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Antenatal Care Attendance, Intermittent Preventive Treatment and Occurrence of Malaria Parasite Infection at Parturition in Abeokuta, Nigeria

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Authors' contributions

This work was carried out in collaboration between all authors. Authors ASB and OAI did the study design and wrote the protocol. Authors SOSW and EF provided other technical inputs. All authors did the statistical analysis and literature searches while analyses of study were done by authors ASB and OAI. All authors read and approved the final manuscript.

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ABSTRACT

The detrimental effect of malaria during and/or after pregnancy cannot be over emphasized, and lot of efforts had been put in place in order to reduce its scourge. Antenatal Care (ANC) is a major tool in improving maternal and foetal health. This study aims at evaluating the efficacy of ANC visit(s) against malaria infection at parturition with respect to ANC clinic attendance and Intermittent Preventive Treatment (IPT) uptake among parturients who seek delivery services in two secondary health facilities in Abeokuta. Blood samples from maternal and placenta were collected from 211 parturients. Blood films were prepared, stained with 10% giemsa staining technique and observed for malaria parasites under the microscope. Relevant maternal demographic characteristics were obtained from the parturients and Chi-square tests were conducted to measure relationships using SPSS version 16.0. Generally, a high turnout of ANC attendance (97.2%) was recorded among the parturients seeking delivery in Abeokuta Nigeria. However, about 60% of the respondent's made

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above 3 ANC visits. Maternal age was a significant factor ($p<0.05$) affecting booking timing (early or late) and number of ANC visits made by the parturients. Furthermore, Late attendance as well as attending <4 ANC clinics are associated ($p<0.05$) with incomplete doses of IPT which in turn increases susceptibility to Pregnancy associated malaria in Abeokuta Ogun State. None usage of IPT, late ANC booking and receiving first dose of IPT towards the end or after second trimester are significant factors ($p<0.05$) associated with Pregnancy associated malaria. The full benefit of attached with ANC services could not be utilized as a result of late and inconsistent attendance practiced by the parturients during pregnancy and this could result in poor outcomes.

Keywords: Malaria; antenatal; parturients; doses; trimester.

1. INTRODUCTION

Malaria is a parasitic disease that affects humans especially in the sub-Saharan Africa, where about 90% of malaria associated mortality occurs [1]. Malaria is a vector borne disease caused by the parasite of the genus *Plasmodium*. It is transmitted by the bite of an infected female anopheles mosquito. Four species are primarily responsible for human malaria infections; *P. falciparum, P. malariae, P. ovale*, and *P. vivax*. *P. falciparum* is the commonest in Africa and is responsible for up to 98% of cases in Nigeria and is associated with severe morbidity and mortality [2].

In Nigeria, like other endemic areas, its severe and complicated effects are most common among infants and pregnant women [3]. In areas of Stable Malaria transmission, *P. falciparum* infection in pregnant women is associated with maternal anaemia and Low Birth Weight (LBW) [4-5]. The occurrence of Low Birth Weight had been traced to intrauterine growth retardation (IUGR) which might have been as a result of malaria parasites infection of the placenta [6] in which the frequency is usually higher among the primigravidae and immuno compromised (HIV) infected mothers [6].

The detrimental effect of malaria during and/or after pregnancy cannot be over emphasized, and lot of efforts had been put in place in order to reduce its scourge. This includes the use of Long Lasting Insecticidal Nets (LLIN), Intermittent Preventive Treatment (IPT) and effective case management primarily channelled through antenatal care (ANC) [7].

Antenatal care (ANC), along with skilled delivery care and emergency obstetric care, is a key element of the package of services aimed at improving maternal and newborn health [1,8].

Considering the evidence from a 2001 systematic review [9], the World Health Organization (WHO) began promoting a new form of ANC for low-income countries, moving away from the conventional model. The reorganized model, based on 'reduced but goal-orientated clinic visits' [10], is known as 'focused' ANC, consisting of not less than four visits to a health facility during normal pregnancy [10]. Recently, lot of questions had been raised about the efficacy of focused ANC [11] and revised evidence-based guidelines are being compiled. However, focused ANC remains the WHO recommendation for low-income countries [10].

On the other hand, irregular, late or non-attendance at antenatal care clinics has been connected with poor maternal outcome [12]. A high percentage of pregnant women in Africa attend ANC clinic at least once during pregnancy hence the antenatal clinic provides a good prospect for delivering interventions to control malaria in pregnancy in endemic regions. Studies have shown that the utmost benefit of IPT can be gained by receiving two or more doses of SP [7]. More so, majority of women who received a minimum of two doses of SP do attend four or more ANC visits [13].

