STUDY OF ASSOCIATION OF PULMONARY TUBERCULOSIS AND DIABETES MELLITUS IN A TERTIARY CARE CENTRE

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ABSTRACT

BACKGROUND
Tuberculosis continues to be one of the most prevalent infection in the world despite all efforts to eliminate it. Patients with diabetes are more susceptible to infections as hyperglycaemia decreases the ability of many types of immune cells to function properly which leads to infections in these patients. In a developing nation like India, the growing burden of diabetes is contributing to the sustained high levels of tuberculosis in the community.

MATERIALS AND METHODS
The present study was conducted in the inpatient wards of department of General Medicine, S. Nijalingappa Medical College and Hanagal Shri Kumareshwar Hospital and Research Centre, Bagalkot, Karnataka. From December 1st 2016 to June 30th 2018. 85 subjects who were admitted and had given informed consent, with history of diabetes and were on treatment & who had signs and symptoms of tuberculosis were studied. 59 patients (69%) were male and 26 patients (31%) were females with male to female ratio was 2.26:1

RESULTS
The mean age of patients was 49.09 years. Also, we found that majority in this study 38 (44.70%), were in the age group of 41-60 years. In our study of 85 participants, 17 patients (20%) were found to have pulmonary tuberculosis; in that 15 patients (88%) had Type 2 DM & 2 patients (12%) had Type 1 DM among whom male patients 15 (17.64%) had a higher incidence than female patients 2 (2.35%). In this study, we found that among diabetics with pulmonary tuberculosis, most were in the age group of 30-40 (35.29%) years, in whom the duration of DM was more in 10 patients (58.82%) with a time period between 5-10 years.

CONCLUSION
As evidenced in our study, age is no bar for patients with diabetes to develop pulmonary tuberculosis. So, all patients with diabetes specially with type 2 DM, with history for more than 6.5 year and with Hba1c levels of more than 8.5% should be screened for pulmonary tuberculosis on a routine basis.

KEYWORDS
Pulmonary Tuberculosis, Diabetes Mellitus.

department of General Medicine between December 1st 2016 to June 30th 2018.

**Inclusion Criteria**
Patients above 16 years who were previously diagnosed as diabetes and were on treatment & who had signs and symptoms of tuberculosis were included.

**Exclusion Criteria**
Patients aged less than 16 years. Newly diagnosed patients of DM, patients on immuno-suppressive drug/ steroids, were excluded from the study.

**Investigations Used in The Present Study**
- Random blood sugar.
- HbA1c.
- Sputum AFB.
- Chest x-ray.

All the tests were measured by standard protocols.

**Method of Collection of Data**
Pulmonary tuberculosis was diagnosed by detailed history, sputum examination for acid fast bacilli, chest radiography.

Known diabetes and who were on treatment had undergone through routine diabetic check up with RBS & HbA1C. Fasting blood glucose > 126 mg/dl and HbA1C > 6.5% were considered.

All patients who fulfill the above criteria were included in the study.

**Statistical Analysis**
The collected data were entered into an excel sheet. The data was analysed and expressed as percentages (%).

**RESULTS**
A total of 85 patients were included in this study. The mean age of patients were 49.09 years. Also, we found that majority in this study 38 (44.70%) were in the age group of 41 – 60 years. All the details of age distribution of patients in the study are summarized in Table 2. In this study 59 patients (69%) were male and 26 patients (31%) were females (Figure 1) with male to female ratio was 2.26:1. In this study 74 patients (87.5%) had Type 2 DM & 11 patients (12.94%) had Type 1 DM (Figure 2). In this study we found that majority of patients 45 (52.94%) had duration of DM for 6-10 yrs. In our study of 85 participants 17 patients (20%) were found to have pulmonary tuberculosis in that 15 patients (88%) had Type 2 DM & 2 patients (12%) had Type 1 DM among whom male patients 15 (17.64%) had a higher incidence than female patients 2 (2.35%) (Figure 3). In this study we found that among diabetes with pulmonary tuberculosis most were in the age group of 30-40 (35.29%) years (Table 10), in whom the duration of DM was more in 10 patients (58.82%) with a time period between 5-10 years.

<table>
<thead>
<tr>
<th>Age</th>
<th>Frequency (N)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 20 Years</td>
<td>2</td>
<td>2.35%</td>
</tr>
<tr>
<td>21 - 40 Years</td>
<td>15</td>
<td>17.64%</td>
</tr>
<tr>
<td>41 - 60 Years</td>
<td>38</td>
<td>44.70%</td>
</tr>
<tr>
<td>61 - 80 Years</td>
<td>25</td>
<td>29.41%</td>
</tr>
<tr>
<td>&gt; 80 Years</td>
<td>5</td>
<td>5.88%</td>
</tr>
</tbody>
</table>

Table 2. Age Wise Distribution Among Study Participants (n=85)

Mean Age: 49.09 years

<table>
<thead>
<tr>
<th>Type</th>
<th>Frequency (N)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 1</td>
<td>11</td>
<td>12.94%</td>
</tr>
<tr>
<td>Type 2</td>
<td>74</td>
<td>87.05%</td>
</tr>
</tbody>
</table>

Table 3. Diabetes Mellitus (DM) Distribution Among Study Participants (n=85)

As shown in table, 52.94% of the patients had a duration of diabetes between 6-10 years and 28.23% of the patients had a duration of diabetes between 2-5 yrs. and in 17.64% of the patients, Duration of the diabetes above 10 yr. 1.17% of the patients had diabetes less than 1 yr.
As shown in table 5, the random blood sugar values showed a definite correlation with Pulmonary tuberculosis. 7% of the patients had random blood sugar values between 151 to 200 mg/dl and 76.7% had values between 201 - 300 mg/dl and 14% of the patients had values above 300 mg/dl.

