

## **Original Research Article**

### **NEAR MISS OBSTETRIC EVENTS AND ITS CORRELATES AT A TEACHING HOSPITAL IN SOUTH-SOUTH, NIGERIA**

#### **ABSTRACT**

**Background:** Maternal Near Miss refers to a woman who nearly died but survived a complication during pregnancy, delivery, or within 42 days of termination of pregnancy. It serves as a tool that allows clinicians and health facilities to assess and improve the quality of maternal health care.

**Aim and Objectives:** To evaluate the factors associated with maternal near-miss morbidity at the University of Port Harcourt Teaching Hospital (UPTH).

**Material and Methods:** A retrospective institution-based cross-sectional study was carried out at the department of Obstetrics and Gynaecology of the University of Port Harcourt Teaching Hospital. A stratified sampling method was used to select the folders of 610 women who were managed during pregnancy, labour or postpartum period, abortion and ectopic pregnancy between January 1, 2018, and December 31, 2020. Data collection tool was used to obtain socio-demographic and obstetric characteristics from folders and SPSS 25 used for analysis. Mean and standard deviation was used to summarize descriptive data, while the test for association was done using chi-square test and logistic regression. The results are presented in tables.

**Results:** The majority 214 (35.1%) of the women were aged 30 - 34 years, with a mean age of  $31.57 \pm 5.0$  years. Most 541, (88.7%) of the women were married, more than half 335 (54.9%) had tertiary education, while 273 (44.8%) were engaged in partly skilled jobs. About one-fifth

138 (22.6%) of the women were booked. Single marital status (aOR: 2.46; 95% CI: 0.99-6.13; p=0.043), unbooked status (aOR=4.74, 95% CI: 1.93-11.68, p=0.001) gravidity (aOR=3.34, 95% CI: 1.63-6.85, p=0.001) and parity (aOR=0.32, 95% CI: 0.14-0.70, p=0.005) were observed to be significant determinants of MNM.

**Conclusion:** There is a huge burden of maternal near-miss conditions at UPTH. Early detection and treatment of these potential causes may provide a window of opportunity to reduce maternal morbidity and mortality.

**Keywords:** Maternal Near miss, Associated factors, South-south, Nigeria

## 1. INTRODUCTION

Maternal mortality was previously used as an indicator to monitor the maternal health of a nation and has been of global concern for decades. However, studies have shown that maternal mortality accounts for only a small fraction of the burden of maternal morbidity, since it represents only the end of a spectrum, because for every one of these maternal deaths, there is a huge burden of maternal morbidity which is a potential cause of long-term disabilities.<sup>[1,2]</sup> This led the World Health Organization in 2014 to begin to stress the significance of going beyond merely reporting deaths to better understanding of why they occur and how they might be averted.<sup>[3]</sup> These unfavorable obstetric events that result in maternal deaths can be prevented if timely interventions are carried out to save the woman's life.<sup>[4]</sup> As a result, women who survive these difficulties may serve as surrogates, providing crucial data for a better understanding of these preventable disorders that lead to maternal death (MD).<sup>[5]</sup>

A maternal near miss (MNM) is regarded as the survival of women with life-threatening conditions, either due to timely management or by chance. MNM shares similar characteristics

with MD. It was described as a supplement to assessing severe maternal outcomes and maternal deaths. <sup>[4,6]</sup>

MNM is defined by WHO (2011) as a woman who nearly died but survived a complication during pregnancy, delivery, or within 42 days of termination of pregnancy. <sup>[7]</sup> The World Health Organization (WHO) did, however, adopt a standardized systematic MNM strategy in 2011. <sup>[8]</sup> MNM obstetric events are assessments of women who nearly died but survived a potentially fatal condition during pregnancy, labour, or puerperium. <sup>[9]</sup> The WHO criteria include a set of clinical criteria, laboratory markers, and organ system dysfunction, all of which represent the severity of illnesses and allow MNM cases to be identified. <sup>[8]</sup>

