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Intermittent Preventive Treatment among Pregnant Women Attending a Tertiary Healthcare Facility in Jos, North Central Nigeria: Adherence Patterns and Preliminary Assessment of Associated Factors

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ABSTRACT

Adherence to intermittent preventive treatment with Sulphadoxine-Pyrimethamine (IPTp-SP) for malaria prevention in pregnancy remains a challenge in Nigeria. This retrospective cross-sectional study investigated IPTp-SP adherence patterns among pregnant women attending antenatal clinics at a tertiary healthcare facility in Jos, North Central Nigeria, from January 2022 to December 2024. A preliminary assessment of sociodemographic factors associated with IPTp-SP adherence was also conducted using univariate analysis, with statistical significance set at $p<0.05$. Most participants were aged 21-30 years (50.0%), resided in urban and peri-urban areas (80.0%), and were multigravida (40.0%). Overall, 60.1% initiated IPTp-SP in the second trimester, while 60.0% received at least two doses. Adherence was assessed based on the time of IPTp-SP initiation, the number of doses received, and intake intervals. Across these three criteria, IPTp-SP adherence was consistently and significantly associated with occupation ($\chi^2=34.89$, $p<0.001$; $\chi^2=14.38$, $p<0.01$; $\chi^2=28.51$, $p<0.001$) and residence ($\chi^2=19.93$, $p<0.001$; $\chi^2=25.79$, $p<0.001$; $\chi^2=10.81$, $p<0.01$). Additionally, the time of IPTp-SP initiation was significantly associated with the timing of antenatal registration ($\chi^2=9.18$, $p<0.01$). In a subset of participants, 73.9% of second-trimester initiators and 30.4% of third-trimester initiators tested negative for malaria parasitemia, suggesting that earlier initiation of IPTp-SP enhances the reduction of maternal malaria burden. Targeted interventions addressing access barriers and promoting early antenatal enrollment and adherence to IPTp-SP guidelines are critical for improving malaria prevention and maternal health outcomes in North Central Nigeria.

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XII Issue VIII August 2025

Keywords: Malaria prevention, Intermittent Preventive Treatment, IPTp-SP Adherence, Sulphadoxine-Pyrimethamine, Antenatal care, Pregnant women; Northcentral Nigeria

INTRODUCTION

Malaria is a protozoan disease caused by five Plasmodium species and spread by the female Anopheles mosquitoes [1]. It is one of the leading causes of morbidity and mortality, with enormous medical and economic impact [2]. Several species, including *P. vivax* and *P. falciparum,* are known to infect humans in Nigeria and are the most common and widely distributed parasites [3, 4]. According to the World Malaria Report 2024, about half of the world's population live in regions at risk of malaria transmission, with an estimated 263 million cases in 2023 representing about 11 million increase from 2022 [5]. It is a major public health issue in humid and subtropical areas [6, 7]. In 2020, about 130 million pregnancies occured in malaria transmission areas, mostly in Africa [8]. In 2021, in 38 malaria transmission countries in the WHO African Region, an estimated 40 million pregnancies occurred, out of which 13.3 million were exposed to malaria infection, with West Africa having the highest malaria exposure prevalence [9]. In Nigeria, malaria continues to cause significant morbidity and mortality particularly among pregnant women, who are known to have a higher risk of contracting malaria than non-pregnant women [10, 11].

Malaria during pregnancy is associated with serious adverse consequences such as maternal deaths, abortion, premature labour, maternal anaemia and low birth weight resulting in maternal and infant morbidity and mortality [10, 12]. These unfavorable pregnancy outcomes relate to sequestration of malaria parasites in the placental intervillous spaces attached to chondroitin-sulphate-A. When pro-inflammatory cells and cytokines invade the placental bed, the net result is impairment of foetal blood and nutrient supply, which results in low birth weight, which is reported as a critical risk factor for neonatal mortality [13].

