ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25jun1071

Pre-Natal Alcohol Use Disorder: Prevalence and Pregnancy Outcomes in Plateau State North Central Nigeria

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Publication Date: 2025/06/26

Abstract:

- ***Background:***

Alcohol use and alcohol use disorder among pregnant women have been recognized as a major public health problem globally and appear to be on the increase in Africa, particularly in Nigeria. It is of importance because of its effect on the mother and the unborn child. This study was meant to determine the prevalence of prenatal alcohol use disorder and also assess pregnancy outcomes in pregnant women with prenatal alcohol use disorder.

- ***Methodology:***

It was a facility-based, descriptive cross-sectional study conducted at Vom Christian Hospital and General Hospital, Barkin-ladi, among 263 pregnant women attending the antenatal clinic. A multi-stage sampling technique was used to select study participants and data collection tools were interviewer/self-administered questionnaires and alcohol use disorder identification test questionnaires. Data was analyzed using statistical package for social sciences software version 23 and p values < 0.05 was considered significant statistically. Logistic regression analysis was used to determine predictors of alcohol use disorder.

- ***Results:***

The prevalence of alcohol use disorder in pregnancy was 14%, with 22.8% of those with alcohol use disorder being dependent. The age band, 35+ (75.5%) was associated more with alcohol use disorder. Women whose spouses used alcohol were 3 times more likely to have alcohol use disorder (OR = 3.129; 95% C.I. = 0.695-14.0.85). In respect of pregnancy outcome, only history of prematurity 5 (100.0%) was significantly associated with alcohol use disorder (p = 0.046). Low level of education was predictive of alcohol use disorder.

- ***Conclusion:***

This study found a high prevalence of alcohol use disorder among the study population. There was a significant association between prenatal alcohol use disorder and prematurity. Low level of education was predictive of alcohol use disorder.

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➢ ***Recommendations*:**

Government and development partners should build the capacity of health care workers on the implications of prenatal alcohol use. Health talks during ante-natal care should, as a matter of policy, prioritize the implications of alcohol use in pregnancy. The government should establish a national policy on prenatal alcohol use with emphasis on community mobilization and health promotion.

Keywords: *Alcohol Use Disorder, Prenatal, Pregnancy Outcomes, Prevalence.*

How to Cite: Agbo Paul Ede; Ogwuche John Igoche; Changkat Lucky Lohnan; Mary Momoh; Kingsley Omaji Onaji; Rashida Musa; Okoro Steve Chinedu; Agbo Favour Ene; Abdulmumuni Ahmed Lawal (2025) Pre-Natal Alcohol Use Disorder: Prevalence and Pregnancy Outcomes in Plateau State North Central Nigeria. *International Journal of Innovative Science and Research Technology*, 10(6), 1871-1879. https://doi.org/10.38124/ijisrt/25jun1071

I. INTRODUCTION

It has been observed that more women are engaging in alcohol use from an early age [1,2] and continue to take alcohol before becoming aware of their pregnancy status[3]. It has also been documented that a significant number of women continue to take alcohol even after learning that they are pregnant, thereby exposing their fetuses to the toxic effects of alcohol[4,5,6]. Despite the increasing number of women engaging in alcohol use, only about 9.8% of women worldwide consume alcohol during pregnancy[4].

Women are more vulnerable to the toxic effects of alcohol due to decreased "First pass" metabolism as a result of low levels of alcohol dehydrogenase, reduced body weight, lower total body water, and a higher proportion of body fat, hence causing intoxication more readily[7,8]. Unfortunately, most are unaware of the untoward effects of alcohol on fetuses like spontaneous abortion, stillbirth, prematurity, low birth weights (LBW), Intrauterine growth restriction (IUGR), and post-natal growth retardation[9–11]. The umbrella term for these toxic effects on the fetus is referred to as Fetal Alcohol Spectrum Disorder (FASD)[12]. Even though alcohol ingestion in small quantities is teratogenic, the risk of FASD, among other consequences, as well as its negative impact on pregnancy outcome, is directly proportional to the amount of alcohol consumed[13,14]. It is estimated that one in every 13 women who consumes alcohol during pregnancy gives birth to a child with FASD, and approximately 630,000 children are born with FASD globally every year[15].

