

Assessment of Coverage and Predictors of Intermittent Preventive Treatment of Malaria in Pregnancy Uptake Among Antenatal Attendees, January 2022-December 2023 in Ohaukwu, Ebonyi State, Nigeria

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ASSESSMENT OF COVERAGE AND PREDICTORS OF INTERMITTENT PREVENTIVE TREATMENT OF MALARIA IN PREGNANCY UPTAKE AMONG ANTENATAL ATTENDEES, JANUARY 2022-DECEMBER 2023 IN OHAUKWU, EBONYI STATE, NIGERIA

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ABSTRACT

Background: Intermittent Preventive treatment of Malaria in Pregnancy using Sulfadoxine Pyrimethamine (IPTp-SP) is a strategy to reduce maternal and neonatal mortality. This study assessed the coverage and predictors of uptake of IPTp-SP among antenatal care attendees in Ohaukwu between 2022 -2023.

Materials and Methods: This was a cross-sectional study. The information were extracted from maternal record booklets in the selected health facilities. Kobo collect data tool was used and analysis was done using SPSS version 26.

RESULTS: The 295 participants studied fell mostly within the age of 21-30 years. Most of them are business women and married. Only 92(31.3%) received IPTp1, 79(26.8%) IPTp2, 63(21.2%) received IPTp3 and 47(15.9%) received none. Predictors of increase IPTp uptakes includes- more ANC attendants, Primigravidae and early commencement of ANC.

Conclusion: The coverage of IPTp-SP in ohuakwu is generally low.

Key Words: Intermittent Preventive treatment of Malaria in Pregnancy, SP, Ohaukwu, Ebonyi State, Nigeria.

Introduction

Maternal mortality is still a disaster affecting women of reproductive age across African Sub-region despite the global decline to 34.2%% between 2000 and 2020 .[1] More than 2/3 (69%) of maternal deaths occur in African region and this serves as a wake-up call for key stakeholders in health to focus efforts on ways to reduce maternal mortality rate to SDG target of 70 maternal deaths per 100,000 live birth by 2030.[1] Nigeria has maternal mortality rate of 1047 deaths per 100,000 live births , the third worst in African region.[1,2]

In African region, about 30 million women in malaria endemic areas become pregnant and are exposed to malaria infection each year leading to increased maternal and infant mortality and morbidity.[3] Documented evidence reveals that up to 10,000 maternal deaths are as a result of malaria in pregnancy annually.[4]

The World Health Organization (WHO), recommends a three pronged approach to address the challenge of Malaria in Pregnancy in endemic regions.[5,6,7] There are effective case management of malaria infection, Intermittent Preventive treatment using sulphadoxine-pyrimethetamine (IPTp-SP) and the use of insecticide treated nets (ITN).[8,9] IPTp has been recommended since 2012 by World Health Organization at each scheduled antenatal care visit starting in the second trimester of gestation, with the aim of ensuring the uptake of at least three doses (IPTp3+) before birth.[10,11] The average IPTp3+ coverage in Nigeria in

2010 was 2%, this increased to 22% in 2017 and 31% in 2018.[12] However, this is still far below the universal coverage targeted by the WHO.[12]

Several factors have been documented as barriers to IPTp coverage at the level of health system such as stock out of SP, User fee, poor supervision of its uptake by health workers, poor knowledge, high work load of antenatal staff, lack of cup and or drinking water at the health facilities etc.[13]

In a cross-sectional study carried out in four African countries -Democratic Republic of Congo, Madagascar, Mozambique and Nigeria to determine the coverage of IPTp and antenatal care attendance, in March 2018 using 3911 a sample of 3911 women, the coverage of IPTp1 and IPTp+ was 22% and 24% respectively in DRC, 23% and 12% in Madagascar, 11% and 16% in Nigeria.[14]

In another Cross-sectional study to assess the Knowledge and Utilization of intermittent preventive treatment for malaria among pregnant women attending antenatal clinics in primary health care centres in rural southwest, Nigeria in 2007, revealed that out of 209 respondents who reported to heard of IPTp, on about 24% of them were able to define it. Only 27% reported to have received at least one dose of SP during the index pregnancy. [15] These results show that the coverage of IPTp in Nigeria is generally low.

In another study carried out to examine the influence of demand side factors on IPTp coverage. Data was collected from 1307 women who were delivered of a live baby within the one year period preceding the study and through an exit poll from 146 women attending ANC. The findings show that 96.1% of respondents attended ANC up to five visits with only 13.7% and 7.3% receiving IPTp first and

second doses respectively. This shows that the reason for low IPTp coverage could be coming from the health facilities.[16]

In Ohaukwu local government area of Ebonyi State, a 5 year programme called “TIPTOP” (Transforming Intermittent Treatment of Malaria in Pregnancy for Optimal Performance) to improve IPTp-SP Coverage was carried out by Jhpiego and Unitaids from 2017-2020.[17] The intervention included –health facility strengthening, training of health workers and pregnant women, ensuring the availability of SP, increase attendance to ANC and community distribution of SP through trained Community Health Extension Workers volunteers. The programme saw the increase in the uptake from 2017-2020 as follows: IPTp 1 from 54% to 57%, IPTp 2 from 36% to 42% and IPTp3 from 5% to 25%.[17]

Justification for this study

Nigeria has one of the highest maternal mortality rate in Africa and globally (1047 per 100,000 live birth). All efforts toward the reduction of maternal mortality in Nigeria should be encouraged in order to achieve the Sustainable Development Goal target by 2030.

