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Full Length Research Paper

Combined intervention of intermittent preventive therapy and long-lasting insecticide treated nets among pregnant women in Nigeria

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Sulphadoxine-pyrimethamine (SP) prophylaxis and use of Long Lasting Insecticide Treated nets (LLINs) are the main interventions recommended by WHO to reduce malaria risks during pregnancy. To assess the degree of coverage against malaria is afforded by treated mosquito net alone or combined with sulphadoxine-pyrimethamine among currently pregnant women (cpw) in Nigeria. A population-based cross-sectional household survey conducted in Nigeria in 2007 evaluated single and combined intervention among cpw. Total number of cpw in all the surveyed households was 295 among of which 33% slept under any net and 27% under LLIN. Only 6% took IPT1 and 3% took IPT2. Of those who took IPT1, 47% slept under any net and of those who took IPT1 and IPT2, 33% slept under mosquito net. Cpw in South of Nigeria were twice more likely to sleep under treated nets than their northern counterpart and cpw who slept under treated nets were 4 times more likely to take IPT1 or IPT1 and 2. Combination intervention (CI) of IPT and LLIN use in pregnancy, though desirable, is still low in Nigeria. Aggressive approach to CI and health literacy among women is needed to diminish malaria-attributed maternal morbidity and mortality in Nigeria. Malaria control programs should explore the possibility of pregnant women taking SP at home under supervision of Role Model Caregivers.

Key words: Malaria, pregnant women, mosquito nets, sulphadoxine-pyrimethamine, prevention, community.

INTRODUCTION

Over a decade ago, pregnant women were among the stipulated vulnerable groups to be protected by the use of interventions such as Intermittent Preventive Treatment (IPT) with sulphadoxine-pyrimethamine (SP). Pregnant women were also expected to sleep under insecticide-treated mosquito nets, especially Long Lasting Insecticide-treated Nets (LLINs). This was to reduce the huge morbidity and mortality among them towards achieving a critical issue in the Millennium Development Goals (MDGs). It is known that of the approximately 50 million pregnant women who are annually exposed to malaria worldwide, more than 30 million of them live in the African region. Malaria has many deleterious effects on both the mother and the fetus underscoring the significance of making available to this group of people adequate and "effective protection and case management" (Crawley et al., 2007). Previous studies noted that pregnancy-associated malaria results in substantial maternal and especially fetal and infant morbidity, causing 75, 000 to 200, 000 infant deaths every year (Stekette et al., 2001; Desai et al., 2007). According to Rogerson et al. (2007) pregnant women are more susceptible than non-pregnant women to malaria, and this susceptibility is greatest in the first and second pregnancy. Because the placenta is a site of preferential parasite sequestration and development, pregnant women have increased susceptibility to Plasmodium

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falciparum infection, with more frequent episodes of malaria and higher density of parasitemia than non-pregnant women (Diagne et al., 2000; Tako et al., 2005). Furthermore, Anya (2004) and van Geertruyden et al. (2004) indicated that malaria in pregnancy increases the risk of maternal anaemia, maternal mortality, abortion, prematurity, intrauterine growth retardation, intrauterine death and low birth weight. In Nigeria, malaria is responsible for up to 11% of maternal death (Federal Ministry of Health, 2004). Based on the calamitous effects of malaria in pregnancy, the World Health Organization (WHO, 2000) has suggested certain strategies for the prevention and control of malaria during pregnancy. These include the prophylactic use of sulphadoxine-pyrimethamine (SP) as Intermittent Preventive Treatment (IPT) and that pregnant women should sleep under Long Lasting Insecticide-treated mosquito nets (LLINs) as early in pregnancy as possible and throughout that period. To this effect, many malaria-endemic sub-Saharan countries, including Nigeria, have added IPT of malaria infection during pregnancy in their malaria control programs and have consequently scaled-up the implementation of this strategy (Hill and Kazembe, 2006) with the use of SP, to achieve the Roll Back Malaria (RBM) set targets (WHO, 2000). Although, use of these strategies has been adopted in West Africa, there is still paucity of evidence for their coverage with interventions to indicate reduced burden of malaria in pregnancy. Nigeria recently distributed Long Lasting Insecticide-treated nets to various households and supplied SP to various health facilities, in the same regions where LLINs were distributed. Data on household use of combined SP for IPT and use of LLIN for prevention of vector-woman contact are still scanty in Nigeria.

