Original Article

Effectiveness of 3 doses of Intermittent Preventive Therapy with Sulphadoxine-Pyrimethamine in Pregnancy

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Abstract

Background: In 2014, Nigeria scaled up to at least 3 doses of intermittent preventive therapy in pregnancy with Sulphadoxine-Pyrimethamine (ITPp-SP). While the fact of existing evidence as to the superiority of SP3 over SP2 was shown by WHO back in 2012, the Nigerian Government domesticated it in her Federal Ministry of Health guideline for the prevention of Malaria in pregnancy of 2014. Studies leading to the pronouncement were mainly in East African Countries where the density / pattern of infection as well as the species of the plasmodium tend to vary with what is occasionally obtainable in West African sub-region including, Nigeria. There was an apparent need for the measurement of the effectiveness in hyper / holo-endemic country like Nigeria. **Aim :** To determine the efficacy and safety of 3-doses compared with 2-doses of intermittent preventive therapy in pregnancy with sulphadoxine-pyrimethamine (SP) for the prevention of placental malaria and associated low birth weight. **Subjects and Methods:** Nine hundred and twenty (920) pregnant women were randomised to receive either 2 doses (SP_2) or 3 doses (SP_3) of sulphadoxine-pyrimethamine between December 2013 and August, 2014. Pre-delivery blood samples were collected for maternal haemoglobin as well as placenta blood samples for placenta parasitaemia. The Neonates were weighed and followed-up. Prevalence of placental parasitaemia, low birth weight (LBW), preterm birth and anaemia were analysed using intention-to-treat (ITT) and per-protocol (PP) analysis. **Results:** Data from 910 women were analysed (458 in the SP_2 and 452 in the SP_3 group). Overall, the incidence of placenta parasitaemia, low birth weight and pre-delivery anaemia in pregnancy were significantly lower among the SP_3 group compared with those that had two doses (Sp_2), $p < 0.001$for all factors. There was no neonatal jaundice in either group. **Conclusion:** Addition of a third dose of SP to the current popular two doses of IPT-SP demonstrated a better outcome in the reduction of placenta parasitaemia, LBW and, anaemia in pregnancy among many more advantages. It would be worthwhile to domesticate the at least, 3 dose of IPTp-SP to all pregnant women in our current practice.

Keywords: Malaria, Prevention, Pregnancy, Sulphadoxine-Pyrimethamine

Introduction

Intermittent preventive treatment (IPT) is a tested intervention with proven effectiveness providing significant protection against maternal anaemia and mortality as well as low birth weight and abortion[1]. Malaria disease is endemic in parts of Asia, Africa, Oceania and Central and South America, with around 90% of the global malaria burden borne by Sub-Saharan Africa. Women are more susceptible to malaria during pregnancy and in the puerperium.[2-5] Malaria during pregnancy remains a major risk factor for maternal and child death, and substantially raising the risk of miscarriage, stillbirth and low birthweight.[6,7] The transient depression of immunity to allow for development of the fetus is one of the reasons adduced for the increased susceptibility of pregnant women to malaria.[7] In Nigeria and Mali, closely related high prevalence of malaria in pregnancy has been reported from different parts of the country.[8-13]

To prevent these prevailing adverse events, World Health Organization (WHO) recommends a package of interventions for controlling malaria and its effects during pregnancy including the administration of intermittent preventive therapy with sulphadoxine-pyrimethamine, promotion and use of insecticide-treated nets (ITNs), and appropriate case management through prompt and effective treatment of malaria in pregnant women.[14] This has been widely practiced since its introduction in Nigeria with favourable outcomes for both the pregnant women and their neonates. Malaria parasitaemia at birth was found to be lower among those pregnant women who received IPTs and recorded lower maternal anaemia in a study from Sokoto, Nigeria.[12] In a recent randomised controlled trial, addition of the 3rd dose to immuno-competent pregnant women was associated with

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further lowering the risk of malaria parasitaemia and neonatal complication by 50%.[14] Following such revelation, a meta-analysis of all randomised control trials comparing 2 doses with 3 or more doses was conducted and revealed that 2 doses is no longer as effective in preventing unwanted consequences of malaria in pregnancy as was earlier believed.[15]

While the fact of existing evidence as to the superiority of SP3 over SP2 was shown by WHO back in 2012, the Nigerian Government domesticated it in her Federal Ministry of Health guideline for the prevention of Malaria in pregnancy of 2014. Studies leading to the pronouncement were mainly in East African Countries[15-21] where the density/pattern of infection as well as the species of the plasmodium tend to vary with what is occasionally obtainable in West African sub-region including, Nigeria.[1] There was an apparent need for the measurement of the effectiveness in hyper / holo-endemic country like ours.