One of the major causes of maternal deaths is Malaria infection during pregnancy. The World Health Organization has recommended the Intermittent Preventive Treatment of Malaria in pregnancy (IPTp) with sulfadoxine-pyrimethamine. This approach has been proven to be highly cost-effective. Unfortunately, the coverage rate in Ebonyi State has been very low leading to persistent high maternal mortality rate. Ohaukwu local government area has been shown to have

one of the lowest coverage of IPTP in Ebonyi State. This low coverage led to a 5 year intervention programme (2017-2020) in Ohaukwu L G A by Jhpiego and Unitaids called “Transforming Intermittent Preventive Treatment of Malaria in Pregnancy for Optimal Pregnancy” (TIPTOP)

Study Objective

Broad Objective:

To assess the coverage and predictors of intermittent preventive treatment of malaria in pregnancy in Ohaukwu local government area from January 2022 to December, 2023

Specific Objectives:

1. To assess the coverage of IPTp1 in Ohaukwu LGA from January 2022 to December 2023
2. To assess the coverage of IPTp2 in Ohaukwu L G A from January 2022 to December 2023
3. To assess the coverage of IPTp3+ in Ohaukwu L G A from January 2022 to December 2023
4. To assess the sustainability of the gains recorded by Jhpiego intervention (2017-2020) on IPTp uptake in the area
5. To determine the predictors of IPTp uptake in Ohaukwu L G A

MATERIALS AND METHODS.

Ebonyi state is one of the 5 states in Southeast Nigeria. It lies within latitudes $5/40^{\circ}$ and $6/45^{\circ}$ N and longitudes $7/30^{\circ}$ and $8/20^{\circ}$ E. The 2018 projected population is 3,027,452 with a land mass of about 5,535 square kilometer. It shares borders with Benue in the North, Enugu state to the west, Abia state to the South and Cross River state to the East. The state is made up of thirteen local government areas including Ohaukwu Local Government . [18]

The state is divided into three senatorial zones as follows:

1. Ebonyi North: Comprising of Abakaliki, Ohaukwu, Ebonyi and Izzi LGAs
2. Ebonyi Central: Comprising of Ikwo, Ezza South, Ezza North and Ishielu LGAs
3. Ebonyi South: Comprising of Afikpo North, Afikpo South, Ivo, Ohaozara and Onicha LGAs

The people of Ebonyi state are predominantly farmers and traders. The main crops produced in the state are rice, yam, cassava, palm produce, maize, groundnut, plantain, banana, melon, beans, fruits and vegetables.

The state is blessed with abundant mineral resources such as salt hence the name *salt of the nation*. Other minerals found in the state includes: lead, limestone, zinc, marble.

In the industrial sector, the state has rice industries clustered in different areas of the state which produce the popular Abakaliki rice. There are many quarry industries, plastic pipe

producing industry, fertilizer blending plants, poultry industries, cement industry, salt producing industry.

Educationally, there are two Federal Universities, one Federal polytechnic, one Federal College of Agriculture, one state University, one College of Education, four schools of health Technology and two schools of nursing in the state.

In the health sector, Ebonyi state has two Federal Teaching Hospitals, thirteen general hospitals, six mission hospitals and about 548 public and private health centres.[19]

Site:

Ohaukwu local government of Ebonyi State is located in the North senatorial zone of the State. It has boundaries with Benue state in the north, Ebonyi local government area to the south, Ishielu local government area to the West and Izzi local government area to the east. It is made up of three towns-Ngbo, Ezzangbo and Effium.

There are 35 health facilities in the local government including 1 general hospital. The population of the local government area as of 2016 profile is 258,782 with a yearly population projection of 2.8%.[19]

Study Design

This is a cross-sectional study involving the review of maternal Antenatal booklets to assess the IPTp coverage among pregnant women that attended health facilities in the area from January 2022 to December, 2023.

The Study Population

The study population will include pregnant women in Ebonyi State.

Inclusion criteria

All pregnant women who attended antenatal clinic in selected health centres in Ngbo and Ezzangbo clusters of Ohaukwu Local government area between January 2022 to December 2023 whose maternal booklets are accessible and are eligible for IPTp intake.

Exclusion criteria

Pregnant women who attended antenatal clinics in selected health centres in Ngbo and Ezzangbo clusters of Ohaukwu local government area between January 2022 to December 2023 whose maternal booklets were not accessible during this study.

Sample Size Determination

The formula for sample size calculation for comparison between two groups [20] was used as shown below:

$$N = \frac{2 (Z_{\alpha} + Z_{1-\beta})^2 p(1-P)}{(P_1 - P_2)^2}$$

Where N= Minimum Sample size

Z_{α} = Two sided percentage point of the standard normal distribution at required significance level ($\alpha = 0.05$) = 1.96

$Z_{1-\beta}$ = one sided percentage point of the standard normal distribution at 80% power = 0.84

P_1 = Percentage of IPTp3+ coverage in the Southeast from previous study¹⁶ which is 16%

P_2 = Expected IPTp3+ coverage post-intervention = 36% (20% increase)

$$P = \text{pooled prevalence} = \frac{P_1 + P_2}{2}$$

$P_1 - P_2$ = Difference in proportion of events in two groups (pre and post intervention).

Substituting

$$N = \frac{2[(1.96 + 0.84)^2 0.26(0.74)]}{(0.1)^2} = 255$$

Allowing for a 10% attrition rate or 90% response rate, the sample size was rounded off to 295

Sampling Technique

Ohaukwu local government area is made up of three towns (Ngbo, Ezzangb and Effium)

Multi-stage sampling technique was used to select samples as follows:

1. Stage 1: selection of two clusters out of the three clusters using simple random sampling. (Ngbo and Ezaangbo clusters were randomly selected).
2. Stage 2: Selection of ten health facilities each in the two clusters using simple random sampling.
3. State 3: Selection of a total of 296 maternal booklets in the selected health facilities using simple random sampling.

Informed Consent

Informed Consent to extract the data was obtained from the health facility heads prior to the commencement of the study. The aim, purpose and benefits of the study were explained to the health facility heads. They were also made to understand that data obtained from the maternal booklets will be well stored and will only be used for the purpose of the study. The confidentiality of the data was also ensured by not including patients' names and addresses extracted were only the names of the vilages not postal address.

Informed consent to participate was freely obtained from all the study participants prior to the commencement of the study.

