ORIGINAL RESEARCH

Inequities in the use of sulphadoxine-pyrimethamine for malaria prophylaxis during pregnancy in Nigeria

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Abstract

Background

Intermittent presumptive treatment in pregnancy (IPTp) of malaria using sulfadoxine-pyrimethamine (SP) was introduced in Nigeria in 2005 to reduce the burden of malaria in pregnancy. By 2013, 23% of reproductive aged women surveyed received SP for malaria prevention in their last pregnancy of the past 5 years. This paper highlights geographic and socio-economic variations and inequities in accessing and using SP for malaria prophylaxis in pregnancy in Nigeria, as well as client-related and service delivery determinants.

Methods

Secondary data from 2013 Nigeria demographic and health survey (DHS) was used. Sample of 38,948 eligible women were selected for interview using stratified three-stage cluster design. Data obtained from the individual recode dataset was used for descriptive and logistic regression analysis of factors associated with SP use in pregnancy was performed. Independent variables were age, media exposure, region, place of residence, wealth index, place of antenatal care (ANC) attendance and number of visits.

Results

Women in the upper three wealth quintiles were 1.33 - 1.80 times more likely to receive SP than the poorest (CI: 1.15-1.56; 1.41-1.97; 1.49-2.17). Women who received ANC from public health facilities were twice as likely (inverse of OR 0.68) to use SP in pregnancy than those who used private facilities (CI: 0.60-0.76). Those who attended at least 4 ANC visits were 1.46 times more likely to get SP prophylaxis (CI: 1.31-1.63). Using the unadjusted odds ratio, women residing in rural areas were 0.86 times less likely to use SP compared to those in urban areas.

Conclusions

Inequities in access to and use of SP for malaria prophylaxis in pregnancy exist across sub-population groups in Nigeria. Targeted interventions on the least covered are needed to reduce existing inequities and scale-up IPTp of malaria.

Keywords: Malaria prophylaxis, Pregnancy, Inequities, Use, Access

Introduction

Malaria infection in pregnancy is a public health problem that poses significant risks for mothers and their unborn child[1-2]. Pregnancy reduces a woman's immunity, hence increasing her vulnerability to malaria. Intermittent presumptive treatment in pregnancy (IPTp) of malaria was introduced to reduce the burden of malaria in pregnant women, and its resultant effects on the fetus[3]. Sulfadoxine-pyrimethamine (SP) is the drug currently recommended for IPTp strategy[4-5]. It has been shown to have demonstrable efficacy in preventing malaria in pregnancy as well as reducing placental infection with the parasite[6]. Hence, it is useful for preventing mother-to-child transmission of malaria and other complications such as severe anaemia, spontaneous abortion, stillbirth, premature delivery and low birth weight[3]. IPTp consists of supervised administration of curative dose of SP at least twice during the second and third trimesters of pregnancy, during routinely scheduled antenatal clinic visits, regardless of whether the woman is infected or not[5].

Nigeria adopted IPTp in 2005 to replace weekly prophylaxis[7]. IPTp with SP is given as a package through focused antenatal care and the national protocol for prevention of malaria specifies that it should be given free of charge to pregnant women attending ANC in public health facilities and non-profit facilities[7]. The decline in efforts to scale up IPTp in a number of African countries necessitated a recent update of treatment protocol by World Health Organization (WHO)[8]. They observed that in high burden countries, IPTp noticeably lags behind other malaria control measures, hence the recommendation that it should be administered at every scheduled antenatal care visit after the first trimester at least one month apart[9]. Key barriers to the provision of IPTp have been reported to be unclear policy and guidance, and service delivery factors such as frequent stock-out, confusion over timing of each IPTp dose and introduction of user fees[10]. Client-related factors such as poor antenatal care attendance also affect IPTp uptake[10]. It has also been suggested that failure of health workers to adhere to administering IPTp at the appropriate gestational age contributes to low effectiveness of the strategy[11].

According to the 2013 DHS report of Nigeria, 23% of women received SP for malaria prevention during their last live birth, and the trend in percentage of women taking at least one dose of SP during ANC visit increased by 22% from 2003 to 2013[12]. Variations noted in the proportion of women using SP for malaria prevention in pregnancy were based on type of place of residence, geopolitical zone, level of education and wealth quintile[13]. Some other studies have also reported these variations and inequities[8,10,14-15], but only a few highlight the significance of these inequities in Nigeria. The extent to which these characteristics influence uptake of IPTp with SP in pregnancy is also unclear. Additionally, there are other client-related and service delivery factors related to ANC attendance which could have significant influence on service utilization but are under-explored. Some studies have also reported that pregnant women take antimalarial drugs

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other than SP for prophylaxis in pregnancy but this is not usually described in the DHS report[16]. This information may be useful for further exploratory research to guide design of appropriate interventions.

