

Frequency of newly diagnosed Diabetes Mellitus in patients with Pulmonary Tuberculosis

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SMAS RU ASK ZI conceived idea, SMAS RU MK ZI drafted the study SMAS RU WP collected data, RU SMAS RU ZI SN did statistical analysis interpretation, SMAS RU ASK ZI critical review manuscript.

Declaration of conflicting interests

The Authors declares that there is no conflict of interest.

Abstract

Background: Chronic obstructive pulmonary disease (COPD) is a preventable and treatable disease characterized by shortness of breath and cough. Diabetes mellitus (DM) is a chronic metabolic disease characterized by deficiency or diminished effectiveness of endogenous insulin resulting in hyperglycaemia, deranged metabolism and different complications.

Objective: The objective of this study to determine the frequency of newly diagnosed diabetes mellitus in patients with pulmonary tuberculosis.

Methodology: This cross-sectional study was conducted in the Pulmonology wards/OPD's of Khyber Teaching Hospital Peshawar from 17/06/2017 to 16/12/2017. A total of 117 patients were included in the study using 12.4% proportions of newly diagnosed DM in patients with pulmonary tuberculosis, 95% confidence interval and 6% margin of error under WHO software for sample size determination. All patients with newly diagnosed pulmonary tuberculosis irrespective of sputum smear positivity were included in the study. Patients already diagnosed as diabetes mellitus and those with extra-pulmonary tuberculosis were excluded from the study.

Results: Out of 117 patients, 56.4% (n = 66) were females and 43.6% (n = 51) were males. The mean age of the study population was 37.03 (SD+18.610) years. The frequency of diabetes mellitus in patients with pulmonary tuberculosis was 16.2%.

Conclusions: There is an increased frequency of diabetes mellitus in patients with pulmonary tuberculosis.

Key Words: Diabetes Mellitus; Pulmonary Tuberculosis; Smear Positive; Smear Negative; HbA1C.

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Introduction

Tuberculosis is an infectious disease that is caused by a bacterium called mycobacterium tuberculosis. The global burden of the disease

is on the rise. According to WHO, 8.8 million new cases of tuberculosis were reported in 2010 and it killed 1.45 million people worldwide.¹ Tuberculosis is a major public health problem in the third world countries like Pakistan. According to WHO, Pakistan

ranks sixth among countries with a high TB burden. The prevalence of the disease in Pakistan is estimated to be 420,000 and the incidence is 231/100,000 population.²

The development of TB occurs in two main steps after acquiring the infection. In most cases, infection gets contained by the immune system and the bacteria become restricted in caseous granulomas/tubercles. This is latent tuberculosis. Reactivation of the dormant tubercle bacilli leads to active disease at some stage later in life.³ The progression to active disease is associated with certain risk factors which include immunosuppression (which may occur due to human immunodeficiency virus (HIV), immunosuppressive drugs etc.) malnutrition, socioeconomic factors, indoor air pollution, smoking and alcoholism. Diabetes has also been shown to be a risk factor for the development of active tuberculosis. This is because of different reasons e.g., impaired cell mediated immunity, micronutrient deficiency, renal failure, pulmonary microangiopathy etc. all of which increase their predisposition to develop TB.⁴ Impaired immunity occurs because of decreased activity of the alveolar macrophages, decreased number of T lymphocytes (thus reflecting decreased cellular immunity) and decreased ability of T cells to convert into blast cells, this is evident as a result of different studies. Many studies reported that subjects with diabetes were at three-fold higher risk of developing TB.⁵

Diabetes mellitus is a chronic metabolic disease characterized by deficiency or diminished effectiveness of endogenous insulin resulting in hyperglycaemia, deranged metabolism and different complications. It is associated with an increased risk of infections⁶ including tuberculosis. In Pakistan, the number of people aged 20–79 years with diabetes is estimated to be 7.1 million in 2010 and is expected to rise to 13.8 million in 2030.⁷ As shown in a study conducted in China, 12.4% of patients with pulmonary tuberculosis were found to have diabetes mellitus.⁸ This means that a significant proportion of tuberculosis patients are diabetics.

