



## EFFECT OF MATERNAL AGE AND EDUCATIONAL ATTAINMENT ON THE UPTAKE OF INTERMITTENT PREVENTIVE TREATMENT WITH SULPHADOXINE-PYRIMETHAMINE AMONG PREGNANT WOMEN ATTENDING ANTENATAL CLINICS AT PRIMARY HEALTH CENTRES IN ORLU ZONE, IMO STATE, NIGERIA

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### ABSTRACT

Malaria in pregnancy continues to be a major public health problem in sub-Saharan Africa and a leading cause of maternal and neonatal morbidity and mortality. Intermittent preventive treatment in pregnancy with sulphadoxine-pyrimethamine (IPTp-SP) is an effective strategy to reduce malaria-related complications, and has been recommended by the world health organization. However, uptake of the recommended doses is suboptimal in many parts of Nigeria. The study assessed the effect of maternal age and education on intermittent preventive treatment with sulphadoxine pyrimethamine use among pregnant women attending antenatal clinics in primary health centres in Orlu Zone of Imo State, Nigeria. A longitudinal study was conducted among 400 pregnant women attending antenatal care services in 33 selected primary health centres in Orlu Zone. Participants were selected purposively from an estimated population of 3500 antenatal attendees. The data collection was carried out throughout pregnancy by interviewers using a validated semi-structured questionnaire to capture the IPTp-SP uptake. Descriptive statistics, percentages, tables and charts and Chi-square tests were used to analyse the data. Statistical significance was defined as  $p < 0.05$ . The prevalence of optimal uptake of IPTp-SP was 16.75 %. Maternal age was a strong predictor of uptake. The highest uptake rate was among women aged 30-39 years (41.79%) and the lowest among adolescents  $\leq 19$  years (7.50%). Educational attainment was a significant predictor of IPTp-SP utilisation. The uptake increased progressively with higher levels of education, with women who completed senior secondary education having the highest uptake (37.50%) while women with no formal education had the lowest uptake (1.79%). Higher education attainment seemed to improve awareness, health seeking behaviour and compliance with recommendations for antenatal care. Maternal age and educational status were significant predictors of IPTp-SP uptake among pregnant women in Orlu Zone. Younger women and those with little or no formal education were less likely to achieve optimal doses of IPTp-SP. Interventions that strengthen female education, promote early attendance to antenatal care, improve health education, and implement targeted interventions for adolescent mothers may enhance IPTp-SP coverage and contribute to improved maternal and neonatal health outcomes.

**KEYWORDS:** Pregnancy malaria, IPTp-SP, Sulphadoxine-pyrimethamine, Maternal age, Educational attainment, Antenatal care, Nigeria.

### INTRODUCTION

Malaria is still one of the biggest public health challenges worldwide, especially in tropical and subtropical regions. It is a mosquito-borne infectious disease caused by protozoan parasites of the genus *Plasmodium* and transmitted mainly by the bites of infected female *Anopheles* mosquitoes. Malaria is both preventable and treatable but continues to be a big burden for health

systems worldwide.<sup>[1]</sup> In 2021, there were an estimated 247 million malaria cases and 619 000 malaria deaths globally, as reported by the World Health Organization (WHO). >95% of the global malaria burden and mortality occurred in sub-Saharan Africa. The disease disproportionately affects vulnerable populations, especially children under 5 years of age and pregnant women.<sup>[2]</sup>

Malaria in pregnancy (MiP) continues to be a major public health problem in malaria endemic countries, particularly in sub-Saharan Africa. Pregnancy is a risk factor for malaria infection since the physiological, hormonal and immunological changes in pregnancy lower maternal immunity. As a result, pregnant women are more susceptible to severe malaria and its complications. Malaria in pregnancy has been associated with adverse maternal outcomes including severe anaemia, hypoglycaemia, placental parasitaemia, maternal morbidity and mortality.<sup>[3]</sup> The foetal and neonatal outcomes include spontaneous abortion, intrauterine growth restriction, low birth weight, preterm delivery, stillbirth, congenital malaria, and neonatal death. It has been estimated that about 25 million pregnant women are exposed to malaria infection each year in Africa, resulting in substantial maternal and neonatal morbidity and mortality.<sup>[4]</sup>

