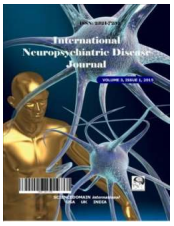

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Tobacco Smoking and Medical Co-morbidities among Patients with Bipolar Disorder in a Nigerian Clinical Setting: A Case Control Study

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Authors' contributions

This work was carried out in collaboration between both authors. Author VOL designed, analyzed and interpreted and prepared the manuscript. Author BAO designed interpreted and was involved in the final editing of the manuscript. Both authors read and approved the final manuscript.

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ABSTRACT

Introduction: Smoking is highly prevalent in patients with bipolar disorder and is associated with medical and psychiatric comorbidities. The main aims of this study were to determine the prevalence and correlates of smoking and the predictors of persistent smoking in patients with bipolar disorder in comparison to a non-psychiatric population**,** findings of which may be useful in planning a smoking cessation program for the concerned group.
Methods: In this case control study, consecutive patients with bipolar I disorder (BD), (251) were matched by age and gender with the controls who were recruited from the General Outpatients Department (GOPD) of the State Hospital Ibadan, Nigeria between January 2008 and June 2009. Information on demography and tobacco smoking, presence of psychotic symptoms, remission state and self-reports of common health conditions in the past year were obtained. Bivariate associations were determined using Chi square statistics and multivariate analysis was used for further exploration of variables that were significant during bivariate analysis.

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Results: Persistent smoking was higher in those with psychotic symptoms, $P < .001$, those not in remission, $P = .01$. Persistent smoking was also significantly associated with malignancies, $P = .02$, cardiovascular diseases, $P = .02$, respiratory diseases, $P = .02$, high BMI, $P = .02$ and chronic pain, $P = .001$. After adjusting for age and gender, presence of psychotic symptoms OR = 2.89, 95% CI (1.42-5.56), being in remission, OR = 0.49, 95% CI (0.009-0.76), high YMRS scores, OR = 2.63, 95% CI (1.42-5.20), high total PANSS scores OR = 3.23, 95% CI (1.79-6.28) and 3 or more episodes in the past year, OR = 1.89, 95% CI (1.12-4.08) remained associated with persistent smoking.

Conclusion: The present study demonstrates higher rates of lifetime and current smoking among individuals with BD and the association with socio-demographic and clinical factors and highlights the significance of these risk factors in effective tobacco prevention and cessation programs for patients with bipolar disorders.

Keywords: Bipolar disorder; tobacco; health conditions; psychotic symptoms; remission; abstainers.

ABBREVIATIONS

BD : Bipolar Disorder
SCID : Structured Clinical Interview According to DSM IV Axis I Disorder
GOPD : General Out Patient Department
YMRS : Young Mania Rating Scale
PANSS : Positive and Negative Symptoms Scale

1. INTRODUCTION

Tobacco smoking is one of the primary preventable causes of mortality [1]. Tobacco smoking is at least two times more common among individuals with bipolar disorder (BD) [2-4]. Six to seven out of ten bipolar patients smoked tobacco compared to 2 to 3 out of ten people in the general population [4,5]. The odds of persons who live with BD initiating smoking at an early age are two to three times compared with general population [3].

Smokers with BD are more likely to be heavy smokers and are also more likely to have less successful quit attempts than general population [3]. There is evidence that nicotine prevalence is higher among individuals with BD than the general population. Compared with rates in other psychiatric disorders, the prevalence of tobacco use is higher at 30 to 70% [3]. Emerging data show that while rates of tobacco use in general population is reducing, the rate in bipolar disorder has remained high [5]. In addition to risks of physical illness and early mortality, high rates of tobacco use among persons with BD might worsen the course of BD [6], might increase the rate of metabolism of medications [7] and eventually lead to poorer mental health outcomes [3].