This paper highlights the inequities in access to and utilization of SP for malaria prophylaxis in pregnancy in Nigeria. It provides additional information on client-related and service delivery determinants of utilization of SP for malaria prophylaxis in pregnancy. This is useful for understanding what factors contribute to low utilization of SP for malaria prophylaxis in pregnancy and could inform the development of targeted interventions for scaling up coverage of SP for IPTp in Nigeria.

Materials and methods

This study used secondary data from the 2013 Nigeria Demographic Health Survey (NDHS). The NDHS is a national sample survey which is conducted at five year intervals by the National Population Commission, within the months of June and October of the reporting year, to provide up to date information on demographic characteristics and health status of households in Nigeria.

Nigeria country profile:

Nigeria has an annual population growth rate of 3.2 percent and ranks seventh among highly populated countries in the world[13]. The constitution of Nigeria provides for the operation of three tiers of government - the Federal, 36 semi-autonomous States (and the Federal Capital Territory) and 774 local government areas grouped into six geopolitical zones. In the last national census of 2006, each locality in Nigeria was subdivided into census enumeration areas determined by average number of households[13].

Primary health care is recognized nationally as the framework for achieving universal health care, including provision of maternal and child health (MCH) care at primary health centers[12]. Utilization of services in the primary health facilities is limited and varies across socioeconomic and geopolitical differences. Ante-natal care attendance ranges from 31% north-east to 87% in the south-west whereas health facility delivery ranges from 8.4% in the north-east to 73% in the south-west[17]. On the other hand, majority of PHCs in the country do not run 24-hour services, thereby denying a lot of patients the opportunity to patronize such centres when ill or for deliveries. In order to address these and other challenges in MCH service delivery, Nigeria introduced the Midwives Service Scheme (MSS) from 2009-2011, the Subsidy Reinvestment and Empowerment Program (SURE-P MCH) in 2012-2015, and the most recent PHC revitalization in 2017, to strengthen coordination and improve quality of service delivery[12].

Sampling method

The 2013 NDHS sample was selected using a stratified three-stage cluster design consisting of 904 clusters, 372 in urban areas and 532 in rural areas. The list of census enumeration areas of 2006 population census formed the DHS sampling frame and primary sampling unit. The sample design allowed for specific indicators to be calculated at zonal and state levels. Mapping of households was done between December 2012 and January 2013 by trained enumerators using Global Positioning System (GPS) receivers. An updated list of households in each CEA was produced and this formed the sampling frame for households[12].

A fixed sample of 45 households was selected per cluster giving a total of 40,680 households. In each selected household, all reproductive aged women who were resident *de facto* were surveyed[12].

Data collection

Two modified NDHS model questionnaires (Households and Women's) were used to collect information on maternal and child health including antenatal care, malaria preventive strategies as well as other relevant health issues.

Relevant data from this study were obtained from the individual recode dataset for women. This dataset is generated using relevant information from the household and women's questionnaires and contains data on intermittent preventive treatment for malaria during pregnancy, antenatal visits, type of place of residence (urban or rural), geopolitical region, asset ownership and wealth index. The women's questionnaire was administered to all reproductive aged women in every second household in the 2013 NDHS sample. Questions concerning IPTp access and use were asked, as well as questions on frequency of antenatal visits and antenatal care service provider.

Principal component analysis based on household ownership of goods, characteristics of dwelling place, source of drinking water, sanitary/toilet facilities and level of education of head of household, was used to rank households into socioeconomic quintiles namely: Q1 – poorest, Q2 – poorer, Q3 - middle, Q4 – richer, Q5 – richest.

Data analysis

DHS dataset is self-weighted by the selection of clusters with probability-proportionate-to-size (PPS)[12]. To create the individual women recode dataset, data from household questionnaire and women's questionnaires were merged. Individual responses were matched to household identification numbers. A total of 38,948 women were surveyed. A new SPSS file was created with relevant variables for analysis. Relevant variables were identified and their data extracted from the individual women recode dataset into a new SPSS file. Descriptive statistics were performed to determine the respondent characteristics, place and number of ANC visits, and malaria prophylaxis in pregnancy. Use of SP for malaria prophylaxis in pregnancy was cross-tabulated with respondent characteristics, place and number of ANC visits, to check for statistical significance. Regression analysis was done to identify the determinants of use of SP for malaria prophylaxis in pregnancy. The independent variables included age category, media exposure, geopolitical region, place of residence (urban vs rural), wealth index, place of ANC attendance and number of ANC visits.

