# Factors influencing the usage of different types of malaria prevention methods during pregnancy in Kenya

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## Abstract

**Background:** In sub-Saharan Africa, malaria is a leading cause of morbidity and mortality, which, during pregnancy, is associated with adverse health outcomes for both mother and foetus. Utilization of Insecticide Treated Nets (ITNs) and Intermittent Preventive Therapy (IPTp) is advocated to prevent malaria during pregnancy.

**Objective:** To examine factors which influence the use of different types of malaria prevention methods among pregnant women in Kenya.

**Methods:** This study used 2008-09 Kenya Demographic and Health survey. Pregnant women aged 15-49 years were included (622 women). Distribution of the study population was assessed in frequency tables. Bivariate and multivariate logistic regression analysis was employed.

**Results:** Fifty-two percent of women used ITNs and 38.5% reported uptake of IPTp. In multivariate analysis age, malaria risk areas, religion, education and income influenced ITN usage, whereas only age, malaria risk areas and marital status were found to influence IPTP uptake.

**Conclusions:** ITN use and IPTp uptake were well below the 80% Kenya Malaria Strategy 2006 target. In an effort to increase uptake it is vital for future research to understand reasons for low usage and uptake of malaria prevention programmes so as to enable policy-makers to make informed decisions.

Keywords: Malaria prevention methods, Pregnancy, Kenya

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# Introduction

Despite efforts to reduce malaria among pregnant women an estimated 30 million pregnant women are still at risk of malaria infection globally<sup>1</sup>. In Africa, the annual rate of malaria related maternal deaths is approximated at 10,000 and 20,000 infant deaths.<sup>2</sup> Malaria

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Shakira Choonara Centre for Health Policy/MRC Health Policy Research Group; School of Public Health; Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, South Africa. Email: Shakira.Choonara@wits.ac.za during pregnancy causes maternal anaemia resulting in low birth weight that predisposes infants to high risk of death.<sup>3,1,4</sup> Within Kenya an estimated 24 million people are at risk of malaria. Over 30.0% of hospital admissions are malaria related and the risk is higher among pregnant women, over 69.0% of which suffer from anaemia.<sup>5,6,7</sup>

The World Health Organisation (WHO) recommends the use of insecticide treated nets (ITNs) and intermittent preventive treatment (IPTp) to prevent malaria during pregnancy.<sup>8</sup> In Africa, the revised Abuja target was to provide 80.0% of pregnant women in endemic areas with ITNs and IPTp by 2005.<sup>9</sup> These measures were taken in order to avert the risk of mortality, anaemia among pregnant women and low birth weight. For instance, in Nigeria there were higher rates of malaria infection among pregnant women who did not make use of an ITN.<sup>14</sup> The highly protective effect of ITNs against malaria was established in Uganda as well.<sup>15</sup> De- **Study variables** spite these malaria prevention benefits, only 50.0% of the women in sub-Saharan Africa use ITNs and 44.0% have received IPTp.<sup>11,12</sup>

Aligned to the Abuja target, Kenya's national malaria strategy plan of 2001-2010 aimed to ensure that 80% of pregnant women in the country received ITNs and IPTp by 2010.<sup>10</sup> As in other parts of Sub-Saharan Africa, adopting malaria prevention has averted the risk of malaria among pregnant women. For example, lower rates of placental malaria were observed among pregnant women who received IPTp treatment in an area of intense malaria transmission in Western Kenva.16 However, despite the efforts and their benefits, Kenya has not achieved one of its key goals to combat malaria among pregnant women despite the resources which have been availed.<sup>11</sup> Less than 50.0% and 40% of the population use ITN and IPTp respectively.<sup>11,12</sup>. Despite and marital status. Age was categorised as 15-24, 25-34 several studies that have been done in Kenva, most have focused on the effect of malaria on mortality and utilisation of prevention measures. For example, malaria prevention was linked to the decline of low birth weight and mortality prevention among children in an area of high perennial malaria transmission in western Kenya.<sup>29,30</sup> These studies did not, however, focus on the determinants of malaria prevention. This study therefore attempts to bridge the existing gap. It is relevant because malaria is responsible for 20% of under-five mortality in Kenya, which threatens annually the lives of 20 million pregnant women and their infants in the country.13

### Materials and methods

### Data source, study design and participants

This study draws its data from the Kenya Demographic and Health Survey (KDHS) of 2008-2009. It uses the female recode that has got the variables necessary for analysis. Such information includes: pregnancy status, malaria prevention measures, socioeconomic status of the women and the demographic variables. The KDHS is a nationally representative survey; it applies a cross sectional study design with a two-staged stratified sampling with a sample size of 8098 women within the reproductive age. A total of 622 currently pregnant binary, which led to the selection of this model. It aswomen were included in this cross-sectional study. The power of the sample size was greater than 80 percent, a population. The model is denoted below: which indicated that the sample was adequate to meet the objectives of the study.