It is in the context that there appears a need to evaluate the effectiveness of this novel approach in a population of pregnant women in Nigeria to strengthen future analysis in this sub-region. The study may also justify the adoption of this novel approach to our antenatal women. It was also reported that the usual fear of neonatal jaundice hitherto associated with late administration of sulphadoxine-pyrimethamine is unfounded. [15] Therefore, adding a third dose of IPTp-SP to protect women during last 4-6 weeks of pregnancy may significantly reduce the risk of placental malaria and low birth weight (LBW) as well, reducing the incidence of severe maternal anaemia among HIV naive pregnant women.[19]

The Objective of this study was to compare the effectiveness and efficacy of 3 doses with the conventional 2 doses of intermittent preventive therapy of malaria in pregnancy using sulphadoxine-pyrimethamine amongst pregnant women attending our antenatal clinic. Its effectiveness in preventing placenta parasitaemia and low birth weight among others were sought and evaluated.

Subjects and Methods

This was a ramdomised controlled clinical trial at the Department of Obstetrics and Gynaecology, University of Abuja Teaching Hospital, Abuja. The Hospital is located in Gwagwalada Area Council of Nigeria's federal capital territory, whose geographical coordinates are 8° 56' 29" North and 7° 5' 31" East – a malaria holo-endemic region of the country.[49] The facility provides health care services to the inhabitants of Abuja and neighboring states of Niger, Kogi and Nasarawa.

The trial compares the efficacy and safety of 3 doses and 2 doses of intermittent preventive therapy regimens in preventing malaria in pregnancy. Eligible women were individually randomized to receiving 2 or 3 doses of SP (1500 mg of sulphadoxine and 75 mg of pyrimethamine). The researcher recruits all the women as they were been seen and the procedure of allocation is as detailed below. Allocation concealment was achieved by keeping 20 allocation slips with pre-assigned study allocations (10 per arm) in opaque containers. Sequential participants were asked to draw 1 allocation slip from the container without possibility of replacement. The randomisation sequence was stratified by the lead researcher and permuted balanced block randomisation was employed (block size of 20). Each SP dose consisted of 1500mg sulphadoxine and 75mg pyrimethamine (administered in a total of 3 tablets). Women in each arm of the study received the first dose between 16-24 weeks and the second dose at least four weeks apart between 24-32 weeks. In addition, women in the SP3 group received a 3rd dose at least four weeks apart from the second dose, between 32-36 weeks. All drug administration was as a direct observational therapy (DOT). Women were observed, and the full dose was repeated if vomiting occurred within 30 minutes of drug administration. Study participants were advised to avoid self-medication of antimalarial drugs until completion of follow-up. All women received ferrous sulphate 200 mg (containing 60 mg of elemental iron) and folic acid (5mg) daily, which were started one week after the commencement of sulphadoxine-pyrimethamine. Unfortunately, the 5mg dose of folic acid that is above the WHO recommendation in pregnancy is the only available preparation in our facility. If clinical malaria occurs during follow-up visits, patients were treated based on the existing antimalarial protocol in the department.

Inclusion criterion was all pregnant women who presented at the booking clinic during the study period and had provided written informed consent. For those who could not write in English language, a verbal consent was obtained after detail explanation of the aim, purpose and the procedure of the study as well as the implication. The drug was administered free. All pregnant women who refused to give consent, women who have had antimalarial in the last one month, those with known hypersensitivity to SP, women on Cotrimoxazole and all HIV positive patients were excluded. Women with serious illness requiring hospital admission, severe anemia (haemoglobin level, <7 g/dL), multiple pregnancy and women who were planning to deliver outside our facility were also excluded. Women that developed complication in the form of vomiting were treated with Intra muscular Promethazine 25mg start. The study was conducted from December 2, 2013 to August 7. 2014 after obtaining the written permission from the College and ethical clearance from the Hospital's scientific and research committee.

The primary endpoint was placenta parasitaemia (asexual stage parasites, any species) while the secondary endpoints were birth weight, preterm delivery and maternal haemoglobin preceding delivery. The safety endpoint was neonatal jaundice in both arms of the study.