Results

Results are presented in tables 1-4. A total of 38,948 women were surveyed. Majority of them were below 40 years and residing in rural areas. More than a third were not educated (35.3%); 44.1% were illiterate and more than a quarter (28%) had no media exposure (table 1). Antenatal care attendance during pregnancy and use of malaria chemoprophylaxis are presented in table 2 below. Out of the 38,948 women surveyed, 20,192 reported that they had given birth in the five years preceding the survey and were eligible to be interviewed about antenatal care and use of malaria prophylaxis; no response was recorded for 120 of these eligible women.

Out of the 20,072 eligible women who responded, 31%

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Table 1: Respondent's characteristics

Demographic and socioeconomic variables		Frequency (%)
Age category	15-19	7905 (20 3)
	20-24	6714 (17.2)
	25-29	7037 (18.1)
	30-34	5373 (13.8)
	35-39	4701 (12.1)
	40-44	3663 (9.4)
	45-49	3555 (9.1)
Region	North Central	6251 (16.0)
	North East	6630 (17.0)
	North West	9673 (24.8)
	South East	4462 (11.5)
	South South	6058 (15.6)
	South West	5874 (15.1)
Type of place of residence	Urban	15545 (39.9)
	Rural	23403 (60.1)
Highest educational level	No education	13740 (35.3)
	Primary	7104 (18.2)
	Secondary	14407 (37.0)
	Higher	3697 (9.5)
Wealth index	Poorest	6602 (17.0)
	Poorer	7515 (19.3)
	Middle	8001 (20.5)
	Richer	8450 (21.7)
	Richest	8380 (21.5)
Literacy	Cannot read at all	17186 (44.1)
	Able to read only parts of sentence	2616 (6.7)
	Able to read whole sentence	18831 (48.3)
	Not assessed	293 (0.8)
	Blind/visually impaired	22 (0.1)
* Media exposure	No exposure	10903 (28.0)
	Exposure to one source	8305 (21.3)
	Exposure to any two sources	12308 (31.6)
	Exposure to all three sources	7432 (19.1)

***Reads newspaper, listens to radio, watches television**

Table 2: Antenatal care and malaria prophylaxis during last pregnancy

Variables	Frequency (%)
Number of antenatal visits during pregnancy	N = 20,072
No antenatal visit	6662 (33.2)
1 – 3	2483 (12.4)
4	1639 (8.2)
>4	8868 (22.8)
Don't remember	420 (2.1)
Timing of first antenatal check	N = 13456
First trimester	3700 (27.5)
Second trimester	8275 (61.5)
Last trimester	1438 (10.7)
Don't know	43 (0.3)
Place of attendance of ANC	N = 13285
Home (respondents' or others')	442 (3.3)
Government hospital	5740 (43.2)
Government health center/post/ dispensary	4767 (35.9)
Other public sector	4
Private hospital/clinic	2796 (21)
Other private sector	62 (0.5)
Other places	13 (0.1)
Antimalarial drug taken during pregnancy	N = 20,110
Received no drug for malaria	10035 (49.9)
Sulphadoxine-Pyrimethamine	5180 (25.8)
Chloroquine	713 (3.5)
Artesunate	120 (0.6)
Coartem	89 (0.4)
Daraprim	184 (0.9)
*Other antimalaria	399 (2.0)
**Other drugs for malaria	1473 (6.8)

