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Study of Pulmonary Tuberculosis in Diabetes Patients

Nair Shraddha, V Suryanarayana , Raja Amarnath G*

Department of Pulmonary Medicine, Sree Balaji Medical College & Hospital Affiliated to Bharath Institute of Higher Education and Research, Chennai, Tamil Nadu, India

ABSTRACT

Tuberculosis was recognized as an infectious disease. A prospective, randomized study was designed to compare the clinical and radiological presentation of pulmonary tuberculosis in DM and non DM cases. The present study focuses on to compare treatment outcomes of TB in DM and non DM cases. The present study compares the clinical presentation profile and outcomes of TB in diabetic and non-diabetic patients at a tertiary reference centre in Chennai.

Key words: Tuberculosis, Diabetes mellitus, HIV/AIDS, Sputum, Chest X-ray

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Corresponding author: Raja Amarnath G
E-mail ✉ :RajaAmarnath.g@bharathuniv.ac.in
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INTRODUCTION

TB prevailed among humans since antiquity, with the earliest evidence of TB dating back to 5800BC when TB was found in the skeleton of a 30-year-old woman in Italy. TB was also found in Egyptian mummies dating back to 1550 BC. Tuberculosis (TB) has existed for millennia and remains a major global health problem. It causes ill-health in millions of people each year and the year 2015, TB was one of the top 10 causes of death worldwide, ranking above Human Immunodeficiency Virus/ Acquired Immuno deficiency Syndrome (HIV/AIDS) as one of the leading causes of death from an infectious disease. This is despite the fact that with a correct treatment, most people who develop TB disease can be cured. According to the Global Tuberculosis Report 2016, the global incidence (number of cases occurring per year) of tuberculosis is 10.4 million. The incidence of TB case in India being 2.84 million with 480,000 deaths.

There are many predisposing factors for TB, which include HIV/ AI DS , silicosis, malnutrition and smoking etc. Incidence of tuberculosis is greatest amongst those with conditions impairing immunity 2' such as Diabetes. In India 18% of the patients with pulmonary tuberculosis have Diabetes 3.Diabetes mellitus (DM) 1s a well-known predisposing factor for tuberculosis (TB) since the ancient times [1-5]. While the link with Diabetes and TB has been known since Roman times, it is only recently that unequivocal evidence has been gathered to show a strong association between the two diseases. At present, India is facing a dual epidemic of diabetes and tuberculosis (TB) [6]. Due to the epidemic-like spreading and severe complications, diabetes is considered one of the most prominent chronic conditions globally. Succeeding the unhealthy lifestyle transitions in developing countries, the diabetes epidemic is now burdened by the infectious (or communicable) diseases [7]. In 2014, there were an estimated 65.1 million people worldwide with diabetes and the number is projected to rise to 109 million in 2035 [8]. Today it is estimated that 80% of all diabetes cases occur in low-and middle income countries. The association between the global diabetes epidemic and the high number of TB cases, particularly in South-east Asia and the Western Pacific, is a global public health concern. Considering that 75% of the total numbers of people with diabetes live in low- and middle income countries, it is of great concern that these same countries also struggle with high rates of TB.

The prevention and treatment of both TB and DM present major public health challenges in all settings across the globe. Given the rising incidence trends of both diseases it is particularly important to understand the association in detail within this setting so that any relevant information can be utilized to aid local TB and DM prevention and control. Any studies have been done in the past which recognizes the link between pulmonary tuberculosis and Diabetes Mellitus. With regards to the possible effects of DM on the presentation and treatment outcome of TB, recent data which are available have conflicting results. Due to the varied presentation of Tuberculosis in DM patients and lot of discrepancies in the literature, this field still needs to be explored.

MATERIALS AND METHODS

The present Study of Pulmonary Tuberculosis in Diabetes patients", was conducted in the Department of Pulmonary Medicine, Sree Balaji Medical College and Hospital,

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he hest radiograhs ere read indeendently e perience pro essiona s an ra io ogica esions on chest ra ere classified into minimal, moderately a ance an ar a ance as per merican horacic ociet criteria.

