malaria in an under-five child may lead to severity of the disease with an increased possibility of fatality [11]. For instance, home management of fever has significantly contributed to the decrease of malaria prevalence and related mortality among under-five children in Burkina Faso and Nigeria by providing suitable and efficacious care of under-five children in these endemic areas of malaria [12,13]. Caregivers of under-fives must recognize early symptoms of malaria, more importantly fever, and consequently seek medical care, to obtain and use recommended drugs appropriately [14]. This recognition, in the background of home malaria management (HMM) has become one of the key strategies to achieve malaria elimination targets [15].

Caregivers' adequate knowledge of malaria treatment, prevention, and transmission measures is essential to interrupt the cycle of transmission. Lacking knowledge on malaria treatment guidelines, preventive measures and inappropriate use of antimalarial drugs have been reported from Cameroon [16].

However, information concerning caregivers' knowledge about childhood malaria is scarce in Cameroon. The study set out to describe the knowledge and attitude of caregivers regarding preventive measures, use of antimalarials, and treatment of children with malaria in BHD. Therefore, the study could contribute to understanding treatment-seeking behaviors that are relevant to formulate malaria control policies targeted at caregivers of under-five children.

2. MATERIALS AND METHODS

2.1 Study Area

2.1.1 Buea health district

Buea is the capital of the South West Region of Cameroon. Buea Health District is made up of both rural and urban communities with a population of 133,092 inhabitants [17]. The BHD encompasses seven Health Areas with 21 both private and government own health facilities.

2.2 Study Population

The study population comprised caregivers of children aged 6–59 months in the 5 selected health areas in the BHD namely Buea road, Molyko, Bokwongo, Muea, and Buea town.

2.3 Study Design

A community-based, descriptive cross-sectional study was carried out from February to June 2020. A structured questionnaire was used to collect data on caregivers' knowledge and attitude towards malaria in under-five children.

2.4 Sample Size Determination

The sample size was determined using the formula for estimating a single population [18]. $N = Z^2 pq / e^2$ Sample size calculation was based on the prevalence of 58.2% of households that have proper knowledge about malaria recorded in South-West Nigeria [19]. where n is the sample size required, $z = 1.96$ is the confidence level test statistic at the desired level of significance, $p = 95\%$ confidence level, and considering a 5% marginal error. and 10% adjustment for non-response rate. The required sample size was 412.

2.5 Sampling Technique

A simple random sampling technique was used to select 5 out of the 7 health areas that made up the Buea Health District. In each randomly selected health area, households with at least an under-five child were visited. The procedure that was used to select each household was as follows; members of each research team stood at the junction or roundabout of the community and spin a bottle, the direction of the head was chosen. Each household with an under-five child was visited. In cases where the target was not

met, the team returns to the roundabout and take the opposite direction following the same technique until the target for the community was met. To have the sample population of each selected health area, a probability proportionate to size calculation was performed [20].

2.6 Operational Definition

Knowledge: In this study, knowledge refers to the correct responses obtained from mothers/caregivers of under-five children on the causative agent and route of transmission of malaria
Attitude: It refers to the way of thinking, acting, and behaving towards risk factors of malaria by respondents.

Risk factors of malaria: It refers to particular habits, behaviors, circumstances, or conditions that increase a person's risk of getting malaria.

2.7 Data Collection Tools

The tools developed and used for data collection were pre-tested structured questionnaire and Likert scale. The structured questionnaire was used to collect socio-demographic data and knowledge regarding risk factors of malaria while the Likert scale was used to assess the caregivers of under-five children 's attitudes regarding risk factors of malaria.

2.8 Questionnaire Administration

A total of 420 questionnaires were prepared in English, pre-tested to determine its clarity and comprehension before use. The questionnaire was administered through face-to-face interview by the research team assisted by the Nurses from the Antenatal Department of the health areas. However, those that could not express themselves in French and English languages were interviewed in Pidgin (Local English). Respondents included in the study were caregivers of under-five children.