Extant literature reveals that cigarette smoking in BD predicts worsening treatment outcomes among which are greater symptom severity [8], more suicidality [9], presence of psychotic symptoms [2,10] and longer stay in the hospital [11]. Individuals who live with BD and smoke have been reported to experience a reduced treatment response and more discontinuation of treatment compared to those with BD who do not smoke [12].

Scientific evidence indicates that at least 8 out of ten persons with bipolar disorder are self-reported ever smokers and that only about 2 out of ten of these ever-smokers had successful quit attempts [4]. This suggests that individuals with BD have higher-than-average likelihood of being heavy smokers and nicotine dependent [13,14].

The rates of cardiovascular, respiratory, and cancer morbidity and mortality in persons with BD have been high possibly due to the high prevalence of smoking and low rate of successful quits in them [15,16]. Deaths in persons with BD occur up to 30 years earlier than individuals in general population [17].

While emerging data in the Western World suggest a bi-directional over-representation of BD and cigarette smoking across the lifecycle [18], highlight the scope of the problem and the clinical implications of tobacco use in BD, limited systematic research is available on this topic in sub-Saharan Africa, particularly in Nigeria, the most populous Black Country. The magnitude of tobacco use among patients with BD and the correlates of use have not been given attention and the relationship between BD and cigarette smoking are poorly recognized in third world countries such as Nigeria. Thus, characterizing the burden, risk and nature of the relationship between BD and cigarette smoking is of particular clinical, scientific and public health importance in Nigeria. Efforts at improving the

understanding of the nature of association between BD and cigarette smoking among sub-Saharan Africans with BD can lead to further refinements in efforts aimed at mitigating the burden of cigarette use among this population. Although lifetime prevalence of BD in the community in Nigeria is 0.1%. Justifiably, understanding the correlates of smoking in BD might provide a context for guiding policy makers and informing clinical practice by planning a tobacco cessation program for them while receiving treatment for BD. To this end, this study aimed to examine the prevalence and correlates of cigarette smoking among a random clinical sample of Nigerian BD patients attending a State psychiatric clinic.

2. METHODS

2.1 Study Area

The study was carried out at the Psychiatric Unit of the State Specialists Hospital Ring Road Ibadan, Nigeria between January 2008 and June 2009. The city has an estimated population of 3.85 million people [19].

2.2 Ethical Considerations

Permission for the study was obtained from the Ethical Review Board of the Oyo State Ministry of Health, to ascertain that the methodology of the study did not contravene laid down guidelines for experiments involving human beings and this was in accordance with the "Helsinski Declaration". Informed consent was obtained from each of the patients and or their relations and the objective of the exercise explained to them.

2.3 Sample Size Determination

The sample size for this study was calculated using the formula for two independent samples [20].

The prevalence of smoking in both the index and comparison groups was used for the calculation.

$N = 2(P(1-P)(Z\beta + Z\alpha 2)^2/(P1-P2)$

n = sample size for each group to be studied.

Zα2 = Standard normal deviation corresponding to 95% confidence level at 1.96

Zβ = Statistical power at 0.84

P1 = prevalence of smoking in patients with bipolar disorder in Nigeria (0.5), a statistically acceptable conservative estimate in the absence of any local reference [21].

P2 = prevalence of smoking in Nigerian adult population (22.6%) [22].

n = 51

We however, carried out a total sampling of all patients with bipolar disorder during the study period, in all, they were 251.

2.4 Study Design

This was a multi-stage case-control study that utilized total sampling of patients with any major mental disorders that regularly attended the psychiatric unit of the state hospital between January 2008 and June 2009.

In the first stage of the study, 1,342 participants who consecutively attended the psychiatric outpatient department of the study site during the study period were screened using the psychosis screening questionnaire [23]. Nine hundred and ninety screened positive as demonstrated by any yes to the six questions of the 6 –item psychosis screening questionnaire and proceeded to the second stage of the study, where the Structured Clinical Interview for DSM IV axis I disorder (SCID) was administered [24]. Two hundred and sixty (260) met DSM IV criteria for bipolar I disorder, current episode mania, but only 251 completed the interview, 9 dropped out because of ill-health.