***Refers to all other antimalaria drugs that are not less commonly used and not listed**

****Refers to other drugs that people take for malaria such as analgesics, antipyretics, antibiotics, etc**

reported they had attended 4 or more ANC visits, while one-third did not attend ANC at all. The first ANC visit for as many as 61.5% of the women was in the second trimester. Majority of them attended ANC in government facilities - hospitals accounted for 43.2% while health centers, posts and dispensaries accounted for 35.9%. Almost half of the women surveyed (49.9%) took no drug for the prevention of malaria in pregnancy. SP was taken by only 25.8% of the study population. Demographic and socioeconomic factors associated with use of SP for malaria prophylaxis in pregnancy are presented in table 3 below. Statistical significant association ($p < 0.001$) exists between use of SP for malaria prophylaxis in pregnancy and age category, level of education, literacy, region, type of place of residence, media exposure and wealth index. Table 4 shows the results of logistic regression analysis of factors associated with the use of SP. Each variable that potentially predicts the use of SP in pregnancy was analyzed independently to generate the unadjusted odds ratio while all other variables were held constant to generate adjusted odds ratio. The predictor variables include age category, exposure to media, type of place of residence, region, wealth index, place of attendance of ANC and number of ANC visits. Women in the age categories of 20 years and above are more likely to use SP in pregnancy than women in 15-19 years age category. Those in the 20-34 years age category are 1.3 or more times more likely to use SP. Those who are exposed to media are more likely to use SP than those who are not. However, exposure to more than one source of media does not make much difference in the likelihood of use of SP in pregnancy. The regional variations show that those in the south are less likely to use SP in pregnancy than those in the north. Women residing

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Table 3: Cross-tabulation of demographic and wealth index characteristics with use of SP for IPTp of malaria

Demographic, geographic and wealth index characteristics		Women who took SP for malaria prevention in pregnancy; n(%)	p-value
Age category	15-19	260 (20.6)	<0.001
	20-24	1037 (26.6)	
	25-29	1396 (26.5)	
	30-34	1144 (27.4)	
	35-39	811 (25.6)	
	40-44	380 (22.8)	
	45-49	152 (22.1)	
Highest educational level	No education	1975 (21.6)	<0.001
	Primary	1071 (26.2)	
	Secondary	1630 (29.4)	
	Higher	504 (37.6)	
Literacy	Cannot read at all	2421 (21.5)	<0.001*
	Able to read only parts of sentence	453 (32.5)	
	Able to read whole sentence	2268 (31.2)	
	Not assessed	6 (8.1)	
	Blind/visually impaired	1 (14.3)	
Region	North Central	808 (26.2)	<0.001
	North East	1140 (28.6)	
	North West	1678 (27.1)	
	South East	414 (24.2)	
	South South	439 (17.7)	
	South West	701 (26.3)	
Type of place of residence	Urban	2232 (33.0)	<0.001
	Rural	2948 (22.1)	
Wealth index	Poorest	672 (15.4)	<0.001
	Poorer	991 (21.6)	
	Middle	1123 (27.7)	
	Richer	1244 (32.9)	
	Richest	1150 (34.5)	
Media exposure	No exposure	1323 (19.4)	<0.001
	Exposed to 1 source only	1202 (24.8)	
	Exposed to any 2 sources	1718 (29.4)	
	Exposed to all 3 sources	937 (36.1)	

***Fisher's exact test**

in urban areas were 1.16 times more likely (unadjusted OR) to use SP in pregnancy than women in rural areas. Women in richer quintiles were more likely to use SP in pregnancy than women in poorer quintiles. The upper three quintiles were 1.33 to 1.8 times more likely to receive SP than the poorest (adjusted OR). The place of attendance of antenatal care predicts whether a woman will use SP for malaria prophylaxis in pregnancy. Women who received ANC from public health facilities in their last live birth (in the past 2 years) were 2 times more likely (inverse of 0.68 OR) to take SP in pregnancy than those who used private health facilities. The number of ANC visits is a strong predictor of use of SP for malaria prophylaxis in pregnancy. Those who attended at least four ANC visits were 1.46 times more likely to use SP in pregnancy than those who attended for less than four times.

Table 4: Logistic regression of factors associated with use of SP for malaria prevention in pregnancy

Demographic and socioeconomic variables		Standardized coefficient	p-value	Adjusted OR	95% C.I. for OR	Unadjusted OR
Age category	*15-19		0.01			
	20-24	0.264	0.01	1.30	1.08 - 1.58	5.37
	25-29	0.298	<0.01	1.35	1.12 - 1.62	7.28
	30-34	0.309	<0.01	1.36	1.13 - 1.64	7.95
	35-39	0.211	0.04	1.23	1.01 - 1.50	6.13
	40-44	0.123	0.27	1.31	0.91 - 1.41	3.40
	45-49	0.140	0.33	1.15	0.87 - 1.52	1.31
Media exposure (newspaper, radio, television)	* Not exposed		0.03			
	Exposed to 1 source only	-0.011	0.86	0.99	0.88 - 1.11	1.165
	Exposed to any 2 sources	-0.108	0.07	0.90	0.79 - 1.01	1.108
	Exposed to all 3 sources	0.103	0.16	1.11	0.96 - 1.28	1.244
Region	* North Central		<0.001			
	North East	0.603	<0.001	1.83	1.61 - 2.08	1.40
	North West	1.254	<0.001	3.50	3.07 - 3.99	1.41
	South East	-0.275	<0.001	0.76	0.65 - 0.89	0.69
	South South	-0.526	<0.001	0.59	0.51 - 0.69	0.53
	South West	-0.253	<0.001	0.78	0.68 - 0.89	0.91
Residence	*Urban vs Rural	-0.002	0.96	0.99	0.90 - 1.10	0.86**

