Publisher homepage: www.universepg.com, ISSN: 2663-7529 (Online) & 2663-7510 (Print)

https://doi.org/10.34104/ejmhs.024.085099

European Journal of Medical and Health Sciences

Journal homepage: www.universepg.com/journal/ejmhs

Knowledge, Attitude and Factors Associated with Depression in Tuberculosis Patients Attending Directly Observed Treatment Short-course (DOTS) Centers in South-West Nigeria

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ABSTRACT

Tuberculosis (TB) is of grave public health concern globally with a reported 1.3 million deaths approximately, caused by the infection. TB infection is closely associated with depression which at its worst stage can bring up suicidal thoughts and death. This study aimed to assess knowledge, attitude and factors associated with depression in TB patients attending Directly Observed Treatment Short course (DOTS) centers in Lagos State, South-West Nigeria. Descriptive, cross-sectional approach was used to evaluate responses from 301 TB patients at 8 DOTS centers in Lagos State. Data from the participants (respondents) was collected using interviewer-administered questionnaires. Patient Health Questionnaire-9 (PHQ-9) was used to determine depression status of the participants. Obtained data was analyzed using SPSS version 23.0, with Chi-square test being used to check for the association of selected factors with the depression status of the participants. Mean age of the respondents was 35.1±11.7 years. 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 participant had no formal education. Knowledge of depression among the participants was average (fair) and the attitude was positive among 41% of them. Factors significantly associated with depression were the presentation of symptoms, drug therapy duration, stigma from family and friends, denial of privileges, HIV status, privacy during treatment, and family support ($p<0.05$). Factors like the thought that tuberculosis makes one depressed, period of being diagnosed, stage of treatment, distance to the treatment center, attitude of the treatment center staff, and time spent on a treatment day were significantly not associated to depression ($p>0.05$). Depression can be fatal. Therefore, TB patients receiving treatment should be well-enlightened about this mental disorder.

Keywords: Knowledge, Attitude, Factors, Depression, Tuberculosis, Patients, DOTS centers, and Nigeria.

INTRODUCTION:

Tuberculosis (TB) is a contagious, airborne, bacterial infection caused by *Mycobacterium tuberculosis* (World Health Organization [WHO], 2023a). Due to the infectious and airborne properties of TB, about one-fourth of the world's population has been infected with TB (Houben, 2016). TB affects the lungs and other extrapulmonary tissues such as bones, lymph nodes, meninges, liver, adrenal glands, and spleen (Le, 2017; Saikat *et al.,* 2020), but then TB is preventable and curable (WHO, 2023a). Closely related to TB is cystic fibrosis which is a genetic disease affecting

mainly the lungs (Ikwuka, 2023a). Other organs which can be affected by cystic fibrosis include the pancreas, liver, kidneys, and intestine. Cystic fibrosis is caused by mutations in both copies of the gene for cystic fibrosis trans-membrane 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 (Saikat *et al*., 2020; Ikwuka, 2023a).

TB was reported by WHO as the second leading cause of death (1.3 million deaths) from a single infectious agent in 2022 after coronavirus disease (COVID-19) and caused almost twice the number of deathslinked to HIV/AIDS (WHO, 2023a). The annually reported new cases per 100,000 population have increased by 3.9% from 128 (95% UI: 120-137) in 2020 to 133 (95% UI: 124-143) in 2022, after an approximately annual 2% decline between 2010 and 2020 (Emery, 2021). Nigeria is shortlisted among the 30 countries with high TB burden. With a total of 467,000 cases reported in 2021 (WHO, 2023b), Lagos State accounted for about 11%(51,370) of the total TB cases (Adebowale-Tambe, 2022). TB complications are compounded by HIV/AIDS, the multi-drug resistant (MDR) tuber-culosis variant, and depression (WHO, 2023a). Chronic metabolic disorders have the capacity to compromise immunity due to the activation of different systemic, immune inflammatory processes. Metabolic disorders e.g. Hypertension, Adiposity, Diabetes mellitus and Dyslipidemia collectively known as Metabolic Syndrome Diseases (MSDs) are diseases related to one another and have very high morbidity and mortality rates (Ikwuka, 2015; Ikwuka, 2017a; Ikwuka, 2017c; Ikwuka, 2023c; Ikwuka, 2023f; Virstyuk, 2016). Results obtained from different researches have shown that hypertension, diabetes mellitus, adiposity and dyslipidemia, asymptomatic hyperuricemia, activation of systemic immune infla-mmation and fibrogenesis (which is also noticeable in chronic TB), can lead 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; Virstyuk, 2019; Virstyuk, 2021a; Virstyuk, 2021b). Kidney damage can lead to anemia due to decreased secretion of erythropoietin. Hemoptysis (blood in sputum) is one of the symptoms of chronic TB and is associated with oxidative stress. Linked with the induction of oxidative stress are major free radicals. Among these major free radicals, superoxide anion, hydroxyl radical, and hydroperoxyl radical are of physiological significance. Non-radical of physiological significance is hydrogen peroxide (Ikwuka, 2023b, Ekechi, 2023a). Hemoptysis can also lead to anemia (Inya, 2023a; Inya, 2023b). Patients with Vitamin K deficiency are also prone to different degrees of bleeding which can lead to anemia (Ikwuka, 2023e). Depression is a common mental disorder. It is characterized by sadness, loss of interest in things that once interested the individual, feelings of hopelessness or dejection, troubled concentration, or thoughts of being better off dead or hurting oneself (Kroenke, 2002). Depression and anxietyhave an average lifetime prevalence of 12%, and both are the highest cause of mental disorders (Bains, 2023). A single experience of depression increases the probability of becoming depressed again, and continues subsequently (National Institute of Mental Health [NIMH], 2021; Institute of Health Metrics and Evaluation, 2022).

