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Dr. P Chudamani
Assistant Professor,
Department of General
Medicine, NRI Medical College
& Hospital Chinakakani,
Guntur, Andhra Pradesh,
India

Comparative study of pulmonary tuberculosis in diabetics and non-diabetics

Dr. P Chudamani

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Abstract

Background: The frequent association of diabetes mellitus and pulmonary tuberculosis has been recognized for many years now. It has also been realized that the diabetic, particularly uncontrolled, is more susceptible to the development of pulmonary tuberculosis than his non-diabetic counterpart.

Objectives: Objective of our study is to compare and analyze pulmonary tuberculosis in patients with diabetes mellitus and in those who do not have.

Methods: Clinical profile and chest radiograph results of 40 diabetics with pulmonary tuberculosis and 40 cases of pulmonary tuberculosis without diabetes were studied, compared and analyzed.

Results: Male preponderance of the disease was noted in both test and control group and peak incidence of the disease was noted in the age group of 50-59yrs in the test while in control group peak occurrence was in the age group 19-29. Weight loss was significantly high in test group when compared to control group. Majority of people in the test and control had anemia. Majority of the patients in our study had poor glucose control. Cavitory lesion was most common lesion found in both test and control group followed by fibrosis. Tuberculosis tends to occur predominantly at the lower lung fields in patients with diabetes when compared to non-diabetics.

Interpretation and conclusion: Majority of patients in the test and control group presented to us with fever and cough. Weight loss was significantly high in test group when compared to control group. In most of the cases in our study diabetes mellitus was diagnosed before the development of tuberculosis. Majority of our patients had poorly controlled blood sugars, presenting complaints of the patients are not much altered by diabetes. Lower lobe involvement is more common in diabetes with tuberculosis. Early diagnosis and properly monitored regimen is the only time tested answer to this problem.

Keywords: diabetes mellitus; pulmonary tuberculosis

Introduction

Tuberculosis (TB) is now the world's foremost cause of deaths from a single infectious agent. More than 5.8 million new cases were reported to the World Health Organization (WHO) in 2009 with estimated 9.4 million new cases. In 2008 there were 1.7 million estimated deaths from TB. The economic impact of disease by way of direct and indirect costs of contact investigations, costs of TB screening and preventive therapy programs, costs of hospital and institutions infection control programs and costs to patients in lost income, is enormous. An increasing number of cases converting to multi drug resistant tuberculosis could escalate these costs dramatically ^[1].

The earliest evidence of tuberculosis (TB) in man and animals is provided by bone finds, mainly fragments of vertebrae, showing the gibbus typical of tuberculous Pott's disease. The oldest examples of spinal TB, in the form of fossil bones, date back to about 8000BC ^[2].

The common risk factors for tuberculosis include poor social circumstances, alcoholism, diabetes mellitus, immigrant population, no previous BCG vaccination and HIV infection ^[3].

The frequency of tuberculosis occurrence in patients of diabetes mellitus (DM) is reported to be 3-4 times than that in non-diabetics. Pulmonary complications of diabetes mellitus are not as well recognized as those involving the cardiovascular, renal, ophthalmologic and neurologic systems ^[4].

The risk of tubercular infection in diabetes is difficult to assess because of lack of prospective studies. Furthermore, the predisposition of diabetes patients to tubercular infection is not yet well documented. The determinants causing the illness will be discussed further in assessing the magnitude of the risk of tubercular infection in diabetes mellitus.

Corresponding Author:
Dr. P Chudamani
Assistant Professor,
Department of General
Medicine, NRI Medical College
& Hospital Chinakakani,
Guntur, Andhra Pradesh,
India

Objectives

To study, compare and analyze pulmonary tuberculosis in patients with diabetes mellitus and in those who do not have.

Methodology

Source of data

Patients diagnosed to have pulmonary tuberculosis and having diabetes mellitus and who are non-diabetic and admitted in NRI Medical College & Hospital, Chinakakani; during study period from September 2017 to August 2019 fulfilling the inclusion and exclusion criteria.

