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Attitudes and Behaviors Around Preventative Measures Against Malaria During Pregnancy in the Luwero District of Uganda

Alyssa Robb¹, Michelle Cathorall²

^{1,2}School of Health and Applied Human Sciences/Public Health, The University of North Carolina Wilmington, Wilmington, NC, USA

ABSTRACT Background: In Uganda, the prevalence of malaria in pregnancy ranges from as low as 8.9% to as high as 50% depending on the level of transmission within the region. It is estimated that malaria may contribute to 8-14% of low birth weight, 3-8% of infant mortality and 3-15% of maternal anemia in Uganda. There is limited information on the attitudes and behaviors of pregnant women related to preventive measures against malaria during pregnancy and the health impacts that these preventive measures have on infant and maternal mortality.

Methods: A cross-sectional study was conducted in June 2023. An in-person structured interview was used to collect data from 63 women on demographics, attitudes and preventive behaviors related to malaria during pregnancy. Interviews conducted in participants' homes took approximately 50 minutes. Descriptive statistics were analyzed for demographic data. Chi-squared tests with a significance level set at $p < 0.05$ were conducted to test relationships between variables of interest. Purpose: The purpose of this study is to understand protective behaviors and attitudes women have about malaria prevention during pregnancy.

Results: Almost one-third of women (31.7%, $n = 20$) reported contracting malaria during their most recent pregnancy. Most respondents (82%, $n = 52$) received prenatal care and 87.3% ($n = 55$) used at least one preventive measure against malaria during their last pregnancy. 8 (12.7%) participants reported not using personal protective measures against malaria. Not using personal protective measures was found to be statistically significant in preventing malaria during pregnancy. Bed net use was found to be significant in preventing malaria during pregnancy, as was taking SP/Fansidar during their most recent pregnancy. Receiving prenatal care was found to be significant in preventing malaria during pregnancy. Education level was found to correlate receiving prenatal care and to the belief that pregnant women should receive malaria treatment during pregnancy.

Conclusion: This study sheds light on the attitudes and behaviors surrounding preventive measures against malaria during pregnancy among a sample of women in rural Uganda. Most women are not receiving the World Health Organizations standard treatment of at least three doses of SP/Fansidar, resulting in malaria infections. While there is a policy on the provision of bed nets to women during antenatal care visits, most households did not meet the standard for one bed net for every two people within the household. The study emphasizes the need for targeted health campaigns to promote bed net use and address barriers to intermittent preventive treatment of malaria for pregnant women (IPTp), such as cost and enforcement of bed net distribution at antenatal care visits for women. Improving access to prenatal care services, particularly in rural communities, is needed to keep women and children healthy. Recognizing the challenges related to the implementation of policies involving bed net distribution and the IPTp standard of care, there is a pressing need to advocate for policies that support effective prevention strategies during pregnancy. Advocacy efforts should be directed towards improved policy implementation and encouraging regular antenatal care visits.

KEY WORDS Malaria, malaria in pregnancy, attitudes and behaviors, preventive methods against malaria

INTRODUCTION

There were an estimated 247 million malaria cases globally in 2021. Out of 40 million pregnancies from 38 moderate to high-transmission countries, 13.3 million were exposed to malaria infection (1). Malaria is one of the leading causes of morbidity and mortality in Uganda. In low-income countries, pregnant women and children aged five and under are at the highest risk. Pregnancy makes women more vulnerable to the effects of malaria. Malaria in pregnancy can progress to placental (2). Placental malaria is the accumulation of *Plasmodium*-infected red blood cells in the placental intervillous space (3). Malaria infection during pregnancy can also infect the fetus, leading to congenital malaria (2). Congenital malaria is not as common as placental malaria and occurs when malarial parasites are found in the peripheral smear of the newborn up to day seven of life (4). Malaria in pregnancy can increase the risk of anemia, maternal death, infant mortality, miscarriages and low birth weight (2). Low birth weight can lead to intrauterine growth retardation (IUGR), which can cause the newborn to have difficulty breathing, eating and maintaining a steady body temperature. Difficulty fighting off infections and potential neurological problems are also harmful effects of malaria in pregnancy (5). In Uganda, the prevalence of malaria in pregnancy ranges from as low as 8.9% to as high as 50% depending on the region (6). The standard of care for IPTp in Uganda is for women to receive at least two doses of SP/Fansidar during their second and third trimester (7).

The World Health Organization recommends intermittent preventive treatment in pregnancy with sulfadoxine-pyrimethamine (SP-IPTp) in endemic regions (8). Endemic regions are geographic areas where there is a constant presence of a disease (9). Sulfadoxine-pyrimethamine (SP) is sold under the brand name of Fansidar and is used to prevent malaria during pregnancy. It also reduces the presence of the parasite in the placenta, thereby reducing the risk of mother-to-infant transmission. There are policies in place to decrease malaria during pregnancy such as distribution of bed nets at antenatal care visits. The government has adopted the standard of care of two doses of IPTp for women. However, women are still being infected with malaria during pregnancy, which fails to meet WHO's goals of malaria reduction. The purpose of this study is to gain a better understanding of the protective behaviors and attitudes toward malaria prevention that pregnant women have.