Women suffer depression almost as twice as men, due tothe effects of childbirth, hormonal differences, psy-chosocial stressors in men and women, and the behavioral model of learned helplessness (Pederson, 2014). The presence of disease increases the chances of depression in a person. A typical proof was in 2020 when COVID-19 emerged, the number of people with depression increased by 28% from the 280 million reported the previous year (WHO, 2022). Depression is common among TB patients with a prevalence of 45.5% (Ige, 2011), particularly among TB patients with extensive pathology of the disease, the elderly, chronic TB infection, and low socio-economic status. A systematic review of the prevalence of depression among TB patients also found that the coexistence of depression and tuberculosis increases the risk of comorbidity (Duko, 2020). Adherence to a treatment plan is essential for quick recovery. However, poor compliance with treatment plans for chronic TB infection has been associated with mental disorders like depression (DeJean, 2013). Early diagnosis and treatment of depression in TB patients may there-

forehelp to ensure compliance to treatment. Nevertheless, there is also need for new and effective treatment options in patients with Metabolic Syndrome Diseases. Sodium-Glucose Linked Transporter 2 (SGLT-2) inhibitors e.g. Dapagliflozin and Glucagon-like Peptide 1 Receptor Agonists (GLP-1 RAs) e.g. Liraglutide have been found to improve the efficacy of treatment and 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). It has also been documented that coconut water has hepatorenal protective functions in alloxan-induced type 1 diabetes mellitus (Ekechi, 2023b). The control and management of TB face huge challenges both locally and internationally. These challenges include poor policy implementation, healthcare facilities delaying the delivery of tuberculosis supplies, medical personnel's poor adherence to guidelines, and very importantly, patients' poor compliance with treatment routine. In addition, with the paucity of information on the knowledge and attitude of tuberculosis patients and factors associated with depression in TB patients; this study, therefore, assesses the knowledge, attitude and factors associated with depression in TB patients attending DOTS centers in Lagos State, South-West Nigeria.

MATERIALS AND METHODS:

Study Setting

Thiscross-sectional, descriptive study was conducted in 8 out of the 78DOTS centers in Lagos State, South-West Nigeria. Of these DOTS centers, 3 are tertiary, 24 are secondary, 31 are primary, and 20 are private centers.

Study Population and Sample Size Determination

The study population consists of TB patients attending DOTS centers for treatment. With 51,370 reported cases of tuberculosis infection in Lagos State, Kish Leslie's formulafor cross-sectional studies were deployed in determining the sample size (Okeke, 2023a; Okeke, 2023b; Udeh, 2023).

$$n = \frac{Z^2PQ}{d^2}$$

Where,

n = minimum sample size required with a study population >10,000

Z = standard normal deviate at 95% confidence level = 1.96

P = incidence rate from a previous study =27.7% (0.277) (Baba, 2009)

Q = complementary proportion = 1-P = 0.723

d = degree of accuracy desired = 5.0% (0.05)

Therefore:

$$n = \frac{1.96^2 \times 0.277 \times 0.723}{0.05^2} = \frac{0.7694}{0.0025} = 307.74 \approx 308$$

A minimum sample size of 308 was calculated, and with the addition of 10% non-response rate, the sample size required increased to 342.

Study Procedure

This study spanned from March 2023 to June 2023. Eight DOTS centers were randomly selected using a table of random numbers from the 78 DOTS centers. These centers were in two tertiary, four secondary, and two primary health facilities. The centers in the primary health facilities were visited just once. TB patients in the outpatient departments, 18 years old or older, and voluntarily consented to the study were included in this study. TB patients below 18 years of age, TB patients who did not voluntarily consent, and TB in-patients (TB patients on admission) were excluded from this study. Data collection was done by the research team after being trained on the research procedure. Patient Health Questionnaire-9 (PHQ-9) was used to determine depression among the participants. Structured pre-tested questionnaireswere used for data collection. The questionnaire had sections for socio-demographic parameters, the participants' knowledge of depression, the participants' attitude towards depression, and factors associated with depression among the participants (respondents) were used.

Data Analysis

Statistical Package for Social Sciences (SPSS) version 23.0 was used for data analysis. The association between selected factors and depression was tested using the Chi-square test at a significance level (*p*-value) <0.05. PHQ-9 instrument scores (not at all "0"; few days "1"; more than half the days "2"; nearly every day "3") were used. A total score less than 4 signifies no depression, 5-9 signifies mild depression,

10-14 signifies moderate depression, 15-19 signifies-moderately severe depression, and 20-27 signifie-ssevere depression.

Ethical Considerations

Ethical approval was obtained from the Human Research and Ethics Committee of Lagos University Teaching Hospital (LUTH), Lagos State. In addition, permission was requested from the DOTS centers for this study and was obtained from the Lagos State Primary Healthcare Board and the Lagos State Hospital Service Commission. Voluntary consent after informed decision from the participantswas also requested and obtained.

RESULTS:

From the 342 calculated sample size, an 88% response rate was recorded as only 301 TB patients responded. The obtained results are expressed as follows:

Table 1: Socio-demographic characteristics of respondents.

Socio-demographic 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)
Igbo	**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)
Monthly income in Naira (₦)	

<30,000	**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 of the participants was 35.2±11.75 years. Age group 21-30 yearswas the largest 114 (37.9%), males were more - 216 (71.8%), 153 (50.8%) were single, 6 (2.0%) were divorced, 3 (1.0%) were widowed,and 1 (0.3%) was separated. On the religion of the study participants, 69.1% were Christians, 29.9% were Muslims, and others were traditionalists (1%).Yorubaethnic group had the highest number of participants (52.2%). The employed versus unemployed was 50.5% versus 49.5%.Participants with monthly income between ₦30,000-₦100,000 were most (51.0%). Most participants were from a nuclear home (59.1%) and just one participant (0.3%) had no formal education. **Fig. 1** illustrates a 51.8%prevalence of depression among the respondents. 156 out of the 301 respondents were depressed. This ratio was calculated from the PHQ-9 used to determine depression among the participants.

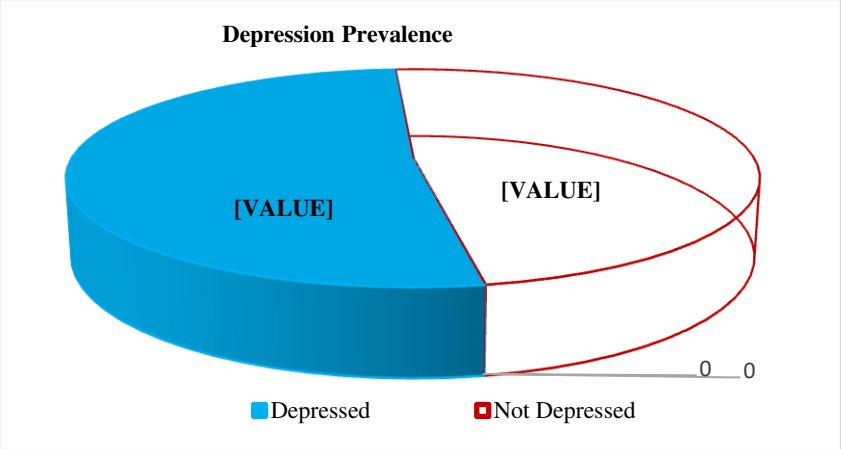

Fig. 1: Prevalence of depression among the respondents.