The MNM instrument is a useful tool for evaluating the quality of obstetric care and providing insight into the chain of events that eventually leads to MDs. Because these near-miss incidents occur more frequently, the survivors have a greater opportunity to recount their tale than in the cases of MDs. It enables the assessment of shortcomings in the standard of obstetric care, the reduction of maternal morbidity and death, and the improvement of pregnancy outcomes. It also allows for comparisons between different studies as well as between countries and regions. <sup>[6,10]</sup>

Previous research on maternal near misses from around the world indicated different causes. Maternal morbidity and near miss have two causes namely direct and indirect obstetrics causes. Postpartum haemorrhage, pre-eclampsia, eclampsia, obstructed labour, uterine rupture, unsafe abortion, and infection are direct causes. The indirect causes include chronic diseases or diseases that developed during pregnancy and are not caused by direct causes but are exacerbated by the pregnancy or its management. Human immunodeficiency virus (HIV/AIDS) infection, tuberculosis, anaemia, and cardiac disease in pregnancy are examples of indirect causes. <sup>[7, 9, 11,12]</sup>

Studies have shown that the predictors of maternal near miss are advanced maternal age, race,

illiteracy, polygamous family, low socioeconomic status, rural residency, fewer or no antenatal care (ANC) follow-up, multiple pregnancies, high parity, previous cesarean delivery, caesarean delivery in the current pregnancy, pre-existing medical conditions, lack of referral, lack of insurance coverage, anaemia, and extremes of body weight. [5, 13-23]

The annual reports of the department of Obstetrics and Gynaecology of the University of Port Harcourt Teaching Hospital revealed a tremendous burden of maternal near miss conditions, yet there is no documentation on the risk factors associated with maternal near miss conditions at the study center. Hence, the study sought to identify the factors associated with maternal near-miss among women admitted at the University of Port Harcourt Teaching Hospital.

## **2. MATERIAL AND METHODS**

### **Study Area**

The University of Port Harcourt Teaching Hospital (UPTH) is a tertiary healthcare facility in Alakahia community in Obio-Akpor Local Government Area (LGA) of Rivers state, Nigeria. It has a total capacity of 884 beds. It provides general and specialized services to patients, as well as serving as a referral center for the majority of the state's peripheral hospitals and health centers. The Obstetrics and Gynaecology department is one of the major clinical departments, accounting for 19.8 percent of the total hospital bed, with 175 beds: 30 in the antenatal ward, 40 in the postnatal ward, 40 in the unbooked lying-in ward, 36 in the gynaecological ward, and 8 in the private/semi-private rooms. The labour ward complex has two admission rooms, 9 beds in the first stage room for booked patients, 4 beds in the first stage room for unbooked patients, 4 delivery suites and a theatre.

An average of 100-120 deliveries is conducted monthly with an average annual delivery of 1500.

The hospital provides a 24-hour emergency and intensive care services, a functional blood bank,

neonatal intensive care unit and an intensive care unit. Women with risk factors or obstetric complications are referred to the hospital from primary and secondary care hospitals, as well as from neighbouring states.

### **Study Design**

This was a retrospective institution-based cross-sectional study conducted at the Obstetrics and Gynaecology department of UPTH from January 1, 2018, to December 31, 2020, to determine the prevalence and pattern of maternal near miss. All pregnant women managed at the UPTH during the antenatal period, delivery or within 42 days of termination of pregnancy from January 1, 2018, to December 31, 2020.

### **Inclusion criteria**

Mothers who presented during the antenatal period, in labour, had delivered or aborted or presented within 42 days of termination of pregnancy with or without obstetric complications, and women who presented with ectopic pregnancy during the study period.

### **Exclusion criteria**

Mothers with complications unrelated to pregnancy, and women with incomplete case records were excluded from the study.

### **Method / Study procedure**

The stratified sampling technique was used to select the women who presented with or without complications during pregnancy, delivery, and 42 days following termination of pregnancy into the three years of study, and the sample was allocated proportionally to size to each year. The assigned sub-samples for each stratum were chosen using a simple random sampling technique with a table of random numbers drawn from 4,598 case records. Thereafter, data was retrieved

from the selected case records using the standardized WHO Maternal Near Miss Tool (WHO, 2011) which was adapted to incorporate information on socio-demographic profile and obstetric history.