Method of collection of data

Data for the proposed study was collected in a pretested proforma which included various socioeconomic parameters like age, sex, occupation, religion, income, etc. 80 cases were selected on the basis of simple random sampling out of which 40 cases of pulmonary tuberculosis with diabetes mellitus form the test group and 40 cases with pulmonary tuberculosis without diabetes mellitus after fulfilling the inclusion and exclusion criteria form the control group in our study.

Inclusion criteria: Patients with pulmonary tuberculosis who are known diabetics and non-diabetics.

Exclusion criteria: Patients with HIV, Immuno suppression from malignancy, cytotoxic therapy, corticosteroid therapy and end stage renal disease.

The following investigations are done to assess the above study

1. Complete blood picture
2. Routine urine analysis
3. FBS, PPBS
4. Blood urea
5. Serum creatinine
6. Chest X-ray PA View
7. Sputum AFB
8. HIV antibodies detected by ELISA
9. Glycosylated hemoglobin
10. Pleural fluid analysis (if indicated)
11. Fine needle aspiration biopsy and / Biopsy of enlarged lymph nodes (if indicated)
12. CT Thorax (if indicated)

Statistical methods applied

Following statistical methods were applied in the present study.

- Chi-square test
- Odds ratio

Results

A clinical, biochemical, hematological and radiological evaluation of 40 cases of pulmonary tuberculosis with diabetes mellitus and 40 cases of pulmonary tuberculosis without diabetes was done.

Table 1: Distribution of the sample by groups and age groups

Age (in years)	Group		Total
	Test	Control	
19-29	2 5%	12 30%	14 17.5%
30-39	6 15%	5 12.5%	11 13.75%
40-49	8 20.0%	10 25%	18 22.5%
50-59	14 35%	6 15.0%	20 25%
60-69	6 15%	6 15%	12 15%
70+	4 10%	1 2.5%	5 6.25%
Total	40 100.0%	40 100.0%	80 100.0%

In the present study, the number of patients above the age of 40 in test group were 80% and peak incidence was in the age groups of 50-59 which was 35% and it was 20% in the age group 40-49 and 15% in 60-69 while in control group peak incidence was in the age group 19-29 which was 30%.

Table 2: Distribution of test and control according to sex

Sex	Group		Total
	Test	Control	
Female	14	5 12.5%	19 23.75%
Male	26	35 87.5%	61 76.25%
Total	40 100.0%	46 100.0%	80 100.0%

$P < 0.05$ Odds ratio 3.769

In the present study, the number of patients above the age of 40 in test group were 80% and peak incidence was in the age groups of 50-59 which was 35% and it was 20% in the age group 40-49 and 15% in 60-69 while in control group peak incidence was in the age group 19-29 which was 30%. In our study the total number of males in test group was 65% while females were and in controls males were still more in number compared to test i.e. 87.5% and females were only 12.5% P. value was found to be significant and odds ratio was 3.769.

Table 3: Duration of cough

Duration of cough	Group		Total
	Test	Control	
15d	15 37.5%	15 37.5%	30 37.5%
30d	9 22.5%	10 25%	19 23.75%
45d	3 7.5%	1 2.5%	4 5%
180d	10	12	22 27.5%
365	3 7.5%	1 2.5%	4 5%
365+	-	1 2.5%	1 1.25%
Total	40 100%	40 100%	80 100%

$P > .1$

In the present study, number of patients who were having cough of more 30 days duration was 62.5% in test group and also in the control group.

Table 4: Distribution of Fever in Test and Control Group

Fever	Group		Total
	Test	Control	
Present	36 90%	35 87.5%	71 88.75%
Absent	4 10%	5 12.5%	9 11.25%
Total	40 100%	40 100%	80 100%

$P > .05$ Odds ratio 1.285

90% in the test group had fever but the same in control group was almost same i.e. 87.5%. P value was found to be not significant.

Table 5: Distribution of Hemoptysis in Test and Control Group

Haemoptysis	Group		Total
	Test	Control	
Present	5 12.5%	3 7.5%	8 10%
Absent	35 87.5%	37 92.5%	72 90%
Total	40 100%	40 100%	80 100%

$P > .05$ Odds ratio 1.76

Haemoptysis was present in only 12.5% with diabetes and 7.5% without diabetes.