This study focuses on possession and use of mosquito nets as well as, intermittent preventive treatment of malaria in survey areas. The objectives of this paper are thus; to examine the method of malaria prevention commonly used by pregnant women in Nigeria, to documents the proportions that use each method of malaria prevention in pregnancy and to give recommendation on how malaria can be further prevented during pregnancy.

MATERIALS AND METHODS

Materials and methods used in this survey had already been described in an earlier paper (Afolabi et al., 2009). Briefly, the study was a cross-sectional household survey that took place between first and fourteenth of August, 2007. Long-lasting insecticide treated nets had earlier been distributed five months before the survey, coinciding with the second raining period of the year and a time of high malaria transmission during the wet season. Concerning LLINs, the survey evaluated mainly if this commodity was being used at all by those who possessed them in the six geo-political zones of the country, studying one state in each zone and one local government area in each selected state, except for Lagos in South-west zone and Akwa Ibom in South-south zone where two local government areas (LGAs) were surveyed respectively. Using a stratified, two-stage cluster sample design, two districts were selected per region, with probability proportional to estimated population.

Sampling design, survey design and sample size

The survey was designed to collect data on various variables on ITN indicators in areas where integrated LLINs-EPI campaigns were conducted in Nigeria. Cluster sampling methodology statistically selected 14 out of the 48 LGAs and households within selected LGAs. The population of those 48 LGAs, according to the 2006 census, was 8,546,280 and with an average household size of five per family (NDHS, 2003). To arrive at a 3% precision (level of error) with 95% confidence level, assumed proportion of 0.5 and presumed desire change of 20%, a sample of 1,712 households was required for meaningful analysis (the sample size was adjusted to none response rate of 10%). This translated to 107 households per LGA and 10.7 per cluster. Rounding up the cluster size to 11 households would require drawing 1760 minimum sample size (110 households per selected LGA and 11 per cluster).

Data management, statistical analysis and ethical consideration

The data from each questionnaire were extracted and fed into a lap-top computer, cleaned and cross-checked for errors. A data base was constructed on Epi-Info 2006. Data entry was processed after data collection, and quality assurance was assured by double check. The data were analyzed descriptively obtaining frequencies and percentages, and inferentially using chi-square (χ^2) test to determine associations. Chi-square was used also to test association between dichotomous variables. Level of statistical significance was set at $p < 0.05$. This survey was approved by the Federal Ministry of Health. Eligible heads of household provided written or verbal informed consent before being enrolled in the study. Data were coded for anonymity. For analysis, treated nets and LLINs were considered as one entity.

RESULTS

A total of 1756 households in 16 Local Government Areas (LGAs) of 14 States spread across the six geo-political zones of the country were surveyed. Of all the 295 cpw seen, 123 (41.7%) slept unprotected by mosquito nets and 172 (58.3%) slept protected by any treated net 93 (31.5%) or by LLIN 79 26.8%) respectively (Table 1). The South-south zone of the country has the highest proportion (72%) of pregnant women who slept under treated net night before the survey, followed by South-east zone (69%), North-east zone (65%), South-west zone (41.7%) and North-west zone (40%). No pregnant woman was recorded as having slept under treated nets night before the survey (Table 1).