Informed Consent to Participate Declaration form

I hereby state that the purpose, procedure and possible risks of this study have been explained to my clear understanding by the researchers. And that I have also been assured of the confidentiality of the data, and that my participation is voluntary and that i can opt out of the study any time i feel uncomfortable with it.

I hereby voluntarily give my consent to participate in this study

Signed/ Finger print

Study Instrument

Structured, Pre-tested electronic based checklist was used to extract data on maternal booklets to (1) Determine the level of IPTp1 coverage (2) Determine the level of IPTp2 coverage (3) Determine the level of IPTp3+ coverage (4) To determine the sustainability of the gains recorded by Jhpiego intervention on IPTp uptake in the area previously (5) To determine the predictors of IPTp uptake in the area.

Data Collection

The structured, pre-tested electronic checklist was used to extraction data from maternal antenatal booklets.

Information that were extracted from maternal booklets included (1) socio-demographic (2) IPTp1, IPTp2 and IPTp3+ coverage and predictors of IPTp uptake.

Study Procedure

Five data collectors with previous knowledge of data collection using electronic device, who hail from the study area and are conversant with the area were recruited. A two-day training of data collectors by the principal investigator and co-investigators prior to field work was carried. The training contents included (1) How to use smart phone to collect data (2) The importance of accurate data collection (3) The importance of adequate preparation before going to field (4) The exact Data to be extracted (5) Pretesting in a nearby health centres. The field work lasted for four days.

Data analysis

The data will be analyzed using SPSS version 26. Descriptive data will be cross tabulated and presented in frequency tables. The Chi-square, Fisher's exact, Z-test, McNemar for paired knowledge test and chi-square test statistics for differences in coverage will be used to test for associations or differences between the variables at significance level set at $P < 0.05$

RESULTS

A total of 295 booklets of ANC attendees in Ohaukwu LGA, Jan 2022-Dec-2023 were extracted, the results are presented in line with the objectives of the study as shown below

As shown in table 1 below, The number of participants who attended ANC in 2022 was 159 (53.9%) while the number that attended in 2023 was 136 (46.1%), slightly lower than that of 2022.

Table 1: No of ANC attendees per year

Year	Frequency (n = 295)	Percent
2022	159	53.9
2023	136	46.1

As shown in table 2 below, most participants were between 21–25 years (31.9%), followed by those aged 26–30 years (28.8%) and over 30 years (26.8%). Those <18 years (3.4%) were all above 16 years. The mean age was 27.08 ± 5.64 years.

The majority resided in Ngbo (66.1%), while the remaining 33.9% were from Ezzangbo. Christianity was the predominant religion (81.4%), with a small proportion identifying as Islam (0.3%) or other faiths (18.3%). Most respondents were married (87.1%), and a small proportion were unmarried (6.1%) or reported other marital arrangements (6.8%).

In terms of education, secondary education was most common (68.5%), followed by primary (16.6%) and tertiary education (9.8%), while only 1.0% had no formal education. Participants' occupations varied, with the largest group engaged in business (41.7%) followed by farming (18.3%) and other informal work (22.0%).

Among married participants, the husband's educational level was predominantly tertiary (59.0%), with 26.4% having no formal education and very few with primary (0.3%) or secondary education (1.4%).

Table 2: Sociodemographic characteristics of participants

Variable	Frequency (n = 295)	Percent
Age		
< 18 years	10	3.4
18-20 years	27	9.2
21-25 years	94	31.9
26-30 years	85	28.8
> 30 years	79	26.8
Mean $\pm$ sd Age (years)	27.08 $\pm$ 5.64	
Community Cluster		
Ezzangbo	100	33.9
Ngbo	195	66.1
Religion		
Christianity	240	81.4
Islam	1	0.3
Others	54	18.3
Marital Status		
Married	257	87.1
Not married	18	6.1
Others	20	6.8
Educational level		
No Formal Education	3	1.0
Primary	49	16.6
Secondary	202	68.5
Tertiary	29	9.8
Others	12	4.1
Occupational Category		
Student	13	4.4
Artisan	22	7.5
Business	123	41.7
Civil servant	18	6.1
Farming	54	18.3
Others	65	22.0
Educational status of husband (for married participants)	(n = 257)	
No formal Education	78	26.4
Primary	1	0.3
Secondary	4	1.4
Tertiary	174	59.0

As shown in table 3 below, among the 295 participants, 234 (79.3%) received IPTp-SP, while 47 (15.9%) did not receive any IPTp-SP dose. Records were missing for 14 (4.7%) participants.

Assessment of the number of IPTp doses received showed that 15.9% (47) had no IPTp dose, 31.2% (92) received one dose, and 26.8% (79) received two doses. Additionally, 21.2% (63) received three doses and above, in line with WHO recommendations for optimal uptake. Dose information was not recorded for 14 (4.7%) of the participants. Overall, the mean number of IPTp doses received was 1.68 ± 1.24 , with a median of 2 doses (range: 0–5).

Table 3: Uptake of Intermittent Preventive Treatment of Malaria in pregnancy (IPTp) among participants

Variable	2022 (n=159) Freq. (%)	2023 (n=136) Freq. (%)	Total (n=295) Freq. (%)
Receipt of IPTp-SP			
Yes	128 (80.5)	106 (77.9)	234 (79.3)
No	26 (16.4)	21 (15.4)	47 (15.9)
No recorded	5 (3.1)	9 (6.6)	14 (4.7)
Number of IPTp Doses received			
None	26 (16.4)	21 (15.4)	47 (15.9)
1 dose	50 (31.4)	42 (30.9)	92 (31.2)
2 doses	42 (26.4)	37 (27.2)	79 (26.8)
≥3 doses	36 (22.6)	27 (19.9)	63 (21.2)
Not recorded	5 (3.1)	9 (6.6)	14 (4.7)
Mean ± SD dose(s)		1.68 ± 1.235	
Median (Min – Max) dose(s)		2 (0 – 5)	

As shown in table 4 below, a total of 31 (10.5%) did not attend ANC at all, while more than half, 159 (53.9%), attended 1–3 visits. Additionally, 26.4% (78) had 4–7 visits, and only 6.8% (20) met the WHO recommendation of eight or more ANC contacts. ANC visit information was not recorded for 7 (2.4%) participants. The mean number of ANC visits was 22.29 ± 13.15 , with a median of 3 visits (range: 0–44).

