Original Article

Clinicopathological Impact of Diabetes Mellitus in Pulmonary Tuberculosis Patients

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Abstract

Background: Tuberculosis (TB) is the one of the leading cause of death globally, more marked in developing countries like Bangladesh. The prevalence of Diabetes Mellitus (DM) is increasing globally fueled by obesity endemic. The study is designed to get an idea about prevalence and clinical impact of DM among pulmonary TB patients.

Objective: The aim of the study is to find out the rate and effect of Diabetes mellitus in patients with pulmonary Tuberculosis.

Material and Methods: This was a cross sectional study conducted in DOTS (directly observed therapy, short course) corner, outpatient department (OPD), Dhaka Medical College & Hospital, Dhaka from July to December 2012. 125 patients of pulmonary Tuberculosis were included in this study as case. 125 age and sex matched controls who were not suffering from pulmonary Tuberculosis were taken from the attendant of the patients who had given the consent. Prevalence and clinical impact of diabetes mellitus was sort out in both case and control group and compared with each other.

Results: The study shows the prevalence of DM among pulmonary TB patients is 26.4% and among normal population (non TB patients) is 20.8%. The relative risk (odds ratio) of DM among pulmonary TB patients is 1.27 times more than non TB person with p-value - 0.02, which is significant. In symptoms analysis, diabetic patients have got more haemoptysis (45%), in contrast to non-diabetic group (13%), with p-value-0.001. In non-diabetic patients Fever are more common, 88% in contrast to diabetic group 57%, p-value-0.001. Sputum positivity is more common (69%) among diabetic pulmonary TB patients than non diabetic pulmonary TB patients (58%). On chest X ray findings this study reveals that pulmonary TB patient with DM having cavitary lesion is 33% while it is only 9.76% in non-diabetic persons.

Conclusion: This study found that there was greater prevalence of DM among pulmonary TB patients (26.4%) than non pulmonary TB persons (20.4%). This findings provides the information that health care provider should intensively search presence of DM in pulmonary TB patients.

Key words: Tuberculosis (TB), Diabetes Mellitus (DM), Prevalence.

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Introduction

Tuberculosis (TB) remains a leading cause of death globally, more marked in developing countries. Nearly one third of global population i.e. two billion people, is infected with *Mycobacterium tuberculosis* and thus at risk of

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developing the diseases.[1] More than nine million people develop active TB every year and about two million die.[2] In 2009 it was estimated that there were more than 9.4 million new cases of TB(both pulmonary and extra-pulmonary) were reported to World Health Organization (WHO), 95% from developing countries.[3] TB is a major public health problem in Bangladesh since long. Estimates suggest that daily about 880 new TB cases and 176 TB deaths occur in our country.[4]

The prevalence of Diabetes Mellitus (DM) is increasing globally fueled by the obesity endemic. The number of individuals with DM is expected to increase from 171 million in 2000 to 400 million in 2030.[2,5]

While it is widely appreciated that 95% of the TB patient live in developing countries, it is also known that 70% of the DM patient live in the developing countries, especially in South East Asia and Western Pacific.[6-8]

Now there are growing evidences that these two diseases are interconnected. A number of studies found that, prevalence of TB is many fold greater in DM patients than it is in normal population. Research suggests that these two diseases do not coexist incidentally but rather DM predisposes the development of TB. As such DM patients are at greater risk of being infected by TB, the relative risk (RR) being as high as 3 to 7.[9]

These two diseases are already major concern of world health. Connection between these two is very much likely to compound the situation and pose a much greater threat to global health scenario. The threats are much more critical for developing countries like Bangladesh. There were an estimated 3.2 million people in Bangladesh with DM in 2010 and projection suggest prevalence will rise to almost 11.1 million by 2030.[5]

The fact that these two major diseases are connected, at one hand it is likely to compound the scenario and worsen the situation. On the other hand, it may provide a way of single management of both the diseases and thus help reducing burden of two diseases.

The objective was to have an idea on population – level impact of DM on pulmonary TB patient in Bangladesh.

Materials and Methods

This was a cross sectional study conducted in DOTS (directly observed therapy, short course) corner, outpatient department (OPD), Dhaka Medical College & Hospital (DMCH), Dhaka from July to December 2012.