2.9 Assessment of Malaria Knowledge

Regarding caregivers' knowledge of malaria, a knowledge Score was adopted allowing for categorizing respondents as poor or good knowledge. These included caregivers' correct knowledge on malarial transmission, disease symptoms, prevention, and use of LLITNs. To achieve a maximum score the respondents had to know that malaria is transmitted by a mosquito

(1 point), could cause symptoms such as fever (1 point), as well as headache, body pains, vomiting, anemia, or convulsions each (1 point). The respondent also needed to know that LLITNs could be used to prevent malaria (1 point), as well as indoor spraying (1 point), chemotherapy (1 point), and mosquito coil (1 point). Altogether, the highest possible score was 9 points. Participants who obtained a total attitude score above ≥ 5 were categorized as "good knowledge" while those with a total attitude score < 5 were classified as "poor knowledge" [21].

2.10 Assessment of Malaria Attitude

Concerning attitude, the tool which consisted of a scale was made up of 10 questions. The attitude was assessed by a 3-point Likert scale and each of these items was equally scored; response options ranged (1= never; 2= sometimes; 3= always). The attitude was arbitrarily classified as favorable attitude, Neutral and unfavorable [22].

2.11 Statistical Analysis

Once recorded, the data were entered into an Excel database and exported to SPSS 20.0 for analysis (SPSS Inc., Chicago, IL, USA). Simple frequencies and proportions were used to describe the socio-demographic and the Chi-square (χ^2) test was used to test the association between knowledge and attitude and the socio-demographic factors. Logistic regression models were used to identify factors associated with caregivers' knowledge of malaria such as mode of transmission, causative agent, and their attitude towards the disease. The differences were considered to be statistically significant when the P-value obtained was less than 0.05.

3. RESULTS

3.1 Socio-demographic Characteristics of the Caregivers of Under-five children

Out of the 420 questionnaires administered, only 390 were valid (properly completed), thus making the response rate of 92.8%. Table 1 provides a summary of the characteristics of the caregivers of under-five children. More than half of caregivers were aged 20-29 years 56.4%, predominantly practice Christianity 93.6% and were self-employed 30%. As regards the type of

house, participants in their majority reside in block or cemented houses 82.3% (313/390). Aside from this, the vast majority of them had an average family size of 3 children 79.0%. Regarding sources of information related to malaria, their main sources were health workers 94.6 % and television 74.1%.

3.2 Malaria Knowledge Score

The mean score of the participant's knowledge was 4.5. Caregivers of under-five children who scored below the mean score were 25.1% (98/390) which was considered poor attitude and above the mean score was 74.9% (292/390) which was considered good attitude.

3.3 Attitude of Caregivers of Under-five Children Towards Malaria

In the present study, the means were significant when ranging from 1-1.67 meaning unfavorable attitude. From 1.67 to 2.33, it means neutral while from 2.33 to 3.00, it means a favorable attitude. The attitudes of caregivers of under-five children towards malaria risk are presented in Table 2, which revealed that the mean score of item 'the use of LLITNs' (mean =2.63 ±.515 SD) ranked the highest followed by 'Good personal hygiene (Mean=2.45±.646 SD). The least mean score for the items 'mosquito coil' (mean =1.71±.665 SD)' and 'Hand killing of mosquitoes' (mean =1.81±.688 SD).

Table 1. Socio-demographic characteristics of respondents

Variable	Category	Number(n)	Frequency (%)
Age group (years)	20-29 years	220	56.4
	30-39 years	130	33.3
	40-49 years	36	9.2
	≥50	4	1.0
Religion	Christian	365	93.6
	Muslim	25	5.2
Marital status	Married	203	52.1
	Single parent	92	23.6
	Co-habiting	75	19.2
	Divorced	15	3.8
	Widow	5	1.3
Educational level	Secondary School	97	24.9
	High School	88	22.6
	Primary School	44	11.3
	No formal education	2	.5
	University	106	27.2
Occupation	Vocational Training	53	13.6
	Unemployed	76	19.5
	Business	106	27.2
	Civil servant	25	6.4
	House Wife	35	9.0
	Self-employed	117	30.0
House type	Private sector	31	7.9
	Block	313	80.3
Number of children	Plank	77	19.7
	1-3	308	79.0
Source of information	4-7	82	21.0
	Husband	140	35.9
	Friends	256	65.6
	Television	289	74.1
	Health Workers	369	94.6
	Information leaflet	260	66.7
	Radio station	267	68.5

Table 2. Descriptive statistics on the caregivers of under-five children attitude towards malaria

