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Prevalence, Patterns and Peculiarities of Depression among Tuberculosis Patients Attending Directly Observed Treatment Short-course (DOTS) Centers in Lagos State Nigeria

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ABSTRACT

Tuberculosis (TB) is an infectious disease that is life-threatening to vulnerable populations, and has been reported to be associated with depression. Nigeria is one of the countries with a high TB burden, and with the current economic hardship in Nigeria, people are becoming poorer suggesting more TB patients are more likely to elapse into depression. The aim of this research was to assess the prevalence, patterns and peculiarities of depression among TB patients attending Directly Observed Treatment Short course (DOTS) centers in Lagos State, Nigeria. A descriptive, cross-sectional survey was conducted among 301 TB patients at 8 DOTS centers in Lagos State, Nigeria using a two-stage sampling method. Data was collected using interviewer-administered questionnaires to elicit responses from the TB patients. Patient Health Questionnaire-9 (PHQ-9) was used to determine and assess depression. Data was analyzed using SPSS version 23.0, with the Chi-square test being used to check for the association between socio-demographic characteristics and depression among the respondents. Mean age of the respondents was 35.1±11.7 years. A majority (71.8%) of the respondents were males, 69.1% were Christians, Yorubas were most (52.2%), 88.4% earned ≤N150,000 monthly, and only 1 respondent had no formal education. The prevalence rate of depression among the TB patients was 51.8%. Socio-demographic characteristics like gender (females were more affected), low financial status, and low educational level were associated with depression ($p<0.05$); unlike age, marital status, ethnicity, employment status, and family setting ($p>0.05$). Depression among TB patients is real as one in every two TB patients is depressed. Therefore, healthcare workers at DOTS centers should pay adequate attention to signs of depression among their patients.

INTRODUCTION

Tuberculosis (TB) is a chronic granulomatous disease caused by Mycobacterium tuberculosis and commonly affects the lungs. Other affected organs in the body include the abdomen, spinal cord, etc. TB is characterized with monocytosis (Ikwuka, 2023e). TB is a chronic disease of grave public health concern in Nigeria (World Health Organization (WHO), 2023a). In 2022, 7.5 million cases of newly diagnosed TB infections were recorded with an estimated 1.3 million deaths caused by the infection (WHO, 2023a). World Health Organization further highlighted that Nigeria is among the thirty high TB burden countries that make up 87% of world TB cases. In addition, Nigeria (4.5%) together with India, Indonesia, China, Philippines, Pakistan, Bangladesh, and the Democratic Republic (DR) of the Congo, account for two-thirds of the global TB cases (WHO, 2023a).

In the previous year, 2021, Nigeria had the highest burden of TB cases with a total of 467,000 cases (WHO, 2023b), and Lagos State accounted for 11% of the total TB cases detected in Nigeria in the same year (Adebowale-Tambe, 2022). The TB burden in Nigeria and other countries (China, DR Congo, India, Indonesia, Mozambique, Myanmar, Philippines, South Africa, and Zambia) is further compounded by the persistent HIV/AIDS epidemic and the emergence of multi-drug resistant tuberculosis (MDR-TB) (WHO, 2023a).

Closely mimicking TB is cystic fibrosis which is a genetic disease affecting mainly the lungs (Ikwuka, 2023a). Other affected organs include the pancreas, liver, kidneys, and intestine. Cystic fibrosis is caused by mutations in both copies of the gene for cystic fibrosis transmembrane conductance regulator (CFTR) protein and has autosomal recessive mode of inheritance (Ikwuka, 2023a). Clinical features of cystic fibrosis include dyspnea, cough with sputum, sinusitis, poor growth, fatty stool, fingers and toes clubbing, etc (Ikwuka, 2023a).

