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# Socio-Demographic Characteristics of Malaria Vector and Prevention Measures in Elobied, West of Sudan

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**Abstract**

A transversal survey was conducted in Elobied, North Kordofan State, Sudan to evaluate the knowledge of the respondents about malaria vector and its relation with house characteristics, demographic characteristics and prevention measures.Most of the respondents reported that mosquito bite the main factor for causes malaria, most of interviewed lived in brackets houses while others in shanty houses and the majority of the respondents use bed nets. The study concluded that establishment of *Anopheles arabiensis* in the study area related to the type of house construction and stagnant water. The uses of bed nets are the most methods for personal protection against mosquitoes.

***Keywords:*** Mosquitoes; Anopheles arabiensis; characteristics; malaria.

## 1. Introduction

Malaria is transmitted through the bites of female *Anopheles* mosquitoes. There are more than 400 different species of *Anopheles* mosquito; around 30 are malaria vectors of major importance. All of the important vector species bite between dusk and dawn. The intensity of transmission depends on factors related to the parasite, the vector, the human host, and the environment [1]. Transmission tends to be more intense in places where the mosquito lifespan is longer and where the females prefer to bite humans rather than other animals. The strong human biting habit of the African vector species is one of the reasons why approximately 90% of the world's malaria cases occur in Africa [2].

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Anopheles arabiensis (A. arabiensis) and Anopheles gambiae (A. gambiae) are the principal vectors of malaria in sub-Saharan Africa, but in some areas, such as the Great Rift Valley in East Africa, *A. arabiensis* is the predominant malaria vector species. *A. arabiensis* is better adapted to dry environments than *A. gambiae* [3].The main malaria vector in Sudan is *A. arabiensis* (formerly species B of the A. gambiae complex), which extends from south and reaches up to the Northern limits near the Egyptian boarders [4,5]. Knowledge of population structure in the major vector species is fundamental to an understanding of malaria epidemiology and the spread of insecticide resistance. Up to date most published works on population structure within the complex has focused upon *An. gambiae s. s.* [6,7]. and refs. therein). Although the two species exist sympatric ally over much of their species range, *An. arabiensis* extends into more arid environments, is more likely to rest in outdoor structures than in the interior of houses and will feed preferentially on animals rather than humans[8]. Navigation of the mosquitoes towards inhabited houses is initiated by increases in $CO_2$ levels in combination with a number of host odours [9].Thus; there is need for additional measures to supplement ITNs and IRS to prevent house entry and human-vector contact. One of such a measure that has been tested under semi field conditions is use of eave tubes treated with insecticide [10,11]. The aim of this study to gain knowledge about malaria vector, its relation with demographic characteristic of the respondent, house characteristic and prevention measures.

## 2. Methods

### *2.1 Study Design and Characteristics of Participants*

A questionnaire was used to collect relevant demographic and clinical information from patients waiting to be seen by doctors. The questionnaire was designed in a simple local language so that everyone can understand its questions.

### *2.2 House characteristics*

Due to the importance of type of the house and its relation to the density of mosquitoes, the participants were asked about the type of houses they live in. Prior to the start of taking blood samples, the type of construction of each house was recorded mainly the construction material used for building of these houses.

### *2.3 Demographic Characteristics*

To calculate the effect of Malaria vectors and the relation with demographic characteristics the questionnaire was used to measure socio-demographic characteristics of education Level, occupation, language, and marital status, number of children compared the amount of income spent in food with the amount of income spent for treatment of malaria.

### *2.4 Awareness of the Vector*

Knowledge of the vector is the only way of gaining practical understanding of local approaches to dealing with malaria control and can be used in developing boarder-based control strategies, planning intervention measures or

making decisions [12]. Control of malaria depends on the adequate knowledges not only on epidemiology of disease in the area but also on the behavior of the people[13].

### *2.5 Prevention Measures*

Because of the nocturnal feeding habits of most of *Anopheles* mosquitoes, malaria transmission occurs primarily at night. Protection against mosquito bites include the use of mosquito bed nets (preferably insecticide-treated nets), and use of insect repellent on exposed skin. Type and concentration of repellents depend on age and status.

### *2.6 Statistical Analysis*

Data were collected through standardized questionnaire and checked for errors and completeness. The data were double entered in Microsoft Excel data sheet, cross checked, transferred, and analyzed using SPSS for Windows version 16.

## 3. Results

### *3.1 House characteristics*

As shown in table 1, the types of buildings varied greatly between the respondents. Most of the respondents are differ in the quality of housing styles, thus, about 71(41.7%) lived in brackets; shanty 49(28.2%); mud 50(29.4%). The majority of buildings were designed with windows119 (70%), some are without windows 32(18.8%), while 9(5.2%) were with windows and walls.

