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SOCIAL CORRELATES OF OWNERSHIP AND UTILLIZATION OF INSECTICIDE AND UTILIZATION OF INSECTICIDE TREATED BED-NETS FOR MALARIA AMONG WOMEN OF CHILD BEARING AGES MOZAMBIQUE

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ABSTRACT

Insecticide Treated Bednets is one of the interventions in combating malaria which is one of the major public health challenges in Africa. The aim of this study is to assess the prevalence and determinants of treated mosquito bed-nets possession and utilization among women of child-bearing ages in Mozambique. The study is based on secondary analysis of 6184 women who were interviewed in the 2018 Malaria Indicator Survey. Data was analyzed using descriptive statistics, chi-square test and logistic regressions. The study reveals that 82.1% of the women know that sleeping under treated mosquito bed-net prevents malaria, 90.2% of the women have treated mosquito nets and 77.0% of the women slept under treated mosquito bed-net in the last night prior to the survey. Multivariate logistic regression indicates that type of province of residence, level of education, having radio in the household, wealth index, knowledge that treated mosquito net protects from malaria and seen or heard of malaria messages in last six months prior to survey were significantly associated with ownership of treated mosquito bed-nets. Meanwhile, education, household with radio and age af household head were significantly related to the use of Insecticide Treated Net.Therefore, there is need for interventions for social behaviour change; wide spread of malaria specific messages and continued free distribution of ITNs to poor households. This would help to increase the ownwership and use of insecticide treated bed-nets.As a policy measure, information, education and communication programmes should be intensified, particularly targeting men. Patriarch structures that reinforce power imbalance between men and women should be dismantled.

Keywords: Malaria, Mozambique, Malaria Indicator Survey, Women, Insecticide Treated Bed-Nets

INTRODUCTION

Insecticide Treated Bednets is one of the interventions in combating malaria which is caused by parasites of the Plasmodium family and transmitted by female Anopheles mosquitoes. Malaria, despite being preventable and treatable, continues to have a devastating impact on people's health and livelihoods around the world. An estimation of 219 million cases of malaria is reported to have occurred worldwide and 92% of the cases in 2017 were in the World Health Organization-African region (World Health Organisation 2018). An estimation of 435 000 deaths from malaria globally in 2017 is also reported (World Health Organisation 2018). Thus, in malaria-endemic countries,

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malaria contributes significantly to maternal morbidity and mortality (World Health Organisation 2017).

An estimated US$ 3.1 billion was spent on malaria control and elimination efforts in 2017 globally (World Health Organisation 2018). Nearly three quarters (US$ 2.2 billion) of investments in malaria-control interventions were spent in the African region due to the high prevalence rate of malaria in the region, (World Health Organisation 2018). Due to its cost effectiveness, insecticide-treated mosquito nets (ITNs) is one of the most used control (Lengeler 2004; Basteiro et al. 2011). ITNs are responsible for a 50% reduction in malaria incidence in malaria-endemic countries (Lengeler 2004). An estimated 552 million ITNs were distributed globally and 83% of these nets were distributed in sub-Saharan Africa between 2015 and 2017 (World Health Organisation 2018).

Malaria is still a public health challenge in sub Saharan Africa (SSA) every year, despite increased efforts to improve ITNs' accessibility and utilization (World Health Organisation 2014). Like in many countries in SSA, malaria is a major public health problem in Mozambique. In Mozambique, the number of suspected malaria cases increased from 6,097,263 in 2010 to 15,453,655 in 2016 (World Health Organisation 2017). However, mortality attributed to malaria seems to be decreasing. In 2010, Mozambique reported 3,354 malaria related deaths and in 2016 this number dropped to 1,685 which represent a 50% decrease in malaria related deaths (World Health Organiation 2017). Meanwhile, there has been considerable progress in scaling up malaria controlling including ITNs distribution hence a contribution to decline in malaria related mortality. The Mozambique malaria strategic plan targets universal coverage of ITNs which is 100% (Republic of Mozambique 2012). By 2015, about 66% of households had atleast an insecticide treated nets (President's Malaria initiative 2018). Notwithstanding, malaria still remains endemic in Mozambique.

Therefore, there is need to establish the significant social determinants of possession and utilization of treated mosquito bed nets in order to reduce the burden that malaria has. Identifying direct and indirect determinants of malaria in a low income malaria endemic country will help in the development of health programmes that target those determinants in order to effectively reduce the burden of malaria with the available resources and also inform health policy. Policies that the poor countries can afford are important as they may be easier to implement. Thus, the aim of this study is to assess the prevalence and social determinants of ownership and utilization of insecticide treated bed-nets for malaria control especially for women of child-bearing ages (15-49 years) in Mozambique. Ensuring that women of child-bearing ages optimally possess and utilize treated mosquito bed nets would have a good effect on children especially aged less than five years who are the most vulnerable in malaria endemic areas.