Chronic metabolic disorders can worsen the clinical course and prognosis of disease in patients with tuberculosis. Metabolic syndrome diseases, MSDs (Hypertension, Adiposity, Diabetes mellitus and Dyslipidemia) are interrelated diseases with very high morbidity and mortality rates (Ikwuka, 2015; Ikwuka, 2017a; Ikwuka, 2017c; Ikwuka, 2023c; Ikwuka, 2023f; Virstyuk, 2016). Results from different studies have shown that high levels of blood pressure, glucose and lipid metabolic disorders, asymptomatic hyperuricemia, activation of systemic immune inflammation and fibrogenesis (also seen in chronic TB), contribute to kidney damage (Ikwuka, 2017d; Ikwuka, 2017e; Ikwuka, 2018a; Ikwuka, 2018c; Ikwuka, 2018d; Ikwuka, 2019a; Ikwuka, 2019c; Ikwuka, 2022; Ikwuka, 2023d; Virstyuk, 2017a; Virstyuk, 2018a;

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Virstyuk, 2019; Virstyuk, 2021a; Virstyuk, 2021b).

Chronic pulmonary TB is characterized with hemoptysis which can lead to anemia (Musa, 2023). Tuberculosis has also been linked with oxidative stress and different systemic immune inflammatory processes. In inducing oxidative stress, the major free radicals that are of physiological significance are superoxide anion, hydroxyl radical, and hydroperoxyl radical, while non-radical is hydrogen peroxide (Ikwuka, 2023b; Udeh, 2023a; Udeh, 2023b). Rauwolfia vomitoria has a neuroprotective ability at it elevates antioxidants and suppresses lipid peroxidation (Ekechi, 2023a).

Depression is a commonly found mental disorder. Depression and anxiety are the leading causes of mental disorders globally, with depression having a lifetime prevalence of 5 to 17%, with 12% being the average (Bains, 2023). The prevalence is almost twice as high in women than in men, simply because of hormonal differences, childbirth effects, psychosocial stressors in men and women, and the behavioral model of learned helplessness (Pederson, 2014). In 2019, 280 million people lived with depression (Institute of Health Metrics and Evaluation (IHME), 2022); and in 2020, the number increased significantly by 28% due to the emergence of COVID-19 pandemic (WHO, 2022). Depression differs from usual mood fluctuations and short-lived emotional responses to challenges in everyday life. When long-lasting with moderate or severe intensity, depression may become a serious health condition. It can cause the affected person to suffer greatly and poorly perform his or her duties. At its worst, depression can lead to suicide which results in an estimated 1 million deaths every year (WHO, 2022).

There are various barriers to effective care such as poorly trained healthcare providers, lack of resources and social stigma associated with mental illnesses. The urgency of the rate of depression to public health is likely compounded by the recognition that, if not effectively treated, it may elapse into a chronic disease. Just experiencing one episode of depression places the individual at a 50% risk of experiencing another, with subsequent episodes raising the likelihood of experiencing more episodes in the future (National Institute of Mental Health (NIMH), 2021).

A study on depression among TB patients reported a prevalence of 45.5% especially in those with extensive TB pathology, older age, long illness duration, nuclear family and unmarried status (Ige, 2011). Recently, a systematic review and meta-analysis study conducted showed that depression is common among TB patients (Duko, 2020). A study on tuberculosis and comorbidities: treatment challenges in patients with comorbid diabetes mellitus and depression outlined that TB patients with depression or diabetes mellitus (TB-DM) both have an elevated risk of relapse, recurrence, and mortality. Relapse in TB treatment could also be caused by alcoholism and homelessness, as both coupled with depression could work in synergy to make the patient not to adhere to proper medication compliance (Cáceres, 2022). Compliance with treatment in chronic disorders has been established to be influenced by psychiatric disorders like depression (DeJean, 2013). Hence, it is safe to assume that prevention, prompt recognition and treatment of depression in TB patients may help ensure treatment compliance which is crucial to the control of TB.

In addition, Metabolic Syndrome Diseases (common comorbidities to TB) also require new and effective treatment regimens. Dapagliflozin which is a Sodium-Glucose Linked Transporter 2 (SGLT-2) inhibitor and Liraglutide which is a Glucagon-like Peptide 1 Receptor Agonist (GLP-1 RA) have been found to increase the effectiveness of treatment and improve the clinical course of type 2 diabetes mellitus and hypertension in patients with such comorbidities (Ikwuka, 2017b; Ikwuka, 2018b; Ikwuka, 2019b; Ikwuka, 2021; Virstyuk, 2017b; Virstyuk, 2018b; Virstyuk, 2018c). The hepatorenal protective functions of coconut water in alloxan-induced type 1 diabetes mellitus has also been documented (Ekechi, 2023b).