These participants proceeded to the third stage of the study. Here the Positive and Negative Syndrome Scale (PANSS) [25] and the Young Mania Rating Scale (YMRS) [26] were administered to determine the severity of the BD.

The first case with BD was randomly selected while the others were consecutively selected, until all the 251 cases were interviewed. Effort was made to avoid duplication of response by the use of identification numbers. These cases were thereafter matched by age and gender with the controls who were attendees of the General-Out Patient Department (GOPD) of the same hospital. For instance, equal proportion of the cases that were males in a specific age age-group were also selected in the control group.

2.5 Inclusion Criteria

All participants in the study group met the DSM IV criteria for BD and were required to be

accompanied by a principal caregiver with whom collateral information could be obtained.

2.5 Exclusion Criteria

Excluded were respondents with schizophrenia, schizoaffective disorder, major depressive disorder or any chronic or severe general medical conditions that commenced before the onset of the psychiatric morbidity.

2.6 Interview Schedule

Participants were interviewed on a single occasion by one of the authors (VO). The diagnosis of BD was made by Structured Clinical Interview for DSM IV axis I disorder (SCID) [24], while lifetime and current tobacco use were ascertained using the SCID. Tobacco use in this study was limited to cigarette smoking. Participants with BD also had PANSS administered. Information was also collected on current physical health problems.

The interviewer completed a detailed case summary and generated diagnosis. Each case was reviewed independently by another clinician blind to the diagnosis (TA). Consensus diagnosis meetings were held and cases were discussed if consensus was not reached between SCID, chart - review and case summary. Only cases where a consensus diagnosis of bipolar disorder could be reached were included in the study. For established cases of BD, multiple episodes was defined as more than 3 episodes in the preceding 12 months; and remission was defined as absence or minimal symptoms of both mania and depression for at least 1 week" [27].

2.7 Measures

We obtained information about socio-demographic characteristics of respondents including age of respondents, gender, educational background, age at onset of illness, age at initiation of smoking, number of episodes in past 12 months, and duration of illness.

2.7.1 Psychosis screen

We obtained information about the presence of psychosis by using the Psychosis Screen Questionnaire [23]. This is a simple yes or no - 6-item questionnaire that elicits information about the lifetime and current occurrence of psychotic symptoms. It probes into the presence of manic symptoms, though interference, persecution, perceptual abnormalities and strange experience. A Yes response, to any item suggestive of psychosis in the PSQ was regarded as indicative of the presence of a psychotic symptom.

2.7.2 Structural clinical interview for diagnostic and statistical manual (DSM) IV axis 1 disorder 2000-1 version (SCID)

The SCID was used to generate the diagnosis of BD and tobacco use. Soon after the publication of DSM III, work began on a clinical diagnostic assessment procedure for making DSM diagnosis. The SCID can be used by the clinician as part of a normal assessment procedure to confirm a particular diagnosis or in research or screening as systematic evaluation of a whole range of medical states. The SCID is available in a patient edition for use with subjects who have been identified as psychiatric patients and in a non-patients edition which is suitable for use in epidemiological studies.

2.7.3 Positive and negative syndrome scale (PANSS)

Positive and Negative Syndrome Scale (PANSS) is a 30-item valid and reliable instrument that was developed from the Brief Psychiatric Rating Scale (BPRS) [28], and Psychopathology Rating Schedule (PRS) [25]. The PANSS addresses both the presence and severity of symptoms. Of the 30 psychiatric parameters assessed on the PANSS, 7 were chosen a priori to constitute a Positive Scale, 7 make up a Negative Scale, and the remaining 16 General Psychopathology. The internal consistency of the positive scale was 0.83, negative scale 0.74 and general psychopathology 0.79. The inter-rater reliability was 0.72, 0.76 and 0.74 respectively for those scales. The PANSS has also been used in several previous studies in Nigeria [29].