Discussion

Our findings reveal that only 1 in 4 Nigerian women used SP for malaria prophylaxis in pregnancy and about half of them did not receive any other antimalarial drugs for prophylaxis in pregnancy in 2013. This implies that malaria infection could continue to rank high on the list of common causes of maternal morbidity in Nigeria, necessitating renewed efforts on this aspect of malaria control. This agrees with other studies reporting low IPTp coverage[13, 15-16, 18]. With respect to potential effects of provider behaviour and availability of supplies on SP use in pregnancy, it has been reported that

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Table 4 Cont...

Wealth index	*Poorest		<0.001			
	Poorer	0.05	0.47	1.06	0.91 - 1.22	1.340**
	Middle	0.288	<0.001	1.33	1.15 - 1.56	1.441
	Richer	0.510	<0.001	1.67	1.41 - 1.97	1.523
	Richest	0.587	<0.001	1.80	1.49 - 2.17	1.404
Place of ANC	*Public vs Private	-0.393	<0.001	0.68	0.60 - 0.76	0.50
Number of ANC visits	*< 4 vs ≥ 4 visits	0.38	<0.001	1.46	1.31 - 1.63	4.18
First antenatal check	*First trimester		0.01			
	Second trimester	0.09	0.07	1.09	0.99 - 1.19	1.21**
	Third trimester	-0.04	0.62	0.96	0.83 - 1.12	1.12

SP is widely available and relatively affordable at the cost of 0.06 USD per dose. Counterfeiting was also not an issue as most products have provisional approval by the National Agency for Food and Drug Administration and Control[19]. Onwujekwe et al also reported in 2012 that private providers still administered weekly malaria prophylaxis to pregnant women using pyrimethamine, chloroquine and proguanil[16]. Hence, SP was not the only antimalarial drug being used to prevent malaria in pregnancy.

The use of SP for malaria prophylaxis in pregnancy was lowest among women ages 15-19 years and above 40 years; who are uneducated; illiterate; not exposed to modern sources of media; residing in rural areas; and in the poorest wealth quintile. It has been reported that women who are unaware of the benefits of IPTp or the preventive value of SP are less likely to use it for malaria prophylaxis in pregnancy[10]. ANC provides opportunities for pregnant women to be trained on various aspects of pregnancy and childbirth, including malaria prevention. Older and multiparous women are more likely to have had more exposures to ANC trainings than younger (teenage) and nulliparous women. Hence, it is expected that they would have higher utilization rates. However, some studies in Nigeria have also reported that women at the upper extremes of reproductive age adhered the least to antenatal care although older age and place pregnant women and their neonates at higher risks of morbidity and mortality[20-24] .

Although education, literacy and exposure to modern media sources have strong statistical associations with utilization of SP for malaria prophylaxis in pregnancy, media exposure is the only determinant of SP use in pregnancy. Community media saturation has been reported to increase maternal health service utilization[25] probably through creating awareness. However, it would be simplistic to conclude that media exposure alone has an independent or direct effect on service utilization, since the decision to use and the actual utilization of health services is an interaction of individual, social, economic and health service factors[26-28].

The higher the wealth index, the more likely that the women used SP for malaria prophylaxis in pregnancy. Also, women residing in urban areas were more likely to use SP than those in the rural areas. The observed socioeconomic inequity in SP use in pregnancy compares well with Dialla et al study where income and wealth index had similar effects on the use of SP, but were interpreted as minor barriers when compared with provider factors such a stock-out of drugs[29]. Takem and colleagues, on the other hand, found that in Beua, Cameroon, socio economic status did not have any effect on the use of IPTp for malaria[30]. Although it is expected that removal of user fees for malaria prophylaxis (in pregnancy) in public health facilities would reduce the SES inequity in access, this may be hampered by frequent stock-out of drugs in primary health centers, necessitating purchase of SP from private providers. The observed inequity in use of SP by type of place of residence (urban versus rural), shows persisting inequity since the DHS Report of 2008[13]. These persisting inequities were also reflected 2 years later in the Malaria Indicators Survey of 2015[31]. Several factors could explain this difference such as different levels of access to service providers and availability of information.