125 patients of pulmonary Tuberculosis in DOTS (directly observed therapy, short course) corner, outpatient department (OPD), Dhaka Medical College & Hospital were included in this study as case. 125 age and sex matched controls who were not suffering from pulmonary Tuberculosis were taken from the attendant of the patients who had given the consent. Prevalence of diabetes mellitus was calculated among both case and control group and compared with each other. Then diabetic and non-diabetic patients of case are kept in two groups. Clinical findings, sputum positivity and chest X-ray findings of diabetic and non-diabetic Tuberculosis patients were compared in order to find out the clinical impact of Diabetes mellitus in pulmonary tuberculosis patient. Patients were diagnosed through proper history, clinical examination and necessary investigation. Data was analyzed through SPSS-15.

Results

In this study, majority of population were from age group (26-40);both in case and control group. There were no statistically significant differences between case and control group in respect to age group. In the aspect of sex, Male is predominant in both case and control group. There is no significant sex variation between case and control (in case of male p- value 1.4, in case of female p - value 1.3).

Table - 1: Age group variation in both case and control

Age group	Case	Control	p-value
10-25	41	29	1.2
26-40	49	62	0.4
41-60	30	33	1.4
61-80	5	1	0.9
Total	125	125	

p-value < 0.05 means significant.

Table 2: Sex distribution in both case and control

Sex	Case	Control	P –value
Male	75	68	1.4
Female	50	57	1.3

p-value < 0.05 means significant.

Peoples from different population were included in this study. In case group, garments worker (26.40%) were the highest population and in control group, house-wives(32%) were most prevalent.

Profession mix in case group
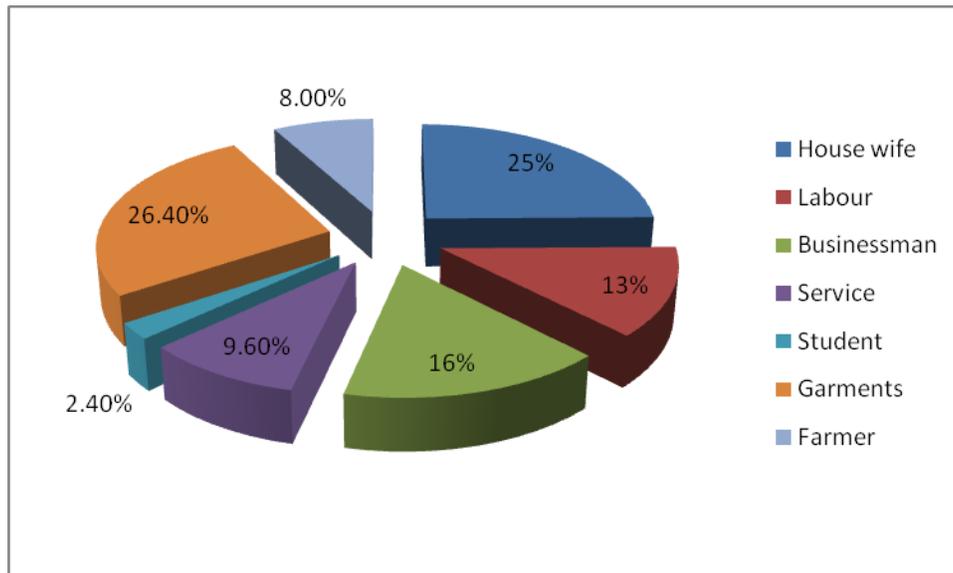
Figure - I: Profession mix in case group

Profession mix in control group
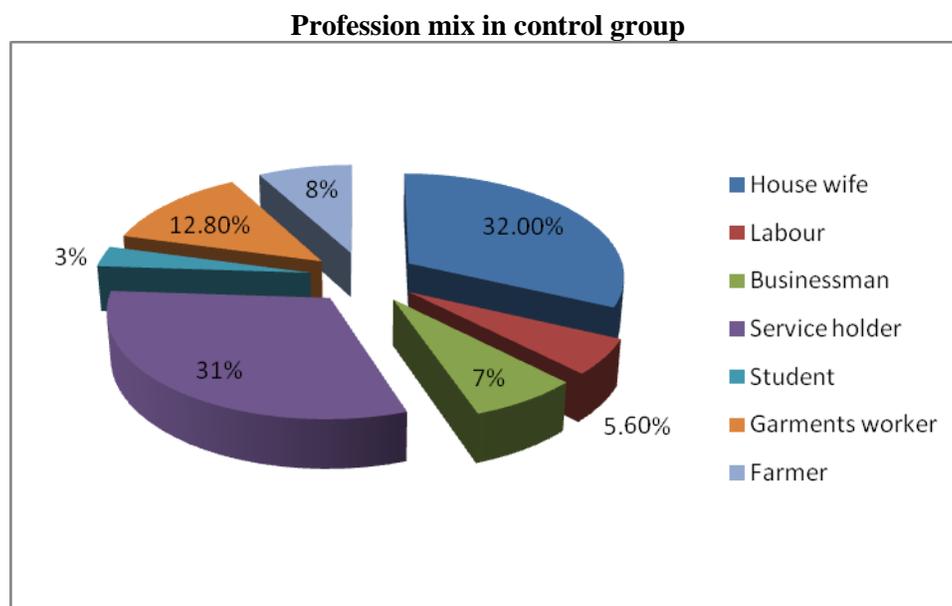
Figure –II: Profession mix in control group