2.7.4 Young mania rating scale (YMRS)

The Young Mania Rating Scale (YMRS) is a cross-cultural valid and reliable rating scales to assess manic symptoms [26]. It comprises of 11 items that yield information on the patient's subjective report of his or her clinical condition over the previous 48 hours as well as information obtained from clinical observations. The items are selected based upon published descriptions of the core symptoms of mania. The scale has four items that are graded on a 0 to 8 scale (irritability, speech, thought content, and disruptive/aggressive behaviour), while the remaining seven items are graded on a 0 to 4 scale. These four items are given twice the

weight of the others to compensate for poor cooperation from severely ill patients. There are well described anchor points for each grade of severity. The baseline scores can be as low as 3 in the depressive phase, 12 in the manic phase and 2 when the patient is euthymic. The YMRS has the clinical advantage of its brevity, wide acceptability and ease of administration. The YMRS is a rating scale used to evaluate manic symptoms at baseline and over time in individuals with mania. The scale is generally administered by a clinician or other trained rater and takes 15–30 minutes to complete.

2.7.5 Physical health problems

We collected information about current physical health problems from available medical records and collateral data from family and/or treating physician. These were complemented by results of physical examination and or laboratory investigation.

2.8 Data Management and Analyses

All questionnaires were serialized and edited; thereafter, information obtained from each subject was entered directly into the computer using the SPSS Software Version 17 [30]. Categorical variables were analysed using Chi square statistics. Mean differences between cases and controls were analysed using independent t test and the ANOVA for comparisons of three groups. Binary regression analysis was used to determine the effects of multiple confounding variables.

All categorical data were dichotomized into 0, 1 for this purpose. For both positive and negative PANNS scores, a score of 7 was recoded as 0, indicating no symptoms, while scores greater than 7 were recoded as 1, indicating presence of symptoms. For total PANSS, a score of 30 was recoded as 0 indicating no symptom while scores greater 30 were coded as 1; 30 being the cut-off point [25]. For YMRS, a score of 0 was coded as 0 indicating no symptom and any score above 0 was coded as 1, indicating presence of symptom [26]. All analyses were carried out within 95% CI, $p < 0.05$.

3. RESULTS

3.1 Demographics

The age and gender distribution of the respondents show that the two groups were well matched. However, a higher proportion of the respondents in the control group were in employment, $\chi^2 = 41.7$, $P < .001$ and were also married, $\chi^2 = 8.5$, $P = .004$.

3.2 Prevalence of Tobacco Use

Prevalence of lifetime smoking in the BD group was higher than the rate in the control group (64.9% vs. 45.2%), and this difference was significant, $\chi^2 = 12.1$, $P = .001$. Prevalence of persistent smoking in BD group was 37.5% and 9.2% in the control group. The difference was also significant, $\chi^2 = 54.3$, $P < .001$ (Table 1).

3.3 Correlates of Tobacco Use

Rates of persistent tobacco use reduced with increasing age and education, $P < .001$ respectively; was higher in men, $P = .001$, among the unmarried, $P = .024$, those with psychotic symptoms, $P < .001$ and those who were not in remission, $P = .01$.

There was a significant difference in the mean YMRS score among the persistent smokers, abstainers and never users, $P < .001$ (Table 2). Post-hoc pairwise comparisons show that this difference was due to a higher mean score in the persistent smokers' group compared with the abstainers, $t = 13.1$, (df 161), $P < .001$ and also when compared with the never-users, $t = 12.1$, (df,180), $P < .001$. There was no significant difference however between mean YMRS scores of the abstainers compared with the never-users, $t = 1.5$, (df,155), $P = .1$.

There was a significant difference in the mean positive PANSS scores among the persistent smokers, abstainers and never users, $P < .001$ (Table 2). Post-hoc pairwise comparisons show that this difference was due to a higher mean score in the persistent smokers' group compared with the abstainers, $t = 4.5$, (df 161), $P < .001$ and also when compared with the never-users, $t = 4.6$, (df,180), $P < .001$. There was no significant difference however between mean positive PANSS scores of the abstainers compared with the never-users, $t = 0.2$, (df, 155), $P = .8$.

