PREVALENCE OF SMEAR POSITIVE PULMONARY TUBERCULOSIS AMONG INMATES AND STAFF OF ABAKALIKI PRISONS, NIGERIA

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ABSTRACT

Introduction: Pulmonary Tuberculosis (PTB) is one of the major diseases of public health importance especially in prisons where case finding rate has been low. The WHO established five facts of prisons PTB spread which include: Prisons receive TB, Prisons concentrate TB, Prisons disseminate TB, Prisons make TB worse, and Prisons export TB. Poor TB case finding result in annual TB transmission risks of 90%. This study determined the prevalence of pulmonary tuberculosis among inmates and staff of Nigerian Prisons, Abakaliki

Methods: A prison-based cross-sectional descriptive study was undertaken among 307 inmates and staff selected using a systematic sampling technique. Informed consent was obtained from the staff and inmates. The respondents were interviewed using a pre-tested interviewer administered structured questionnaire. GeneXpert test was done for respondents with cough of two weeks or more. Data analysis was done using SPSS statistical software version 22. Chi squared test was used for bivariate analysis and level of significance was set at a p-value of less than 0.05. Results were treated with strict confidentiality.

Results: The mean age of inmates was 34.96±5.7 years while staff was 38.43±3.5 years. Majority had secondary education. GeneXpert test result revealed 2.0% prevalence of PTB among suspected inmates, 1.1% among all inmates and 2.8% among staff. Prevalence of TB was associated with age group of both inmates and staff and duration of stay of inmates only.

Conclusion: This study found moderate prevalence of tuberculosis among inmates and prison staff in Abakaliki prison. Although this prevalenceis moderate, it is imperative that periodic screening of old inmates and newly introduced ones be practiced so as to minimize the burden of tuberculosis among prisoners. Implementation of current national or international cell occupancy recommendations would reduce TB transmission by 50% and 94% respectively especially now that there is increase in the incidence of MDR-TB.

Keywords: prevalence, PTB, prison, inmates and staff.

INTRODUCTION

Tuberculosis (TB) in penitentiary services (prisons) is a major challenge to TB control[1]. Pulmonary Tuberculosis (PTB) is one of the major diseases of public health importance especially in prisons where case finding rate has been low and remains a major public health problem, posing specific challenges in numerous geographical areas, particularly in low- and middle-income countries (LMICs) where more than 80% of the global TB burden resides[1]. The WHO established five facts of prisons PTB spread which include: Prisons receive TB, Prisons concentrate TB, Prisons disseminate TB, Prisons make TB worse, and Prisons export TB. Poor TB case finding result in

annual TB transmission risks of 90%[1]. Despite recently gained increased public and political awareness, TB still remains a major infectious disease in prison systems for several reasons. These include but are not limited to the high prevalence of drug-resistant TB forms such as multi- and extensively drug-resistant TB (M/XDR-TB)[1-13], and intravenous drug use among HIV-infected individuals, which makes prison populations more susceptible to the development of TB[14]. Prisons are considered reservoirs promoting transmission of Mycobacterium Tuberculosis (MTB) within their walls, as well as to the community at large. Transmission occurs through prison staff, visitors, and released inmates. The estimated prevalence of latent TB infection (LTBI) and active TB disease in LMICs such as Ethiopia, Thailand and Brazil, where TB prevalence has been reported to be almost 4-, 8-, and 64-times respectively higher among prisoners compared to the general population[15,16]. Factors known to contribute to the transmission of MTB strains and that hamper TB control are overcrowding, delayed case detection, poor contact detection, inadequate treatment of infectious cases, high turnover of prisoners, and poor implementation of TB infection control (IC) measures[17,18]. In addition, limited access to timely and quality health care services further exacerbate the situation. The prison health service is typically underprivileged and under-funded[19] and the prisons suffer from severe overcrowding, poor hygiene and inadequate ventilation, representing an epicentre for transmission of TB to close contacts and surrounding communities. Often there is no medical screening upon admission, and TB-infected prisoners are housed in crowded cells. Thus, the integration of a prison TB control programme into the national TB programme should be given priority. Adequate information is needed about prisoners' awareness and practice regarding TB.