Data were analysed using Stata/IC® version 10.0. Intention-to-treat (ITT) and a per-protocol (PP) analysis were performed. The Intention-to-treat (ITT) analysis included all randomised patients for whom the outcome variables were available and the effect of the intervention was determined by comparing the SP2 group to the SP3 group, regardless of the actual number of intermittent preventive treatment with sulphadoxine-pyrimethamine (IPTp-SP) doses received by the women. The per-protocol (PP) analysis included women randomized in the SP3 group who actually received three doses and women randomized in the SP2 group who received two doses of sulphadoxine-pyrimethamine (SP) and for whom the outcomes data were available.

Comparisons of mean values of continuous variables were done by analysis of variance while for categorical variables, A-Poisson regression model with robust standard error estimates were used to evaluate the relationship between explanatory variables and outcomes. The entire group and/or character being considered as well as sub-groups were analyzed and reported. A p-value ≤ 0.05 was considered as statistically significant.

Results

A total of 910 were recruited and ramdomised after obtaining their informed consent. Four hundred and fifty eight were ramdomised and received two doses of IPTp-SP (Sp_2) and 452 were in the SP_3 group. Therefore, at the onset of the research work, there were 458 (50.33%) SP_2 and 452 (49.67%) SP_3 women in respective groups for both intention to treat and per protocol analysis. One hundred and thirty nine women were unable to finish the participation in the SP2 group leaving a balance of 319 to complete the study. On the other hand, only 330 women completed the study in the SP3 group as 122 women fell out of the research in this category, both on the basis of intention to treat analysis. The fell out / lost to follow up in both groups were due to industrial unrest, travelling outside the study area, development of severe medical disorders in pregnancy necessitating preterm delivery and missed data. Even though, 319 women in SP2 group completes the study, only 193 (60.50%) actually had their prescribed 2 doses as per protocol analysis. Similarly, it was 184 (55.75%) in SP3 that had their completed prescribed 3 doses on per protocol analysis. These were due to inability of the women to complete their antenatal visit were additional doses were scheduled to be served and only reporting during labour [Table 1]. A total of 13 women combined had acute malaria during the course of study and treated based on Departmental protocol. Majority of the respondents were in their second pregnancy (46.7% and 36.73% for SP2 and SP3 respectively) and, in their 2nd trimester of pregnancy (69% and 68.58% respectively for the SP2 and SP3 groups). Educational attainment were similar between the two groups as about 63% and 65% had at least secondary education in SP_2 and SP_3 groups respectively [Table 1].

Overall, the incidence of placenta parasitaemia was 36.46% in SP2 compared with 25% recorded in those that had 3 doses when using 'intention to treat' (ITT) protocol ($p < 0.001$, AIRR-1.001, 95% CL; 1.00-1.002) Table 2. The observation was similar even when compared using per protocol analysis [Table 3] when the incidence of placenta parasitaemia was 54.40% and 39.67% in SP_2 and SP_3 groups respectively (P<0.001, AIRR-1.001, 95%CL 1.0006-1.001).

The incidences of low birth weight (LBW) were 12% in SP_2 and 4.2% among SP_3 group when using ITT analysis respectively [Table 2]. This difference was statistically significant ($p < 0.001$). Using per protocol analysis however, the difference in the LBW incidences of 22.80% in Sp_2 and 5.43% in Sp_3 group were demonstrated to be a chance factor as they were insignificant ($p < 0.528$) [Table 3].

There recorded pre-delivery incidence of Anaemia in pregnancy of 21.41% among Sp_2 group was significantly higher than 14.16%

Table1: Demographic characteristic of women recruited ay inception

Characteristics	Sp2 group (%)	Sp3 group (%)
Age Mean (95%CI)	29.56+ 0.23 (29.12 - 30.02)	29.60+ 0.22 29.17-30.02)
18-23	50 (10.90)	41 (10.60)
24-29	170(37.10)	178 (39.40)
30-35	186 (40.60)	185 (40.90)
>35	52 (11.40)	48 (10.60
Total	458(100)	452(100)
Education		
None	71(15.50)	52 (11.50)
Primary	98(21.40)	108 (23.89)
Secondary	178(38.68)	168(37.17)
Tertiary	111(24.24)	124 (27.43)
Total	458(100)	452 (100.00)
Gravidity		
Primigravidae	118 (25.76)	133(29.42)
Secundlgravidae	214 (46.73)	166 (36.73)
Multigravidae	126 (27.51)	153 (33.85)
Total	458(100.00)	452 (100.00)
Gestational age at enrolment		
2nd trimester	316 (69.00)	310 (68.58)
3rd trimester	142 (31.00)	142 (31.42)
Total	458 (100.00)	452 (100.00)
Dose of SP received		
1	126(39.50)	42(12.73)
2	193(60.50)	104(31.52)
3	_	184(55.75)

