RESEARCH ARTICLE

"A COMPARATIVE STUDY OF SEVERITY OFPULMONARY TUBERCULOSIS AMONG DIBETICS AND NON DIBETICS PATIENTS IN TERTIARY CARE HOSPITAL"

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Manuscript Info

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Abstract

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Aim: To assess the clinical and radiological profile of pulmonary tuberculosis patientswith and without diabetics in order to understand the various presenting modalities, etiological pattern, severity of TB and clinical-radiological connection of the study population.

Design: Comparative cross-sectional study.

Materials & Methods: This is a hospital based cross sectional study conducted at a tertiary care hospital. We were enrolled total of 100 patients with pulmonary tuberculosis and screen them for diabetes militants. To obtain data, a predesigned and pretested questionnaire was used. A clinico-radiological profile of pulmonary tuberculosis between with and without diabetes patients were compared.

Results: We recruited 100 pulmonary tuberculosis patients among them 32% werediabetes and 68% without diabetes.The most common clinical presentation among both with and without diabetes mellitus group was expectoration, it was slightly more common in non-diabetes group (84%) as compared todiabetes (79%). This followed by evening rise in fever which was slightly more common in non-diabetes group (78%) as compared diabetes group (74%).The most common radiological presentation among both with and without diabetes mellitus group was Infiltrations, however, it was more common in diabetes group (90.6%) as compared to non-diabetes group (70.6%). This followed by cavitary which was again more common in diabetesgroup (78.1%) as compared non-diabetesgroup (50%).Most of non-diabetic patients were falling into1+ and 2+ category. In both sample the severity of the disease 3+ was more in diabetes patients than non- diabetes.

Conclusion: Diabetic patients were more likely to get a serious

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pulmonary infection. More over 40 years of age has more chance of this twin morbidity. Detection and treatment of DM among TBpatients may have a beneficial impact on TB control.

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Introduction:-

Diabetes mellitus is a massively prevalent chronic metabolic disorders that is spreading at an alarming rate around the world. Diabetes mellitus is becoming more common in India, with an estimated 124 million people affected by 2030. India has the highest TB burden, accounting for 28% of global incidence in 2016. DM and TB have been linked in a bidirectional trend since the early 20th century [1]. Tuberculosis (TB), an infectious illness, is one of the leading causes of death and morbidity worldwide.The risk of developing active TB is three-fold higher in those patients having Diabetes Mellitus (DM) in comparison to nondiabetic patients [2]. Diabetes can have an impact on the clinical presentation and consequences of tuberculosis, and vice versa**.** In an underdeveloped and lack of resources country like India, a continuing increase in diabetes prevalence has exacerbated the reality of tuberculosis. This comorbidity has been a major source of concern for treating physicians.

The COVID-19 pandemic has halted decades of progress made in the fight to eradicate tuberculosis (TB). The danger of TB transmission has grown as a result of quarantines and stay-at-home policies, particularly for family members. Within the next five years, an increase of 5-15% in tuberculosis incidence and mortality is anticipated. This results in hundreds of thousands more TB deaths worldwide [4,5]. Understanding the dynamics of the rising tuberculosis and diabetes epidemics is more important than ever. A greater knowledge will result in earlier diagnosis, treatment, and prevention of the complications. The broad spectrum of DM and TB is daunting. Because of this, Patients are frequently subjected to unnecessary, intrusive, and expensive investigations for its evaluation. Therefore, understanding the disease spectrum associated with to the Indian population will be useful in the future. The clinical and radiological profile of diabetes mellitus and tuberculosis are highly needed for adequate patient assessment and therapy since limited research have been conducted in our settings.

Therefore, this study was done to find out the clinical and radiological profile of pulmonary tuberculosis anddiabetes mellitus in order to understand the various presenting modalities, etiological pattern and clinical-radiological connection of the study population.Also, we were estimated the burden of DM among PTB patients who attending the tertiary care hospital.