### **Data Collection**

Data was collected for eight weeks, from April 1 to May 31, 2021. Three house officers were recruited as research assistants and received a one-day training on data collection procedures and research protocol, including confidentiality. The folders of selected sub-samples were obtained from the hospital's Records department. The review of records included information on socio-demographic factors, obstetrics history, diagnosis, laboratory findings, therapy and management, and near-miss criterion-based clinical audit. The occupational status was divided into six categories, which are as follows:

- a. professional/Higher managerial occupation e.g Doctors, Lawyers, Engineers, Accountants
- b. Intermediate/Lower occupational occupation e.g Bankers, Teachers
- c. Manual skilled occupation e.g Tailors, Masons/Bricklayers, Carpenters, Electricians
- d. Partly skilled occupation e.g Clerical officers, Traders
- e. Unskilled occupation e.g Janitors, day, or night watchmen
- f. Never worked/Long term unemployed

Each questionnaire was assigned a unique identifier to ensure anonymity and ease of identification. Data on total deliveries, total number of live births, and maternal mortality were obtained from wards, labor wards, ICUs, and theatre records during the review period. The data collection tools were reviewed daily for accuracy and completeness. The data was entered sequentially by the researcher and three research assistants.

## **Data Analysis**

Data was coded and entered in Microsoft Excel Spreadsheet, cleaned, and analyzed using the IBM Statistical Package for Social Sciences (SPSS) version 25.0 software. Descriptive statistics such as means, median, percentages, frequencies, ratios, and standard deviation were used to describe the socio-demographic characteristics and pattern of MNM. Results are displayed in means and percentages and presented in tables.

## **Ethical Consideration**

Ethical clearance was obtained from the Research and Ethics committee of the University of Port Harcourt Teaching Hospital before commencement of the study. There was no direct interaction with the women and the study simply analyzed their case records, hence informed consent from the women was not necessary. However, the study was conducted in compliance with the Helsinki Declaration.

## **3. RESULTS**

### **3.1 Socio-demographic Characteristics**

Table 1 showed that 214 (35.1%) women were aged 30 - 34 years which constituted the highest proportion, with a mean age of  $31.57 \pm 5.0$  years. Majority 541, (88.7%) of the women were married. About 335 women had tertiary education and constituted the highest proportion (54.9%). With regards to occupational status, most of the women, 273 (44.8%) were engaged in partly skilled jobs, followed by 179 women who have never worked or were unemployed for a long time, constituting 29.3%.

The husbands' level of education correlated with those of the women, with majority, 393 (64.5%) of the men having tertiary education. About half of the women's spouses, 297 (48.7%)

were engaged in non-manual skilled occupation, while the lowest proportion was in the unskilled occupation group, constituting 0.8%. This is shown in Table 2.

### **3.2 Obstetric characteristics of the women**

Table 3 showed the obstetric characteristics of the women. With regards to the number of pregnancy (gravidity), only the data for 549 (90%) women was available, which showed that most of the women, 264 (48.1%) had 2-3 pregnancies, while 93 women (16.9%) had either not been pregnant before or had only been pregnant once, with a mean gravidity of  $3.07 \pm 1.57$ . Most of the women, 273 (44.8%) had 2-4 deliveries, only 11 (1.8%) of them had five or more deliveries with a mean parity of  $1.44 \pm 1.28$ . Three hundred and eleven women had one to two living children, accounting for the highest proportion, while 9 (1.5%) of them had 5 or more living children.

Of the 610 women, 371 (60.8%) of them were booked while 101 (16.6%) booked elsewhere. Unbooked women made up 22.6%, accounting for about one-fifth of the study population. Additionally, 182 women were referred, of which 68 (37.4%) of them were from primary health centres, constituting the highest proportion, with 24 (13.2%) referrals from secondary health centres.