Table 2 illustrates that, overall, 104 (35%) cpw, mostly in South-east zone (69.2%) used some malaria prophylaxis at home, 26 (9%) received IPTp 17 (6%) for IPT1 and 9 (3%) for IPT2 and 103 (35%) took other medications apart from SP. South-east zone had the largest proportion of cpw (15%) who received of IPTp (IPT1, IPT1+ IPT2) followed by South-west zone (14%) and South-south zone (8%). South-east zone also had

Table 1. Percent distribution of pregnant women who slept under any net and under LLIN the night before survey (2007).

State-LGA	No. of survey HH	No. (%) of PW in HH	No.(%)of PW in HH who did not sleep under any net	No.(%) of PW in HH who slept under any treated net	No. (%) of who slept under LLIN
South-east zone					
Abia-Ukwa West	110	18 (16)	12 (66.7)	3 (16.7)	3 (16.7)
Enugu-Aninri	110	21 (19)	0 (0.0)	11 (52.4)	10 (47.6)
Total	220	39 (18)	12 (30.8)	14 (35.9)	13 (33.3)
South-south zone					
Akwa Ibom-Eket	110	24 (22)	12 (34.3)	6 (25)	6 (25)
Akwa Ibom-Mbo	110	24 (22)	10 (28.6)	7 (29)	7 (29)
Bayelsa-Brass	110	16 (15)	1 (2.9)	9 (56)	6 (38)
Delta-Oshimili North	110	12 (11)	2 (5.7)	8 (67)	2 (17)
Edo-Owan West	111	22 (20)	10 (28.6)	6 (27)	6 (27)
Rivers-Ogu Bolo	107	27 (25)	0 (0.0)	15 (56)	12 (44)
Total	658	125 (19.0)	35 (28.0)	51 (40.8)	39 (31.2)
South-west zone					
Ekiti-Irepodun /Ifelodun	109	17 (15.6)	11 (64.7)	3 (17.6)	3 (17.6)
Lagos-Badagry	110	16 (14.5)	11 (68.8)	3 (18.8)	2 (12.5)
Lagos-Ikorodu	110	13 (11.8)	13 (100.0)	0 (0.0)	0 (0.0)
Ondo-Owo	110	5 (4.5)	0 (0.0)	0 (0.0)	5 (100.0)
Oyo-Ogo Oluwa	110	21 (19.1)	7 (33.3)	7 (33.3)	7 (33.3)
Total	549	72 (13.1)	42 (58.3)	13 (18.1)	17 (23.6)
North-west zone					
Zamfara-Bungudu	110	30 (27.3)	18 (60.0)	8 (26.7)	4 (13.3)
Total	110	30 (27.3)	18 (60.0)	8 (26.7)	4 (13.3)
North-central zone					
Kwara-Ilorin West	110	9 (8.2)	9 (100.0)	0 (0.0)	0 (0.0)
Total	110	9 (8.2)	9 (100.0)	0 (0.0)	0 (0.0)
North-east zone					
Yobe-Gulani	109	20 (18.3)	7 (35.0)	7 (35.0)	6 (30.0)
Total	109	20 (18.3)	7 (35.0)	7 (35.0)	6 (30.0)
All 16 LGAs	1756	295 (16.8)	123 (41.7)	93 (31.5)	79 (26.8)

LGA, Local government area; HH, households; PW, pregnant women; LLIN, long lasting insecticide treated nets.

Table 2. Distribution of currently pregnant women who used any antimalaria, IPT1 and IPT2 and other medicines in current pregnancy (2007).

