KNOWLEDGE AND AWARENESS OF TUBERCULOSIS IN THE URBAN SLUMS OF LAGOS, NIGERIA

***[1,3]Abiola Victor Adepoju, [2]Victoria Etuk, [1]Oluwatoyin Elizabeth Adepoju, [4]Chidubem Ogbudebe, [5]Marius Olusola Adeniyi, [6]Busayo Kolade Akerele, [7]Olusola Adedeji Adejumo**

[1]Adolescent Friendly Research and Care (ADOLFRIC), Nigeria

[2]Institute of Human Virology of Nigeria

[3]Jhpiego (an affiliate of John Hopkins University)

[4]KNCV Tuberculosis Foundation, Abuja, Nigeria

[5]Ondo State Primary Healthcare Development Agency, Nigeria

[6]University of Calabar Teaching Hospital, Cross River state, Nigeria

[7]Lagos State Ministry of Health, Nigeria

***Corresponding author:** Abiola Victor Adepoju **Email:** schrodinga05@yahoo.com

ABSTRACT

Background: *There are over 300,000 missing tuberculosis (TB) cases in Nigeria and TB is a major cause of morbidity and mortality. Awareness about the disease, symptoms, transmission as well as knowledge of where curative and treatment services can be accessed will help in public health control programs in slum communities. The study aimed to determine the level of awareness and knowledge of tuberculosis among urban slum dwellers in Lagos, Nigeria.*

Method: *A community-based, cross-sectional study was conducted across six urban slums in Nigeria as part of community outreach activities marking the World TB Day. A structured, pretested questionnaire was used to capture relevant information among adult participants seeking TB and other services. Domains identified were knowledge about TB symptoms, prevention, spread and Directly Observed Therapy Short course (DOTS) treatment.*

Results: *A total of 632 respondents participated in this study. Majority were 25-34 years (24.7%), males (65.8%), Christians (55.7%), married (73.7%), attained secondary education (37.8%), with 3-4 persons per household (41%) and 1-2 persons per room (44.5%). About two-third (59.7%) of the respondents have heard of TB, while 41% have heard about DOTS. Only 27.2% were aware of a TB treatment facility; 41.6% knew that TB treatment is free; 48.4% knew that TB is curable and only 31.5% knew who a presumptive TB patient is. Information about TB treatment was mostly provided by community health*

workers, 309 (48.9%) followed by radio (20.4%). The predictors of good knowledge of symptoms of TB were male sex, older age >45 years and having some education (compared to no education) while the predictors of correct knowledge of how TB is spread were smoking, high income and older age >45 years. ***Conclusion:*** *Knowledge of TB free treatment, curability and symptoms of TB and awareness of TB treatment facilities among Lagos slum residents is poor. Knowledge about "free treatment", "TB treatment facilities" and "symptoms of TB" need to be emphasized during community education programs in slums. Policymakers need to prioritize social determinants of TB knowledge and services in slums.*

Key Words: *Knowledge, Awareness, Tuberculosis, Urban slum, Directly Observed Therapy Short Course (DOTS).*

INTRODUCTION

Tuberculosis (TB) is the leading cause of morbidity and mortality worldwide. In 2020, TB was the second leading cause of death from infectious disease after COVID-19[1]. According to the 2021 Global TB Report, an estimated 9.9 million people fell ill with TB in 2020, but only 5.8 million people were notified, down from 7.1 million notified in 2019. This gives a gap of 4.1 million TB patients that were undiagnosed or not reported to National Tuberculosis Programs (NTPs)[1]. TB deaths also increased for the first time in over a decade. Best estimates for 2020 are 1.3 million TB deaths among HIV-negative people (up from 1.2 million in 2019) and an additional 214, 000 among HIV-positive people (up from 209, 000 in 2019)[1]. In 2016, the 'End TB Strategy' was adopted with the goal to reducing the incidence of TB by 85%, and TB-associated mortality by 90% in the year 2030[2,3]

Nigeria is one of the high burden countries for Tuberculosis (TB), TB/HIV co-infection and multidrug resistant TB. A significant progress was recorded in 2020 as the country notified a total of 138,591 cases; over 15% higher compared to 106,533 and 120,266 cases notified in 2018 and 2019 respectively[4]. Notwithstanding, over 300,000 of the estimated 440,000 incident TB cases are still missed annually. Factors such as the HIV/AIDS epidemic, rapid population growth, high poverty levels and the rise in multidrug resistant TB have contributed to this high burden[5]. In 2004, Nigeria adopted the Directly Observed Therapy Short course (DOTS) as a strategy for TB control. Following

this, over 5,000 DOTs facilities have been established in the country. Tuberculosis diagnosis and treatment is also free in Nigeria, under the 'Stop TB' Program[6].