The two main outcomes included ITN use and IPTp uptake. The ITN use variable was created from the 'type of bednet slept under last night' variable in the KDHS. A binary variable was created to limit the variable to 'no' (no bednet used) and 'yes', which only treated nets used (ITNs). The IPTp uptake variable was created from the 'during pregnancy took fansidar for malaria' variable in the KDHS. The variable was limited to either those who received IPTp (yes) or who did not receive IPTp during pregnancy (no). These were the only two possible variables which could be adapted to the study from KDHS, which outlined the usage of these measures during pregnancy.

Independent variables assessed for associations with uptake of the prevention methods included demographic variables such as age, malaria risk areas, religion and above 35 years. Different regions in Kenva were classified according to characteristics of malaria transmission: endemic (20% or higher malaria risk); seasonal endemic (below 5% risk); or low risk (below 0.1 % risk). Religion was grouped as Christian, Muslim and other, and marital status into never married and married. Measures of socioeconomic status were the level of education and a wealth index. Five categories (poorest, poor, middle, rich, richest) of the original wealth index variable were reduced to three (poor, middle and wealthiest). The variable assessing a woman's control over healthcare decisions measures both access to services and women's empowerment, with the categories: respondent and husband/partner; and husband/ partner alone.

#### Statistical analysis

Stata 12.0 (Stata Corporation, College Station, TX, USA) was used in data analysis. Statistical analysis was done at three levels, namely univariate, bivariate, and multivariate. Univariate analysis generated the frequency distributions to reflect the usage of prevention measures and the background characteristics of the women. The binary logistic regression model was used to analvse the data. The response variables of the study were sumes that the observations are a random sample from

$$y = a + \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 \dots \beta_n X_n + \varepsilon_i$$

Where: y represents the dichotomous dependent var- to test associations between the independent variables iable which is either a woman used ITN or not, used and the use of different types of malaria prevention methods during pregnancy, and also controlled for po-IPTp or otherwise,  $\alpha$  is the gradient,  $\beta$ s are the coefficients, x...xn are the independent variables and ei is the tential confounding factors. A combination of forward error term with confident level of 95% and 5% allowand backward elimination methods were used to create the final logistic regression models. ance of error.

The  $\beta$ s are the coefficients indicating the odds of a pregnant woman using the insecticide treated nets and the uptake of IPTp given that the person would not use them. In other words, the coefficients reflected the probability that a pregnant woman used the malaria prevention measures. The value of the coefficient  $(\beta)$ changes as an additional independent variable is added in to the model. The Hosmer and Lemeshow method was used to test the overall goodness of fit of all multivariate logistic regression models.

Table 1 shows that approximately half of the pregnant women used ITNs (52.9%), while only 24.1% received IPTp. Forty-seven percent of the study sample was aged 15-24 years, and 12.9% older than 35 years. Seventy-five percent of the sample was Christian and 21.4% were Muslim. Other characteristics of participants indicate that close to 90.0% of participants were Odds ratios are yielded through logistic regression married. For 56.3% of women, primary education was models to measure association between independent the highest level reached. A low percentage of pregand dependent variables. Unadjusted odds ratios were nant women (22.8%) reported higher education. Most vielded through logistic regression. The use of multiwomen made healthcare decisions together with their variate logistic regression yielded adjusted odds ratios partners, though for a quarter of women still had their health care decisions made solely by their partners.

Table 1: Outcomes & Characteristics of Currently Pregnant Women in Kenya 2008-2009

Variable Var. group Total Po ITN usage ١o Yes Outcomes IPTp Uptake Yes Age 15-24 25-34 Demographics 35+ Religion Christian Muslim Other Marital status Never married Currently married Level of education No education Socioeconomic Primary Higher Education Wealth index Poor Middle Wealthiest Health decisions Respondent & husband/partner ent <u>E</u> Husband/partner alone

# Results

# Malaria prevention and background characteristics of the respondents

8	
opulation (N=622)	Percentage (%)
293	47.1
329	52.9
472	75.8
150	24.1
295	47.4
247	39.7
80	12.9
466	75.0
133	21.4
23	3.6
67	10.8
555	89.2
130	20.9
350	56.3
142	22.8
275	44.2
106	17.0
241	38.8
398	64.1
224	36.0

# malaria prevention measures

Unadjusted and adjusted odds ratios (Table 2) indicate IPTp (AOR=1.83; 95% CI=1.21-2.81). Women who strong associations between demographic factors and the uptake of prevention methods. Age was associated with both outcomes. Women aged 25-34 were close

Determinants influencing use of different types of to two times more likely to utilise ITNs (AOR=1.52; 95% CI=1.04-2.21). Similar odds were reported for resided in seasonal risk and low risk areas were 42.0% and 83.0% less likely to use ITNs than women in endemic areas (AOR=0.58; 95% CI=0.39-0.87 versus AOR=0.17; 95% CI 0.10-0.30).