**Table 1:** House Characteristics

| Characteristics | Total | Mean | Std- deviation | Test | P-value |
|---|---|---|---|---|---|
| Type of building | | | | | |
| Shanty | 49(28.8%) | | | | |
| Mud | 50(29.4%) | | | | |
| Bracket | 71(41.7%) | 2.13 | 0.83 | 2 | > 0.066 |
| Design of building | | | | | |
| With windows | 119(70%) | | | | |
| Without windows | 32(18.8%) | | | | |
| With walls | 10(5.8%) | | | 2 | |
| With windows with walls | 9(5.2%) | | | | |

### *3.2 Socio-Demographic Characteristics of the Patients in Elobeid Hospital and National Insurance Health*

#### *3.2.1 Gender distribution*

A total number of 170 patients were interviewed, including 100(58.8%) females and 70(41.1%) males to study the detailed socio demographic characteristics (see table 2).

### *3.2.2 Education level*

Again, they varied in their education levels. About 62(36.4%) of respondents attended basic and secondary school. The percentage of respondents who attended primary school 32(18.8%) was larger than illiterate 27(15.8%). Respondents who completed university and post university education were about 49(28.8%) of the population.

### *3.2.3 Language*

Almost all the participants' (patients') language is Arabic and few of them speak English. The percentage of respondents who spoke Arabic was 164(96.4%) while those who spoke both Arabic and English made 6(3.5%) of the surveyed population.

### *3.2.4 Number of children*

The mean number of children per family was (2.54). The percentage of the children according to the age range showed that those who were between 0-5 were 50(29.4%) and those who were 5 – 10, 41(24.1%); while those ranged from 10 -15 were 31(18.8%). The percentage of the youth in the age range from 15 to 20 was 33(19.4%) out of the total population.

### *3.2.5 Marital status*

The majority of the residents who were married was 118(63.5%). The percentage of single individuals constituted 56(32.9%) of the surveyed patients. The percentage of the widowed was 6(3.5%).

### *3.2.6 Occupations*

As stated by the respondents,41(24.1%) were students,28 (16.4%) were laborers, 31(18.2%) were officers,18 (10.5%) were teachers and 52(30.5%) were others.

**Table 2:** Socio- Demographic Characteristics of the Patients

| Characteristics | Total | Mean | Std - deviation | Test | P-value |
|---|---|---|---|---|---|
| Sex | | | | | |
| Male | 70(41.1%) | 1.59 | 0.49 | 2 X =5.29 | < 0.00 |
| Female | 100(58.8%) | | | | |
| Education level | | | | | |
| Illiterate | 27(15.8%) | | 1.4 | 2 X =18.18 | < 0.000 |
| Primary | 32(18.8%) | | | | |
| Basic and secondary | 62(36.4%) | 3.07 | | | |
| University and high | 49(28.8%) | | | | |
| Language | | | | | |
| Arabic | 164(96.4%) | | | | |
| Arabic and english | 6(3.5%) | 1.11 | 0.5 | 2 X =146.84 | < 0.000 |
| Number of children | | | | | |
| From (0-5) | 50(29.4%) | | 1.3 | 2 X =19.88 | < 0.001 |
| From (5-10) | 41(24.1%) | | | | |
| From (10-15) | 31(18.8%) | 2.54 | | | |
| From (15-20) | 33(19.4%) | | | | |
| Miss | 15(8.8%) | | | | |
| Marital status | | | | | |
| Married | 108(63.5%) | | | 2 X =91.81 | < 0.000 |
| Single | 56(32.9%) | 1.44 | 0.6 | | |
| Widowed | 6(3.5%) | | | | |
| Occupation | | | | | |
| Student | 41(24.1%) | | | 2 | < |

### *3.2.7 Knowledge about the Vector of Malaria*

**Table 3:** Knowledge of Malaria Vector

| Characteristics | Total | Mean | Std- deviation | Test | P-value |
|---|---|---|---|---|---|
| Cause malaria | | | | | |
| Mosquito | 121(71.1%) | | | 2 X =195.27 | > 0.000 |
| Unhygienic surrounding | 19(11.1%) | 1.59 | 1.04 | | |
| Others | 9(5.2%) | | | | |
| Mosquit. Unhy | 21(12.3%) | | | | |
| Mosquito breeding | | | | | |
| Stagnant water | 125(73.5%) | | 1.11 | 2 X =218.37 | > 0.000 |
| Under zeers | 13(6.6%) | 1.61 | | | |
| Other places | 6(3.5%) | | | | |
| Stag+unde | 21(15.7%) | | | | |
| Number of mosquitoes each house | | | | | |
| Yes | 81(47.6%) | 1.52 | 0.50 | 2 X =0.37 | > 0.000 |
| No | 89(52.3%) | | | | |

Out of 170 interviewed 121 (71.1%) reported that mosquito bite is the main factor for cause of malaria, 19(11.1%) is unhygienic surrounding, 9(5.2%) by others and 21(12.3%) from mosquito bite plus unhygienic surrounding. As shown in Table (3), using chi-square test, the knowledge about mosquito breeding sites was statistically significant: the recent age of the subjects with adequate knowledge was high in stagnant water 125(73.5%), while those under zeers 13(6.6%), whereas other places 6(3.5% ) and stagnant water plus under zeers 21(15.7%).