South-east zone	No. (%) of currently PW in HH	No. (%) of currently PW in HH who took antimalarialat home	No. (%) of currently PW who took only IPT1 at HF	No. (%) of currently PW who took IPT1 and IPT2 at HF	No. (%) of currently PW who took other medication
Abia-Ukwa West	18	14 (61)	3 (17)	0 (0)	11 (61)
Enugu-Aninri	21	13 (62)	1 (5)	2 (10)	13 (62)
Total	39	27 (69.2)	4 (10.2)	2 (5.1)	24 (61.5)
South-south zone					
Akwa Ibom-Eket	24	6 (25)	1 (4)	0 (0)	6 (25)
Akwa Ibom-Mbo	24	3 (13)	0 (0)	0 (0)	3 (13)
Bayelsa-Brass	16	6 (38)	0 (0)	0 (0)	6 (38)
Delta-Oshimili North	12	5 (42)	2 (17)	1 (8)	5 (42)
Edo-Owan West	22	5 (18)	1 (5)	0 (0)	4 (18)
Rivers-Ogu Bolo	27	11 (41)	3 (11)	2 (7)	11 (41)
Total	125	36 (28.8)	7 (5.6)	3 (2.4)	35 (28.0)
South-west zone					
Ekiti-Irepodun / Ifelodun	17	8 (47)	1 (5)	0 (0)	12 (71)
Lagos-Badagry	16	5 (31)	0 (0)	1 (6)	5 (31)
Lagos-Ikorodu	13	3 (23)	1 (8)	1 (8)	3 (23)
Ondo-Owo	5	2 (40)	0 (0)	1 (20)	1 (20)
Oyo-Ogo Oluwa	21	12 (57)	4 (19)	1 (5)	11 (52)
Total	72	30 (41.7)	6 (8.3)	4 (5.6)	32 (44.4)
North-west zone					
Zamfara-Bungudu	30	7 (23.3)	0 (0)	0 (0)	8 (26.7)
Total	30	7 (23.3)	0 (0)	0 (0)	8 (26.7)
North-central zone					
Kwara-Ilorin West	9	2 (22.2)	0 (0.0)	0 (0.0)	2 (100.0)
Total	9	2 (22.2)	0 (0.0)	0 (0.0)	2 (100.0)
North-east zone					
Yobe-Gulani	20	2 (10.0)	0 (0.0)	0 (0.0)	2 (100.0)
Total	20	2 (10.0)	0 (.00)	0 (0.0)	2 (100.0)
All 16 LGAs	295	104 (35.3)	17 (5.8)	9 (3.1)	103 (34.9)

*62 (21.0%) currently pregnant women did not take any medication or patronized traditional medical practitioner.

Table 3. Chi-square test for mosquito nets use and for IPTp.

Geo-political location	Used Mosquito net		OR	Received						
				χ^2	p-value	IPTp		OR	χ^2	p-value
	Yes	No				Yes	No			
Southern zones										
South-east	27	12	3.51 (1.59-7.84)	12.0	0.0005	6	33	1.61 (0.53-4.67)	0.91	n.s.
South-south	90	35	2.44 (1.37-4.34)	10.7	0.001	10	115	0.52 (0.21-1.27)	2.47	n.s.
South-west	30	42	0.29 (0.15-0.53)	18.8	0.00001	10	62	1.49 (0.59-3.72)	0.87	n.s
Total	147	89								
Northern zones										
North-west	12	18	0.82 (0.26-2.62)	0.14	0.71	0	30	-	-	-
North-central	0	9	0.00 -	-	0.007*	0	9	-	-	-
North-east	13	7	4.18 (1.17-15.52)	6.34	0.01	0	20	-	-	-
Total	25	34								
Southern vs. northern zone:			2.25 (1.21-4.18)	7.70	0.006					

*Fisher's Exact 2-tailed.

the largest proportion of cpw (62%, $p < 0.01$) who took other medication to avert malaria in pregnancy. There was no significant difference in the proportion of pregnant women who used other malaria-preventive medications in the southern part of Nigeria. No cpw in the three northern zones was recorded as receiving IPTp during this survey.