recorded in the Sp_3 group when analysed using ITT protocol ($p < 0.001$) [Table 2]. This statistical significant difference in incidence of anaemia in pregnancy was reproduced between the two groups (41.45% for Sp2 and 30.98% for Sp3) using per protocol analysis ($p < 0.001$) [Table 3].

When premature delivery was analysed using ITT, the incidence of premature delivery in SP_2 was 3.71% compared with 1.72% in the Sp3 group [Table 2] similar to 7.77% and 0.54% respectively for Sp_2 and Sp_3 recorded by per protocol analysis [Table 3]. These differences were analysed to be of significance (P<0.001). Results were further analysed based on the parity. Using both ITT [Table 2] and per protocol analysis [Table 3], the incidence of placenta parasitaemia was much higher in Sp_2 group (62.65%) than 0.48% in Sp_3 group ($p < 0.001$), [Tables 2 and 3]. Although there was a relative lower incidence of LBW among Sp_3 group, the differences were not statistically significant when analysed using both ITT and per protocol analysis [Tables 2 and 3]. The incidence of anaemia in pregnancy and premature delivery were considerably lower among Sp_3 group when compared with their Sp_2 counterpart using ITT analysis [Tables 2 and 3] ($p < 0.001$). Similarly, the incidences of placenta parasitaemia, anaemia in pregnancy and premature delivery among women in their second pregnancy (Secundigravidae) were significantly lower in SP_3 group than SP_2 group using both ITT and per protocol [Tables 2 and 3, $p < 0.001$]. The incidences of placenta parasitaemia, LBW and anaemia in pregnancy were significantly lower in the Sp_3 group than among Sp_2 group using per protocol analysis [Table 3, $p < 0.001$]. There was no recorded incidence of neonatal jaundice in both groups of the study arms.

Table 2: Intention to treat analysis - Outcomes using Poisson regression analysis with robust error estimation of Adjusted Incident rate ratio(AIRR)

	Proportion of women with characteristics		Robust estimation		Confidence interval	P Values
characteristics	**Sp2**	**Sp3**	**Adjusted Incident rate ratio (AIRR**	**Standard error**		
Overall						
Placenta Parasitaemia	36.46 (167/458)	25.00 (113/452)	1.001	0.0012	1.00- 1.002	<0.001
LBW	12.01 (55/458)	4.20 (19/452)	1.0296	0.0017	0.026 - 1.033	<0.001
Anaemia	21.40 (98/458)	14.16 (64/452)	1.016	0.0003	1.016 -1.02	<0.001
Premature delivery	3.71 (17/458)	1.77 (8/452)	1.034	0.003	1.028 - 1.041	<0.001
Neonatal jaundice	–	–	–	–	–	–
GRAVIDAE 1						
Placenta Parasitaemia	65.25 (77/118)	48.12(64/133)	1.002	0.0002	1.0013-1.002	<0.001
LBW	17.80 (21/118)	4.51 (6/133)	1.027	0.046	0.943-1.121	0.54
Anaemia	29.66 (35/118)	24.81 (33/133)	1.015	0.003	1.009- 1.021	<0.001
Premature delivery	7.63 (9/118)	5.26 (7/133)	<0.001	< 0.0001	<0.001	<0.001
Neonatal jaundice	–	–	–	–	–	–
Gravidae 2						
PlacentaParasitaemia	22.43 (48/214)	19.89(37/186)	1.002	0.0002	1.001- 1.002	<0.001
LBW	5.14(11/214)	5.91 (11/186)	1.154	0.0621.	0396-1.283	< 0.01
Anaemia	18.22(39/214)	3.76 (7/186)	1.015	0.003	1.01-1.02	<0.001
Premature delivery	3.27 (7/214)	0.54(1/186)	4.606	1.84	2.103- 10.08	<0.001
Neonatal jaundice						
GRAVIDAE ≥ 3						
Placenta Parasitaemia	33.33 (42/126)	7.84 (12/153)	1.001	0.0001	1.001- 1.002	<0.001
LBW	10.32 (13/126)	1.31 (2/153)	1.012	0.0002	1.0013-1.002	<0.001
Anaemia in Pregnancy	19.05 (24/126)	15.69 (24/153)	1.00	0.005	0.99-1.01	0.89
Premature delivery	0.79 (1/126)	0/153	—	—	—	—
Neonatal jaundice	–	–	–	–	–	–