Table 6: Distribution of Breathlessness in Test and Control Group

Breathlessness	Group		Total
	Test	Control	
Present	9 22.5%	8 20%	17 21.25%
Absent	31 77.5%	32 80%	63 78.75%
Total	40 100%	40 100%	80 100%

$P > .05$ Odds ratio 1.16

22.5% presented to us with breathlessness in test group while the same in control was 20%. P value was $> .05$ odds ratio of 1.16.

Table 7: Distribution of Chest pain in Test and Control Group

Chest pain	Group		Total
	Test	Control	
Present	2 5%		2 2.5%
Absent	38 95%	40 100%	78 97.5%
Total	40 100%	40 100%	80 100%

$P > .1$

Those having chest pain in test group was 5% and none among the control group had chest pain.

Table 8: Distribution of weight loss in Test and Control Group

Weight Loss	Group		Total
	Test	Control	
Present	35 87.5%	15 37.5%	50 62.5%
Absent	5 12.5%	25 62.5%	30 37.5%
Total	40 100%	40 100%	80 100%

$P > .001$ Odds ratio 11.66

Weight loss was significantly high in test group when compared to control group and it was 87.5% in patients with diabetes and 37.5% in control. P value was found to be significant with odds ratio of 11.66.

Table 9: Distribution of Wheezing in Test and Control Group

Wheezing	Group		Total
	Test	Control	
Present	6 15%	14 35%	20 25%
Absent	34 85%	26 65%	60 75%
Total	40 100%	40 100%	80 100%

$P < .05$ odds ratio .3277

Patients presented with wheeze were more in control group i.e. 35% and in test it was 15%. This may be due to the fact that majority of control were smokers. Here also p was found to be significant i.e. $p < .05$ with odds ratio 0.3277.

Table 10: Past history of tuberculosis in Test and Control Group

Past history of tuberculosis	Group		Total
	Test	Control	
Present	22 55%	10 25%	32 40%
Absent	18 45%	30 75%	48 60%
Total	40 100%	40 100%	80 100%

$P < .01$ Odds ratio 3.66

55% of patients in test group had past history of tuberculosis and 25% of control had the same. P value was found to be significant with Odds ratio 3.66

Table 11: Family history of tuberculosis in Test and Control Group

Family history of Tuberculosis	Group		Total
	Test	Control	
Present	5 12.5%	3 7.5%	8 10%
Absent	35 87.5%	37 92.5%	72 90%
Total	40 100%	40 100%	80 100%

$P > .1$ Odds ratio 1.76

12.5% in the test group and 7.5% in the control group had family history of tuberculosis. P value was found to be not significant for the same odds ratio of 1.76.

Table 12: Past history of DM in Test and control Group

Past history of DM	Group		Total
	Test	Control	
Present	29 72.5%	-	29 36.25%
Absent	11 27.5%	40 100%	51 63.75%
Total	40 100%	40 100%	80 100%

$P < .001$

72.5% of patients had diabetes prior to hospital admission and 27.5% were detected to have diabetes in our hospital in test group.

Table 13: Duration of Diabetes

Duration of DM	Group		Total
	Test	Control	
NO DM	-	40 100%	40 50%
<1 Yr	16 40%	-	16 20%
1.01 – 5 Yr	14 35%	-	14 17.5%
5.01-10Yr	6 15%	-	6 7.5%
10+	4 10%	-	4 5%
Total	40 100%	40 100%	80 100%

In most of the cases in our study diabetes mellitus was diagnosed before the development of tuberculosis. 72.5% had diabetes Prior to the onset of tuberculosis 40% were detected to had diabetes less than one year and 1-5 Year Duration for the same in 35% while 15% of patients were in 5.01-10 year group and had diabetes more than ten years duration.