Comparing the survey sites in the southern geo-political zones of the country, cpw were 3.5 times more likely to sleep under treated nets in South-east (33%; $\chi^2 = 12.0$, $p < 0.005$) than in South-south (31%; OR=2.4,1.37< OR< 0.34, $\chi^2 = 10.7$, $p < 0.005$) or South-west (246%; OR = 0.29, $0.15 < OR < 0.53$, $\chi^2 = 18.8$, $p < 0.005$) (Table 3). In the North, cpw were 4.2 times more likely to sleep under treated nets in North-east (30%; $\chi^2 = 6.3$, $1.7 < OR < 15.52$, $p < 0.05$) than in North-west (13%; OR= 0.82, $0.26 < OR < 2.62$, $\chi^2 = 0.1$, $p > 0.05$) or in North-central (0%, Fisher's exact = 0.007). Overall, cpw in southern zones of the country were twice more likely to sleep under treated nets than in the Northern (OR=2.25, $1.21 < OR < 4.18$, $\chi^2 = 7.70$, $p < 0.05$) (Table 3). Currently pregnant women in south-east (OR=1.6, 0.53<OR<4.67, $\chi^2 = 0.9$, $p > 0.05$ and south-west (OR=1.5, $0.59 < OR < 3.72$, $\chi^2 = 0.87$, $p > 0.05$) were about one and a half times more likely to take IPT at ANC clinic than in south-south zone (OR = 0.52, $0.21 < OR < 1.27$, $\chi^2 = 2.5$, $p > 0.05$). During the time of this survey, no pregnant woman was recorded as having taken IPT 1 or IPT 2 in the northern zones. Table 4 illustrates the distribution of IPT use and sleeping under LLIN among cpw in the survey areas. There was a low utilization of both ITN and IPTp in all zones of the country. Data from our study revealed that cpw who slept under treated nets were about four times more likely take IPT1 (OR 3.9, 1.7< OR<8.7; $\chi^2 = 12.9$, $p < 0.005$) or IPT1 and 2 (OR 3.5, $1.8 < OR < 6.9$; $\chi^2 = 16.9$, $p < 0.005$) than those not sleeping under any net. Overall, 63, 6 and 26% of cpw in rural residence received IPT at ANC clinics, other health facilities and at home respectively (Figure 1). Likewise, 33 and 67% of cpw in urban residences received IPT at other health facilities and at home. About 6% were not sure of where they received IPT. According to wealth index, the percentage of those who took SP during cpw ranged from 45% among the rich to 35% among the core poor. Whereas 4% of the cpw classified as "rich" according to wealth index took other medication for prevention of malaria during current pregnancy, none took SP (Figure 2).

DISCUSSION

As far as we know, this study is the first in Nigeria to examine the combination intervention of intermittent preventive treated (IPT) with SP and LLINs among pregnant women. Malaria prevention in pregnancy is a three-pronged approach, consisting of LLIN, IPT in pregnant women and case management. It is tragic that the vast majority of the morbidity and mortality due to malaria in pregnancy are avoidable. However, LLINs and SP are the current evidence-based interventions proven to manage this crisis. Key findings in this study include the distribution of pregnant women in households, a situation that may be linked with socio-cultural and religious characteristics in different parts of the country. The implication of this is that, through community health workers, households with more pregnant women may need more health attention to avert both infant mortality and maternal mortality, two points stressed by the MDGs. Another key finding is that currently pregnant women who took IPT1 were very few and those that took IPT2 even fewer but those who took other medications were

Table 4. Distribution of currently pregnant women in survey who did or did not sleep under treated mosquito net as well as took intermittent preventive treatment at health facilities.

Intermittent preventive	Did not sleep under a mosquito net	Slept under treated net		
Treatment		**Any treated net**	**LLIN**	**Total**
Took IPT1				
No.	9	34	8	51
%	17.6	66.7	15.7	17.3
OR	3.78 (1.68-8.74)			
χ^2	12.94			
p	0.0003			
Took IPT2				
No.	6	15	3	24
%	25.0	62.5	12.5	8.1
OR	3.53 (1.82-6.92)			
χ^2	16.89			
p	0.000007			
Took IPT3				
No.	1	0	1	2
%	50.0	0.0	50.0	0.7
OR	3.36 (1.76-6.49)			
χ^2	16.17			
p	0.00006			
Did not take any IPT				
No.	104	50	68	222
%	76.7	11.0	12.3	24.7
Total				
No.	120	99	80	299
%	40.1	33.1	26.8	100.0