Fig. 2 shows the severity of depression among the 156 depressed respondents. 41.03% were mildly depressed, 39.1% were moderately depressed, 14.1% hadmoderately severe depression, and 5.77% were severely depressed.

Table 2 shows the knowledge of depression among the respondents. 86 (28.6%) of the respondents have not heard of depression, while 215 (71.4%) have heard about it. 211 (70.1%) knew that depression can cause suicide, 146 (48.5%) knew that marked loss of interest is a symptom of depression, while only 69 (22.1%) believed it could be cured using unorthodox medicine, and 172 (57.1%) agreed that it can also be treated with talk therapy.

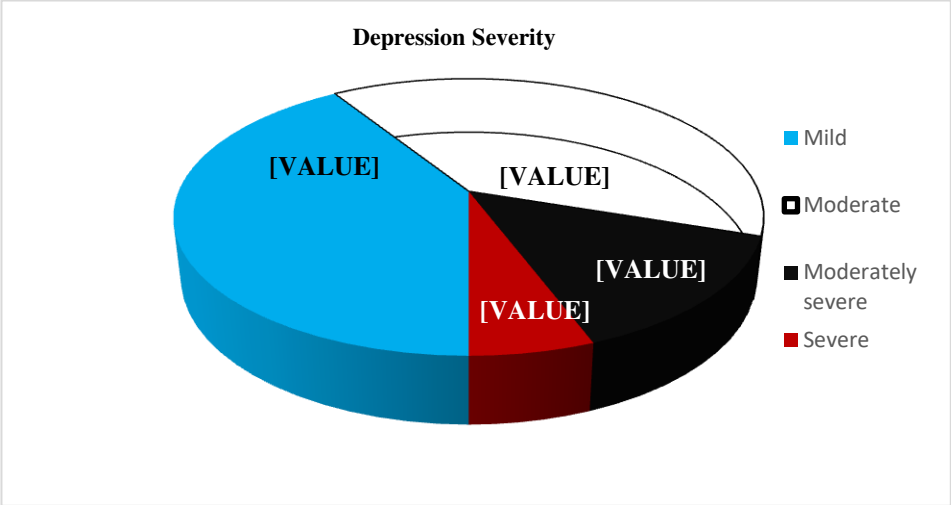

Fig. 2: Depression severity among the depressed respondents.

Table 2: Knowledge of depression among the respondents.

S/No.	Statements on the knowledge of depression(*n*=301)	Frequency (%)
1.	I have heard of depression	215 (71.4)
2.	Depression is a common psychiatric disorder	148 (49.2)
3.	Depression can cause suicide	211 (70.1)
4.	Depression can start in childhood	145 (48.2)
5.	Depression affects both men and women	235 (78.1)
6.	Depression can be treated with unorthodox medicine	69 (22.1)
7.	Depression can be caused by biological factors such as genes	78 (25.9)
8.	I know that it can be caused by emotional stress	197 (65.4)
9.	I know that it can be caused by prolonged grief over loved ones	187 (62.1)
10.	I know that it can be caused by certain medical conditions as tuberculosis	184 (61.1)
11.	Depression can be caused by the birth of a new baby	83 (27.6)
12.	Depression can be caused by social factors such as work-related problems	173(57.5)
13.	I know that it can be caused by old age	114 (37.9)
14.	I know that a symptom is a change in sleep pattern	192 (63.8)
15.	I know that a symptom is poor concentration	204 (67.8)
16.	Respondent knows that a symptom is frequent crying for no obvious reasons	125 (41.5)
17.	I know that a symptom is not good-decision making	167 (55.5)
18.	I know that a symptom is a marked loss of interest	146 (48.5)
19.	I know that a symptom is a change in appetite	179 (59.5)
20.	I know that a symptom is guilty thoughts	159 (52.8)
21.	I know that a symptom is the desire to commit suicide	178 (59.1)
22.	A depressed person should see a doctor	217 (72.1)
23.	Depression can be treated with orthodox medicine	99 (32.9)
24.	Depression can be treated with talk therapy	172 (57.1)
25.	It can be treated by getting involved in physical activities	169 (56.1)
26.	Depression cannot be treated by eating more often	73 (24.3)
27.	Depression can be treated by pulling yourself together	177 (58.8)

Fig. 3 illustrates that only 24.6% of the participants had an above average (good) knowledge of depression, 42.9% hadan average (fair) knowledge of depression, and 32.6% had a below average (poor) knowledge of depression.

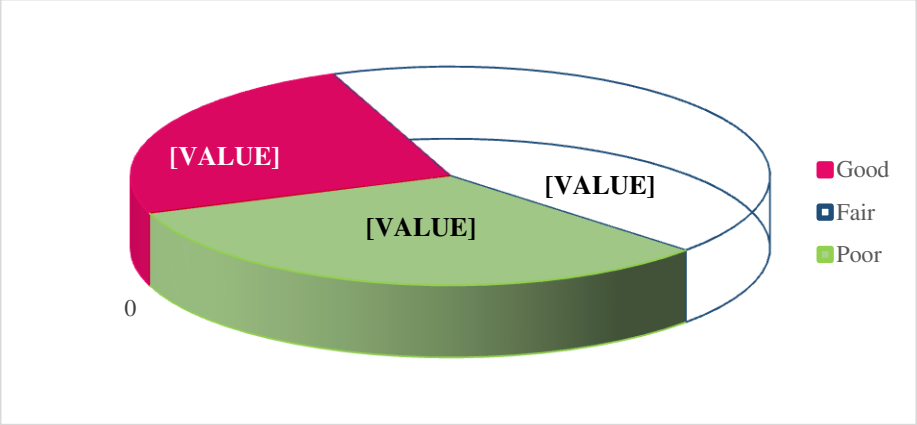

Fig. 3: Level of knowledge of depression among the respondents.

Table 3: Attitude of the respondents towards depression.