In this study, DM prevalence is more in pulmonary TB patient (26.4%) than normal population (20.8%) with p-value 0.02, which is significant.

Table 3: Diabetic prevalence in different age group of both case and control

Age group	Case		Control		Diabetic incidence ratio (case vs control) odds ratio	p-value
	Diabetic count	%	Diabetic count	Diabetic %		
10-25	4	9.80	2	6.90	1.41	0.01
26-40	13	26.50	10	16.10	1.64	0.001
41-60	15	50.00	13	39.40	1.27	0.02
61-80	1	20.00	1	100.0	0.2	1.21
Total	33	26.40	26	20.80	1.27	0.02

Odds ratio > 1 means Exposure is a risk factor.
p-value < 0.05 means significant.

In sputum analysis, Sputum positivity is more in Diabetic pulmonary TB patients (69%) than non diabetic pulmonary TB patients (56%). Regarding symptomatology, haemoptysis is more common in Diabetic group (45% vs. 13%). Fever is more common in non diabetic group. (88% vs. 57%).

Table 4: Sputum test outcome

	Age group	Sputum AFB Positive		Negative		Total	Percentage of sputum positivity
		Number	%	Number	%		
Diabetic	10-25	3	75	1	25	4	
	26-40	7	54	6	46	13	
	41-60	12	80	3	20	15	
	61-80	1	100	0	0	01	
Total		23		10		33	69%
Non-diabetic	10-25	25	67	12	23	37	
	26-40	16	45	20	55	36	
	41-60	9	60	6	40	15	
	61-80	2	50	2	50	4	
Total		52		40		92	56%
Grand total		75		50		125	

Table 5: Symptomatology

symptoms	Diabetic Number	Total number	%	Non-diabetic number	Total number	%	p-value
Cough	28	33	84	75	92	81	1.28
Productive sputum	23		69	52		56	0.02
Haemoptysis	15		45	12		13	0.001
Fever	29		57	81		88	0.001
Weight - loss	5		15	12		13	1.27

In chest X –ray comparison between case and control group, Diabetic group has more cavitary lesion (33.33% vs 9.76%) than the non-diabetic control group.

Chest X-ray involvement in Diabetic and non –diabetic group
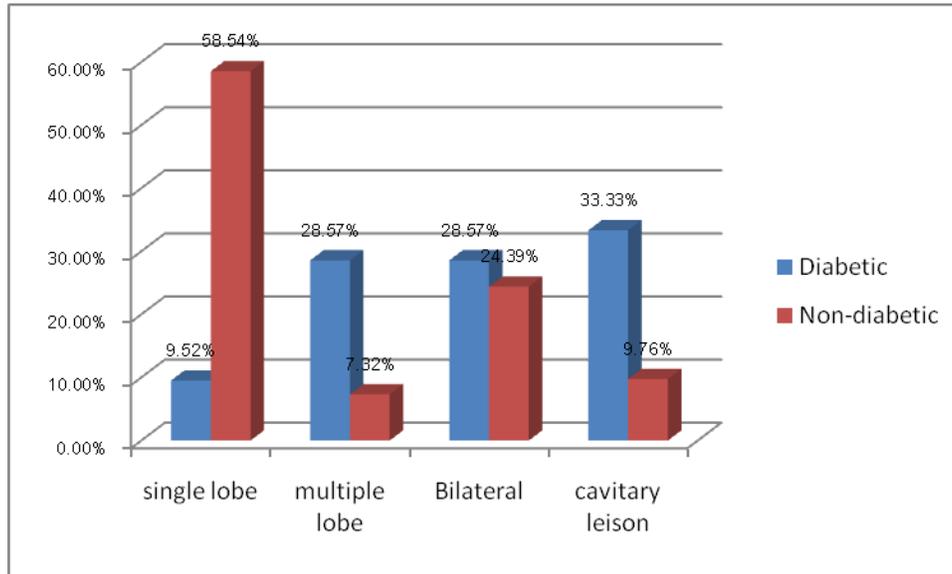
Figure- III: Chest X-ray involvement in Diabetic and non –diabetic group.