comparatively large. Thirdly, very few currently pregnant women took IPT1 or IPT2 and at the same time slept under LLIN or under any net. The findings of this study indicate that though, overall, more pregnant women were sleeping under an ITN (26.8%) than what Baume et al reported; very few were taking IPT 1 or IPT2. This study also shows that a worrisome high proportion of pregnant women, especially in northern Nigeria were still not sleeping under any mosquito nets, suggesting that these women were either missed during LLIN campaigns or health education on the importance of sleeping under LLIN did not reach them. The report is in accordance with the work of Musa et al. (2009) that very few pregnant women north of Nigeria had never used ITN before; and with the work of Belay and Deressa (2008) that lack of access to ITNs and the perception that nets could not prevent malaria were probable reasons for non-ownership of nets. Data from our study correlates with other studies (Musa et al, 2009) which provide insight to the low net ownership and usage among the pregnant women, specifically, in central and North-west parts of the country despite the fact that self-reported bed net use was statistically associated with lower risk for low birth weight for untreated and treated bed nets, respectively (Kabanywanyi et al., 2008).

Previous studies noted that irrational use of malaria drugs with under-dosage and sub-curative measure-ments using substandard and fake drugs are a major cause of drug resistance in malaria parasites (Salako, 1991, 1992). Understanding the non-utilization of LLINs in Nigeria is essential for reprogramming and mid-stream decision to reduce the public health and economic burden of malaria. Though, Belay and Deressa (2008) noted that household ownership of treated mos-quito nets and their use by pregnant women is promising with current efforts to scale-up LLIN implementation,