Table 14: Distribution of Smoking in Test and control Group

Past history of DM	Group		Total
	Test	Control	
Yes	20 50%	27 67.5%	47 58.75%
No	20 50%	13 32.5%	33 41.25%
Total	40 100%	40 100%	80 100%

$P > .1$ Odds ratio 0.48

20 out of 26 males in test group and 27 out of 35 males in control group were smokers in our study. That's 50% of test group and 67.5% of control were smokers. P value was found to be of no significance with odds ratio of 0.48 This may be due to the fact that cases were randomly selected and since both test and control both had tuberculosis and since the test group had diabetes too, they might have been counseled about the ill effects of smoking and most of them might had quit smoking.

Table 15: Distribution of Clubbing in Test and Control Group

Clubbing Group	Group		Total
	Test	Control	
Present	4 10%	3 7.5%	7 8.75%
Absent	36 90%	37 92.5%	73 91.25%
Total	40 100%	40 100%	80 100%

$P > .1$ Odds ratio 1.37

Clubbing was noted in 10% of the patients with diabetes and pulmonary tuberculosis and in those without diabetes was 7.5%. P value was found to be not significant for the same.

Table 16: Distribution of Lymphadenopathy in Test and Control Group

Lymphadenopathy group	Group		Total
	Test	Control	
Present	4 10%	6 15%	10 12.5%
Absent	36 90%	34 85%	70 87.5%
Total	40 100%	40 100%	80 100%

$P > .5$ Odds ratio 0.6296

10% in the test group and 15% in the control group had cervical lymph node enlargement.

Table 17: Distribution of Oral Candidiasis in Test and Control Group

Oral Candidiasis Group	Group		Total
	Test	Control	
Present	2 5%	-	2 2.5%
Absent	38 95%	40 100%	78 97.5%
Total	40 100%	40 100%	80 100%

$P > .1$

In present study 5% of the patient with diabetes and pulmonary tuberculosis had oral candidiasis and none among the control group had the same.

Table 18: Hemoglobin in Test and control Group

Hb Group	Group		Total
	Test	Control	
<7gm/dl	2 5%	1 2.5%	3 3.75%
7.01-10gm/dl	17 42.5%	21 52.5%	38 47.5%
10.01-12gm/dl	16 40%	13 32.5%	29 36.25%
12+	5 12.5%	5 12.5%	10 12.5%
Total	40 100%	40 100%	80 100%

$P > 0.5$

87.5% of patients belonging to test group had anemia and among them 5% had severe anemia (Hb<7gm/dl) and 40% had mild (Hb 10-12gm/dl) 42.5% (Hb<7-10gm/dl) had moderate anemia and anemia in control group was 87.5% and among them 2.5% had severe anemia, 52.5% had moderate anemia and 32.5% had mild anemia.

Table 19: Distribution of Total count and Lymphocyte Count in Test and Control Group.

		N	Mean
TC	Test Control	40	9518
		40	7117
L	Test Control	40	38.6
		40	41.2

The total white cell count in our study showed an average value of 9518 in test and 7117 in control group and lymphocytes were an average of 38.6% in test and 41.2% in control.

Table 20: Distribution of ESR in Test and Control Group.

ESR	Group		Total
	Test	Control	
<20	4 10%	7 17.5%	11 13.75%
20-50	10 25%	2 5%	12 15%
50.01-100	22 55%	28 70%	50 62.5%
100+	4 10%	3 7.5%	7 8.75%
Total	40 100%	40 100%	80 100%

P>.05

55% of patients in this study in test group showed an erythrocyte sedimentation rate between 51 to 100 and 25% had values between 20-50 mm/hr. Values above 100 were noted in 10% of patients. The same in control was 70% and 5% respectively and 7.5% has ESR above 100. Hence we conclude ESR was relatively higher in Control group than test.

Table 21: Distribution of FBS in Test Group.

FBS	Frequency	Percent
<100	2	5
101-126	2	5
>126	36	90
Total	40	100

The fasting blood sugar value of >126 was seen in 90% and only 10% had the same < 126mg %.

Table 22. Distributi0n of PPBs in Test group

FBS	Frequency	Percent
<140	2	5
141-200	18	45
200+	20	50
Total	40	100

PPBS only 5% had <140mg% and 45% had values between 140 and 200 and 50% had the same above 200mg%.