Table 2 Factors influencing use of different	types of malaria preventi	on methods among pregnant	women in Kenva 2008-09

Variables	ITN usage		IPTp administration	
variables	Unadjusted Odds Ratios	Adjusted Odd Ratios	Unadjusted Odds Ratios	Adjusted Odds Ratios
Age				
15-24	1.00	1.00	1.00	1.00
25-34	1.45(1.03-2.04)*	1.52(1.04-2.21)*	1.79(1.20-2.67)*	1.83(1.21-2.81)*
35+	0.92(0.56-1.51)	1.12(0.65-1.91)	1.52(0.85-2.07)	1.52(0.83-2.79)
Malaria risk areas				
Endemic	1.00	1.00	1.00	1.00
Seasonal risk	0.58(0.41-0.82)*	0.58(0.39-0.87)*	0.68(0.46-1.01)	0.60(0.38-0.94)*
Low Risk	0.26(0.16-0.43)*	0.17(0.10-0.30)*	0.28(0.14-0.56)*	0.28(0.26-0.60)*
Religion				
Christian	1.00	1.00	1.00	1.00
Muslim	1.75(1.18-2.62)*	2.26(1.35-3.76)*	1.29(0.84-2.00)	1.21(0.72-2.06)
Other	0.45(0.18-1.13)	0.60(0.23-1.59)	0.32(0.07-1.40)	0.28(0.06-1.28)
Marital status				
Never married	1.00	1.00	1.00	1.00
Currently married	2.53(1.48-4.33)*	2.29(1.28-4.07)*	2.54(1.18-5.44)	2.19(0.99-4.82)*
Level of education				
No education	1.00	1.00	1.00	1.00
Primary	1.18(0.79-1.78)	1.36(0.78-2.38)	0.97(0.61-1.54)	0.95(0.51-1.75)
Higher Education	1.64(1.01-2.64)*	2.07(1.07-4.00)*	0.79(0.44-1.38)	0.89(0.43-1.85)
Wealth index				
Poor	1.00	1.00	1.00	1.00
Middle	1.12(0.71-1.75)	1.27(0.77-2.09)	0.87(0.52-1.45)	0.93(0.53-1.63)
Wealthiest	1.41(0.10-2.00)	1.83(1.17-2.83)*	0.68(0.45-1.03)	0.82(0.51-1.32)
Health decisions				
Respondent and husband/partner	1.00	-	1.00	
Husband/partner alone	1.07(0.76-1.53)		1.00(0.66-1.47)	-

OR-odds ratio; CI-confidence interval; ITN-Insecticide Treated Net; IPTp-Intermittent Preventive Therapy; \*Significance on the 5% level; -Removed from model

In contrast to endemic areas, fewer pregnant women in seasonal and low risk areas received IPTp (AOR= 0.60; 95% CI 0.38-0.94 versus AOR=0.28; 95% CI 0.26-0.60). Muslim women were 2.3 times more likely to use ITNs in comparison to Christian women (95% CI AOR=1.35-3.76). Married women were higher users of ITNs than never-married ones as reflected in the odds ratios (AOR=2.29; 95% CI=1.28-4.07). Similarly, relative to never-married women, the married ones were more likely to receive IPTp (AOR=2.19; 95% CI=0.99-4.82).

After adjusting for potentially confounding variables, associations were also detected between socioeconomic indicators, ITN use and combined uptake. Socioeconomic indicators such as the level of education and wealth index were associated with study outcomes. Women with higher education also had almost two-fold higher odds of ITN usage than women with no education (AOR=2.07; 95% CI=1.28-4.07). No associations were established between education, wealth index and IPTp. Associations between women from wealthier households and ITN use were considerably higher than women from poorer households (AOR=1.83; 95% CI=1.17-2.83).