LITERATURE REVIEW

An insecticide-treated net (ITN) is a mosquito net that repels, disable or kills mosquitoes coming into contact with insecticide on the netting material (World Health Organisation n.d.). There are two categories of ITNs, namely conventionally treated nets and long lasting insectsicide nets (LLINs). Conventionally treated nets are treated through dipping in a diluent containing insecticide after production either at the factory or post distribution. LLINs are considered far more effective

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as they are infused with a WHO-recommended insecticide during production using netting material with insecticide bound within or around the fibres at the factory resulting in nets that retain their efficacy for much longer than conventionally treated nets (World Health Organisation n.d). As part of WHO's Global Malaria Technical Strategy 2016-2030 to reduce the burden of global malaria by 90 per cent by 2030, WHO recommends universal coverage with effective vector control including the use of insecticide-treated mosquito nets (ITN), particularly long-lasting insecticidal nets (LLINs), as core interventions for all populations at risk in all malaria-endemic settings (World Health Organisation 2015, 2019). LLINs were developed in the 1990s and first approved by the WHO Pesticides Evaluation Scheme (WHOPES) in 2003 (Pulkki-Brännström et al. 2012).

In relation to ownership of ITNs, a systematic review of studies especially done in sub-Shara Africa reviews that that providing ITNs free probably increases the number of people who own ITNs, compared to providing subsidized ITNs or ITNs offered at full market price, thus removing the barrier of cost improves ownership of ITNs by the most disadvantaged groups in a population, who are also the most atrisk for malaria (Polec 2015). Notwithstanding, other factors found significantly associated with ITN ownership based on review of studies in sub-Sahara Africa include education, knowledge of malaria or ITNs and marital status (Singh 2013). However, 10% of those owning an ITNs in sub-Saharan Africa do not sleep under ITNs (WORLD HEALTH ORGANISATION 2014). Hence, the findings of the systematic review of studies also show that education strategies aiming at increasing the appropriate use of ITNs are necessary (Polec et al. 2015). Meanwhile, Singh et al (2013) findings show that ITNs use in sub-Sahara Africa is associated with factors including education, household income, socio-economic status or ownership of goods, malaria and ITN knowledge, misconceptions, and rural-urban residence. However, according to Scott et al. (2021) there is heterogeneity of determinants of ITNs ownership specifically use in different settings in sub-Sahara Africa which further compounded by the shifting epidemiology of malaria over time thus understanding the context-specifc factors associated with ITN use is crucial in providing guidance for local ITNs distribution for ownership and use.

Mozambique being among the top 5 countries globally accounting for nearly half of malaria cases (WORLD HEALTH ORGANISATION 2015), is not spared in the commitment of maximizing ITNs ownership and use. The use of ITNs as a malaria vector control strategy began in 1994 through a pilot in Boane district of Maputo province (MISAU 2015). After this pilot study several initiatives of free ITNs distribution took place in some districts. The first free mass bed nets distribution campaign was piloted in 2009 in the central province of Sofala (MISAU 2015). This was partly made possible because of strategies put in place especially the third National Malaria Strategic Plan (2012-2016) which contributed to distribution of LLINs expansion to areas that had previously not received bed nets through mass campaigns and pre-natal services and bed nets replacement was also prioritized (PNCM INFORM and LSHTM 2015). In 2016 and 2017, the first national and countrywide bed nets distribution was successfully conducted, delivering more than 16 million bed nets (Arroz et al. 2017).

In relationship to ownership and use, the 2018 Malaria Indicator Survey (MIS) shows that 82% of households in Mozambique owned at least one ITN and 68% of the population slept under an ITN the night before the survey (INS and ICF 2019). In relation to determinants of ITNs

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ownership and use, studies show heteregenous findings among districts or regions but generally formal schooling and household income have prevailing associationwith both ITNs ownership and use (Moon et al. 2016; Scott 2021; Chase et al. 2009). However, the studies on correlates of ITNs ownership and use among women of reproductive age at national level are scarce in Mozambique as the available studies have focused on either households in general or female headed households as well as pregnant women only. Moreover, the studies only focused on a particular geographical location not at national level. Thus, exploring the correlates of ownership and utilization of ITNs for malaria control among women of reproductive age is important because the betterment of women can be extrapolated to children especially those under 5 years as mainly women of reproductive age carry the physiological burden of pregnancy and the care of infants and under-5 children (Forty & Keetile 2021). Furthermore, other than the reported prevailing variables associated with ITNs ownership and use which of course are used and controlled for in this study, the stud also explored other variables like ownership of radio and listening or hearing malaria messages which were found associated with ITNs ownershio and use in Malawi (Forty & Keetile 2021).