Despite a high ANC clinic turnout in most countries in sub-Saharan Africa, reported coverage level of IPTp-SP and LLINs remains beneath the target of 80% [1]. The determinants and barriers for delivery and uptake of IPT and ITN vary with different regions [14]. Meta analysis of factors affecting the delivery, access, and use of interventions to prevent malaria in pregnancy in sub- Saharan Africa identified education, knowledge and perception about malaria [15], socio-economic status [16], number and timing of antenatal clinic visits [17], number of pregnancies, healthcare system issues [15] as factors that influence intervention coverage as well as access to ANC services.

Having this background, this study aims at evaluating the efficacy of ANC visit(s) against

malaria infection at parturition with respect to ANC clinic attendance and IPTp-SP uptake among parturients who seek delivery services in two secondary health facilities in Abeokuta.

2. MATERIALS AND METHODS

2.1 Study Area

The research was carried out in Abeokuta, which is the capital of Ogun state. Abeokuta is located within longitude 7° 15[1] North and Latitude 3° 21[1] East. Two hospitals; Oba-Ademola Maternity Hospital with coordinates (7°10′20.8″N, 3°2′29.6″E) and State hospital Sokenu Ijaiye with coordinates (7°09′11.9″N, 3°21′10.9″E) were used for this study. The two Hospitals were one of the most frequently patronized Health facilities in Abeokuta.

2.2 Criteria for Selection and Study Population

Only pregnant women that are in labour (Parturients) were included in this study. A total of 211 parturients were randomly selected from the two Hospitals using a formula according to [18]. The sample population was selected irrespective of age, educational background, marital status, and occupation.

2.3 Ethical Clearance and Informed Consent

Ethical clearance for the study was approved by the Research and Ethics Committee of the State Hospital Sokenu Ijaiye.

All medical personnel of the selected Hospitals and the participants (Parturients) were fully briefed on the objective of the study. Only parturients who gave their consent were enrolled for the study.

2.4 Collection of Maternal, Placenta, Cord Blood Samples and Questionnaire Administration

Maternal, placenta and cord blood samples were collected as described by [19]. Relevant maternal demographic and clinical characteristics were recorded with the aid of a questionnaire. Information obtained includes; age, gravidity, education, use of IPT as well as history of antenatal care visits (ANC) during pregnancy.

2.5 Laboratory Procedures

Thick and thin smears were prepared and stained with 10% Giemsa as described [20]. The blood films were examined microscopically using 100× objectives (with oil immersion). Malaria diagnosis was based on identification of asexual stages of *Plasmodium species* on the thick blood film while thin smears were used for species identification. Slides were declared negative after observing at least 100 high power fields without detecting any parasites.

2.6 Statistical Analysis

Chi-square statistics was used to analyze data obtained in the study and a probability value (P-value) of $P<0.05$ was regarded as significant, using the SPSS version 16.0.

3. RESULTS

3.1 Demographic Characteristics of the Respondents

The mean age of the parturients was 28.5±0.28 years. Majority 94(44.5%) of the parturients were within the age range 28-32 years, followed by age group 23-27 years. The highest proportion of the parturients were multigravidae 87(41.2%), followed by primigraviade 67(31.8%) and secundigravidae 57(27.0%) respectively.

Majority of the parturients had tertiary education. The parturients were mainly traders by occupation, followed by teachers and civil servants.

3.2 Pattern of ANC Visits among the Study Populations

Majority (97.2%) of the parturients booked for ANC in which many (57.1%) booked during the second trimester, while 60(29.3%) and 28(13.6%) of the parturients booked during the first and third trimester of pregnancy respectively. Furthermore, majority (61.5%) of the parturients attended at least 4 ANC clinics during pregnancy.

3.3 Factors Associated with ANC Booking and Attendance among the Parturients

There was a significant ($p<0.05$) association between parturients level of education and ANC

booking as all the parturients with tertiary education booked for ANC while a high proportion of parturients with secondary education booked for ANC services compared with those that had primary education (Table 1).

In this study, there was no significant relationship (p>0.05) between age, gravidity and ANC booking status among the parturients (Table 1).