Regarding the facilities attended for ANC, the most commonly utilized centers were Umuebe PHC, attended by 40 (13.6%) participants, and Ngbo Maternity, used by 30 (10.2%). Other frequently attended facilities included Ndiagu Ubochi Health Centre with 25 (8.5%), Amike Health Center 20 (6.8%), Ezzangbo Maternity 20 (6.8%), Ijinike PHC 20 (6.8%), Ameku Health Centre 19 (6.4%), and Umugbor MDG 19 (6.4%). Additional facilities with notable attendance were Chima Maternity 18 (6.1%), Obodo Eje MDGS 17 (5.8%), and Okposhi III Akpaka 16 (5.4%). Smaller proportions attended Ishingbo II Ndiagu Iyiogwe Ukwagba 15 (5.1%), Ekwashi MDGs Ishingbo I 10 (3.4%), Akpaka MDGS 10 (3.4%), Ishingbo I MDGs Ekwashi 8 (2.7%), and Little Seed Hospital 8 (2.7%).

Table 4: Antenatal Care Characteristics of participants

Variable	Frequency (n = 295)	Percent
Number of ANC Visits		
None	31	10.5
1–3	159	53.9
4–7	78	26.4
≥8	20	6.8
Not recorded	7	2.4
Mean ± SD visits	2.97 ± 2.58	
Median (Min – Max) visits	2 (0 – 11)	
Facility Attended for ANC		
Akpaka MDGS	10	3.4
Ameku Health Centre	19	6.4
Amike Health Center	20	6.8
Chima Maternity	18	6.1
Ekwashi MDGs Ishingbo I	10	3.4
Ezzangbo Maternity	20	6.8
Ijinike PHC	20	6.8
Ishingbo I MDGs Ekwashi	8	2.7
Ishingbo II Ndiagu Iyiogwe Ukwagba	15	5.1
Little Seed Hospital	8	2.7
Ndiagu Ubochi Health Centre	25	8.5
Ngbo Maternity	30	10.2
Obodo Eje MDGS	17	5.8
Okposhi III Akpaka	16	5.4
Umuebe PHC	40	13.6
Umugbor MDG	19	6.4

As shown in table 5 below, among the 295 participants, gravidity distribution showed 12.5% (37) were primigravidae. The majority, 70.9% (209), were multigravidae ($\geq G2$), and 3.7% (11) had gravidity not recorded. The mean gravidity was 3.38 ± 2.57 .

Regarding pregnancy outcomes, only a few events were documented because outcome information was missing for most respondents (73.9%, $n = 218$). Among the recorded outcomes, 3.1% (9) experienced early neonatal death or perinatal loss, and 21.4% (63) had live births with both mother and baby alive. Other outcomes occurred at low frequencies, including maternal death (0.3%, 1), live birth with baby outcome not recorded (0.3%, 1), mother and baby sick/admitted (0.3%, 1), mother and baby sick/referred (0.3%, 1), and referred with outcome undetermined (0.3%, 1).

Assessment of gestational age at first IPTp administration showed that 24.7% (73) received IPTp at (<16 weeks), while 10.8% (32) initiated IPTp at (16–20 weeks). Nearly one-quarter, 23.1% (68), commenced IPTp at 21–28 weeks, whereas 31.5% (93) started after 28 weeks, indicating late initiation. The mean gestational age at first IPTp was 22.29 ± 13.15 weeks, with a median of 3 weeks (range: 0–44 weeks). Finally, 30.2% (89) reported not receiving IPTp due to contra-indications, while 69.8% (206) had no such contraindication.

Table 5: Obstetric Characteristics of participants

Variable	Frequency (n = 295)	Percent
Gravida		
Primigravida (G1)	75	25.4
Low Multigravida (G2–G4)	117	39.7
Grand Multigravida (G5–G9)	86	29.2
Great-Grand Multigravida ($\geq$ G10)	17	5.8
Mean $\pm$ SD gravida	3.38 $\pm$ 2.57	
Outcome of Pregnancy		
Early Neonatal Death / Perinatal Loss	9	3.1
Live Birth – Baby Outcome Not Recorded	1	0.3
Live Birth – Mother & Baby Alive	63	21.4
Maternal Death	1	0.3
Mother & Baby Sick / Admitted	1	0.3
Mother & Baby Sick / Referred	1	0.3
Referred (Outcome Not Determined)	1	0.3
Missing / Not Recorded	218	73.9
Gestational Age at First IPTp (weeks)		
<16 weeks	73	24.7
16–20 weeks	32	10.8
21–28 weeks	68	23.1
>28 weeks	93	31.5
Mean $\pm$ SD Gestational age	22.29 $\pm$ 13.15	
Median (Min – Max) Gestational age	3 (0 – 44)	
No IPTp dose due to contra-indication		
Yes	89	30.2
No	206	69.8

As shown in table 6 below, regarding marital status, IPTp uptake was highest among married participants, with 207 (80.5%) receiving IPTp, 40 (15.6%) not receiving IPTp, and 10 (3.9%) not recorded. Among those not married, 12 (66.7%) received IPTp, while 3 (16.7%) did not and 3 (16.7%) had no record. For participants classified as others, 15 (75.0%) received IPTp and 4 (20.0%) did not. No statistically significant association was observed between marital status and IPTp receipt (Fisher's Exact = 5.842; $p = 0.162$).

Analysis by educational level showed that 2 (66.7%) participants with no formal education received IPTp, while none did not receive IPTp and 1 (33.3%) had no record. Among those with primary education, 40 (81.6%) received IPTp, compared with 6 (12.2%) who did not. Participants with secondary education had an IPTp uptake of 163 (80.7%), while 30 (14.9%) did not receive IPTp. Among those with tertiary education, 22 (75.9%) received IPTp and 6 (20.7%) did not. Participants in the "other" education category had the lowest uptake, with 7 (58.3%) receiving IPTp and 5 (41.7%) not receiving it. However, educational level was not significantly associated with IPTp uptake (Fisher's Exact = 10.324; $p = 0.181$).

