Reported knowledge, attitudes and practices regarding malaria and mosquito net use among women seeking antenatal care in south-western Tanzania

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Abstract: To improve control measures against malaria, Tanzania has increased the distribution of free and subsidized insecticide-treated mosquito nets (ITNs) to pregnant women. However, data on ownership and use of ITNs, as well as knowledge, attitudes and practices of these women regarding malaria are scarce. The objective of this study was to describe knowledge, attitudes and practices towards malaria, frequency of bed net use and level of ownership of bed nets among women seeking antenatal care in Iringa regional hospital, southern Tanzania**.** This cross-sectional study involved women attending antenatal clinic at Iringa Regional Hospital in south-western Tanzania. A pre-tested structured questionnaire was applied. Among the 222 pregnant women included, 173 (78%, 95%CI, 72-84.2) owned a bed net, and 150 (68%, 95%CI, 61-75) reported to sleep always under a bed net. The use of bed nets was mentioned by 142 (64%, 95%CI, 56.2-72). Of the 46 women who did not own a bed net, seven (15.2%) reported cost as the main obstacle for owning one. About 53% (95%CI, 44-62) preferred to use mosquito nets they bought rather than the one provided for free. Several factors such as gravidity, fearing of getting malaria, knowledge on the cause, marital status, and ways used to prevent malaria were significantly associated with mosquito net ownership (all $P<0.001$). Education level and gravidity were associated with the behaviour to sleep always under bed nets ($P<0.002$). Multigravidae (2-4 pregnancies) (OR 2.1, 95%CI 1.2-4.8) and married women (OR, 1.9, 95%CI, 1.2-5.2) were more likely to own a net, as compared to primigravidae and single women. In conclusion, ITNs ownership and use among pregnant women was good and they preferred to use the nets they bought from private sector. Thus, integrating public and private sector will improve the distribution and coverage of insecticides treated mosquito among high risk groups, such as pregnant women.

Keywords: pregnant women, mosquito net, ownership, use, malaria, Tanzania

Introduction

There are between 300 and 500 million malaria infections and 1 million malaria attributed deaths worldwide each year (Roll Back Malaria/WHO, 2002). About 90% of these deaths occur in sub-Saharan Africa (Roll Back Malaria/WHO, 2002), and the majority of these cases occur among women and children (Roll Back Malaria/WHO,

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2002). Malaria also presents major obstacles to social and economic development of affected countries. In African countries with stable malaria transmission, infection during pregnancy is estimated to cause about 10,000 maternal deaths each year, 8-14% of low birth weight babies and 3-8% of all infant deaths (WHO/UNICEF, 2003). Because of this, pregnant mothers and chhildren under 5 year-olds have been the key targets for malaria prevention, using Insecticides Treated Mosquito Nets (ITNs).

ITNs reduce human contact with infected mosquitoes and have been shown to be an effective malaria prevention measure (Roll Back Malaria, 2005). Use of ITNs among pregnant women is associated with lower prevalence of malaria infections, lower occurrence of premature birth and significant reductions maternal anaemia (D'Alessandro *et al*., 2003; ter Kuile *et al*., 2003). In addition to the direct benefit to the individual, ITNs use offers a protective benefit for the entire community. Increased ITNs use throughout a community reduces transmission and thus has a more powerful impact than individual change (Teklehaimonot *et al*., 2007).

In 2004, the National Malaria Control Programme (NMCP) introduced a voucher subsidy for pregnant women as part of a nation-wide programme to prevent malaria by enhancing coverage of pregnant women and the young children who share their sleeping spaces during and after the pregnancy. Although distribution of ITNs to pregnant mothers and under 5 year-olds has been massively expanded in Tanzania, there is little information on the frequency of ownership, knowledge, attitudes and practices (KAP) of pregnant women on ITNs use. Some studies have suggested that mosquitoes nuisance, malaria knowledge and socio-demographic factors, including education and household income are important determinants of bed net ownership and use (Opiyo *et al*., 2007, Wiseman *et al*., 2007, Mazigo *et al*., 2010). However, knowledge on the benefits of ITNs or ownership of ITNs does not necessarily imply use. Therefore, the objective of this study was to investigate the level of bed net ownership and use, as well as KAP towards malaria and ITNs use, among pregnant women attending an antenatal care clinic. Understanding the factors involved with bed net ownership and use in pregnant women is essential for refining ITNs distribution and for developing effective information, education and behavioral change activities.

