

Assessing Health Seeking Behaviour and Malaria Prevention Practices Among Communities in Four Districts of the Volta Region of Ghana

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Abstract

Background: Malaria is a preventable disease that causes huge morbidity and mortality in malaria-endemic areas especially among children and pregnant women. The malaria control program focuses on the prevention of mosquito bites using Insecticide Treated Nets (ITNs) and mosquito aerosol spray and coil, and prevention of severe disease among those infected through prompt and adequate treatment. The success of the malaria control program in Ghana is dependent on the malaria prevention practices of people in the community. Therefore, this study evaluated the malaria prevention practices of participants in four districts of the Volta Region of Ghana.

Methods: This was a cross-sectional study conducted in Ketu South, Nkwanta South, Hohoe Municipality and Ho West districts of the Volta Region of Ghana. Questionnaire were administered to adults who consented to each household visited. Questions were asked on the socio-demographics and malaria prevention practices of the households. Data analysis was done using SPSS version 23 with frequency distribution done for all the variables. Pearson chi-square was used to determine the significant association between socio-demographics and malaria prevention practices, and logistic regression was used to analyze the strength of the association.

Result: Of the 668 participants that had a fever within the past 3 days, 268 (40.1%) visited a patent medicine store and 156(23.4%) visited health facilities. Out of the 2493 participants; 2234 (89.6%) owned ITN and 1528 (68.4%) used ITN a night before this study, 768(30.8%) used mosquito aerosol spray and 368 (15%) used mosquito coil. More females significantly owned ITN than males (1293, 92.4%, $p \leq 0.001$). Participants from Ketu South had 1.5 times higher odds of owning an ITN (AOR, 1.56 [95% 1.09-2.22]; $p=0.01$).

Conclusion: There is high ownership of ITNs but relatively low utilization among the community members. Education on malaria prevention practices should be intensified and continuous among the population of the Volta Region to ensure the success of malaria control in the region.

Introduction

Malaria is a serious public health issue causing preventable morbidity and mortality in malaria-endemic areas worldwide, especially in sub-Saharan African (1)(2). In sub-Saharan Africa where *Plasmodium falciparum* is responsible for the majority of malaria cases. There is an unevenly high burden of malaria, constituting about 93% and 94% of the global 409 million malaria cases and 229 million deaths respectively. These result in an estimated loss of over 35 million Disability Adjusted life years(1)(2)(3). Despite the appreciable reduction of malaria cases and deaths in the region due to the vibrant control and prevention programs, malaria still poses a threat to a million lives in sub-Saharan Africa (1)(2).

Malaria control and prevention has evolved over the years with the World Health Organization (WHO) initiation of the Rollback malaria program in 1998 focused on reducing malaria cases by 50% by the year 2010. The WHO Global Technical Strategy for Malaria 2016–2030 focuses on the reduction of malaria

burden by 90% by the year 2030(4) (5). In summary malaria control and prevention is focused on mortality and infection prevention. Mortality prevention employs the strategy of adequate case management involving prompt diagnosis followed by effective treatment while infection prevention uses vector control strategies like eradication of mosquitoes through indoor and outdoor sprayings and preventing human bite using insecticide-treated bed nets (ITNs) (5)(6)(7). One of the major challenges of these control strategies is inadequate prevention practices among the targeted population or communities (6).

Malaria prevention practices among individuals in a community are key to the success of malaria control programs in targets populations(7). How well individuals in a community imbibe the practices of malaria control and prevention activities will determine the success of the program in achieving the desired outcomes of reduced malaria morbidity and mortality in the community(6)(7). Health seeking behaviour for malaria treatment is fundamental in the success of mortality prevention of malaria(8)(9). Some decisions taken after the onset of putative malaria symptoms include staying home and doing nothing, treatment with herbal medication, self-medication with over the counter drugs and visits to the health facilities(8)(9). Any decision that does not ultimately result in prompt diagnosis and treatment might result in fatal consequences, especially among children(10). The ITN is a very beneficial malaria prevention tool(11) that has still not reached 100% uptake in many malaria-endemic areas (11)(12). Though the mass distribution of ITN has been employed, its uptake has been marred by several logistics challenges as well a poor usage by households who own ITN (12). Insecticides indoor spraying, a vector control strategy that is commonly practised in malaria-endemic areas, is also effective in preventing bites from mosquitoes (13). It involves insecticides in aerosol spray cans and mosquito coils which target adult flying or resting mosquitoes(14)(15)(16).

In Ghana, malaria is still endemic, contributing to 4% and 7% of global malaria cases and malaria burden in West Africa respectively(17)(18). Malaria control and prevention in Ghana has undoubtedly yielded some desired outcome with close to 50% reduction in malaria cases from 2005 to 2015 and a decline in malaria-related deaths from 19% to about 4.2% in 2016(17)(18). With the early participation in the Rollback malaria program, Ghana has made enviable strides in ITN campaign and coverage in the country with 73% household ownership in 2016 from 68% two years earlier(19). With the availability of effective treatment and an improvement in easy access to healthcare through the national health insurance scheme and availability of primary healthcare centres in the communities, there was improved access to effective malaria treatment in Ghana(18)(19). Despite these laudable interventions, there are still challenges about malaria control in Ghana(17). ITNs ownership coverage is uneven within the country with 42% in greater Accra and 52% in the Volta Region(19). More so, ownership does not translate to usage as only 42% of those who own ITN sleep under it (19). Improvement in the healthcare system has not improved the malaria treatment-seeking behaviour of the people as report shows that some people still use self-medication, herbal treatment and other informal treatment in the management of malaria(20)(21). With the changing and uneven trends of malaria prevention activities in the country, it is very apt for a constant evaluation of the progress of malaria control and prevention programme at the

district and regional levels in Ghana. Thus, this study was conducted to assess health seeking behaviour and malaria prevention practices in four districts in the Volta Region of Ghana.