There was a significant difference in the mean negative PANSS scores among the persistent smokers, abstainers and never users, $P < .001$ (Table 2). Post-hoc pairwise comparisons show that this difference was due to a higher mean score in the persistent smokers' group compared with the abstainers, $t = 2.9$, (df 161), $P = .004$ and also when compared with the never-users,

t = 3.6, (df,180), *P* < .001. There was no significant difference however between mean negative PANSS scores of the abstainers compared with the never-users, t = 0.3, (df, 155), *P* = .7.

There was a significant difference in the mean general psychopathology PANSS scores among the persistent smokers, abstainers and never users, *P* < .001 (Table 2). Post-hoc pairwise comparisons show that this difference was due to a higher mean score in the persistent smokers' group compared with the abstainers, t = 3.4, (df 161), *P* = .001 and also when compared with the never-users, t = 3.4, (df,180), *P* < .001. There was no significant difference however between mean negative PANSS scores of the abstainers compared with the never-users, t = 0.1, (df, 155), *P* = .8.

There was a significant difference in the mean total PANSS scores among the persistent smokers, abstainers and never users, *P* < .001 (Table 2). Post-hoc pairwise comparisons show that this difference was due to a higher mean score in the persistent smokers' group compared with the abstainers, t = 5.1, (df 161), *P*< .001 and also when compared with the never-users, t = 3.8, (df,180), *P* < .001. There was no significant difference however between mean negative PANSS scores of the abstainers compared with the never-users, t = 0.3, (df, 155), *P* = .8.

Table 1. Sociodemographic and smoking profile among patients with bipolar disorder and the control group

	Bipolar N = 251		Control N = 250		χ^2	*P*
	N	**%**	**N**	**%**		
Age (Years)						
<25	51	20.3	49	19.6	0.1[X]	.99
25-34	97	38.6	95	38.0		
35-44	64	25.5	67	26.8		
45-54	39	15.5	39	15.6		
Gender						
Male	107	42.6	104	41.6	0.05[X]	.82
Female	144	57.4	146	58.4		
Education						
No formal	44	17.5	54	21.6	3.7[X]	.29
Elementary	113	45.0	112	44.8		
Secondary	76	30.3	60	24.0		
Post-Secondary	18	7.2	24	9.6		
Employment						
Employed	149	59.4	213	85.2	41.7[X]	< .001
Unemployed	102	40.6	37	14.8		
Marital Status						
Married	99	39.4	131	52.4	8.5[X]	.004
Unmarried	152	60.6	119	47.6		
Religion						
Christianity	94	37.5	96	38.4	0.05[X]	.81
Islam	157	62.5	154	61.6		
Lifetime smoking						
Yes	163	64.9	113	45.2	18.9[X]	< .001
No	88	35.1	137	54.8		
Persistent smoking						
Yes	94	37.5	23	9.2	54.3[X]	< .001
No	157	62.5	227	90.8		
Mean age at smoking initiation (SD)	18.55	(3.18)	21.65	(4.15)	-3.1[t]	.001
Mean number of sticks/day (SD)	23.22	(8.45)	12.22	(8.07)	6.1[t]	< .001