By occupational category, IPTp uptake was highest among students (11; 84.6%) and business owners (99; 80.5%). Among artisans, 17 (77.3%) received IPTp, while 5 (22.7%) did not. Civil servants had a comparatively lower uptake, with 12 (66.7%) receiving IPTp and 6 (33.3%) not receiving it. Among farmers, 43 (79.6%) received IPTp, and in the "others" occupational category, 52 (80.0%) received IPTp. No statistically significant association was found between occupational category and IPTp receipt (Fisher's Exact = 10.324; $p = 0.181$).

Table 6: Socio-demographics and receipt of IPTp among participants

Variables	Receipt of IPTp			Test Statistics	p-value
	Yes (n=234) Freq. (%)	No (n=47) Freq. (%)	Not Recorded (n=14) Freq. (%)		
Age					
< 18 Years	9 (90.0)	0 (0.0)	1 (10.0)	$\chi^2 = 7.845$	0.443
18-20 years	25 (92.6)	1 (3.7)	1 (3.7)		
21-25 years	74 (78.7)	15 (16)	5 (5.3)		
26-30 years	65 (76.5)	15 (17.6)	5 (5.9)		
> 30 Years	61 (77.2)	16 (20.3)	2 (2.5)		
Community Cluster					
Ezzangbo	66 (66)	34 (34)	0 (0.0)	$\chi^2 = 41.561$	<0.001
Ngbo	168 (86.2)	13 (6.7)	14 (7.2)		
Marital Status					
Married	207 (80.5)	40 (15.6)	10 (3.9)	Fischer's Exact = 5.842	0.162
Not married	12 (66.7)	3 (16.7)	3 (16.7)		
Others	15 (75.0)	4 (20.0)	1 (5.0)		
Educational level					
No Formal Education	2 (66.7)	0 (0)	1 (33.3)	Fischer's Exact = 10.324	0.181
Primary	40 (81.6)	6 (12.2)	3 (6.1)		
Secondary	163 (80.7)	30 (14.9)	9 (4.5)		
Tertiary	22 (75.9)	6 (20.7)	1 (3.4)		
Others	7 (58.3)	5 (41.7)	0 (0.0)		
Occupational Category					
Student	11 (84.6)	2 (15.4)	0 (0.0)	Fischer's Exact = 10.324	0.181
Artisan	17 (77.3)	5 (22.7)	0 (0.0)		
Business	99 (80.5)	20 (16.3)	4 (3.3)		
Civil servant	12 (66.7)	6 (33.3)	0 (0)		
Farming	43 (79.6)	7 (13.0)	4 (7.4)		
Others	52 (80.0)	7 (10.8)	6 (9.2)		

As shown in table 7 below Antenatal care (ANC) attendance demonstrated a strong and statistically significant association with IPTp uptake (Fisher's Exact = 63.748; $p < 0.001$). Among participants who did not attend ANC, only 13 (41.9%) received IPTp, while 18 (58.1%) did not. In contrast, IPTp uptake increased progressively with the number of ANC visits: 124 (78.0%) of those with 1–3 visits received IPTp, compared with 74 (94.9%) among those with 4–7 visits. Notably, all participants with ≥ 8 ANC visits (20; 100%) received IPTp. Among participants whose ANC visit status was not recorded, 3 (42.9%) received IPTp, while 4 (57.1%) had IPTp status not recorded.

IPTp uptake was substantially higher among primigravidae (G1), with 35 (94.6%) receiving IPTp. Similarly, 99 (84.6%) of low multigravidae (G2–G4) and 69 (80.2%) of grand multigravidae (G5–G9) received IPTp. Among great-grand multigravidae ($\geq G10$), 5 (83.3%) received IPTp, while 1 (16.7%) did not.

Gestational age at first IPTp administration showed a statistically significant association with IPTp receipt (Fisher's Exact = 23.536; $p < 0.001$). Participants who initiated IPTp at the gestational age of 16–20 weeks all received IPTp (32; 100%), while uptake remained very high among those who initiated at 21–28 weeks (67; 98.5%). In contrast, IPTp uptake was lower among participants who initiated at (< 16 weeks), where 47 (64.4%) received IPTp and 26 (35.6%) did not. Among those at (> 28

Table 7: Antenatal and Obstetrics characteristics with receipt of IPTp among participants

Variables	Receipt of IPTp			Test Statistics	p-value
	Yes (n=234) Freq. (%)	No (n=47) Freq. (%)	Not Recorded (n=14) Freq. (%)		
ANC Attendance					
None	13 (41.9)	18 (58.1)	0 (0.0)	Fischer's Exact = 63.748	<0.001
1	124 (78)	25 (15.7)	10 (6.3)		
–3	74 (94.9)	4 (5.1)	0 (0.0)		
4–7	20 (100)	0 (0.0)	0 (0.0)		
≥8	3 (42.9)	0 (0.0)	4 (57.1)		
Community Cluster					
Primigravida (G1)	54 (72.0)	20 (26.7)	1 (1.3)	Fischer's Exact = 19.084	<0.001
Low Multigravida (G2–G4)	99 (84.6)	15 (12.8)	3 (2.6)		
Grand Multigravida (G5–G9)	69 (80.2)	11 (12.8)	6 (7.0)		
Great-Grand Multigravida (≥ G10)	12 (70.6)	1 (5.9)	4 (23.5)		
Gestational Age at First IPTp (weeks)					
<16 weeks	47 (64.4)	26 (35.6)	0 (0.0)	Fischer's Exact = 23.536	<0.001
16–20 weeks	32 (100)	0 (0.0)	0 (0.0)		
21–28 weeks	67 (98.5)	1 (1.5)	0 (0.0)		
>28 weeks	82 (88.2)	9 (9.7)	2 (2.2)		

Discussion

Despite the recommendation and implementation of IPTp-SP in some countries in tropical Africa some decades ago, pregnant women are still affected by malaria disease with consequent effects on their neonates (Quakyi *et al* 2019). This is particularly due to the low utilization of the IPTp policy irrespective of high coverage of ANC visits (Chico *et al.* 2015; WHO, 2005). To address this, WHO revised the policy to a monthly administration of SP to reduce inadvertent low or non-uptake of SP (WHO, 2013). Thus, determining the coverage effectiveness of this policy is of utmost importance to its sustainability or otherwise across the different SP-resistant areas in tropical Africa (Quakyi *et al.*, 2019).