Materials & Methods:-

This is a cross sectional hospital-based study conducted on 100patients diagnosed with pulmonary tuberculosis(with or withoutdiabetic) attending the department of respiratory medicine and general medicine of a tertiary care hospital in Chhattisgarh during the period of May 2022 and April 2023.

The data was collected using structure questionnaire to elicit demography and clinical variableswhich contained history of DM in all patients who are diagnosed with pulmonary tuberculosis. The informed consent was taken before enrolling patients in study. The ethical approval was taken from institutional ethical committee before conduction the study.

The patient's demographic information, clinical characteristics, chest X-ray findings, sputum for Acid Fast Bacilli (AFB), HIV status, HbA1c, fasting blood sugar, postprandial blood sugar levels, history of comorbidities, pharmacological history, and any significant events on past were all taken into consideration throughout the evaluation.

A chest x-ray and sputum examination for Acid Fast Bacilli (AFB) using Ziehl-Neelsen (ZN) stainwere performed on all patients with a history and clinical profile suggestive of pulmonary tuberculosis at the designated microbiology centre in our hospital.

For retreatment cases, culture and drug susceptibility tests were performed to rule out drug-resistant tuberculosis. Based on the findings, sputum positive and sputum negative radiologically positive pulmonary tuberculosis cases

were included in the study. All of these patients were also tested for HIV status using the ELISA (Enzyme-Linked Immune-Sorbent Assay) test.

Blood samples from every patient with pulmonary tuberculosis were taken in order to determine their HbA1c, random blood sugars, and fasting blood sugars.

Inclusion Criteria:
1. Patient having pulmonary tuberculosis with and without Diabetes Mellitus with age above 18.
2. Patients who willing to give written informed consent.

Exclusion Criteria:
1. Extra pulmonary tuberculosis.
2. Patients on steroids, thiazide diuretics.
3. Co-morbid conditions like Chronic Kidney Disease, Malignancies, HIV and any other comorbidities.
4. Patients not willing to participate.
5. Pregnant women and women in postpartum period less than 6 weeks of delivery.
6. Multi drug resistance Tuberculosis patients.

Statistical Analysis:
The sample size of 100 patients was estimated based on prevalence of diabetic's militants in pulmonary tuberculosis patients at 95% assurance level and 8% allowable error in estimate.The continuous and categorical variables were expressed as mean $\pm$ SD and frequency count with percentages, respectively.To determine statistical significance, the Chi square test was utilised, which was illustrated using appropriate diagrams such as a stacked bar diagram.P value< 0.05 was considered statistically significant. R statistical package (R-4.2.3) was used for statistical analysis.

Results:-
A total of 100 patients of pulmonary Tuberculosis were included in the study, among them 32% of patients were diabetics. The mean age of participants was 47.3 ± 8.1 years with the range from 18 to 75 years.

Table 1:- Age Wise Distribution of Pulmonary Tuberculosis.

| Age (in Years) | Pulmonary Tuberculosis | | | | Total | |
| | With DM | | Without DM | | | |
	Number of cases (n)	Percentage (%)	Number of cases (n)	Percentage (%)	Number of cases (n)	Percentage (%)
18-20	0	0.00	1	1.47	1	1.00
21-30	0	0.00	13	19.12	13	13.00
31-40	5	15.63	27	39.71	32	32.00
41-50	17	53.13	13	19.12	30	30.00
51-60	8	25.00	6	8.82	14	14.00
61-75	2	6.25	8	11.76	10	10.00
Total	32	100.00	68	100.00	100	100.00
DM: Diabetes Mellitus						

Age Wise Distribution of Pulmonary Tuberculosis (Table 1):
It was found that the tuberculosis occurs in all age groups, but highest number of cases of TB with DM (53.13%) were observed during 5th decade of life while highest number of cases of TB without DM(32%) were observed during 4th decade of life.