Statements	N	Minimum	Maximum	Mean	Std. Deviation
LLITNs	390	1	3	2.63	.515
IRS	390	1	3	2.02	.573
Prompt treatment	390	1	3	2.33	.587
Mosquito coil	390	1	3	1.71	.665
Good personal hygiene	390	1	3	2.45	.646
Healthy diet	390	1	3	2.01	.706
Keeping windows and doors closed	390	1	3	2.15	.546
Chemotherapy	390	1	3	2.29	.567
Hand killing of mosquitoes	390	1	3	1.81	.688
How often the under 5 child sleeps under LLITN	390	1	3	2.41	.688
Valid N (listwise)	390				

Table 3. Frequency distributions of respondents of attitude towards malaria

Characteristics	Attitude level n(%)		
	Unfavorable	Neutral	Favorable
Age group			
20-29 years	4(1.8)	141(64.1)	75(34.1)
30-39 years	5(3.8)	100(76.9)	25(19.2)
40-49 years	2(5.5)	27(75)	7(19.4)
≥50	0(0.0)	3(75)	1(25)
Occupation			
Unemployed	1(1.3)	50(65.8)	25(32.9)
Business	5(4.7)	82(77.4)	19(17.9)
Civil servant	0(0.0)	14(56)	11(44)
House Wife	0(0.0)	22(62.8)	13(37.2)
Self employed	3(2.6)	80(63.4)	34(29.0)
Private sector	2(6.4)	23(74.2)	6(19.3)
Educational level			
Secondary School	3(3.1)	67(69.1)	27(27.8)
High School	5(5.7)	57(54.8)	26(29.57)
Primary School	0(0.0)	33(75)	11(25)
No formal education	0(0.0)	1(50)	1(50)
University	1(0.9)	74(69.8)	31(29.2)
Vocational Training	2(3.7)	39(73.6)	12(22.6)
Marital status			
Married	6(2.9)	137(85.2)	60(29.5)
Single parent	1(1.1)	63(68.5)	28(30.4)
Co-habiting	3(4)	55(7.3)	17(26.7)
Divorced	1(6.6)	12(80.0)	2(1.3)
Widow	0(0.0)	4(80.0)	1(20.0)
Number of children			
1-3	9(2.9)	206(66.8)	93(30.2)
4-7	2(2.4)	65(79.3)	15(18.3)
Religion			
Christian	10(3.7)	252(69.1)	103(28.5)
Muslim	1(4.0)	19(76.0)	5(20.0)
House type			
Block	11(3.5)	216(69.0)	86(27.5)
Plank	0(0.0)	55(71.4)	22(28.6)
Total	11(2.8)	271(69.5)	108(27.7)

3.4 Overall Attitude Score

The maximum attitude score is determined for each caregiver of under-five children by adding up the scores across the 10 attitude items or questions. The right answer scored 3 points and the wrong answer 1 point following the Likert scale. Out of the 390 respondents, the majority of caregivers had a neutral attitude 69.5%. Meanwhile, 27.7 % of participants carried a favorable attitude (Table 3) and only 2.8 % of them had an unfavorable attitude regarding risk factors of malaria.

3.5 Distributions of Respondent's Attitude towards Malaria

The proportion of caregivers of under-five children that had a neutral attitude towards malaria were highest on the age group 30-39 years 76.9%, business 77.4%, with a primary level of education 75% and married 85.2% as depicted in table 2.

3.6 Analysis of Factors Associated with Malaria Knowledge score

The univariate analyses showed evidence for negative associations between age group ($r = -.033$), number of children ($r = -.009$) and educational level ($r = -.041$) and level of knowledge of malaria risk. Multiple logistic regression analysis was performed to identify factors associated with caregivers of under-five knowledge of malaria. Participants' levels of education, occupation and marital status were found to have significant associations. In that regard, caregivers with a primary school level of education were 4.1 times (AOR = 4.1, CI = 1.486-11.102) times more likely of receiving a high malaria knowledge score as compared to those with no formal education (Table 4).

Factors associated with caregiver's attitude level towards malaria risk were educational level and marital status which showed significant associations in the univariate analysis. All variables of the study tested for association with unfavorable neutral and favorable attitude regarding malaria using multivariate logistic regression showed no significant association.

(Table 5). The attitude towards malaria risk factors was also significantly associated with poorly constructed houses and with open eaves such as plank houses.