Table 23: Distribution of HbA1C in Test Group

HbA1C	Group		Total
	Test		
<7	9 22.5%		9 22.5%
>7	31 77.5%		31 77.5%
Total	40 100%		40 100%

Majority of patients in our study had poor glucose control. Only 22.5% had HbA1C<7 and 77.5% had the same>7.

Table 24: Distribution of Sputum Positivity in Test and Control Group

Sputum Group	Group		Total
	Test	Control	
Sputum Negative	13 32.5%	9 22.5%	22 27.5%
Sputum Positive	27 67.5%	31 77.5%	58 72.5%
Total	40 100%	40 100%	80 100%

P>.1 Odds ratio 1.658

Sputum AFB was demonstrated in 67.5% in test and 77.5% in control and sputum was negative for AFB in 32.5% of test and 22.5% of control and here P value was not significant.

Table 25: Analysis of Chest X-ray in Test and Control Group

X-ray	Group		Total
	Test	Control	
RU/L	9 22.5%	15 37.5%	24 30%
LU/L	6 15%	9 22.5%	15 18.75%
RL/L	2 5%	-	2 2.5%
LL/L	2 5%	1 2.5%	3 3.75%
B/L Apical	2 5%	14 35%	16 20%
B/L L/L	8 20%	-	8 10%
L Extensive	4 10%	-	4 5%
Rt Extensive	3 7.5%	-	3 3.75%
Rt mid Zone	2 5%	1 2.5%	3 3.75%
B/L Extensive	2 5%	-	2 2.5%
Total	40	40	80

Table 26: Distribution of upper and lower lobe involvement in test and control

Chest X-Ray	Group		Total
	Test	Control	
Upper Lobe	17 30.9%	38 69.09%	55
Lower Lobe	12 92.3%	1 7.69%	13

P<.05

Right-sided lung lesions were noted in 40% of the cases in test group and left sided lesions in 30% of the cases and 30% had bilateral lesion. Right sided lung lesions in 40% in control group and left sided lesions in 25% and 35% had bilateral lesion in the control group. Overall 30% in the test had lower lobe involvement and only 2.5% had lower lobe involvement in the control group. In total lower lobe involvement, 92.3% cases were from test group and 7.69% from control group. After excluding right, left and bilateral extensive involvement, comparison was done between test and control group based up on upper and lower lobe involvement as shown in the table and p value was found to be significant to conclude lower lobe involvement were more common in diabetics than non-diabetics.

Table 27: Chest X-ray in Test and Control Group

Chest X-Ray	Group		Total
	Test	Control	
Cavity	13 32.5%	20 50%	33 41.25%
Fibrosis	11 27.5%	13 32.5%	24 30%
Consolidation	7 17.5%	4 10%	11 13.75%
Pleural effusion	-	2 5%	2 2.5%
Hydro pneumothorax	1 2.5%	-	1 1.25%
Bronchiectasis	4 10%	1 2.5%	5 6.25%
Fibrocavity	4 10%	-	4 5%
Total	40 100%	40 100%	80 100%

Chest X-ray showed cavity lesions in 32.5% in test and 50% in cont.-oL fibrosis in 27.5% test and 32.5% in control. Other lesions noted are consolidation 17.5% in test and 10% control, pleural effusion 5% in control hydroneumothorax 2.5% in test, bronchiectasis in 10.0% in test and 2.5% in control group.

Table 28: Complications in Test Group

	Yes	No
Retinopathy	10 25%	30 75%
Nephropathy	9 22.5	31 77.5%
Neuropathy	6 15%	34 85%
Diabetic Ketoacidosis	3 7.5%	37 92.5%
Ischemic Heart Disease	3 7.5%	37 92.5%
Peripheral Vascular disease	3 7.5%	37 92.5%
Cerebro Vascular accident	-	-
Deep Vein thrombosis	-	-

Retinopathy was seen in 25% and nephropathy was seen 22.5% in of Test group, 15% had neuropathy, 7.5% presented to us with diabetic ketoacidosis and 7.5% Ischemic heart disease. 7.5% had peripheral vascular disease.