Table 3: Per Protocol analysis - Outcomes using Poisson regression analysis with robust error estimation of adjusted incident rate ratios (AIRR)

	Proportion of women with characteristics		Robust estimation		Confidence interval	P Values
Characteristics	**Sp2**	**Sp3**	**Adjusted Incident rate ratio (AIRR)**	**Standard error**		
Overall						
Placenta Parasitaemia	54.40(105/193)	39.67(73/184)	1.001	0.00012	1.0006-1.001	<0.001
LBW	22.80 (44/193)	5.43 (10/184)	0.957	0.067	0.835-1.097	< 0.01
Anaemia	41.45 (80/193)	30.98(57/184)	1.015	0.003	1.01-1.020	<0.001
Premature delivery	7.77 (15/193)	0.54 (1/184)	<0.001	<0.00001	0- 0.0001	<0.001
Neonatal jaundice	-	-	-	-	-	-
GRAVIDAE 1						
Placenta Parasitaemia	56.25(36/64)	40.32(25/62)	1.001	0.0024	1.0005-1.0015	<0.001
LBW	32.81(21/64)	4.84 (3/62)	1.032	0.062	0.92-1.161	< 0.01
Anaemia in pregnancy	46.88(30/64)	37.10(23/62)	1.009	0.005	0.99-1.019	0.07
Premature delivery	7.81 (5/64)	0.00 (0/62)	-	-	-	-
Neonatal jaundice	–	–	–	–	–	–
GRAVIDAE 2						
Placenta Parasitaemia	63.64(56/88)	40.21 (39/97)	1.000	0.0002	1.00-1.002	<0.001
LBW	17.05(15/88)	4. 12(4/97)	1.02	0.165	0. 74- 1.400	< 0.01
Anaemia in pregnancy	36.36(32/88)	26.80(26/97)	1.014	0.003	1.001- 1.019	<0.001
Premature delivery	7.95 (7/88)	1.03 (1/97)	0.13	0.047	0. 63- 0.266	<0.001
Neonatal jaundice	-	-	-	-	-	-
GRAVIDAE ≥ 3						
Placenta Parasitaemia	31.71(13/41)	28.13 (9/32)	1.00	0.0003	0.99-1.001	< 0.01
LBW	19.51 (8/41)	9.38 (3/32)	1.13	0.133	0.88 - 1.41	< 0.01
Anaemia in pregnancy	43.90(18/41)	25 (8/32)	0.99	0.009	0. 97- 1.007	< 0.01
Premature delivery	7.32(3/41)	0 (0/32)	-	-	-	-
Neonatal jaundice	- _	- _	_-	-_	- _	- _

Discussion

The overall incidence of placenta parasitaemia was 25% among women on 3 doses of sulphadoxine-Pyrimethamine. This was significantly lower than 36.46% observed in Sp_2 group ($p< 0.001$) using ITT analysis just as it was with 39.67% and

54.40% respectively for Sp_3 and Sp_2 ($p < 0.001$) using per protocol analysis. This observation is in keeping with the WHO findings in 2013.[14] It appears that our pregnant women also receive improved protection from persistent parasitaemia with the addition of the 3rd dose of the IPTp-SP as is now the global norm. Addition of the 3rd dose on the earlier standard 2 dose regimen is said to further increase the protective role against placenta parasitaemia by additional 50%.[14] These findings can be compared with random-effects meta-analysis of trials comparing the standard 2 dose of SP to 3 doses of sulphadoxine-pyrimethamine for intermittent preventive therapy during pregnancy by HIV Status in Mali, Malawi and Zambia.[16, 17, 18] The extra dose of SP was well tolerated as was shown by previous workers.[16-23] The higher reduction in placenta malaria in the 3 dose group may have been facilitated by the fact that, the last dose was administered on average about 4 weeks to term, clearing existing infections and reducing the susceptibility of the new born to new infections at term since the drug provides an extra period of post treatment prophylaxis of 4–6 weeks. The incidence of LBW was found to be 4.20% in SP_3 group, much lower than 12% in SP_2 group ($p < 0.001$). This statistically significant difference was also reported from the Kenyan and Calabar studies.[15, 23] The observation was corroborated when the analysis was effected using per protocol approach. Previous report in systematic review and meta-analysis [15] demonstrated in their study that in women in the region of high malaria transmission, additional doses of SP significantly further reduces the incidence of low birth. It also appears possible that other numerous factors influencing the prevalence of placenta malaria and LBW in pregnant women, including maternal age, gravidity, use of prophylaxis, nutrition, host genetic factors, and level of anti-parasite immunity, as well as parasite genetics and transmission rates may have played their roles as documented in WHO publication[14]. This however is unlikely to affect the result as if indeed their effect was contributory, both arms may have been equally prone. Randomisation was however, not stratified by gestational age.