In April 2000, the African Summit on Roll Back Malaria adopted the Abuja Declaration in which regional leaders committed themselves to ensuring that 60% of pregnant women in malaria-endemic communities accessed effective prevention and treatment of malaria by 2005 [14]. In addition, 80% scale-up was also initiated by the Nigeria Federal Government to ensure that at least 80% of pregnant women in the country participated in intermittent preventive treatment [IPT] with pyrimethamine or chloroquine. However, poor compliance contributing to emergence of drug-resistant strains of Plasmodium falciparum compromised the efficacy of these drugs [15]. To enhance the prevention of malaria in pregnancy and its subsequent adverse effects, the World Health Organization recommends IPT with sulphadoxine-pyrimethamine (IPTp-SP) for all pregnant women in malaria-endemic areas in Africa starting in the second trimester with at least two doses taken at one month intervals [16]. IPT is provided as part of a comprehensive antenatal package to control maternal anaemia, and it has proved to be safe, inexpensive and effective, with attendant increase in maternal haemoglobin levels and birth weight [5].

While majority of pregnant women attend antenatal clinic at least once during pregnancy, recent reports show that IPTp-SP compliance has been low, particularly in countries with the highest transmission of malaria [5]. In order to develop intervention strategies for improvement of the effectiveness of IPTp-SP in Northcentral Nigeria, this study was designed to assess the patterns of adherence to IPTp-SP guidelines among pregnant women receiving antenatal care (ANC) at a university teaching hospital in Jos, Plateau State, Nigeria. A preliminary assessment of sociodemographic factors associated with IPTp-SP adherence among participants was also conducted.

MATERIALS AND METHODS

Study Design and Setting

This cross-sectional study was conducted using records of pregnant women enrolled at the Antenatal Clinics of Bingham University Teaching Hospital, Jos, Plateau State, Nigeria over a three-year period, from January 2022 to December 2024. The hospital, located in Jos, the metropolitan capital of Plateau State, serves as a major referral center providing comprehensive antenatal, obstetric, and gynecological services to urban, peri-urban, and rural populations across the State. Jos hosts various large agricultural produce markets that are

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frequently visited by people, mostly women, from various agrarian peri-urban and rural communities within the State [17].

Study Population, Inclusion and Exclusion Criteria

The study population comprised pregnant women attending antenatal care (ANC) at the facility during the study period. Inclusion criteria were confirmed pregnancyand history of receiving at least one dose of Sulphadoxine-Pyrimethamine (SP) during the index pregnancy. Records of pregnant women who had not received at least one dose of SP were excluded.

Sample Size, Sampling Technique, and Data Collection Tools and Procedures

The study included 2,316 participants, using consecutive sampling technique. Data were collected through a review of participants' antenatal clinic records using a structured questionnaire. The questionnaire captured sociodemographic characteristics (age, education, marital status, residence, occupation, religion, parity, and monthly income), antenatal registration details, IPTp-SP initiation time, number of SP doses received, and SP intake intervals. Clinical data on febrile illness episodes during pregnancy and malaria parasitemia at delivery were obtained from medical records and laboratory reports on malaria parasite microscopy.

Operational Definitions

Adherence to IPTp-SP was premised on three criteria, based on WHO recommendations. These were initiation of SP in the second trimester, receipt of at least two doses of SP, and intake of SP at least one month apart [4, 5]. Febrile illness referred to self-reported or clinically documented episodes of fever during the current pregnancy. Malaria parasitemia was confirmed via microscopic examination of blood smears.

Data Analysis

Data were cleaned and entered into Microsoft Excel and analyzed using SPSS version 27 (Armonk, USA). Descriptive statistics were computed to summarize socio-demographic characteristics and IPTp-SP adherence patterns. Categorical variables were presented as frequencies and percentages. Chi-square test was used to examine associations between IPTp-SP adherence criteria and socio-demographic factors, as well as between IPTp-SP adherence and clinical outcomes (febrile illness and malaria parasitemia). Statistical significance was determined at $p<0.05$.

Ethical Considerations

Ethical approval was obtained from the Health Research and Ethics Committee, Bingham University Teaching Hospital, Jos, Nigeria with reference number NHREC/21/05/2005/01598. The requirement for informed consent from each participant was waived as data used for the study were obtained from clinical records as part of routine ANC. Data were completely anonymized.

RESULTS

Socio-demographic Characteristics

A total of 2,316 pregnant women participated in the study. Table 1 shows the socio-demographic characteristics of participants. Most were aged 21-30 years, had secondary education, were married and resided in urban and peri-urban areas. About half of the participants were engaged in private businesses, received a monthly income below ₦50,000, and were multigravida, while 60.0% registered for antenatal care in the second trimester. Figure 1 is a chart showing the proportional representation of various categories of participants.