S/No.	Attitude towards depression(*n*=301)	Agree,*n* (%)	Disagree,*n* (%)	Neutral,*n* (%)
1.	People with depression can get over it if they want to	187 (62.1)	26 (8.6)	88 (29.2)
2.	Depression is a sign of personal weakness	173 (57.5)	45 (15.0)	83 (27.6)
3.	Depression is not a real medical illness	139 (46.2)	56 (18.6)	106 (35.2)
4.	People with depression are dangerous	152(50.5)	46 (15.3)	103 (34.2)
5.	It is best to avoid people with depression so you don't become depressed yourself	68 (22.6)	114 (37.9)	119 (39.5)
6.	A depressed person is unpredictable	184 (61.1)	29 (9.6)	88 (29.2)
7.	If I had depression, I would not tell anyone	61 (20.3)	123 (40.9)	117 (38.9)
8.	I would not employ someone if I knew they had been depressed	116 (38.5)	86 (28.6)	99 (32.9)
9.	I would not vote for a politician if I knew they had been depressed	130 (43.2)	70 (23.3)	101 (33.6)

The table above shows that 173 (57.5%) respondents agreed that depression is a sign of personal weakness and 139 (46.2%) agreed that it is not a real medical illness. 187 (62.1%) agreed that people with depression can get over it if they want to, and 123 (40.9%) respondents disagreed that if they had depression, that they would not tell anyone. **Fig. 4** reflects the attitude of the respondents towards depression. 41.0% of the respondents had a positive attitude while 59.0% had a negative attitude towards depression.

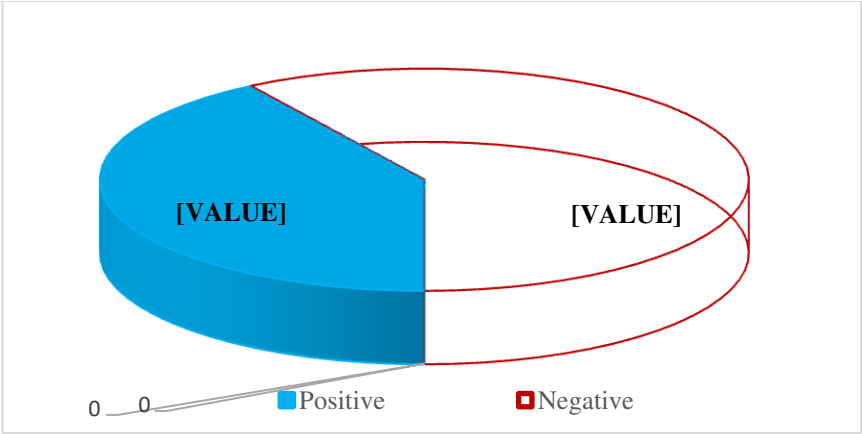

Fig. 4: Attitude towards depression among the respondents.

Some of the factors associated with depression in TB patients are shown in **Table 4A** and continued in **Table 4B**.

Table 4A: Factors associated with depression among respondents.

Factors	Prevalence				
	Depressed, *n* (%)	Not Depressed, *n p* (%)	X^2	Df	*p*-value
Socio-occupational dysfunction					
Not difficult	70(38.0)	114(62.0)			
Somewhat difficult	59(72.0)	23(28.0)	36.621	3	**.000**
Very difficult	20(76.9)	6(23.1)			F-Exact
Extremely difficult	7(77.8)	2(22.2)			
Total	156(51.8)	145(48.2)			
Has symptom(s) of TB					
Yes	85(60.7)	55(39.3)	8.431[a]	2	**.015**
No	55(43.3)	72(56.7)			
I don't know	16(47.1)	18(52.9)			
Total	156(51.8)	145(48.2)			
Drug therapy duration					
1-3months	46(47.3)	51(52.7)	11.088	4	**.020**
4-6months	90(57.3)	67(42.7)			F-Exact
7-12months	11(31.4)	24(68.6)			
1year and above	9(75.0)	3(25.0)			
Total	156(51.8)	145(48.2)			
Experiences stigma from family and friends					
Yes	59(63.4)	34(36.6)	9.599[a]	2	**.008**
No	70(50.4)	69(49.6)			
I don't know	27(39.1)	42(60.9)			
Total	156(51.8)	145(48.2)			
Has been denied communal privileges					
Yes	31(77.5)	9(22.5)	13.700[a]	2	**.001**
No	100(50.0)	100(50.0)			
I don't know	25(41.0)	36(59.0)			
Total	156(51.8)	145(48.2)			
Thinks TB can make one depressed					
Yes	74(54.4)	62(45.6)	0.671[a]	2	.715
No	45(50.0)	45(50.0)			
I don't know	37(49.3)	38(50.7)			
Total	156(51.8)	145(48.2)			
HIV status					
Yes	48(64.9)	26(35.1)	8.536[a]	2	**.014**
No	92(49.7)	93(50.3)			
I don't know	16(38.1)	26(61.9)			
Total	156(51.8)	145(48.2)			
Period diagnosed of TB					
<3 months	35(41.7)	49(58.3)	7.641	5	.168
3-6 months	89(56.0)	70(44.0)			F-Exact
6-9 months	13(50.0)	13(50.0)			
9-12 months	6(46.2)	7(53.8)			
More than 12 months	11(73.3)	4(26.7)			
No response	2(50.0)	2(50.0)			

Total	156(51.8)	145(48.2)			
Stage of treatment					
Newly diagnosed	119(48.0)	129(52.0)	8.411	4	.073
Extra pulmonary	12(75.0)	4(25.0)			F-Exact
Treatment failure	12(66.7)	6(33.3)			
Disease relapse	5(71.4)	2(28.6)			
Returned after treatment interruption	8(66.7)	4(33.3)			
Total	156(51.8)	145(48.2)			

Table 4B: Factors associated with depression among respondents (continued).