Material and Methods

Study area, design and population

This cross-sectional study was carried out between July and September 2009 at Iringa Regional Hospital. Iringa municipality is located between latitude 7° 49' south to longitude 35° 15' east and lies at 1560-2000m altitude. The area receives an annual rainfall of 750-1000 mm, mostly between December and April. The mean annual temperature is about 19°C.

The study focused on women attending antenatal clinics (ANC) at the hospital. Pregnant women who were at least 14 years old and consented to be interviewed were eligible to participate in the study. Participants were recruited consecutively until the sample size of 222 pregnant women was reached. Study participants were interviewed

at the ANC in Kiswahili language by the principal investigator (EEA), using a pre-tested structured questionnaire. The questionnaire covered socio-demographic information, questions on bed net ownership, information about bed net use, as well as questions on knowledge, attitudes and practices about malaria, bed net use and malaria control activities. To guarantee privacy of the information from the participants, pregnant women were interviewed individually by the investigator in a room which was allocated at ANC. The interview was conducted after pregnant women had received all the ANC services.

Data management and analysis

Data entry was done in Microsoft Access (Microsoft Corp., Redmond, USA) in duplicate, and datasets were checked for entry-related errors. Data were analyzed using SPSS version 11.5 for Window (SPSS Inc, Chicago, IL, USA). Frequency tables were generated and cross tabulations of important variables done. Bivariate analyses were conducted to determine factors associated with net ownership and net usage using chi-squared statistics.

Ethical considerations

The study was carried out as part of an elective course of the principal investigator (Emmanuela E. Ambrose) and received ethical clearance from Iringa regional hospital management and Weill-Bugando University College of Health Sciences. General information regarding the nature of the study and its objectives was explained to participants. Confidentiality and anonymity was maintained by using codes instead of participants' names. Inclusion of participants took place after informed written consent was received.

Results

Socio-demographic characteristics of the study population

A total of 222 pregnant women consented to be interviewed and were included in data analysis. Table 1 details the demographic characteristics of the study population. The mean age was 29.5 years (SD=7.2 years) and ranged between 14 and 45 years. Most of the women were married (71.6%), while seven (3.2%) were single living alone, and another 43 (19.5%) living with their parents. The majority of women (54.1%) were in their second to fourth pregnancy, and few were gradimultipara. About 50% of the respondents had completed primary school education, while few had secondary education.

Table 1: Demographic characteristics of women seeking antenatal care in Iringa region hospital, Southern Tanzania in July to September 2009

Variables		N	%
Age			
	14-19	37	16.7
	20-24	86	38.7
	25-29	57	25.7
	30-34	23	10.4

	Above 35	17	7.7
Marital status			
	Live alone	7	3.2
	Married	159	71.6
	Living with fiancee	8	3.6
	Separated	1	0.5
	Divorced	1	0.5
	Still living with parents	43	19.4
	House girl	1	19.4
Number of pregnancies			
	1	87	39.2
	2-4	120	54.1
	More than 5	13	5.9
Level of education			
No primary education		33	14.9
Completed primary school		114	51.4
Not completed secondary school		21	9.5
Completed secondary school		39	17.6
Completed college		7	3.2
University		6	2.7

Knowledge of malaria and use of bed nets

All participants reported they had heard of malaria, and 178 (80.2%) knew that the disease is transmitted by mosquitoes (Table 2). The major method of malaria prevention used by respondents was sleeping under bed nets (64%). The vast majority of women had been diagnosed with malaria during the past year, with most diagnoses made by a physician (Table 2). In total, 173 (77.9%) of the pregnant women reported to own a mosquito nets (ITNs and untreated bed nets) and 150 (68%) reported to sleep always under a bed net (Table 2). Of those having mosquito nets, 170 (98.3%) owned between 1-4 mosquito nets in their houses. The majority of those who did not own a mosquito bed nets, reported the costs to be the main barrier for not owning a net (Table 2). When asked about the reasons for not sleeping under a net, 45.6% of women stated not having a net (Table 2).