Despite interventions and projects implemented globally and nationally to combat tuberculosis, the disease continues to pose a major public health threat. To achieve effective control, mechanisms may have to gear more towards patient-centeredness and exploring the human aspects of control. There is insufficient information on the prevalence of depression among TB patients in Nigeria, specifically in the Southwestern part of Nigeria. Therefore, this study seeks to determine the prevalence of depression among TB patients attending Directly Observed Treatment Short course (DOTS) centers in Lagos State, Nigeria.

MATERIALS AND METHODS

Study Setting

This descriptive, cross-sectional study was conducted in Lagos State which is the second most populous state in Nigeria. Due to heavy immigration from other states in Nigeria in search of better economic prospects, the Lagos State population has become diverse with more than 250 ethnic groups as well as small minorities of American, British, Chinese, Greek, Syrian, etc. Lagos State is Nigeria's largest urban area. However, 66% of its population dwells in slums with no access to good roads, clean water, electricity, proper waste disposal, proper housing plans or good hygiene practices. Lagos State has a total of 78 DOTS centers and these centers are made up of 3 tertiary, 24 secondary, 31 primary, and 20 private centers.

Study Population and Sample Size Determination

The study population involves TB patients attending DOTS centers in Lagos State. With over 50,000 TB cases in Lagos State, Kish Leslie's formula for cross-sectional studies to calculate the sample size was used (Okeke, 2023a; Okeke, 2023b; Udeh, 2023c).

$n=(Z^2\ PQ)/d^2$

Where,
n = minimum sample size required when the total population is greater than 10,000.
Z = standard normal deviate; set at 1.96 at 95% confidence level.
P = incidence rate of depression among TB patients from a previous study; (Baba, 2009) determined 27.7% (0.277).
Q = complementary proportion equivalent to 1-P, which is 0.723
d = degree of accuracy desired (absolute precision), which is 5.0% (0.05).
Therefore:
$n = (1.96^2 \times 0.277 \times 0.723)/0.05^2 = 308$
The minimum sample size for this study was 308. With the addition of 10% non-response rate, the sample size required for the study became 342.

Study Procedure
This study spanned a period of 4 months, from March 2023 to June 2023. A list of 78 DOTS centers was obtained from the Lagos State Ministry of Health. These comprise 3 tertiary centers, 24 secondary centers (made up of 1 Police, 2 Army, 2 Navy, 1 Air Force), 31 primary centers (made up of 1 Police and 2 Prisons), and 20 private centers (made up of 8 private not-for-profit (missionary) and 12 private for-profit health institutions). Eight DOTS centers were randomly selected using a table of random numbers. They were: Nigerian Institute for Medical Research (61), Lagos State University Teaching Hospital (44), Mainland Hospital, Yaba (68), Lagos Island General Hospital (32), Randle General Hospital (39), Isolo General Hospital (20), Desile Primary Health Center (22), Ebute-Metta and Bariga LGA Primary Health Centers (15). The primary health centers were visited only once on their clinic days because the same patients would be seen while several visits were made to the other facilities to see different patients on different days.
TB patients in the outpatient departments of the eight DOTS centers were selected. The patients were 18 years old or above, and voluntarily consented to participate in the study. TB patients below 18 years of age, adult TB patients who did not consent, and in-patients were all excluded from this study. Data collection was done by the research team after being trained on the research procedure. Structured, pre-tested questionnaires with sections for the collection of data on socio-demographic parameters, prevalence, patterns and peculiarities of depression among the respondents were used. Patient Health Questionnaire-9 (PHQ-9) to determine and assess depression was extracted from (Kroenke, 2002).