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XII Issue VIII August 2025

Table 1: Socio-demographic characteristics of study participants

Variables	**Categories**	**Frequency**	**Percentage (%)**
Age Groups	16-20	232	10.0
	21-30	1158	50.0
	31-40	579	25.0
	41-50	347	15.0
	Total	2316	100.0
Educational Status	None	237	10.2
	Primary School	458	19.8
	Secondary School	1042	45.0
	Tertiary	579	25.0
	Total	2316	100.0
Marital Status	Single	232	10.0
	Married	1505	65.0
	Divorced	232	10.0
	Widowed	347	15.0
	Total	2316	100.0
Residence	Rural	463	20.0
	Urban and Periurban	1853	80.0
	Total	2316	100.0
Occupation	Unemployed	347	15.0
	Private Business	1158	50.0
	Civil Servant	162	7.0
	Medical Staff	162	7.0
	Other Hospital Staff	487	21.0
	Total	2316	100.0
Religion	Christianity	926	40.0
	Islam	1390	60.0

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XII Issue VIII August 2025

	Total	2316	100.0
Parity	Primigravida	579	25.0
	Secondigravida	695	30.0
	Multigravida	1042	45.0
	Total	2316	100.0
Time of Antenatal Registration	1st Trimester	232	10.0
	2nd Trimester	1389	60.0
	3rd Trimester	695	30.0
	Total	2316	100.0
Monthly Income	Below N50,000	1158	50.0
	50,000-100,000	811	35.0
	100,000-500,000	347	15.0
	Above 500,000	0	0.0
	Total	2316	100.0

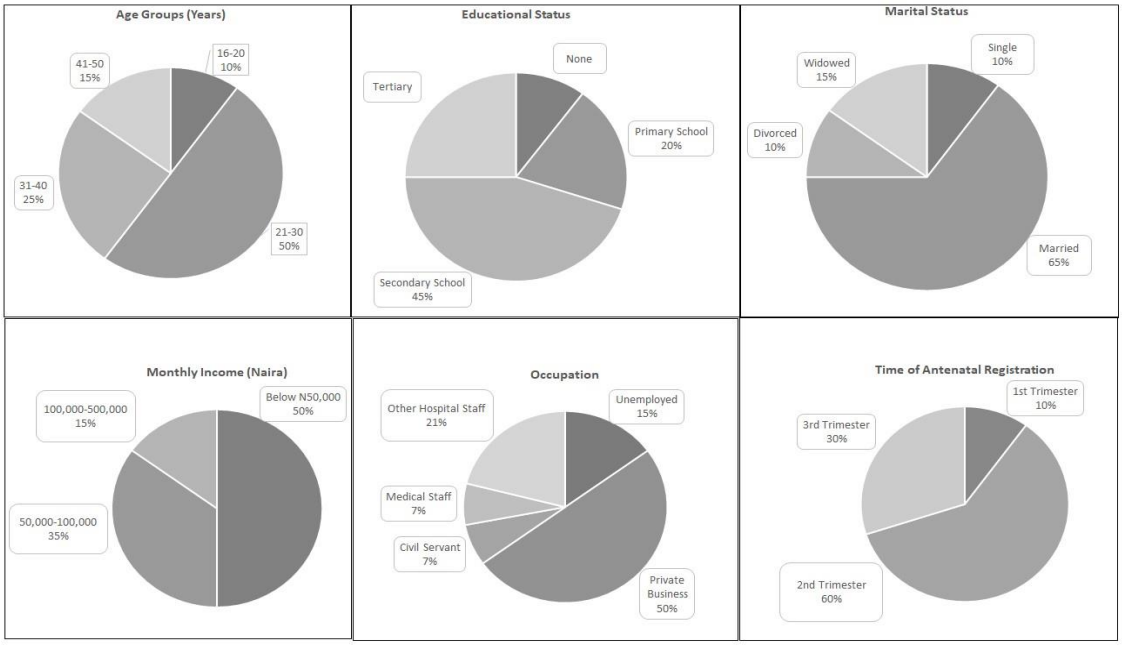

Fig. 1: Chart Showing the Proportional Representation of Various Categories of Participants