MATERIALS AND METHODS

Study Population and Procedure

A cross-sectional study was conducted in the Luwero district of Uganda. The Luwero district is a region located in central Uganda where malaria is endemic (10). Data was collected from four villages within this district. The villages were selected because of their proximity to Ndejje University and the long-standing relationship the university has with the villages. The research team was comprised of six US public health undergraduate research assistants and the principal investigator, who has worked with the university and villages for the last eight year. A convenience sample was used to collect data from 106 households for 15 days in June 2023. The in-person survey took between 40-60 minutes to complete depending on the number of people living within the household. The surveys took place at the participants' homes. Eligible participants lived in one of the four villages. Data was collected from one adult individual in each household. Eligible participants were residents of one of the four villages, were 18 years or older and spoke English. Data used for this study was collected as part of a larger study on malaria. For this study, data from female respondents meeting the inclusion requirements and who had previously had at least one live birth was analyzed. The study was approved by the University of North Carolina Wilmington IRB (#H23-0682).

Data Collection Instrument

The data collection instrument was developed for the larger study. Questions were adapted from the USAID Malaria Index Survey (MIS) and a questionnaire developed by Hutchins (13). The full data collection instrument includes 82 survey questions. For this study, data from 35 of the questions was analyzed.

Demographic Characteristics and Antenatal Care

Socio-demographic variables including age, education level and distance to health clinics were collected. Data on antenatal care service utilization including the number of visits and the kind of provider they saw were collected. Participants were asked if they received SP/Fansidar during their last pregnancy. If participants responded yes to receiving SP/Fansidar, a follow-up question asked how many doses they received during their most recent pregnancy.

Attitude and Behaviors Around Bed Nets

Participants were also asked if there were bed nets in the home. If the participant responded yes, a follow-up question was asked about the total number of bed nets in the home and if the nets were Insecticide Treated Net

(ITN), Long Lasting Insecticide Treated Net (LLIN), or not treated. Participants were also asked who used the bed nets and if they viewed bed nets as safe for pregnant women.

Data Analysis

Data was entered and analyzed using SPSS version 27 (12). Descriptive statistics reported as frequencies were used to summarize the data, including sex, age, education level, home with mosquito nets, type of net, malaria during pregnancy and SF use during pregnancy. For preventive behaviors, the totals may not equal 100% because participants were able to select all that apply.

Inferential analysis was conducted using Pearson χ^2 , where statistical significance was set a priori as $P < 0.05$. This was used to determine whether there was a relationship between a woman's education level, if they received prenatal care, use of insecticide cream, insecticide coil/smoke, staying indoors at night, wearing long sleeves, clearing stagnant water, avoiding places with mosquitoes, burning dung/leaves, closing doors/windows, or if they reported the not protecting themselves and malaria infection in their most recent pregnancy. Education level was examined to determine if there is a relationship with women receiving prenatal care.

RESULTS

Population Demographics

A total of 63 women with at least one pregnancy that resulted in a live birth participated in this study with an average age of 37 years, ranging from 18-82 (Table 1).

TABLE 1. PARTICIPANT CHARACTERISTICS

Variables	Percentage of Participants (N=63)
Age	
18-20	38.1 (n=24)
30-41	27 (n=17)
42-53	6.3 (n=4)
54-65	6.3 (n=4)
>65	7.9 (n=5)
Education Level	
Primary	38.1 (n=24)
Secondary	47.6 (n=30)
Higher	7.9 (n=5)
Distance to Health Facility	
<20 minutes	49.2 (n=31)
20-40 minutes	12.7 (n=8)

41-61 minutes	15.9 (n=10)
83-103 minutes	1.6 (n=1)
104-124 minutes	6.3 (n =4)
167-187 minutes	1.6 (n=1)
>200 minutes	3.2 (n=2)

Of these women, 31.7% (n = 20) reported getting malaria during their most recent pregnancy. The distance to local health facilities ranged from 0-240 minutes away, with the 49.2% (n = 31) of participants being within 20 minutes of the nearest healthcare facility.

Behaviors Around Malaria Prevention During Pregnancy

84.1% (n = 53) of participants had bed nets while 14.3% (n = 9) did not. Bed net use by the respondents was found to be significantly related to whether they had malaria in their most recent pregnancy (Table 2). Not using personal protection methods was found to be significant for participants getting malaria in their most recent pregnancy ($\chi^2 = 9.744, p = .008$). None of the other protective behaviors were found to be significant (Table 2).