Methods

Study site and population

The survey was conducted in the Volta Region of Ghana. The region is one of the 16 regions in the country (previously 10) (Ghana Statistical Service [GSS], 2013). The Volta Region is located between latitudes 5° 45'N and 8° 45'N along the southern half of the eastern border of Ghana, which it shares with the Republic of Togo. The region shares boundaries to the west with Greater Accra, Eastern and Brong Ahafo regions, to the north with the Northern Region, and has the Gulf of Guinea to the south. The region's total land area is 20,570 square kilometres, representing 8.7% of the total land area of Ghana (GSS, 2013), with a population of 1,865,332, with about 72% living in rural areas. The Volta Region has a total of 326 health institutions out of which 242 are administered by the GHS, 18 are mission owned, one is quasi-government, and 65 are privately owned (GSS, 2013).

The study was conducted in four districts/municipalities out of the 18 districts/municipalities of the Volta Region. These four districts/municipalities include Ho West District, Ketu South Nkwanta South (now in the newly created Oti Region) and Hohoe Municipalities. According to the 2010 Population and Health Census of Ghana, the total number of households in Hohoe is 43,329, Ketu South is 39,119 while Ho West and Nkwanta South have 23,875 and 22,733 respectively. The study population from these sites comprised men and women aged 18- 70 years from selected households.

Study Design

This was a cross-sectional household survey involving a multi-staged sampling of household members between the ages of 18 to 70 years. The first stage involved random sampling of four districts from the three ecological zones (savanna, middle, and coastal zones) of the region. Ketu South district was selected for the coastal ecological zone, Nkwanta South district for the savanna while Ho West and Hohoe were selected for the middle zone.

The second stage of the sampling involved the use of a simple random sampling of thirty communities from each of the study sites and in each community, fifteen households were randomly selected for the third stage. For the selection of the 15, the random walk technique was adopted. With this technique, interviewers selected the first housing unit by moving clockwise from the centre of the community and then followed a specific path of travel to select the rest of the housing units. Finally, the fourth stage of the sampling involves the random sampling of the available adults in each household sampled.

Sample Size

Based on the 2010 populations of the household for the four districts populations, Yamané's (1998) formula for sample size determination was used to determine the minimum number of participants for

this study.

With the formula $n = \frac{N}{1 + N(\alpha)^2}$. Where n is the minimum sample size to be determined, N is the study population, and α is the margin of error which was 0.05 at a significance level of 95% and adding 10% non-response rate, the minimum participants for the four districts were 436 for Ketu South, 433 for Ho West, 437 for Hohoe, and 432 for Nkwanta South resulting in a minimum sample size total of 1738 participants.

Data collection procedure

Data were collected with a structured questionnaire electronically administered using a Computer Assisted Personal Interview (CAPI) installed in smartphones of data collectors. The data collection exercise took place from February to April 2019 from 9 am to 2 pm each weekday.

Information such as age, gender, occupation, income level, level of education, and religion was obtained to highlight the demographic characteristics of the participants. Questions on health-seeking behaviour were also asked and they include, whether fever was experienced in the past 3 days, r, and what was done after the onset of symptoms. Questions on ownership, use of ITN and the use of sprays coils and the use of other vector control practices, were also asked.

Data Analysis

Electronic data were downloaded into a single master (Microsoft excel 2016 spreadsheet) database following completion of the fieldwork and *Statistical Package for the Social Sciences* (SPSS) version 22, was used for analysis. Descriptive statistics comprising frequencies and proportions were used to summarize sociodemographic variables and malaria prevention practices among the participants. Chi-square was used to test for significance of associations between socio-demographic variables and malaria prevention practices such as ownership and use of ITN and health-seeking behaviour like actions taking after the onset of fever among participants. Multivariate logistic regression analysis was used to test the strength of the association between socioeconomic variables and ownership and the use of ITN variables. All analysis was done using 95% confident intervals and statistical significance set as $p \leq 0.05$

Ethical considerations

Ethical clearance for the survey was obtained from the UHAS Review Ethics Committee (UHAS-REC A.6 [7] 17/18). Permission was also sought from the district/municipal health directorates and traditional authorities of the various communities before data were collected. Written Informed consent was obtained from participants before including them in the study. Confidentiality was also ensured by using initials and questionnaire number codes instead of real names.

Results

Socio-demographic characteristics

The sociodemographic characteristics are summarized in Table (1) below. A total of 2493 participants took part in this study, with 56% (1400) and 44% (1093) comprising females and males respectively. The majority of the participants were between the ages of 18–29(612; 25%) while the least number of them is seen among those from 70 years and above (151; 6.1%). Ketu south district had the highest number of participants (834; 34%) while Nkwanta south had the least number of participants (446; 18%). Christianity was the modal religion among the participants (2154; 86%) and the majority had Junior high school (JHS) as their highest level of education (994; 40%). Farming was the highest occupation of the participants (742; 30%) while 283(11%) of them were unemployed (Table 1).