Adherence to IPTp-SP Guidelines on Time of Initiation

Table 2 reveals the pattern of participants' adherence to IPTp-SP guidelines based on time of initiation. Overall, 60.1% of the respondents commenced IPTp-SP in the second trimester, while 39.9% initiated it in the third trimester. A significant association was observed between IPTp-SP initiation time and occupation (χ^2=34.89, p<0.001), residence (χ^2=19.93, p<=0.001), parity (χ^2=7.86, p<0.02), and time of ANC registration (χ^2=9.18, p<0.01). Civil servants and medical staff had notably lower second-trimester initiation rates (46.9%

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XII Issue VIII August 2025

and 45.1%, respectively) compared to unemployed women (65.7%) and private business owners (60.6%). A higher proportion of urban and peri-urban residents were more likely to commence IPTp-SP in the second trimester (62.3%) than rural dwellers (51%), and multigravida women had a higher proportion of early IPTp-SP initiation (62.5%) compared to primigravida women (60.8%). Early ANC registration was also associated with timely IPTp-SP initiation, with 59.5% of first-trimester registrants commencing IPT in the second trimester.

Table 2: Assessment of adherence to IPT guidelines based on time of initiation

Variables	**Categories**	**Commencement of IPT (%)**		**Chi-square**	***p*-value**
		Second Trimester	**Third Trimester**		
Age Groups	16-20 (n = 232)	134 (58.8)	98 (42.2)	4.63	0.20
	21-30 (n = 1158)	698 (60.3)	460 (39.7)		
	31-40 (n = 579)	335 (57.9)	244 (42.1)		
	41-50 (n = 347)	224 (64.6)	123 (35.4)		
	Total (N = 2316)	1391 (60.1)	925 (39.9)		
Marital Status	Single (n = 232)	136 (58.6)	96 (41.4)	0.94	0.82
	Married (n = 1505)	900 (59.8)	605 (40.2)		
	Divorced (n = 232)	139 (59.9)	93 (40.1)		
	Widowed (n = 347)	216 (62.2)	131 (37.8)		
	Total (N = 2316)	1391 (60.1)	925 (39.9)		
Educational Status	None (n = 237)	138 (58.2)	99 (41.8)	3.38	0.34
	Primary (n = 458)	278 (60.7)	180 (39.3)		
	Secondary (n = 1042)	643 (61.7)	399 (38.3)		
	Tertiary (n = 579)	332 (57.3)	247 (42.7)		
	Total (N = 2316)	1391 (60.1)	925 (39.9)		
Occupation	Unemployed (n = 347)	228 (65.7)	119 (34.3)	34.89	0.001*
	Private Business (n = 1158)	702 (60.6)	456 (39.4)		
	Civil Servant (n = 162)	76 (46.9)	86 (53.1)		
	Medical Staff (n = 162)	73 (45.1)	89 (54.9)		
	Other Hospital Staff (n = 487)	312 (64.1)	175 (35.9)		
	Total (N = 2316)	1391 (60.1)	925 (39.9)		

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XII Issue VIII August 2025

Residence	Rural (n = 463)	236 (51.0)	227 (49.0)	19.93	0.001*
	Urban and Periurban (n = 1853)	1155 (62.3)	698 (37.7)		
	Total (N = 2316)	1391 (60.1)	925 (39.9)		
Religion	Christianity (n = 926)	548 (59.2)	378 (40.8)	0.50	0.49
	Islam (n = 1390)	843 (60.6)	547 (39.4)		
	Total (N = 2316)	1391 (60.1)	925 (39.9)		
Parity	Primigravida (n = 579)	352 (60.8)	227 (39.2)	7.86	0.02*
	Secondigravida (n = 695)	388 (55.8)	307 (44.2)		
	Multigravida (n = 1042)	651 (62.5)	391 (37.5)		
	Total (N = 2316)	1391 (60.1)	925 (39.9)		
Time of Antenatal Registration	1st Trimester (n = 232)	138 (59.5)	94 (40.5)	9.18	0.01*
	2nd Trimester (n = 1389)	867 (62.4)	522 (37.6)		
	3rd Trimester (n = 695)	386 (55.5)	309 (44.5)		
	Total (N = 2316)	1391 (60.1)	925 (39.9)		
Monthly Income (₦)	Below N50,000 (n = 1158)	698 (60.3)	460 (39.7)	4.63	0.10
	50,000-100,000 (n = 811)	469 (57.8)	342 (42.2)		
	100,000-500,000 (n = 347)	224 (64.6)	123 (35.4)		
	Total (N = 2316)	1391 (60.1)	925 (39.9)		