There are five major species of *Plasmodium* that infect humans: *Plasmodium falciparum*, *Plasmodium vivax*, *Plasmodium malariae*, *Plasmodium ovale* and *Plasmodium knowlesi*. Of these species, *Plasmodium falciparum* is the most widespread and virulent in sub-Saharan Africa and is responsible for most of the pregnancy-related complications of malaria. In 2020, an estimated 11.6 million pregnancies in sub-Saharan Africa were exposed to malaria infection, resulting in an estimated 819,000 low-birth-weight deliveries. Furthermore, malaria in pregnancy is responsible for an estimated 50,000 maternal deaths and 200,000 stillbirths annually worldwide.<sup>[5]</sup>

The World Health Organization proposes a three-pronged strategy to reduce the burden of malaria in pregnancy: prompt diagnosis and effective treatment of malaria; consistent use of insecticide-treated mosquito nets (ITNs); and intermittent preventive treatment in pregnancy with sulphadoxine-pyrimethamine (IPTp-SP). Intermittent preventive treatment with sulphadoxine-pyrimethamine (IPTp) is currently the mainstay of malaria prevention in pregnant women living in areas of moderate to high malaria transmission. The WHO recommends that IPTp-SP should be given from the second trimester and at each antenatal care (ANC) visit scheduled at least four weeks apart until delivery.<sup>[6]</sup>

Evidence from randomised controlled trials and systematic reviews has shown the effect of IPTp-SP in reducing maternal parasitaemia, placental malaria, maternal anaemia, low birth weight and adverse pregnancy outcomes. The protective effect of IPTp-SP increases with the number of doses taken during pregnancy. WHO recommends that all eligible pregnant women are given at least three doses before delivery and should be encouraged to give the vaccine at every antenatal contact after quickening.<sup>[7]</sup>

However, despite its proven effectiveness, the uptake of IPTp-SP remains suboptimal in many malaria-endemic

countries, especially in sub-Saharan Africa. Although antenatal care attendance rates are relatively high in many settings, the proportion of women receiving the recommended three or more doses of IPTp-SP is still considerably lower. This difference indicates the presence of missed opportunities in maternal healthcare systems. Poor uptake has been attributed to supply side factors such as drug stock-outs, poor implementation of directly observed therapy (DOT) and poor adherence to guidelines by health care providers, and demand side factors such as late ANC registration, poor knowledge of malaria prevention, fear of adverse drug reactions, cultural beliefs and socioeconomic barriers.<sup>[8]</sup>

Socio-demographic characteristics have been consistently reported to be significant determinants of maternal healthcare utilisation and uptake of preventive interventions during pregnancy.<sup>[9]</sup> Access to and use of antenatal services can be influenced by maternal age, education, parity, household wealth, marital status, occupation, place of residence and exposure to health information. Educational attainment, in particular, has been linked to higher health literacy, better knowledge of preventive health measures, and greater utilisation of maternal health services. Also maternal age may affect health seeking behaviour, decision making autonomy, and compliance with recommended antenatal interventions.<sup>[10]</sup>

National surveys in Nigeria still indicate huge gaps between antenatal care attendance and optimal IPTp-SP uptake. Many pregnant women attend ANC at least once during the pregnancy but a relatively small proportion receive at least three doses of IPTp-SP as recommended. These differences suggest that socio-demographic and health-system factors continue to affect the effectiveness of malaria prevention programmes.<sup>[11]</sup>

The Orlu Zone of Imo State in South Eastern Nigeria depends largely on primary health centres for the provision of maternal and child health services. These facilities are the main sites for delivery and for administering antenatal care and IPTp-SP to pregnant women, particularly in rural and peri-urban areas. However, there is little empirical evidence on the role of maternal age and educational attainment on IPTp-SP uptake in the zone. Understanding the role of these factors is important to design targeted interventions to improve malaria prevention during pregnancy.<sup>[12]</sup>

The study therefore evaluated the influence of maternal age and educational attainment on uptake of intermittent preventive treatment with sulphadoxine-pyrimethamine among pregnant women attending antenatal clinics in primary health centres in Orlu Zone, Imo State, Nigeria. The findings are expected to inform policy makers, health care managers and public health practitioners in their efforts to improve IPTp-SP coverage and reduce the malaria burden in pregnancy.