Table 1
Socio-demographic characteristics

| Characteristics | Frequency | % |
|------------------------|------------------|----------|
| Gender | | |
| Male | 1093 | 43.8 |
| Female | 1400 | 56.2 |
| Age | | |
| 18–29 | 612 | 24.5 |
| 30–39 | 605 | 24.3 |
| 40–49 | 509 | 20.4 |
| 50–59 | 392 | 15.7 |
| 60–69 | 224 | 9.0 |
| ≥ 70 | 151 | 6.1 |
| Districts | | |
| Ketu South | 834 | 33.5 |
| Ho West | 671 | 26.9 |
| Hohoe | 542 | 21.7 |
| Nkwanta South | 446 | 17.9 |
| Religion | | |
| Christianity | 2154 | 86.4 |
| Islam | 96 | 3.9 |
| Traditional | 243 | 9.7 |
| Education | | |
| None | 357 | 14.3 |
| Primary | 372 | 14.9 |
| JHS | 994 | 40.0 |
| SHS | 532 | 21.3 |
| Tertiary | 238 | 9.5 |
| Occupation | | |
| Farming | 742 | 29.8 |

| Characteristics | Frequency | % |
|------------------|-----------|------|
| Trading | 685 | 27.5 |
| Skilled labour | 437 | 17.5 |
| Unskilled labour | 139 | 5.6 |
| Civil servants | 155 | 6.2 |
| Unemployed | 281 | 11.2 |
| Others | 54 | 2.2 |

Health seeking behaviour and Malaria prevention practices

Table 2 shows health seeking behaviour and malaria prevention practices among the participants. A total of 668 (27%) participants affirmed that they had experience fever within the past 3 days of the interview of which 156 (23%) visited the hospital after the onset of the fever, 268(40%) patronized the pharmacy, 62 (9.3%) had recourse to herbal treatment, and 140(21%) did not do anything. Nine in 10 participants in this study owned at least one ITN (2234; 89.6%) which was predominantly obtained for free from health facilities (1367; 61%). Of those who owned ITN, 1528 (68%) used them the night before the study. Seven hundred and sixty-eight (31%) and 368 (15%) of the participants reported using mosquito sprays and mosquito coils respectively.

Figure1 illustrates other actions taking by the 42 participants after their onset of fever. The majority of them took alcoholic bitters 18 (42.9) and 17 (40.5) took leftover drugs at home.

Table 2
Health seeking behaviour and Malaria prevention practices

| Characteristics | Frequency | % |
|---|------------------|----------|
| History of Fever within 3days | | |
| Yes | 668 | 26.8 |
| No | 1825 | 73.2 |
| Actions taken during fever | | |
| Visited a health facility | 156 | 23.4 |
| Visited a patent medicine store/pharmacy | 268 | 40.1 |
| Visited the herbalist | 62 | 9.3 |
| Did not do anything | 140 | 20.9 |
| Others | 42 | 6.3 |
| Ownership of ITN | | |
| Owned ITN | 2234 | 89.6 |
| Did not own ITN | 259 | 10.4 |
| Source of ITN | | |
| Bought personally | 51 | 2.3 |
| from community programs | 793 | 35.5 |
| from a health facility | 1367 | 61.2 |
| Gift from family member/friend | 23 | 1.0 |
| Use of ITN previous night (n = 2234) | | |
| Used | 1528 | 68.4 |
| Did not use | 706 | 31.6 |
| use of mosquito spray | | |
| Yes | 768 | 30.8 |
| No | 1725 | 69.2 |
| use of mosquito coil | | |
| Yes | 368 | 14.8 |
| No | 2125 | 85.2 |
| Use neither ITN, mosquito spay or coil | 413 | 16.6 |

Characteristics of participants stratified by actions taken after the onset of fever

Table 3 shows the association between the sociodemographic variables and the actions taken after the onset of fever by the 668 participants who had a fever within the past 3 days. There was no significant difference seen in the actions taken after the onset of fever concerning sex, district, religion and highest educational level ($p > 0.05$). However, there was a significant difference noted among the different occupations ($p = 0.001$), with civil servants (7, 30.4%) and traders (57; 30.5%) constituting the highest proportions of participants who visited the hospital after the onset of fever and the lowest proportion seen among the unemployed (14; 17.3%). Furthermore, civil servants (11; 47.8%) were among the highest proportion of occupation that patronized patent medicine store only slightly below skilled labourers which constituted the highest proportion (67; 52.3%). Unskilled labourers constituted the highest proportion of participants that resorted to herbal treatment (6; 17.6%) followed by traders (27; 14.4%). The unemployed 30 (37%) constituted the highest proportion of participants that resorted to doing nothing after the onset of fever followed by unskilled labourers 9 (26.5%).

Table 3
 Characteristics of participants stratified by actions taken after the onset of fever

