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PREVALENCE OF TUBERCULOSIS AND ITS CONTRIBUTORY FACTORS AMONG PRISON OFFICERS IN SRI LANKA.

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ABSTRACT

Tuberculosis (TB) remains as one of the major infectious diseases with high disease burden and causes ill-health among millions of people each year. TB is still a public Health problem in Sri Lanka. Adverse conditions prevailing in prisons make the prison community more vulnerable for getting tuberculosis. Prison officers are at risk of getting TB due nature of their work. To determine the prevalence and contributory factors for Pulmonary Tuberculosis among prison officers working in prison institutions in Colombo. Descriptive cross-sectional study was done among 526 prison officers who were directly contact with prisoners and employed for more than three months, in three major prisons in Colombo Sri Lanka. Data were collected using a self-administered questionnaire, a pre structured symptom check list and a clinical examination form. All presumptive TB cases identified were subjected to chest x ray, sputum for direct smear microscopy, and sputum for cartridge based nucleic acid amplification test for TB. Majority between 30-39 years of age and employed for more than five years in the prison. Eighty-three (15%) were identified as having presumptive TB. Among them only one patient was (0.1%) detected as having TB disease with two sputum samples positive for AFB on microscopy, chest X-Ray suggestive of

TB and positive Xpert (MTB/RIF) test for TB. The present study revealed a prevalence of 190 per 100,000 among prison officers which is a threefold increase than in general population of Sri Lanka. These findings highlight the importance of planning further studies among groups of employees with high risk.

Keywords: Tuberculosis, prison officers

INTRODUCTION

Tuberculosis (TB) remains as one of the major infectious diseases with a high disease burden causing ill-health among millions of people each year. The global estimate of incident TB cases in 2017 was 10.4 million. It is the leading cause of death due to a single infectious agent and the estimated deaths among HIV negative TB cases in 2017 was 1.3 million.¹

TB is still a leading public health problem in Sri Lanka. Annually, around 9000-10000 cases of TB are detected, and 8511 cases were reported to the National Programme for Tuberculosis Control and Chest Diseases in 2017. Western province of Sri Lanka accounts for 43% of the total case burden of TB.² TB is an air borne infection. When a person with infectious TB coughs or sneezes, a large number of droplets nuclei containing tubercle bacilli

are enter into the air and when a non-infected person inhales, he or she may get infected with TB. Anybody can get infected with TB, but certain groups of people are more prone to acquire TB. The prison community is considered as one such group at a greater risk of exposure to tuberculosis. Adverse conditions prevailing in prisons, such as overcrowding in poorly ventilated enclosures, long indoor confinement, unhealthy lifestyle, and poor health seeking behavior among prisoners contribute to the spread of TB in prisons. TB in correctional settings (e.g., jails, prisons, detention centers) is a growing problem. There are approximately 10 million individuals who are detained worldwide. Literature indicates that, despite efforts for penal reform and the use of alternative punishment systems, prison populations continue to rise throughout the world³. Prisons act as reservoirs of TB, pumping the infection into the civilian community through staff, visitors and inadequately treated former inmates. Prison staff should be considered a part of the prison population in view of transmission of infectious diseases. Due to the nature of their duties, they are always in close contact with prisoners for prolonged hours. They tend for the sick, and accompany them to health centers and courts, in addition to their routine work. Lack of adequate staff makes them engaged in extra hours of work. Poor knowledge about health matters, in particular, not knowing about infection control measures makes them more vulnerable to acquire infectious diseases like TB.

In addition, prison staff act as a constant link between the enclosed prison environment and the outer environment. They spread diseases to their families and then to the community, once they acquire an infection. Available data around the globe show that prevalence of TB among prisons usually exceeds the prevalence

rates in the specific country significantly and over 3,000 per 100,000, when compared with general population⁴. In Sri Lanka, a significant proportion of TB patients is detected from prisons all over the country through routine screening programmes carried out by the NTP². Though, there is some information regarding the magnitude of TB disease among prison inmates, scientific evidence on the extent of the problem among prison staff is very scarce. Available literature is mostly from the European Region with very few studies conducted in South East Asia and none from Sri Lanka.