### *3.3 Preventive Measures*

**Table 4:** Preventive Measures of Mosquitoes

| Characteristics | Percentage | Mean | Std- deviation | Test | P-Value |
|---|---|---|---|---|---|
| **The number of spraying houses** | | | | | |
| **All the month** | 14(8.2%) | 2.48 | 0.64 | 2 x =58.38 | > **0.000** |
| **All the year** | 61(35.8%) | | | | |
| **Not found** | 95(55.8) | | | | |
| **The spraying which done is efficient** | | | | | |
| **Yes** | 85(50%) | 1.50 | 0.50 | 2 x =000 | > **1.000** |
| **No** | 85(50%) | | | | |
| **Keeping mosquito away** | | | | | |
| **Using impregnated** | 135(79.4%) | 1.35 | 0.87 | 2 x =496.56 | > **0.000** |
| **Burn herb** | 25(14.7%) | | | | |
| **Using traditional** | 3(1.7%) | | | | |
| **Spray** | 1(0.5%) | | | | |
| **Impr+Spray** | 5(2.9%) | | | | |
| **Imp+Spra+Burn** | 1(0.5%) | | | | |
| **Using impregnated net** | | | | | |
| **Yes** | 119(70%) | 1.51 | 0.81 | 2 x =106.03 | > **0.000** |
| **No** | 16(9.4%) | | | | |
| **Some times** | 35(20.5%) | | | | |
| **Family using impregnated net** | | | | | |
| **Yes** | 95(56.2%) | 1.65 | 0.81 | 2 x =38.84 | > **0.000** |
| **No** | 38(22.3%) | | | | |
| **Some times** | 36(21.1%) | | | | |
| **Sleeping Undernet** | | | | | |
| **Mother** | 19(11.1%) | 3.18 | 0.99 | 2 x =125.23 | > **0.000** |
| **Father** | 12(7%) | | | | |
| **Children** | 60(35.2%) | | | | |
| **Mo,Fat.Chi** | 77(45.2%) | | | | |
| **No ne** | 2(1.1%) | | | | |
| **Impregnated net cost a lot** | | | | | |
| **Yes** | 78(45.8%) | 1.71 | 0.74 | 2 x =22.24 | > **0.000** |
| **No** | 63(37.05%) | | | | |
| **I do not know** | **29(17.05%)** | | | | |

Table (4) presents the respondent's knowledge and practices about malaria, and its preventive measures. The regular use of bed nets for prevention of malaria was mentioned by 119(70%) of the respondents. Among those who use nets, out of the 70%, about12 (7%) were fathers, and mothers 19(11.1%), while children 60(35.2%), i.e. altogether 77(45.2%) and none 2(1.1%). Other measurements applied were using insecticide aerosol sprays; destruction of mosquito breeding and resting area; use of burn herb; and using traditional seed. The spraying that was done by malaria administration unit, about 95(55.85%) said it was not found, while 61(35.8%) said it was done one time in a year, and 14(8.2%) said only one time in a month.

## 4. Discussion

A descriptive Analysis was done to interpret the data collected on knowledge; attitudes; and other practices were applicable to the design and improvement of malaria control programs; and to identify indicators for a program's effectiveness [14] .The establishment of Anopheles species inside houses was related to the type of houses construction; poorly constructed houses having higher risk for harboring *An. arabiensis* more than those that were complete and built with permanent material. A very strong relationship was found between the presence of Anopheles mosquitoes and location of the houses relative to the locally important breeding sites. Similarly, it was found that storing water for drinking in houses was the main reason for the presence of the vector during the dry season. Mosquitoes prefer being in shanty houses rather than in mud and brick houses. Additionally, homes constructed of shanty, mud and bricks are lacking enough window coverings (barriers to mosquito entry) accounted for a significant higher risk of reporting malaria during the previous year. Generally, the majority of the respondents associated mosquito bite with malaria transmission, showed a common observation in malaria endemic areas where people suffer frequently from the disease. However, in this study 71.1% of the respondents mentioned a correct transmission route (The bites of a mosquito which had bitten a malarial patient). Unexpectedly, about 11.1% of the respondents mentioned that non-hygienic surroundings could cause malaria, while 5.2% did not know the mode of transmission. Stagnant water as the suitable breeding site was described by more than 78.5%, moreover, 47.6% of the respondents said that the number of mosquitoes were high in their houses. As mentioned above, the regular use of bed nets for prevention of malaria was mentioned by 70% of the respondents, it shown that bed nets are among the most recognized methods of personal protections against mosquitoes and many studies have reported the benefits of ITNs[15] . Most of the respondents (55.8%) said that they did not receive spraying by Malaria Administration Unit while only 35.8% confirmed that they received spraying one time every year, although in some tropical regions, the Global Campaign to Eradicate Malaria produced enormous reductions in the burden of the disease. However, malaria cases rebounded dramatically after cessation of control activities [16]. Similar results were reported in a cross-sectional survey data collected from one historical trial of indoor residual spraying against malaria vector in two contiguous districts in Tanzania, Kenya the Pare Taveta project[17].

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