| Characteristics | Health facility N (%) | Patent medicine store N (%) | Herbal treatment N (%) | Nothing N (%) | Others N (%) | Total | P |
|------------------|--------------------------|--------------------------------|---------------------------|------------------|-----------------|-----------|------|
| Gender | | | | | | | |
| Male | 45[17.7] | 113[44.5] | 28[11.0] | 51[20.1] | 17[6.7] | 254[38] | 0.06 |
| Female | 111[26.8] | 155[37.4] | 34[8.2] | 89[21.5] | 25[6.0] | 414[62] | |
| Age | | | | | | | |
| 18–29 | 39[25.3] | 64[41.6] | 9[5.8] | 37[24.0] | 5[3.2] | 154[23.1] | |
| 30–39 | 35[19.6] | 80[44.7] | 16[8.9] | 35[19.6] | 13[7.3] | 179[26.8] | |
| 40–49 | 28[19.2] | 65[44.5] | 17[11.7] | 24[16.4] | 12[8.2] | 146[21.9] | |
| 50–59 | 24[24] | 30[30] | 12[12] | 27[27] | 7[7] | 100[14.9] | 0.13 |
| 60–69 | 18[35.3] | 15[29.4] | 6[11.8] | 9[17.6] | 3[5.9] | 51[7.6] | |
| ≥ 70 | 12[31.6] | 14[36.8] | 2[5.3] | 8[21.1] | 2[5.3] | 38[5.7] | |
| Districts | | | | | | | |
| Ketu South | 56[23.1] | 96[39.7] | 26[10.7] | 50[20.7] | 14[5.8] | 242[36.2] | |
| Ho West | 35[24.6] | 48[33.8] | 15[10.7] | 34[23.9] | 10[7.0] | 142[21.3] | 0.3 |
| Hohoe | 31[21.9] | 66[46.8] | 7[4.9] | 32[22.8] | 5[3.6] | 141[21.1] | |
| Nkwanta South | 34[23.8] | 58[40.6] | 14[9.8] | 24[16.8] | 13[9.1] | 143[21.4] | |
| Religion | | | | | | | |
| Christianity | 137[24.8] | 222[40.2] | 44[7.9] | 120[21.7] | 29[5.3] | 552[82.6] | |
| Islam | 5[19.2] | 7[26.9] | 4[15.4] | 6[23.1] | 4[15.4] | 26[3.9] | 0.1 |
| Traditional | 14[15.6] | 39[43.3] | 14[15.6] | 14[15.6] | 9[10] | 90[13.5] | |
| Education | | | | | | | |
| None | 25[22.5] | 51[45.9] | 11[9.9] | 16[14.4] | 8[7.3] | 111[16.6] | |
| Primary | 25[20.5] | 48[39.3] | 14[11.5] | 25[20.5] | 10[8.2] | 122[18.3] | 0.4 |
| JHS | 61[21.9] | 107[38.4] | 24[8.6] | 71[25.4] | 16[5.7] | 279[41.8] | |
| SHS | 34[28.3] | 46[38.3] | 11[9.2] | 23[19.2] | 6[5.0] | 120[17.9] | |

| Characteristics | Health facility N (%) | Patent medicine store N (%) | Herbal treatment N (%) | Nothing N (%) | Others N (%) | Total | P |
|-------------------|--------------------------|--------------------------------|---------------------------|------------------|-----------------|-----------|-------|
| Tertiary | 11[30.6] | 16[44.4] | 2[5.6] | 5[13.9] | 2[5.6] | 36[5.4] | |
| Occupation | | | | | | | |
| Farming | 46[22.9] | 81[40.3] | 18[8.9] | 39[19.4] | 17[8.5] | 201[30.1] | |
| Trading | 57[30.5] | 63[33.7] | 27[14.4] | 30[16.0] | 10[5.3] | 187[27.9] | |
| Skilled labour | 23[17.9] | 67[52.3] | 7[5.5] | 27[21.1] | 4[3.1] | 128[19.2] | 0.001 |
| Unskilled labour | 6[17.6] | 10[29.4] | 6[17.6] | 9[26.5] | 3[8.8] | 34[5.1] | |
| Civil servants | 7[30.4] | 11[47.8] | 1[4.3] | 2[8.7] | 2[8.7] | 23[3.4] | |
| Unemployed | 14[17.3] | 31[38.3] | 2[2.5] | 30[37.0] | 4[4.9] | 81[12.1] | |
| Others | 3[21.4] | 5[35.7] | 1[7.1] | 3[21.4] | 2[14.4] | 14[2.1] | |

Characteristics of participants stratified by the ownership and usage of ITN

Table 4 shows the association between sociodemographic variables and ITN ownership and usage. ITN ownership was significantly seen more with females (1293: 92.4%, $p \leq 0.001$). Though females (903, 69.8%) slept more under ITN compared to males (625 66.4%), this finding was not significant ($p = 0.13$). There was no significant association between ITN ownership and the age groups ($p = 0.16$). However, the participants in the above 70 years age group constituted the significant lowest proportion of ITN non-usage (37; 26.8%) and the highest proportion of ITN usage (101; 73.2%)($p = 0.04$). All four districts have over 85% ownership of ITN with Nkwanta South Municipality significantly having the highest proportion (424; 95.1%, $p \leq 0.001$) and also had the significant highest proportion of participants who used ITN (355; 83.7%, $p \leq 0.001$). Religion did not have a significant association ($p = 0.1$) with ownership of ITN even though participants who are traditionalist had the highest proportion (225, 92.6%). The usage of ITN was however significant in its association with religion with participants who are traditionalist having the highest proportion (182; 80.9%, $p \leq 0.001$) of usage. Participants without education constituted the highest proportion of those who owned (329; 92.2%, $p = 0.003$) and used ITN (265; 80.5%, $p \leq 0.001$). Participants who are farmers constituted the highest proportion of those who owned (688; 92.7%, $p \leq 0.001$) and used ITN (531; 77.2%, $p \leq 0.001$).