Urban slums are communities vulnerable to TB due to overcrowding, unsanitary living conditions, high poverty levels and other barriers limiting access to health promotion, preventive and treatment services[7]. Vulnerable slum populations are also at higher risk of contracting TB and spreading the disease. There are concerns that the poor socioeconomic determinants of health in this population may limit access to information and understanding of drivers of TB infection, transmission and associated stigma[8,9]. Studies have identified lack of formal education, unemployment and lack of access to health services as determinants of poor TB knowledge in urban slums[9,10]. Communities in urban slums in Nigeria are disproportionately affected by tuberculosis and other infectious diseases due to above mentioned barriers and risk factors. However, few studies have assessed the awareness and knowledge of TB among marginalized populations in urban slums in Nigeria. The study sought to determine the level of awareness and knowledge of tuberculosis among urban slum dwellers in Lagos, Nigeria.

METHODOLOGY

Study Design

This was a community based, cross-sectional study. The study took place from March 1-31st, 2017 as part of the commemoration of annual World TB Day. Community based TB case finding (outreaches) were carried out across six slum communities in high TB prevalent LGAs in Lagos, Nigeria based on the TB case notification rate 2014.

Study Setting, Population and Sample Technique

The study took place in Lagos, Nigeria. Lagos is an urban city in Southwestern Nigeria. Lagos population was 14,862,000 in 2021[11]. Participants are eligible if aged 18 years old or more; present with cough of 2 weeks or more or with any other symptoms of tuberculosis. A total of 632 participants across five LGAs were recruited for the study with average of 125 subjects per Local Government Area (LGA). These five LGAs have a combined population of over one million people.

Recruitment of subjects took place during open, concurrently run outreaches, preceded by community entry, mobilization and sensitization until a sample size of 632 was reached. Considering the limited resources to conduct the research, the study LGAs, slum communities and sample size were purposively selected. The selected communities met the official classification and definition as urban poor communities. They were densely populated with congested residential conditions, dense mix of migrants and temporary settler's characteristic of typical urban slums.

The selected LGAs are: Ikeja, Ojo, Ifako Ijaiye, Apapa and Ajeromi-Ifelodun. These LGAs have various hotspots for TB transmission. One slum community was selected per LGA with the exception of Ajeromi with two slum outreach locations. Each location had a team of healthcare workers consisting of medical doctors, laboratory scientist (Genexpert focal person for the collection of sputum), TB Local Government Area Supervisor, health educator, community health extension workers, referral coordinator, a nurse and two data entry clerks administering the survey questionnaires to clients just after the documentation of the attendees' vital signs.

Data Collection

Data were collected using a structured interviewer-administered questionnaire. The tool was pre-tested in a similar community outside of the study sites and relevant corrections were made. The survey collected information on socio-demographic characteristics (age, sex, income, occupation, marital status, household occupancy, smoking status, alcohol etc), TB knowledge and awareness of TB symptoms, causes, spread, and treatment of TB, awareness of TB treatment facilities and sources of TB information. Face-to-face interviews were conducted by twelve trained research assistants (two per outreach location) with higher education and fluent in the local Nigerian languages. Surveys took place under a private canopy after taking vital signs of participants. Respondent interview took an average of 20 minutes to complete. Subsequently, sputum samples were taken from individuals who presented with symptoms of TB. Samples were taken to the laboratory by sputum transporters. Results were mostly available to participants within 24 hours. Participants who could not collect TB results were followed up within 48 hours via phone call.