## MATERIALS AND METHODS

### Study Design

This study employed a longitudinal descriptive study design to assess the effect of maternal age and educational attainment on the uptake of intermittent preventive treatment with sulphadoxine-pyrimethamine among pregnant women attending antenatal clinics at selected primary health centres in Orlu Zone, Imo State, Nigeria. Participants were enrolled during pregnancy and followed up until delivery to document IPTp-SP utilization.

### Study Area

The study was conducted in Orlu Zone, one of the three geopolitical zones in Imo State, South-Eastern Nigeria. Orlu Zone comprises twelve Local Government Areas (LGAs), namely Orlu, Orsu, Isu, Njaba, Nwangele, Nkwere, Oru East, Oru West, Ideato North, Ideato South, Oguta, and Ohaji/Egbema. The zone has an estimated population of approximately three million inhabitants and is predominantly rural and semi-urban. Healthcare services within the zone are provided through a network of primary, secondary, and tertiary health facilities. Primary health centres serve as the first point of contact for most pregnant women seeking antenatal care services. Of the approximately 72 primary health centres within the zone, 33 facilities were selected for inclusion in this study.

### Study Population

The study population consisted of pregnant women attending antenatal clinics at the selected 33 primary health centres in Orlu Zone during the study period. Records from the participating facilities indicated that approximately 3,500 pregnant women attended antenatal care services during the period under review.

### Sample Size Determination

The sample size was determined using Cochran's formula for finite populations:

$$n = N / [1 + N(e^2)]$$

Where:

n = required sample size

N = study population (3,500)

e = margin of error (0.05)

Substituting the values:

$$n = 3500 / [1 + 3500(0.05^2)]$$

$$n = 358$$

To improve representativeness and account for possible attrition during follow-up, the sample size was increased to 400 participants.

### Ethical Considerations

Ethical approval for the study was obtained from the IMSUTH Health Research Ethics Committee. Permission was also obtained from the management of participating primary health centres. Written informed consent was obtained from all participants before enrolment into the study. Confidentiality, anonymity, and voluntary participation were maintained throughout the study.

### Sampling Technique

A purposive sampling technique was employed to recruit eligible participants from the selected primary health centres. Pregnant women who met the inclusion criteria and consented to participate were enrolled consecutively until the required sample size of 400 was achieved.

### Inclusion Criteria

1. Pregnant women attending antenatal clinics at the selected primary health centres.
2. Women residing within the study area throughout the duration of pregnancy.
3. Women who provided informed consent to participate in the study.

### Exclusion Criteria

1. Pregnant women who declined participation.
2. Women with incomplete antenatal records.
3. Women who were lost to follow-up before delivery.

### Data Collection Instrument

Data were collected using a structured interviewer-administered questionnaire developed after extensive review of relevant literature. The questionnaire contained sections on socio-demographic characteristics, including maternal age, educational attainment, parity, marital status, and household characteristics. Information regarding antenatal attendance and IPTp-SP uptake was also obtained.

### Validity of the Instrument

The questionnaire was subjected to face and content validation by experts in public health and maternal health research. Necessary modifications were made following expert review to ensure that the instrument adequately captured variables relevant to the study objectives. A pilot study was conducted among pregnant women attending antenatal clinics outside the study area to assess clarity and appropriateness of the instrument.

### Reliability of the Instrument

The reliability of the questionnaire was enhanced through pre-testing and standardization of data collection procedures. Research assistants received training on questionnaire administration to ensure consistency and minimize interviewer bias. Necessary corrections identified during the pilot phase were incorporated before commencement of the main study.