Table 29: Distribution in Test Group received Insulin/OHA

Insulin/OHA	Group		Total
	Test	Control	
NO		40 100%	40 50%
Insulin	27 67.5%		27 33.75%
Ins + OHA	13 32.5%		13 16.25%
Total	40 100%	40 100%	80 100%

P<.0001

67.5% of our patients were receiving insulin alone and 32.5% were treated with both insulin and oral hypoglycemic agents.

Discussion

Data for the proposed study was collected in a pretested proforma which include various parameters like age, sex, occupation, religion, income, etc. 80 cases were on the basis of simple random sampling out of which 40 consecutive cases tuberculosis with diabetes mellitus form the test group and 40 cases of pulmonary tuberculosis without diabetes mellitus after fulfilling the inclusion and exclusion criteria were the control group in our study.

In our study the total number of males in test group was 65% while females were 35% and in controls males were still more in number compared to test i.e. 87.5% and females were only 12.5%. P value was found to be significant and Odds ratio was 3.769.

Other studies have shown that, the prevalence as well as incidence of tuberculosis is higher among males than among females. Male sex and increasing age were significant risk factors for TB in both univariate and multivariate analyses [5]. A retrospective epidemiologic analysis of sex-specific tuberculosis incidence rates in San Francisco from 1991-1996 shown that in the study period, the male to female incidence rate ratio was 2.1 [6].

Patel JC showed a similar ratio of male to female. In the 179 cases he studied, 76% were males and 24% females [7].

Tuberculosis incidence among male diabetics was than that of female diabetics as reported by Kim SJ [8].

All the above studies showed an increased incidence of the disease in males as compared to females and our study also noted the same.

The high incidence of disease in males is possibly due to fact that both tuberculosis and diabetes are more common in males.

In the present study, the number of patients above the age of 40 in test group were 80% and peak incidence was in the age groups of 50-59 which was 35% and it was 20% in the age group 40-49 and 15% in 60-69 while in control group peak incidence was in the age group 19-29 which was 30%.

A study by Chaimowicz Z F on the age transition of tuberculosis incidence and mortality in Brazil shown that the incidence of tuberculosis has begun to shift to the older population. This shift results from the decline in the annual risk of infection as well as the demographic transition. An increase in reactivation tuberculosis in older people is expected [9].

Deshmukh reported that 14% of the tuberculosis patients over the 40 had diabetes^[10].

Euro TB started in 1996 with the objective to improve the contribution of public health surveillance to tuberculosis control in Europe and the standardization of tuberculosis surveillance methods. This study shows that age distribution of the total number of cases could be described according to recommended age Groups in 32 countries reporting a total of 107096 cases. Among these cases, 4% were reported in children (1% in children under five, 3% in the 5 to 14 age), 77% In adolescents and adults less than 65 years old (11% in the 15 to 24 years age group, 18% in the 25 to 34 group, 20% in the 35 to 44 group, 15% in the 45 to 54 group, 13% in the 55 to 64 group) and 19% in patients aged 65 or more^[11].

This study also showed a higher incidence of tuberculosis in diabetic people over the age of 40 Yrs. In this study the highest incidence was in the age group of 50-59 years.

In the present study, number of patients who were having cough of more than 30 days duration was 60% in test group and also in the control group.

22.5% presented to us with breathlessness in test group while the same in control was 20%. & 90% in the test group had fever but the same in control group was almost same that is 87.5%.

Haemoptysis were present in only 12.5% with diabetes and 7.5% without diabetes and those having chest pain was 5% but none among the control group had chest pain.

Patients presented with wheeze were more in control group i.e. 35% and in test it was 15%. This may be due to the fact that majority of control people were smokers. P was found to be significant i.e. $P < .05$ with odds ratio 3277.

Weight loss was significantly high in test group when compared to control group and it was 87.5% in patients with diabetes and 37.5% in control and P value was found to be significant with odds ratio of II .667. In a study done in Ethiopian diabetic patients with tuberculosis and most common symptoms of tuberculosis were fever (80.5%), and cough (70.5%)^[12].

