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Factors Influencing the Usage of Insecticide Treated Mosquito Nets among Pregnant Women

Abstract

Purpose: Malaria in Sudan is a leading cause of morbidity and mortality. Incidence remains very high especially among pregnant women and children under five. study was conducted to determine the factors influencing the usage of insecticide treated mosquito nets (ITNs) for prevention of malaria among pregnant women.

Methods: A cross-sectional study design with convenience sampling was conducted in antenatal care clinic in Sudan.

Results: Among the 104 respondents, prevalence of malaria was 71.2%. The coverage of ITNs was 58.7% but only 11.5% used ITNs regularly. Ninety six (92.3%) showed good knowledge on malaria causes, 103 (99%) had good knowledge on malaria complications and 62 (59.6%) showed good knowledge on the aim of ITNs usage. Only 23 (22.1%) knew the proper usage of ITNs. Maternal age, income, gravidity, parity, abortion, number of family members, usage of ITNs during last pregnancy, previous history of malaria, usage of ITNs by other family members and accessibility to ITNs were significantly associated with current usage of ITNs.

Conclusion: Although there was good knowledge of ITNs among women in Sudan, proper usage of ITNs is poor. Factors influencing usage of ITNs among the pregnant women include maternal age, income, gravidity, parity, abortion, number of family members, usage of ITNs during last pregnancy, previous history of malaria, usage of ITNs by other family members and accessibility to ITNs.

Keywords: ITN, malaria, pregnancy, Sudan.

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Introduction

In Sudan, malaria is a major public health problem. It is a leading cause of morbidity and mortality with more than 7.5 million cases and 35,000 deaths each year [1,2]. Whilst the whole populations are at risk, there is higher incidence among pregnant women and children under five years of age. Instead of many preventive interventions, incidence of malaria during pregnancy is still very high. More than 52% of pregnant women attending antenatal care clinics are affected by malaria. Malaria during pregnancy has been reported to be associated with serious impacts on mothers, their fetus, and neonates in Sudan. Anemia, spontaneous abortion, intrauterine growth retardation, stillbirth, premature and preterm labour, low birth-weight and maternal mortality often complicate the disease [3].

Before the development of insecticide treated nets (ITNs) as a new technology in the mid-1980s, people in many countries were already using different types of nets, mainly to protect themselves against insects' bites and for other cultural reasons [4-6]. It was only recently appreciated that a net treated with insecticide offers much greater protection against malaria; not only does the net act as a mechanical barrier to prevent mosquitoes come into contact and bite humans, but also the insecticide repels, inhibits, or kills any mosquitoes attracted to feed. By reducing the vector population, ITNs when used by the majority of the target population provides protection both to individuals sleeping under them and to the other community members who do not sleep under the nets. It can give protection of up to 90% and significantly reduces the incidence of malaria during pregnancy as well as its complications. The effect is so significant that the usage of ITNs is considered to be one of the most effective prevention measures for malaria [7,8]. In addition to prevention of malaria when used by pregnant women, ITNs are also efficient in reducing maternal anaemia, placental infection, and low birth weight [9].

In April 2000, African heads of state participating in the Abuja Summit agreed that at least 60% of

those at risk for malaria, particularly pregnant women and children under 5 years of age, are to benefit from the most suitable combination of personal and community protective measures such as ITNs by 2005 [10]. Following the recommendation of the World Health Organization (WHO), the Sudan Maternal and Neonatal Health (MNH), and Roll Back Malaria (RBM) program, ITNs was promoted for prevention of malaria during pregnancy in Sudan [11].

There are substantial numbers of published studies regarding the cost effectiveness of the ITNs. However, there are relatively fewer studies conducted to find its level of coverage and factors influencing its usage especially among those who are at higher risk, particularly pregnant women. Despite the cost barrier to the widespread usage of ITNs, knowledge of the appropriate usage of ITNs is very crucial.

This study was conducted to determine the factors influencing the usage of ITNs in prevention of malaria among pregnant women as well as malaria prevalence, ITNs coverage, and knowledge regarding malaria causes, complications and purpose of ITNs usage.

Methods

Study setting

This study was carried out in the antenatal care clinic of Omdurman Maternity Hospital in Omdurman – the largest city of the head of the triangle that form the capital of Sudan - between June and November 2009. The hospital is the first and the biggest specialized maternity hospital in Sudan providing care and medical services to mothers and newly born babies to most of the 2.5 million population of the city.

Study design

This was a cross-sectional study using the convenience sampling method in which all pregnant women attending antenatal care clinic were recruited until total number of sample size was achieved. Sample size of 104 respondents

used was calculated based on a 2-sided hypothesis tests using Epi-info with 80% power, confidence interval of 95%, expected frequency for ITNs coverage of 50%, and a precision of 10%, and having added additional 10% to account for non-response.