TB control could be significantly improved if more consideration was given to the population's knowledge and attitudes about TB and related health care-seeking behaviour[20] by directing efforts towards making individuals more informed and aware of all aspects of TB, its treatment, and basic rules for preventing the spread of the disease to close contacts (community and family members, prison staff, inmates, and others who have social or physical contact with TB patients).

In response to the continuing challenges facing the control of TB and M/XDR-TB, and as the current Global Plan to Stop TB (Stop TB Strategy) 2011–2015, the World Health Organization (WHO) has recently developed the End TB Strategy with the goal to end the TB epidemic by 2035[21]. As such this study determined the prevalence of pulmonary tuberculosis among inmates and staff of Nigerian Prisons, Abakaliki

MATERIALS/METHODS

Study area and design: A cross-sectional study was conducted at Abakaliki Prisons (the largest prisons in Ebonyi State, Nigeria) from June, 2017 to August, 2017. It was purposively selected. The prison has a clinic that follows the health status of the prisoners and refers cases like tuberculosis to Federal Teaching Hospital Abakaliki (FETHA) for confirmation and initiation of treatment.

Study subjects and sampling technique: Study subjects were selected using systematic sampling technique from the

total population (*n* = 516) based on established criteria for describing the prevalence of PTB. These included cough for ≥2 weeks, taking anti-tuberculosis treatment for PTB during the study period and consent to participate in the study. In all, 307 (59.5%) inmates who fulfilled the selection criteria were included in the study.

Data collection: A structured interviewer administered questionnaire was used to collect data on socio-demographic information, signs and symptoms of TB among respondents.

Sputum collection and GeneXperttest: Sputum samples of study participants were collected in clean, dry tightly capped containers. The samples were immediately taken to FETHA Laboratory for appropriate examination and analysis. Results were observed and interpreted by two laboratory scientists to ensure their validity

Data analysis: Data were analyzed using SPSS version 22. Mean and percentages were used to summarize the results. Chi-square test was done to assess significant associationbetween prevalence of tuberculosis and inmate's and staff's socio-demographic variables. A significance level was set at a p-*value* less than 0.05.

Ethical considerations: The ethical approval was obtained from the research and ethics committee of Ebonyi State Ministry of Health. Informed consent was given by the study participants. Participants were assured of confidentiality. Inmates who were found positive were enrolled into the directly observed short course treatment protocol.

Results: The mean age of inmates was 34.96±5.7 years while staff was 38.43±3.5 years. Majority had secondary education. This study found 2.0% point prevalence of PTB by GeneXperttest among suspected inmates, 1.1% among all inmates and 2.8% among staff

Table 1: Socio-demographic profile of respondents (N= 307 for Inmates), (N=69 for Staff)

Variables	Inmates, n (%)	Staff, n (%)	Total, N=376 (%)	P-value
Sex				
Male	286 (93.2)	53 (76.8)	339 (90.2)	**<0.001**
Female	21 (6.8)	16 (23.2)	37 (9.8)	
Age (years)				
18-49	284 (92.5)	64 (92.8)	348 (92.6)	**0.94**
≥50	23 (7.5)	5 (7.2)	28 (7.4)	
Educational status				
<Secondary	63 (20.5)	4 (5.8)	67 (17.8)	**0.02**
≥Secondary	244 (79.5)	65 (94.2)	309 (82.2)	
Occupation				
Government employees	59 (19.2)	69 (100)	128 (34.0)	**FT0.03**
Non-government employees	248(80.8)	0 (0)	248(66.0)	
Duration of stay				
≤ 1 year	167 (54.4)	5 (7.2)	172 (45.7)	**<0.05**
>1 year	140 (45.6)	64 (92.8)	204 (54.3)	