TABLE 2. CHI-SQUARE FOR PROTECTIVE BEHAVIORS

Variables	Chi-Square and <i>p</i> Values	Percentage of Participants (N=63)
Insecticide Cream	$\chi^2 = 1.110$ <i>p</i> = .574	11.1 (n=7)
Insecticide Coil/Smoke	$\chi^2 = .971$ <i>p</i> = .615	11.1 (n=7)
Staying Indoors at Night	$\chi^2 = 2.282$ <i>p</i> = .319	11.1 (n=7)
Wearing Long Sleeves	$\chi^2 = .478$ <i>p</i> = .787	7.9 (n=5)
Clear Stagnant Water	$\chi^2 = 1.620$ <i>p</i> = .445	20.6 (n=13)
Avoiding Places With Mosquitoes	$\chi^2 = .288$ <i>p</i> = .866	4.8 (n=3)
Burning Dung/Leaves	$\chi^2 = 1.885$ <i>p</i> = .390	3.2 (n=2)
Closing Doors/Windows	$\chi^2 = 1.050$ <i>p</i> = .592	22.2 (n=14)
I Don't Protect Myself	$\chi^2 = 9.744$ <i>p</i> = .008	12.7 (n=8)
Bed Net Use	$\chi^2 = 7.113$ <i>p</i> = .029	69.8 (n=44)

SP/Fansidar Use

 $\chi^2 = 46.534$ $p = < .001$

71.4 (n=45)

During their last pregnancy, 42.8% (n = 27) of these women had received >two doses of SP/Fansidar, and 38.1% (n = 24) had three or more doses. The use of SP/Fansidar was found to be significant in preventing malaria during pregnancy ($\chi^2 = 46.534$, $p = < .001$), but the number of doses was not significantly related. Most participants 82.5% (n = 52) received prenatal care. Receiving prenatal care was found to be significantly related to not having malaria during their most recent pregnancy ($\chi^2 = 24.186$, $p = < .001$). Education level was found to be significantly related to whether women received prenatal care ($\chi^2 = 14.634$, $p = .023$). Education level was not statistically related to getting malaria during pregnancy ($\chi^2 = 10.533$, $p = .104$).

Attitudes Around Malaria Prevention During Pregnancy

When asked “Do you think that all women should receive malaria treatment when pregnant?”, 11.1% (n = 7) said no, one woman said she was unsure and 87.3% (n = 55) said yes. Education level was found to be significantly related to the belief that women should receive malaria treatment during pregnancy ($\chi^2 = 17.084$, $p = .009$). When asked “Do you think bed nets are safe for pregnant women?”, 98.4% (n = 62) said yes. Education level was not significantly related to beliefs about bed net use during pregnancy ($\chi^2 = 1.651$, $p = .648$).

Malaria During Pregnancy and S/P Fansidar Use

A logistic regression was performed to ascertain the effects of the number of doses of SP/Fansidar on the likelihood that participants contracted malaria during pregnancy. The logistic regression model was not statistically significant ($\chi^2 = 1.789$, $p = .161$). The model explained 69.0% (Nagelkerke R^2) of the variance of malaria infection and correctly classified 59.5% of cases. Distance from the nearest health facility was similarly not significantly related to malaria infection in pregnancy according to logistic regression.

DISCUSSION

This study investigated the attitudes and behaviors around malaria prevention during pregnancy in the Luwero district of Uganda. Overall, 87.3% (n = 55) of participants used at least one means of preventing malaria. Barriers to preventing malaria during pregnancy include: women's non-attendance to antenatal care visits and limited access to IPTp for pregnant women due to cost and its inaccessibility in rural areas(11). The number of doses of SP/Fansidar was not found to be significantly related to preventing malaria during pregnancy, perhaps due to the small sample size (14). Although the dose of SP/Fansidar was not statistically significant, the finding indicates some practical significance. The results indicate that women who reported taking five, six, or seven doses of SP/Fansidar during pregnancy developed malaria less often during their most recent pregnancy compared to women who reported taking fewer doses. The promotion of bed net use, addressing barriers to IPTp implementation and targeted educational interventions can contribute to enhancing maternal and child health outcomes. While the standard of care is three doses of IPTp (9), evidence from this study suggests that increasing the number of doses of SP/Fansidar during pregnancy may be useful in preventing malaria infection, but more research is needed to confirm this finding. A study with a larger sample size to gain a better understanding of the significance of more than three doses of SP/Fansidar. Along with indicating when the study participants most recent pregnancy occurred. Since some study participants' most recent pregnancy was before IPTp was the standard of care.

Implications for Practice

This study confirms bed net use as a statistically significant prevention measure against malaria during pregnancy in a rural endemic setting. This study emphasizes the importance of implementation of targeted campaigns that focus on the importance of bed net use, including promotion by health-care providers of bed net use in pregnancy. Barriers to the implementation of IPTp are often associated with the supply and demand of SP/Fansidar (14). Lack of policy enforcement in this area contributes to the number of pregnant women who contract malaria. Advocacy should focus on implementing policies that facilitate the delivery of preventive measures and strengthening efforts to improve access to prenatal care services that include the provision of free nets and IPTp particularly to keep women and children healthy. Advocacy should focus on reducing barriers to healthcare access, particularly in rural communities.

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