A significant association (p<0.05) existed between age and time of booking among the respondents. A high proportion of the older women (age 23-27, 28-32 and above 33 years) booked earlier compared with women within the age bracket of 18-22 years (Table 2). However, there was no significant relationship (p>0.05) between age and the trimester in which the first ANC visit was made. Furthermore, a significant relationship existed between the age of parturients and number of ANC visits among the parturients as the older women made more visits compared with the young (18-22 years) women (Table 2).

Table 1. Factors associated with ANC booking among the parturients

Characteristics	Booking status		
	No examined N (%)	Booked	Unbooked
Age (Years)	**(p>0.05)**		
18-22	22(10.4)	20(90.9)	2(9.1)
23-27	53(25.1)	50(94.3)	3(5.7)
28-32	94(44.5)	93(98.9)	1(1.1)
33 and above	42(20.0)	42(100.0)	0(0.0)
Education	**(p<0.05)**		
Primary	39(18.5)	36(92.3)	3(7.7)
Secondary	77(36.5)	74(96.1)	3(3.9)
Tertiary	95(45.0)	95(100.0)	0(0.0)
Gravidity	**(p>0.05)**		
Primigravid	67(31.8)	65(97.0)	2(3.0)
Secundigravid	57(27.0)	55(96.5)	2(3.5)
Multigravid	87(41.2)	85(97.7)	2(2.3)

Table 2. Relationship between age and ANC attendance among the parturients

Characteristics	Age (Years)			
	18-22	23-27	28-32	33 and above
Timing of booking	**(P<0.05)**			
Early booking	7(46.7)	31(58.5)	54(57.4)	21(50.0)
Late booking	15(53.3)	22(41.5)	40(42.6)	21(50.0)
Total	22(100.0)	53(100.0)	94(100.0)	42(100.0)
ANC visit	**(p>0.05)**			
Yes	20(90.9)	50(94.3)	93(98.9)	42(100.0)
No	2(9.1)	3(5.7)	1(1.1)	0(0.0)
Total	22(100.0)	53(100.0)	94(100.0)	42(100.0)
Trimester at first visit	**(P=0.05)**			
1st	4(20.0)	18(36.0)	28(35.0)	10(23.8)
2nd	13(65.0)	21(42.0)	51(63.8)	31(73.8)
3rd	3(15.0)	11(22.0)	1(1.2)	1(2.4)
Total	20(100.0)	50(100.0)	80(100.0)	42(100.0)
No of antenatal visit	**(P<0.05)**			
< 4 antenatal visits	11(68.8)	11(31.4)	23(31.5)	17(45.9)
4 visits and above	5(31.2)	24(68.6)	50(68.5)	20(54.1)
Total	16(100.0)	35(100.0)	73(100.0)	37(100.0)

Early booking= between the first and fourth month of gestation,
Late booking= above 4 months of gestation [21]

3.4 ANC Attendance and IPT Usage

About 77% coverage of IPT uptake was recorded among the study population in which only 27.8% received at least 2 doses.

A significant association ($p<0.05$) existed between booking time and IPT uptake, as high proportion of parturients that booked during the first and second trimester recieved IPT during pregnancy while a low proportion of the parturients that booked during the third trimester received IPT during pregnancy (Fig. 1).

Furthermore, majority of the respondents that booked early (1st month – 4th month) during pregnancy received their first dose of IPT earlier (during the 4th month of conception) compared with those that booked late (5 month and above) (Fig. 2).

In this study, a significant association ($p<0.05$) existed between time of booking and dosage of IPT taken. Parturients that registered within the first trimester received more doses of IPT compared with those that registered within the second and third trimester respectively (Table 3). Furthermore, all parturients that made < than 4 ANC visits received a single dose of IPT, while about 45.4% of the parturients that made at least 4 ANC visits received 2 or more doses of IPT (Table 3).