This study assessed the coverage and predictors of IPTp-SP uptake among antenatal attendees in Ohaukwu LGA, Ebonyi State, between January 2022 and December 2023, in the post-intervention period following the TIPTOP programme implemented by Jhpiego and Unitaid. The findings provide important insights into the sustainability of IPTp gains and the health-system and client-level factors influencing uptake.

Overall, 79.3% of participants received at least one dose of IPTp-SP, while only 21.2% achieved optimal uptake of ≥ 3 doses (IPTp3+). Although this reflects substantial improvement compared with earlier national estimates for Nigeria where IPTp3+ coverage was 16% in 2015 and 31% in 2018 as reported in the World Health Organization *World Malaria Report* coverage (WHO, 2023; WHO, 2022), the percentage number of women receiving three or more doses of IPTp in this study remains below the WHO-recommended universal target and fall below the

National Malaria Elimination Programme's target for 100% of pregnant women attending ANC in Nigeria to receive at least three IPTp-SP doses by 2020 (Fidock, 2013). Similar low uptake of at least three doses of IPTp-SP has been reported in Nigeria (Adeyemo *et al.*, 2024; Kalu *et al.* 2022) and across sub-Saharan African countries (WHO, 2020).

The IPTp3+ coverage of 21.2% observed in Ohaukwu is comparable to findings from multi-country analyses in sub-Saharan Africa, which demonstrate persistent gaps between ANC attendance and IPTp uptake with IPTp3+ uptake found to be less than 25% in Democratic Republic of Congo, Madagascar and Nigeria (Pons-Duran *et al.*, 2020). In Nigeria, estimates in 2018 from Ebonyi State (particularly Ohaukwu) showed a decrease in IPTp3+ uptake from 2015, whereas Ondo State (Akure South LGA) experienced increase in recent years (DHS, 2018). Despite relatively high ANC contact in many settings, conversion to optimal IPTp dosing remains suboptimal, suggesting missed opportunities within health facilities. The mean dose of 1.68 ± 1.24 further indicates that many women initiate IPTp but fail to complete the recommended three or more doses.

The current coverage of 21.2% in this current study when compared with the pre-TIPTOP period in Ohaukwu where IPTp3 coverage was 5% in 2017 and up to 25% by 2020, suggests partial sustainability of gains but possible decline after withdrawal of intensive programme support. This pattern aligns with previous report showing that donor-supported malaria interventions often experience attenuation once active supervision, commodity support, and community engagement reduce (Onuoha *et al.*, 2021).

Early commencement of ANC attendance in the first trimester or earlier in the second trimester as well as frequent ANC visits implied an increased likelihood of initiating the first dose and completing at least three doses of IPTp-SP during pregnancy (Kalu *et al.*, 2022; Anchang-Kimbi *et al.*, 2020). In the present study, a strong and statistically significant association was observed between ANC attendance and IPTp uptake ($p < 0.001$). Women with ≥ 8 ANC contacts achieved 100% IPTp uptake, while only 41.9% of women who did not attend ANC received IPTp. These findings align with the new IPTp-SP policy, which recommends the uptake of the first IPTp-SP dose after the first trimester during pregnancy and then successive IPTp-SP doses received in each scheduled ANC visits at least one month interval (Muhammad *et al.*, 2021; WHO, 2013)

Recent evidence continues to affirm that frequency and early initiation of ANC are among the strongest predictors of IPTp3+ uptake in Nigeria and other malaria-endemic countries (Adeyemo *et al.*, 2024; Muhammad *et al.*, 2021; Yaya *et al.*, 2018). However, despite over half of participants attending 1–3 ANC visits, only a small proportion completed ≥ 3 IPTp doses. This supports earlier findings in Nigeria by Adewole *et al.*, (2019), whose study revealed that low utilization of IPTp was mostly due to supply-side constraints such as SP stock-outs, provider practices indicating that high ANC attendance does not automatically translate into adequate IPTp coverage

Gestational age at first IPTp administration was observed to significantly affect the completion of IPTp-SP uptake. Women initiating IPTp between 16–28 weeks had near-universal uptake, whereas initiation before 16 weeks was associated

with lower completion. This is consistent with WHO policy recommending IPTp-SP commencement in the second trimester to optimize dosing opportunities (WHO, 2013). Late initiation (>28 weeks) was also common (31.5%), limiting the number of possible doses before delivery. Similar delays in ANC booking and IPTp initiation have been reported in Nigeria and are recognized barriers to achieving IPTp3+ coverage (Yaya *et al.*, 2018).

Gravidity showed significant association with IPTp uptake, with higher coverage among multigravidae compared to primigravidae. This pattern aligns with behavioural evidence suggesting that women with prior pregnancy experience may better understand ANC importance and malaria risks (Hill *et al.*, 2013). Other studies (Oppong *et al.*, 2019; Amoran *et al.*, 2012) also reported significant association between parity and IPTp-SP use. Conversely, previous reports (Ifebude *et al.*, 2021; Adewole *et al.* 2019) showed that previous pregnancy or parity has no significant relationship with the utilization of IPTp-SP. According Pons-Duran *et al.* (2020) Primi-gravid women are more likely to take IPTp than mutltigravid women.