RESEARCH METHODOLOGY

Study Areas

Mozambique is one of the countries in Southern Africa that share boarder boundaries with Malawi, Tanzania, Zambia, South Africa, Swaziland and Zimbabwe (Lowe et al. 2013). About 66% of its population of 28.9 million (2017) live and work in rural areas. Mozambique is divided into ten provinces (Niassa, Cabo Delgado, Nampula, Tete, Zambezia, Manica, Sofala, Gaza, Inhambane, Maputo) and one capital city (Maputo) (see figure 1). The provinces are subdivided into 129 districts (World Fact Book 2020). Mozambique is a poor, sparsely populated country with high fertility and mortality rates and a rapidly growing youthful population, 45% of the population is younger than 15 (World Fact Book 2020). Mozambique's high poverty rate is sustained by natural disasters, disease, high population growth, low agricultural productivity, and the unequal distribution of wealth. The country's birth rate is among the world's highest, averaging around more than 5 children per woman (and higher in rural areas) for at least the last three decades (Central Intelligence Agency 2020).

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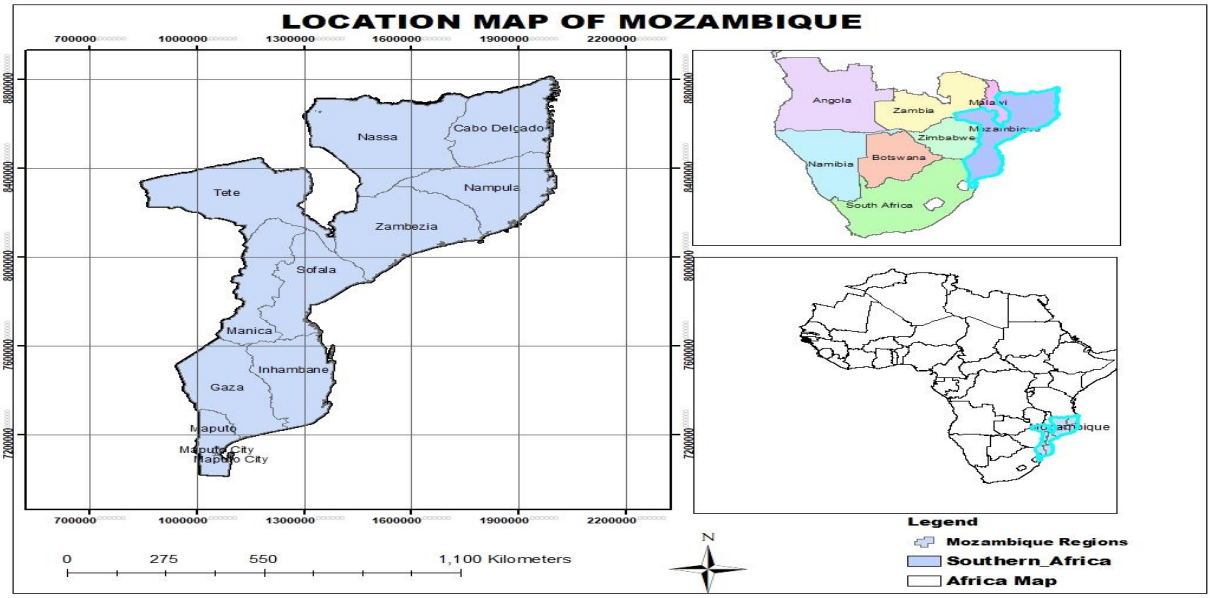
Figure 1: Maps showing the location of Mozambique and its subdivisions



While Mozambique´s entire population is considered at risk for malaria, regional prevalence can be quite different across the country, ranging from 1.5 % in Maputo in the south to 54.8 % in Zambézia Province in the north in 2011. Additionally, a threefold higher prevalence has been reported in rural areas compared to urban (Moçambique InquéritoDemográficoede Saúde 2011). Mozambique´s National Malaria Control Programme is responsible for developing policy, planning, and coordinating all malaria controlled activities within the country. In recent years, major investments have been made through programmes such as the United States President's Malaria Initiative (PMI) and the Global Fund to Fight AIDS, Tuberculosis, and Malaria (Global Fund). Mozambique´s National Malaria Prevention and Control Strategic Plan: 2012–2016 continues to focus heavily on four proven and highly effective prevention and treatment strategies: insecticide-treated mosquito nets (ITNs), indoor residual spraying (IRS), diagnosis and treatment with artemisinin-based combination therapy (ACT), and intermittent preventive treatment of pregnant women (IPTP) (President's Malaria Initiative 2015). For several years, a cornerstone of Mozambique's malaria strategy plan has been to strive for universal coverage of ITNs. In 2009, Mozambique officially adopted a policy of universal coverage, defined as one ITN for every two persons (President's Malaria Initiative 2015).