Factors	**Prevalence**				
	Depressed,*n* (%)	**Not Depressed,*n* (%)**	**X^2**	**Df**	***p*-value**
Distance to treatment center					
Very close	41(48.8)	43(51.2)	2.099[a]	4	.718
Close enough	47(51.6)	44(48.4)			
A little bit far	32(50.0)	32(50.0)			
Far	22(62.9)	13(37.1)			
Very far	14(51.9)	13(48.1)			
Total	156(51.8)	145(48.2)			
Attitude of treatment center staff					
Very friendly	68(53.1)	60(46.9)	8.158	4	.0718
Friendly	74(48.7)	78(51.3)			F-Exact
Indifferent	6(75.0)	2(25.0)			
Hostile	7(87.5)	1(12.5)			
Very hostile	1(20.0)	4(80.0)			
Total	156(51.8)	145(48.2)			
Time spent on a treatment day					
Short and adequate	135(51.7)	126(48.3)	1.984	3	.590
Quite long	5(38.5)	8(61.5)			F-Exact
Long	8(53.3)	7(46.7)			
Very long	8(66.7)	4(33.3)			
Total	156(51.8)	145(48.2)			
Privacy concerns in treatment center					
Yes	74(64.9)	40(35.1)	12.746[a]	2	**.002**
No	46(42.6)	62(57.4)			
I don't know	36(45.6)	43(54.4)			
Total	156(51.8)	145(48.2)			
Family support					
Little support	6(40.0)	9(60.0)			
Moderately supportive	29(65.9)	15(34.1)	11.417	4	**.017**
Very supportive	108(48.0)	117(52.0)			F-Exact
Not supportive	11(84.6)	2(15.4)			
Indifferent	2(50.0)	2(50.0)			
Total	156(51.8)	145(48.2)			
Social support group					
Yes	7(36.8)	12(63.2)	1.824[a]	1	.177

No	149(52.8)	133(47.2)			
Total	156(51.8)	145(48.2)			

Tables 4A and B show the relationship between factors associated with depression and depression. 38.0% of the respondents who agreed life was not difficult were depressed, and 7 out of the 9 respondents who confirmed life was extremely difficult were depressed. 60.7% of patients with TB symptoms were depressed. 63.4% of respondents who experienced stigma from family and friends were depressed, while 50.4% of the respondents without the experience of stigmatization from family and friends were depressed as well. Half of those (50.0%) who do not think TB can make someone depressed were depressed. 64.9% of HIV-positiveTB patients were depressed. 73.3% of those diagnosed with TB for more than 12 months were depressed. 66.7% of the respondents with treatment failure were also depressed. 7 out of 8 respondents who experienced hostility from treatment center staff were depressed. 64.9% of those concerned about privacy at treatment centers were depressed. 84.6% of those whom their family were not supportive were depressed, and 52.8% of those who do not belong to any social support group were depressed.

DISCUSSION:

Studies have been conducted on tuberculosis and how closely related depression is to it. Reports have also shown that there is an increase in the incidence of tuberculosis (Emery, 2021; WHO, 2023a).The mean age of the participants in this study was 35.2±11.75 years.Most (83.7%) of the patients (participants) were 21 to 50 years old, suggesting that the workforce population has the highest TB infection compared to those below 21 years and beyond 50 years. Males are more infected in this study, similar to the studies of (Dahiya, 2017) and (Salodia, 2019).An interpretation of this could be that men interact more with people or strangers than women. In agreement with (Dahiya, 2017) study, the single or unmarried participants were 50.8%, suggesting a broad range of interaction for unmarried people compared to the married, divorced, widowed, or separated. Majority of the respondents were Christians (69.1%) and over half were Yorubas (52.2%). These indicate that Christianity and Yorubas were the dominant religion and tribe respectively among the TB patients in Lagos State. Unemployment was high with a 49.5% incidence. However, the incidence of tuberculosis is almost equal between the employed and unemployed. The state government has to channel more resources to employment. Tuberculosis is highest among people with a monthly income ≤₦100,000, supporting the study of (Dahiya, 2017) where low-income earners dominated the tuberculosis-infected population. From this present study, it is proven that tuberculosis is available across every education level. There is limited information on the knowledge of depression among tuberculosis patients. This present study reported that 24.6% respondents had an above average (good) knowledge of depression, 42.9% had an average (fair) knowledge, whereas 32.6% had a below average (poor) knowledge of depression. It was discovered that 71.4%have heard of depressionand 70.1% know that it can cause suicide. More than half of the respondents believe that it is not a common psychiatric disorder. 61.1% know that tuberculosis can cause depression while over half were not sure that depression can be caused by biological factors such as genes (74.1%), birth of a baby (72.4%), and old age (62.1%). In addition, participants were admirably knowledgeable of the symptoms of depression. Surprisingly, 72.1% believed a depressed person should see a doctor, one-third thinks that religious leaders should be sought for help and a lesser number believe it should be a family member. More than half of the respondents believed that depression can be treated with talk therapy (57.1%), getting involved in physical activities (56.1%), and pulling yourself together (58.8%). In summary, the level of knowledge of depression among the participantscan be said to be average (fair), which may be due to low education on depression in treatment centers or poor public enlightenment on tuberculosis. Positive attitude was exhibited by 41.0% of the participants while 59.0% had a negative attitude towards depression. Hence, there was a general negative attitude towards depression among the respondents. More than half of the respondents had a negative attitude towards depression which agrees with the literature which says that knowledge and attitude go hand-in-hand. A lower level of knowledge tends towards a more negative

attitude as seen in this present study. Most respondents agreed that people with depression could get over it if they want to (62.1%), and 40.9% agreed that they would tell someone if they were depressed. A good number of the respondents agreed depression is a sign of personal weakness (57.5%), that it is not a real medical illness (46.2%), and that they would not vote for a politician if they knew he/she had been depressed (43.2%).