The purpose of this study was to screen the patients suffering from pulmonary tuberculosis (both smear positive and negative) for diabetes mellitus as diagnosing diabetes mellitus in tuberculosis patients would result in the timely treatment of this important co-morbidity.

Methodology

This cross-sectional study was conducted in the

Pulmonology ward/OPD, Khyber Teaching Hospital Peshawar, Pakistan from 17/06/2017 to 16/12/2017. A total of 117 patients were included through consecutive, non-probability sampling technique. The sample size was calculated using the WHO software for sample size determination in health studies with the assumptions of 12.4% proportion of newly diagnosed DM in patients with pulmonary tuberculosis, 95% confidence interval and 6% margin of error.

All patients newly diagnosed as pulmonary tuberculosis irrespective of sputum smear result were included in the study. Those patients with extra-pulmonary tuberculosis and already diagnosed as diabetes mellitus were excluded from the study.

After taking approval from ethical review board, written informed consent was taken all patients. These patients were screened for diabetes mellitus. This was done as per American diabetes association (ADA) guidelines with measurement of HbA1C levels. The cut off value of HbA1C was >6.5.

Statistical analysis was carried using SPSS version 19. Frequencies and percentages were calculated for categorical variables like gender, and diabetes. Mean + standard deviation was calculated for continuous variables like age, and HbA1C. Diabetes mellitus was stratified among age, gender, and HbA1C to see effect modification. All the results will be presented as tables and charts.

Results

A total of 117 patients with a diagnosis of pulmonary tuberculosis were enrolled and assessed for the presence of new diabetes mellitus. Out of these, 56.4% (n = 66) were females and 43.6% (n = 51) were males, as shown in the figure 1.

The mean age of the study population was 37.03 (SD+18.610) years. Out of 117 patients, 16.2% (n = 19) patients with pulmonary tuberculosis were found to have diabetes mellitus while 83.8% did not have diabetes mellitus. Out of 19 patients who tested positive for diabetes, 63.15% were males while 36.8% were females. Table 1 shows the frequency of tuberculosis patients with and without diabetes in both genders.

The mean HbA1C in pulmonary tuberculosis patients was 8.447 (SD+1.868).

Table 1 shows the frequency of diabetes mellitus in smear positive and negative pulmonary tuberculosis patients.

Figure 3 shows age categorization of tuberculosis patients diagnosed with newly diagnosed diabetes mellitus.

Discussion

Tuberculosis is a disease that is quite common in third

world countries like Pakistan, which ranks sixth among countries with a high tuberculosis load. There are certain risk factors that lead to the reactivation of pulmonary tuberculosis one of which is diabetes mellitus. It is a chronic metabolic disease that is characterized by hyperglycaemia. It has certain

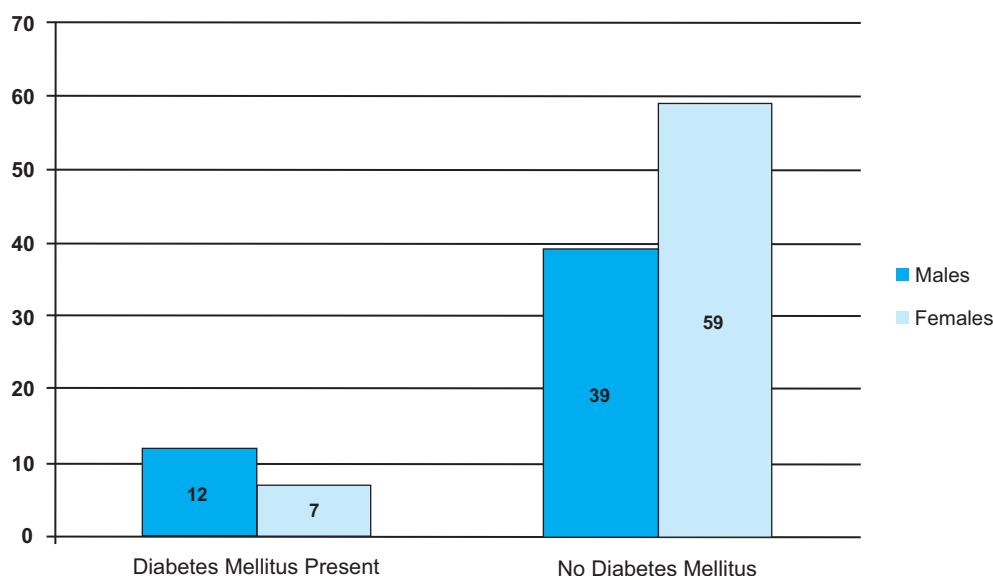


Figure 1: Gender distribution of DM

Table 1: Frequency of tuberculosis patients with and without diabetes in both genders