Research Design

This is studyused secondary data of 2018 Malaria Indicator Survey (Mozambique government 2018). Malaria Indicator Survey is a nation-wide cross-sectional survey which interviewed a representative sample of women aged 15 -49 year. The survey also collected information for children aged less than five years. It is designed to provide data for monitoring malaria situation and interventions. A two-stage cluster sampling procedure was used to generate a nationally

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representative sample of households for the country. In the first stage, enumeration areas or clusters (in urban areas and in rural areas) were selected with probability proportional to sample enumeration area size. In the second stage, households in urban and rural clusters were selected using a systematic random sampling approach. All women of reproductive age (15–49 years) in the selected households were eligible to participate. Population sampling adjustments weights were done to account for differences due to the unequal proportions selected per cluster. Mozambique had a weighted of households of 6196 and 6184 women aged 15-49 years who were the study population (Mozambique Government 2018).

Study Variables and Measurements

Dependent variables

The outcome variables of this study were: (1) ownership of treated mosquito bed nets, (2) slept under the net by women the night prior to survey. Women were asked if they had a treated mosquito bed net and if they had slept under the net the night prior to survey. The possible responses to these questions were "no" or "yes" indicating that these variables were dichotomous.

Independent variables

The variables used were age groups, type of place of residence, sex of household head, age of household head, wealth index of household, knowing that sleeping in treated bed net protects from malaria, seen or heard of malaria message, level of education and ownership of radio. Age groups were categorized as 15-19, 20-24, 25-29, 30-34, 35-39, 40-44 and 45-49 years. Type of place of residence was categorized as urban and rural. Wealth index categories: poorest and poorer were combined and recoded as poor; middle and richer were combined and recoded as middle income and richest remained the same. No education, primary, secondary, higher/tertiary levels were categorized as educational level. Having radios at in the households was used as proxy as main the medium to have information on malaria on the assumption that malaria being a big concern in this country, there is always information about malaria aired on radio stations. Seen or heard of malaria message in last six months and knowing that sleeping in treated bed net protects from malaria were used as measures of knowledge of malaria and control.

These variables were included in this study based on their importance in influencing ITNs possession and use and have been used in previous studies: Age (Seyoum et al, 2017;Gikandi, 2008 & Bennett et al. 2012); type of place of residence (Ankomah et al. 2012;Nkonka et al. 2018); education level of women (Muhumuza et al. 2016;Choonara et al. 2015); wealth index (Kanu 2016; Singh 2013; Sena 2013; Eteng 2014; Baume & Franca-Koh 2011); knew that ITNs prevent malaria (Ankomah et al. 2012); ownership of radio (Sibhatu et al. 2012); and seen or heard of malaria message (Owusu 2014; Bowel 2013; akoyam& Arthur 2013). Furthermore, sex of the household head and age of household head were found to be significant with ITNs and use (Tapera 2019).

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Ethical Consideration

Permission to use the data was obtained from the MEASURE DHS. MEASURE DHS assists countries worldwide in the collection and use of data to monitor and evaluate population, health and nutrition programmes. It is also authorised to distribute survey data files for legitimate academic research. The original study was approved by Mozambique government through National Directorate for Public Health of the Ministry of Health (Direcção Nacional de Saúde Publica).

Data Management and Analysis

First, the data was cleaned and recoded from some of the variables to suit the objective of this study. The outcome variables; ownership of insecticide treated net and slept under the net the night prior to the survey were analyzed separately. Descriptive statistics was used to come up with summarized univariate data and the results were presented as percentages (%). Secondly, cross-tabulations and Chi-Square tests were used to examine the relationship between dependent and independent variables. Thirdly, binary logistic regression was employed for multivariate analysis to identify predictors of outcome variables. Crude and adjusted odds ratios and their 95% confidence intervals (95% CI) were estimated. All statistical analyses were performed using Statistical Package for the Social Sciences (SPSS, IBM version 25) and statistical significance was set at a p-value of less than 0.05.

RESEARCH FINDINGS

Univariate Distribution

Table 1 gives the summary statistics of the study population. The age distribution of the sample shows that the proportion of sampled women declined with increasing age, with highest proportions found in ages 15-19 years (22.3%) and lowest proportions in ages 45-49 years (7.9%). Most of the sampled women resided in rural areas (54.1%), that had primary education (55.8%), had no radios (57.4%), belonged to middle income (38.4%), knew that sleeping under ITN protects from malaria (82.1%) and did not hear or see malaria messages in last six months prior to survey (66.2%). Furthermore, most of the sample women's households are male headed (65.8%) and most household heads are aged between 35 and 44 years (26.7%). Most women were sampled from Manica (10.6%) and least sampled from Cabo Delgado (7.4%).From the sample, 90% (5581/6184) of women had treated insecticide treated bed nets and 67% (4763/6184) slept under the net the night prior to the survey.