Data collection

The data was collected using a pre-tested structured questionnaire which consisted of three sections with closed ended questions. The first part covered the socio-economic and demographic characteristics of the respondents, the second part was related to the prevalence of malaria during pregnancy and knowledge about its causes and complications, while the third part was about the ITNs coverage, knowledge regarding the purpose and proper way of ITNs usage, and the factors influencing ITNs usage.

Data analysis

Data analysis was conducted by using Statistical Package for Social Sciences (SPSS) version 16. Descriptive analysis of the collected data was done first then the appropriate statistical tests of bivariate and multivariate was applied. At 95% confidence interval, p values less than 0.05 were considered significant.

Results

All 104 recruited participants completed the study giving 100% response rate. The median age of the respondents was 30 years, (IQR±6). Majority of them (54, 51.9%) were housewives. The ITNs coverage was 61 (58.7%); however, only 12 respondents (11.5%) used ITNs regularly. ITNs usage by respondents' other family members was 59 (56.7%). Prevalence of malaria among pregnant women was 71.2%. Ninety six respondents (92.3%) demonstrated good knowledge of malaria causal factors, and almost all respondents (103, 99%) had good knowledge of malaria complications. Some (59.6%) demonstrated good knowledge on the aim of ITNs usage but only 23 respondents (22.1%) knew the proper usage of ITNs. Those with increased maternal age, income, gravidity, parity,

abortion, and number of family members were more likely to use ITNs during pregnancy (Table 1).

Table 1: Analysis of socio-demographic factors by ITN users (n=104)

| Factor | ITNs users Median (IQR) | ITNs non users Median (IQR) | p-value ^a |
|---------------|-------------------------------|-----------------------------------|----------------------|
| Age in years | 31 (6) | 27 (7) | <0.01 |
| Income (SP) | 16000 (10000) | 1000 (14000) | <0.05 |
| Gravidity | 3 (2) | 1 (1) | <0.01 |
| Parity | 1 (2.5) | 0.0 (1) | <0.01 |
| Abortions | 1 (1) | 0.0 (0.0) | <0.01 |
| No. of family | 5 (3) | 4 (2) | <0.01 |

Although the level of education played a major role in access to curative and preventive health services, there was no significant association between the level of education and ITNs usage. Pregnant women who lived in their own houses were found to have increased chance to use ITNs (Table 2).

Although good knowledge related to malaria causes and its complications and the purpose of ITNs usage is crucial in any preventive measurements; however it was found that it doesn't increase the ITNs utilization by the respondents; this may be explained partially by what is said to be difficulties in ITNs fixation and limitation to freedom of movement. In addition, the high incidence of malaria among ITNs users which happens due to the low level of knowledge regarding the proper usage of ITNs makes some people wrongly think that ITNs is not effective as a tool for malaria prevention (Table 2).

Pregnant women who had malaria during past pregnancies with or without complications, those who used ITNs during last pregnancy or regularly use ITNs in addition to those who mentioned that accessibility to ITNs is easy or have one or more of their family members using ITNs were found to be more prone to use ITNs (Table 2). Those who use other preventive method are satisfied with them.

Table 2: Analysis of the level of education, gestational age and type of house by ITN users (n =104)

| Item | OR (95% CI) | χ^2 (df) | p-value |
|--------------------------------------|----------------------------|---------------|---------|
| Level of education | | | |
| None | 1.0 | 21.7 (3) | |
| Primary | 0.3 (0.0, 1.7) | | >0.05 |
| Secondary | 0.2 (0.0, 1.0) | | >0.05 |
| Tertiary | 1.8 (0.3, 11.3) | | >0.05 |
| Gestational age | | | |
| First trimester | 1.0 | 1.1 (2) | |
| Second trimester | 0.6 (0.2, 1.6) | | >0.05 |
| Third trimester | 0.8 (0.3, 5.1) | | >0.05 |
| Type of house | 2.3 (1.0, 5.1) | 4.0 (1) | <0.05 |
| Knowledge of malaria Cause | | | |
| Poor | 1.0 | 0.2 (2) | >0.05 |
| Moderate | 2.0 (0.1, 51.6) | | >0.05 |
| Good | 1.4 (0.1, 23.1) | | >0.05 |
| Complications | 1.7 (1.5, 2.0) | 0.0 (1) | >0.05 |
| Proper use of ITNs | 23.7 (3.1, 16.7 (1) 184.2) | | <0.01 |
| Purpose of ITN usage | | 2.1 (1) | >0.05 |
| Other factors | | | |
| ITN usage last pregnancy | 42.0 (9.2, 191.5) | 40.7 | <0.01 |
| Malaria current pregnancy | 0.6 (0.3, 1.5) | 1.1 | >0.05 |
| Current pregnancy with complications | 0.8 (0.3, 2.1) | 0.2 | >0.05 |
| Past pregnancies | 11.8 (4.6, 30.1) | 30.4 | <0.01 |
| Past pregnancies with complications | 10.6 (4.2, 26.9) | 28.2 | <0.01 |
| Regular usage of ITNs | 0.5 (0.4, 0.7) | 7.7 | <0.01 |
| ITN usage by other family members | 40.9 (13.1, 127.6) | 54.7 | <0.01 |
| Easy accessibility to ITNs | 18.2 (2.2, 148.3) | 10.3 | <0.01 |
| Usage of other preventive methods | 0.5 (0.2, 1.2) | 2.2 | >0.05 |