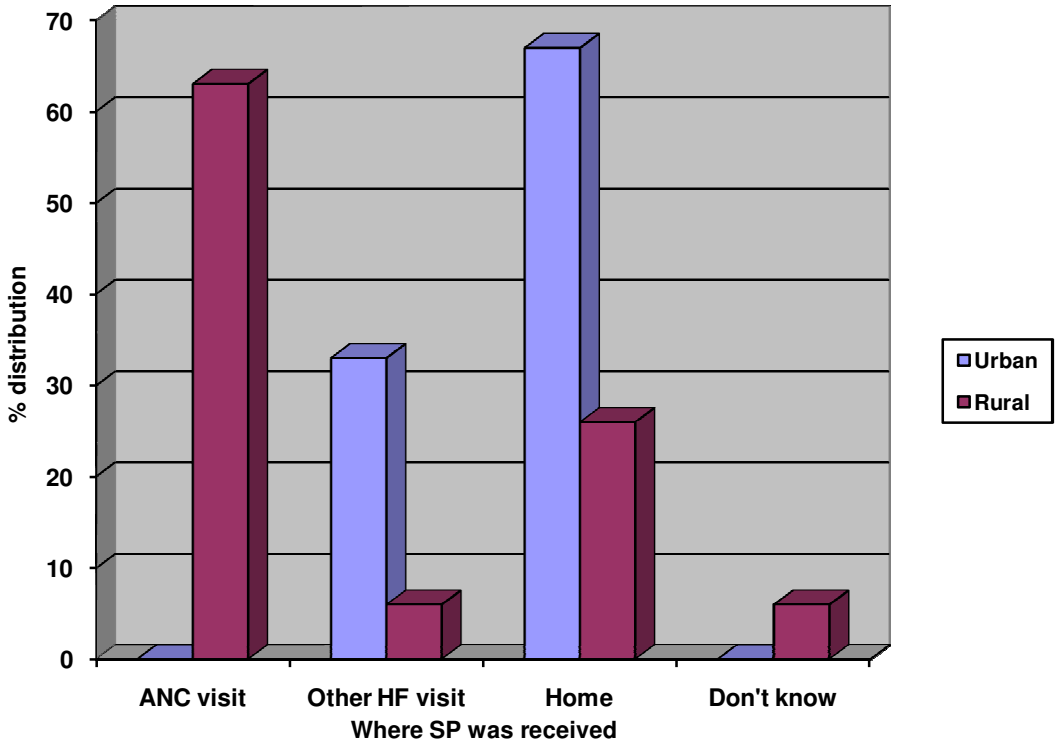

Figure 1. Percent distribution of currently pregnant women who received 1 or more doses of Sulphadoxine pyrimethamine at health facility or at home for last pregnancy according to locality (urban/rural).

nevertheless, the gap between ownership and use is still high as shown in this study.

A process to identify the characteristics of individuals at higher risk of malaria illness or death is of essence in designing an appropriate program to reach them. Another study noted that some risk from malaria during pregnancy persisted in the absence of IPTp coverage (Kabanywanyi et al., 2008). Even when treated with SP, mutant *P. falciparum* strains potentially resistant to SP has emerged, a situation considered as alarming given the importance of the IPTp to control malaria in pregnancy (Andrianaranjaka et al., 2011). Recent controversy has raised questions as to whether the use of SP in IPT is the most appropriate approach for malaria prevention in pregnant women in Africa given the reported increased in parasite resistance to SP in some areas (Ter et al., 2005). Menendez et al. (2008) have argued that though two-dose SP was associated with a reduction in some indicators, but these were not translated to significant improvement in other maternal or birth outcomes.

Those who were not covered by IPTp should have been reached by ITN. Nigerian women in the northern zones of the country, currently pregnant or in reproductive age are at significantly greater risk of malaria morbidity and mortality than their counterparts in Southern zones. This elevated risk is found for non-use of ITN and appears to occur for non-use of IPT as well, though the mortality rates for non-use of ITN have not yet been clearly determined in Nigeria. Regularly sleeping under ITN and thus avoiding mosquito-human contact may reduce the need for SP to which adverse drug reaction may develop during pregnancy. Sustainable distribution of ITNs, especially where mosquito nets are not traditionally used, increase in knowledge of an association between mosquitoes and malaria and aggressive social marketing may therefore be the focal points for intervention especially in the zones with low use of LLINs. Though, household possession of treated mosquito nets is becoming more acceptable than before, it is glaringly clear that more efforts are still needed to combine this with IPT. There are remarkably few studies on the impact of combination intervention focusing on not only the coverage but also the usage of insecticide treated net as a protective measure and administration of SP as IPT of malaria during pregnancy. After a limited period of national net distribution in Nigeria, this study has shown that the overall use among pregnant women in varied communities within the six zones of the country was relatively low, ranging from zero (0.0%) in North-central to 36% in the Southeast zone. LLIN should be the primary focus of malaria prevention in pregnancy. In pregnancy, women should not be exposed to nor be made to endure malaria parasitaemia until they are critically ill as is the case in sub-Saharan Africa. All cadres

