

# Preventing malaria during pregnancy: factors determining the use of insecticide-treated bed-nets and intermittent preventive therapy in Juba

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## Abstract

The study was carried out among 334 pregnant and newly delivered women seen at Juba Teaching Hospital in 2009. The objective was to assess the coverage of insecticide-treated bed-nets (ITN) and Intermittent Preventive Therapy (IPT) among these women and the factors associated with their use. Overall 87% of the women used ITN and 61% used IPT. ITN use was positively associated with buying nets, indoor spraying of insecticide and higher household income. IPT use was positively associated with more frequent antenatal clinic visits, indoor spraying and buying ITN.

## Introduction

Studies show that malaria infections are higher in first and second pregnancies than subsequent ones (1). In South Sudan, as in other places, malaria is a cause of:

- maternal anaemia
- intra-uterine growth retardation
- low birth weight
- stillbirths and abortions, and
- maternal mortality (2, 3)

The World Health Organization (WHO) recommends IPT in pregnancy after studies showed that it reduced the prevalence of maternal anaemia and low birth weight (4, 5). The drug acts by clearing malaria parasites from the placenta during the period of rapid foetal growth (6).

To date there is no documentation on the coverage and determinants of the use of ITN or IPT in pregnancy in South Sudan. So the objective of this study was to fill this information gap.

## Methods

A cross-sectional study was carried out between September and November 2009 at Juba Teaching Hospital (JTH). The Cochran formula ( $z^2 \times p(1-p)/d^2$ ) was used to estimate the minimum sample size assuming the proportion of pregnant women using ITN (or IPT) was 33% (8, 1), a 95% confidence interval and a precision of 5%.

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The participants were pregnant women attending the ante-natal clinic (ANC) in their second and third trimesters and women in the maternity ward in the immediate period after delivery. Every sixth woman meeting the inclusion criteria and giving her consent was selected. A total of 334 women were recruited – 167 from ANC and 167 from the ward. Data were collected on:

- use of ITN and IPT during pregnancy
- attitudes towards IPT
- how bed-nets were acquired
- ANC attendance
- indoor spraying of insecticide
- general knowledge and attitudes about the cause and prevention of malaria
- age, employment, education, monthly household income and parity.

## Statistical Analysis

Epi Info version 3.4.3 statistical software was used for data entry and analysis. A descriptive statistical analysis was carried out on the use of ITN. Differences in proportions were analyzed using Chi square tests or Fisher exact test where appropriate. During bivariate analysis for factors associated with ITN and IPT use the measure of association was Odds Ratio (OR). A P-value  $\leq 0.05$  was considered a statistically significant association.

Factors that were significant during bivariate analysis ( $P \leq 0.05$ ) were used as independent variables in the unconditional multiple logistic regression where a backward stepwise elimination method was used to obtain the final model. During the backward stepwise methods all the significant factors were entered in the model and the regression run until only factors that were significant (at  $P \leq 0.05$ ) were retained in the model which was the final “best” model. This allowed for the assessment of

### Ministry of Health guidelines for reducing malaria during pregnancy.

In accordance with WHO recommendations, the guidelines for reducing malaria during pregnancy in South Sudan are:

- treat clinical malaria
- promote the use of insecticide-treated bed-nets and
- prescribe Intermittent Preventive Therapy. Give at least two doses of sulfadoxine-pyrimethamine (SP) tablets at one month intervals, beginning after quickening in the second trimester. Give at least three doses to HIV infected women (7).

*SSMJ plans to have an article on malaria in pregnancy in a future issue.*

measures of association among nested levels of the factors retained in the model.

## Results

### Socio-demographic characteristics of participants (for full details see Table 1 in the Annex in the version of this article published on the SSMJ website)

The majority of women were in the 18-31 year age group (the mean age was 24 ( $\pm 5.4$ ) years); most were unemployed or housewives (74%) and Christian (79%). Two thirds had attained primary or secondary education while 27% had not gone to school. The monthly income of the husbands of more than half of the women was between 500-1000 Sudanese pounds (approximately US\$185-370).

The overall use of ITN was 87% (n = 296; 95% CI = 85% - 92%) and of IPT was 61% (n = 204; 95% CI = 56% - 63%). The use of ITN and IPT was highest among women who:

- were aged 32 years and above
- were formally employed
- had attained secondary school education
- had a monthly household income above 1,000 Sudanese Pounds.