Approximately 30.2% reportedly did not receive IPTp due to contraindications. This proportion appears high and raises questions about documentation practices or possible misclassification. True contraindications to SP are limited (e.g., sulfonamide allergy), and overestimation may reflect provider caution or misinterpretation of guidelines. Hill *et al.* (2013) emphasized that health worker misconceptions contribute substantially to missed IPTp opportunities in sub-Saharan Africa.

This study revealed that no significant relationship existed between the socio-demographic variables and utilization of IPTp-SP. The IPTp-SP utilization was high across all age groups. The finding of this study is consistent with the report of Sinyange *et al.* (2023) who found that there was no significant association between age and taking four or more doses of IPTp-SP. Furthermore, the study did not agree with Adewole *et al.* (2019), who reported significant relationship between socio-demographic variables and utilization of IPTp-SP in their studies. Level of education, occupation and marital status was not significantly associated with the utilization of IPTp-SP as observed in this study. Other studies (Sinyange *et al.*, 2023; Kalubula and Li, (2016) reported similar findings where no significant association between education level, occupation and utilization of IPTp-SP was found. Adewole *et al.* (2019) reported that there was no significant association between level of education and utilization but a significant association between occupation and IPTp-SP uptake existed. Conversely, the finding did not corroborate the earlier studies of Orish *et al.* (2023), who noted that education was significantly associated with the perception and uptake of IPTp-SP in their study. The current finding suggests that structural health-system factors may play a more decisive role than individual socioeconomic characteristics. Recent analyses using Demographic and Health Survey data similarly indicate that facility-level determinants (drug availability, supervision, and DOT implementation) may outweigh sociodemographic predictors when ANC access is already established (WHO, 2023).

Community cluster was significantly associated with IPTp uptake ($p < 0.001$), with higher coverage in Ngbo (86.2%) compared to Ezzangbo (66%). This disparity may reflect differential health facility performance, SP availability, staff training levels, or varying residual effects of the TIPTOP intervention. Geographic inequities in IPTp delivery have been widely documented across Nigeria and sub-Saharan Africa, often linked to uneven health-system strengthening and supervision (Hill *et al.*, 2013; WHO, 2023). These findings emphasize the importance of localized implementation strategies because even within the same LGA, contextual factors can influence the effectiveness of service delivery.

The TIPTOP intervention implemented by Jhpiego demonstrated marked improvements between 2017 and 2020, especially in IPTp3 coverage. The current study suggests that while overall receipt of at least one IPTp dose remains high (79.3%), the uptake of IPTp3+ rates (21.2%) shows that while gains from the TIPTOP era may have been partially sustained, the absence of continued intensive supervision and community engagement could impede achievement of higher coverage levels. Sustained efforts in community outreach, adequate SP supply, and provider training may therefore be necessary to consolidate gains beyond the lifespan of time-limited programmes.

The limitations of this study includes the possible incomplete and inaccurate data in the maternal booklets from which the information for this study was dependent on.

Conclusion

The IPTP-SP coverage in Ohaukwu local government area remains low. The increase uptake of SP in the area achieved by TIPTOP intervention some years ago was partially sustained as the coverage of IPTp –SP in the area is currently comparable to that 2020. Those who received up to three or more doses of SP were low in both 2022 and 2023. More ANC attendance, being in Ezzangbo cluster and early commencement of SP before 16 weeks of gestation were positive predictors of increase intake of IPTp- SP. It was also observed that most of the participants were not delivered of their babies in the facilities where they registered as the outcome of the pregnancy was not recorded in most of the maternal booklets which possibly indicates that mostly deliveries happen at homes.

Recommendations.

1. Enlightenment of pregnant women by state and local government on the need to Demand for IPTp administration from health workers each time they attend ANC
2. Public enlightenment on the need for early antenatal registration and continuous routine ANC visits to improve IPTP coverage and overall maternal and child health is highly recommended.
3. Regular training of health workers on the importance of IPTP-SP administration to eligible women each time they come for ANC

4. There is also need for government at all levels to ensure the sustainability and improvement on the health gains achieved by non-governmental Organisations and other implementing partners in their areas through capacity building, sustained supply of drugs and deliverables as well as target setting.

LIST ABBREVIATIONS

1. IPTp - Intermittent Preventive Treatment of Malaria in Pregnancy
2. IPTp-SP - Intermittent Preventive Treatment of Malaria in Pregnancy- Sulfadoxine Pyrimethamine
3. SP - Sulfadoxine Pyrimethamine
4. ANC - Antenatal Care
5. WHO- World Health Organization
6. TIPTOP- Transforming Intermittent Preventive Treatment of Malaria in Pregnancy for Optimal Performance
7. IPTp1 - Intermittent Preventive Treatment of Malaria in Pregnancy first dose
8. IPTp2- Intermittent Preventive Treatment of Malaria in Pregnancy second dose
9. IPTp3- Intermittent Preventive Treatment of Malaria in Pregnancy third dose
10. IPTp3+ - Intermittent Preventive Treatment of Malaria in Pregnancy more than three doses.

- 11. LGA – Local Government Area
- 12. SPSS- Special Package for Social Science
- 13. ITN – Insecticide Treated Net
- 14. TETFUND- Tertiary Trust Fund

Declaration by authors

The authors of this report hereby declare that they have no known competing financial interests, personal relationships, or affiliations that could have appeared to have influenced or biased the work presented in this manuscript.

Ethical approval

The ethical approval was obtained from the David Umahi Federal University of health sciences ethical review committee. Ethical approval was also obtained from the Ebonyi State ministry of health ethical review committee to enable us gain entry into their health facilities. The ethical approval was in accordance with the Declaration of Helsinki. The study was carried out strictly in accordance with the approved study protocol. The ethical approval numbers are DUFUHS/VC/TETFUND/IBR/25/08 and EBSHREC/100/09/25 respectively

Clinical Trial Number

Clinical trial number is not applicable

Consent to Publish

Consent to publish as well as consent to participate was obtained from all the study participants.