Mean age (inmates) = 34.96±5.7 years
Mean age (staff) = 38.43±3.5 years

Table 2: Sociodemographic variables and their association with prevalence of Tuberculosis

Variables	Inmates (N=307)			Staff (N=69)		
	GeneXpert result			GeneXpert result		
	Positive (%)	Negative (%)	P-value	Positive (%)	Negative (%)	P-value
Sex						
Male	5 (1.6)	281 (91.6)	0.33	2 (2.9)	51 (73.9)	FT (0.06)
Female	1 (0.3)	20 (6.5)		0 (0)	16 (23.2)	
Age (years)						
18-49	4 (1.3)	280 (91.2)	FT(0.01)	1 (1.4)	63 (91.4)	FT (0.02)
≥50	2 (0.7)	21 (6.8)		1 (1.4)	4 (5.8)	
Residence						
Urban	1 (0.3)	113 (36.8)	0.29	0 (0)	58 (84.1)	FT (0.11)
Rural	5 (1.6)	188 (61.3)		2 (2.9)	9 (13.0)	
Educational status						
<Secondary	2 (0.7)	61 (19.9)	FT(0.31)	0 (0)	4 (5.8)	FT (0.09)
≥Secondary	4 (1.3)	240 (78.1)		2 (2.9)	63 (91.3)	
Occupation						
Government employees	1 (0.3)	58 (18.9)	0.30	2 (2.9)	67 (97.1)	FT(0.12)
Non-government employees	5 (1.6)	243 (79.2)		0 (0)	0 (0)	
Previous contact with TB patient						
Yes	5 (1.6)	140 (45.7)	0.07	2 (2.9)	10 (14.5)	FT (0.06)
No	1(0.3)	161 (52.4)		0 (0)	57 (82.6)	
Duration of stay						
≤ 1 year	2 (0.7)	210 (68.4)	FT(0.04)	0 (0)	5 (7.2)	FT (0.07)
>1 year	4 (1.3)	91 (29.6)		2 (2.9)	62 (89.9)	

FT=Fisher's exact test

Risk factor assessment: Almost all the risk factors assessed except age of inmates and staff, and duration of prison stay by inmates, did not show statistically significant association with the prevalence of tuberculosis among respondents.

DISCUSSION

Although the recommended international cell occupancy was not exceeded, the Nigerian prisons Abakaliki was relatively congested as at the time of this study. This may be largely due to the fact that it serves the entire State and its environs. The 2.0% prevalence of PTB by GeneXpert test among suspected inmates, 1.1% among all inmates and 2.8% among staff is higher than the 0.9% found in the Multi centre prisons study in Nigerian prisons[22] and the 0.7% found among TB suspected inmates in Malawi[23]. The difference may be attributed to the methods employed in the selection of study participants; the Malawian study recruited prisoners with cough history of one week and above which may cause decreased case detection and increased sample size, but this study included only individuals with cough of two weeks duration or more. It is however lower than the 4.5% in Brazil[24] and 8.59%

in Gondar[25] . This difference may largely be attributed to the selection criteria of patients in Brazilian study which included prisoners with cough duration of greater than three weeks only. That made the sample size very small resulting in a low prevalence rate. The 2.0% prevalence rate found among inmates in this study is still lower than the 8.9% in Eastern Ethiopia[16]and 10.4% in other place[26] . This study also found 1.1% prevalence rate among the general inmates. The lower TB prevalence in this study might be also associated with the precautionary measures by the general public in Nigeria. The1.1% prevalence is at variance with the 2.0% reported in Gondar prisons[25] .That high rate was expected to be attributable in large part to the high concentration of risk factors for tuberculosis in incoming prisoners, including HIV infection, a history of intravenous drug use, low socioeconomic status, malnutrition, homelessness, and inability to access community-based health care. Other risk factors included poor ventilation and overcrowding which promote transmission of tuberculosis in prisons[27].