Significantly, pregnant and non-pregnant women not only consume alcohol but also binge with a prevalence of 10.2% and 3.1% for alcohol use and 53.6% and 18.2% for binging, respectively in a study in the United States[16]. According to an international multicenter cross-cohort comparison, the rates of alcohol use in pregnancy range from 20% to 80% in Ireland and 40% to 80% in Australia, New Zealand, and the United Kingdom[17]. In another European study, the prevalence of alcohol use in pregnancy was 15.8% in general, but was as high as 28.5% among UK women, 26.5% and 20.9% among Russian and Swiss women, respectively[18]. Among Africans, one study gave a prevalence of 2.2% in Equatorial Guinea, 20.5% in Uganda, 14.8% in Sierra Leone, 4.3% in Algeria[19] and an estimated overall prevalence of 22% for the sub-Saharan African region[20]. Higher values of 32.5% and 32.4% were found in the Democratic Republic of Congo[21] and Burundi[20] respectively. In Nigeria, prenatal alcohol use ranges between 12.0% and 59.2% in the southern part of the country, with a dearth of recent studies in the northern part [22-25]. This study was meant to determine the prevalence of prenatal alcohol use disorder and also assess pregnancy outcomes in pregnant women with prenatal alcohol use disorder. Apart from the fact that studies bordering on alcohol use disorder in pregnancy are very scanty in this environment, the findings from this study may act as a nidus for further research and will be presented to relevant stakeholders with the hope that it may influence policy decisions appropriately.

II. MATERIALS AND METHODS

➢ *Study Setting*

The study was a facility-based study conducted at the antenatal clinics of the Vom Christian Hospital (VCH) and General Hospital Barkin-Ladi in Jos South and Barkin-ladi Local Government Areas (LGAs), respectively of Plateau State. The main occupation of these LGAs' residents is farming; the predominant tribe is Berom. VCH is a 300-bed capacity, faith-based secondary health facility that has a memorandum of understanding with Jos University Teaching Hospital for resident doctors' postings. The Psychiatry Department of Jos University Teaching Hospital maintains a Center for Addiction Treatment and Research (CATR) in this facility. General Hospital, Barkin-Ladi is an 88-bed secondary health facility that is managed by the Plateau State Hospital Management Board and is the only secondary health facility in the entire local government area[26].

➢ *Study Design*

This study employed a descriptive cross-sectional study design.

➢ *Study Population*

Pregnant women attending the Antenatal Clinic of VCH and General Hospital, Barkin Ladi, at the time of the study.

➢ *Inclusion And Exclusion Criteria*

- *Inclusion criteria*

✓ Pregnant women between the ages of 15 years to 49 years attending the ANC clinic at the time of the study.
✓ Pregnant women who consented to participate in the study.

- *Exclusion criteria*

✓ Pregnant women using other substances with teratogenic potential in addition to alcohol.

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✓ Pregnant women who were not booked in the study facilities

➢ *Sample Size Determination*

The minimum sample size was calculated using the formula for determining sample size for a comparative study[47]

$$n = \frac{K\,(p^1q^1) + (p^2q^2)}{(p^1 - p^2)^2}$$

Where:
n = minimum same size
k = constant = 7.85
α = level of significance: usually set at 5% or (0.05)
p^1 = prevalence of alcohol use among a pregnant cohort.[42]
= 37.6% = 0.376
$q^1 = 1 - p^1 = 1\text{-}0.376 = 0.624$
p^2 = prevalence of alcohol use disorder among a pregnant cohort.[35]
= 25.79%= 0.258

$q^2 = 1 - p^2 = 1\text{-}0.258 = 0.742$

$$n = \frac{7.85\,(0.376 \times 0.624) + (0.258 \times 0.742)}{(0.376 - 0.258)^2}$$
= 240

10% of n was added to correct for non-response. A total of 264 eligible pregnant women were therefore enrolled.

➢ *Sampling Technique*

A multi-stage sampling technique was used.

- *Stage 1: Selection of Study Areas*

The two LGAs, Jos South and Barkin Ladi, were purposively selected for this study because of their reputations for widespread consumption of alcoholic beverages, especially local alcoholic brews.