Tuberculosis

Tuberculosis (TB) is an infectious disease commonly caused by the bacillus "Mycobacterium tuberculosis". In majority of cases, TB affects the lungs (Pulmonary TB) but it also can affect any part of the body (Extra pulmonary TB). Cough more than two weeks is the most common presenting symptom of pulmonary tuberculosis. This may or may not accompany with haemoptysis, shortness of breath, chest pain, fever and night sweats, loss of appetite, loss of weight and fatigue. Symptoms of extra pulmonary TB depend on the organ affected and can be associated with constitutional symptoms such as fever, night sweats, loss of weight and fatigue⁵. Being a airborne infection. When a patient with infectious pulmonary tuberculosis coughs, sneezes or laughs, bacilli are expelled into the air in the form of tiny droplets. When a healthy person inhales these droplets containing the tubercle bacilli, he/she may become infected. An untreated sputum positive patient has the potential to infect 10-15 persons per year. Approximately 10% of people infected with TB bacilli will develop the disease in their lifetime. The risk of transmission of infection from sputum negative patients and from patients with extra pulmonary TB is very much lower⁵.

TB in Prisons

According to available data active TB disease in prison systems are reported to be much higher than the average estimates in the general population. An available literature reveal that, prisoners have 10-100 times higher risk of getting TB than the civilian populations irrespective of the economic status and the population TB burden of the country⁴. In low and middle-income countries including Bangladesh, Thailand, Ethiopia, and Brazil, TB prevalence among prisoners has been reported to be four, eight, seven, and 64 times higher, respectively, compared to the general population.⁶⁻¹² A study carried out in Sri Lanka among convicted prisoners also reported a 15 times higher prevalence of TB among prisoners than the general population¹³. Limited data exist on TB infection among prison staff. A study conducted among full time prison employees in Malaysia, revealed that prevalence of TST positivity was 81% and was associated with longer duration of work and tobacco use¹⁴.

Many prisons worldwide are overcrowded, well beyond their official capacity. Overcrowded prisons facilitate the spread of mycobacterial strains, as prisoners are in close contact with one another, often for 12 hours or more each day without access to fresh air. A study conducted in Brazil has identified the lack of mechanical ventilation systems as another major risk factor for contracting TB¹⁵. A study conducted in Sri Lanka, in major prisons revealed that poor ventilation and illumination in prisons has significant association with prevalence of TB¹³.

Alcohol Consumption, Substance Use and TB

Improper lifestyle factors such as substance abuse and alcohol consumption have an impact on the occurrence and spread of TB. 30 out of 137 studies between 1994 and 2005 were included in

a systematic review on risk factors associated with recent transmission of tuberculosis. These studies revealed a higher risk of TB among excessive alcohol users (OR 2.27, 95% CI 1.35-1.72) and persons with acquired immune deficiency syndrome (OR 1.66, 95% CI 1.36-2.05)¹⁶.

Nutrition and TB

Poor nutrition has an impact on occurrence of TB and its prognosis. On the other hand, TB disease itself can cause loss of appetite and lead to malnutrition. A systematic review on six cohort studies that collected data on weight and height at baseline and a diagnosis of active TB as the study outcome revealed a log-linear inverse relationship between TB incidence and BMI, (within the BMI range of 18.5-30 kg/m²)¹⁷. Studies conducted in Cameroon¹⁸ identified low BMI as a risk factor for development of TB and a study conducted in Ethiopia revealed a high incidence of TB among prisoners with BMI below 18.5 kg/m²¹⁹. A study conducted in Sri Lanka found a significant association between smear positive TB and BMI < 18 (p < 0.0001) and perception of poor nourishment¹⁴.

Co-Morbidities and TB

Chronic diseases such as diabetes and kidney disease have an impact on occurrence and outcome of TB. A case control study in Russia to assess risk factors in developing TB found that Diabetics have 2.6 times higher risk of developing the disease²⁰. In some other studies also showed that DM was associated with an increased risk of TB^{21,22}. A systemic review including 13 studies found that Diabetic patients had three fold the risk of developing TB compared to those without diabetes²³. A study analyzed 14 national studies in high TB-burden countries and found that tobacco, alcohol, diabetes, and low BMI were all significant individual risk factors.