Measures

Socio-demographic information collected include age, gender, formal education, income status, residence, smoking and alcohol history. TB awareness was investigated by asking the questions: "Have you ever heard of tuberculosis or TB?" (Yes, No), "Have you heard of DOTS" (Yes, No), "Are you aware of TB treatment facilities" (Yes, No). Sources of TB information were investigated by asking the question, "Where did you hear about tuberculosis or TB?" (Family/friends, school/workplace, health care provider, television, radio, newspaper, and others). TB knowledge was assessed with 12 questions: 2 questions assessed the causes of TB, 6 questions assessed the transmission/spread of TB, and 4 questions assessed TB symptoms. Responses were coded as correct (1) or incorrect (0). The correct responses across the TB knowledge domains were summed to give a total TB knowledge score. The maximum score was 12 and the minimum was zero. For each knowledge domain assessed, knowledge score of ≥8 or ≥75% was classified as good knowledge while knowledge score of < 8 or < 75% was classified as poor knowledge of TB.

Data Analysis

Data were entered into MS Excel and exported to SPSS Version 23 (IBM, Armonk, NY, USA) for statistical analysis. The frequency and proportion of different variables were reported by descriptive statistics. The association between participant characteristics and their knowledge of TB symptoms and spread was assessed using univariate logistic regression model with Odds Ratio (OR) and 95% Confidence Interval (CI). Adjusted odds ratios (AORs) were calculated to determine the strength of association between independent variables and knowledge of symptoms and spread of tuberculosis. All variables with $P < 0.05$ in the univariate analysis were included in the stepwise multivariate logistic regression model. A p-value < 0.05 was considered statistically significant.

Ethical Approval

The study was approved by the Health Research and Ethics Committee of Lagos State University Teaching Hospital with approval number: **LREC. 06/10/828.** Written informed consent was

obtained from the participants before the administration of questionnaires. Respondents' confidentiality was also maintained by not using identifiers.

RESULTS

Sociodemographic characteristics of respondents

Table 1 shows that a total of 632 respondents participated in the study. Majority were in the age group 25-34 years (24.7%), males (65.8%), Christians (55.7%), married (73.7%), secondary education (37.8%), with 3-4 persons per household (41%) and 1-2 persons per room (44.5%).

Table 1: Sociodemographic characteristics of respondents N=632

Characteristics	Number	Frequency
Age(years)		
<15	8	1.3
15-24	33	5.2
25-34	156	24.7
35-44	151	23.9
45-54	138	21.8
55-64	82	13.0
>65	64	10.1
Sex		
Male	416	65.8
Female	216	34.2
Religion		
Christianity	352	55.7
Islam	277	43.8
Traditional Religion	3	0.5
Ethnicity		
Yoruba	469	74.2

Ibo	69	10.9
Hausa/Fulani	44	7.0
others	50	7.9
Marital Status		
Single	91	14.4
Married	466	73.7
Separated/Divorced	23	3.7
Widowed	52	8.2
Education		
No formal education	132	20.9
Primary	170	26.9
Secondary	239	37.8
Tertiary	91	14.4
Average no of household		
1-2	99	15.7
3-4	259	41.0
5-6	180	28.5
7-8	51	8.1
8-10	16	2.5
>10	27	4.3
No of persons per room		
1-2	281	44.5
3-4	243	38.4
5-6	90	14.2
>6	18	2.9

Awareness of Tuberculosis treatment, treatment facility and curability

In Table 2, about two-third (59.7%) of the respondents have heard about TB, while 41% have heard about DOTS. Only 27.2% were aware of a TB treatment facility while 41.6% knew that TB was free and 48.4% knew that TB is curable. Only 31.5% knew who a presumptive TB patient was.

Table 2: Knowledge of TB and management by respondents n=632

Knowledge of TB and management	Frequency	Percentage
Heard of TB	377	59.7
Heard of DOTS	259	41.0
Aware of TB treatment facility	172	27.2
Knowledge that TB is free	263	41.6
Knowledge that TB is curable	306	48.4
Knowledge of Presumptive TB	199	31.5

Sources of Information about tuberculosis treatment facility

In Table 3, the major source of information about TB treatment facility was from a healthcare worker (48.9%) followed by radio (20.4%), friends/neighbors (21.5%) and then television (1.1%) and from old patient (1.1%).