- *Stage 2: Selection of Health Facilities*

The two facilities, Vom Christian Hospital and General Hospital Barkin-ladi, were purposively selected based on the fact that they both offer comprehensive ANC services and their reputations as sites with heavy patient loads.

- *Stage 3: Selection of Subject*

A systematic random sampling technique was used at the facility level to select the respondents. The line list of all pregnant women attending the ANC clinic at the two facilities was used as the sampling frame. The sampling interval (k) was obtained by dividing the number of pregnant women attending the ANC clinic by the calculated sample size for both facilities. The first pre-coded folder in all cases was randomly selected by balloting from the line list. Thereafter, every k^{th} folder based on the sampling interval was selected. In situations where the owner of a selected folder was unavoidably absent or does not consent to the study, the next consecutive folder in the list was selected. Thereafter, the sampling interval was reintroduced.

➢ *Study Instruments*

Data was collected using the following instruments:

- A semi-structured self/interviewer-administered (for those who could not read or write) questionnaire, adapted from similar studies in Nigeria, was used for this study[16]
- Alcohol Use Disorder Identification Test (AUDIT) questionnaire

This is a 10-item questionnaire designed in collaboration with the World Health Organization and is useful in screening for binging, hazardous drinking, harmful drinking and dependence. It uses a scoring system to categorize individuals into Lower risk, Increasing risk, higher risk, and Possible dependence. It has been validated in pregnancy and has a high sensitivity and specificity[31,32]. This questionnaire was translated into the Hausa language and back-translated by a lecturer in the Hausa department of the University of Jos. Studies have also shown that the internal consistency of the AUDIT is not affected by translation, changes in wording, and ordering of questions [33].

➢ *Scoring and Grading of the AUDIT Questionnaire*

- Cut-off for hazardous alcohol use (questions 1 to 3) was 6.
- Cut-off for dependence (questions 4 to 6) was 4.
- Cut-off for harmful use of alcohol (questions 7 to 10) was 7 points.

Scores ≥8 were considered an indicator of problematic alcohol use[30].

➢ *Study Participants were also Categorized into the Following Groups:*

- Abstainers = Did not report alcohol consumption since the onset of pregnancy.
- Light infrequent drinkers = Reported alcohol use during current pregnancy but never took 4 drinks at any time.
- Heavy infrequent drinkers = Reported drinking 4 drinks less than a month during current pregnancy.
- Heavy, moderate, frequent drinkers = Reported drinking at least 4 or more drinks on an occasion at least monthly.
- Heavy frequent drinkers = Reported drinking 4 drinks on an occasion at least weekly.
- Heavy regular drinkers = Reported drinking at least 4 drinks almost daily.

III. DATA COLLECTION

The study was carried out between January and April 2018 with the help of four research assistants who were earlier trained on the research protocol. To reduce the chances of misinformation concerning alcohol use in pregnancy, a slight modification of the first question of the AUDIT was done, and it read: "alcohol is used for many reasons and may be good in pregnancy, do you agree?".

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➢ *Data Management*

The questionnaires were serialized to avoid double entry and codes were used to ensure confidentiality. Data were checked for completeness and then entered into the computer for analysis. Independent or explanatory variables were age, sex, marital status, and job designation. Dependent or outcome variables were the pregnancy outcomes.

➢ *Data Analysis*

Data was analysed using the Statistical Package for Social Sciences (IBM) version 23. Data were summarized using tables, frequencies, and percentages for categorical variables; mean and standard deviation for symmetrical continuous variables, and differences in means were tested using the students' t-test. The association between categorical variables was tested using the chi-square test. Logistic regression analysis was used to predict the association between the level of education and AUD. With a confidence limit set at 95%, P<0.05 was considered statistically significant.

➢ *Ethical Consideration*

- Informed consent was obtained from each participant before enrolment into the study.
- Ethical clearance was obtained from the Health Research/Ethics Department of the State Ministry of Health

IV. LIMITATIONS OF THE STUDY

- The fact that it was a facility-based study may hamper the external validity to some extent.
- There was no way to determine the true extent of alcohol use, as some individuals may have underestimated or overestimated the quantity of alcohol consumed.
- Possible confounders like maternal nutritional status, previous antenatal attendance, circumstances surrounding pregnancy outcomes, and other constitutional states may affect the statistical power of the findings adversely.