Table 4
 Characteristics of participants stratified by the ownership and usage of ITN

| Characteristics | Ownership of ITN | | P-value | Usage of ITN | | P-value |
|------------------|------------------|-----------|---------|--------------|-----------|---------|
| | YES | NO | | YES | NO | |
| Gender | | | | | | |
| Male | 941[86.1] | 152[13.9] | ≤ 0.001 | 625[66.4] | 316[33.6] | 0.13 |
| Female | 1293[92.4] | 107[7.6] | | 903[69.8] | 390[30.2] | |
| Age | | | | | | |
| 18–29 | 533[87.1] | 79[12.9] | 0.16 | 358[67.2] | 175[32.8] | 0.04 |
| 30–39 | 546[90.2] | 59[[9.8] | | 390[71.4] | 156[28.6] | |
| 40–49 | 464[91.2] | 45[8.8] | | 294[63.4] | 170[36.6] | |
| 50–59 | 355[90.6] | 37[9.4] | | 247[69.6] | 108[30.4] | |
| 60–69 | 198[88.4] | 26[11.6] | | 138[69.7] | 60[30.3] | |
| ≥ 70 | 138[91.4] | 13[8.6] | | 101[73.2] | 37[26.8] | |
| Districts | | | | | | |
| Ketu South | 720[86.3] | 114[13.7] | ≤ 0.001 | 477[66.3] | 243[33.7] | ≤ 0.001 |
| Ho West | 608[90.6] | 63[9.4] | | 398[65.5] | 210[34.5] | |
| Hohoe | 482[88.9] | 60[11.1] | | 298[61.8] | 184[38.2] | |
| Nkwanta South | 424[95.1] | 22[4.9] | | 355[83.7] | 69[16.3] | |
| Religion | | | | | | |
| Christianity | 1925[89.4] | 229[10.6] | 0.1 | 1280[66.5] | 645[35.5] | ≤ 0.001 |
| Islam | 84[87.5] | 12[12.5] | | 66[78.6] | 18[21.4] | |
| Traditional | 225[92.6] | 18[7.4] | | 182[80.9] | 43[19.1] | |
| Education | | | | | | |
| None | 329[92.2] | 28[7.8] | 0.003 | 265[80.5] | 64[19.4] | ≤ 0.001 |
| Primary | 329[88.4] | 43[11.6] | | 24474.2][| 85[25.8] | |
| JHS | 907[91.2] | 87[8.8] | | 609[67.1] | 298[32.9] | |
| SHS | 460[86.5] | 72[13.5] | | 290[63.0] | 170[37.0] | |
| Tertiary | 209[87.8] | 29[12.2] | | 120[57.4] | 89[42.6] | |

| Characteristics | Ownership of ITN | | | Usage of ITN | | P-value |
|-------------------|------------------|----------|---------|--------------|-----------|---------|
| | YES | NO | P-value | YES | NO | |
| Occupation | | | | | | |
| Farming | 688[92.7] | 54[7.3] | ≤ 0.001 | 531[77.2] | 157[22.8] | ≤ 0.001 |
| Trading | 620[90.5] | 65[9.5] | | 398[64.2] | 222[35.8] | |
| Skilled labour | 383[87.6] | 54[12.4] | | 244[63.7] | 139[36.3] | |
| Unskilled labour | 115[82.7] | 24[17.3] | | 82[71.3] | 33[28.7] | |
| Civil servants | 134[86.5] | 21[13.5] | | 85[63.4] | 49[36.6] | |
| Unemployed | 244[86.8] | 37[13.2] | | 154[63.1] | 90[36.9] | |
| Others | 50[92.6] | 4[7.4] | | 34[68] | 16[32.0] | |

Other vector control technique employed by participants

Out of 2493 participants in this study, 70 (2.8%) participants weed the surrounding as a means to reduce mosquitos, 46(1.9%) use electric fans, 23 (0.9%) close all door and windows in the evening, 18 (0.7%) wear protective clothing and 8(0.3%) remove stagnant water (Fig. 2).

Multivariate logistic regression analysis of the odds of owning and using an ITN

Table 5a and 5b shows the multivariate logistic regression analysis of the odds of owning and using ITN among participants respectively. Participants from Ketu South significantly had higher odds of owning a net (Unadjusted OR, 1.60 [95% 1.14–2.24]; p = 0.01]; Adjusted OR, 1.56 [95% 1.09–2.22]; p = 0.01) (Table 5a). Participants from Nkwanta South were significantly less likely to own an ITN (Unadjusted OR, 0.51 [95% 0.35–0.85]; p = 0.01]; Adjusted OR, 0.49 [95% 0.29–0.86]; p = 0.01) (Table 5a). Also, participants from Nkwanta South were less likely to use ITN (Unadjusted OR, 0.35 [95% 0.25–0.48]; p ≤ 0.001]; Adjusted OR, 0.40 [95% 0.29–0.57]; p ≤ 0.001) (Table 5b). Participants with no education (Adjusted OR, 0.32 [95% 0.20–0.50]; p ≤ 0.001), primary (Adjusted OR, 0.42 [95% 0.28–0.64]; p ≤ 0.001) and JHS (Adjusted OR, 0.61 [95% 0.43–0.87]; p ≤ 0.001) had significantly lower odds of using ITN (Table 5b).

Table 5a
Multivariate logistic regression analysis of the odds of owning ITN

| Characteristics | Unadjusted OR (95% CI) | | Adjusted OR (95% CI) | |
|---------------------|---------------------------|------|-------------------------|------|
| Sex | | | | |
| female | 0.48(0.36–0.610) | 0.10 | 0.55(0.39–0.69) | 0.12 |
| Male | | 1 | 1 | |
| Districts | | | | |
| Ketu South | 1.60(1.14–2.24) | 0.01 | 1.56(1.09–2.22) | 0.01 |
| Nkwanta South | 0.51(0.30–0.85) | 0.01 | 0.49(0.29–0.86) | 0.01 |
| Hohoe | 1.29(0.88–1.89) | 0.19 | 1.23(0.83–1.81) | 0.31 |
| Ho West | 1 | | 1 | |
| Occupation | | | | |
| Farming | 0.65(0.22–1.89) | 0.43 | 0.66(0.22–2.04) | 0.47 |
| Trading | 0.96(0.33–2.78) | 0.91 | 1.37(0.46–4.06) | 0.58 |
| Skilled labour | 1.39(0.48–4.04) | 0.55 | 1.34(0.45 – 0.395) | 0.6 |
| Unskilled labour | 2.25(0.73–6.90) | 0.16 | 1.87(0.59–5.85) | 0.25 |
| Civil servants | 1.62(0.54–5.14) | 0.38 | 1.46(0.46–4.99) | 0.52 |
| Unemployed | 1.47(0.49–4.35) | 0.40 | 1.65(0.54–4.99) | 0.37 |
| Others | 1 | | 1 | |
| Education | | | | |
| None | 0.55(0.31–0.98) | 0.04 | 0.89(0.47–1.73) | 0.75 |
| Primary | 0.85(0.50–1.44) | 0.55 | 1.27(0.70.2.30) | 0.43 |
| JHS | 0.64(0.40–1.02) | 0.06 | 0.95(0.57–1.59) | 0.86 |
| SHS | 1.15(0.72–1.85) | 0.56 | 1.50(0.89–2.55) | 0.13 |
| Tertiary | 1 | | 1 | |