*Statistically significant association ($p<0.05$) IPT: Intermittent Preventive Treatment

Adherence to IPT Guidelines on Number of Sulphadoxine-Pyrimethamine Doses

About 60.0% of respondents received two doses of SP, while 40.0% received only one dose. Educational status ($\chi^2=9.38$, $p<0.03$), occupation ($\chi^2=14.38$, $p<0.01$), residence ($\chi^2=25.79$, $p<0.001$), and monthly income ($\chi^2=13.16$, $p<0.001$) were significantly associated with the number of SP doses received. Women with secondary education (63.1%) and those with no formal education (58.2%) had higher rates of completing two doses compared to those with tertiary education (55.4%). Unemployed women had the highest adherence to the two-dose recommendation (66.3%), while civil servants (54.9%) and medical staff (53.7%) had lower adherence rates. Urban residents (62.6%) were more likely to complete two doses than rural residents (49.7%). Higher adherence was also observed among women earning below ₦50,000 (61.6%) compared to those in the ₦50,000-₦100,000 income bracket (55.4%). These results are shown in Table 3.

Adherence to IPT Guidelines on SP Intake Intervals

Table 4, which reveals adherence patterns in relation to SP intake intervals, shows that 30.0%, 40.0%, and 30.0% of respondents received SP at one-month, two-month, and three-month intervals, respectively.

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XII Issue VIII August 2025

Significant associations were noted with occupation (χ^2=28.51, p<0.001), residence (χ^2=10.81, p<0.01), and religion (χ^2=9.42, p<0.01).

Table 3: Assessment of adherence to IPT guidelines based on number of doses of Sulphadoxine-Pyrimethamine received

Variables	**Categories**	**Number of S-P Doses (%)**		**Chi-square**	***p*-value**
		One	**Two**		
Age Groups	16-20 (n = 232)	99 (42.7)	133 (57.3)	7.84	0.05
	21-30 (n = 1158)	443 (38.3)	715 (61.7)		
	31-40 (n = 579)	256 (44.2)	323 (55.8)		
	41-50 (n = 347)	128 (36.9)	219 (63.1)		
	Total (N = 2316)	926 (40.0)	1390 (60.0)		
Marital Status	Single (n = 232)	105 (45.3)	127 (54.7)	3.42	0.33
	Married (n = 1505)	589 (39.1)	916 (60.9)		
	Divorced (n = 232)	96 (41.4)	136 (58.6)		
	Widowed (n = 347)	136 (39.2)	211 (60.8)		
	Total (N = 2316)	926 (40.0)	1390 (60.0)		
Educational Status	None (n = 237)	99 (41.8)	138 (58.2)	9.38	0.03*
	Primary (n = 458)	184 (40.2)	274 (59.8)		
	Secondary (n = 1042)	385 (36.9)	657 (63.1)		
	Tertiary (n = 579)	258 (44.6)	321 (55.4)		
	Total (N = 2316)	926 (40.0)	1390 (60.0)		
Occupation	Unemployed (n = 347)	117 (33.7)	230 (66.3)	14.38	0.01*
	Private Business (n = 1158)	484 (41.8)	674 (58.2)		
	Civil Servant (n = 162)	73 (45.1)	89 (54.9)		
	Medical Staff (n = 162)	75 (46.3)	87 (53.7)		
	Other Hospital Staff (n = 487)	177 (36.3)	310 (63.7)		
	Total (N = 2316)	926 (40.0)	1390 (60.0)		
			(0.0)		
Residence	Rural (n = 463)	233 (50.3)	230 (49.7)	25.79	0.001*