<table>
<thead>
<tr>
<th>RBS (mg/dl)</th>
<th>Frequency (n)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 126</td>
<td>0</td>
<td>0%</td>
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<tr>
<td>126-150</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>151-200</td>
<td>6</td>
<td>7.05%</td>
</tr>
<tr>
<td>201-300</td>
<td>65</td>
<td>76.47%</td>
</tr>
<tr>
<td>&gt;300</td>
<td>14</td>
<td>16.47%</td>
</tr>
</tbody>
</table>

Table 5. RBS Distribution Among Study Participants (n=85)

As shown in table 6, 52.94% of the patients had HbA1c values between 7%-9%, 35.5% had values between 9%-12% and 4.70% of the patients had values above 12%.

As shown in table 6, among PTB patients 64.70% had HbA1c values between 7%-9%, 23.52% had values between 9%-12%.

<table>
<thead>
<tr>
<th>HbA1c</th>
<th>Frequency (n)</th>
<th>Percentage (%)</th>
<th>In PTB (n=17) frequency</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 7%</td>
<td>1</td>
<td>1.71%</td>
<td>1</td>
<td>5.88%</td>
</tr>
<tr>
<td>7%-9%</td>
<td>45</td>
<td>52.94%</td>
<td>11</td>
<td>64.70%</td>
</tr>
<tr>
<td>9%-12%</td>
<td>35</td>
<td>41.17%</td>
<td>4</td>
<td>23.52%</td>
</tr>
<tr>
<td>&gt;12%</td>
<td>4</td>
<td>4.70%</td>
<td>1</td>
<td>5.88%</td>
</tr>
<tr>
<td>Mean</td>
<td>21.5</td>
<td>47.22%</td>
<td>4.25</td>
<td>38.63%</td>
</tr>
</tbody>
</table>

Table 6. HbA1c Distribution Among Study Participants (n=85) & HbA1c Distribution Among Pulmonary TB Patients

DISCUSSION
Despite all the efforts by health organizations, TB is one of the most prevalent diseases and is thought to be infecting one third of the world’s populations.4 Tuberculosis (TB) contributes to co-morbidity in diabetic patients. Studies have shown that most of the TB infections in diabetics go unnoticed as many of the symptoms such as lethargy, weight loss, anorexia are shared by both these conditions.5 The pathophysiology behind is higher glycaemic indices and poor control leads to low immunity which makes diabetic patients more susceptible to infections including TB. In a systematic review by Christie et al., prevalence of TB among Diabetics was found significantly high and authors confirmed the idea that DM increase risk for TB.6
In our study the total number of males were 59 (69%) and females were 26 (31%) the male to female ratio was 2.26:1. Patel JC showed a similar ratio of male: female. In the 179 cases he studied, 76% were males and 24% were females. Morris and others also in their study observed that male population outnumbered the female. In our study of 85 participants 17 patients (20%) were found to have pulmonary tuberculosis in that 15 patients (88%) had Type 2 DM & 2 patients (12%) had Type 1DM among whom male patients 15 (17.64%) had a higher incidence than female patients 2 (2.35%) the high incidence of disease in males is possibly due to the fact that both tuberculosis and diabetes are more common in males. In the present study, coexisting with diabetes and pulmonary tuberculosis most were in the age group of 30-40(35.29%) years. In a study by Qayyum et al from Pakistan, the highest prevalence of TB was found maximum in 4th and 5th decade. In another study from Australia, authors found that age of the patients did not modify risk of TB among diabetics. Similarly in our study, age was not found increasing risk of TB among patients with DM. In the present study 17 patient’s with TB had HBA1C levels between 7%-13.5% with a mean of 8.6%. Another recent study, that recruited 4,690 elderly diabetic patients in Hong Kong, showed that the patients with greater HbA1c value (>7%) had a hazard risk of active TB that was 3 times increased compared with those who had HbA1c <7% (HR 3.11; 95% CI 1.63–5.92, p <0.01). Existing evidence based on data from 15 included studies with 23,068 study participants revealed a 4.7% point prevalence of TB among diabetic patients in these countries. Poor DM control (as indicated by high HbA1c level) may be associated with differences in the physiological/pathological functions that perhaps boost progression to active TB disease in these patients. This finding is higher as compared to a previous systematic review by Jeon. et al.In a study on 4690 elderly patients with diabetes in Hong Kong, patients with haemoglobin A1c greater than 7% were at risk of active TB three times more than those with haemoglobin A1c of less than 7%. These data suggest that poor glycaemic control is a risk factor for tuberculosis. In this study we found that majority of patients 45 (52.94%) had duration of DM for 5-10 years with mean age of 6.5 years of diabetes history. In our study, 15 patients with active TB had type II diabetes and 2 patients had type 2 DM, while in a study in Tanzania TB was accompanied by type I diabetes.

**Limitations**
This being a hospital based study, it involved only a small sample size and subjects were selected by purposive sampling. The study lacks generalizability; hence needs to be carried out in larger samples.

**CONCLUSION**
As evidenced in our study, age is no bar for patients with diabetes to develop pulmonary tuberculosis. So, all patients with diabetes specially with type 2 DM, with history for more than 6.5 years and with HbA1c levels of more than 8.5% should be screened for pulmonary tuberculosis on a routine basis. A highly effective treatment exists in contrast to many other serious health conditions. Most deaths and serious consequences due to pulmonary tuberculosis are entirely preventable by making safe and effective initiation of ATT which is more widely available and accessible.

**REFERENCES**