Table 3: Source of information on knowledge of TB treatment centers by respondents N=270 (Multiple response allowed)

	Frequency	Percentage
Health care worker	132	48.9
Radio	55	20.4
Friends/neighbor	58	21.5
Posters	19	7.0
Television	3	1.1
Old patient	3	1.1

Knowledge of symptoms and spread of Tuberculosis

On univariate logistic regression, most of the variables significantly influenced participants' knowledge of TB symptoms and spread. A stepwise logistic regression identified that age, sex and education were strong predictors of good knowledge of TB symptoms while age, sex and smoking status significantly predicted good knowledge of spread/transmission of TB. In Table 4, the significant predictors of good knowledge of TB symptoms include male sex, older age >45years and having some education (compared to no education). In Table 5, the significant predictors of good knowledge of how TB is spread include smoking, high income and older age>45years.

Table 4: Predictors of Good knowledge of TB symptoms

Variables	AOR,95% CI	P-value
Sex		
Male	1.62(1.05-2.49	0.028
Female	1	
Age		
≤ 45 year	1	
>45 year	1.67(1.14-2.46)	0.009
Education		
Some education	0.54(0.32-0.92)	0.023
No Education	1	

Table 5: Predictors of Good knowledge of TB Spread

Variables	AOR, 95% CI	P-value
Age		
≤ 45 year	1	
>45 year	1.66(1.14-2.46)	0.011
Income		
High income	0.59(0.38-0.91)	
Low income	1	0.016
Smoking Status		
Smoking	0.3(0.1-0.9)	0.036
No smoking	1	

DISCUSSION

This study sought to identify the level of community awareness and knowledge among urban slum dwellers in Lagos. About 40% of community residents have never heard of TB. Although these findings are similar to those reported by Bamgboye *et al* 2016[12], among women living in coastal areas in Lagos, they are much higher than those reported in Nigeria, India and Uganda[9,13,14]. Despite the high incidence of TB in Nigeria, a large proportion of this population were not aware of the disease. This population who are unaware of TB represents a significant risk for continued transmission of the disease. Only about 48.4% of study participants knew that TB is curable. This lack of information may lead to stigmatization of those with the disease in these communities. Health promotion activities should target marginalized communities in urban slums.

The findings of this study show that major sources of knowledge of TB in this population were health care workers and the radio. This is similar to findings from an earlier study in Nigeria, where 59% of study participants heard about TB from the radio and a study in Ethiopia where healthcare professionals were the major source of TB information[15,16]. Healthcare workers and mass media have

been found to contribute to increased knowledge and risk perception of TB among adults in Malawi, Ethiopia and South Africa[16-18]. Persons who have access to both health education programs and mass media are more likely to have better knowledge and a higher risk perception of TB. Tuberculosis education and awareness can be disseminated through mass media and the use of community health extension workers. These methods have proven to be effective in reaching communities in urban slums.

In this study, we identified that in urban slums, being male, being older than 45 years and having some form of education were independent predictors of good knowledge of TB symptoms. Several studies have identified male gender as a predictor of good TB knowledge[16,18-19]. This may be because in developing countries, males have better access to education, information and financial resources, which are social determinants of health. This gender gap is also seen in urban slums. Thus, even in poorer communities, males have greater access to social determinants of health, which improves their knowledge of TB. Females in urban slums should be prioritized in tuberculosis awareness campaigns and programs. Stakeholders involved in tuberculosis control can make use of female support groups to specifically reach females in urban slums.

Older adults (older than 45) had significantly good knowledge of TB, as compared to those below the age of 45 years. Although this has been reported in earlier studies, this shows that health promotion and mass media efforts have not targeted younger people, although they are at a higher risk, due to a higher prevalence of HIV. It is also reported that young people aged 15-24 years in Nigeria have a high prevalence of TB (274 per 100,000 people)[20-21] . However, studies show that young people are neglected in global health, as they are perceived as being healthy[22].The National TB control program should prioritize young people in TB awareness and knowledge campaigns.

This study suggests that having education is a predictor of good knowledge of TB in this population, as compared to no formal education. This finding was supported by previous studies[16, 23-25]. School settings are health promotion settings, and health topics are taught in schools. People with formal education can understand health messages, and can obtain information from various sources.

Community members with formal education have a higher level of health literacy, and can access health care systems for health information. Education is a social determinant of health, and it is associated with correct knowledge of TB. Therefore, TB programs in urban slum populations should focus on people without formal education.