Tuberculosis in prisons encompasses not only TB among prisoners, but also prison staff that ultimately interacts directly with their families and community when they leave work[28] . The 2.8% prevalence rate reported among the prison staff in this study is high when compared to the 0.53% among prison staff in Ethiopia[29] .There was significant association between prevalence of TB and duration of prison stay for more than 1 year. This may be possible because new cases of tuberculosis positive prisoners are being introduced to the prison. This situation on the other hand may contribute to the increased prevalence of tuberculosis in the general population as those prisoners released may transmit the infection. The results of this study indicate the importance of initial screening of newly introduced prisoners to the prisons. More over periodic screening is also important to minimize the burden of tuberculosis[25] .

The sensitivity and specificity of this study was limited by its inability to investigate TB-HIV co-infected inmates and staff and this would have been very important in this situation

REFERENCES

1. World Health Organization. Global tuberculosis report 2013. WHO/HTM/TB/ 2013. 11. Geneva: WHO; 2013.

2. Stop TB. Partnership. The global plan to stop TB 2011-2015: transforming the fight towards elimination of tuberculosis. WHO/HTM/STB/2010. 2. Geneva: WHO; 2010.

3. Raviglione M, Marais B, Floyd K, Lonnroth K, Getahun H, Migliori GB, et al. Scaling up interventions to achieve global tuberculosis control: progress and new developments. Lancet 2012;379:1902–13.

4. Dara M, Chadha SS, Vinkeles MNV, Melchers NV, Van den HJ, Gurbanova E, et al. Time to act to prevent and control tuberculosis among inmates. Int J Tuberc Lung Dis 013;17:4–5.

5. Skrahina A, Hurevich H, Zalutskaya A, Sahalchyk E, Astrauko A, Van Gemert W, et al. Alarming levels of drug-resistant tuberculosis in Belarus: results of a survey in Minsk. EurRespir J 2012;39:1425–31.

6. Migliori GB, Dara M, de Colombani P, Kluge H, Raviglione MC. Multidrug-resistant

tuberculosis in Eastern Europe: still on the increase? EurRespir J 2012;39:1290–1.

7. Migliori GB, Sotgiu G, Lange C, Centis R. Extensively drug-resistant tuberculosis: back to the future. EurRespir J 2010;36:475–7.

8. Jenkins HE, Plesca V, Ciobanu A, Crudu V, Galusca I, Soltan V, et al. Assessing spatial heterogeneity of multidrug-resistant tuberculosis in a high-burden country. EurRespir J 2013;42:1291–301.

9. Ahuja SD, Ashkin D, Avendano M, Banerjee R, Bauer M, Bayona JN, et al. Multidrug resistant pulmonary tuberculosis treatment regimens and patient outcomes: an individual patient data meta-analysis of 9,153 patients. PLoS Med 2012;9: e1001300.

10. Migliori GB, Sotgiu G, Gandhi NR, Falzon D, DeRiemer K, Centis R, et al. Drug resistance beyond extensively drug-resistant tuberculosis: individual patient data meta-analysis. EurRespir J 2013;42:169–79.

11. Floyd K, Hutubessy R, Kliiman K, Centis R, Khurieva N, Jakobowiak W, et al. Cost and cost-effectiveness of multidrug-resistant tuberculosis treatment in Estonia and Russia. EurRespir J 2012;40:133–42.

12. Zhao Y, Xu S, Wang L, Chin DP, Wang S, Jiang G, et al. National survey of drug-resistant tuberculosis in China. N Engl J Med 2012;366:2161–70.

13. Post FA, Grint D, Werlinrud AM, Panteleev A, Riekstina V, Malashenkov EA, et al. Multi-drug-resistant tuberculosis in HIV positive patients in Eastern Europe. J Infect 2014;68:259–63.