Data Analysis
Data was analyzed using descriptive statistics (frequencies, percentages, tables, graphs). Statistical Package for Social Sciences (SPSS) version 23.0 was used. Tests of the association between depression and factors associated with it were done using the Chi-square test at a significance level (p-value) of 5%. The research team used PHQ-9 instrument scores (not at all "0"; few days "1"; more than half the days "2"; nearly every day "3"). A total score below 4 indicates no depression, 5–9 indicates mild depression, 10–14 indicates moderate depression, 15–19 indicates moderately severe depression, and 20–27 indicates severe depression.

Ethical Considerations
Ethical consideration was sought from the Human Research and Ethics Committee of the Lagos University Teaching Hospital (LUTH), Idi Araba, Surulere, Lagos State. Permission to conduct the study in DOTS centers was obtained from the Lagos State Primary Healthcare Board and the Lagos State Hospital Service Commission as well as voluntary consent obtained from participating TB patients after informed decision.

RESULTS
342 respondents were targeted for the study but only 301 responded giving a response rate of 88%. The reason for this is that the DOT centers are very early morning clinics and some patients going to work or to their private businesses were impatient to wait to be interviewed. The results are expressed in tables and figures as follows:

Table 1: Socio-demographic characteristics of respondents

Socio-demographics characteristics	**Frequency, n (%)**
Age (in years)	
18-20	12 (4.0)
21-30	114 (37.9)
31-40	87 (28.9)
41-50	51 (16.9)
51-60	23 (7.6)
>60	14 (4.7)
Total	**301 (100.0)**
Mean age±standard deviation	**35.2±11.75**
Gender	
Male	216 (71.8)

Female	85 (28.2)
Total	**301 (100.0)**
Marital status	
Single	153 (50.8)
Married	138 (45.8)
Divorced	6 (2.0)
Widowed	3 (1.0)
Separated	1 (0.3)
Total	**301 (100.0)**
Religion	
Christianity	208 (69.1)
Islam	90 (29.9)
Traditional	3 (1.0)
Total	**301 (100.0)**
Ethnicity	
Hausa	14 (4.7)
Ibo	81 (26.9)
Yoruba	157 (52.2)
Others	49 (16.3)
Total	**301 (100.0)**
Employed	
Yes	152 (50.5)
No	149 (49.5)
Total	**301 (100.0)**
Estimated monthly income in Naira (N)	
<30,000 (minimum wage in Nigeria)	72 (23.8)
30,000-100,000	154 (51.0)
100,001-150,000	41 (13.6)
>150,000	34 (11.6)
Total	**301 (100.00)**
Family setting	
Nuclear	178 (59.1)
Extended	59 (19.6)
Polygamous	64 (21.3)
Total	**301 (100.0)**
Education	
Primary	46 (15.3)
Secondary	135 (44.9)
Tertiary	119 (39.5)
No formal education	1 (0.3)
Total	**301 (100.0)**

The mean age was 35.2±11.75 years with the largest number of respondents (37.9%) within the 21-30 years age group. Males were 216 (71.8%) while females were 85 (28.2%). 153 (50.8%) respondents were single, while a small percentage were either divorced (2.0%), widowed (1.0%), or separated (0.3%). Christian respondents were most (69.1%). 14 (4.7%) of the respondents were Hausas, 26.9% were Ibos, and 52.2% were Yorubas. Employed (152) and unemployed (149) respondents were almost equal. Monthly income between N30,000 and N100,000 had the highest frequency (51.0%). Most of the respondents were from a nuclear home (59.1%), and just one TB patient had no formal education.