Higher income and older age were associated with correct knowledge of the spread of TB in our study. This was supported by different studies reported earlier[26-27]. People with higher income have access to better education, information and health care. As tuberculosis is a disease of poverty, socioeconomic policies, as well as TB programs should focus on marginalized and poorer households in urban slums. Current study highlights the interrelationships among poverty, lack of education, male gender and low income as key social drivers of TB transmission in slum communities. Ending TB in slum will therefore require more than innovative diagnostic and treatment services for TB patients but also policies addressing socioeconomic barriers that limit access to quality prevention, diagnostics and treatment services.

In conclusion, despite the many strengths of the study, there are also limitations of the findings. One, the methods of assessment and measurement of TB knowledge differ across literatures which makes cross-study comparison to be difficult. Also, the premobilization awareness that was carried out a day before the outreaches leading to this study could have also indirectly influenced knowledge of TB gained from healthcare workers by slum community residents through enquiries prior to the time of administering the questionnaires. Despite the limitations, the findings of the study could help National TB Programs on specific policy issues and priorities around TB programming for slum residents in Nigeria and beyond.

Competing interest

We declare no conflict of interest

Authors' contribution

AVA was responsible for the overall supervision of the manuscript; AVA and AOA wrote the protocol and analyzed the data; EV and AOE supervised data collection and wrote the introduction and

discussion; AMO and ABK wrote the methodology; AOA and OC wrote the results and interpreted the data. All authors have read and agreed to the final manuscript.

Acknowledgments

The authors express their appreciation to the study participants and slum communities in Lagos Nigeria, who took time out and responded to our survey. We are also indebted to the National TB, Leprosy, Buruli Ulcer Control Program, Lagos State TB, Leprosy and Buruli Ulcer Control Program, Medical Officers of Health in Ajeromi-Ifelodun,Apapa, Ojo, Ifako-Ijaiye and Ikeja LGAs, LGA TB Supervisors, traditional rulers for their assistance during community entry.

Ethical conformity

The Ethics Committee of the Lagos State University Teaching Hospital approved the study. Permission was also obtained from the Lagos State TB control program. Informed consent was taken from the participants

REFERENCES

1. World Health Organization (WHO). Global Tuberculosis Report 2021. WHO; 2021. Accessed February 20, 2022. Available from: https://apps.who.int/iris/rest/bitstreams/1312164/retrieve
2. WHO. Implementing the end TB strategy: the essentials. Geneva: World Health Organization; 2015. Accessed February 20, 2022. Available from: http://www.who.int/tb/publications/2015/end_tb_essential.pdf?ua=1
3. World Health Organization. On the road to ending TB: highlights from the 30 highest TB burden countries. World Health Organization;2016. Accessed February 20, 2022. Available from https://apps.who.int/iris/handle/10665/204662
4. Nigeria records gain in fight against tuberculosis amidst coronavirus pandemic. World Health Organization. 2021. Accessed Feb 27, 2022. Available from: https://www.afro.who.int/news/nigeria-records-gain-fight-against-tuberculosis-amidst-coronavirus-pandemic