Table 2: Knowledge of malaria and use of mosquito nets among antenatal clinic attendees

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Variable	Response	N*	%
Causes of malaria (unprompted)	Mosquito	178	80.2
	Dirty environment	2	0.9
	Standing water	4	1.8
	Mosquito and standing water	3	1.4
	Mosquito and dirty environment	1	0.5
	I don't know	22	9.9
Do you know ways to prevent	Yes	204	91.9

malaria?			
	No	15	6.8
What are the ways to prevent malaria?	Mosquito net	142	64.0
	Environmental cleanliness	3	1.4
	Antmalarial drugs	7	3.2
	Mosquito net and environmental cleanliness	12	5.4
	Mosquito net and antmalarials	17	7.7
	Mosquito net, antmalarial and environmental cleanliness	19	8.6
	I don't know	19	8.6
Malaria diagnosis in the past years?	Yes	187	84.2
	No	32	14.4
Who diagnosed your malaria?	Self diagnosis	8	3.6
	Physician	181	81.5
Do you own mosquito nets?	Yes	173	77.9
	No	46	20.7
Number of mosquito nets owned in the house hold (n=173)	1	85	49.1
	2-4	82	47.4
	4-5	2	1.2
	>5	4	2.3
Do you always sleep under mosquito nets	yes	150	67.6
	no	68	30.6
Reasons for why not to sleep under bed nets always (n=68)	I don't have	31	45.6
	My bed net was torn	4	5.9
	I get tired	7	10.3
	No mosquito	8	11.8
	I forget	5	7.4
	I dislike	3	4.4
Reason for not owning a mosquito net (unprompted) n=46	Cost (very expensive)	34	73.9
	It was damaged	3	6.5
	I don't like	1	2.2
	No mosquito in my area	8	17.4
	Not interested in bed nets	1	2.2

*For some variables, responses were not available in all cases.

Attitudes about malaria

Attitudes about malaria and bed net use are depicted in Table 3. The vast majorities of participants were worried about getting malaria, stated that it was a serious disease, and believed that it is important and beneficial to sleep under a mosquito net every night. About half reported that they would prefer to use a net they had bought by themselves, compared to one distributed for free (Table 3). Only 18.5% reported being unable to afford buying a mosquito net if they would not receive one for free.

Factors associated with mosquito net ownership

Several factors such as gravidity (P<0.001), knowledge on the cause of malaria (P<0.001) and knowledge to prevent malaria (P<0.001), fearing to get malaria (P<0.001) and marital status were associated with bednets ownership among pregnant women. Age (P=0.269) and education level (P=0.152) were not associated with mosquito net ownership. In bivariate analysis, multigravidae (2-4 pregnancies) (OR 2.1, 95%CI 1.2-4.8) and married women (OR, 1.9, 95%CI, 1.2-5.2) were more likely to own a net compared to primigravidae and single women. Furthermore, factors such as gravidity (multigravidae, 2-4 pregnancies) (P<0.001), education levels (P<0.002) and fearing to get malaria (P<0.001) were associated with the behaviour of sleeping under mosquito nets among net owners.

Table 3: Attitudes about malaria and bed net use among women seeking antenatal care

	N	%
In your opinion, do you think that most people where you live		
Are worried/concerned about getting malaria	190/204	93.1
Believe that using mosquito nets is the best way for prevention against malaria	210/216	97.2
Prefer using a mosquito net that they have brought rather than one given to them for free	117/160	73.1
In your own opinion, do you believe		
that are you worried of getting malaria	144/219	65.7
it is important and beneficial to sleep under a mosquito nets every night	217/219	99
you would prefer using a mosquito net you have bought better than one given to you for free	80/148	54.1
that you wouldn't afford to buy a mosquito if you didn't receive one for free	38/206	18.5
it is useless to use a mosquito net because you can suffer from malaria anyway	10/206	4.9
that obtaining mosquito net in the community where you live is easy	114/212	53.8
that malaria is a serious disease	217/220	98.6
that it is more difficult to use a mosquito net than taking drugs when you suffer from malaria	17/211	8.1
that children suffer from malaria more than adult do	159/163	97.5
it's difficult to use a mosquito net	7/212	3.3