### **3.3 Socio-demographic Determinants of Maternal Near Miss**

As shown in Table 4, bivariate logistic regression analysis was done for socio-demographic variables. The variables included maternal age, marital status, educational status of women and their spouses and all showed a statistically significant relationship with maternal near miss. The table further showed that women who are < 30 years of age are about 5 times at odds of having maternal near miss condition compared with those who are  $\geq 30$  years (cOR=1.59, 95% CI: 1.06-2.41,  $p=0.025$ ). It also observed that single women were 4.27 times more likely to develop

maternal near miss conditions than married women (cOR=4.27, 95% CI: 2.48-7.35, p=0.001). Similarly, the study showed 2.97 odds of maternal near miss among mothers with secondary education or less compared with those who had tertiary education (cOR=2.97, 95% CI: 1.96-4.50, p=0.001). Additionally, the table showed that women whose spouses had secondary education were 3.49 times at odds of maternal near miss compared with those whose spouses had secondary education or less (cOR=3.49, 95% CI: 2.32-5.23, p=0.001) compared to women whose spouses who had tertiary education.

Multivariate logistic regression analysis for socio-demographic determinants of maternal near miss is as displayed in Table 5, which showed that marital status was the most significant determinant of maternal near miss of all the socio-demographic variables. Single women were 2.46 times at odds of having a maternal near miss compared to married women (aOR: 2.46; 95% CI: 0.99-6.13; p=0.043). There was no statistically significant relationship between maternal age, the educational status of the women and their spouses with maternal near miss after adjusting for confounders.

#### **3.4 Obstetric Determinants of Maternal Near Miss**

Table 6 showed bivariate logistic regression analysis for obstetric determinants of maternal near miss. There was a statistically significant relationship between the booking status, gravidity, parity, and number of living children and maternal near miss. The table showed that 26 (28.26%) and 69 (53.08%) of the women with maternal near miss were booked elsewhere and unbooked respectively compared to 343 (92.45%) of women with uncomplicated pregnancies that were booked at UPTH. Booked elsewhere and unbooked status was significantly associated with maternal near miss. Those who booked elsewhere were about 4.38 times more likely to have maternal near miss conditions compared with those who booked at the study location (cOR=

4.83; 95% CI: 0.11-0.39,  $p = 0.001$ ). Similarly, unbooked cases are about 14 times at odds of maternal near miss compared with those women who booked at UPTH (cOR= 13.86; 95% CI: 0.19-0.61;  $p = 0.001$ ). In addition, a higher proportion of women with 4 or more pregnancies (20.83%) experienced a maternal near miss compared with those with 3 or less pregnancies, hence showing a statistically significant relationship (cOR= 1.99; 95% CI: 1.24- 3.21;  $p = 0.009$ ).

Parity was significantly associated with maternal near miss. Women with more than 2 deliveries were about 20 times more likely to have maternal near miss conditions compared to those with none or one pregnancy (cOR= 19.61; 95% CI: 0.56- 1.24;  $p = 0.0002$ ). Furthermore, there was also a statistically significant relationship between number of living children and maternal near miss. Those who had maternal near miss conditions had 3 or more living children. Logistic regression showed that those with 3 or more living children are about 2 times at odds of maternal near miss compared to those with 0-2 children (cOR= 1.83; 95% CI: 1.14- 2.94;  $p = 0.001$ ).

From Table 7, the multivariate logistic regression analysis still showed a statistically significant relationship between booking status, gravidity, and parity with maternal near miss. It was observed that unbooked women were 4.74 times at odds of experiencing maternal near miss compared with booked women (aOR=4.74, 95% CI: 1.93-11.68,  $p=0.001$ ).

Women with 4 or more pregnancies were still shown to be significantly associated with maternal near miss, with 3.34 times odd of experiencing a maternal near miss compared with women who had three or less pregnancies (aOR=3.34, 95% CI: 1.63-6.85,  $p=0.001$ ). Similarly, there was a statistically significant association between parity and maternal near miss, with a higher proportion observed in women with 2 or more deliveries (cOR=0.32, 95% CI: 0.14-0.70,

**Comment [AB1]:** No history is documented in relation to antenatal complications in previous pregnancy??

$p=0.005$ ). However, there was no statistically significant relationship between number of living children and maternal near miss.