Regional differences exist in the use of SP for malaria prophylaxis in Nigeria. However, different from the frequently reported relatively lower maternal and child health service utilization rates in northern Nigeria[32], geopolitical regions in the north had better utilization rates than the south. Regional variation has been reported in the past concerning uptake of maternal and child health interventions in Nigeria[33]. With respect to use of SP for malaria prophylaxis in pregnancy this variation could be accounted for by the fact that far more women in the northern regions than the southern regions were reported to have been accessing antenatal care from public facilities during the 2013 DHS[12]. The 2015 Malaria Indicator Survey also highlights that the proportion of Nigerians living under conditions of hyper-transmission and holoendemic transmission of malaria are in the northern region, and this could also account for the higher SP utilization rate[31]. Practices in private health facilities often differ from those in government owned health facilities. Mubyazi et al reported that failure to adhere to national guidelines for malaria control through IPTp was more likely to happen in private health facilities[34]. For instance, they were more likely to charge fees for SP and to dispense other antimalarial drugs on the request of their pregnant clients; hence, creating inconsistencies in National programme implementation[34].

Whereas the use of SP in pregnancy differs significantly between those who booked at the first and second trimesters, there was no significant difference in the use of SP between the first and third or second and third trimester bookings. Marginal difference in the use of SP was also observed, with respect to frequency of ANC visits, between those who had less than four visits and those who had at least four visits. Place of attendance of ANC was seen to be a determinant of IPTp with SP in Nigeria. Women who attended ANC in public facilities were more likely to receive SP than those who attended ANC in private facilities. This could be because SP is given free of charge to pregnant women attending ANC in public health facilities. While this may be the case for most regions, Onwujekwe et al reported that women attending ANC in private health facilities in South-east Nigeria were more likely to receive SP for malaria prophylaxis than those attending public facilities[16]. This could be associated with frequent stock-out of drugs which is commonly experienced in public health facilities and has been reported as one of the major factors affecting malaria interventions in Nigeria[29, 35-36].

The timing of the first ANC visit and frequency of visits may well affect the use of SP for malaria prophylaxis in pregnancy[11], and although Dialla et al reported that attaining the recommended number of ANC visits did not ensure that women received at least 2 doses of IPTp, the difference in sample size could explain this observed disparity[29]. Overall, our findings corroborate reports of substantial missed opportunities for administering SP in pregnancy since a considerably larger proportion of women appear to be attending ANC than using SP for malaria prophylaxis in pregnancy[10].

Although SP prophylaxis is provided free of charge to mothers receiving ANC in public facilities in Nigeria, coverage is still poor and inequities in access and use exist. Considerable effort is still required by the national and sub-national malaria control programs to improve coverage of IPTp in Nigeria. The widely reported SP resistance in malaria endemic areas necessitates that more efficacious antimalarial drugs should be used for scaling up IPTp.

Our study did not evaluate use of malaria prevention strategies such as insecticide-treated bed net which is routinely given to pregnant women, and indoor residual spraying with insecticides which is gaining coverage in Nigeria. The availability/coverage and use of these preventive strategies[10, 35] may explain the poor utilization of IPTp among pregnant women in the survey. However, this paper cannot report on this relationship and this is a limitation of the study.

Conclusions

Use of SP for malaria prophylaxis in pregnancy is generally low across all demographic groups, socioeconomic groups, geographic and geo-political regions in Nigeria. Inequities still exist across these categories and those in vulnerable population segments (such as teenagers of reproductive age; uneducated women; rural dwellers; women from the poorest households) are the least covered. Various ANC utilization indicators (such as place of attendance, timing of first attendance and frequency of visits) as well as demographic, socioeconomic and geographic characteristics (such as age category, media exposure, wealth index type of place of residence and region) predict whether a woman will use SP for malaria prophylaxis in pregnancy. Thus, interventions to scale-up IPTp should be designed to target the least covered in order to reduce the existing inequities.

Declarations

Ethics statement

Authorization to access, download and use the DHS data set was sought from and given by The Demographic and Health Surveys (DHS) Program, ICF INTERNATIONAL, 530 Gaither Road, Suite 500, Rockville, MD 20850 USA.

Consent for publication

Not applicable.

Availability of data

The DHS data set for Nigeria, analyzed during the current study, are available in the DHS website, http://www.dhsprogram.com/data/dataset_admin/login_main.cfm, following registration and an on-line application process.

Competing interests

The authors declare no competing interests.

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