In our study also percentage of cough and fever was high and there was no significant difference between test and control group based on symptoms with which they present to us. P value was not significant for fever, breathlessness and cough. 55% of patients in test group had past history of tuberculosis and 25% of control had the same and 12.5% in the test group and 7.5% in the control group had family history of tuberculosis too and p value was significant for both. 72.5% of patients had diabetes prior to hospital admission and 27.5% were detected to be diabetic in our hospital. 20 out of 26 males in test group and 27 out of 35 males in control group were smokers in our study, i.e., 50% of the test group and 67.5% of control were smokers.

Clubbing was noted in 10% of the patients with diabetes and pulmonary tuberculosis and in 7.5% of those without diabetes. There was no significant difference between the test and control and P value was $> .1$ and is not significant.

A study by Macfarlane JJ, Ibrahim M, Tor-Agbidye. S on the importance of finger clubbing in pulmonary tuberculosis, shown that finger clubbing was observed in 21% of 70 adult Nigerian patients presenting with pulmonary tuberculosis. These patients had a significantly higher incidence of haemoptysis and they also showed a significantly lower body weight and serum albumin than those without clubbing. Their chest X-rays revealed larger

ities and at 2 months the mortality of the patients with finger clubbing (40%) was very much higher than of those without (5.5%). It is suggested that finger clubbing is of value in assessing patients with pulmonary tuberculosis because it helps to identify those with severe destructive disease^[13].

10% in the test group and 15% in the control group had cervical lymph node enlargement. In present study 5% of the patient with diabetes and pulmonary tuberculosis had oral candidiasis and none among the control group had the same.

87.5% of patients belonging to test group had anemia and among them 5% had severe anemia (HB < 7 gm/dl) and 40% had mild (HB 10-12gm/dl) and 42.5% (HB 7-10gm/dl) had moderate anemia and the same in control group was 87.5% and among them 2.5% had severe anemia, 52.5% had moderate anemia and 32.5% had mild anemia. Morris *et al.* observed anemia in 60 percent of the patients; males being more frequently affected than females. (54) In our study it was higher.

The cause of low haemoglobin level in pulmonary tuberculosis is considered to be multifactorial. Bone marrow iron has been found to be decreased in some studies. Similarly; serum iron and total iron binding capacity have been observed to be decreased in patients with pulmonary tuberculosis and anaemia compared to those without anaemia. Further, bone marrow non-haeme iron was found to be greater, suggesting decreased release of marrow iron stores and suppression of erythropoiesis by inflammatory response mediators. Ebrahim recently found that the erythropoietin level was low in patients with both pulmonary tuberculosis and anaemia and suggested that blunted erythropoietin response in these patients was due to the inhibitory effect of tumor necrosis factor - α [TNF- α]^[14].

55% of patients in this study in test group showed an erythrocyte Sedimentation rate between 51 to 100 and 25% had values between 20 to 50 mm/hr. Values about 100 were noted in 10% of patients. The same in control was 70% and 5% respectively and 7.5% had ESR above 100. Hence to conclude ESR was relatively higher in control group than test.

The ESR is a nonspecific test and it can be elevated in numerous conditions. It is not of any diagnostic value. It is the manifestation of a generalized disease or of tissue destruction. Single determination of the value is of no significance and repeated tests have some practical value. The test also has some practical value in the prognosis of chronic pulmonary tuberculosis cases under treatment.

In most of the cases in our study diabetes mellitus was diagnosed before the development of tuberculosis. 72.5% had diabetes prior to the onset of tuberculosis 40% were detected to have diabetes less than one year and 1-5 year duration for the same in 35% while 15% of patients were in 5-10 yr. group and 10% had diabetes in this study was more than 10 yrs duration.

The duration of diabetes is significant because there is an increased opportunity for infections with increased duration of diabetes. The result of the present study is comparable to other studies.

Majority of the patients in our study had poor glucose control. The fasting blood sugar value of > 126 was seen in 90% and only 10% had the same < 126 mg% while PPBS only 5% had PPBS < 140 mg% and 45% had value between

140 and 200 and 50% had the same above 200mg%. only 22.5% had HbA1C<7 and 77.5% had the same > 7.