V. RESULTS

A total of 263 pregnant women out of the 264 enrolled participated in the study, giving a response rate of 99%.

Table 1: Socio-Demographic Characteristics and Alcohol Use Disorder.

Variable	Status of alcohol use		χ^2	P
	AUD (%)	Non-AUD (%)		
Age group				
15-20	8 (61.5)	5 (38.5)		
21-25	8 (38.1)	13 (61.9)		
26-30	11 (40.7)	16 (59.3)		
31-35	4 (40.0)	6 (60.0)		
>35+	6 (75.0)	2 (25.0)	4.912	0.296
Religion				
Christianity	37 (50.0)	37 (50.0)		
Islam	0 (0.00)	5 (100.0)	2.909	0.088*
Denomination				
Catholic	6 (54.5)	5 (45.5)		
Pentecostal	4 (80.0)	1 (20.0)		
Others	26 (45.6)	31 (54.4)	2.316	0.314
Educational level				
None	10 (50.0)	10 (50.0)		
Primary	17 (100.0)	0 (100.0)		
Secondary	9 (24.3)	28 (75.7)		
Tertiary	1 (20.0)	4 (80.0)	28.354	0.001*
Occupation				
Housewife	0(0.0)	4(100.0)		
Trader	10 (45.5)	12 (54.5)		
Farmer	24 (60.0)	16 (40.0)		
Others	3 (23.1)	10 (73.9)	9.272	0.026*
Marital status				
Married	36 (46.2)	42 (53.8)		
Single	1 (100.0)	0 (0.0)	1.150	0.284

**Yate's correction factor.*

Table 1: Though the proportion of women with AUD was found more in the age group 35+ (75.5%), Pentecostal denomination (80.0%), and the unmarried (100.0%), the associations were not statistically significant. There were statistically significant associations between AUD and educational level and occupation ($p < 0.05$).

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25jun1071

Table 2: Prevalence of Alcohol Use Disorder (AUD) in the Study Population

Alcohol use disorder	Frequency	Percentage (%)
AUD	37	14.0
Non-AUD	42	16.0
Do not use alcohol	184	70.0
Total	263	100.0

Table 2: The prevalence of alcohol use disorder was 37(14.0%), while 42(16%) of women who consumed alcohol in pregnancy had no disorder.

Table 3: Association between Obstetric History and Alcohol Use Disorder.

Obstetric history	Status of alcohol use		χ^2	P
	AUD(%)	Non AUD(%)		
History of spontaneous abortion				
Yes	9(45.0)	11(55.6)		
No	28(47.5)	31(52.5)	0.036	0.849
History of stillbirths				
Yes	7(70.0)	3(30.0)		
No	30(43.5)	39(56.5)	2.467	0.116
History of prematurity				
Yes	5(100.0)	0(0.0)		
No	32(43.2)	42(56.8)	3.994	0.046*
History of jaundice in offspring				
Yes	9(64.3)	5(35.7)		
No	2843.1)	37(56.9)	2.081	0.149
History of low birth weight				
Yes	5(71.4)	2(28.6)		
No	32(44.4)	40(55.6)	1.866	0.172
History of congenital abnormalities				
Yes	3(50.0)	3(50.0)		
No	34(46.6)	39(83.4)	0.026	0.872
History of abnormal head circumference and birth length at birth				
Yes	1(100.0)	0(0.0)		
No	36(46.2)	42(53.8)	0.004	0.949*

**Yate's correction factor*

Table 3: Only the history of prematurity 5 (100.0%) was significantly associated with AUD (p = 0.046).

Table 4: Mean Scores of Gestational Age at Birth, Number of Pregnancies, and Number of Live Births

Variable	Status of Alcohol Use		T-Test	P
	AUD	Non AUD		
Gestational age	27.08±1.12	29.33±0.97	1.525	0.131
Number of pregnancies	3.97±0.44	2.90±0.28	2.088	0.040
Number of live births	2.47±0.36	1.31±0.23	2.834	0.006

Table 4: There was no significant difference in the mean gestational age between subjects with AUD compared to non-AUD (p = 0.131), even though the frequency was higher (29.33±0.97) in non-AUD. The mean number of pregnancies was significantly higher (p=0.040) in women with AUD (3.97±0.44) when compared with non-AUD women (2.90±0.28). Similarly, the mean differences in number of live births were significantly more (P=0.006) in subjects with AUD (2.47±0.36) compared with non-AUD subjects (1.31±0.23).