Minimal

Minimal lesions include those that are of slight to mo erate ensit t hich o not contain emonstra e ca itation. he ma in o e a sma part o one or oth ngs t the tota e tent regar ess o istri tion sho not e cee the o me o ng on one si e that occ pies the space a o e the secon chon rosterna nction an the some o the o rth or the o o the fifth thoracic ter a.

Moderately advanced

Moderately advanced lesions may be present in one or oth ngs t the tota e tent sho not e cee the o o ing imits isseminate esions o s ight to mo erate ensit that ma e ten thro gho t the tota o me o one ng or the e i a ent in oth ngs ense an confluent lesions limited in extent to one hird the o me o one ng tota iameter o ca itation i present m st e ess than cm.

Far advanced

Lesions more extensive than moderately advanced Lower ng field tu rculosis as defined as tu rculosis isease o n e o an imaginar ine trace across the hi ar an inc ing the parahi ar regions on a stan ar posterior-anterior chest roentgenogram". he first infection th the tu rcle acillus is n as primar t erc osis. he esion at the primar site o in o ement raining mphatics an inflamed regional mph no e constit te the primar comp e . hen the primar site o imp antation is in the ng it is ca e hon s oc s. he raining mphatics an the in o e mph no es together ith hon s oc s constit te the primar comp e hon comp e . he s se ent co rse is etermine the imm ne stat s o the host. n or er to ca se an in ection the . t erc osis acteri m m st first ass through the hysical defences of the u er respirator tract inc ing those o the nose nasa ca it t r inates an phar n . acteri m m st a oi impingement or e p sion m coci iar action or the co gh an snee e reflexes itto cause a diseased state.

RESULTS

Data analysis

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Table 2: Grouping of patients.

Groups	Definition	Number
PTB-DM	Pulmonary tuberculosis proven by sputum positivity with diabetes mellitus	32
PTB	Pulmonary tuberculosis proven by sputum positivity without diabetes mellitus	36

By conventional criteria the association between the study groups and age distribution is considered to be statistically significant since in patients longing to P group the mean age is years th mar ority longing to years age grou ollowed years age grou in P group the mean age is years th mar ority longing to years age grou ollowed years age grou e mean age as more in P group com ared to the P group ith a mean difference of years. he increased mean age in P group com ared to the P group statistically significant as the alue is s r una red t test indicating a true statistical difference e en study grou and gure and gure con ntional criteria the association e en the study grou and gender status is considered to not statistically significant since

he stud y ulation consists mar ity of males. In P males ing in ollowed females in and in P grou so mar ity longed to male gender in ollowed female gender in and gure

Table 3: Age groups.

Age -Groups	PTB+DM	PTB	PTB+DM (%)	PTB (%)
20 years	0	1	0	2.78
21-40 years	0	17	0	47.22
41-60 years	25	14	78.13	38.89
61-80 years	7	4	21.88	11.11
Total	32	36	100	100

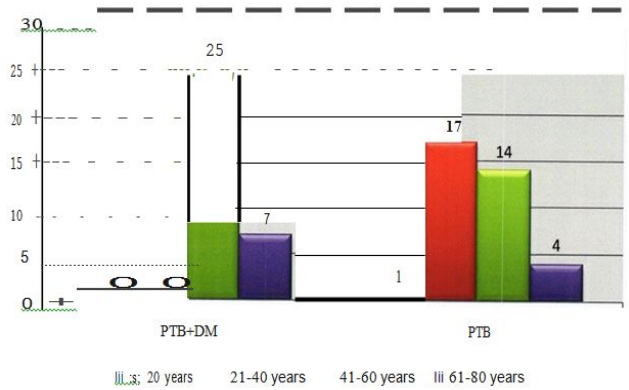

Figure 1: Age groups.

Table 4: Age distribution.