4. DISCUSSION

Proper understanding of caregivers of under-five children's knowledge and attitude about malaria transmission, prevention, and control holds the key to the success of a control program aiming at the reduction in malaria morbidity and mortality in under-five children [21]. The present study provides up-date information about the level of malaria knowledge and attitude among caregivers of under-five children in the BHD. The overall knowledge of malaria among caregivers of under-five children was found to be adequate (74.9%). These findings are similar to a recent study, conducted in Douala (Cameroon) which showed that of 2507 employees surveyed, 90.7% of the respondents knew that mosquitoes were vectors that transmit malaria [23]. Also, Our findings of the high level of knowledge concord with previous studies in Cameroon [24]. However, there are still lower than observed by jumbam [25] in Zambia where 91%, of participants, reported that malaria could be transmitted by the bite of an infected female anopheline mosquito. The level of knowledge in the present study may be attributed to the positive effects of the periodic distribution of LLITNs have been going on since 2012 and the implemented a national malaria communication campaign under a unified brand, the "KO Palu" (Knock Out Malaria). The upgraded knowledge of caregivers of under-fives concerning malaria might also be attributed to the fact that in Cameroon, about 90 % of pregnant women receive the first dose of SP, while about 64 % take the complete dose [26] following WHO recommendations of at least three free SP doses between the 16th and the 36th weeks of pregnancy alongside the use of ITNs have been implemented in Cameroon [27]. ANC is the platform where these interventions are delivered alongside talks about malaria knowledge.

Despite sufficient knowledge of malaria risk factors, the behavioral attitude of caregivers of under-fives was quite unsatisfactory. Caregivers of under-fives showed an unenthusiastic attitude towards malaria risk. One of the many decisions made by caregivers which had consequences on family wellbeing, were prompt treatment and the use of chemotherapy. As revealed in this study, the majority of caregivers do not see anything wrong with delayed treatment and the non-use of chemotherapy at the onset of symptoms in their under-five children. WHO and UNICEF have recommended the need to strengthen the

Table 4. Univariate and multivariate analysis of factors associated with malaria knowledge score

Characteristics	Level of knowledge		COR	95%CI	P-value	AOR	95%CI	P-value
	Good* n (%)	Poor n(%)						
Age group (years)								
20-29	163(74.1)	57(25.9)	1.049	.107-10.289	.967		Reference	
30-39	96(73.8)	34(26.2)	1.063	.107-10.563	.959	2.574	.217-30.523	.454
40-49	30(83.3)	6(16.7)	.600	.053-6.795	.680	2.226	.189-26.282	.525
≥50	3(75)	1(25)				1.444	.107-19.500	.782
Religion								
Christian	275(75.4)	90(24.6)	.695	290-1.666	.415		Reference	
Muslim	17(58)	8(32)				.897	.339-2.376	.827
Occupation								
Unemployed	58(76.3)	18 (23.7)	.892	.341-2.337	.816		Reference	
Business	80(75.5)	26(24.5)	.934	.373-2.340	.885	.684	.239-1.957	.479
Civil servants	18(75)	6(25)	1.118	.341-3.665	.854	.658	.245-1.767	.406
House wife	26(74.2)	9(25.7)	.995	.330-3.006	.993	1.064	.310-3.651	.921
Self employed	87(74.4)	30(25.6)	.991	.401-2.451	.985	.566	.167-1.925	.362
Employed in the private sector	23(72)	8(25)				.627	.237-1.663	.348
House type								
Block	238(76.8)	72(23.2)	.740	.426-1286	.285		Reference	
Plank	54(70.2)	23(29.8)				1.285	.628-2.628	492
Educational level								
Secondary School	76(78.4)	21(21.6)	1.188	.513-2.754	.688	1.240	.512-3.006	.634
High School	61(69.3)	27(30.7)	1.903	.835-4.338	.126	2.000	.845-4.734	.115
Primary School	25(56.8)	19(43.2)	3.268	1.315-8.124	.011	4.062	1.486-11.102	.006
No formal education	2(100.0)	0(0.0)	.0	0.0-0	.		Reference	
University	85(80.5)	21(19.8)	1.062	.460-2.455	.887	.992	.413-2.385	.986
Vocational Training	43(81.1)	10(18.9)						
Marital status								
Married	147(72.4)	56(27.6)	11x10 ⁶	17.4-19.71	.0001		Reference	