X: Chi square; t: t test

Table 2. Sociodemographic and clinical profile of persistent smokers

Age group (Years)	User (94)		Abstainers (69)		Never (88)			
	N	%	N	%	n	%		
< 25	40	61.5	12	18.5	13	20.0	44.0 df 6 [X]	< 0.001
25-34	46	44.2	25	24.0	33	31.8		
35-44	9	20.9	14	32.6	20	46.5		
>44	-	-	13	37.1	22	62.9		
Years of education								
0	42	70.0	10	16.7	8	13.3	48.9 df 6 [X]	< 0.001
1-6	34	38.6	20	22.7	34	38.7		
7-12	10	20.4	15	30.6	24	49.0		
>12	8	14.8	24	44.4	22	40.8		
Gender								
Male	52	52.0	22	22.0	26	26.0	15.1 df 2 [X]	0.001
Female	42	27.8	47	31.1	62	41.1		
Marital Status								
Currently married	29	29.3	34	34.3	36	36.4	7.4 df 2 [X]	0.024
Unmarried	65	42.8	31	20.4	56	36.8		
Employment								
Unemployment	57	38.3	41	27.5	51	34.2	0.1 df 2 [X]	0.9
Employed	37	36.3	28	27.4	37	36.3		
Religion								
Christianity	38	40.5	24	25.5	32	34.0	0.6 df 2 [X]	0.7
Islam	56	35.7	45	28.7	56	35.6		
Psychotic symptoms								
Yes	50	48.6	23	24.7	20	20.6	18.6 df 2 [X]	< 0.001
No	44	29.7	46	29.1	68	41.2		
Remission								
Yes	27	28.7	35	35.4	37	37.3	9.1 df 2 [X]	0.01
No	67	45.6	34	23.3	45	30.6		
Past year no of episodes								
>3 [M]	54	60.0	15	16.7	21	23.3	26.7 df 2 [X]	< 0.001
≤ 3	40	28.3	54	29.1	67	42.6		
Mean (SD)YMRS	27.68	11.04	11.77	3.44	12.67	3.78	129.6 df 2 [F]	< 0.001
Mean PANSS (SD) (P)	22.6	8.4	16.44	8.99	16.78	8.56	14.1 df 2 [F]	< 0.001
Mean PANSS (SD) (N)	21.8	9.9	17.34	9.54	16.84	8.45	7.7 df 2 [F]	<0.001
Mean PANSS (SD) (G)	48.1	11.6	41.34	14.11	41.67	13.57	7.5 df 2 [F]	<0.001
Mean PANSS (SD) (T)	85.6	24.2	64.55	28.6	63.12	27.9	19.6 df 2 [F]	< 0.001
Mean age at onset of Illness	28.38	8.51	32.8	9.02	33.6	8.7	9.3 df 2 [F]	< 0.001
Mean age at smoking initiation	26.34	7.03	29.44	8.16	29.53	8.28	4.8 df 2 [F]	0.01

M: Median is 3 episodes: X: Chi square; t: t test; YMRS: Young Mania Rating Scale; F: ANOVA; X : Chi Square' PANSS: Positive and Negative Symptoms Scale

There was a significant difference in the mean age at onset of the illness among the persistent smokers, abstainers and never users, *P* < .001 (Table 2). Post-hoc pairwise comparisons show that this difference was due to a higher mean age at onset of the illness in the persistent smokers' group compared with the abstainers, t = 3.2, (df 161), *P*= .002 and also when compared with the never-users, t = 5.1, (df,180), *P* < .001. There was no significant difference however mean age at onset of the illness of the abstainers compared with the never-users, t = 0.6, (df, 155), *P* = .6.

There was a significant difference in the mean age at initiation to smoking among the persistent smokers, abstainers and never users, *P* = .01 (Table 2). Post-hoc pairwise comparisons show that this difference was due to a higher mean age at initiation to smoking in the persistent smokers' group compared with the abstainers, t = 2.5, (df, 161), *P*= .006 and also when

compared with the never-users, t = 2.8, (df,180), *P* = .005. There was no significant difference however mean age at smoking initiation between the abstainers compared with the never-users, t = 0.1, (df, 155), *P* = .9.

Persistent tobacco use was also significantly associated with malignancies, *P* = .02, cardiovascular diseases, *P* = .02, respiratory diseases, *P* = .02, high BMI, *P* = .02 and chronic pain, *P* = .001. (Table 3).