UNDER PEER REVIEW

**Table 1: Socio-demographic characteristics of the women**

<b>Variable</b>	<b>Frequency (n=610)</b>	<b>Percent</b>
<b>Age as at last birthday (years)</b>		
<20	10	1.6
20-24	45	7.4
25-29	147	24.1
30-34	214	35.1
35-39	170	27.9
≥40	24	3.9
<b>Mean Age</b>	<b>31.57 ± 5.0</b>	
<b>Marital status</b>		
Married	541	88.7
Single	69	11.3
<b>Level of education completed</b>		
No formal education	2	0.3
Primary	36	5.9
Secondary	237	38.9
Tertiary	335	54.9
<b>Occupational status</b>		
Professional/higher managerial occupations	42	6.9
Intermediate/lower managerial occupation	114	18.7
Manual skilled occupation	2	0.3
Partly skilled occupation	273	44.8
Unskilled occupation	0	0.0
Never worked/long term unemployed	179	29.3
<b>Religion</b>		
Christianity	584	95.7
Islam	26	4.3

**Table 2: Socio-demographic characteristics of their husbands**

<b>Variable</b>	<b>Frequency (<i>n=610</i>)</b>	<b>Percent</b>
<b>Husbands' Level of education completed</b>		
No formal education	2	0.3
Primary	44	7.2
Secondary	171	28.0
Tertiary	393	64.5
<b>Husbands' Occupational status</b>		
Professional/higher managerial occupations	102	16.7
Intermediate/lower managerial occupation	135	22.1
Non-manual skilled occupation	297	48.7
Manual skilled occupation	71	11.7
Unskilled occupation	5	0.8

**Table 3: Obstetric characteristics of the women**

Variable	Frequency (n=610)	Percent
<b>Gravidity (number of pregnancies) (n=549)<sup>γ</sup></b>		
≤1	93	16.9
2-3	264	48.1
4 or more	192	35.0
<b>Mean</b>	<b>3.07 ± 1.57</b>	
<b>Parity (number of delivery)</b>		
Para 0	184	30.2
Para 1	142	23.2
Para 2-4	273	44.8
Para ≥ 5	11	1.8
<b>Mean</b>	<b>1.44 ± 1.28</b>	
<b>Number of living Children</b>		
None	190	31.1
1-2	311	51.0
3-4	100	16.4
≥ 5	9	1.5
<b>Mean</b>	<b>1.41 ± 1.28</b>	
<b>Booking status</b>		
Booked	371	60.8
Booked elsewhere	101	16.6
Unbooked	138	22.6
<b>Gestational age at booking (n=371)</b>		
<b>Mean</b>	<b>18.49 ± 5.09 weeks</b>	
<b>Patient referred to the facility (n=239)</b>		
Yes	182	76.2
No	57	23.8
<b>Sources of Referral (n=182)</b>		
Primary Health centre	68	37.4
Traditional Birth Attendants / Church	47	25.8
Private clinic / Maternity	43	23.6
Secondary Health centre	24	13.2

<sup>γ</sup> = number of pregnancies was not stated in some folders

**Table 4: Bivariate Analysis for Socio-demographic Determinants of Maternal Near Miss**

Variables	Maternal Near miss		$\chi^2$ (P-value)	cOR [95% CI]
	(Freq %)			
	Yes n=123	No n=470		
<b>Maternal age (years)</b>				
$\geq 30^R$	73 (18.16)	329 (81.84)	-	-
< 30	50 (26.18)	141 (73.82)	5.056 ( <b>0.025</b> )*	1.59R [1.06-2.41]
<b>Marital status</b>				
Married <sup>R</sup>	93 (17.55)	437 (82.45)	-	-
Single	30 (47.62)	33 (52.38)	30.921 ( <b>0.001</b> )*	4.27 R [2.48-7.35]
<b>Educational level of mother</b>				
Tertiary <sup>R</sup>	43 (12.95)	289 (87.05)	-	-
$\leq$ Secondary	80 (30.65)	181 (69.35)	27.798 ( <b>0.001</b> )*	2.97R [1.96-4.50]
<b>Educational level of spouse</b>				
Tertiary <sup>R</sup>	71 (34.98)	132 (65.02)	-	-
$\leq$ Secondary	52 (13.33)	338 (86.67)	37.973 ( <b>0.001</b> )*	3.49 [2.32-5.23]