In combination, these risk factors are associated with triple or quadruple the risk of development of recent active TB24.

METHODOLOGY

A descriptive cross-sectional study was carried out in three major prisons (Welikada, Magazine and Remand) in Colombo in the year 2018. All prison officers who worked in direct contact with prisoners in the above three prisons were considered as the study population.

The prison officers employed for more than three months at the prison and routinely worked in direct in contact with prisoners were included in the study. The prison officers who worked less than three months in the above prisons and who worked exclusively in the offices were excluded from the study.

The study was carried out in 3 steps.

At first all the eligible prison officers were provided with a self-administered questionnaire in order to obtain information on socio-demographic factors, lifestyle factors, past and present medical conditions, and TB contact history. Then they were subjected to a clinical examination by a medical officer on the same day to identify presumptive TB cases. A pre structured symptom check list and a clinical examination form were used to record the presence of symptoms and signs suggestive of TB and clinical findings. Symptom checklist consisted of seven of symptoms and each was given scores. The operational criteria for presumptive TB were “Cough more than 2 weeks of duration and/ or Scoring 5 or more to the to the symptom check list or Past history of TB treatment and/ or Body Mass Index (BMI) less than 20”. All presumptive TB cases identified in the study from those criteria were subjected to chest x ray, sputum for direct smear microscopy for Acid Fast Bacilli (AFB) on three sputum samples (two spot and one

early morning), and sputum for cartridge based nucleic acid amplification test for TB, Xpert MTB/RIF (WHO Approved Rapid Diagnostics). Investigations were conducted at the District Chest Clinic Laboratory, Colombo.

A case of pulmonary TB was defined as a person with two sputum smears are positive for AFB by direct smear microscopy or a person with at least one smear positive for AFB by microscopy and as determined by a clinician based on chest X ray findings suggestive of TB or a patient with or without sputum smear positive for AFB but sputum positive for *M. tuberculosis* on Xpert MTB/RIF or a person who does not fulfil the criteria for bacteriological confirmation but has been diagnosed with active TB by a clinician.

DATA ANALYSIS

A total of 526 participants were enrolled for this study. A summary of socio-demographic and work-related characteristics are shown in table 1.

Most were males accounting for 84.6% (n=445). Majority were between 30-39 years of age and were employed for more than five years in the prison.

Table 2 shows distribution of BMI, Health Related Habits, Co-morbidities among respondents. One hundred and fifty-eight (30%) out of total study population reported currently taking alcohol and 27% were smokers (Table 2).

Among the participants 7% had diabetes mellitus and Thirteen (2.5%) had bronchial asthma and one had chronic kidney disease (Table).

Nearly 55% with BMI of more than 25 Kg/m².

Table – 1 Socio Demographic Characteristics of the population

	No	%
Gender		
Female	81	15.4
Male	445	84..6
Total	526	100.0
Age (years completed at the last birthday)		
18-29 years	137	26.1
30-39 years	198	37.6
40-49 years	121	23.0
> 50 years	70	13.3
Total	526	100.0
Ethnicity		
Malay	1	0.2
Muslim	2	0.2
Sinhala	511	97.2
Tamil	12	2.4
Total	526	100.0
Religion		
Buddhist	499	95.0
Catholic	15	2.5
Hindu	9	1.7
Islam	2	0.6
Other	1	0.2
Total	526	100.0
Job category		
Prison Guard	446	84.8
Jailor	62	11.8
Health Worker	18	3.4

	526	
Duration of employment in prison		
6 months - 1 year	20	3.8
1 - 3 Years	121	23.0
3 - 5 years	51	9.7
More than 5 years	334	63.5
Total	526	100.0

Table – 2 Distribution of BMI, Health Related Habits, Co-morbidities among respondents

	No	%
BMI		
<18.5	19	3.7
18.5-24.9	214	40.6
25-30	186	35.4
>30	107	20.3
Total	526	
Current smoker		
Yes	142	27%
No	384	73
Total	526	
Currently taking alcohol		
Yes	158	30%
No	368	70
Total	526	
Diabetes		
Yes	38	7.2%
No	488	92.8

Total	526	
Asthma		
Yes	13	2.5%
No	513	99.5
Total	526	

One person (0.1%) had a past history of TB and four (0.7%) had contact history of TB other than prison inmates.