Table 2:- Gender Wise Distribution of Pulmonary Tuberculosis.

| Gender | Pulmonary Tuberculosis | | Total |
	Number of cases	Percentage	

Male	With DM	18	(18%)	56 (56%)
	Without DM	38	(38%)	
Female	With DM	14	(14%)	44 (44%)
	Without DM	30	(30%)	

Gender Wise Distribution of Pulmonary Tuberculosis with DM (Table 2):
There were 56% of male and 44% of female in this study. 18% and 14% of male and female were diabetics respectively, while 38% and 30% of male and female were non diabetics respectively.

Table 3:- Family history of DM and PTB.

History		With DM	Without DM
History of DM	Present	15(47%)	18 (26%)
	Absent	17(53%)	50 (74%)
	P-value = 0.043		
History of PTB	Present	9 (29%)	15 (22%)
	Absent	23 (71%)	53 (78%)
	P-value = 0.508		
DM: Diabetes Mellitus,PTB: Pulmonary Tuberculosis			

**Family history of DM and PTB (Table 3):**
47% of DM patients had family history and 26% of Patients without DM also had family history of DM. 29% of DM patients had family history PTB and 22% of Patients without DM also had family history of PTB. There was statistically significant association between DM and family history of DM (p=0.043) while the association between DM and family history of PTB was not statistically significant (p=0.508)

Table 4:- Addition present in participants.

Addiction		With DM	Without DM
Alcohol	Yes	21 (67%)	31 (45%)
	No	11 (33%)	37 (55%)
Smoking	Yes	13 (41%)	23 (34%)
	No	19 (59%)	45 (66%)
Pan Chewing	Yes	7 (21%)	12 (17%)
	No	25 (79%)	56 (83%)
DM: Diabetes Mellitus			

Addition present in participants(Table 4):
33%, 41% and 21% patients with DM had addiction of alcohol, smoking and pan chewing respectively while it was observed that 45%, 34% and 17% of patients without DM had addiction of alcohol, smoking and pan chewing respectively.

Figure 1: Clinical Presentation Pulmonary Tuberculosis
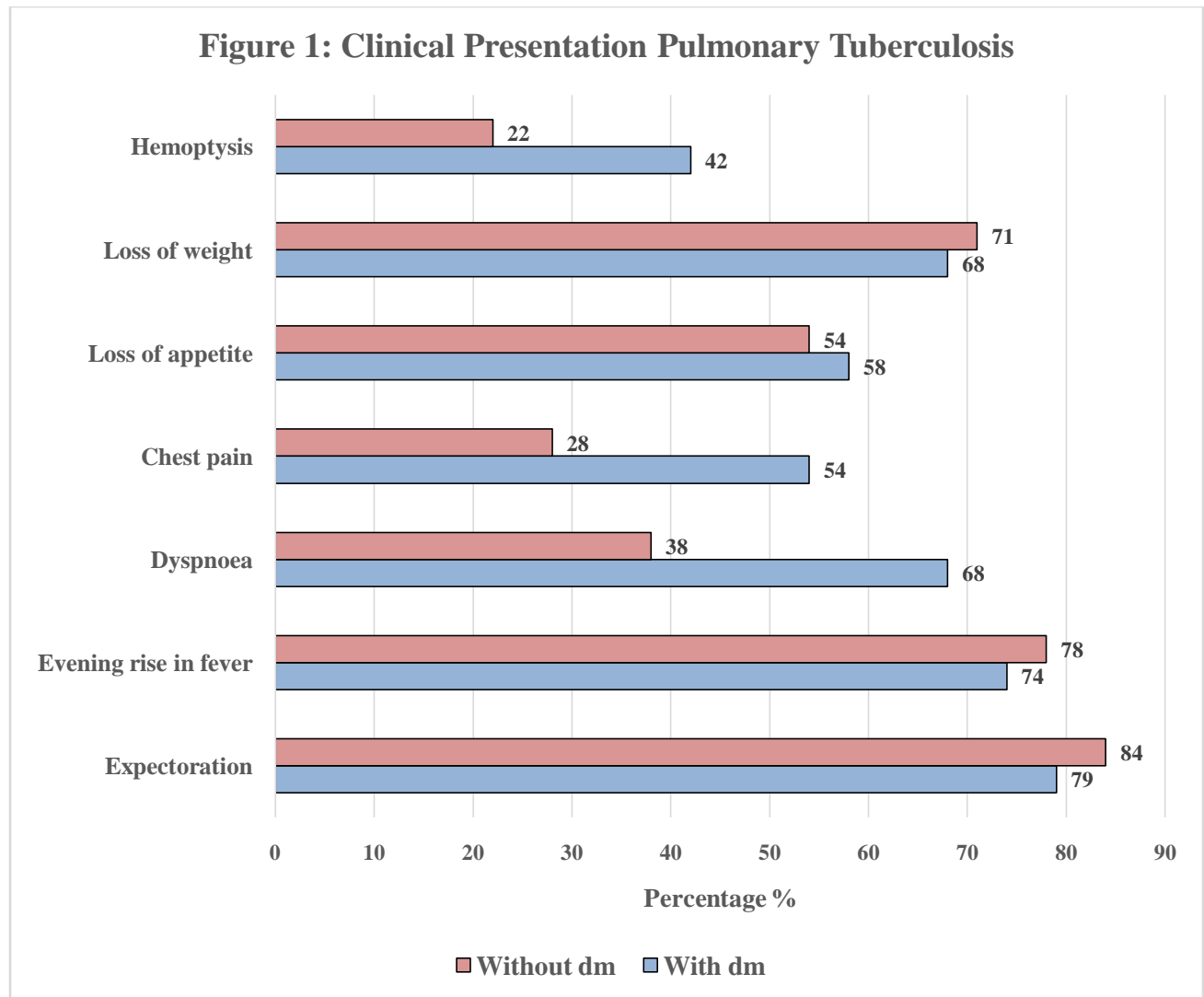
Clinical Presentation Pulmonary Tuberculosis (Figure 1):