This present study recorded a51.8% prevalence of depression among TB patients, a value higher than 23.6% in New Delhi, India (Salodia, 2019) and 30% in Lesotho (Larson, 2017). The value is close to 51.9% in Eastern Ethiopia (Dasa, 2019), and lower than 80% in Pakistan (Anwar, 2010). All these countries of study are developing countries with financial crises. The variation in the prevalence of depression could be attributed to various factors as described in the following paragraphs. There was a statistical association (significance) between depression and socio-occupational dysfunction (p=0.000). 59 (72.0%) of those whofoundlife somewhat difficult were depressed, 20 (76.9%) of those who expressed finding life very difficult were depressed, and 7 (77.8%) of those whofound life extremely difficult were also depressed. TB is a debilitating illness with high morbidity. This may make coping with general activities difficult and a patient's extent of inability to cope may influence his vulnerability to depression. Depression was significant for TB patients being strongly affected by symptoms of TB (p=0.015). 85 (60.7%) of the participants who had TB symptoms (particularly coughing and weight loss) were depressed. This finding is similar to the report of (Baba, 2009) where persistent cough among tuberculosis patients was significant for depression.It is easy for symptomatic patients to elapse into depression because of the negative reactions from people whom they interact with especially extreme weight loss and persistent coughing in public.The duration of the treatment of tuberculosis is also significantly associated with depression (p=0.020) as 90 (57.3%) of those in 4-6months of therapy and 9 (75.0%) of those on therapy for more than 12 months were depressed. This is consistent with the findings from two different studies done in Ibadan (Ige, 2011) and Enugu (Aniebue, 2007). This may be because having to take drugs for a prolonged time consistently may be distressing to the TB patients. However, new findings of associated factors not seen in other studies were found in this study. For example, depression was found to be significantly associated with the experience of stigma from family and friends (p=0.008). 59 (63.4%) of those who said family and friends kept their distance were depressed. Any form of stigmatization (perceived or real) may contribute to developing depression. Denial of certain privileges in the comm.-unity was also statistically associated with depression (p=0.001) as 31 (77.5%) of those experiencing denial of privileges in their communities were depressed. In addition, the association between depression and HIV-TB comorbidities was significant (p=0.014). This finding was also reported in Ethiopia (Adem, 2014). This is only natural as the burden of these two major diseases can be particularly frustrating, distressing and discouraging. Furthermore, depression was significantly associated with privacy concerns in treatment centers (p=0.002) as 74 (64.9%) of those who expressed concern for privacy in treatment centers were depressed. This is only natural as people feel uncomfortable being identified as TB patients in public. Finally, there was a statistical association (significance) between depression and family support (p=0.017) as 11 (84.6%) of those receiving no support from family were depressed. Majority of the respondents do not belong to any social support group (52.8%) and were depressed, although the association was not significant. Lack of social support groups in treatment centers and family support may contribute to depression as there would be no platform for worries and anxieties to be calmed. Other factors that were not significantly associated with depression include thought that tuberculosis makes one depressed, period of being diagnosed with tuberculosis, stage of treatment, distance to treatment center, attitude of treatment center staff, and time spent on a treatment day.

CONCLUSION:

Tuberculosis is a chronic debilitating infectious disease of global public health concern and ending the global tuberculosis burdenneedsthe translationinto action of the commitments highlighted at the 2023 United Nations high-level meeting on tuberculosis.

CONFLICTS OF INTEREST:

Authors declare that they do not have any conflict of interest.

REFERENCES:

1) Adebowale-Tambe, N. (2022). Lagos accounts for 11 percent of Nigeria's TB cases in 2021 - Official. *Premium Times.* http://www.premiumtimesng.com/regional/ssouth-west/522500-lagos-accounts-for-11-per-cent-of-nigerias-tb-cases-in-2010-official-html?tztc=1
2) Adem, A. Tesfaye, M. & Adem, M. (2014). The prevalence and pattern of depression in patients with tuberculosis on follow-up at Jimma University Specialized Hospital and Jimma Health Center. *Medicine Science,* **3**(1), 955-968. https://doi.org/10.5455/medscience.2013.02.8097
3) Aniebue, P. N., Okonkwo, K. O. B. & Aniebue, P. N. (2007). Prevalence of depressive symptoms amongst pulmonary tuberculosis patients at the University of Nigeria Teaching Hospital, Enugu. *Inter J. of Medicine and Health Development,* **11**(2), 120-124.
4) Anwar, M. S., Dogar, I. A., & Niaz, O. (2010). Prevalence of depression among tuberculosis patients, *A.P.M.C.*, **4**(2), 133-137. http://applications.emro.who.int/imemrf/Ann_Punjab_Med_Coll/Ann_Punjab_Med_Coll_2010_4_2_133_137.pdf
5) Baba, A. & Issa, A. D. Y. (2009). Depression comorbidity among patients with tuberculosis in a university teaching hospital outpatient clinic in Nigeria. *Mental Health and Family Medicine*, **6**(3), 133-138.
6) Bains, N. & Abdijadid, S. (2023). Major depresssive disorder. In Stat Pearls (Ed), *Treasure Island (FL). Stat Pearls Publisher*
7) Dahiya, S., Khichi, S. K., & Singh, N. K. (2017). Prevalence of depression among tuberculosis patients. *Scholars J. of Applied Medical Sciences,* **5**(6C), 2212-2215.
8) Dasa, T.T., Roba, A. A., & Tesfaye, E. (2019). Prevalence and associated factors of depression among tuberculosis patients in Eastern Ethiopia. *BMC Psychiatry,* **19**, 82-88.
9) DeJean, D., Giacomini, M., & Brundisini, F. (2013). Patient experiences of depression and anxiety with chronic disease. *Ontario Health Technology Assessment Series*, **13**(16), 1-33.
10) Duko, B., Bedaso, A. & Ayano, G. (2020). The prevalence of depression among patients with tuberculosis: a systematic review and meta-analysis. *Annals of General Psychiatry,* **7**, 19-30. https://doi.org/10.1186/s12991-020-00281-8
11) Ekechi, H. O., Ikwuka, A. O., & Abraham, J. C. (2023a). Effects of Ethanol Extract of *Rauwol fiavomitoria* Leaf on Lipid Profile and Cerebellar Histology in Cisplatin-induced Oxidative Stress. *British J. of Medical and Health Research*, **10**(5), 16-39. https://doi.org/10.5281/zenodo.8042521
12) Ekechi, H. O., Ikwuka, A. O., & Uche, V. U. (2023b). Hepatorenal Protective Functions of Coconut Water in Alloxan-Induced Type 1 Diabetes Mellitus. *World J. of Current Medical and Pharmaceutical Research,* **5**(4), 114-122. https://doi.org/10.37022/wjcmpr.v5i4.276
13) Emery, J. C., Richards, A. S., & Houben, R. M. G. J. (2021). Self-clearance of Mycobacterium tuberculosis infection: implications for lifetime risk and population at-risk of tuberculosis disease. *Proc Biological Science,* **288**(1943), 20201635.
14) Houben, R. M. & Dodd, P. J. (2016). The global burden of latent tuberculosis infection: a re-estimation using mathematical modelling. *PLoS Medicine,* **13**(10), e1002152 https://doi.org/10.1371/journal.pmed.1002152
15) Ige, O. M. & Lasebikan, V. O. (2011). Prevalence of depression in tuberculosis patients in comparison with non-tuberculosis family contacts visiting the DOTS clinic in a Nigerian tertiary care hospital and its correlation with disease pattern. *Mental Health and Family Medicine*, **8**(4), 235-241.
16) Ikwuka, A. O. (2015). Risk factors for the pathogenesis of diabetes mellitus type 2. *Materials of 84th Scientific and Practical Conference of Students and Young Scientists with International Participation "Innovations in medicine"*, p. 19.
17) Ikwuka, A. O. (2017a). Dyslipidemia risk severity in patients with diabetes mellitus type 2 and essential hypertension. *J. of the 21st Inter*

Medical Congress of Students and Young Scientists, p. 59.