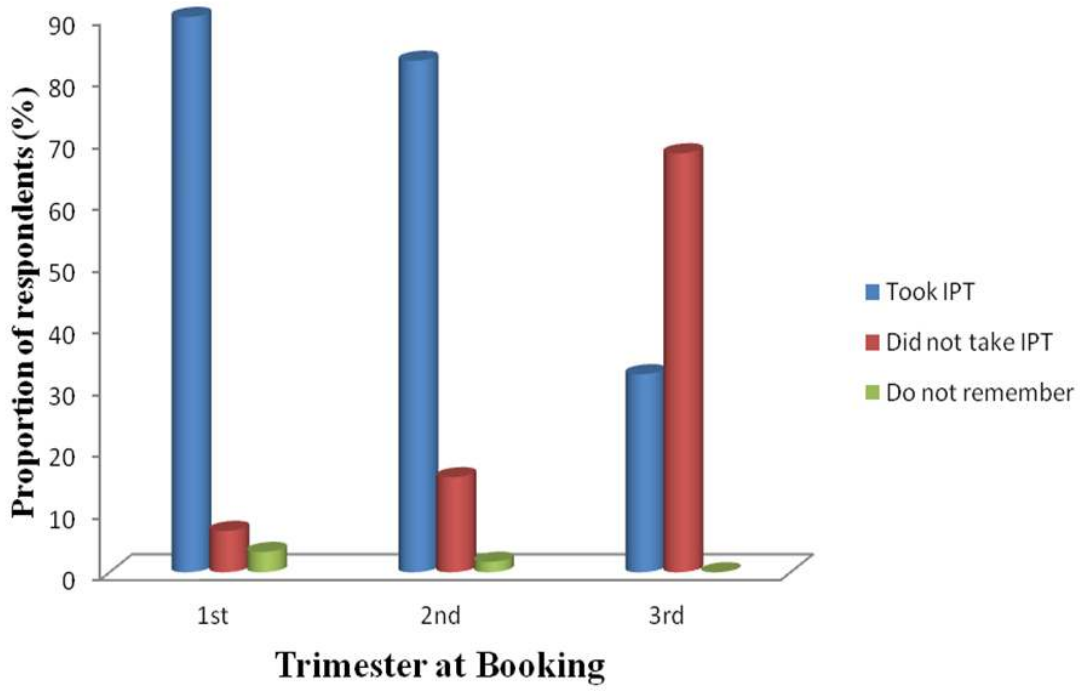

Fig. 1. Relationship between booking time and IPT uptake among the parturients

Table 3. Association between ANC attendance and IPT uptake among the parturients

Characteristics	Dosage of IPT				
	No examined N (%)	Once	Twice	Thrice	Do not remember
Trimester registered	**(p<0.05)**				
1st	56(34.4)	33(58.9)	20(35.7)	1(1.8)	2(3.6)
2nd	98(60.1)	75(76.5)	20(20.4)	3(3.1)	0(0.0)
3rd	9(5.5)	8(88.9)	1(11.1)	0(0.0)	0(0.0)
Number of ANC visits	**(p<0.05)**				
< 4 antenatal visits	62(38.5)	61(100.0)	0(0.0)	0(0.0)	0(0.0)
4 visits and above	99(61.5)	54(54.5)	41(41.4)	4(4.0)	0(0.0)