The most common clinical presentation among both DM and without DM group wasexpectoration, it was slightly more common in without DM group (84%) as compared to patients DM (79%). This followed byevening rise in fever which was slightly morecommon inwithout DM group (78%) as compared withDM group (74%). The haemoptysis wasleast common in both groups while loss of weight and loss of appetite were almost equal in both groups.

Table 5:- Radiological Presentation of Tuberculosis.

Presentation	With DM		Without DM	
	Number of cases (n)	Percentage (%)	Number of cases (n)	Percentage (%)
Cavitary	25	78.1%	34	50.0%
Infiltrations	29	90.6%	48	70.6%
Consolidation	7	21.9%	17	25.0%
Pleural effusion	1	3.1%	11	16.2%
Lung abscess	3	9.4%	1	1.5%
Bronchiectasis	2	6.3%	3	4.4%
Pneumothorax	1	3.1%	5	7.4%
DM: Diabetes Mellitus				

Radiological Presentation of Tuberculosis (Table 5):
The most common radiological presentation among both DM and without DM group was Infiltrations, however, it was more common in DM group (90.6%) as compared to patients without DM (70.6%). This followed by cavitary which was again more common in DM group (78.1%) as compared without DM group (50%).The pleural effusion and pneumothorax were least common in DM group while lung abscess was least common in without DM group.

Table 6:- Sputum for AFB (Sample A).

Grade	With DM		Without DM	
	Number of cases (n)	Percentage (%)	Number of cases (n)	Percentage (%)
Scanty	1	3.1%	6	8.8%
1+	1	3.1%	22	32.4%
2+	12	37.5%	33	48.5%
3+	18	56.3%	7	10.3%
DM: Diabetes Mellitus, AFB: Acid Fast Bacillus				

Table 7:- Sputum for AFB (Sample B).