Discussion

This study was done among 250 samples. 125 patients of pulmonary TB in DOTS corner, DMCH were included in this study as case. 125 age and sex matched controls, who did not have pulmonary TB were taken from the attendant of the patients who had given the consent. Mean age of the samples were 34 yrs ±12.38, male -58%, female -42%. A related research article by Stevenson CR et al also shows similar type of age and sex distribution, where mean age are 35 yrs ± 11.28; male -62%, female -48%.[10]

It has been found from this study that in general, there is greater prevalence of DM among pulmonary TB patients than normal persons. The study shows the prevalence of DM among pulmonary TB patients is 26.4% and among normal population (non TB patients) is 20.8%. A related research article by Stevenson CR et al also shows 18.4% of pulmonary TB patients had DM. Here in the study we see that the diabetes prevalence among control group is 20.8%. According to Sayeed MA et al, overall prevalence

of DM in urban population of Bangladesh was 11.2% in 2007, which was 8% in 1997 and only 4% in 1992.[11] Comparatively DM prevalence result obtained from this study is very high. This may be because of the fact that for the study we tested blood sugar free of cost. This made many subjects, suspecting themselves as diabetic, interested to be included in the study. Probably this results in large number of diabetic patients in control group than usual.

The study shows that the relative risk (odds ratio) of DM among TB patients is 1.27 times more than non TB person with p-value 0.02 which is significant. Thus, null hypothesis is rejected and our study hypothesis that prevalence of DM is more in pulmonary TB patients than in normal persons is established. Whereas Kim SJ et al showed the value to be 3 to 4 times higher in TB patients as compared to controls.[12] This deviation may be attributed to two reasons. First, in the case group, a large percentage (>one fourth) of the sample is from garments industry. Their average age (25 yrs) is also much below the average of total survey population (34.36 yrs). Diabetic

prevalence is much less in this age group (12.1% in contrast to 26% of total case group). This resulted in large number of TB patients without DM. Secondly; the large number of diabetic patients in the control group as mentioned above might have caused the distortion of result.

Here it should be highlighted that the garments workers intend to develop TB more than any profession because of the nature of the job and working environment.

The study demonstrates a strong association between DM and pulmonary TB among the age group below 40 years. The Odds ratio (OR) is higher in age group 10-25 years (1.41) and 26-40 years (1.64). It declines with increasing age; 41-60 years (1.27) and 61-80 years (0.2). This findings are compatible with Christie et al; where we find the OR in the age group 20-29 years (1.26), 30-39 years (1.31) that declines in the age group 40-49 years (0.905).[13]

The study further reveals that sputum positivity is more prevalent (69%) among pulmonary TB patients with DM than non-DM patients (58%). According to Dooley KE et al sputum positivity in pulmonary TB patients is 61% in diabetic cases and 55% in non-diabetic cases.[7]

In symptoms analysis, diabetic patients has got more haemoptysis (45%), in contrast to non-diabetic group (13%), with p-value-0.001. In non-diabetic patients Fever are more common (88%) in contrast to diabetic group (57%), p-value-0.001. This also established our hypothesis that clinical presentations of pulmonary TB patients with DM are different than that of non-diabetic pulmonary TB patients. Dooley KE et al showed haemoptysis in diabetic patients are more common (52%) in comparison to non-diabetic patients (21%).They also showed fever are more common in non-diabetic patients (80%) in contrast to diabetic patients (42%). These observations are in conformity with that of our study.

This study reveals that pulmonary TB patient with DM having cavitary lesion is 33% while it is only 9.76% in non-diabetic persons. These findings are supported by Wang JY et al. In his study he mentioned that diabetic patients were more likely to present with cavitary lesion. Again in this study, multiple lobe involvement among the patients having both pulmonary TB and DM is 28.57%. This is only 7.32% in non–diabetic TB patients. Another study in Bangladesh by Uddin FM et al shows bilateral involvement was 43% and cavitation was 17% in diabetic pulmonary TB patients.[14]

Along with others, the study had an objective of finding any relation, if there is any, between the duration of diabetes and the rate of TB in diabetic patients. But the objective cannot be achieved due to the fact that, before the test performed during this study, most diabetic patients were unaware of the fact that they are already diabetic. There were only 24 known case of diabetes out of 59 diabetic patients. This fact has two implications; first-a huge portion of diabetic patients are unaware of their disease due to lack of access to proper medical services and information. Secondly, diabetic prevalence might be higher in Bangladesh than it is officially reported or estimated.

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