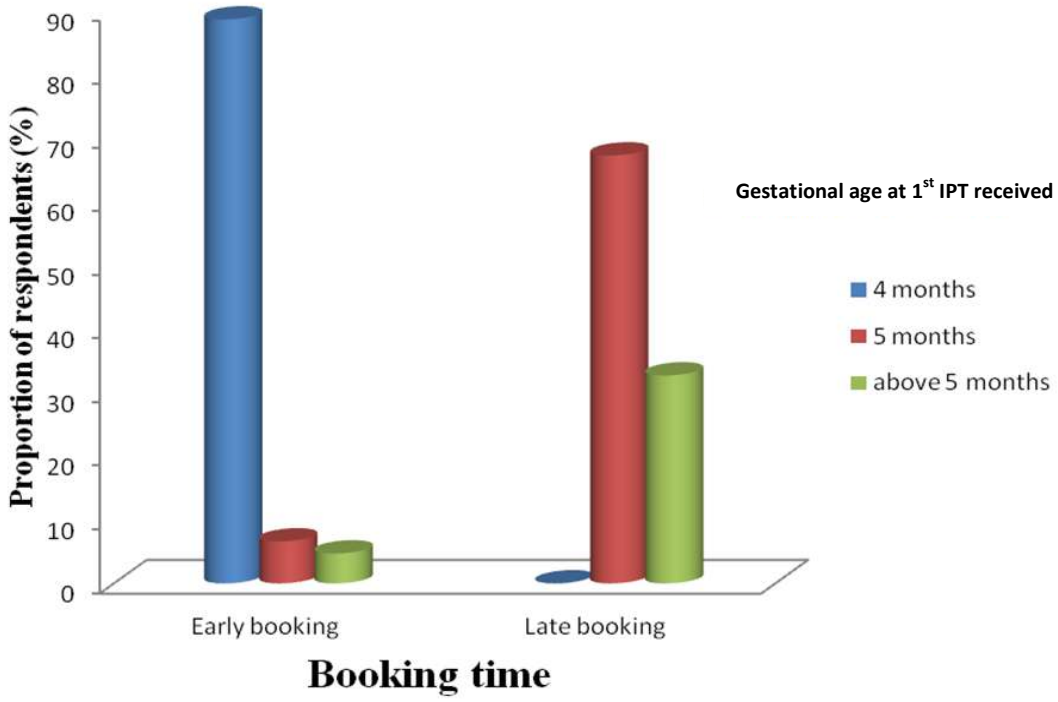

Fig. 2. Relationship between booking time and gestational age at which the first IPT was administered

3.5 Impact of ANC Booking and IPT Usage on Malaria Parasite Infection at Parturition among the Parturients

There was a significant relationship ($p<0.05$) between ANC booking status and occurrence of pregnancy associated malaria (PAM) among the parturients. Parturients that booked for ANC recorded lower occurrence of maternal, placental and cord malaria parasite infection compared with those that did not.

Furthermore, a significant relationship ($p<0.05$) existed between the gestational age at booking and occurrence of pregnancy associated malaria as low prevalence of maternal, placental and cord malaria parasite infection was recorded among those that booked within the first trimester of pregnancy compared with those that booked within the second and third trimester respectively (Table 4).

A low prevalence of maternal and placental malaria infections was recorded among parturients that received IPT during pregnancy ($p<0.05$), compared with those who did not receive IPT (Table 4). The prevalence of cord malaria parasite infection was low (4.4%) among parturients that received IPT during pregnancy compared with parturients that did not receive IPT (10.6%).

A low prevalence of malaria parasite infections as was recorded among parturients that received IPT during the second trimester ($p<0.05$) compared with those that received IPT during the third trimester (Table 4).

There was no significant relationship ($p>0.05$) between dosage of IPT taken and occurrence of pregnancy associated malaria except for maternal peripheral blood malaria infections that shown a significant relationship ($p<0.05$) with dosage of ITP taken (Table 4).

4. DISCUSSION

This study assessed some factors that affect ANC clinic attendance and IPTp-SP uptake among parturients who seek delivery services at two frequently patronized secondary health care facilities in Abeokuta, Nigeria in order to identify factors that can facilitate the scaling up of IPTp-SP in the study area. This study also examined the impact of ANC booking and IPTp-SP usage on Malaria parasite infection at parturition among the parturients.

Table 4. Impact of ANC booking and IPT usage on malaria parasite infection at parturition among the parturients

Variables	Number examined (%)	Various malaria infections		
		Maternal N (%)	Placental N (%)	Cord N (%)
Antenatal booking	**211 (100)**			
Yes	205(97.2)	81(39.5)	36(17.6)	12(5.9)
No	06(2.8)	05(83.3)	04(66.7)	0(0.0)
	p-values	**0.031**	**0.004**	**0.542**
Trimester booked	**205 (100)**			
1st	60(29.3)	23(38.3)	06(10.0)	0(0.0)
2nd	117(57.1)	39(33.3)	19(16.2)	05(4.3)
3rd	28(13.6)	19(67.9)	11(39.3)	07(25.0)
	p-values	**0.001**	**0.000**	**0.000**
IPT usage	**207 (100)**			
Yes	160(77.3)	54(33.8)	24(15.0)	07(4.4)
No	47(22.3)	30(63.8)	16(34.0)	05(10.6)
	p-values	**0.001**	**0.018**	**0.081**
Trimester given 1st IPT	**156 (100)**			
2nd	144(93.6)	47(32.6)	18(12.5)	05(3.5)
3rd	12(6.4)	06(50.0)	06(50.0)	02(16.7)
	p-values	**0.004**	**0.002**	**0.049**
Dosage of IPT given	**162(100)**			
Once	117(72.2)	41(35.0)	16(13.7)	04(3.4)
Twice	41(25.3)	13(31.7)	08(19.5)	03(7.3)
Thrice	04(2.5)	0(0.0)	01(25.0)	0(0.0)
	p-values	**0.001**	**0.98**	**0.429**

The high coverage of ANC attendance observed among the parturients that participated in this study is in keeping with previous reports from West Africa [22-24]. The WHO recommendation of four ANC visits met by 61.5% of the parturients is comparable with that of [21] in a study carried out in Cameroon and two other African countries [25,15]. This is an indication that the rate of antenatal care utilization is above average in the study area, thereby offering the potential for execution of the recommended approaches to the prevention and control of pregnancy related malaria.

