Prevalence of diabetes mellitus and HIV/AIDS among tuberculosis patients in Kerala

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Abstract

Introduction: It is estimated that 10 million people fall ill with Tuberculosis (TB) every year worldwide. TB continues to be in the top 10 causes of death globally with India being the home to the world's largest number of TB patients. One of the major factors attributing to this is the presence of comorbidities such as Diabetes Mellitus and HIV/AIDS. **Aim:** The aim of this study was to determine the prevalence of comorbidities such as Diabetes mellitus & HIV/AIDS among the newly diagnosed TB patients in Kerala in 2019 and also to determine the factors associated with it. **Materials and Methods:** A cross-sectional study was carried out using the secondary data from NIKSHAY portal. There were a total of 16,527 cases of pulmonary and extrapulmonary TB cases reported from 14 districts of Kerala from January to September 2019. Using a checklist, data regarding the age, gender, type of case, Type of patient, site of disease, drug resistance were collected separately for TB patients suffering from Diabetes mellitus and HIV/ AIDS. The data was then entered into Excel sheet and was analyzed using SPSS version 23. **Results:** Out of the total 16,527 study population, most of the patients were elderly above the age of 60 years (28.6%). The prevalence of Diabetes mellitus (22.6%) was higher among TB patients when compared to HIV/AIDS (1.2%). Males in the age group between 50-59 years were found to be significantly associated with TB- Diabetes Mellitus comorbidities. Diabetes was significantly associated with Pulmonary TB patients, while HIV/ AIDS was significantly associated with extrapulmonary TB. **Conclusion:** Both Diabetes Mellitus and HIV/AIDS are comorbidities that have a strong impact on the diagnosis and management of Tuberculosis patients. Therefore, there is an urgent need to prevent these comorbidities from occurring along with the implementation of early diagnosis and appropriate management strategies. This study is of prime importance especially among Primary care Physicians who are treating TB patients on routine basis. They are particularly important in TB control since they are usually the first to meet a TB suspect, before diagnosis occurs. Both HIV/AIDS and Diabetes mellitus are immunocompromised conditions and these comorbidities can affect the treatment outcomes of TB. Primary care physicians are essential in detecting TB suspects and treating them, thus contribute significantly to reducing the burden of TB.

Keywords: Comorbidities, diabetes mellitus, HIV/AIDS, TB

Introduction

It is estimated that 10 million people fall ill with Tuberculosis (TB) every year worldwide. TB continues to be in the top 10 causes of

death globally with India being the home to the world's largest number of TB patients.[1] According to the World TB report, India is estimated to have 28,00,000 TB cases. Kerala, a southern state in India is working towards TB elimination; however, its TB incidence still remains at 67 cases per 1, 00,000 population.[2]

Despite the implementation of several interventions to control it, TB continues to be a Public Health problem. One of the major factors attributing to this is the presence of comorbidities such as Diabetes Mellitus and HIV/AIDS. It is estimated that 0.8 million

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and 0.4 million of TB cases are suffering from comorbidities such as HIV/AIDS and diabetes respectively.[3] If these comorbidities are not treated in a timely manner, it may affect treatment outcomes which may further result in delaying TB elimination.[4] Therefore, it is essential that routine assessments for associated comorbidities are conducted on people diagnosed with tuberculosis in order to plan proper coordinated clinical management.

Hence, the aim of this study was to determine the prevalence of comorbidities such as Diabetes mellitus & HIV/AIDS among the newly diagnosed TB patients in Kerala in 2019 and also to determine the factors associated with it.