14. El-Bassel N, Shaw SA, Dasgupta A, Strathdee SA. Drug use as a driver of HIV risks: re-emerging and emerging issues. CurrOpin HIV AIDS 2014;9:150–5.

15. Banu S, Hossain A, Uddin MK, Uddin MR, Ahmed T, Khatun R, et al. Pulmonary tuberculosis and drug resistance in Dhaka central jail, the largest prison in Bangladesh. PLoS One 2010;5:e10759.

16. Abebe DS, Bjune G, Ameni G, Biffa D, Abebe F. Prevalence of pulmonary tuberculosis and associated risk factors in Eastern Ethiopian prisons. Int J Tuberc Lung Dis 2011;15:668–73.

17. Stuckler D, Basu S, McKee M, King L. Mass incarceration can explain population increases in TB and multidrug-resistant TB in European and central Asian countries. ProcNatlAcadSci U S A 2008;105:13280–5.

18. Baussano I, Williams BG, Nunn P, Beggiato M, Fedeli U, Scano F. Tuberculosis incidence in prisons: a systematic review. PLoS Med 2010;7:e1000381

19. Moller L, Gatherer A, Dara M. Barriers to implementation of effective tuberculosis control in prisons. Public Health 2009; 123: 419–421.

Storla D G, Yimer S, Bjune G A. A systematic review of delay in the diagnosis and treatment of tuberculosis. BMC Public Health 2008; 8: 15

20. World Health Organization. Draft global strategy and targets for tuberculosis prevention, care and control after 2015. Report by the Secretariat. Sixty-seventh World Health Assembly. WHO; March 14, 2014. Available at: http://apps.who.int/ gb/ebwha/pdf_files/WHA67/A67_ 11-en.pdf?ua=1. (accessed November 9, 2017).

21. Onu E,EnejohVA, OlarewajuJ, salihu,I, Igwegbe L, Uwaezuoke M et al. An Enhanced TB Case Finding Program experience from 13 Nigerian Prisons. Annals of Global Health . 2017; 83(1):59-70

22. Banda HT, Gausi F, Harries AD, Salaniponi FM. Prevalence of smear-positive pulmonary tuberculosis among prisoners in Malawi: a national survey.lnt*J TubercLungDis*2009; 13: 1557-1559.

23. Vieira AA, Ribeiro AS, Siqueira MA, Galesi MNV, Santos ARL, Golub EJ. Prevalence of patients with respiratory symptoms through active case finding and diagnosis of pulmonary tuberculosis among prisoners and related predictors in a jail in the city of Carapicuiba, Brazil.*Rev Bras Epidemiol*2010; 13: 641-650.

24. Zelalem A, Emebet A, Abebe A, Wubet B, Biniam M, Belaynesh T, et al . Prevalence of smear positive pulmonary tuberculosis In Gondar prisoners, North West Ethiopia. Asian Pacific journal of Tropical Medicine (2015)127-131

25. Moges B, Amare B, Asfaw F, Tesfaye W, Tiruneh M, Belyhun Y, et a l. Prevalence of smear positive pulmonary tuberculosis among prisoners in North Gondar Zone Prison, north west Ethiopia. *BMC Infectious Dis* 2012; 12: 352-358.

26. Fazel S, BaillargeonJ. The health of prisoners. [Online] Available from: www. Thelancet.com [Accessed on November 11, 2017]. DOl:10.1016/S0140-6736(1O)61053-7.

27. O'Grady J, Hoelscher M, Atun R, Bates M, Mwaba P, Kapata N, et al. Tuberculosis in prisons in sub-Saharan Africa the need for improved health services, surveillance and control. Tuberculosis 2011: 1-6.

28. Montoro E, Rodriguez R. Global burden of tuberculosis. In: Palomino JC, Leao SC, Ritacco V, editors. Tuberculosis 2007: From basic science to patient care. [Accessed online on October 20, 2017] Available at: www. TuberculosisTextbook.com