The timing of ANC booking was also found to be consistent with findings from other African countries [26]. The fact that majority of the parturients attended their first ANC clinic during the second trimester represents an opportunity for timely delivery of IPT-SP. Consequently, the timing of ANC attendance had a significant effect on the uptake of first IPT dose. This finding is in keeping with a more recent finding in Cameroon [21].

There was no doubt that ANC, along with skilled delivery care and emergency obstetric care, is a key element of the package of services aimed at improving maternal and newborn health [1].

However, late ANC booking was associated with inability of the parturients to make up to the required number of visits during pregnancy. WHO recommended that in order to gain the utmost benefit of 2 doses of IPT, pregnant women should have made at least 4 ANC visits [7]. As a result, all the parturients that could not make up to the required number of ANC visits in this study did not receive more than a single dose of IPT. This finding is in line with recent findings [21,27].

On the other hand, about 45.4% of the parturients that made at least 4 ANC visits received 2 or more doses of IPT. This implies that about 55% of parturient with more than three ANC visits had incomplete SP uptake (< than 2 doses) which is a proof that several ANC visits does not necessarily ensure complete IPTp uptake [21], thus identification of facilitating factors to enhance uptake of complete IPTp dose needs proper investigation.

Factors affecting ANC clinic attendance has been extensively reviewed [14]. In this study,

there was a significant association between education and ANC attendance. High frequency of ANC booking was recorded among the parturients with at least secondary education compared to those with primary education. This could be attributable to the high level of exposure among the more educated women.

Though, there was no significant association between age and ANC booking, however a significant relationship existed between age and time of booking as well as number of ANC visits among the women. This finding is consistent with that of [28]. The older women booked earlier compared with the adolescents. Studies have shown that adolescents and unmarried younger women hid their pregnancies and delayed ANC to avoid the potential social implications of pregnancy which includes; exclusion from school, expulsion from their natal home, partner abandonment, stigmatization and gossip [28].

There was a significant relationship with antenatal booking and occurrence malaria infections ($p<0.05$). Unsurprisingly, pregnant women who did not book were more infected with both maternal and placenta malaria parasite, when compared with those that booked ($p<0.05$). This is attributable to the inaccessibility of the un-booked pregnant women to preventive packages consisting of IPT, LLIN and effective case management [7].

Furthermore, it is not only enough to book for ANC but it is imperative to book as early as possible, as pregnant women who booked late had more malaria parasite infections of the maternal, placental and cord blood compared with those who booked earlier. This finding could be explained by the fact that the susceptibility to malaria increases early in pregnancy and parasitemia peak at 9 – 16 weeks [29-30] thus, booking visit in the first trimester can promote early entry of the pregnant women into care [7] which in turn reduces the susceptibility to pregnancy associated malaria.

The usage of intermittent preventive treatment (IPT) significantly reduced the risk of maternal, placenta and cord malaria prevention among parturients ($p<0.05$). Several studies had reported similar findings [4,6]. Furthermore, there is a significant association ($p<0.05$) between the stages of pregnancy (in terms of trimester) when the first dose of IPT was received and occurrences of maternal, placental and cord malaria infections as their respective prevalence increases with increase in stage of pregnancy. Studies have shown that malaria may have important effects on the foetus before IPTp is usually administered [29-30]. This finding justified the fact that the usage of IPT as early as possible in the second trimester is the appropriate standard for prevention of Malaria infection during pregnancy according to the WHO policies on prevention of malaria during pregnancy [7].

5. CONCLUSION

Generally, a high turnout of ANC attendance was recorded among the parturients seeking delivery in Abeokuta Nigeria. However, the full benefit attached with ANC services could not be utilized as a result of late and inconsistent attendance practiced by the parturients during pregnancy. Maternal age was a significant factor affecting booking timing (early or late) and number of ANC visits made by the parturients.

Furthermore, Late attendance as well as attending <4 ANC clinics are associated with incomplete doses of IPT which in turn increases susceptibility to Pregnancy associated malaria in Abeokuta Ogun State.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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