Methods

After obtaining Institutional Ethical Committee clearance a cross-sectional study was carried out using the secondary data from NIKSHAY portal. NI-KSHAY- (Ni = End, Kshay = TB) is a web-enabled patient management system for TB control under the National Tuberculosis Elimination Programme (NTEP). It is developed and maintained by the Central TB Division (CTD), Ministry of Health and Family Welfare, Government of India, in collaboration with the National Informatics Centre (NIC), and the World Health Organization Country office for India.[5] The NIKSHAY data was obtained from the state TB cell officer, Government of Kerala. There were a total of 16,527 cases of pulmonary and extrapulmonary TB cases reported from 14 districts of Kerala from January to September 2019. Using a check list, data regarding the age, gender, type of case, Type of patient, site of disease, drug resistance were collected separately for TB patients suffering from Diabetes mellitus and HIV/AIDS. The data was then entered into Excel sheet and was analyzed using SPSS version 23. The prevalence rate of Diabetes mellitus and HIV/AIDS in both Pulmonary and Extra pulmonary TB patients were calculated in percentages. To test the statistical significance of the association, Chi-square test was used.

Results

Out of the total 16,527 study population, most of the patients were elderly above the age of 60 years (28.6%). The mean age of TB patients was observed to be 46.83 ± 24.57 years. Majority of them were males (67.2%) and the rest were females. The numbers of pulmonary TB cases (66.9%) were found to be higher in comparison to Extra pulmonary cases (33.1%). Most of them were new patients (92%) and was taking treatment from the Public sectors (88%). The details of which are provided in Table 1.

The Chi-square analysis of various sociodemographic factors of TB patients with Diabetes mellitus and HIV/AIDS as a comorbidity are shown in Table 2. Based on comorbidities, it was observed that the prevalence of Diabetes mellitus (22.6%) was higher among TB patients as compared to HIV/AIDS (1.2%). Based on gender, diabetes mellitus was higher among males (25.2%) when compared to females (17.4%) and the findings were found to be statistically significant (p < 0.001),

whereas there was no significant difference for HIV based on gender among TB patients. It was observed that those who belonged to the age group 50–59 years (32.2%) were more diabetic when compared to other age groups and HIV was higher among those belonging to the age group of 40-49 years (2.4%), and these findings were statistically significant with P < 0.001. It was observed that diabetes mellitus was predominant among pulmonary TB patients (27.6%) when compared to extrapulmonary TB cases (12.6) with a statistically significant difference of *P* < 0.001. However, HIV as a comorbidity was found to be higher among extra pulmonary TB patients (1.5%) when compared to pulmonary TB patients (1%) and it was found to be statistically significant (p < 0.001). On the basis of place of diagnosis i.e., whether they were diagnosed from public or private sector, it was found that 23.7% of TB-Diabetic patients and 1.3% TB-HIV patients were diagnosed from public centers than private centers and was found to be statistically significant (p < 0.001). Based on the type of case, a statistically significant difference was observed for patients belonging to Retreatment- Treatment after failure for having diabetes mellitus (34.6%) (p < 0.001) whereas for HIV the statistically significant difference was observed for patients belonging to retreatment (4.4%) (P < 0.001).

Discussion

The prevalence of Diabetes mellitus among the TB patients was found to be 22.6% and this was found to be similar to the prevalence observed in studies conducted at tertiary care centers in the neighboring states of Tamil Nadu[6] and Karnataka[7] which was 29% & 25.3% respectively. Over the years, there has been an increase in the number of diabetes cases in India which is a major public health concern and has been found to have an impact on TB prevention and control activities.[8] The bidirectional relationship existing between Diabetes and TB has known to impact the presentation of each other. Diabetes has been recognized as a risk factor for TB and it may affect its presentation, while TB may worsen the glycemic control.[9] Because of the severity of Diabetes mellitus complicated with TB, the treatment of these two diseases is facing great difficulties.[10]

However, the prevalence of HIV/AIDS among TB patients in our study was observed to be 1.2% and this was similar to a study where the sero-prevalence across 8 states of India ranged from 1% to 13.8%.[11] This could probably be because the prevalence of HIV in Kerala has always been low.[12] HIV/AIDS and TB are two major infectious diseases that causes a major burden in India.[13]

It was observed that diabetes was significantly associated with pulmonary TB patients, while HIV/AIDS was significantly associated with extrapulmonary TB. These finding has been supported by studies done by Bacakoğlu F *et al*.[14] and Gupta S.[15] The probable reason why Pulmonary TB is more common than extrapulmonary TB among diabetic patients is due to the hyper-reactive cell-mediated immune response to Mycobacterium TB in Diabetes Mellitus patients. It may be suboptimal for containing the Mycobacterial growth within the lung, but