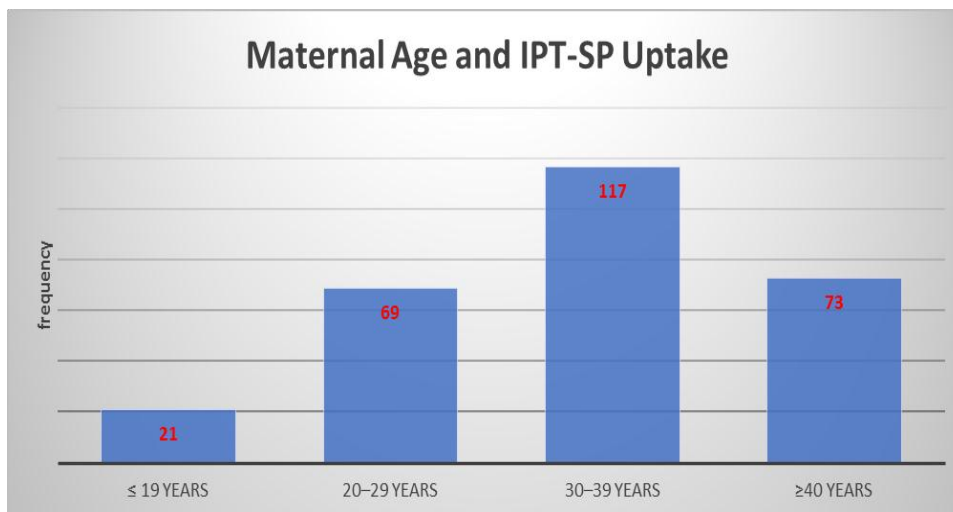
### Statistical Analysis

Data were entered, cleaned, and analyzed using appropriate statistical software. Descriptive statistics including frequencies, percentages, tables, pie charts, and bar charts were used to summarize the data. Associations between maternal age, educational attainment, and IPTp-SP uptake were assessed using the Chi-square test. Statistical significance was established at a p-value of less than 0.05.

**RESULTS**

**Table 1: Maternal Age and IPT-SP Uptake.**

Age (years)	≤ 19	20-29	30-39	≥40
No of women	21	69	117	73
Percentage %	7.5	26.64	41.79	26.07



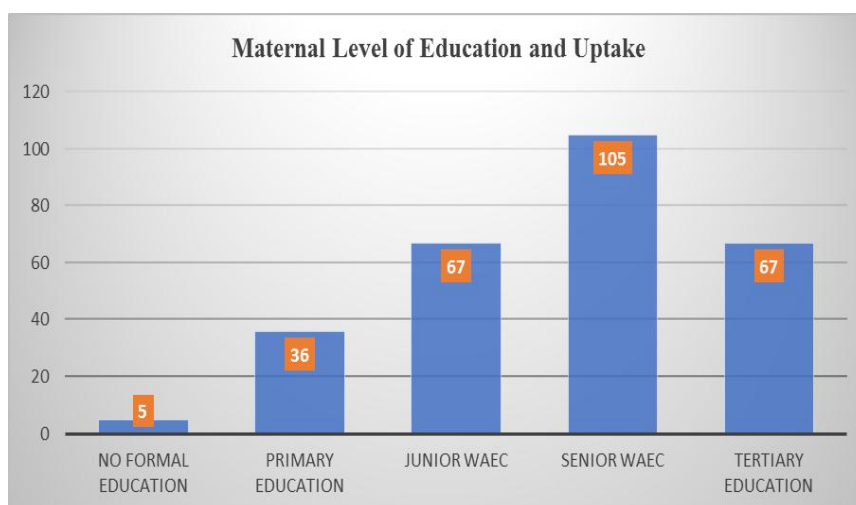
On the effect of maternal age on the uptake of intermittent preventive treatment with sulphadoxine-pyrimethamine among the participants, it can be seen from the results that the highest number of participants that took the drug was 117 (41,79%), and all were in the 30-39 years age group. This was followed by those in the 40 years and above age group, and the number was 73 (26.07%). The number of those in the range of 20-29 years that took the drug was 69

(26.64%). While the lowest number of participants that took the drug were those aged 19 years and below and the number was 21 (7.50%).

Women aged 30-39 years had the highest uptake. Uptake is lowest among adolescents, indicating that younger mothers are less likely to utilize preventive malaria treatment.