Eighty-three (15%) were identified as having presumptive TB. Among them only one patient was (0.1%) detected as having TB disease with two sputum samples positive for AFB on microscopy, chest X-Ray suggestive of TB and positive Xpert (MTB/RIF) test for TB.

Prevalence of TB among the study population is .190/100,000 (CI 30/100,000 – 1070/100,000).

Characteristics of the Patient who has been diagnosed as having TB.

The participant diagnosed with active pulmonary TB was a 55-year-old male officer with diabetes and chronic kidney disease. His BMI was less than 18.5. He revealed habits of smoking and taking alcohol. He did not have any contact history with TB patients outside the prison.

DISCUSSION

Prisons are considered as reservoirs for TB infection creating threats not only to inmates of prisons, also to the community through relatives, visitors, released prisoners as well as the prison workers. The transmission dynamics between prison population and the general population have been hypothesized to play a key role in driving overall population-level TB incidence, prevalence, and

mortality. In order to interrupt this transmission cycle, evidence-based approaches are a must. Though there are studies available for prisoners, very few studies were carried out among prison employees globally and none were from Sri Lanka. Due to logistic and security reasons this study was confined to three major prisons in Colombo which have higher number of officers.

Available data in literature show that the estimated prevalence's active TB disease in prisons are reported to be much higher than the average estimates in the general population^{3, 6-13}. The present study revealed a prevalence of 190 per 100,000 among prison officers which is a threefold increase than in general population of Sri Lanka. According to available data, most of the factors under study, working more than 5 years in prisons & full-time employment history of alcohol consumption and smoking have an impact on the occurrence and spread of TB. However, the present study could not identify causal relationships due to low numbers of TB patients. Under nutrition or low BMI (> 18.5) had been identified as a risk factor in most of the literature. In the patient detected in this study, BMI was below 18.5 though significance cannot be established due to smaller number of samples. Comorbidities play a major role in treatment outcome and prognosis. The patient identified in the present study is having Chronic Kidney Disease and Diabetes. These findings highlight the importance of planning further studies

among groups of employees with a high risk of occupational exposure to TB.

Both, the patient detected of TB in the present study and the officer who had past history of TB did not have any contact with outside TB patients. This finding suggests the possible exposure within the prison community.

CONCLUSION AND RECOMMENDATIONS

The study revealed high prevalence of TB among prison officers, therefore periodic screening of these officers should be done, and priority should be given to those with chronic diseases.