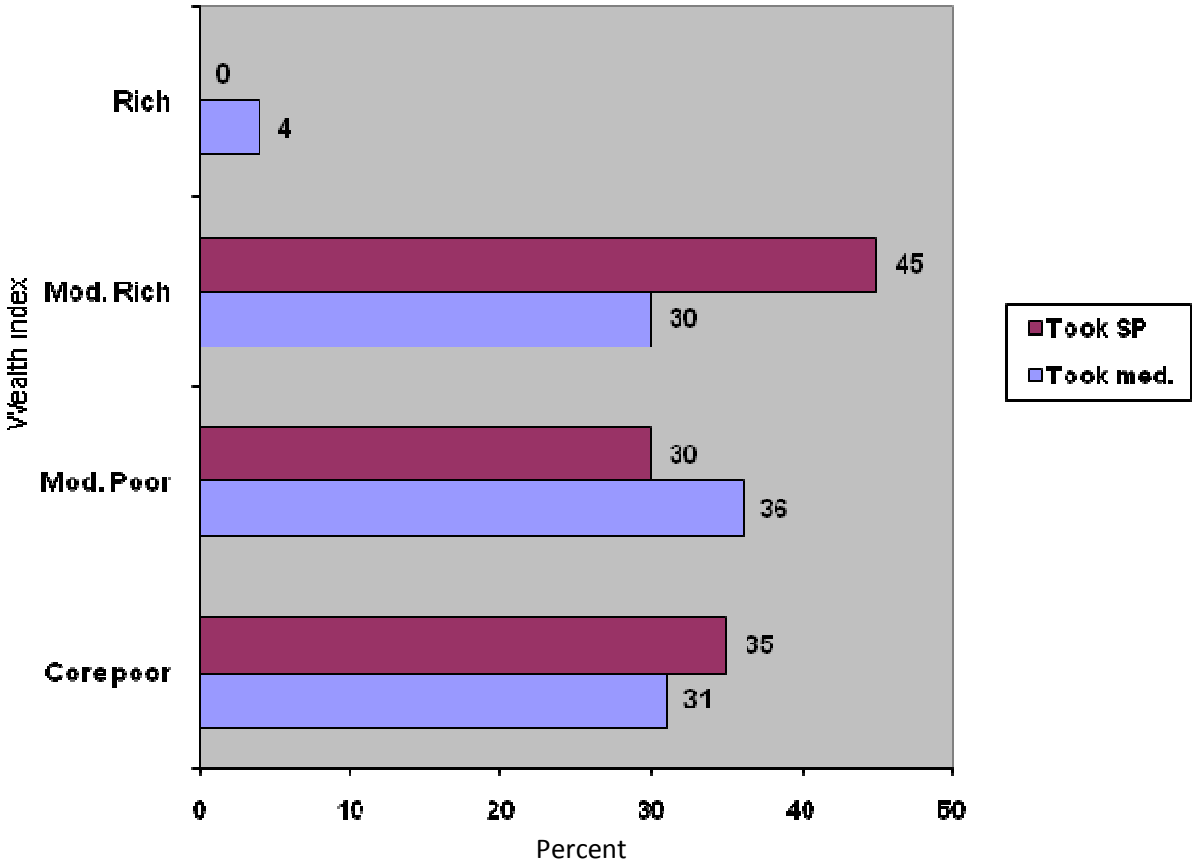

Figure 2. Percent distribution of pregnant women who took mediciation to prevent malaria during current pregnancy according to wealth class (quantiles).

of health workers at antenatal care clinics should provide relevant information on proper use of medications, including anti-malaria drugs, during pregnancy. Women, from the time they are young girls, should be given appropriate health education on their susceptibility to malaria since without this, they will be ignorant of the fact that most neonatal deaths, low birth-weight babies and pre- or post-partum haemorrhages might be as a result of malaria in pregnancy.

Limitations

This is a national survey which has some inherent limitations regarding inferences that could be drawn from the result of the study. First, it may not be representative of all the pregnant women in Nigeria. Secondly, only two local governments were studied in the three Northern zones of the country. Thirdly, analysis of data could have been more robust if a stronger statistical tool was used.

Conclusion

This study looked into mono-utilization of either treated net or IPTp and the possibility of using combination of these two strategies. The use of treated mosquito nets as well as IPTp was even lower. In consonance with Okwa (2003) special health education directed at pregnant women should be incorporated into malaria enlightenment programs. LLIN use during pregnancy may lessen the necessity of IPTp administration. Malaria control program in sub-Saharan Africa should focus on making the combination of LLIN and IPT an integral part of focused antenatal care package for every pregnant woman. Improving coverage of and access to either SP or LLINs, or to both, in pregnancy is a major task for programs on malaria in pregnancy.

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