**Table 2: Maternal Level of Education and Uptake.**

Level of education	Did not go to school	Completed primary school	Completed only junior WAEC	Completed senior WAEC	Has tertiary education
No of women	5	36	67	105	67
%	1.79	12.86	23.93	37.50	23.93



From table, on the effect of maternal level of education and the uptake of intermittent preventive treatment among the participants, it can be seen that the highest number of

women that took the drug was 105 (37.50%), and these were women that have completed secondary education, the second highest number of women that took the IPT-SP

was 67 (23.93%), and these women had tertiary education, and coincidentally was the same number as those that completed only junior secondary education. The lowest number was 5 (1.79%), and were those that did not complete primary education. Uptake increases with educational attainment, peaking among women with senior secondary education. Education is a strong predictor of IPT-SP utilization.

## DISCUSSION

The present study investigated the association between maternal age and education and the utilisation of intermittent preventive treatment with sulphadoxine-pyrimethamine (IPTp-SP) among pregnant women attending antenatal clinics in primary health centres in Orlu Zone, Imo State. Findings showed that maternal age and education had a significant effect on the use of IPTp-SP.<sup>[13]</sup>

The study found that the highest uptake of IPTp-SP was among women aged 30–39 years, and the lowest uptake was among adolescents aged 19 years and below. The finding indicates that the use of malaria prevention interventions during pregnancy increases with maternal age. Older women may have greater health awareness, more autonomy in decision making, more previous experience of pregnancy and a greater appreciation of antenatal services compared with younger women. Similar findings have been observed in sub-Saharan Africa where maternal age has been identified as a significant predictor of antenatal care utilisation and uptake of malaria preventive services.<sup>[14]</sup>

Late antenatal booking, poor knowledge of malaria prevention strategies, limited financial resources, social stigma associated with teenage pregnancy and reduced exposure to health information may account for the low uptake among adolescent mothers. Adolescents often encounter barriers that hinder their optimal utilisation of maternal health services and are at increased risk of malaria-related complications during pregnancy.<sup>[15]</sup>

Educational attainment was also a strong predictor of IPTp-SP uptake. The highest rates of utilisation were found among women who completed senior secondary education and the lowest rates of uptake among women with no formal education. Health literacy, understanding of malaria prevention strategies, communication with health care providers and adherence to antenatal care recommendations are likely to be improved by education. Women with higher education levels are more likely to recognise the benefits of preventive interventions, and therefore are more likely to accept and complete the recommended doses of IPTp-SP.<sup>[16]</sup>

This finding is consistent with previous studies in Nigeria, Ghana, Kenya and Tanzania that reported significantly higher IPTp-SP uptake among women with secondary and tertiary education. Education level has always been one of

the most important determinants of maternal health care utilisation because it increases access to health information, improves socioeconomic opportunities and strengthens women's capacity to make informed decisions over their health care.<sup>[17]</sup>

The findings also indicate that socio-demographic inequalities still influence the access to malaria preventive services despite the widespread availability of antenatal care services. Many women attend antenatal clinics but age and educational status differences lead to disparities in use of recommended preventive interventions.<sup>[18]</sup> This finding is in agreement with previous reports that high antenatal care attendance does not necessarily translate to optimal IPTp-SP uptake.<sup>[19]</sup>

The low overall prevalence of optimal IPTp-SP uptake (16.75 %) found in this study is a matter of concern. The prevalence is far below the national and international targets and reflects lost opportunities in antenatal care services. Contributing factors may include late initiation of ANC, inadequate counselling, irregular drug supply, non-implementation of directly observed therapy (DOT) and poor compliance with national malaria prevention guidelines.<sup>[20]</sup>

## CONCLUSION

Maternal age and education level were significant predictors of uptake of intermittent preventive treatment with sulphadoxine-pyrimethamine among pregnant women attending antenatal clinics in primary health centres in Orlu Zone of Imo State. Highest uptake was observed among the age group of 30-39 years and among those with secondary education and the lowest utilisation was observed among Adolescents and those with no formal education. The results indicate that socio-demographic factors continue to be important determinants of malaria prevention practices during pregnancy. Improving female education, promoting early antenatal registration, better health education during antenatal visits and targeted interventions for younger mothers may add substantially to IPTp-SP coverage and improve the health of mothers and babies.

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