18) Ikwuka, A. O. (2017b). Effectiveness of dapagliflozin in patients with diabetes mellitus type 2 and essential hypertension. *Book of abstracts of the 7th International Students' Scientific Conference of Young Medical Researchers*, p. 102.
19) Ikwuka, A. O. (2017c). Influence of dyslipidemia in patients with diabetes mellitus type 2 and essential hypertension. *The Pharma Innovation J.*, **6**(3), 101-103. http://www.thepharmajournal.com/archives/?year=2017&vol=6&issue=3&part=B
20) Ikwuka, A. O. & Haman, I. O. (2017d). Features of kidney damage in patients with diabetes mellitus type 2 and essential hypertension. *J. of 86th Scientific and Practical Conference of Students and Young Scientists with International Participation "Innovations in medicine"*, p. 144.
21) Ikwuka, A. O., Virstyuk, N. G. & Luchko, O. R. (2017e). Features of the functional state of kidneys in patients with diabetes mellitus type 2 and essential arterial hypertension. *Materials of scientific-practical conference with international participation "Babenkivski reading"*, p. 48.
22) Ikwuka, A. O. (2018a). Clinical dynamics in patients with diabetes mellitus type 2 and concomitant essential hypertensive disease treated with dapagliflozin. *J. of the 22nd International Medical Congress of Students and Young Scientists,* p. 32.
23) Ikwuka, A. O. (2018b). Clinical effectiveness of SGLT-2 inhibitors in patients with diabetes mellitus type 2 and essential hypertensive disease. *Endocrine Practice*, **24**(1), 74. https://doi.org/10.1016/S1530-891X(20)47129-0
24) Ikwuka, A. O. (2018c). Features of kidney damage in patients with arterial hypertension and type 2 diabetes mellitus and optimization of treatment. *Specialized Academic Council IFNMU*.
25) Ikwuka, A. O. & Paliy, Yu. (2018d). Structural changes of the left ventricular myocardium in patients with essential arterial hypertension and diabetes mellitus type 2. *Abstracts of the 87th Scientific Conference of Students and Young Scientists with International Participation "Innovations in medicine"*, p. 25-26.
26) Ikwuka, A. O. (2019a). Clinical dynamics of nephropathy in patients with diabetes mellitus type 2 and concomitant essential hypertensive disease. *Clinical Medicine*, **19**(2), s39.
27) Ikwuka, A. O. (2019b). Clinical effectiveness of GLP-1 RAs in patients with metabolic syndrome diseases. *Endocrine Practice*, **25**(1), 104-105. https://doi.org/10.1016/S1530-891X(20)46611-X
28) Ikwuka, A. O. & Virstyuk, N. G. (2019c). Pattern of cardiac remodelling of the left ventricle in patients with essential hypertensive disease and concomitant type 2 diabetes mellitus. *Clinical Medicine*, **19**(3), s92.
29) Ikwuka, A. O. & Virstyuk, N. G. (2021). Influence of SGLT2 inhibitor and A2RB (AT1) on fibrogenesis and heart failure in patients with essential hypertensive disease combined with diabetes mellitus type 2. *E-Poster No. 143 of the 44th & 45th Annual General and Scientific Meeting of the West African College of Physicians (WACP), 1 - 3 November, 2021*.
30) Ikwuka, A. O. & Virstyuk, N. (2022). Prognostic markers of nephropathy in patients with dual metabolic syndrome diseases (essential hypertensive disease and concomitant type 2 diabetes mellitus). *Endocrine Practice*, **28**(5), S65-S66.
31) Ikwuka, A. O. (2023a). Dr. Aloy's Core Essential Series (DACES) Medical Genetics. 1st Edition. *Science and Education Publishing*, USA, p. 15.
32) Ikwuka, A. O. (2023b). Dr. Aloy's Core Essential Series (DACES) Immunology. 1st Edition. *Science and Education Publishing*, USA, p. 30.
33) Ikwuka, A. O. & Virstyuk, N. (2023c). Patterns and Influence of Cardio-Metabolic Insufficiency in Patients with Essential Hypertensive Disease and Concomitant Type 2 Diabetes Mellitus. *Endocrine Practice*, **29**(5), S32-S33. https://doi.org/10.1016/j.eprac.2023.03.076
34) Ikwuka, A. O., Virstyuk, N. G., & Kobitovych, I. (2023d). Heterogeneity of Renal Pathogenicity on The Background of Asymptomatic Hyperuricemia In Patients with Dual Metabolic Syndrome Diseases (Essential Hypertensive

Disease and Type 2 Diabetes Mellitus). *British J. of Medical and Health Research*, **10**(2), 1-9.