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Table 1: Description of sample characteristics

Varriables	Frequency	Percentage
Age		
15-19	1382	22.3
20-24	1286	20.8
25-29	993	16.1
30-34	810	13.1
35-39	673	10.9
40-44	608	9.8
45-49	432	7.0
Sex of household head		
Male	4067	65.8
Female	2117	34.2
Province		
Niassa	529	8.6
Cabo-Delgado	458	7.4
Nampula	551	8.9
Zambezia	520	8.4
Tete	515	8.3
Manica	657	10.6
Sofala	604	9.8
Inhambane	534	8.6
Gaza	591	9.6
Maputo	597	9.7
Maputo-city	628	10.2
Type of place of residence		
Urban	2839	45.9
Rural	3345	54.1
Highest education level		
No education	1199	19.4
Primary	2880	46.6
Secondary	1939	31.4
Tertiary	166	2.7
Wealth group		
Poor	1827	29.5
Middle income	2377	38.4
Rich	1980	32.0

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Household with radio		
No	3502	57.4
Yes	2603	42.6
Knows that sleeping under net prevents malaria		
No	1110	17.9
Yes	5074	82.1
Seen or heard of malaria message in last 6 months		
No	4094	66.2
Yes	2090	33.8
Age-group of household head		
15-24	621	10.1
25-34	1460	23.6
35-44	1650	26.7
45-54	1392	22.5
55-64	667	10.8
65+	392	6.3
Posses treated mosquito bed net		
No	603	9.8
Yes	5581	90.2
Respondent slept under net last night prior to survey day		
No	1421	23.0
Yes	4763	67.0
Total (N)	6184	100

Bivariate Associations between Possession of Treated Mosquito Bed Nets and Social Correlates

The association between the outcome variates and each of the independent variables was examined using chi-square.The results indicated that all the possession of ITNs was significantly associated with all variables except the age of respondents whereas the use of ITNs was significantly associated with all variables.

Table 2: Possession and use of ITNs by women's social characteristics with P-value less than 0.05 showing statistical significance, 2018 MIS (N=6184)

Variables	**Possessed ITNs**			**Slept under ITNs night prior survey**		
	Nunber	Percentage	Chi-Square and p-value	Numbe r	Percentage	Chi-Square and p-value
Age			$\chi^2 = 1.696$, p = 0.945			$\chi^2 = 54.375$, p = 0.000

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15-19	1241	89.8		973	70.4	
20-24	1165	90.6		996	77.4	
25-29	896	90.2.		771	77.6	
30-34	732	90.4		645	79.6	
35-39	614	91.2		556	82.6	
40-44	547	90.0		491	80.8	
45-49	386	89.4		331	76.6	
Sex of household head			$\chi^2 = 4.928$, p = 0.026			$\chi^2 = 14.875$, p = 0.000
Male	3695	90.9		3193	78.5	
Female	1886	89.1		1570	74.2	
Province			$\chi^2 =$ 343.531, p = 0.000			$\chi^2 = 400.726$, p = 0.000
Niassa	460	87.0		417	78.8	
Cabo-Delgado	444	96.9		421	91.9	
Nampula	450	81.7		422	76.6	
Zambezia	467	89.8		435	83.7	
Tete	454	88.2		377	73.2	
Manica	591	90.0		517	78.7	
Sofala	594	98.3		551	91.2	
Inhambane	520	97.4		429	80.3	
Gaza	563	95.3		410	69.4	
Maputo	565	94.6		461	77.2	
Maputo-city	473	75.3		323	51.4	
Type of place of residence			$\chi^2 = 3.973$, p = 0.046			$\chi^2 = 8.349$, p = 0.004
Urban	2539	89.4		2139	75.3	
Rural	3042	90.9		2624	78.4	
Highest education level			$\chi^2 = 51.663$, p = 0.000			$\chi^2 = 33.159$, p = 0.000
No education	1028	85.7		916	76.4	
Primary	2639	91.6		2290	79.5	
Secondary	1778	91.7		1452	74.9	
Tertiary	136	81.9		105	63.3	

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Wealth group			$\chi^2 = 86.137$, p = 0.000			$\chi^2 = 19.880$, p = 0.000
Poorest	1581	86.5		1412	77.3	
Poorer	2248	94.6		1935	81.4	
Middle	1752	88.5		1416	71.5	
Household with radio			$\chi^2 = 36.318$, p = 0.000			$\chi^2 = 5.329$, p = 0.021
No	3091	88.3		2669	76.2	
Yes	2418	92.9		2049	78.7	
Knows that sleeping under net prevents malaria			$\chi^2 = 98.306$, p = 0.000			$\chi^2 = 81.956$, p = 0.000
No	913	82.3		740	66.7	
Yes	4668	92.0		4023	79.3	
Seen or heard of malaria message in last 6 months			$\chi^2 = 9.380$, p = 0.002			$\chi^2 = 3.989$, p = 0.046
No	3661	89.4		3122	76.3	
Yes	1920	91.9		1641	78.5	
Age-group of household head			$\chi^2 = 15.127$, p = 0.010			$\chi^2 = 40.108$, p = 0.000
15-24	541	87.1		487	78.4	
25-34	1323	90.6		1192	81.6	
35-44	1484	89.9		1281	77.6	
45-54	1251	89.9		1043	74.9	
55-64	612	91.8		474	71.1	
65+	368	93.9		284	72.4	