Table 2: Prevalence of depression among the respondents

Depression diagnostic criteria (n=301)	Not at all n (%)	Few days n (%)	More than half the days, n (%)	Nearly every day, n (%)
Little interest or pleasure in doing things	142 (47.2)	72 (23.9)	51 (16.9)	36 (12.0)
Feeling down, depressed or hopeless	188 (62.5)	67 (22.3)	17 (5.6)	29 (9.6)
Trouble falling or staying asleep, or sleeping too much	161 (53.5)	68 (22.6)	43 (14.3)	29 (9.6)
Feeling tired or having little energy	142 (47.2)	85 (28.2)	43 (14.3)	31 (10.3)
Poor appetite or eating too much	180 (59.8)	50 (16.6)	22 (7.3)	49 (16.3)
Feeling bad about yourself- or that you are a failure or have let yourself or your family down	203 (67.4)	48 (15.9)	14 (4.7)	36 (12.0)
Trouble concentrating on things, such as reading the newspaper or watching television	205 (68.1)	59 (19.6)	14 (4.7)	23 (7.6)
Moving or speaking so slowly so that other people could have noticed or the opposite - being so fidgety or restless that you have been moving around a lot more than usual	21 (70.8)	49 (16.3)	21 (7.0)	18 (6.0)
Thoughts that you would be better off dead or of hurting yourself in some way	223 (74.1)	40 (13.3)	19 (6.3)	19 (6.3)

PHQ-9 extracted from (Kroenke, 2001)

Table 2 shows that 51 (16.9%) of the TB patients had little interest or pleasure in doing things for more than half the days while 36 (12.0%) had little interest nearly every day. 36 (12.0%) of the respondents feel bad about themselves nearly every day while 15.9% had this feeling for a few days. 23 (7.6%) had trouble concentrating on things nearly every day, while 205 (68.1%) did not have any trouble concentrating on things. 19 (6.3%) harbor thoughts of being better off dead or of hurting themselves in some way more than half of the day and nearly every day while 40 (13.3%) had this feeling for a few days.

Table 3: Prevalence and severity of depression among the respondents

Depression severity (n=301)	Score	Frequency, n (%)
Depression rate		
Depressed		156 (51.8)
Not Depressed		145 (48.2)
Total		**301 (100.0)**
Severity of depression (n=301)		
None	0-4	145 (48.2)
Mild depression	5-9	64 (21.3)
Moderate depression	10-14	61 (20.3)
Moderately severe depression	15-19	22 (7.3)
Severe depression	20-27	9 (3.0)
Total		**301 (100.0)**

PHQ-9 score card extracted from (Kroenke, 2001)

Table 3 above shows that the prevalence of depression among TB patients was 51.8%. The severity of depression among the respondents indicates that 48.2% of the TB patients were not depressed, 21.3% had mild depression, 20.3% had moderate depression, 7.3% were had moderately severe depression, and 3% were severely depressed.

Figure 1 shows that 61.1% of the respondents found life as not difficult, 27.2% found life generally as somewhat difficult, 8.6% found life as very difficult, and 3.0% found life as extremely difficult.

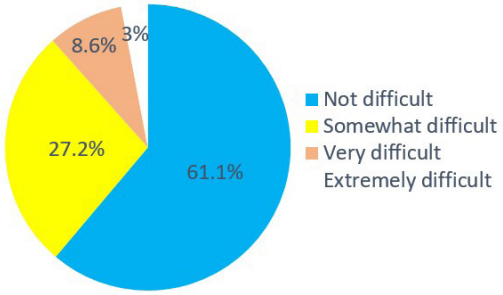

Figure 1: Bar chart showing socio-occupational dysfunction among the respondents

Table 4: Association between socio-demographic characteristics and depression status of respondents