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XII Issue VIII August 2025

	Urban and Periurban (n = 1853)	693 (37.4)	1160 (62.6)		
	Total (N = 2316)	926 (40.0)	1390 (60.0)		
Religion	Christianity (n = 926)	388 (41.9)	538 (58.1)	2.37	0.12
	Islam (n = 1390)	538 (38.7)	852 (61.3)		
	Total (N = 2316)	926 (40.0)	1390 (60.0)		
Parity	Primigravida (n = 579)	242 (41.8)	337 (58.2)	3.40	0.18
	Secondigravida (n = 695)	289 (41.6)	406 (58.4)		
	Multigravida (n = 1042)	395 (37.9)	647 (62.1)		
	Total (N = 2316)	926 (40.0)	1390 (60.0)		
Time of Antenatal Registration	1st Trimester (n = 232)	97 (41.8)	135 (58.2)	1.77	0.41
	2nd Trimester (n = 1389)	540 (38.9)	849 (61.1)		
	3rd Trimester (n = 695)	289 (41.6)	406 (58.4)		
	Total (N = 2316)	926 (40.0)	1390 (60.0)		
Monthly Income (₦)	Below N50,000 (n = 1158)	445 (38.4)	713 (61.6)	13.16	0.001*
	50,000-100,000 (n = 811)	362 (44.6)	449 (55.4)		
	100,000-500,000 (n = 347)	119 (34.3)	228 (65.7)		
	Total (N = 2316)	926 (40.0)	1390 (60.0)		

*Statistically significant association (p<0.05) S-P: Sulphadoxine-Pyrimethamine

Table 4: Assessment of adherence to IPT guidelines based on Sulphadoxine-Pyrimethamine intake interval

Variables	**Categories**	**S-P Intake Interval**			**Chi-square**	***p*-value**
		1 Month	**2 Months**	**3 Months**		
Age Groups	16-20 (n = 232)	70 (30.2)	95 (40.9)	67 (28.9)	7.90	0.25
	21-30 (n = 1158)	349 (30.1)	462 (39.9)	347 (30.0)		
	31-40 (n = 579)	181 (31.3)	241 (41.6)	157 (27.1)		
	41-50 (n = 347)	95 (27.4)	128 (36.9)	124 (35.7)		
	Total (N = 2316)	695 (30.0)	926 (40.0)	695 (30.0)		
Marital Status	Single (n = 232)	78 (33.6)	76 (32.8)	78 (33.6)	9.87	0.13
	Married (n = 1505)	460 (30.6)	609 (40.5)	436 (29.0)		

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XII Issue VIII August 2025

	Divorced (n = 232)	70 (30.2)	93 (40.1)	69 (29.7)		
	Widowed (n = 347)	87 (25.1)	148 (42.7)	112 (32.3)		
	Total (N = 2316)	695 (30.0)	926 (40.0)	695 (30.0)		
Educational Status	None (n = 237)	71 (30.0)	95 (40.1)	71 (30.0)	6.64	0.36
	Primary (n = 458)	123 (26.9)	180 (39.3)	155 (33.8)		
	Secondary (n = 1042)	319 (30.6)	410 (39.3)	313 (30.0)		
	Tertiary (n = 579)	182 (31.4)	241 (41.6)	156 (26.9)		
	Total (N = 2316)	695 (30.0)	926 (40.0)	695 (30.0)		
Occupation	Unemployed (n = 347)	54 (33.3)	73 (45.1)	35 (21.6)	28.51	0.001*
	Private Business (n = 1158)	52 (32.1)	77 (47.5)	33 (20.4)		
	Civil Servant (n = 162)	160 (32.9)	173 (35.5)	154 (31.6)		
	Medical Staff (n = 162)	351 (30.3)	460 (39.7)	347 (30.0)		
	Other Hospital Staff (n = 487)	78 (22.5)	143 (41.2)	126 (36.3)		
	Total (N = 2316)	695 (30.0)	926 (40.0)	695 (30.0)		
Residence	Rural (n = 463)	153 (33.0)	200 (43.2)	110 (23.8)	10.81	0.01*
	Urban and Periurban (n = 1853)	542 (29.2)	726 (39.2)	585 (31.6)		
	Total (N = 2316)	695 (30.0)	926 (40.0)	695 (30.0)		
Religion	Christianity (n = 926)	311 (33.6)	350 (37.8)	265 (28.6)	9.42	0.01*
	Islam (n = 1390)	384 (27.6)	576 (41.4)	430 (30.9)		
	Total (N = 2316)	695 (30.0)	926 (40.0)	695 (30.0)		
Parity	Primigravida (n = 579)	172 (29.7)	232 (40.1)	175 (30.2)	3.89	0.42
	Secondigravida (n = 695)	214 (30.8)	291 (41.9)	190 (27.3)		
	Multigravida (n = 1042)	309 (29.7)	403 (38.7)	330 (31.7)		
	Total (N = 2316)	695 (30.0)	926 (40.0)	695 (30.0)		
Time of Antenatal Registration	1st Trimester (n = 232)	71 (30.6)	90 (38.8)	71 (30.6)	3.92	0.42
	2nd Trimester (n = 1389)	409 (29.4)	545 (39.2)	435 (31.3)		
	3rd Trimester (n = 695)	215 (30.9)	291 (41.9)	189 (27.2)		

