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[1]. In Africa, the annual rate of malaria related maternal deaths is approximated at 10,000 and 20,000 infant deaths.[2] Malaria during pregnancy causes maternal anaemia resulting in low birth weight that predisposes infants to high risk of death.[3,1,4] 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.[5,6,7]

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The World Health Organisation (WHO) recommends the use of insecticide treated nets (ITNs) and intermittent preventive treatment (IPTp) to prevent malaria during pregnancy.[8] In Africa, the revised Abuja target was to provide 80.0% of pregnant women in endemic areas with ITNs and IPTp by 2005.[9] 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.[14] The highly protective effect of ITNs

against malaria was established in Uganda as well.[15] Despite these malaria prevention benefits, only 50.0% of the women in sub-Saharan Africa use ITNs and 44.0% have received IPTp.[11,12]

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.[10] 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 Kenya.[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.[11] Less than 50.0% and 40% of the population use ITN and IPTp respectively.[11,12]. Despite several studies that have been done in Kenya, 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.[29,30] 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 women were included in this cross-sectional study. The power of the sample size was greater than 80 percent, which indicated that the sample was adequate to meet the objectives of the study.

Study variables

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 marital status. Age was categorised as 15-24, 25-34 and above 35 years. Different regions in Kenya 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 analyse the data. The response variables of the study were binary, which led to the selection of this model. It assumes that the observations are a random sample from a population. The model is denoted below:

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

Where: y represents the dichotomous dependent variable which is either a woman used ITN or not, used IPTp or otherwise, α is the gradient, βs are the coefficients, x…xn are the independent variables and εi is the error term with confident level of 95% and 5% allowance of error.

The βs 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 (β) 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.

Odds ratios are yielded through logistic regression models to measure association between independent and dependent variables. Unadjusted odds ratios were yielded through logistic regression. The use of multivariate logistic regression yielded adjusted odds ratios to test associations between the independent variables and the use of different types of malaria prevention methods during pregnancy, and also controlled for potential confounding factors. A combination of forward and backward elimination methods were used to create the final logistic regression models.

Results

Malaria prevention and background characteristics of the respondents

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 married. For 56.3% of women, primary education was the highest level reached. A low percentage of pregnant women (22.8%) reported higher education. Most women made healthcare decisions together with their 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

Var. group	Variable	Total Population (N=622)	Percentage (%)
Outcomes	*ITN usage*		
	No	293	47.1
	Yes	329	52.9
	IPTp Uptake		
	No	472	75.8
	Yes	150	24.1
Demographics	*Age*		
	15-24	295	47.4
	25-34	247	39.7
	35+	80	12.9
	Religion		
	Christian	466	75.0
	Muslim	133	21.4
	Other	23	3.6
	Marital status		
	Never married	67	10.8
	Currently married	555	89.2
Socioeconomic	*Level of education*		
	No education	130	20.9
	Primary	350	56.3
	Higher Education	142	22.8
	Wealth index		
	Poor	275	44.2
	Middle	106	17.0
	Wealthiest	241	38.8
Empowerment	*Health decisions*		
	Respondent & husband/partner	398	64.1
	Husband/partner alone	224	36.0

Determinants influencing use of different types of malaria prevention measures

Unadjusted and adjusted odds ratios (Table 2) indicate strong associations between demographic factors and the uptake of prevention methods. Age was associated with both outcomes. Women aged 25-34 were close to two times more likely to utilise ITNs (AOR=1.52; 95% CI=1.04-2.21). Similar odds were reported for IPTp (AOR=1.83; 95% CI=1.21-2.81). Women who 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 prevention methods among pregnant women in Kenya 2008-09

Variables	ITN usage		IPTp administration	
	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).

Discussion

In sub-Saharan Africa the effectiveness of ITNs and IPTp during pregnancy is well established. In Burkina Faso it was found that an increased dose of IPTp during pregnancy was associated with a reduced risk of low birth weight of infants in Burkina Faso.[17] The utilisation of ITNs among pregnant women in Malawi was associated with a decrease in placental malaria and the low birth weight of infants.[8] It has been argued in previous literature that there is a need to understand factors which influence the use of ITNs and IPTp.[18] This study examined the effects of several demographic, socioeconomic and empowerment determinants influencing the use of different types malaria prevention measures during pregnancy.

A prior study indicates no association between marital status age, and ITN use in Ethiopia.[19] In Kenya associations were detected between age, marital status and the outcome measures of this study (ITN, and IPTp). Residing in different malaria risk areas was linked with use of ITNs, IPTp and combined uptake. Levels of uptake during pregnancy were lower in parts of Kenya with less malaria transmission, as found in a study in Ghana.[20] Qualitative research in Ethiopia showed that when women perceive the risk of malaria to be low, malaria ceases to be a serious problem psychologically, resulting in low usage of preventive measures.[21] Similar to findings in Nigeria, religion played an important role in the uptake of malaria prevention measures.[22] This study merely displayed association although further insight into examining the impact of religion on use of malaria prevention measures is clearly needed.

Some associations were established between socioeconomic variables and the use of ITNs. Once these were adjusted, no associations were made between these variables and IPTp administration increased odds of the usage of ITNs, and increased with education support findings in Kenya where there was an association between the level of knowledge of malaria and education.[23] It is also argued that educated women tend to have more knowledge regarding malaria and are therefore found to make greater use of these measures.[24] These results are similar to an earlier study where significant associations were established between women with a primary level of education and IPTp administration in Uganda.[25]

The higher uptake of malaria prevention among women from wealthier households was also noted in previous studies. In Uganda, for example, high costs of ITNs inhibited malaria prevention among pregnant women.[26] In this study, significant associations were established between wealth index and the use of ITNs. A possible explanation for the low usage of ITNs and IPTp among pregnant Kenyan women could be due to the cost associated with these measures. This is supported by the findings in Kilifi district in western Kenya where close to 85% of women mentioned lack of money as the major reason for the non-usage of ITNs during pregnancy.[23] Other direct and indirect costs may include long queues at antenatal clinics, limited resources for IPTp at health facilities and transport costs to the clinics.

Study Limitations

The study has a few limitations although these are not strong enough to invalidate the results. The limitations include the following:

1) The different recall periods used in the measure of IPTp and ITN use in the KDHS survey limits the validity of the combined uptake variable. Data collected as part of the KDHS was based on individual responses from women which are subject to recall bias.

2) The KDHS did not capture the period between pregnancy status and the time for initiating the malaria prevention measures. It is possible that women might have just confirmed their pregnancy status close to the time of data collection and may not have actually used any prevention methods as there is a time lag between realising pregnancy status and enrolling for antenatal care services. Such scenarios could have led to a possible underestimation of the use of prevention methods.

3) The study only relied on the quantitative approach. It would have been important to establish the reasons that most of the women failed to take malaria prevention. This would lead to a deeper understanding of the causes that could be used in policy designs and implementation by health officials, administrators and the community leaders.[14]

Conclusions

The levels of usage of ITNs (52.9%) and IPTp uptake (24.1%) are well below the 80% Kenya Malaria Strategy 2006 target, which concerns the adverse effects of malaria during pregnancy on both mothers and infants.[3] A range of socio-demographic variables was found to influence use of different types of malaria prevention

measures during pregnancy in Kenya. In particular, low 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 those 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 literature in this regard. Furthermore, there is a need for these studies to be coupled with qualitative research in order to have a thorough understanding of how and why these factors truly influence the use of prevention measures.

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