35) Ikwuka, A. O. (2023e). Dr. Aloy's Core Essential Series (DACES) Hematology. 1st Edition. Science and Education Publishing, USA, p. 84.
36) Ikwuka, A. O., Omoju, D. I. & Mahanera, O. K. (2023f). Profiling of Clinical Dynamics of Type 2 Diabetes Mellitus in Patients: A Perspective Review. *World J. of Current Medical and Pharmaceutical Research*, **5**(5), 210-218. https://doi.org/10.37022/wjcmpr.v5i5.294
37) Institute of Health Metrics and Evaluation. (2022). Global Health Data Exchange (GHDx).
38) Inya, A. U., Achara, A. P., & Onazi, O. (2023a). Clinical Dynamics of Anemia in Pregnancy: A 16-week Cross-sectional Study of Pregnant Women Who Attended Antenatal Clinic of Federal Medical Center, Keffi, Nasarawa State, Nigeria. *American J. of Clinical Medicine Research*, **11**(1), 1-9. https://doi.org/10.12691/ajcmr-11-1-1
39) Inya, A. U., Achara, A. P., & Onazi, O. (2023b). Patterns, Peculiarities and Associated Risk Factors of Anemia in Pregnancy: A Case Study of Pregnant Women Attending Antenatal Clinic in North-Central Nigeria. *European J. of Preventive Medicine*, **11**(2), 21-31.
40) Kroenke, K., Spitzer, R. L. & Williams, J. B. (2002). The PHQ-9: validity of a brief depression severity measure. *J. of General and Internal Medicine,* **16**(9), 606-613.
41) Larson, E. H., Moverman, H. Y., & Howard, A. A. (2017). Depressive symptoms and hazardous/ harmful alcohol use are prevalent and correlate with stigma among TB-HIV patients in Lesotho. *Inter J. of Tuberculosis and Lung Diseases,* **21**(11), S34-S41.
42) Le, T., Bhushan, V., & Chavda, Y. (2017). First Aid for the USMLE Step 1. 1st Edition, p. 136. *McGraw Hill Education*.
43) National Institute of Mental Health. (2021). Depression. https://www.nimh.nih.gov/sites/default/files/documents/health/publications/depression/21-mh-8079-depression_0.pdf
44) Okeke, G. C., Okeke, I. K, & Udeh, F. C. (2023a). COVID-19 Vaccination in Pregnancy: Acceptance and Challenges amongst Pregnant Women in Adena, North-Central Nigeria. *World J. of Preventive Medicine,* **11**(1), 1-9.
45) Okeke, G. C., Okeke, I. K., & Udeh, F. C. (2023b). Knowledge, Perception and Acceptance of COVID-19 Vaccination Amongst Pregnant Women in Adena, Kwara State, Nigeria. *World J. of Public Health,* **8**(2), 165-174.
46) Pederson, C. B., Mors, O., & Eaton W. W. (2014). A comprehensive nationwide study of incidence rate and lifetime risk for treated mental disorders. *JAMA Psychiatry,* **71**(5), 573-581.
47) Saikat ASM, Kabir ML, and Khalipha ABR. (2020). An In silico approach for structural and functional annotation of uncharacterized protein Rv0986 present in *Mycobacterium tuberculosis, Eur. J. Med. Health Sci*., **2**(3), 61-67. https://doi.org/10.34104/ejmhs.020.061067
48) Saikat ASM, Mahmud S, Masud MH, and Uddin ME. (2020). Structural and Functional Annotation of Uncharacterized Protein NCGM946K2_146 of *Mycobacterium tuberculosis*: An *In-Silico* Approach. *Proceedings*, **66**(1):13. https://doi.org/10.3390/proceedings2020066013
49) Salodia, U. P., Sethi, S. & Khokhar, A. (2019). Depression among tuberculosis patients attending a DOTS centre in a rural area of Delhi: A cross-sectional study. *Indian Journal of Public Health,* **63**, 39-43.
50) Udeh, F. C., Ikwuka, A. O., & Anaetor, I. S. C. (2023). Human Anatomy Education: Knowledge, Attitude, Perception and Challenges Encountered by Medical and Nursing Students in Two Gambian Universities. *J. of Tertiary Education and Learning*, **1**(3), 29-38. https://doi.org/10.54536/jtel.v1i3.2277
51) Virstyuk, N. G., Ikwuka, A. O., & Adebomi, M. S. (2016). Diabetes mellitus type 2, arterial hypertension and dyslipidemia. *Materials of 2nd International Scientific and Practical Conference "Therapeutic readings: modern aspects of diagnosis and treatment of diseases of internal organs"*, p. 46-47.
52) Virstyuk, N. G. & Ikwuka, A. O. (2017a). Diagnostic and prognostic markers of the diabetes mellitus type 2 courses in connection with

essential arterial hypertension taking into account the kidney function. *Precarpathian J. Pulse*, **8**(44), 53-62.

53) Virstyuk, N. H., Ikwuka, A. O., & Markiv, H. D. (2017b). Dapagliflozin utility in patients with diabetes mellitus type 2 and essential hypertensive disease. *Actual Problems of Modern Medicine*, **4**(60)1, 76-79. http://www.umsa.edu.ua/journal2stat4_2017_eng.html

54) Virstyuk, N. G. & Ikwuka, A. O. (2018a). Features of asymptomatic hyperuricemia in patients with diabetes mellitus type 2 and concomitant essential arterial hypertension. *Clinical and Experimental Pathology*, **1**(63), 22-26. https://doi.org/10.24061/17274338.XVII.1.63.2018.5

55) Virstyuk, N. G., Ikwuka, A. O. & Didushko, O. M. (2018b). Effect of dapagliflozin on the level of uric acid during asymptomatic hyperuricemia in patients with diabetes mellitus type 2 and concomitant arterial hypertension. *Art of Medicine*, **1**(5), 21-26.

56) Virstyuk, N. H. & Ikwuka, A. O. (2018c). Dapagliflozin influence on the clinical course of diabetes mellitus type 2 and essential hypertension in patients. *Recent Advances in Environmental Science from the Euro-Mediterranean and Surrounding Regions*, p. 2007-2008.

57) Virstyuk, N. G. & Ikwuka, A. O. (2019). Nephro-pathic characteristics in patients with diabetes mellitus type 2 and essential hypertensive disease. *Art of Medicine*, **1**(5), 44-47. https://doi.org/10.21802/artm.2019.1.9.44

58) Virstyuk, N. G. & Ikwuka, A. O. (2021a). Asymptomatic hyperuricemia and functional state of the kidneys in patients with essential arterial hypertension and concomitant diabetes mellitus type 2. *European J. of Clinical Medicine*, **2**(3), 100-104.

59) Virstyuk, N. H., Ikwuka, A. O., & Kocherzhat, O. I. (2021b). Peculiarities of renal insufficiency in patients with diabetes mellitus type 2 and arterial hypertension. *Materials of scientific-practical conference with international participation "Achievements and prospects of experimental and clinical endocrinology "Twentieth Danilevsky readings*, p. 86-87.

60) World Health Organization, (2022). Mental Health and COVID-19: Early evidence of the pandemic's impact. *WHO Scientific Brief*. Geneva.

61) World Health Organization, (2023a). Global Tuberculosis Report 2023. WHO.

62) World Health Organization, (2023b). Osun State not taking its foot off the pedal in the fight against tuberculosis. WHO Africa. http://afro.who.int/countries/nigeria/osun-state-not-taking-its-foot-off-the-pedal-in-the-fight-against-#tuberculosis

Citation: Okoro LC, Odukoya O, Ikwuka AO, and Udeh FC. (2024). Knowledge, attitude and factors associated with depression in tuberculosis patients attending directly observed treatment short-course (DOTS) centers in South-West Nigeria. *Eur. J. Med. Health Sci.*, **6**(4), 85-99. https://doi.org/10.34104/ejmhs.021.085099