5. Vitoria M, Granich R, Gilks CF, Gunneberg C, Hosseini M, Were W et al. The global fight against HIV/AIDS, tuberculosis, malaria: current status and future perspective. Am J Clin Pathol. 2009; 131(6): 844-848
6. Federal Ministry of Health, Department of Public Health. The National Strategic Plan for Tuberculosis Control: Towards Universal Access to Prevention, Diagnosis and Treatment (2015–2020). Abuja: National Tuberculosis and Leprosy Control Programme; 2014.
7. Balogun MR, Sekoni AO, Meloni ST, Odukoya OO, Onajole AT, Longe-Peters OA, et al. Predictors of tuberculosis knowledge, attitudes and practices in urban slums in Nigeria: a cross-sectional study. Pan Afr Med J. 2019;32:60.
8. Suganthi P, Chadha V K, Ahmed J, et al. Health seeking and knowledge about tuberculosis among persons with pulmonary symptoms and tuberculosis cases in Bangalore slums. Int J Tuberc Lung Dis. 2008; 12: 1268–1273.
9. Obuku EA, Meynell C, Kiboss-Kyeyune J, Blankley S, Atuhairwe C, Nabankema E, et al. Socio-demographic determinants and prevalence of tuberculosis knowledge in three slum populations of Uganda. BMC Public Health. 2012;12:536.
10. Hassan AO, Olukolade R, Ogbuji QC, Afolabi S, Okwuonye LC, Kusimo OC, et al. Knowledge about tuberculosis: a precursor to effective TB control-findings from a follow-up national KAP study on tuberculosis among Nigerians. Tuberc Res Treat. 2017.
11. Macrotrends. Lagos Nigeria Metro Area Population 1950-2021.Accessed February 20, 2022. Available from https://www.macrotrends.net/cities/22007/lagos/population
12. Afolabi BM, Ezedinachi ENU, Okon BI, Iwara A. Raising awareness about tuberculosis among women living in rural communities on the Atlantic Coastline of Nigeria. TranslBiomed. 2016;7:3.
13. Tobin EA, Okojie PW, Isah EC. Community knowledge and attitude to pulmonary tuberculosis in rural Edo state, Nigeria. Ann Afr Med 2013;12:148-54.
14. Chinnakali P, Ramakrishnan J, Vasudevan K, Gurumurthy J, Upadhyay RP, Panigrahi KC. Level of awareness about tuberculosis in urban slums: Implications for advocacy and communication strategy planning in the National program. Lung India. 2013;30(2):139-142.

15. Uchenna OU, Chukwu JN, Oshi DC, Nwafor CC, Meka AO. Assessment of tuberculosis-related knowledge, attitudes and practices in Enugu, South East Nigeria. J Infect Dis Immun. 2014;6(1):1–9.
16. Gelaw SM. Socioeconomic Factors Associated with Knowledge on Tuberculosis among Adults in Ethiopia. Tuberculosis Research and Treatment. 2016; 2016: 6207457.
17. Chizimba R, Christofides N, Chirwa T, Singini I, Ozumba C, et al. The association between multiple sources of information and risk perceptions of tuberculosis, Ntcheu District, Malawi. Plos One. 2015;10:4.
18. Naidoo P, Simbayi L, Labadarios D, Ntsepe Y, Bikitsha N, Khan G, et al. Predictors of knowledge about tuberculosis: results from SANHANES–1, a national, cross-sectional household survey in South Africa. BMC Public Health. 2016;16:276.
19. Bati J, Legesse M, Medhin G.(2013) Community's knowledge, attitudes and practices about tuberculosis in Itang special district, Gambella region, south western Ethiopia. BMC public health.13(1):1.
20. Snow KJ, Sismanidis C, Denholm J, Sawyer Susan M, Graham SM. The incidence of tuberculosis among adolescents and young adults: a global estimate. Eur Respir J. 2018;51-52.
21. Snow KJ, Nelson LJ, Sismanidis C, Sawyer SM, Graham SM. Incidence and prevalence of bacteriologically confirmed pulmonary tuberculosis among adolescents and young adults: a systematic review. Epidemiol Infect . 2018; 146:946–953.
22. Gore, F. M., Bloem, P. J., Patton, G. C., Ferguson, J., Joseph, V., Coffey, C., . . Mathers, C. D. Global burden of disease in young people aged 10–24 years: A systematic analysis. Lancet. 2011; *377*: 2093–2102.
23. Mondal MNI, Nazrul HM, Chowdhury MRK, Howard J. Socio-demographic factors affecting knowledge level of Tuberculosis patients in Rajshahi City, Bangladesh. Afr Health Sci. 2014;14(4):855–65.
24. Luba, T.R., Tang, S., Liu, Q. et al. Knowledge, attitude and associated factors towards tuberculosis in Lesotho: a population-based study. BMC Infect Dis. 2019; **19(1):** 96.

25. Agho KE, Hall J, Ewald B. Determinants of the knowledge of and attitude towards tuberculosis in Nigeria. J Health Popul Nutr. 2014;32(3):520-538.
26. Castro DBD, Pinto RC, Albuquerque BCD, Sadahiro M, Braga JU. The Socioeconomic Factors and the Indigenous Component of Tuberculosis in Amazonas. PLOS ONE. 2016; 11(6): 1-11.
27. Hargreaves JR, Boccia D, Evans CA, et al. The social determinants of tuberculosis: from evidence to action. Am J Public Health. 2011; 101: 654–662.