\*Statistically significant ( $p < 0.05$ ); Notes: R= reference, cOR= crude Odds Ratio

**Table 5: Multivariate Analysis for Socio-demographic Determinants of Maternal Near miss**

Variables	Maternal Near miss (Freq %)		aOR [95% CI]	P-value
	Yes	No		
	n=123	n=470		
<b>Maternal age (years)</b>				
≥ 30 <sup>R</sup>	73 (18.16)	329 (81.84)	-	-
< 30	50 (26.18)	141 (73.82)	0.95 [0.48-1.88]	0.877
<b>Marital status</b>				
Married <sup>R</sup>	93 (17.55)	437 (82.45)	-	-
Single	30 (47.62)	33 (52.38)	2.46 [0.99-6.13]	<b>0.043*</b>
<b>Educational level of mother</b>				
Tertiary <sup>R</sup>	43 (12.95)	289 (87.05)	-	-
≤ Secondary	80 (30.65)	181 (69.35)	1.71 [0.70-4.18]	0.238
<b>Educational level of spouse</b>				
Tertiary <sup>R</sup>	71 (34.98)	132 (65.02)	-	-
≤ Secondary	52 (13.33)	338 (86.67)	1.08 [0.45-2.61]	0.867

\*Statistically significant (p<0.05); Notes: R=reference, aOR=adjusted Odds Ratio

**Table 6: Bivariate Analysis for Obstetric determinants of Maternal Near Miss**

Variables	Maternal Near miss (Freq %)		$\chi^2$ (P-value)	cOR [95% CI]
	Yes n=123	No n=470		
<b>Booking Status</b>				
Booked <sup>R</sup>	28 (7.55)	343 (92.45)	-	-
Booked elsewhere	26 (28.26)	66 (71.74)	30.634 ( <b>0.001</b> )*	4.38R [0.11-0.39]
Unbooked	69 (53.08)	61 (46.92)	127.563 ( <b>0.001</b> )*	13.86R [0.19-0.61]
<b>Gravidity (number of pregnancy)<sup>Y</sup>(n=87; 462)</b>				
$\leq 3$ <sup>R</sup>	47 (13.17)	310 (86.83)	-	-
$\geq 4$	40 (20.83)	152 (79.17)	9.52 ( <b>0.009</b> )*	1.99 [1.24- 3.21]
<b>Parity (number of delivery)</b>				
Para 0-1 <sup>R</sup>	70 (22.15)	246 (77.85)	-	-
Para $\geq 2$	53 (19.13)	224 (80.87)	0.83 ( <b>0.0002</b> )*	19.61 [0.56-1.24]
<b>Number of living Children</b>				
0-2 <sup>R</sup>	91 (19.16)	410 (81.84)	-	-
$\geq 3$	32 (29.36)	60 (70.64)	25.85 ( <b>0.001</b> )*	1.83 [1.14- 2.94]

\*Statistically significant (p<0.05); Notes: R= reference, cOR= crude Odds Ratio  $\gamma$ =Some folders had no record

**Table 7: Multivariate Analysis for Obstetric determinants of Maternal Near Miss**

Variables	Maternal Near miss (Freq %)		aOR [95% CI]	P-value
	Yes	No		
	n=123	n=470		
<b>Booking Status</b>				
Booked <sup>R</sup>	28 (7.55)	343 (92.45)	-	-
Booked elsewhere	26 (28.26)	66 (71.74)	2.27 [0.86-5.97]	0.096
Unbooked	69 (53.08)	61 (46.92)	4.74[1.93-11.68]	<b>0.001*</b>
<b>Gravidity (number of pregnancy)<sup>γ</sup></b>				
≤ 3 <sup>R</sup>	47 (13.17)	310 (86.83)	-	-
≥ 4	40 (20.83)	152 (79.17)	3.34 [1.63-6.85]	<b>0.001*</b>
<b>Parity (number of delivery)</b>				
Para 0-1 <sup>R</sup>	70 (22.15)	246 (77.85)	-	-
Para ≥ 2	53 (19.13)	224 (80.87)	0.32 [0.14-0.70]	<b>0.005*</b>
<b>Number of living Children</b>				
0-2 <sup>R</sup>	91 (19.16)	410 (81.84)	-	-
≥ 3	32 (29.36)	77 (70.64)	1.28 [0.48-3.37]	0.625