Correlates of Possession and Use of Insecticide Treated Bed Nets

The results presented in Table 3 indicate that region, educational level of the respondents, household with radio, knows that sleeping under net prevents malaria, knows that sleeping under net prevents malaria and age of household head had significantly impact on the possession of Insecticide Treated Net in Mozambique.After adjusting for covariates, women residing in provinces of Niassa (AOR= 3.82, CI= 2.51 – 5.87), Cabo-Degaldo (AOR= 17.79, CI= 9.56 – 33.78,), Nampula (AOR= 2.14, CI= 1.46 – 3.15), Zambezia (AOR= 5.00, CI= 3.23 – 7.77), Tete

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(AOR= 3.35, CI= 2.22 – 5.06), Manica (AOR= 3.50, CI= 2.35 – 5.07), Sofala (AOR= 30.41, CI= 15.22 – 60.76), Inhambane (AOR= 10.47, CI= 5.65 – 19.38), Gaza (AOR= 7.02, CI= 4.34 – 11.33) and Maputo (AOR= 5.34, CI= 3.49 – 8.16) were more likely to possess ITNs. Furthermore, women with primary education (AOR= 1.78, CI= 1.08 – 2.95) and secondary education (AOR= 2.02, CI= 1.25 – 3.26) were more likely to possess ITNs than women with tertially education. On the other hand, women whose households had no radio (AOR= 0.63, CI= 0.51 – 0.78), did not know that sleeping under ITN (AOR= 0.39, CI= 0.32 – 0.48), who did not see or hear malaria messages 6 months prior to survey (AOR= 0.81, CI= 0.65 – 0.99) were less likely to possess ITNs. While women whose household heads (AOR= 0.40, CI= 0.25 – 0.63) old heads were aged 15-24 (AOR= 0.43, CI= 0.26 – 0.73), 25-34 (AOR= 0.61, CI= 0.37 – 0.99), 35-44 (AOR= 0.53, CI= 0.33 – 0.86) and 45-54 (AOR= 0.60, CI= 0.2=37 – 0.97) less likely to possess ITNs.

In addition, the results in Table 3 indicate that region, education, household with radio and age af household head had significant impact on the use of Insecticide Treated Net in Mozambique. Women residing in provinces of Niassa (AOR= 5.01, CI= 3.63 – 6.92), Cabo-Degaldo (AOR= 14.98, CI= 9.85 – 22.79,), Nampula (AOR= 3.97, CI= 2.92 – 5.93), Zambezia (AOR= 6.95, CI= 4.96 – 9.72), Tete (AOR= 3.03, CI= 2.24 – 4.09), Manica (AOR= 4.21, CI= 3.16 – 5.60), Sofala (AOR= 13.00, CI= 9.10 – 18.58), Inhambane (AOR= 3.94, CI= 2.88 – 5.41), Gaza (AOR= 2.29, CI= 1.75 – 2.99) and Maputo (AOR= 3.15, CI= 2.42 – 4.11) were more likely to use ITNs. Furthermore, women with primary education (AOR= 1.66, CI= 1.22 – 2.45) and secondary education (AOR= 1.70, CI= 1.16 – 2.48) were more likely to use ITNs. On the other hand, women whose households had no radio (AOR= 0.76, CI= 0.66 – 0.88) and did not know that sleeping under ITN (AOR= 0.48, CI= 0.41 – 0.57) were less likely to use ITNs. While women whose household heads were aged 25-34 (AOR= 1.37, CI= 1.03 – 1.83) more likely to use ITNs.

Table 3: Unadjusted and adjusted odds ratios showing the likelihood of ownership and utilization of treated mosquito bed-nets among women in Mozambique

Variable	Possession of Insecticide Treated Net				Use of Insecticide Treated Net			
	Unadjusted Model		Adjusted Model		Unadjusted Model		Unadjusted model	
	Exp (B)	95% C.I.	Exp (B)	95% C.I.	Exp (B)	95% C.I.	Exp (B)	95% C.I.
Sex of household head								
Male	1.22***	1.02-1.45	1.15	0.95-1.39	1.27***	1.13-1.44	1.18***	1.03-1.35
Female	1.00		1.00		1.00		1.00	
Province								
Niassa	2.19***	1.60-2.98	3.82***	2.51-5.82	3.52***	2.71-4.56	5.01***	3.63-6.92
Cabo-Delgado	10.39***	5.92-18.23	17.97***	9.56-33.78	10.74	7.42-15.57	14.98***	9.85-22.79
Nampula	1.46***	1.10-1.94	2.14***	1.46-3.15	3.10***	2.40-3.97	3.97***	2.92-5.93
Zambezia	2.89***	2.06-4.05	5.00***	3.23-7.73	4.83***	3.65-6.40	6.95***	4.96-9.72
Tete	2.44***	1.77-3.37	3.35***	2.22-5.06	2.58***	2.01-3.31	3.03***	2.24-4.09