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XII Issue VIII August 2025

	Total (N = 2316)	695 (30.0)	926 (40.0)	695 (30.0)		
Monthly Income (₦)	Below N50,000 (n = 1158)	348 (30.1)	463 (40.0)	347 (30.0)	6.72	0.15
	50,000-100,000 (n = 811)	232 (28.6)	344 (42.4)	235 (29.0)		
	100,000-500,000 (n = 347)	115 (33.1)	119 (34.3)	113 (32.6)		
	Total (N = 2316)	695 (30.0)	926 (40.0)	695 (30.0)		

*Statistically significant association (p<0.05) S-P: Sulphadoxine-Pyrimethamine

Impact of IPT Adherence on Febrile Illness Occurrence and Malaria Parasitemia

As shown in Table 5, among women who commenced IPTp-SP in the second trimester, 96.5% reported an absence of febrile illness, compared to 95.1% among third-trimester starters, although this difference was not statistically significant. However, malaria parasite microscopy showed a significant association, with 73.9% of second-trimester initiators testing negative for malaria parasites compared to 30.4% of third-trimester initiators (χ^2=22.2, p<0.0001). While completion of two SP doses was associated with higher febrile illness-free rates (96.6% compared to 95.0% among one-dose recipients), and higher malaria microscopy negativity rates (55.6% compared to 48.9% among one-dose recipients), the observed differences were not statistically significant. SP intake intervals also did not significantly affect febrile illness occurrence or malaria microscopy outcomes.

Table 5: Impact of adherence to intermittent preventive treatment and usage of insecticide-treated net among study participants

Adherence Measures	**Categories**	**Absence of Febrile Illness (N = 2,316)**			**Negative MP Microscopy (n = 92)**$^+$		
		Percentage (%)	**Chi-square**	***p*-value**	**Percentage (%)**	**Chi-square**	***p*-value**
Commencement of IPT	2nd Trimester	96.5	2.88	0.09	73.9	22.2	0.0001*
	3rd Trimester	95.1			30.4		
	Total	96.0			52.2		
Number of S-P Doses	One	95.0	3.63	0.06	48.9	5.34	0.07
	Two	96.6			55.6		
	Total	96.0			52.2		
S-P Intake Interval	1 Month	95.7	1.29	0.53	53.3	4.78	0.31
	2 Months	95.7			40.5		
	3 Months	96.7			68.0		
	Total	96.0			52.2		

+Percentage were estimated for few participants with MP microcopy results MP: Malaria Parasite

*Statistically significant association (p<0.05)

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DISCUSSION

This study assessed adherence to intermittent preventive treatment in pregnancy (IPTp) using Sulphadoxine-Pyrimethamine (SP) among pregnant women and its association with key socio-demographic characteristics and malaria-related outcomes in a tertiary healthcare facility in Jos, Northcentral Nigeria. The findings provide important insights into the patterns of IPTp uptake and highlight significant disparities related to occupation, parity, residence, and timing of antenatal care registration.

Overall adherence to IPTp, based on initiation in the second trimester and uptake of at least two doses, was approximately 60.0%. This figure, which is relatively higher than some previous reports from sub-Saharan Africa [18, 19], still falls below the World Health Organization's recommendation that all eligible pregnant women should receive at least three doses of SP at monthly intervals starting from the second trimester [4, 5]. The suboptimal adherence observed underscores ongoing challenges in achieving IPTp coverage targets in sub-Saharan Africa, even within tertiary health facilities.