Table 5: Multiple Logistic Regression Analysis of AUD in the Study Population.

Variables	OR	95% Confidence Interval for OR		P
		Lower Bound	Upper Bound	
Status of spouse				
Use alcohol	3.129	0.695	14.085	0.137
Do not use alcohol	1.0			
History of abuse				

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25jun1071

Yes	1.916	0.385	9.525	0.427
No	1.0			
Educational level				
Informal/Primary	6.333	2.151	18.643	0.001
Secondary/Tertiary	1.0			
Occupation				
Farmer	1.800	0.629	5.148	0.273
Housewife	0.360	0.077	1.678	0.193
Trader	1			
Religion				
Christianity	6.148	2.355	16.050	0.001
Islam	1.0			
Denomination				
Catholic	3.257	1.183	1.539	0.308
Pentecostal	0.626	0.255	8.967	0.022
Others	1.0			
Educational level				
None	15.692	4.950	49.747	0.001
Primary	6.193	2.064	18.577	0.001
Secondary	4.102	1.517	11.091	0.005
Tertiary	1,0			
Occupation				
Farmer	7.407	2.278	24.090	0.001
Housewife	0.855	0.251	2.909	0.802
Trader	3.548	1.064	11.835	0.039
Others	1			

Table 5: Women whose spouses use alcohol are 3 times (OR = 3.129; 95% C.I. = 0.695-14.0.85) more likely to have AUD. In the same vein, those with no education are 6 times more likely to have AUD (OR = 6.333; 95% C.I. = 2151-18.643, p = 0.01). Christian religion, having less than a secondary level of education, and farming were predictors of alcohol use (p=0.001).

VI. DISCUSSION

This study, meant to determine the prevalence and effect of AUD on pregnancy outcomes in a cohort of pregnant women in Plateau State, Nigeria, discovered the fact that the age group, 35 years and above, was more likely to engage in alcohol use than any other age group. This same pattern was reflected concerning AUD, as they were also more likely to suffer from AUD compared to other age groups. This study also found that while older women were more likely to drink and suffer from other forms of AUD, the younger age groups were more likely to binge. This is in agreement with the findings of Leonardson and colleagues[31] in rural America, Croxford and colleagues[32] in South Africa, Yaw-Adua and colleagues[33] in Ghana, Onwuka et al[34] and Envuladu et al[35] in Nigeria, who reported that the younger age groups were more likely to be involved in drinking alcohol. In contrast to the findings from this study, Nayak and colleagues [36] in the US, O'Keeffe et al[37,] and Lanting and coworkers [38] in Europe found that the older age groups were more likely to engage in both alcohol use and binge drinking. This difference could be attributed to contextual factors as even the Western studies among rural populations[31] reported findings similar to the African studies.

This study found an inverse relationship between alcohol use and educational qualification or attainment with the least educated engaging in alcohol use more and the association was significant. For AUD, however, those with a Primary level of education were more affected as all those who used alcohol had AUD (100%), and the association was also statistically significant (p=0.001). Tertiary level of education was protective against both alcohol use and AUD. This is consistent with several findings all over the world, particularly in Africa, where lack of education will account for the lack of knowledge on the possible detrimental effects of alcohol on the fetus. This is in agreement with the findings reported in Ukraine, where Chambers et al[39] found a significant positive relationship between alcohol use and low education. Similarly, Yuko et al[40] in Japan and So et al [41] in South Korea also found that lower educational level was associated with AUD, and for So et al[41], the relationship was statistically significant (p= 0.01). In Ghana, Lekettey and coworkers[42] also found that a higher educational level was protective. Envuladu and colleagues[35], Ordinioha and coworkers [30], and Onwuka et al [34] in Nigeria found a significant relationship between lower educational level and alcohol use. Harrison and Sidebottom[42] in the USA, Lanting and colleagues[38] in the Netherlands, as well as Dehse and coworkers[43] in Australia found that, contrary to the general norm and expectation, higher education was not protective and the reason adduced was that most of the women started using alcohol right from their high school years and as such

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25jun1071

would not stop on account of being pregnant. The study by Lanting and coworkers[38] demonstrated a significant positive relationship (p = 001) between alcohol use and a higher level of education.