Jawad *et al.* reported glucose intolerance in as many as 49 per cent of the patients with active tuberculosis, with impaired glucose tolerance in 29 per cent and diabetes mellitus in 20%. After anti tuberculosis therapy, 50 per cent of them had normalization of glucose intolerance. Some authors reported an association between severity of tuberculosis and abnormal glucose tolerance.

However, no association has been found -93-with age, family history of tuberculosis, ethnicity or duration of treatment. A number of postulations have been made to explain the increased prevalence of diabetes mellitus in tuberculosis. Nicholas suggested that whenever two diseases are associated, a reciprocal relationship is expected. Others have suggested that occult glucose intolerance predisposes to tuberculosis infection. Most tuberculosis patients in developing countries have malnutrition and low body mass index. Malnutrition has been postulated as a modulatory factor in the pathogenesis of diabetes mellitus. Roychowdhury and Sen have suggested tuberculosis of the pancreas to be a possible cause of glucose intolerance. Another suggested possibility is stress induced diabetes mellitus which can occur in major illnesses like tuberculosis [15].

Sputum AFB was demonstrated in 67.5% in test and 77.5% in control and sputum was negative for AFB in 32.5% of test and 22.5% in control group. Sosman and Steidl had made an observation that tuberculosis tends to occur predominantly at the lower lung fields in patients with diabetes, as also shown by Weaver R [16].

However, Parmer M and Berger H showed that lower lung field involvement is an infrequent location of pulmonary tuberculosis, occurring in 7 percent or less of patients with active pulmonary tuberculosis [17, 18].

Cavity lesions 32.5% were the most common type of lesions noted followed by fibrosis 27.5%, consolidation in 17.5% hydroneumothorax 2.5%. 10% in test had bronchiectasis and fibro cavity respectively. In control group cavity lesions were 50%, fibrosis 32.5%, consolidation in 10% and pleural effusion in 5% were noticed, while 2.5% had Bronchiectasis.

Right-sided lung lesions were noted in 40% of the cases in test group and left sided lesions in 30% of the cases and 30% had bilateral lesion. Right-sided lung lesions were noted in 40% in control group and left sided lesions in 25% of the cases and 35% had bilateral lesion in the control group. 30% in the test had lower lobe involvement and only 2.5% had lower lobe involvement control group.

A more recent study of Perez-Guzman *et al.* who reviewed the radiographs of 192 diabetic patients with tuberculosis, also reported this finding [19]. Moris JT, found that multiple lobe involvement is the predominant presentation of pulmonary tuberculosis in diabetics [20].

Retinopathy was seen in of test group, nephropathy was seen in 22.5%, while 15% had neuropathy, 7.5% presented to us with diabetic ketoacidosis, 7.5% had Ischemic heart disease, 7.5% had peripheral vascular disease.

7.5% of our patients were receiving insulin alone and 32.5% were treated with both insulin and oral hypoglycemic agents. Our study correlates with most of the above radiological studies in regards to the side of lesion, site of lesion, extent of lesion as well as nature of radiological patterns.

Conclusion

In our study the total number of males in test group were 65% while females were 35% and in controls males were still more in number compared to test i.e.87.5% and females were only 12.5%.

This study also showed a higher occurrence of tuberculous diabetics in people over the age of 40 yrs. In the study the highest incidence was in the age group of 50-59 yrs.

Majority of the patients in the test and control group presented to us with fever and cough. Weight loss was significantly high in test group when compared to control group.

Clubbing was noted in 10% of the patients with diabetes and pulmonary tuberculosis and in those without diabetes was 7.5%. Majority of people in the test and control group had anemia. ESR was relatively higher in control group than test.

In most of the cases in our study diabetes mellitus was diagnosed before the development of tuberculosis. Majority of the patients in our study had poor glucose control. Cavitary lesion was most common lesion found in both test and control group followed by fibrosis, extensive lesions were seen in 22.5% of the test group.

Upper lobe lesions were noted in 42.5% in test group while the same in control was 95%, 10% in the test group has got unilateral lower lobe involvement while 2.5% in the control has the same and bilateral lower lobe involvement was in 20% of test, the same was none in control group. Tuberculosis tends to occur predominantly at the lower lung fields in patients with diabetes.

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Conflict of Interest

None

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