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Manica	2.93***	2.15-4.01	3.50***	2.35-5.07	3.49***	2.73-4.45	4.21***	3.16-5.60
Sofala	19.47***	10.15-37.3	30.41***	15.22-60.76	9.82***	7.11-13.55	13.00***	9.10-18.58
Inhambane	12.17***	6.95-21.33	10.47***	5.65-19.38	3.86***	2.96-5.03	3.94***	2.88-5.41
Gaza	6.59***	4.33-10.03	7.02***	4.34-11.33	2.14***	1.69-2.71	2.29***	1.75-2.99
Maputo	5.79***	3.88-8.63	5.34***	3.49-8.16	3.20***	2.50-4.10	3.15***	2.42-4.11
Maputo-city	1.00		1.00		1.00		1.00	
Type of place of residence								
Urban	0.84***	0.71-0.99	0.77	0.58-1.02	0.84***	0.75-0.95	1.06	0.88-1.28
Rural	1.00		1.00		1.00		1.00	
Highest education level								
No educ.	1.33	0.87-2.03	0.98	0.57-1.69	1.88***	1.34-2.65	1.16	0.76-1.77
Primary	2.42***	1.59-3.66	1.78***	1.08-2.95	2.26***	1.62-3.13	1.66***	1.12-2.45
Secondary	2.44***	1.59-3.73	2.02***	1.25-3.26	1.73***	1.24-2.41	1.70***	1.16-2.48
Tertiary	1.00		1.00		1.00		1.00	
Wealth group								
Poor	0.84	0.69-1.01	0.69	0.45-1.05	1.36***	1.17-1.57	0.74***	0.56-0.99
Mid income	2.27***	1.81-2.84	1.20	0.84-1.69	1.74***	1.51-2.01	1.07	0.86-1.33
Rich	1.00		1.00		1.00		1.00	
Household with radio								
No	0.58***	0.48-0.69	0.63***	0.51-0.78	0.87***	0.77-0.98	0.76***	0.66-0.88
Yes	1.00		1.00		1.00		1.00	
Knows that sleeping under net prevents malaria								
No	0.40***	0.34-0.49	0.39***	0.32-0.48	0.52***	0.45-0.60	0.48***	0.41-0.57
Yes	1.00		1.00		1.00		1.00	
Seen or heard of malaria message in last 6 months								
No	0.75***	0.62-0.91	0.81***	0.65-0.99	0.88***	0.77-0.99	0.89	0.77-1.03
Yes	1.00		1.00		1.00		1.00	
Age-group of household head								
15-24	0.44***	0.27-0.71	0.43***	0.26-0.73	1.38***	1.03-1.85	1.35	0.97-1.88
25-34	0.63***	0.40-0.99	0.61***	0.37-0.99	1.69***	1.31-2.19	1.37***	1.03-1.83
35-44	0.58***	0.37-0.91	0.53***	0.33-0. 86	1.32***	1.03-1.70	0.95	0.72-1.27
45-54	0.58***	0.37-0.91	0.60***	0.37-0.97	1.14	0.88-1.46	0.98	0.74-1.29

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55-64	0.73	0.44-1.19	0.74	0.44-1.25	0.93	0.71-1.23	0.84	0.62-1.13
65+	1.00		1.00		1.00		1.00	

****Statistically significant at P<0.05*

DISCUSSION

This study looked at the significant association of correlates and women of reproductive age possessing and sleeping under insecticide-treated nets. The findings showed higher proportion (90.2%) of insecticide-treated nets possession in Mozambique. This is an increase from the 2015 proportion of 66% possession as reported by President's malaria initiative. Likewise, there was also increased proportion (67%) in using of insecticide-treated nets. Despite increased efforts to improve ITNs accessibility, use of ITNs is relatively low among women in Mozambique. Findings of this study indicate that possession of ITNs did not necessarily translate into use. Thus, suggesting the need for innovative ways that ensure an increased use in ITNs.