Grade	With DM		Without DM	
	Number of cases (n)	Percentage (%)	Number of cases (n)	Percentage (%)
Scanty	2	6.3%	3	4.4%
1+	11	34.4%	16	23.5%
2+	5	15.6%	32	47.1%
3+	14	43.8%	17	25.0%
DM: Diabetes Mellitus, AFB: Acid Fast Bacillus				

Sputum for AFB (Table 6 &7):
The two-sputum sample (A& B) were studied for detection of AFB and it was found that the severity of the disease based on sputum microscopy is more in patients with DM compared to non-diabetic'spatients. Most of non-diabetic patients were falling into1+ and 2+ category. In both sample the severity of the disease 3+ was more in DM patients than non- diabetes.

Discussion:-
In this study, total of 100 patients with PTB were included, among them 32 (32%) were with DM and 68(68%) were without DM. The mean age of PTB patients was 47.3 ± 8.1years withrange vary from 18 to 75 years and the highest number of cases of TB with DM (53.13%) were observed during 5th decade of life while highest number of cases of TB without DM (32%) were observed during 4th decade of life which is similar to study conducted byNarayan mood et al[6]. In a study conducted by Kousmi et al observed that TB with DM most common in 6th decade of life[7]. In this study we found that tuberculosis with diabetes and without DM frequently occurred in males 18% and 38% respectively as compared to females which are 14% and 30% respectively which is similar to study conducted by Narayan Mood et al [6].

In present study, we found that the family history of diabetes militants was present 47% individuals among DM group while it was only 26% in without DM group. The person history of PTB was observed 29% in DM group while it was 22% in without DM group which is similar with findings in study conducted by Viswanathan V et al [10].

According to this study, alcoholics (67%), smokers (41%), and pan chewers (21%), had a higher risk of tuberculosis than non-alcoholics (45%), non-smokers (34%), and non-pan chewers (17%). According to a study conducted by Narayan Mood et al, diabetes is substantially connected with older age, family history of diabetes, use of alcohol, smoking, and sputum positive, and the risk of tuberculosis is higher with an above risk factor. This study is comparable to the current study.

In this study, the most common symptom in patients with or without DM wasexpectoration

Followed by evening rise in fever. loss of appetite and loss of weight is almost equal in both groups and least common symptom was haemoptysis which is similar to study conducted by Vishwakarma P et al and Kouismi H, et al[7,8].

In this study,it was found that the infiltration is more common in DM group (90.6%) as compared to patients without DM (70.6%). This followed by cavitary which was again more common in DM group (78.1%) as compared without DM group (50%). The pleural effusion and pneumothorax were least common in DM group while lung abscess was least common in without DM group which is similar to finding in study conducted by Narayan Mood et at [6]

In this study, we examined two sputum samples (A and B) for the detection of AFB and discovered that the severity of the disease is greater in patients with DM than in non-diabetic individuals based on sputum microscopy which is comparable withstudy conducted in Korea which they found the risk of TB increased progressively with increasing diabetes severity. [11,12]In this study, the majority of non-diabetic patients were in the 1+ and 2+ categories. In both samples, DM patients had more severe disease (3+) than non-diabetics. These results were similar to findings of study conducted by Anand CB et al [9] Finally this study reached to conclusion that diabetes had a major impact on tuberculosis care and management in diabetic individuals.

Limitations of the Study:
1. This study was conducted over a limited period of time with small sample size at only a tertiary care hospital.
2. The study has been primarily cross sectional in nature.
3. A few habit facts, such as addiction of smoking, pan chewing and alcohol consumption are self-reported and hence prone to social desirability biases.
4. There will be no long-term follow-up.

Conclusion:-
Diabetic patients were more likely to get a serious pulmonary infection. More over 40 years of age greatly raises the chance of this twin morbidity.Diabetes is substantially connected with older age, family history of diabetes, use of alcohol, smoking, and sputum positive, and the risk of tuberculosis is higher with an above risk factor. Hence the detection and treatment of DM among TB patients may have a beneficial impact on TB control.

Conflicts of Interest
Regarding the research, writing, and/or publication of this article, the authors stated that they had no any potential conflicts of interest.

Ethical approval
The study was approved by the Institutional Ethics Committee.

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