Table 1: Distribution of study participants based on socio demographic factors

VARIABLE	FREQUENCY (16,527)	PERCENTAGE (%)
AGE		
<20 years	1622	9.8%
20-29 years	1816	11%
30-39 years	1989	12%
40-49 years	2908	17.6%
50-59 years	3446	20.9%
>60 years	4746	28.7%
GENDER		
Male	11110	67.2%
Female	5417	32.8%
SITE OF DISEASE		
Pulmonary TB	11051	66.9%
Extra Pulmonary TB	5476	33.1%
TYPE OF CASE		
New	15207	92%
PMDT (Programmatic management of drug resistant TB)	217	1.3%
Retreatment: Recurrent	287	1.7%
Retreatment: Treatment after failure	52	0.3%
Retreatment: Treatment after lost follow up	59	0.4%
Retreatment: Others	705	4.3%
PLACE OF TREATMENT		
Public Sector	14540	88%
Private Sector	1987	12%

Table 2: Association of socio demographic factors with TB patients suffering from Diabetes mellitus and HIV/AIDS

VARIABLE	DIABETES MELLITUS *n* (%)	P	HIV/AIDS *n* (%)	P
GENDER				
Male	2796 (25.2%)	P<0.001	131 (1.2%)	P=0.942
Female	943 (17.4%)		64 (1.2%)	
AGE				
<20 years	12 (0.7%)	P<0.001	5 (0.3%)	P<0.001
20-29 years	41 (2.3%)		14 (0.8%)	
30-39 years	282 (14.2%)		41 (2.1%)	
40-49 years	811 (27.9%)		71 (2.4%)	
50-59 years	1111 (32.2%)		45 (1.3%)	
>60 years	1482 (31.2%)		19 (0.4%)	
SITE OF DISEASE				
Pulmonary TB	3048 (27.6%)	P<0.001	111 (1.0%)	P<0.001
Extra Pulmonary TB	691 (12.6%)		84 (1.5%)	
PLACE OF TREATMENT				
Public Sector	3445 (23.7%)	P<0.001	189 (1.3%)	P<0.001
Private Sector	294 (14.8%)		6 (0.3%)	
TYPE OF CASE				
New	3441 (22.6%)	P<0.001	154 (1.0%)	P<0.001
Retreatment: Recurrent	75 (26.1%)		6 (2.1%)	
Retreatment: Treatment after failure	18 (34.6%)		0 (0.0%)	
Retreatment: Treatment after lost follow up	4 (6.8%)		0 (0.0%)	
Retreatment: Others	143 (20.3%)		31 (4.4%)	

effective for preventing its dissemination and reactivation elsewhere in the body.[16] Similarly, studies have hypothesized in the past that the decline in CD4 lymphocyte counts in HIV/AIDS would be the reason for the increase in severe variants of Extra Pulmonary TB.[17]

It was interesting to see that majority of TB patients suffering from either of the comorbidities were utilizing the public healthcare services more when compared to the private sector. This reflects the presence of a strong public healthcare system in Kerala that continues to provide good quality care that is par with the private sector.[18]

To conclude, both Diabetes Mellitus and HIV/AIDS are comorbidities that have a strong impact on the diagnosis and management of Tuberculosis patients. The findings from this

study show that the prevalence of Diabetes mellitus was higher among TB patients when compared to HIV/AIDS. Diabetes was significantly associated with Pulmonary TB patients while, HIV/AIDS was significantly associated with extrapulmonary TB. Therefore, there is an urgent need to prevent these comorbidities from occurring along with the implementation of early diagnosis and appropriate management strategies for these comorbidities in order to ensure successful TB treatment outcomes.

This study is of prime importance especially among Primary Health Care Physicians who are the frontline suppliers of care to patients. They play an important role in prevention and control of TB and other comorbidities through early detection and treatment and can contribute significantly to reducing the burden of disease.

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Conflicts of interest

There are no conflicts of interest.

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