Table 5b
Multivariate logistic regression analysis of the odds of using ITN

| Characteristics | Unadjusted OR (95% CI) | | Adjusted OR (95% CI) | |
|-------------------|------------------------|---------|----------------------|---------|
| Districts | | | | |
| Ketu South | 0.93(0.74–1.18) | 0.50 | 1.04(0.81–1.33) | 0.73 |
| Nkwanta South | 0.35(0.25–0.48) | ≤ 0.001 | 0.40(0.29–0.57) | ≤ 0.001 |
| Hohoe | 1.18(0.92–1.52) | 0.20 | 1.20(0.93–1.56) | 0.162 |
| Ho West | 1 | | 1 | |
| Occupation | | | | |
| Farming | 0.65(0.22–1.89) | 0.008 | 0.56(0.27–1.12) | 0.12 |
| Trading | 0.96(0.33–2.78) | 0.59 | 1.24(0.61–2.51) | 0.56 |
| Skilled labour | 1.39(0.48–4.04) | 0.67 | 1.11(0.54–2.27) | 0.78 |
| Unskilled labour | 2.25(0.73–6.90) | 0.31 | 0.80(0.30–1.50) | 0.59 |
| Civil servants | 1.62(0.54–5.14) | 0.90 | 0.76(0.35–1.66) | 0.49 |
| Unemployed | 1.47(0.49–4.35) | 0.82 | 1.19(0.37–2.47) | 0.65 |
| Others | 1 | | 1 | |
| Education | | | | |
| None | 0.29(0.19–0.43) | ≤ 0.001 | 0.32(0.20–0.50) | ≤ 0.001 |
| Primary | 0.40(0.28–0.54) | ≤ 0.001 | 0.42(0.28–0.64) | ≤ 0.001 |
| JHS | 0.57(0.42–0.78) | 0.001 | 0.61(0.43–0.87) | 0.006 |
| SHS | 0.73(0.22–1.02) | 0.68 | 0.73(0.57–1.07) | 0.11 |
| Tertiary | 1 | | 1 | |
| Religion | | | | |
| Christianity | 2.19(1.51–3.18) | ≤ 0.001 | 1.77(1.17–2.67) | 0.01 |
| Islam | 1.98(1.05–3.75) | 0.04 | 1.84(0.93–3.64) | 0.08 |
| Traditional | 1 | | 1 | |

Discussion

More than half of the 668 participants who admitted to having had fever within the past 3 days, either sought help from a patent medicine store (40%) or visited a health facility (23%). The high patronage of

patent medicine stores or vendors is not surprising as they are replete in many African rural settings where they provide care for patient especially prompt malaria treatment(22)(23)(24). Though they are not usually manned by trained pharmacists and not stocked with expensive malaria drugs, they are often stocked with basic and effective artemisinin combination therapy (ACTs) dispensed by a trained medicine counter assistant(24). More so they are often equipped with simple RDT to quickly arrive at a malaria diagnosis in patients with malaria symptoms(23)(25). Visiting health facilities after the onset of fever was the second-best option for participants in this study and it was significantly reported among civil servants and traders probably because of the financial implications vis a vis the relatively higher out of pocket expenses compared to patent medicine store (22)(26)(27). Only 62 participants reported having taken herbal treatment for their fever which is a rather common practice in malaria-endemic areas including Ghana (28)(29). Another group of participants claim not to have done anything since the onset of their fever within the past three days, probably still observing the symptom to either take action if symptoms persist or worsen (30). This attitude usually leads to delay in treatment resulting in the complication of malaria especially in vulnerable groups such as children and pregnant women (30).

ITN ownership and usage (sleeping under ITN) among the participants in this study was 90% and 68% respectively. This trend of low usage of ITN despite relatively high ownership has been reported in many parts of the country (19)(31)(32)(33)(34). There are several reasons people give for not sleeping under ITN despite having one at home. These include the inability to mount the ITN due to lack of appropriate location in the household, complaints that sleeping under the ITN is uncomfortable due to increase warmth and not enough ITN to accommodate every member of the household (35)(36). Aside from these complaints, there is however inappropriate use of the ITN as it has been reported that some people use them for fishing, farming and other activities (37)(38). The majority of the ITN in this study were obtained through free means, either through health facilities (61%) or community outreach programs (36%) and this might contribute to the reason for the inappropriate usage of the ITN (36)(39).