This study, as well, found that the occupation of the subjects significantly determined whether one would consume alcohol or even suffer from AUD, and this association was statistically significant (p= 0.001). Considering the different occupations examined, subjects who are farmers were most likely to use alcohol than all other groups. The finding for those suffering from AUD is not different as farmers and traders were also most likely to use alcohol harmfully, although the association in this case was not statistically significant. From this study, being a civil servant, which is also the same as gainful employment, is protective of both alcohol use and AUD. This is in consonance with the findings of Dehse and colleagues in Australia[43] who found that high socio-economic class which could be adjudged to be a function of occupation is protective. Similarly, London L[44] in the Western Cape in South Africa reported a high prevalence of drinking among farmers, Yau Adua-Poku[33] in Ghana and Envuladu and coworkers[35] in Nigeria found a correlation between substance use and unemployment, but the result of this study is at variance with the finding of Lekettey et al[45] who found a very high alcohol prevalence among civil servants. The finding of this study is not surprising given the fact that the form of alcohol mostly consumed was locally brewed and usually serve as meal for most persons particularly the farmers and artisans.

Some of the findings from this study appear to have challenged some established dogmas. The reason for this may not be unrelated to contextual factors and possible confounders. This study, for instance, found that the mean gestational age at birth was higher in the non-AUD subjects compared to those with AUD. This association was however, not statistically significant. The mean differences in the average number of pregnancies (p=0.04) and number of livebirths (p=0.01) between subjects with AUD compared to the non-AUD were statistically significant.

This study discovered that the history of prematurity was more in pregnant women with AUD compared to those without AUD. This difference was statistically (p= 0.014). Surprisingly though, this study found that there were more episodes of spontaneous abortions among non-AUD women compared to those with AUD although this association was not statistically significant. Some of the afore-mentioned findings are consistent with the findings of studies by Lunderberg and coworkers[46], Nykjaer and colleagues[47] and Meyer- Leu and coworkers[48] who found a significant positive relationship between alcohol use disorder and low birth weight or prematurity. Similarly the study by Envuladu and coworkers[35] found that women who abused alcohol were more likely to give birth to premature babies compared to those who did not. In contrast to the result of this study however, Russell and Skinner[49] found a significant relationship between alcohol misuse and spontaneous abortion, while Isaksen and coworkers[50] in Tanzania found that women who used alcohol were more likely than others to give birth to large babies and less likely to give birth to premature babies. This study also found an equal number of congenital abnormalities between both groups of women, supporting the notion that no amount of alcohol is safe in pregnancy.[3]

This study also used socio-demographic variables to predict the likelihood of AUD in pregnancy. Low level of education was predictive of AUD (p=0.001), and this occurred after the educational levels were dichotomized into less than secondary and greater than secondary education. This is similar to the findings of Fortin and coworkers[51] who found that less than a tertiary level of education was predictive of alcohol use disorder.

VII. CONCLUSION AND RECOMMENDATIONS

A. Conclusion

This study used a cross-sectional research design to determine the prevalence of AUD and implications of AUD on pregnancy outcomes in a cohort of pregnant women attending ante-natal clinic. The study found a high prevalence of AUD among the study population. Certain demographic factors such as young age, low level of education and farming were strongly associated with alcohol use disorder. History of prematurity was more in pregnant women with AUD compared to those without AUD. Low level of education was also predictive of alcohol use disorder.

B. Recommendations

Based on the findings above, the following recommendations are noteworthy:

- Government and development partners should build the capacity of health care workers on the implications of prenatal alcohol use, and health talks during ANC visits should always feature the implications of alcohol use in pregnancy.
- The government should establish a national policy on prenatal alcohol use with a lot of emphasis on community mobilization and health promotion in this respect.

ACKNOWLEDGEMENT

We are sincerely grateful to the Plateau State Hospital Management Board, the Department of Psychiatry, Jos University Teaching Hospital, the management of General Hospital, Barkin Ladi, and Vom Christian Hospital for their cooperation in this research. No funding support was received from any individual or corporate body.

➢ Conflict of Interest

The authors hereby declare that there was no conflict of interest in the course of this research work.

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