The higher uptake of malaria prevention among women Discussion In sub-Saharan Africa the effectiveness of ITNs and from wealthier households was also noted in previous studies. In Uganda, for example, high costs of ITNs IPTp during pregnancy is well established. In Burkina Faso it was found that an increased dose of IPTp durinhibited malaria prevention among pregnant women.<sup>26</sup> ing pregnancy was associated with a reduced risk of low In this study, significant associations were established birth weight of infants in Burkina Faso.<sup>17</sup> The utilisabetween wealth index and the use of ITNs. A possible tion of ITNs among pregnant women in Malawi was explanation for the low usage of ITNs and IPTp among associated with a decrease in placental malaria and the pregnant Kenyan women could be due to the cost aslow birth weight of infants.8 It has been argued in previsociated with these measures. This is supported by the ous literature that there is a need to understand factors findings in Kilifi district in western Kenya where close which influence the use of ITNs and IPTp.<sup>18</sup>This study to 85% of women mentioned lack of money as the maexamined the effects of several demographic, socioecjor reason for the non-usage of ITNs during pregnanonomic and empowerment determinants influencing cy.<sup>23</sup> Other direct and indirect costs may include long the use of different types malaria prevention measures queues at antenatal clinics, limited resources for IPTp at during pregnancy. health facilities and transport costs to the clinics.

A prior study indicates no association between marital status age, and ITN use in Ethiopia.19 In Kenya asso-The study has a few limitations although these are not ciations were detected between age, marital status and strong enough to invalidate the results. The limitations the outcome measures of this study (ITN, and IPTp). include the following: Residing in different malaria risk areas was linked with 1) The different recall periods used in the measure of use of ITNs, IPTp and combined uptake. Levels of IPTp and ITN use in the KDHS survey limits the validuptake during pregnancy were lower in parts of Kenya ity of the combined uptake variable. Data collected as with less malaria transmission, as found in a study in part of the KDHS was based on individual responses Ghana.<sup>20</sup> Qualitative research in Ethiopia showed that from women which are subject to recall bias. when women perceive the risk of malaria to be low, 2) The KDHS did not capture the period between malaria ceases to be a serious problem psychologically, pregnancy status and the time for initiating the malaria resulting in low usage of preventive measures.<sup>21</sup> Similar prevention measures. It is possible that women might to findings in Nigeria, religion played an important role have just confirmed their pregnancy status close to the in the uptake of malaria prevention measures.<sup>22</sup> This time of data collection and may not have actually used study merely displayed association although further inany prevention methods as there is a time lag between sight into examining the impact of religion on use of realising pregnancy status and enrolling for antenatal malaria prevention measures is clearly needed. care services. Such scenarios could have led to a possi-

Some associations were established between socioeco-3) The study only relied on the quantitative approach. nomic variables and the use of ITNs. Once these were It would have been important to establish the reasons adjusted, no associations were made between these varthat most of the women failed to take malaria preveniables and IPTp administration increased odds of the tion. This would lead to a deeper understanding of the usage of ITNs, and increased with education support causes that could be used in policy designs and implefindings in Kenya where there was an association bementation by health officials, administrators and the tween the level of knowledge of malaria and educacommunity leaders.<sup>14</sup> tion.<sup>23</sup> It is also argued that educated women tend to have more knowledge regarding malaria and are there-Conclusions fore found to make greater use of these measures.<sup>24</sup> The levels of usage of ITNs (52.9%) and IPTp uptake These results are similar to an earlier study where sig-(24.1%) are well below the 80% Kenya Malaria Stratenificant associations were established between women gy 2006 target, which concerns the adverse effects of malaria during pregnancy on both mothers and infants.<sup>3</sup> with a primary level of education and IPTp administration in Uganda.25 A range of socio-demographic variables was found to influence use of different types of malaria prevention

### **Study Limitations**

ble underestimation of the use of prevention methods.

measures during pregnancy in Kenya. In particular, low Death in the Extremely Low Birth Weight in Infant. levels of use was recorded among women in seasonal and low risk areas, less educated women, those who were not married, women of different religions, and B. Changes in the burden of malaria in sub-Saharan Afthose from poor and middle-income households. The findings of this study indicate that women in these categories in Kenya be specifically targeted to optimise the uptake of prevention measures during pregnancy. While associations have been detected between these variables and the actual usage of these measures, this study fails to provide depth and insight as to why or how these factors are associated with use of these measures during pregnancy. More studies need to be geared towards understanding the influence of these factors in Kenya as well as in other settings, due to there being minimal intermittent preventative therapy or bed nets. PLoS One. literature in this regard. Furthermore, there is a need for these studies to be coupled with qualitative research 9. Beer N, Ali AS, Savigny D, Al-Maf A, Ramsan M, in order to have a thorough understanding of how and why these factors truly influence the use of prevention measures.

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