Age Distribution	PTB+DM	PTB
Mean	57.47	39.81
SD	6.19	11.16
P Value Unpaired t Test		<0.0001

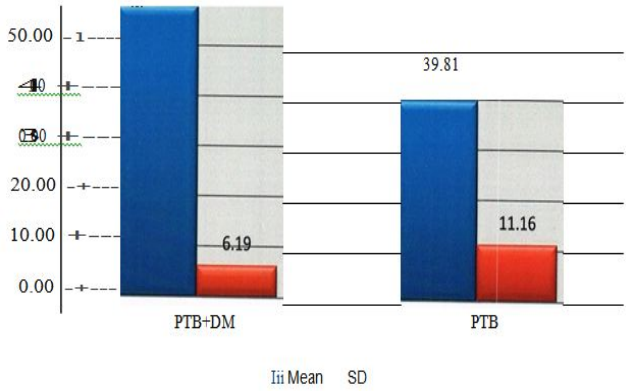

Figure 2: Age distribution.

Table 5: Gender status.

Gender Status	PTB+DM	PTB	PTB+DM (%)	PTB (%)
Male	23	21	71.88	58.33
Female	9	15	28 .13	41.67
Total	32	36	100	100
P Value Chi Squared Test			0.2435	

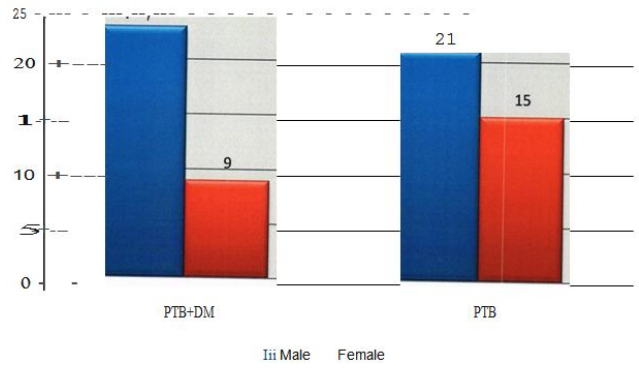

Figure 3: Gender status.

By conventional criteria the association between the study groups and BMI status is considered to be statistically significant since p<0.05. In patients belonging to PTB-DM group, majority belonged to overweight BMI group (n=20, 62.50%) followed by normal BMI group (n=l 1, 34.38%). In PTB group, majority belonged to normal BMI group (n=20, 55.56%) followed by underweight BMI group (n=16, 44.44%). The incidence of overweight BMI status is more in PTB-DM group compared to the PTB group by 38% with a percentage difference of 62.50 points. This is statistically significant as the p value is <0.0001 as per fishers exact test indicating a true statistical difference between study groups (Table 6 and Figure 4). By conventional criteria the association between the study groups and smoking status is not considered to be statistically significant. In patients belonging to PTB-DM group, majority are smokers (n=22, 68.75%) followed by non-smokers (n=9, 28.12%). In PTB group, similarly majority are smokers (n=21, 58.33%) followed by non-smokers (n=15,41.66%) (Table 7 and Figure 5).

Table 6: BMI status.

BMI Status	PTB+DM	PTB	PTB+DM (%)	PTB (%)
Underweight	1	16	3.13	44.44
Normal	11	20	34.38	55.56
Overweight	20	0	62.5	0
Obese	0	0	0	0
Total	32	36	100	100
P Value Fishers Exact Test			<0.0001	

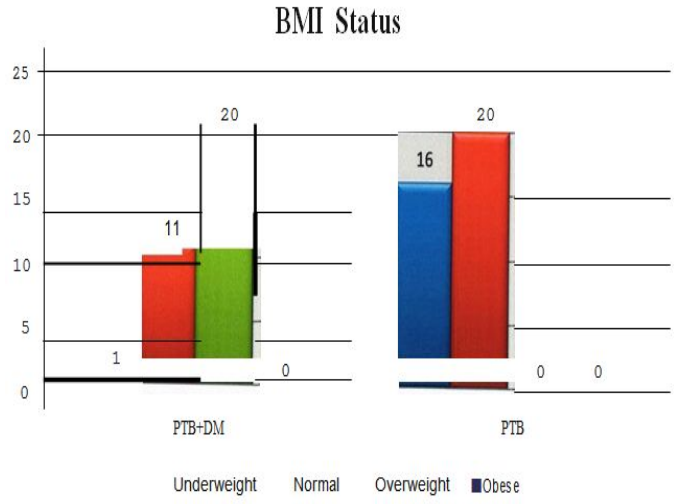

Figure 4: BMI status.