Females (92%) significantly (≤ 0.001) owning more nets than males (86%) in this study and, though more women slept under the ITN, this finding was not statistically significant. This finding has been reported in some other studies (40)(41). The likelihood of females especially those of reproductive age to visit health facilities when pregnant or participate in community outreach programs where free ITN are distributed might explain this finding (42)(43). Females are also prioritized to sleep under the ITN when there are not enough ITN in the household and they often share ITN with younger children (40)(41). Participants from Ketu south were 1.5 times more likely to own and use ITN, while participants from Nkwanta south were less likely to own and sleep under an ITN. This finding might have been influenced by the varied sociodemographic characteristics of the districts (44)(45). Education seems to influence the use of ITN in this study a finding similarly reported in some other studies, as participants with lower levels of education were less likely to use ITN (46)(47)(48).

Mosquito spray and coil were other methods of vector control used by participants in this study. Mosquito coils are usually cheaper alternatives compared to mosquito aerosol spray for those who do not have ITN and it is widely used in several malaria-endemic countries including Ghana (15)(34)(48).

Mosquito aerosol spray is also widely used in malaria-endemic areas including Ghana (16)(34)(49)(50)(51). There are no official approval or recommendation by the National Malaria Control Program or the Ghana Health Service on the use of mosquito aerosol spray and coils but its use seem to be common in Ghana as some prefer it to ITN because of easy availability and applicability (34). Although this study observed ITN use together with mosquito spray and coil it is very likely that in reality they were not used together as the use of mosquito spray and coil often reduced the likelihood of the use of ITN (34). The findings in this study show that only a few of the participants relied on mosquito spray and mosquito coil, a finding similar to studies done in Sunyani in Ghana and Imo State in Nigeria (34)(52).

This study had better ITN ownership and usage compared to some studies in other parts of Ghana (19)(32)(33)(34). This relatively higher ITN ownership and usage might have been influenced by the rainy season when this study was done, which normally increase ITN ownership and usage (34)(53), though this influence was not seen in ITN ownership and usage in the study done in Sunyani in Ghana (34). However, a worrying finding is the 16.6% of the study participant who did not employ any form of vector control methods like ITN, mosquito coil and spray a figure much higher than 13.8% in the Sunyani study (34).

Conclusion

The study showed that the majority of the participants who had a fever within the past 3 days visited patent medicine store (40%) and health facilities (23%). ITN ownership was 90% and usage was 68% with more females owning and using ITN than males. Participants from Ketu South were 1.5 times likely to own an ITN while those from Nkwanta South were less likely. Mosquito aerosol spray and mosquito coil was also used by a few participants as a vector control method. Though the percentage of ITN ownership and usage among participants in this study were relatively higher than most studies in Ghana it is still below the national malaria control program target and more worrying is that about 17% of participants practice no form of vector control. It is therefore very important that education on malaria prevention practices should be intensified and continuous among the population of the Volta Region to ensure the success of malaria control in the region.

Declarations

Ethical approval and consent to participate

Ethical approval was obtained from the University of Health and Allied Sciences' ethical review committee. District directors of health services of the participating districts consented before data were collected. Written informed consents were obtained from participants.

Consent for publication

Not applicable

Availability of data and Materials

The datasets used during the current study are available from the corresponding author on reasonable request.

Competing interest

The authors declare that they have no competing interest.

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Author's contributions

VNO, RSM, OYD, BYH, and **EK** made contributions to the conception and design of the study. **EK, SW** and **HJ** made a substantial contribution to the study design and management of the research activities. **VNO** and **RSM** analysed the data and **VNO** drafted the manuscript. All authors were involved in critical revision for important intellectual content and approved the final manuscript.