\*Statistically significant (p<0.05); Notes: R= reference, aOR= Adjusted Odds Ratio γ=Some folders had no record

#### 4 DISCUSSION

Maternal morbidity and mortality have remained unacceptably high in resource-poor countries. Maternal mortality has been shown to be a small fraction of the burden of maternal morbidity, as it represents only the end of a spectrum, hence the need to evaluate maternal near miss.<sup>[1,2,12,24]</sup>

Maternal “near-miss obstetrics events” (MNM) is a review of cases at the severe end of the maternal morbidity spectrum of women who nearly died but survived a life-threatening condition during pregnancy, delivery and postpartum.<sup>[9]</sup>

Determinants are referred to as attributes or exposures that increase the likelihood of a disease or specified outcome, in this case near miss morbidity. The socio-demographic characteristics found to be substantially linked with maternal near miss in this study were maternal age below 30 years ( $p=0.025$ ), being single ( $p=0.001$ ), and low level of education of the women and their husbands ( $p=0.001$ ). Similar relationships were observed in Ife and Enugu.<sup>[13,14]</sup> Both studies were carried out in Tertiary hospitals in Nigeria, which may explain the similarities. In contrast, polygamy, rural housing, long distance from hospital, poor monthly income, and job in the agricultural sector were identified as significant associations in research conducted in Uganda, Ethiopia, South Sudan, and India.<sup>[9,15,17,19,21,23]</sup>

Single marital status was observed to be the most significant socio-demographic predictor of maternal near miss, with a two-fold increase in risk when compared to married counterparts. This was corroborated by the findings in Ile-Ife and Ethiopia.<sup>[13,15]</sup> This emphasizes the importance of male involvement and support in maternity care in developing countries, as unmarried women are more likely to lack male support. In Thailand, on the other hand, single marital status was found to be protective for near miss.<sup>[25]</sup> This disparity could be because women in industrialized

countries are frequently more empowered and financially independent, enabling them to seek care earlier and have health insurance to cover the expense of care.

Unbooked status was observed to be a significant determinant of maternal near miss in this study, with unbooked women having a four to five times higher probability of a near miss than booked women. These women were transferred from peripheral health centres, homes of traditional birth attendants, private clinics, and maternity homes. This could be due to a delay in seeking appropriate care, delay in detecting potentially life-threatening complications as well as a poor referral system. Similar findings were reported in several other studies conducted in Nigeria, Uganda, Ethiopia, and Morocco.<sup>[5,15-20]</sup> Women who received antenatal care are more likely to have a better health seeking behaviour, present early for emergency obstetric care and give birth in hospitals with skilled birth attendants and receive postpartum care. However, it was at variance with the report in India where maternal near miss conditions occurred more in booked patients, this may be because it is a tertiary care centre where high-risk patients registered for antenatal care.<sup>[26]</sup>

Gravidity and Parity were also identified as independent determinants of maternal near miss, as multigravid and multiparous women were more likely to experience a maternal near miss condition. Similar observations were made in South Sudan, Western Ethiopia, Northern Ethiopia, Iran, and India.<sup>[15,19,21-23]</sup> Hence, there may be a need to increase awareness, broaden access and overcome known barriers to family planning services, to limit the number of pregnancies, thereby reducing near miss morbidities.

## 5. CONCLUSION

This study found a significant association between maternal age less than 30 years, single marital status, primary and secondary level of education, and unbooked status and maternal near miss at the University of Port Harcourt Teaching Hospital. The authors recommend scaling up of peripheral health facilities to be able to provide comprehensive emergency obstetric care, with regular and progressive assessment, and strengthening the health systems at all levels to ensure health workers promptly refer complicated cases by establishing linkages between peripheral health care facilities and the referral hospitals, to minimize delays.

**Comment [AB2]:** What are the training or minimal facilities you expect the peripheral health care centers should have?? Any measures you suggest to the Doctors or other health care providers in periphery to identify the patient conditions as early as possible and refer them to tertiary centers like yours

## REFERENCES

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