Table 7: Smoking.

Case	Smokers	X-Smokers	Non-smokers
PTB-DM	22	1	9
PTB	21	0	15

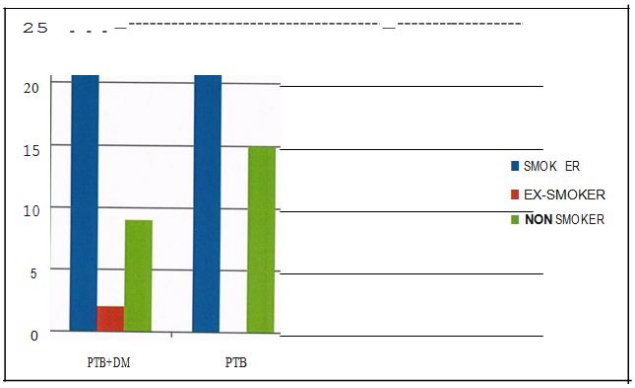

Figure 5: Smoking.

By conventional criteria the association between the study groups and alcohol intake status is not considered statistically significant since p > 0.05. In patients belonging to PTB-DM group, majority were alcoholics (n=20, 62.50%) followed by non-alcoholics (n=l 1, 34.38%). In PTB group, majority were alcoholics (n=27, 75.00%) followed by non-alcoholics (n=9, 25.00%) (Table 8 and Figure 6).

Table 8: Alcohol intake status.

Alcohol Intake Status	PTB+DM	PTB	PTB+DM (%)	PTB (%)
Alcoholic	20	27	62.5	75 .00
Non Alcoholic	11	9	34.38	25
Ex-Alcoholic	1	0	3.13	0
Total	32	36	100	100
P Value Fishers Exact Test			0.3515	

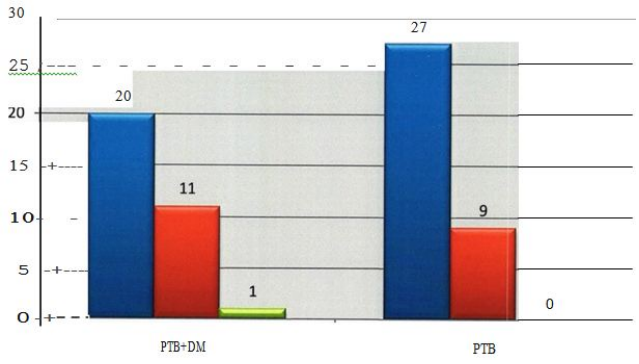

Figure 6: Alcohol intake status.

DISCUSSION

In the present study of age and gender distribution the patients belonging to PTB - DM group, the mean age is 57. 47 years with majority belonging to 41-60 years age group (78.13%) ,followed by 61 -80 years age group (21 . 88%). In PTB group, the mean age is 39. 81 years with majority belonging to 21 -40 years age group (47.22%) foll owed by 41 - 60 years age group (38.89 %). The mean age is more in P TB -DM group compared to the PTB group by 31 % with a mean difference of 1 7.66 years. The number of n" Ie patients are more than the females in both the groups. In P TB-DM males being (71 .88%) followed by females (28.1 3%) and in PTB group also majority belonged to male gender (58.33%) followed by female gender (41.67 %). In a previous study it is shown that the PTB- DM patients were on average older than non- DM TB patients. One study reported that majority of cases of PTB-DM belong to the age group of 45 and above 92. Like our study, studies have also shown that tuberculosis is higher in males. In the study it was reported that 62.9% were males and 37.1 % were females. Others also in their study observed that male population outnumbered the females 93 similar to our study. The high incidence of disease in males is possibly due to the fact that both tuberculosis and diabetes are more common in males. Smoking and alcohol consumption among them. Smoking and alcohol consumption may be a contributing factor in developing tuberculosis in these patients.