Adherence was significantly associated with several sociodemographic factors, including occupation, residence, parity, and timing of ANC registration. Occupation was a significant determinant of adherence ($p<0.001$), with higher proportions of unemployed women, those categorized under "other hospital staff", and those in private business initiating IPTp in the second trimester and completing two doses, in contrast to civil servants and medical staff, who demonstrated lower adherence. This unexpected trend may reflect occupational barriers, such as inflexible working hours or perceived lower vulnerability due to medical knowledge or advanced literacy levels. This is similar to previous studies which reported higher IPTp-SP uptake positively correlayed with engagement in gfarming or business [20], suggesting that structural and occupational constraints may hinder optimal ANC attendance and IPTp uptake [21, 22]. It is however different from findings in a previous report from Cameroon where illiterate participants were had a significantly lower IPTp-SP uptake compared to literate women [23].

Residence was also found to significantly influence adherence during this study. Women from urban and peri-urban areas demonstrated higher adherence rates, with respect to initiation of IPTp in the second trimester and completion of two doses, compared to their rural counterparts. This finding aligns with previous studies that associate urban residence with better access to healthcare, more frequent ANC visits, and higher IPIp-SP uptake [24-26]. This suggests that the persistent urban-rural divide in healthcare access remains a key concern in malaria prevention efforts.

Parity and timing of ANC registration were also significantly associated with adherence. Similar to some previous reports, multigravida women showed significantly higher compliance with IPTp recommendations than primigravida counterparts [27]. This may be attributed to increased awareness and experience gained from previous pregnancies. In the present study, women who registered in the second trimester were more likely to initiate IPTp early and receive the recommended two doses, compared to late registrants. This supports existing literature emphasizing early ANC initiation as a determinant of IPTp adherence [28-30].

Furthermore, the study evaluated the clinical impact of IPTp adherence. Commencement of SP in the second trimester and receiving two doses were associated with a higher absence of febrile illness and increased likelihood of negative malaria microscopy at delivery, although only the timing of IPTp commencement showed a statistically significant association with malaria test results. This reinforces evidence that IPTp-SP effectively reduces malaria parasitemia and febrile episodes during pregnancy, thereby contributing to improved maternal and fetal outcomes [4, 5]. Interestingly, SP intake intervals [one, two, or three months] did not significantly affect outcomes, suggesting that timing of initiation and total dose count may be more critical than spacing alone. However, this may also be attributed to limitations associated with self-reporting and non-specific nature of febrile illness, and the small sample size of participants tested for malaria parasite burden.

CONCLUSION AND RECOMMENDATIONS

Adherence to IPTp-SP among pregnant women attending the tertiary healthcare facility was moderate, with only about 60.0% initiating treatment in the second trimester and receiving at least two doses. Key

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determinants of adherence included occupation, residence, parity, and timing of antenatal care registration. Improved adherence was associated with better clinical outcomes, notably reduced febrile episodes and lower malaria parasitemia. These findings highlight the need for targeted interventions addressing socio-demographic barriers to optimize IPTp uptake and improve maternal health outcomes in malaria-endemic settings. Early antenatal care registration should be prioritized through targeted health education campaigns. Workplace-friendly ANC services can help boost uptake among employed women, especially civil servants and healthcare staff. Rural access must also be enhanced via mobile clinics and stronger primary care systems. Further research, particularly using more robust statistical analysis, is needed to explore the benefits of additional SP doses and optimal dosing intervals.

Limitations of the Study

Limitations of the study includes its cross-sectional design, which precludes causal inferences between adherence and outcomes, and non-consideration of the seasonality of malaria in Nigeria and its impact on IPTp-SP adherence. The study was also conducted at a single tertiary healthcare facility, which may limit the generalizability of the findings to other settings, particularly primary healthcare centers. In addition, the data used for the study relied on hospital records and participant self-reporting, which may introduce recall or reporting bias, and malaria microscopy results were available for only a small subset of participants, limiting the strength of statistical associations with parasitemia.

Conflicts of Interest: None

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