Characteristics	Level of knowledge		COR	95%CI	P-value	AOR	95%CI	P-value
Single parent	70(76.1)	22(23.9)	98 x10 ⁶	17.229-19.580	.0001	69 x10 ⁶	20x10 ⁶ -23x10 ⁷	.000
Co-habiting	60(80)	15(20)	78 x10 ⁶	16.962-19.389	.0001	53 x10 ⁶	15 x10 ⁷ -19 x10 ⁷	.000
Divorced	10(66.7)	5(33.3)	15 x10 ⁶	18.869-18.869	.0001	49 x10 ⁶	1319 x10 ⁶ -1719 x10 ⁷	.000
Widow	5(100)	0(0.0)				95 x10 ⁶	95 x10 ⁶ -95 x10 ⁷	.000
Number of children								
1-3	230(74.7)	78(25.3)	1.051	.597-1.851	.862		Reference	
4-7						1.285	.628-2.628	.492

*The reference category is: Good

Table 5. Association between caregiver’s attitude and socio-demographic characteristics

Variables	Univariate Analysis		Multivariate analysis		
	n (%)	COR (95%CI) p-value	Unfavorable AOR (95%CI) p value	Neutral	Favorable
Age group (years)					
20-29	220(56.4)	1.41 (-1.815-2.492) .758		Reference	Reference
30-39	130(33.3)	0.65(-2.605-1.743) .698		10.587 (.341-328.385) .178	20.490 (1.697- 247.426) .018
40-49	36(9.2)	0.61(-2.771-1.776) .668		5.589 (.205-152.472).308	5.841 (.578-59.072) .135
≥50	4(1.0)			3.159(.245-40.776) .378	4.060 (4.060-4.060)
Occupation					
Unemployed	76(19.5)	2.34(-.120-1.823).086		Reference	Reference
Business	106(27.2)	1.00(-.958-.966) .994		3.575 (211-60.483) .377	5.984 (.316- 113.464) .233
Civil servant	25(6.4)	3.78 (.174-2.490) .024		1.783 (.262- 12.138) .554	1.581 (.195-12.818) .668
House Wife	35(9.0)	2.89 (-.025-2.148) .056		3919623 (.000-) .993	12953363 (0.000-) .993
Self employed	117(30.0)	1.91 (-.289-1.580) .176		6000790 (.000-) .991	12294230 (0.000-) .990
Private sector	31(7.9)			2.598 (.326-20.702).367	3.945 (.430-36.163).225
Educational level					
Secondary School	97(24.9)	1.29 (-.507- 1.029).505		2553793 (.000-) .991	3309389 (.000-) .990
High School	88(22.6)	1.189 (-.646-.992).678		.212 (.000-) 1.000	.721 (.000-) 1.000
Primary School	44(11.3)	2.86 (.399-1.704).002		.334 (.051-2.186) .253	.459 (.063- 3.340) .442
No formal education	2(0.5)	3.42 (.434-2.024).002		Reference	Reference
University	106(27.2)	1.67 (-.207-1.239).162		3.0 (.226-40.589) .402	3.101 (.214- 44.902) .407
Vocational training	53(13.6)			.813(.114-5.816) .837	
Marital status					
Married	203(52.1)	.023 (-7.738-.164).060		Reference	Reference
Single parent	92(23.6)	0.07 (-6.541-1.269).186		0.0 (.000-) .997	0.0 (.000-) .997
Co-habiting	75(19.2)	0.003 (-11.263-- .435).034		0.0 (.000-) .997	0.0 (.000-) .997
Divorced	15(3.8)	8.4 (-18.240-- .542).038		0.0 (.000-) .997	0.0 (.000-) .997

	Univariate Analysis		Multivariate analysis	
Widow	5(1.3)		0.0 (.000-)	.997
Number of children				
1-3	308(79.0)	1.6 (-.123-1.114).116	Reference	Reference
4-7	82(21.0)		.307 (.036-2.652) .283	.523 (.056- 4.903) .570
Religion				
Christian	365(93.6)	1.6 (-.494-1.379) .354	Reference	Reference
Muslim	25(6.4)		3.837 (.296-49.707) .303	7.052 (.477-104.365).155
House type				
Block	310(80.1)	1.2 (-.713-.350) .503		Reference
Plank	77(19.9)		.0 (.000-) .986	.0 (.000-).986

family's ability to identify danger signs and prompt care-seeking to curb the childhood illnesses [28].