Symptoms of present illness

The common respiratory complaints in PTB-DM were fever (96 A) cough (93. 75%), expectoration (90.63), anorexia (90.63),weight IDSS (87.50%), dypnoea (50%). Hemoptysis (43.75%) and others including giddiness, vomiting etc. (3.13%). The PTB patients presented with cough (94.44%), expectoration (83.33%), fever (72.22%), weight loss (58.33%), inorexia (38.89%), hemoptysis (l3.89), dyspnoea (2.78%), chest pain (2.78%). Although findings were based upon fieelf report of symptoms. Some symptoms of DM and TB: weight loss and fatigue is continent to both. A few studies have shown that the clinical characteristics of TB do not differ among diabetic and non-diabetic patients. As with a typica1 radiographic presentation, a typical presenting signs and symptoms amongst this group of co morbid individuals and the conflicting results between various studies may be due to the control status of DM. There seems to be relatively few studies that looked at the symptoms of co- infected DM and TB patients and with sparse data and contradictory findings further research upon whether TB symptoms a signs differ amongst those with and without DM is needed .

By conventional criteria the association between the study groups and sputum smear status is cons ide red to be statistically significant since p<0.05. In patients belonging to PTB-DM group, majority belonged to 2+ sputum smear status (n=l9, 59.38%) followed by 3+ sputum smear status. In PTB group, majority belonged to 1+sputum smear status (n=l 9, 52.78%) followed by

scanty sputum smear status (n=l 1,30.56%). The incidence of 3+ sputum smear status is more in PTB-DM group compared to the PTB group by 93% with a percentage difference of 34.72 points which is statistically significant s the p value is <0.0001 as per fishers exact test indicating a true statistical difference between study groups.

By conventional criteria the association between the study groups and location of lesion in chest x-ray status is considered to be statistically significant since $p < 0.05$. In patients belonging to PTB-DM group, majority have lower lobe lesions in x-ray chest (n=31) followed by middle lobe lesions (n=33). In PTB group, majority have upper lobe lesions in chest x-ray (n=40) followed by middle lobe (n=12). The incidence of lower lobe lesions in x-ray chest is more in PTB-DM group compared to the PTB group by 89% with a percentage difference of 66.67 points group which is statistically significant as the p value is <0.0001 as per fishers exact test indicating a true statistical difference between study groups.

By conventional criteria the association between the study groups and grade of lesion in chest x-ray status 1s considered to be statistically significant since p<0.05. In patients belonging to PTB-DM group, majority had advanced grade lesions in x-ray chest (n=l 8, 56.25) followed by far advanced grade lesions (n=33, 21.88). In PTB group, majority had minimal grade lesions in x-ray chest (n=l3, 36.11) followed by moderate grade lesions (n=l 1, 30.56). The incidence of advanced and far advanced grade lesions in x-ray chest is more in PTB+DM group compared to the PTB group by 57% with a percentage difference of 44. 79 points. The increased incidence of advanced and far advanced grade lesions in x-ray chest in PTB-DM group compared to the PTB group is statistically significant as the p value is 0.0016 as per fisher's exact test indicating a true statistical difference between study groups [9-30].

CONCLUSION

The severity of tuberculosis in terms of, grade of radiological lesions, sputum mycobacterial load was compared between TB patients and TB-DM patients. All the patients in the study were given the same treatment consisting of a standard regimen of daily rifampicin, isoniazid, pyrazinamide, and ethambutol for 2 months, the Intensive phase(IP) and rifampicin and isoniazid for another 4 months ,the continuation phase(CP). Patients were then followed biweekly during the intensive phase and monthly thereafter. History, physical examination, FBS and PPBS and microscopic examination of sputum samples will be repeated at the end of 2, 3, 5 and end of treatment. The treatment response in terms of, sputum conversion at the end of 2, 3, 5 months and the end of treatment were compared between patients with patients with TB and TB-DM.

FUNDING

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ETHICAL APPROVAL

The study was approved by the Institutional Ethics Committee.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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