Factors like usage of ITNs by other family members and accessibility to ITNs also positively

affected the current usage of ITNs by pregnant women. However, when confounders were controlled, interaction treated, and multicollinearity resolved only three factors remained as good predictors for the ITNs usage by pregnant women. Multivariate analysis using multiple logistic regression showed that the increasing number of deliveries inversely related to the likelihood of ITNs usage (Adj. OR = 0.1, $P < 0.05$). However pregnant women who used ITNs during last pregnancy were more likely to use it during their current pregnancy (Adj. OR = 68.6, $P < 0.05$). Usage of the ITNs by other family members encouraged the usage of ITNs by the pregnant women during their pregnancies (Adj. OR = 25.5, $P < 0.01$) (Table 3).

Table 3: Multiple logistic regression analysis (N =104)

| Variable | Adj. OR (95% CI) | χ^2 (df) | p-value |
|-----------------------|------------------|---------------|---------|
| Parity | 0.1 (0.0, 0.7) | 5.1 (1) | <0.05 |
| ITN last pregnancy | 68.6 (1.5, 3234) | 4.6 (1) | <0.05 |
| ITNs family members | 25.5 (2.9, 228) | 30.1 (1) | <0.01 |
| ITNs proper knowledge | 37.5 (0.6, 21) | 3.1 (1) | >0.05 |

Discussion

This study provides one of the few studies carried out on factors influencing the usage of ITNs among pregnant women in Sudan beside the perceptions of the causes of malaria and its complications. It has revealed that pregnant women were knowledgeable about the causes and complications of malaria and the benefits of using malaria preventive methods such as ITNs, but very few of them could use ITNs properly and regularly. The prevalence of malaria was similar to other countries in the area with only mild differences that may be attributed to the skills and experiences of the laboratory personnel involved in blood film preparation, staining and reading of the slides; in Nigeria, the prevalence rate is between 36.5% and 72% and in Gabon was 57% [12-15]. ITNs coverage in this study is also similar to those reported in Tanzania Demographic and Health Survey 2004/5 which

estimated household ownership of about 46% with coverage among pregnant women of 54% [16-18].

Some other studies have documented different percentage of ITNs coverage. In Eritrea, the bed-net treatment rate increased from 20% in 2000 to 58.5% in 2002. The estimate of the number of nets in use in Eritrea was 533200, with some 226000 nets having been produced and distributed in 2002. Most households in endemic areas of Eritrea possess two nets at least [19]. A community programme in rural Zambia achieved net coverage of more than 60% of individuals at risk [20]. In a neighbouring country, like Uganda where there is still high burden of malaria, the coverage of ITNs is only 26% [21]. In Mozambique, where about less than 3% of people had heard about ITNs, only 9% use ordinary non insecticide treated nets. However in Ghana - a western African country - the ITNs coverage was estimated to be more than 65% [22].

Conclusion

In Sudan, pregnant women studied had good knowledge of ITNs but the proper usage of ITNs is poor. Among the women, maternal age, income, gravidity, parity, abortion, number of family members, usage of ITNs during last pregnancy, previous history of malaria, usage of ITNs by other family members and accessibility to ITNs are factors influencing the usage.

The poor knowledge on proper usage of ITNs is a real challenge if an improvement in ITNs distribution and efficiency is to be achieved. Increasing knowledge of proper ITNs usage increases its efficiency and significantly increases the confidence of pregnant women to use ITNs for prevention of malaria during their pregnancies.

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Conflict of interest

No conflict of interest associated with this work.

Contribution of Authors

We declare that this work was done by the authors named in this article and all liabilities pertaining to claims relating to the content of this article will be borne by the authors

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