After adjusting for covariates, the study found that women from poor household were less likely to possess to use ITNs. This finding corroborates previous studies (Lengeler 2004; Baume and Franca-Koh 2011; Mathanga et al. 2012; Singh 2013; Sena 2013; Eteng2014;Choonara et al. 2015; Muhumuza et al. 2016;Berthe et al. 2019). The findings were expected as poor women can hardly afford to replenish their ITNs if worn out. On the other hand, women with secondary or less education were more likely to own and use ITNs for protection against malaria. This in inconsistent with other studies (Lengeler 2004; Baume & Franca-Koh 2011; Mathanga et al. 2012; Singh 2013; Sena 2013; Eteng2014;Choonara et al. 2015; Muhumuza et al. 2016; Berthe et al. 2019). The relatively low possession and use of ITNs among tertiary educated women was unexpected nonetheless that may be as a result of such women using alternatives like insecticides repellant detergents since such women may are well informed and can afford other alternatives.

Moreover, findings of this study indicate that ownership of radio; having seen or heard of malaria message in the past six months prior to the survey and knowing that sleeping under insecticide treated nets were significant correlates of utilization of ITNs. For instance, we found that women who lived in households without a radio and those who have not seen or heard of malaria message in the last six months and did not know that sleeping under treated insecticide treated nets were less likely to utilize ITNs. This finding is quite indicative and suggests that access to information about the benefits of ITNs for malaria prevention among women is vital. This is consistent with some studies in Africa and other low income settings which have consistently emphasized the need to strengthen methods of communicating malaria prevention information (Spjeldnæs et al. 2014; Malenga et al. 2017; Dhiman 2019; Owusu 2014; Bowel 2013; Akoyari&Aurthur 2013).

Furthermore, the study indicates that province of residing, age of household head and sex of household head were significant correlates of possessing and using ITNs. For instance, there was no significant difference between households headed by females and households headed by males in possessing ITNs and the results was consistent with Garley (2013) finding. However, male headed households used more ITNs than female headed households and this result was not consistent with Garley's (2013) finding. The latter may be attributed to the fact that most males tend to be relatively educated hence they can guide their households in using ITNs. On the other

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hand, the households headed by those aged 54 and less were found to be less likely to own ITNs. This may suggest that in the ITN distribution priority might have been given to households headed by those aged 55 and above probably are thought to be old and dependent. Nonetheless, on the use there was no significant difference. In relation to province of residence, women from ten provinces Niassa, Cabo-Delgado, Nampula, Zambezia, Tete, Manica, Sofala, Inhambane, Gaza and Maputo were found to be significantly to possess and use ITNs compared to women residing in Maputo city. This could be because Maputo City and Province has historically implemented activities aimed at reducing the burden of malaria in the area and consequently the lower the number of importations into its neighbouring countries (Mabaso, 2004). Thus, this may be because of such past interventions and other current alternative interventions the women of Maputo worry less of malaria hence tend to lowly possess and use ITNs.

Although this study provides vital insights on correlates of possession and use of ITNs for prevention of malaria among women of reproductive ages, there are some limitations. For example, the outcome variables are explained based on women only yet most of them live with their husbands/partners who are likely to be heads of households. As a result, there is the possibility of missing out on the male factor(s) that might have effect on the possession and utilization of insecticide treated -bed nets by women. Moreover, information was collected using self-reports, which can distort the accuracy of the results. This is because there is the possibility of social desirability inherent with self-reporting and recall bias from the respondents. Furthermore, there might possible selection and misclassification biases. Nonetheless, these biases were mitigated by MIS for example selection of enumeration areas based on urban/rural consideration, random selection of households and sample weighting ensured of representativeness and mitigation of selection bias. On the other hand, the use of age groups mitigated the misclassification which is common with single ages due to age misreporting. Furthermore, the study's results would be explaining the malaria situation in Mozambique based on primary data of 2018 which is more than 1.5 years to-date thus there might be some changes to possession and utilization of treated mosquito bed nets by women.Despite these limitations, findings of this study provide vital information on the possession and use of insecticide treated bed-nets for malaria prevention among women of reproductive ages (15-49 years) which have a ripple effect that can be extrapolated to infants and children less than 5 years who are mostly looked after by these women.

CONCLUSION

The findings of this study generally indicate low ITNs possession among women from poor households, who did not have radios, did not know that sleeping under ITNs prevent malaria, did not see and hear malaria messages six months prior to this survey and whose household heads were aged less than 55 years. Likewise, women who did not have radios and did not know that sleeping under ITNs prevents malaria were associated with low use of ITNs. Furthermore, women with secondary and less education were more associated with ITNs use. Thus, interventions that ensure households own radios would be desirable for example promoting community-based initiatives, like by-laws, that ensure each household has a radio thus community leaders should be able to identify the ultra-poor for help so as they can also own radios.

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Furthermore, there is need for social behaviour change for example community leaders should be empowered so as every now and then they should be able to hold meetings on malaria-specific messaging, and health surveillance assistants (HSAs) should also convey same messages in their communities of jurisdictions and religious leaders should also be engaged so as they mention malaria-specific massaging in their services. Additionally, as an effort to prevent malaria morbidity and mortality among women from poor households, the government needs to continue with the free distribution of ITNs to families.

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