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Figures

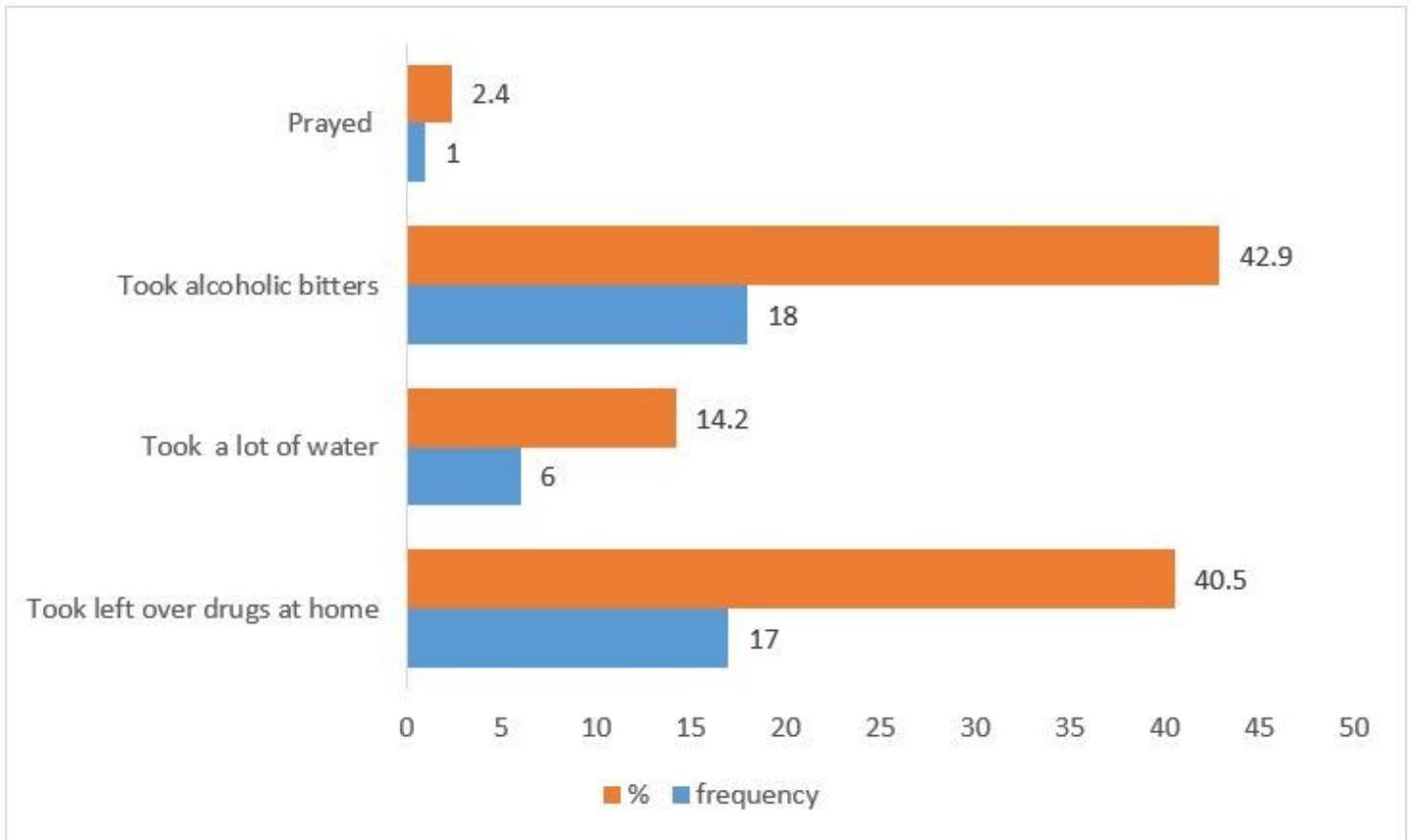


Figure 1

Other Actions taken during fever

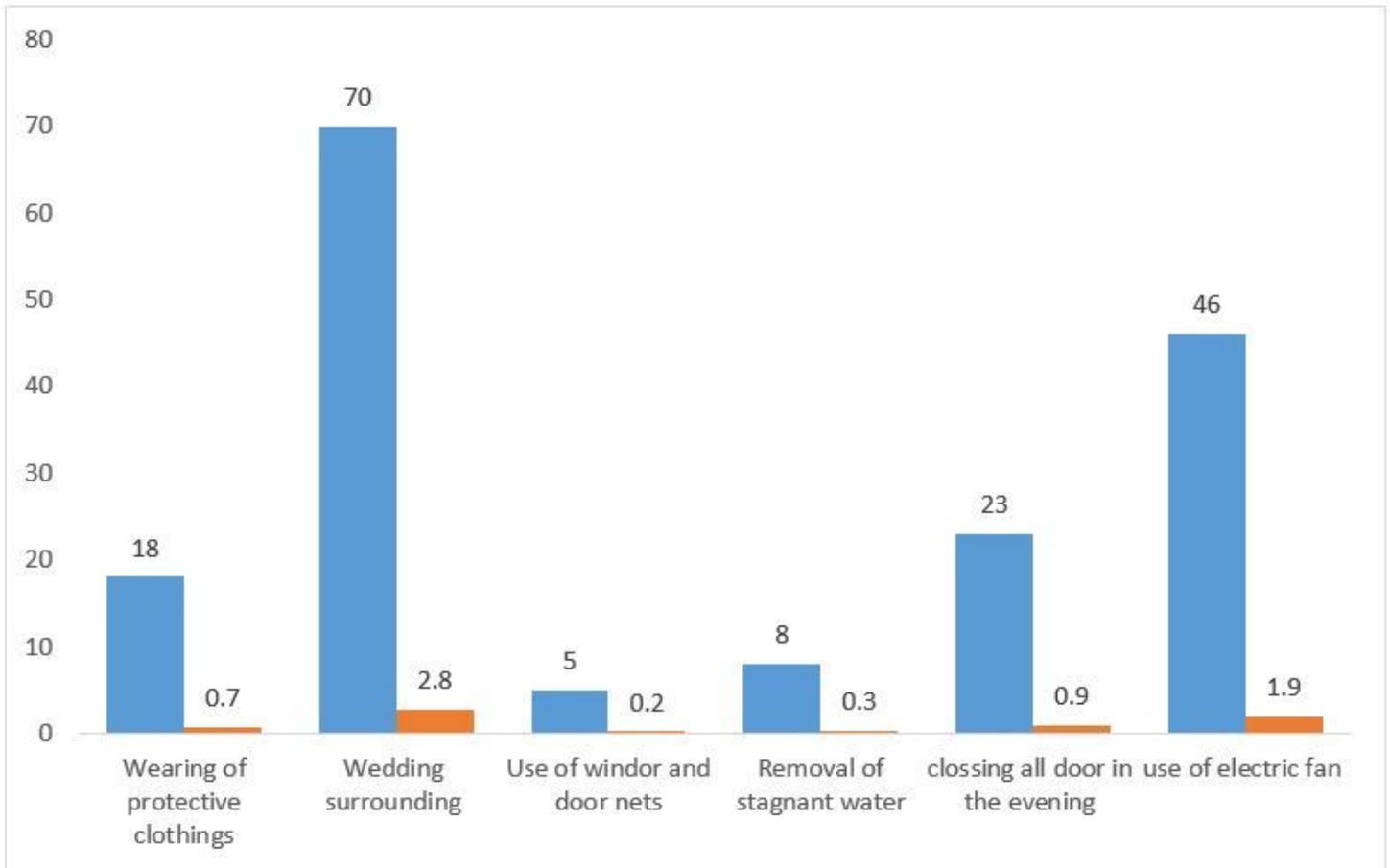


Figure 2

Other vector control technique employed by participants