Consent to Publication

The authors hereby give consent for the article to be published.

Availability of data

The authors declare that the data for this study is available at the link below.

<https://figshare.com/s/9e83799f5d19b635dd56>

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Authors Contributions

Onwe Francis – Conceptualization of the study.

- Abstract, Introduction and Part of Materials and Methods

Ukpai Ekenem - Part of Materials and methods

- Consent writing, Acknowledgement, Funding information, declaration

Nwaze Eric - part of Data analysis and report writing

Onuoha Herbert- Data analysis and table presentation

Nwele David - Discussion

Ngwu Esther- Conclusion and recommendations

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REFERENCES

1. World Health Organization (WHO), 2022, Atlas of African Health Statistics.
<https://apps.who.int/bitstream/handle/1065/364839/9789290234845-eng.pdf>.
2. aho.afro.who.int
3. Marielle KBA, Denisa EIC, Modeste MM, Eric K, Pierre BM, Elie M, Maryvonne K. Prevalence of plasmodium falciparum Infection in Pregnant women in Gabon. *Malar J.* 2003, 2: 1-17, 10.1186/1475-2875-2-1.
4. Nigeria Presidential Malaria initiative (PsMI). Malaria Operational plan FY 2019. Department of Health and Human Services-USA 2016. Available at <https://d1u4sg1s9ptc4z.cloudfront.net/uploads/2021/03/fy-2019-nigeria-malaria-operational-plan.pdf> (Accessed February 2, 2025).

5. World Health Organization (WHO) Guidance for Prevention and Treatment of Malaria in Pregnancy. Geneva: World Health Organization WHO; 2010 [cited 2025 February 2].
6. Updated WHO policy recommendation (2013) World Health Organization. Available at https://cdn1.sph.harvard.edu/wp-content/uploads/sites/2413/2014/08/iptp_sp_updated_policy_recommendation_en_102012.pdf(accessed February 2, 2025)
7. World Health Organization (WHO) policy brief for the implementation of Intermittent Preventive treatment of malaria in pregnancy using sulfadoxine-pyrimethamine (IPTp-SP) (2014) World Health Organization. Available at :<https://www.who.int/publications-detailredirect/WHO-HTM-GMP-2014> (Accessed February 2, 2025).
8. Harrington W, McGreedy R, Muehlenbachs A, Fried M, Nosten F and Duffy P, 2012. Intermittent preventive treatment in pregnancy with sulfadoxine-pyrimethamine: the times they are a changin'. Clinical infectious diseases, 55(7), pp.1025-1026. Available at <https://doi.org/10.1093/cid/cid/cis568>.
9. Updated who policy recommendation; Intermittent Preventive Treatment of malaria in pregnancy using sulfadoxine-pyrimethamine (IPTp-SP) (October 2012) updated WHO policy recommendation: intermittent preventive treatment of malaria in pregnancy using SP October 2012/RBM Partnership to End Malaria. Available at [https://endmalaria .org/related-material/updated-who-policy-](https://endmalaria.org/related-material/updated-who-policy-)

recommendation-intermittent-preventive-treatment-malaria (Accessed February 2, 2025).

10. WHO. Guidelines for the treatment of Malaria. 2015. <https://www.who.int/malaria/publication/0z/97824149127/en/> (Accessed February 2, 2025).

11. WHO. Intermittent Preventive Treatment of malaria in Pregnancy using Sulfadoxine-Pyrimethamine (IPTp-SP).2012.

12. WHO. World Malaria Report 2019. <https://www.who.int/publications-detail/world-report-2019> [Accessed February 2, 2025]

13. Hill J, Hoyt J, Van Ejik A M, et al. Factors affecting the delivery , access, and use of intervention to prevent malaria in pregnancy in Sub-Saharan Africa: a systemic review and meta--analysis. PLoS Med 2013; 10:e1001488.

14. Clara Pons Duran, Mireja Liach, Charfudin Sacoar, Sergi Sanz, Eusebio Macete, Iwara Arikpo, Maximo Ramirez, Martin Meremikwu, Didier Mbombo Ndombe, Susana Mendez, Manu Manun Ebo, Ranto Ramaaniato, Victor R Rabeza, Maya Tholandi, Eleine Roman, Franco Pagnoni, Raquel Gonzalez, Clara Menedez. Coverage of intermittent preventive treatment of malaria in pregnancy in four sub-Saharan countries: findings from household surveys. Int. J. Epidemiol. 2020 Dec.8:50(2):550-559. doi: 10-1093/ije/dyaa233

15. Stella O Ahinleye, Catherine O Falade, Ikeoluwapo O Ajayi. Knowledge and utilization of intermittent preventive treatment for malaria among women attending antenatal clinics in primary health care centres southwest, Nigeria: a cross- sectional study. BMC, July 9, 2009 open journal access. Accessed Feb, 10th 2025

16. Chima A Onoka, Kara Hanson, Obinna E, Onwujekwe. Low coverage of intermittent preventive treatment for alaria in pregnancy in Nigeria: demand-side influences. *Malaria Journal*, March 23, 2012.82(2012)(Open Access.) Accessed Feb. 10th, 2025.DOI: 10.1186/1475287-11-82.
17. Herbert Enyeribe Onuoha, Bartholomew Odio, Christina Maly, Lawrence Nwankwo, Folayan Waheed Adewale et al: Changes in ANC Attendance and IPTp Uptake after Introduction of Complimentary Community Intervention. *ASTMH*, Nov 2021 <http://malariamatters.org>
18. .National Population Commission. Population and housing Census of the Federal Republic of Nigeria. Priority table Abuja 2009; vol. 1.
19. Government of Ebonyi State of Nigeria. Diary 2016. A Publication of the Ministry of Information and Orientation. P.M.B 039, Abakaliki, Ebonyi State 2016. www.ebonyistate.gov.ng
20. Jaykaran Charan, Tamoghna Biswas. How to calculate sample size for different study designs in medical research. *India Journal of Pschol. Med.* April-June, 2013; 35(2): 121-126i