The more prevalence of pre-delivery anaemia in pregnancy and premature delivery among the SP_2 group was in keeping with the known association between high placenta parasitaemia and this disorders.[15] There was a statistical significant lower incidence of 14.16% in SP_3 compared with 21.40% in SP_2 group using ITT ($p < 0.001$). Per protocol analysis also corroborated similar result of lower incidence of anaemia in pregnancy (SP_3=30.98% and SP_2=41.45%, $p < 0.001$). The lower incidence of anaemia in pregnancy and premature delivery among those receiving greater than or equal to 3 doses of IPTp-Sp have been well discussed in the systematic review and meta-analysis.[16-23] except that such review had no input from Nigeria, the most populous black nation in Africa. It may therefore be a real coincident with our finding and may likely become a cheap and affordable strategy to reducing those menaces in resource poor communities like ours. This finding is however gravidity dependents as the effect are maximal only among the primigravidae and Secundigravidae. [13-15,23] When those with greater than or equal to 3 gravidity were analysed using both ITT and per protocol, there was no statistical significant difference observed. This finding appears to be a new input to the field of science as previous workers and the meta-analysis reported in this review were silent on this observation.[15-23] It may be probable that the association is more casual as parity rises to and beyond 3. Perhaps, the untoward effect of recurrent pregnancies and depleted nutrient stores might be a more responsible factor than placenta parasitaemia. It may also be that enough maternal derived antibodies against malaria parasitaemia may have been profound at those parities making the effect of placenta parasitaemia less likely.

There was no recorded neonatal jaundice when the fetuses were followed up. This development is encouraging as previous thinking that late administration of sulphur-containing drugs such as SP may predisposed to neonatal jaundice, a position that has recently been refuted by current WHO guide line on the use of IPTp-Sp in prevention of malaria in pregnancy.[15]

Out of Hospital delivery constituted a great challenge for the surgery. There was relative high number of women who did not complete the administration of their drugs due to high proportion of drop out from the study. Perhaps, if all had completed the study, the findings might have been statistically more representative and significant than the observed values.

Conclusion

Therefore, the result demonstrated that there was a significant reduction in the overall incidence of placenta parasitaemia, anaemia in pregnancy and premature delivery in women that received the additional 3rd dose of SP when compared with those that were administered 2 doses following analysis by both ITT and Per Protocol. Due to high fell out of women in ITT analysis, perhaps, the conclusion based on per protocol analysis may be more rewarding. The overall incidence of LBW was however only shown to be lower in the SP_3 than the SP_2 using ITT analysis and was not reproduced when the analysis was effected by per protocol method. The result also concord with the general rule that the effect of placenta parasitaemia is maximal as it relates causation of anaemia in pregnancy and LBW among primigravidae and secundegravidae. It demonstrated the safety of sulphadoxine-pyrimethamine even when administered in late pregnancy among our women as had been proven by WHO guideline.

The policy guideline as contained in WHO recommendation and adopted by the Federal Government of Nigeria has yielding the expected benefit and should be maintained for long lasting effect. This has tendency to reducing the burden of maternal illnesses due to malaria during pregnancy and reducing incidences of low birth weight babies with its attendant complication and National resource wasting in fighting Neonatal complications.

Recommendation

Adoption of at least, 3 dose regimen of IPT to our pregnant population is highly commendable and should be sustained without uncertainty concerning the occurrence of Neonatal jaundice as had been proven by WHO guideline. Adding the third dose may near effectively prevent malaria in pregnancy in our antenatal population.

Conflict of interest

There are no conflicts of interest.

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