There was no significant difference in use of ITN and IPT among Christians and Muslims.

### Factors associated with ITN use (for full details see Table 2 in the Annex in the version of this article published on the SSMJ website)

Bivariate analyses for factors associated with ITN use showed that the following factors were statistically significant at  $P \leq 0.05$ : buying ITN; being on the third or more ANC visit; household monthly income of  $\leq$  US\$ 100; use of indoor spraying to prevent mosquito bites; no education; doing nothing to prevent mosquito bites; Christianity; awareness that mosquitoes cause malaria and use of IPT.

These factors were used to obtain the final "best

fit model" and only three of these were independently associated with ITN use in pregnancy in the study. Those who had bought ITNs and those who used residual indoor spraying were more likely to sleep under insecticide treated nets. However women with low incomes were found to be less likely to use bed-nets.

### Factors associated with IPT use (for full details see Table 3 in the Annex in the version of this article published on the SSMJ website)

Bivariate analyses for factors associated with IPT use showed that the following factors were statistically significant at  $P \leq 0.05$ : buying ITN; being on the third or more ANC visit; a household monthly income of  $\leq$  US \$100; use of indoor spraying for preventing mosquito bites, no education and starting ANC at above six months gestation.

Again, from the final best fit model only three factors were found to be independently associated with IPT use, namely, the buying of ITN, use of indoor spraying, and having attended three or more ANC visits.

## Discussion

Eighty seven percent of women reported using ITN. This is almost twice that reported in Tanzania (9) and surpassed the target for the Abuja Declaration which set a target of 60% ITN coverage. Although this indicates that the target has been reached only one facility was covered in this study and more studies need to be done. Sixty one percent of women used IPT.

The highest proportion of both ITN and IPT users were in the 32-38 year-old group. Women who were formally employed and who were better educated had higher IPT and ITN use than women in the informal sector or with poorer education. This might be because the formally employed women have regular incomes and were more able to buy IPT. Those with a higher household income also had high IPT use. Formally employed women are likely to be better educated and hence know more about preventing malaria. Women with secondary education, or whose husbands had a university education, were also higher users of IPT.

The factors independently associated with both IPT and ITN use were:

1. Buying ITN.

These findings are in line with those from Kenya (10) and Congo Brazzaville (11) where it was shown that the poorest households had poorer access to the tools for preventing malaria than richer ones. A low income was negatively associated with ITN use.

2. Use of indoor spraying.

Visiting ANC three or more times was associated with increased IPT use. This indicated that the more the women go for ANC, the more knowledge they acquire and the more likely they are to receive IPT.

### Recommendations

- The Ministry of Health should undertake further studies to find out whether the Abuja targets have been achieved in other health facilities.
- There should be rigorous public health education on the use of ITNs in addition to subsidizing ITNs or giving them out for free.
- The Ministry of Health should undertake rigorous awareness campaigns to educate mothers on the importance of regular ANC visits and IPT use targeting especially those with lower incomes or less education.
- There should also be further studies on the use of IPT in pregnancy to assess their impact since their introduction into the government's health policy.

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### Further reading

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- van Eijk A-M. et al Coverage of malaria protection in pregnant women in sub-Saharan Africa: a synthesis and analysis of national survey data *The Lancet Infectious Diseases* March 2011 11 (3) 190 - 207 (doi:10.1016/S1473-3099(10)70295-4).

**Table 1. Distribution of participants' use of IPT and ITN according to their socio-demographic characteristics**

Socio demographic characteristics	Total enrolled	IPT users		ITN users	
		n	%	n	%
<b>Total</b>	334	204	61	296	87
<b>Age in years</b>					
<18	49	32	65	41	84
18-24	147	87	59	131	89
25-31	101	58	57	89	88
32-38	29	21	72	27	93
>39	4	4	100	4	100
<b>Occupation</b>					
Formal Employment	37	28	76	34	92
Housewife/unemployed	247	152	61	219	88
Informal employment	24	09	38	21	88
Student	24	14	58	21	88
Others	1	1	100	1	100
<b>Education level of participant</b>					
None	90	47	52	74	82
Primary	106	60	57	95	90
Secondary	115	83	72	106	92
College/University	23	14	61	21	91
<b>Participant's husband education level</b>					
None	57	30	53	47	83
Primary	48	26	54	44	92
Secondary	169	106	63	151	89
College/University	60	42	70	54	90
<b>Husband monthly income</b>					
250 SDG and below	139	74	53	113	81
500-1,000 SDG	186	123	66	174	94
>1,000 SDG	9	7	78	9	100
<b>Religion</b>					
Christianity	264	163	62	228	86
Muslim	65	40	62	64	99
Traditional	5	1	20	4	80