	Prevalence				
	Depressed	**Not Depressed**	**X2**	**Df**	**p-value**
Socio-demographic characteristics	**n (%)**	**n (%)**			
Age (years)					
18-20	4 (33.3)	8 (66.7)	10.550	5	0.059
21-30	60 (52.6)	54 (47.4)			F-Exact
31-40	54 (62.1)	33 (37.9)			
41-50	23 (45.1)	28 (54.9)			
51-60	7 (30.4)	16 (69.6)			
>60	8 (57.1)	6 (42.9)			
Total	**156 (51.8)**	**145 (48.2)**			
Gender					
Male	104 (48.1)	112 (51.9)	4.147[a]	1	0.042
Female	52 (61.2)	33 (38.80)			
Total	**156 (51.8)**	**145 (48.2)**			
Marital status					
Single	79 (51.6)	74 (48.4)	2.237	4	0.742
Married	73 (52.9)	65 (47.1)			F-Exact
Divorced	2 (33.3)	4 (66.7)			
Widowed	1 (33.3)	2 (66.7)			
Separated	1 (100.0)	0 (0.0)			
Total	**156 (51.8)**	**145 (48.2)**			
Religion					
Christianity	115 (55.3)	93 (44.7)	5.241	2	0.049
Islam	41 (45.6)	49 (54.4)			F-Exact
Traditional	0 (0.0)	3 (100.0)			
Total	**156 (51.8)**	**145 (48.2)**			
Ethnicity					
Igbo	42 (51.9)	39 (48.1)	3.953[a]	3	0.267
Yoruba	88 (56.1)	69 (43.9)			
Hausa	6 (42.9)	8 (57.1)			
Others	20 (40.8)	29 (59.2)			
Total	**156 (51.8)**	**145 (48.2)**			
Employed					
Yes	73 (48.0)	79 (52.0)	1.777[a]	1	0.183
No	83 (55.7)	66 (44.3)			
Total	**156 (51.8)**	**145 (48.2)**			
Estimated monthly income in Naira (N)					
<30,000	25 (71.4)	10 (28.6)	11.596[a]	3	0.009
30,000-100,000	34 (45.3)	41 (54.7)			
100,001-150,000	6 (30.0)	14 (70.0)			
>150,000	6 (35.3)	11 (64.7)			
Total	**71 (48.3)**	**76 (51.7)**			
Family setting					
Nuclear	97 (54.5)	81 (45.5)	1.618[a]	2	0.445
Extended	30 (50.8)	29 (49.2)			
Polygamous	29 (45.3)	35 (54.7)			

Total	**156 (51.8)**	**145 (48.2)**			
Education level					
Primary	16 (34.8)	30 (65.2)	8.119	3	0.027
Secondary	78 (57.8)	57 (42.2)			F-Exact
Tertiary	61 (51.3)	58 (48.7)			
No formal education	1 (100.0)	0 (0.0)			
Total	**156 (51.8)**	**145 (48.2)**			

Table 4 shows that the age group 21-30 years were the most depressed with 60 respondents out of the 156 depressed respondents. On gender, 48.1% males were depressed. The depressed/not depressed ratio among the single respondents was 51.6:48.4. More of the depressed TB patients were unemployed (55.7%). 71.4% of the respondents earning less than the minimum wage (N30,000) were depressed, while 35.3% of the respondents earning above N150,000 monthly were depressed. 57.8% of the respondents who were secondary school leavers were depressed.

DISCUSSION

Tuberculosis (TB) is an infectious disease that requires proper treatment and management to prevent its spread and fatality in infected individuals. TB has been reported to be associated with mental illnesses such as depression (Duko, 2020; WHO, 2023a). Thus, it is crucial to analyze the population index of the disease and understand how TB patients are coping with depression.

The mean age of TB patients in this study was 35.2±11.75 years, slightly above the 30-year mean age in the study of (Salodia, 2019). Patients between ages 21 and 50 years accounted for 83.7% of the sample size, this gives a clue that TB infection is common among the workforce population and less common among the people below 21 and above 50 years of age, who are being catered for. Males are more infected than females as males accounted for 71.8% of the respondents, just as was found in the studies of (Dahiya, 2017) and (Salodia, 2019). This could also be related to the fact that men actively interact with people more than women daily. Single or unmarried patients accounted for half (50.8%) of the respondents, suggesting a wide spectrum of interaction for the unmarried compared to married, divorced, widowed, or separated individuals. This supports (Dahiya, 2017) study. Most of the respondents were Christians and over half (52.2%) were Yorubas. This indicates that Lagos State is dominated by adherents of the Christian religion and that the Yorubas in the state are the people mostly infected with tuberculosis. Almost half (49.5%) of the respondents were unemployed, indicating the need for the Lagos State government to improve on employment of the masses. However, TB infection is equally distributed among the unemployed and employed. TB is more prevalent among people earning a low monthly income of N100,000 or less as compared to people earning a higher income (>N100,000), as illustrated by findings in this study and in the study of (Dahiya, 2017). This study also proves that tuberculosis is distributed across every level of education. A high (51.8%) prevalence of depression among the participants was recorded in this study. This prevalence rate was higher than the 23.6% found in New Delhi (Salodia, 2019), 30% in Lesotho (Larson, 2017), 31.1% in Ethiopia (Molla, 2019), and 45.5% in Oyo State, Nigeria (Ige, 2011). The value in this present study is almost the same as the 51.9% in Eastern Ethiopia reported by (Dasa, 2019), 69.55% in Pakistan (Javaid, 2017), and 80% in Pakistan (Anwar, 2010).