Sputum Smear Results For AFB	Diabetes Mellitus		Total
	Yes	No	
Smear Positive	13	70	83
Smear Negative	6	28	34
Total	19	98	117

complications one of which is increased predisposition to infections like pulmonary tuberculosis. Diabetes does so by impairing the immune status of the patient.

We diagnosed diabetes mellitus with help of HbA1C which is more reliable than doing single blood glucose level which can be elevated due to other reasons although the former test is relatively expensive.

Our study has shown that the frequency of diabetes mellitus in patients with pulmonary tuberculosis is 16.2%. This is consistent with result from a study in Tanzania9(16.7%). Nearly, similar result was obtained in an Indian study which showed a frequency of 18%10.

On the other hand, another study done in India (by Dave et al) showed that the frequency of newly

diagnosed diabetes mellitus in patients with pulmonary tuberculosis was 4%11. This difference in values between frequencies could possibly be due to different diagnostic criteria used for the detection of diabetes mellitus in the two study populations. Our study population is relatively older as compared to that of Dave et al. study, and the risk of diabetes mellitus increased with age. Another reason could be the difference in the geographic distribution of the study populations. Our study sample was mainly from urban area while their study population was from rural area with different lifestyles and dietary habits.

Diabetes mellitus was not diagnosed in younger population in our study and this result is consistent with Dave et al.'s study.

Kottarath MD et al. conducted similar study in India

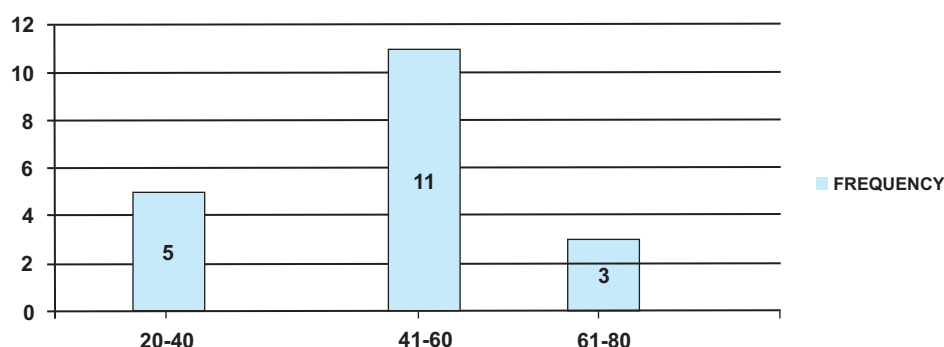


Figure 2: Frequency of diabetes in patients with smear positive and smear negative patients pulmonary patients.

and found the incidence of diabetes mellitus to be 19.6%¹².

This high incidence is close to findings in our study. This is most probably because of almost same condition of both countries. Similar higher prevalence of diabetes in tuberculosis patients was reported in studies from Tamil Nadu (25%), Pondicherry (29%) and Saudi Arabia^{13, 14, 15}.

Another study in Kerala reported a very high Diabetes prevalence in tuberculosis of 44% but the diagnostic criteria for diabetes was based on HbA1c > 6.5%¹⁶.

Globally, with increased health care facilities, better living Conditions and changing life styles the prevalence of Diabetes is increasing. Routine screening and detecting pre-diabetic stage might decrease the incidence of Tuberculosis in diabetics.

The prevalence of diabetes mellitus in tuberculosis is high in our community. To conclude, considering the bidirectional linkage of both diseases screening for diabetes needs to be intensified in the community especially in Tuberculosis patients.

Conclusion

There is an increased frequency of diabetes mellitus in patients with pulmonary tuberculosis.

Recommendations

Patients with pulmonary tuberculosis should be screened for diabetes mellitus.

Further studies should be conducted in order to assess the effects of diabetes mellitus on the treatment outcome

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