After adjusting for age and gender, the factors that remained significantly associated with persistent smoking were: presence of psychotic symptoms OR = 2.89, 95% CI (1.42-5.20), being in remission, OR = 0.49, 95% CI (0.009-0.76), high total YMRS score, OR = 2.63, 95% CI (1.42-5.56), high total PANSS score OR = 3.23, 95% CI (1.79-6.28) and 3 or more episodes of BD in the past year, OR = 1.89, 95% CI (1.12-4.08) (Table 4).

Table 3. Disease conditions among persistent smokers

Disease condition	Users (94)		Abstainer (69)		Never (88)			
	n	%	N	%	n	%	X^2	P
Malignancies								
Yes	16	64.0	4	16.0	5	20.0	8.3 df 2	0.02
No	78	34.5	65	28.8	83	36.7		
Cardiovascular								
Yes	17	72.7	3	10.3	9	31.0	7.6 df 2	0.02
No	77	34.7	66	29.7	79	35.6		
Respiratory								
Yes	12	66.6	3	16.7	3	16.7	7.3 df 2	0.02
No	82	35.2	66	28.3	85	36.5		
Haematological								
Yes	9	52.9	3	17.6	5	29.4	2.9 df 2	0.4
No	85	36.0	66	28.0	83	36.0		
Musculoskeletal								
Yes	6	37.5	4	25.0	6	37.5	0.6 df 2	0.87
No	88	37.4	65	27.7	82	34.9		
Diabetes mellitus								
Yes	2	33.3	2	33.3	2	33.3	0.1 df 2	0.89
No	92	37.6	67	27.4	86	35.0		
High BMI								
Yes	15	62.6	4	16.6	5	20.8	7.6 df 2	0.02
No	79	34.8	65	28.6	83	36.6		
Opthalmological								
Yes	5	55.6	2	22.2	2	22.2	1.4 df 2	0.45
No	89	35.8	67	27.7	86	35.5		
Ear/Nose/Throat								
Yes	5	35.7	4	28.6	5	35.7	0.2 df 2	0.86
No	89	37.6	65	27.4	83	35.0		
Gastrointestinal diseases								
Yes	6	33.3	5	27.8	7	38.9	0.2 df 2	0.89
No	88	37.8	64	27.5	81	34.7		
Chronic pain								
Yes	17	45.9	3	24.3	3	29.7	14.4 df 2	0.001
No	77	36.0	66	28.0	85	36.0		
Any disease condition								
Yes	17	45.9	5	24.3	9	29.7	4.88 df 2	0.09
No	77	36.0	64	28.0	79	36.0		

Table 4. Multivariate analysis of persistent smoking

	OR	95% CI		*P*
	Upper	Lower	Upper	
Married	1.32	0.95	2.8	.42
Education	1.14	0.87	2.51	.36
Cardiovascular diseases	1.14	0.55	1.87	.59
Respiratory diseases	1.46	0.88	2.21	.55
Malignancies	1.03	0.80	2.32	.34
High BMI	2.11	0.78	2.77	.23
Chronic pain	1.29	0.69	3.01	.5
Remission	0.49	0.009	0.76	.016
Psychotic symptoms	2.89	1.42	5.20	< .001
YMRS	2.63	1.42	5.56	<.001
PANSS (P)	1.63	0.89	2.71	.1
PANSS (N)	1.26	0.71	2.36	.1
PANSS (G)	1.41	0.63	2.12	.1
PANSS (T)	3.23	1.79	6.28	< .001
3 or more episodes in a year	1.89	1.12	4.08	.003
Mean age at onset of illness	1.56	0.89	2.11	.07

YMRS: Young Mania Rating Scale; PANSS: Positive and Negative Symptoms Scale

4. DISCUSSION

In an effect to characterize the magnitude and relationship of tobacco smoking among persons with bipolar disorder, we conducted a case-control study and examined the lifetime and persistent use of tobacco smoking as well as the its correlates among a random sample of cases and control of matched patients in a general hospital setting in Nigeria.