REFERENCE

- World Health Organization WHO . *Global tuberculosis report*. Geneva: WHO; 2018.
- National Programme for Tuberculosis Control & Chest Diseases. *Annual Tuberculosis data (unpublished)*. Sri Lanka: Ministry of Health;2017
- International Centre for Prison Studies. 2014. *World Prison Population List (11th ed.)*. London: Institute of Criminal Policy Research, Birkbeck University of London. www.prisonstudies.org
- Tuberculosis Coalition for Technical Assistance (TB/CTA) and International Committee of the red cross: *guidelines for control of tuberculosis in prisons*. The Global Health, Office of Health, Infectious Disease and Nutrition (HIDN). US Agency for International Development;2009.
- Tuberculosis fact sheet NO www.who.int/features/qa/08/en/.
- Jittimane S, Ngamtrairai N, White MC, Jittimane S. A prevalence survey for smear positive tuberculosis in Thai prisons. *Int J Tuberc Lung Dis* 2007;11:556–61.
- Chiang CY, Hsu CJ, Hsu PK, Suo J, Lin TP. Pulmonary tuberculosis in the Taiwanese prison population. *J Formos Med Assoc* 2002;101:537–41.
- 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.
- United Nations. Millennium Development Goals Indicators. The official United Nations site for the MDG Indicators. Available at: <http://mdgs.un.org/unsd/mdg/SeriesDetail.aspx?srid=617> (accessed June 11, 2014).
- 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.
- Abramo RM, Nogueira PA, Malucelli MI. Tuberculosis in county jail prisoners in the western sector of the city of Saõ Paulo, Brazil. *Int J Tuberc Lung Dis* 2006;10:203–8.
- Sanchez A, Gerhardt G, Natal S, Capone D, Espinola A, Costa W, et al. Prevalence of pulmonary tuberculosis and comparative evaluation of screening strategies in a Brazilian prison. *Int J Tuberc Lung Dis* 2005;9:633–9.
- de Alwis A.K.S.B., Samaraweera SD Pallewatte NC, Ambagahage TM, Kumarasiri KADL. Smear positive TB among convicted prisoners in Srilankan prisons and its contributory factors International Conference on public Health Innovations National Institute of Health Sciences Sri lanka 2013
- Al-Darraj HA, Tan C, Kamarulzaman A, Altice FL (2015) Prevalence and correlates of latent tuberculosis infection among employees of a high security prison in Malaysia. *Occup Environ Med* 72:442–447. doi:10.1136/oemed-2014-102695
- Vieira, A.A., Ribeiro, S.A., de Siqueira, A.M., Galesi, V.M., dos Santos, L.A., and Golub, J.E. 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 Carapicuíba, Brazil. *Rev Bras Epidemiol*. 2010; 13: 641–650
- Nava-Aguilera E, Andersson N, Harris E, Mitchell S, Hamel C, Shea B, et al. Risk factors associated with recent transmission of tuberculosis: systematic review and meta-analysis. *Int J Tuberc Lung Dis*. 2009;13: 17–26. [PubMed]

Knut Lönnroth, Brian G Williams, Peter Cegielski, Christopher Dye. A consistent log-linear relationship between tuberculosis incidence and body mass index. *Int J Epidemiol* (2009) 39 (1): 149-155.

Cameroon J. Noeske, C. Kuaban, G. Amougou, A. Piubello and Pouillot R. Pulmonary Tuberculosis in the central prison of Douala, *East African medical journal* January 2006 25-30

.Beyene Moges, Bemnet Amare , Fanaye Asfaw , Wogahta Tesfaye, Moges Tiruneh, YeshambeBelyhun, Andargachew Mulu and Afework Kassu. Prevalence of smear positive pulmonary tuberculosis among prisoners in North Gondar Zone Prison, northwest Ethiopia. *BMC Infectious Diseases* 2012, 12:352

R. Coker, M. McKee, R. Atun, et al. 2006. Risk Factors for Pulmonary Tuberculosis in Russia: Case Control Study. *British Medical Journal* 332: 85-7.

Alisjahbana B, Van Crevel R, Sahiratmadja E, den Heijer M, Maya A, Istriana E, et al. Diabetes mellitus is strongly associated with tuberculosis in Indonesia. *The International Journal of Tuberculosis and Lung Disease*. 2006;10(6):696-700. [PubMed]

Kim SJ, Hong YP, Lew WJ, Yang SC, Lee EG. Incidence of pulmonary tuberculosis among diabetics. *Tubercle and Lung Disease*. 1995;76(6):529-533. [PubMed]

Jeon CY, Murray MB. Diabetes mellitus increases the risk of active tuberculosis: a systematic review of 13 observational studies. *PLoS Med*. 2008;5(7, article e152)

.Patra J, Jha P, Rehm J, Suraweera W (2014) Tobacco Smoking, Alcohol Drinking, Diabetes, Low Body Mass Index and the Risk of Self-Reported Symptoms of Active Tuberculosis: Individual Participant Data (IPD) Meta-Analyses of 72,684 Individuals in 14 High Tuberculosis Burden Countries. *PLoS ONE* 9(5):e96433.doi:10.1371/journal.pone.0096433