Table 2: Factors associated with ITN use during pregnancy during bivariate and subsequent multivariate analysis

Characteristics	ITN USE		COR	Bivariate analysis		Multivariate analysis	
	Yes	NO		95%CI	P-Value	AOR	95%CI P-Value
1. Bought ITN							
Yes	284(96)	2(5)	426	91.6-1980.39	0.001	504.1	91.50-2777.93
No	12(4)	36(95)					<0.001
2. Indoor spraying							
Yes	87(29)	1(3)	14.4	2.08-114.0	0.001	16.6	1.33-206.22
No	209(70)	37(97)					0.029
3. House hold income < \$90							
Yes	113(88)	26(68)	0.3	0.14-0.59	0.001	0.17	0.04-0.71
No	183(62)	12(32)					0.015
4. First ANCG visit							
Yes	38(13)	11(29)	0.4	0.17-0.79	0.016		Not Significant
No	258(87)	27(71)					
5. Awareness that mosquitoes cause malaria							
Yes	292(99)	34(90)	8.6	2.05-35.91	0.0035		Not Significant
No	4(1)	4(10)					
6. Not attended school							
Yes	74(25)	16(42)	0.5	0.23-0.92	0.041		Not Significant
No	222(75)	22(58)					
7. Use of protection against insect bite							
Yes	47(16)	11(29)	0.7	0.21-0.99	0.075		Not Significant
No	249(84)	27(71)					
8. Christian religion							
Yes	228(77)	36(95)	0.2	0.04-0.79	0.02		Not Significant
No	68(23)	2(5)					
9. Use of IPT							
Yes	190(64)	14(37)	3.1	1.52-6.19	0.002		Not Significant
No	106(36)	24(63)					

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**Table 3: Factors significantly associated with IPT use in pregnancy during bivariate and subsequent multivariate analysis among participants**

Characteristics	IPT Use		Bivariate analysis			Multivariate analysis		
	Yes n (%)	NO n (%)	COR	95%CI	P-Value	AOR	95%CI	P-Value
<b>1. ≥3 ANC Visits</b>			<b>4.2</b>	<b>2.65-6.75</b>	<b>&lt;0.001</b>	<b>4.0</b>	<b>2.49-6.47</b>	<b>&lt;0.001</b>
Yes	141 (69)	45 (35)						
No	63 (31)	85 (65)						
<b>2. Indoor spraying</b>			<b>2.5</b>	<b>1.45-4.40</b>	<b>0.001</b>	<b>2.2</b>	<b>1.21-3.91</b>	<b>0.009</b>
Yes	67 (33)	21 (16)						
No	137 (67)	109 (84)						
<b>3. Bought ITN</b>			<b>2.5</b>	<b>1.35-4.70</b>	<b>0.005</b>	<b>2.0</b>	<b>1.02-3.91</b>	<b>0.045</b>
Yes	184(90)	102 (79)						
No	20 (10)	28 (22)						
<b>4. House hold income &lt; 90USD</b>			<b>0.6</b>	<b>0.36-0.89</b>	<b>0.017</b>			<b>Not significant</b>
Yes	74 (36)	65 (50)						
No	130 (64)	65 (50)						
<b>5. No education of participant</b>			<b>0.6</b>	<b>0.37-0.99</b>	<b>0.059</b>			<b>Not significant</b>
Yes	47(23)	43 (33)						
No	157 (77)	87 (67)						
<b>6. ANC &gt; 6 months</b>			<b>0.6</b>	<b>0.34-0.97</b>	<b>0.049</b>			<b>Not significant</b>
Yes	38 (19)	37 (28)						
No	166 (81)	93 (72)						