Our findings showed that, one-third of the caregivers of under-fives have a neutral attitude towards malaria risk factors. However, this report contradicts that of Fuge [29] where more than half of the pregnant participants showed a positive attitude towards the severity of malaria and its prevention methods like sleeping under bed nets as well as its threat on under-five children. Also, Runsewe-Abiodun [19] reported a 30% positive attitude towards malaria in South-West Nigeria while Pyae [30] pointed out that among the respondents living in the malaria-endemic area of Myanmar, more than half (56.8 percent) had a good level of attitude.

Overall, assessing the comprehensive attitude level of caregivers, the present study revealed that 69.5% of caregivers had a neutral attitude and only 27.7% had a favorable attitude, contrasting with the findings of Kebede [31] where 55.1% of respondents had a positive attitude and 44.9% had a negative attitude towards malaria. Likewise, in another study from Southern Ethiopia, they found out that, slightly more than half of the respondents (51.1%) had a positive attitude towards malaria [32]. Community members' attitude towards malaria as a disease is important in understanding their health-seeking behavior and their adoption of preventive methods. Several studies have indicated that some communities do regard malaria as a dangerous disease that can kill and affects more children under-fives than the adults. Such positive attitudes are essential opportunities for behavior change campaigns.

The correct response about the use of LLITNs in this study was remarkable. Similar values were reported by other studies in Cameroon [33] but contrast with the report by Taremwa Southwestern Uganda [34] where the high rate of LLITNs possession and good knowledge did not translate into overwhelming usage and this impact negatively on the prevention of malaria among vulnerable populations. The use of LLITNs has not only remained one of the most important of all measures of protection against malaria and when used properly, but its efficacy in reducing maternal anaemia, placental infection, and low birth weight has also been reported. LLITNs.

The misconception was still widespread among caregivers in spite of the high level of malaria knowledge. The misconception of caregivers regarding the mode of transmission of malaria such as good personal hygiene (mean= 2.41±.646) was significant. These findings reflect outcomes from a study in rural Zambia [25]. The possible explanation for the misconceptions displayed by caregivers of under-fives about the transmission and control means could be attributed to the attention they gave for personal hygiene and the misinterpretation of messages conveyed by community health workers and nurses during ANC.

Based on the results of this study, the socio-economic factors closely related to the risk of malaria were the level of education, marital status, and religion. These were expected findings because, with increasing age and level of education thus, the level of knowledge increases. These findings are in agreement with reports by Isah [33]. For instance, according to the study conducted in Areka Town, Southern Ethiopia, households whose heads attain the educational level of college and above were 6 times more likely to have good knowledge of malaria as compared to their counterparts with no formal education [34].

The odds of having a favorable attitude towards malaria were more than eight times lower if the child is living with a caregiver in the blockhouse. This finding was in line with the study carried out in North-western Tanzania, [35] where Mosha found out that the odds of malaria infection were lower with living in the block, with closed eaves, use of LLINs. These types of house construction likely prevent mosquitoes to enter the house and bite [36], and thus, offer more protection compared to those made of planks with open eaves and holes that provide resting places for mosquitoes [37].

5. CONCLUSION

Caregivers of under-fives displayed a good knowledge of malaria risk factors. However, in these endemic areas for malaria, caregiver attitude was found to be unenthusiastic and unresponsive, thus posing additional challenges in reaching the malaria elimination goal. Thus, it is suggested that educational messages during the campaign should be contextual to reach out to local communities to trigger a positive behavioral change.

CONSENT

Before data collection and written informed consent was obtained from voluntary participants during data collection. The respondents were assured of their right to withdraw from the interview at any time they would wish during the exercise. All authors hereby declare that all experiments have 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

The study was approved by the Institutional Review Board of the University of Buea (No CEI-UD/377/01/2015/M). An administrative authorization was obtained from the Regional Delegation of Public Health, South West Region (R11/ MINSANTE/ SWR/ RDPH/ PS/ 535/ 751). Study subjects were provided information about the purposes and objectives of the study.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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