Our research confirms the bidirectional relationship between BD and cigarette smoking in adult outpatients in a general hospital. This is probably the first study in sub-Saharan Africa to address this relationship. In line with Western studies [3,4,13,31], we found that the prevalence of tobacco smoking is higher among persons with BD compared with the general population. Individuals with bipolar disorder were more likely to be ever smokers and four times more likely to be current smokers. It is therefore pertinent draw attention to patients with BD who smoke tobacco because they are more at high risk of the negative consequences of tobacco use.

Another key finding in this study was that tobacco smoking was more prevalent in the BD patients who are younger age, never married, males, and with low educational status. This confirms previous studies in Nigeria that reported similar demographic correlates of smoking with mental disorders [32-34]. It is important to note that this study provides evidence for the refinement of efforts at mitigating cigarette use among patients with BD. These risk factors are important for the clinicians in identifying individuals with BD that are more at risk of smoking tobacco.

We also found that smokers with BD are more likely to have initiated smoking at an earlier age. One, this finding is congruent with the report by Heffner and colleagues that patients with BD are more likely to start smoking tobacco are earlier age than those in the general population [3]. Two, individuals with BD are more likely to smoke for a longer period and have a higher likelihood of being heavy smokers and tobacco dependent as highlighted in previous studies [14]. Three, the mean age of tobacco smoking initiation among BD respondents is earlier than the mean age of 21 years reported by Weissman and colleagues [35] as the mean age of onset of BD. This arguably adds to the extant literature that suggests that smoking in adolescence might increase the risk of developing BD [6]. We therefore conceive that tobacco prevention programs that target adolescents might possibly influence the development of nicotine dependence and BD. In addition, such preventive programs could reduce the rates of cardiovascular, respiratory and cancer morbidity and mortality among persons with BD.

Our main finding is that patients with BD were more likely to persist with tobacco smoking if they were not in remission, if they scored high on YMRS or PANSS, and if they had psychotic symptoms and they have had more than three episodes of illness in the past year. This finding confirms previous studies that reported bi-directional association of higher rate of smoking with greater symptoms severity [8,11,36] including three or more lifetime episodes with BD [37], with presence of psychotic symptoms [2, 16], and with the experience of a reduced treatment response and treatment discontinuation [12]. In clinical practice, these risk factors should be targeted in other to improve the treatment outcomes of patients with BD. Having found association between psychotic symptoms, active symptoms with persistent

smoking, we can also argue in favour the self-medication hypothesis [38].

In support of well documented evidences of associations between smoking and various health conditions [39], univariate analysis shows that persistent tobacco use was associated with malignancies, respiratory diseases, cardiovascular, high BMI and chronic pain. Research evidences have shown association between smoking and malignancies [40], respiratory [41], cardiovascular [42], obesity [43] and chronic pain [44]. These chronic health conditions contribute to tobacco related mortality [1]. However, none of the health conditions studied remained associated with smoking after multivariate analysis. Further studies, including retrospective and prospective, are more likely to clarify this relationship.

5. CONCLUSION

BD is significantly associated with smoking. Smoking in BD was more prevalent in the younger age group, those with fewer years of education, in men and in the unmarried and was associated with certain general health conditions. Predictors of smoking in BD were: severity of the manic symptoms, presence of psychotic symptoms, and clinical state of the patients (in remission or not) and frequent episodes.

Thus, our study has clinical and public health implications. Patients with BD require routine general physical health assessments as well as screening for tobacco use for early detection and prompt treatment of medical comorbidities and smoking cessation programmes. Thus, if implemented, will reduce mortality associated with BDs and also improve their quality of life.

This study has a number of limitations. Data on health conditions were by self-reports and confirmation from medical records. This could possibly have been under-reported. No toxicological screen was carried out neither was any diagnosis of nicotine dependence allocated to subjects in this study. There is the need for longitudinal studies in order to confirm the findings in our study.

ETHICS

Permission for the study was obtained from the Ethical Review Board of the Oyo State Ministry of Health.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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