Discussion

The current death rates from malaria in Africa are undoubtedly decreasing because of improvement in health services, individual and community increased use of malaria intervention tools such as ITNs. Currently, malaria endemic countries are optimistic to eliminate the disease in the near future, however, the control of malaria requires good knowledge and awareness of appropriate preventive measures among the general public to ensure positive health behavior changes and health seeking habits (Minja *et al*., 2001; Panter-Brick *et al*., 2006).

Uses of ITNs among pregnant women have been found to be increasing in different areas of Africa. In community surveys of six sub-Saharan countries, use of ITNs by women of reproductive age varied from 32% to 69% (Baume *et al*., 2007). In another survey in Burkina Faso where pregnant women were interviewed in ANC clinics and Delivery Units, 58% reported owning an ITN (Sirima *et al*., 2006). Majority of the pregnant women in the present study reported to own bed nets and about 2/3 reported always to sleep under a bed net. This observation gives a promising future to attain the Roll Back Malaria (RBM) partnership goal of 80% mosquito net coverage in pregnant women. At the time of this study, bed nets were distributed freely to mothers of underfives, as part of the Tanzania government strategies to control malaria. This could partly explain the high level of mosquito net ownership in multigravidae women. Pregnant mothers were also receiving subsidized ITNs under voucher schemes when they attended antenatal clinics. However, not all pregnant women who attend ANC can afford to pay for the subsidized nets and the system have been critised to favour the better off (Matovu *et al*., 2009). Alternative sources of ITNs for pregnant women are private sectors such as retail shops (Matovu *et al*., 2009). This is clearly demonstrated in our study, where more than 50% of the pregnant women reported to obtain their nets from the private sector. Accessibility of ITNs from retail shops is easier for the pregnant women in the present study area; however, the high cost could be an obstacle (Osero *et al*., 2006; Noor *et al*., 2006; Matovu *et al*., 2009; Mazigo *et al*., 2010). Lack of affordability was reported as an important barrier to ITNs ownership (Pulford *et al*., 2011). Previous studies have found that free distribution of ITNs has resulted in substantial increase in net coverage compared to subsidize (Noor *et al*., 2006; Maxwell *et al*., 2006). Thus, mass and free distribution of ITNs might be necessary to achieve the targets of Roll Back Malaria (RBM), however, this will not guarantee the use of the interventions (Panter-Brick *et al*., 2006). To increase the uptake and use of the malaria intervention by the targeted group or community, the designed interventions should be build on the existing practices, culture and the community must be fully engaged (Panter-Brick *et al*., 2006).

The overall understanding of malaria transmission and effective means to prevent transmission were good in the present study population. About 65% of the women reported being worried about contracting malaria and reported positive attitudes towards using bed nets to prevent malaria. Factors such as gravidity,

knowledge on the cause and preventive measures against malaria, fearing to contract malaria and being married were strongly associated with net ownership. However, age and education level of pregnant women were not associated with bed net ownership and use. This stands in contrast with other studies in Africa, which have reported that women with higher education were more likely to own and use bed nets (Osero *et al*., 2006; Noor *et al*., 2007; Mazigo *et al*., 2010).

Our study is subject to limitations. We acknowledge the fact that the ANC-based study population may not be representative for the general population. Furthermore, the study sample came from a single clinic and all the information used in the present study relied on the individual reporting on the ownership and use of ITNs.

In conclusion, acceptability of mosquito nets, and net ownership and use are promising in the study population. To achieve maximum ITNs distribution and coverage among risk groups such as pregnant women, there is a need to integrate public and private sector.

Competing interests

None

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