The variation in the prevalence of depression could be attributed to various factors such as socio-occupational dysfunction, presentation of TB symptoms, prolonged drug therapy duration, HIV status, other comorbidities e.g. MSDs, stigma from family and friends, denial of communal privileges, family support, period of diagnosis of TB, stage of treatment, the distance to a treatment center, and the attitude of treatment center staff. Analyzing the socio-occupational dysfunction of the respondents, 61.1% of them found life as not difficult, 27.2% found life as somewhat difficult, 8.6% found life as very difficult, and 3.0% found life as extremely difficult.

The prevalence of depression among the 301 respondents can be summarized as 48.2% (no depression), 21.3% (mild depression), 20.3% (moderate depression), 7.3% (moderately severe depression), and 3.0% (severe depression). This means that 89.7% of the respondents are most likely to comply to proper medication because they are either not depressed or have mild or moderate depression, yielding a better treatment outcome for the tuberculosis infection. Additionally, from this study, it can be stated that out of 20 depressed TB patients: 16 will be mildly and moderately depressed (evenly shared); 3 moderately severely depressed; and 1 will be severely depressed.

The association between socio-demographic characteristics and depression status of the participants shows that age, marital status, ethnicity, employment status, and family setting were not associated with depression. The relationship between marital status and depression in this present study aligns with the study of (Salodia, 2019).

Apart from these socio-demographic parameters, gender shows a significant association with depression, opposing the result of (Salodia, 2019). The ratio of depressed female participants was significantly higher (p=0.042) than the ratio of depressed male participants. Women

are the caregivers in the home, and being unable to render this care due to morbidity of TB and the fear of communicating the disease to their family members might contribute to their vulnerability to depression.

Religion was found to be slightly associated with depression (p=0.049). With more Christian and less Muslim participants being depressed, the reason for this disparity could be slated for further studies.

Financial status was significantly associated with depression (p=0.009) as a high percentage of participants earning N100,000 or less were depressed and only a low percentage of those earning over N100,000 were depressed. This is consistent with the study of (Aniebue, 2007). Financial stability is essential to maintain a good health. Patients under treatment are always advised to eat a balanced diet adequately and maintain healthy lifestyles. With financial hardship being experienced, patients may be unable to afford adequate balanced meals or lifestyles. The combination of poverty and a debilitating illness like tuberculosis could be responsible for depression among low-income earners.

Depression was also found to be associated with educational level (p=0.027). This study shows that more educated participants were more depressed. This is because a less educated person will not be exposed to more information about TB which can boost his morale and alter negative mindsets that may make him/her elapse into depression.

The strength of this study lies in the fact that a standard PHQ-9 was used to extract information to determine and assess depression among the participants. The researchers were adequately trained before the study to collect accurate data during interviews with the participants, and the sincerity of the participants was commendable. This study is limited in the aspect of identifying the occupation of the respondents and determining the association between occupation, TB infection and depression. It was challenging to persuade respondents to wait because they were always in a rush to leave the center and go to work since the DOTS centers only schedule early morning clinics for TB patients on weekdays. Prospect for further study is to determine knowledge, attitude and factors associated with depression in TB patients.

CONCLUSION

Tuberculosis is a chronic, debilitating disease with high morbidity and mortality, thus making coping with general life activities difficult. A TB patient's inability to cope with the disease may influence his or her vulnerability to depression.

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