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Tuberculosis infection with the risk of diabetes mellitus

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Abstract
Background: Tuberculosis (TB) is one of the major causes of morbidity and mortality in developing countries like India. Diabetes is also increasing rapidly in the country, but not the co-existence of these diseases. The aim of the study is to document the co-existence of *Diabetes mellitus (DM)* and Tuberculosis in TB patients of South Indian population.
Materials and Methods: Epidemiological study based on properly framed questionnaire was done on 103 clinically diagnosed TB patients who are undergoing treatment in Govt Chest and Tuberculosis Hospital, Visakhapatnam, A.P, India.
Results: The prevalence of *DM* among the TB patients in the study was 5.8%. The risk of TB was high in age group between 20-40 years of age, while the risk of Tuberculosis associated with Diabetes was between 40-70 years of age.
Conclusion: Diabetes makes an important contribution to the incidence of Tuberculosis in India. This study raises the need to bring awareness of screening of *DM* in adult TB patients.

Keywords: Prevalence and Risk of Tuberculosis (TB) and *Diabetes mellitus* (*DM*), Epidemiological study.

1. Introduction
Tuberculosis remains as the major infectious disease, causing morbidity and mortality throughout the world. On the other hand *Diabetes mellitus* is one of the non-communicable diseases which are affecting millions of people worldwide. Several studies revealed that there is possible association of *Diabetes mellitus* with Tuberculosis (Richard Mortan, 1694, Dooley K E, Chaisson R E, 2009) [10, 3]. It was estimated that 65.1 million people in India are affected with *Diabetes mellitus* in the year 2013(International Diabetes Federation 2013). Surveys suggest that the prevalence of this disease will increase to nearly 80 million by 2030 (Gothi G D *et al*., 1976) [5]. The overall importance of *Diabetes mellitus* as a risk factor for Tuberculosis is still vastly unknown, though few studies showed association (Gopi PG *et al*., 2006) [4]. Presently, with the risk in the prevalence of Type -2 Diabetes and Tuberculosis, the association between the two diseases is being re-evaluated. Studies on *Diabetes mellitus* and Tuberculosis showed that *Diabetes mellitus* increases the risk of Tuberculosis. It was also revealed that *Diabetes mellitus* paves way to impaired innate immune responses to Tuberculosis. Studies suggest that not only there is increased frequency of Tuberculosis occurrence in diabetics but also significant increase in mortality (Mc. Majon MM, Bistrian B R 1995, Gupta A, Shah A 2000) [8, 6]. Some epidemiological studies showed that there is reactivation of *TB* lesions due to *Diabetes mellitus,* while some studies showed that there was no association between both these diseases. The association between *TB* and *DM* may be related to host defenses and immune cell functions. Abnormal chemotaxis adherence, phagocytosis and microbicidal functions of polymorpho nuclear leucocytes are some of the immunologic abnormalities in Diabetes. (Mc Mahon MM, 1995, Koziel, 1995, Gupta A, 2000) [8, 7, 6]. This impaired immune response leads to diminished bronchial reactivity, reduced elasticity and lung volumes, reduced diffusion capacity, and reduced ventilator response to hypoxemia. When a *Diabetes mellitus* patient with such impaired immune response get tubercle bacilli it leads to further alterations in the cytokines, monocyte-macrophages and CD4/CD8 T cells multiplication. CD4 and CD8 T cells play an important role in modulation of host defense against *Mycobacterium tuberculosis*.

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The objective of this study is to determine prevalence of *DM* among Tuberculosis patients in a South Indian Population. India has a large population size with increased incidence rate of Tuberculosis and *Diabetes mellitus* and both these conditions create a major public health problem in the society.

2. Methods: Epidemiological data from 103 Tuberculosis patients visiting the RNTCP centers and Government Chest and Communicable disease Hospital during 2011-2014 in Visakhapatnam, A.P, India, were taken into study. The study was approved by the Institutional Ethical Committee, Andhra University, Visakhapatnam, A.P, India. Informed and written consent was obtained from the patients who were clinically diagnosed with Tuberculosis. *HIV* associated TB patients were not taken into study. TB patients aged 15 years and above were interviewed with well framed questionnaire according to WHO guidelines. Information on socio-demographic characters was recorded. The obtained data was calculated using MS. Excel 2003. The prevalence of diabetes among the TB patients was estimated by calculating the number of Tuberculosis cases with and without Diabetes.

3. Results: An individual level analysis between the clinically reported TB infefction with self-reported diagnosed *Diabetes mellitus* was noted. Among the 103TB patients taken into study, 56 TB patients were retreatment cases while 44TB patients were new cases. Out of all the 103 TB patients taken into study, 6 patients were reported to be associated with Diabetes mellitus.

Age	No. Of TB patients	% of TB patients	No. TB patients associated with Diabetes	% of TB patients associated with Diabetes
10-20 years	2	1.94%	-	-
21-30 years	27	26.21%	-	-
31-40 years	22	22.66%	-	-
41-50 years	19	18.44%	2	1.94%
51-60 years	19	18.44%	3	2.91%
61-70 years	11	10.67%	1	0.97%
71-80 years	3	2.91%	-	-
Total	103	100%	6	5.8%

The study observed that the risk of Tuberculosis is high in people aged between 21 -40years of age, while the risk of Tuberculosis associated with Diabetes was observed in patients aged between 40-70 years of age and all the *DM* associated TB cases were retreatment cases which strengthens the fact of reactivation of TB.

4. Discussion: The prevalence of *Diabetes Mellitus* among Tuberculosis patients in the present study was 5.8%. This incidence rate of TB associated with Diabetes is comparable with the study done by Olayinka AO et al., 2013 [1], where it was reported to be 5.7% in Nigerian population, and the study made by the Lagos state 6% on the prevalence of *Diabetes mellitus*.
But this observed study deviates from the studies done by

Restrepo *et al*., 2007 [9] on the American population, where the incidence of *DM* in TB patients was 27.8% in Texas population, 17.8% in Mexican population. Studies done on Indonesian TB infected population revealed that DM is strongly associated with Tuberculosis 13.2%. (Alisjahbana B *et al*., 2006) [2]. This shows that the risk of Diabetes in TB patients contributes to ethnic or Geographical variation. It is therefore important to encourage screening of *DM* in TB infected patients who are above 40 years of age. The mean age of TB patients with *Diabetes mellitus* was observed to be similar to the study done by Restrepo *et al*., 2007 [9], and Olayinka *et al*., 2013 [1]. It strengthens the fact that *Diabetes mellitus* is present among Adult TB patients.

5. Conclusion: The study reveals 5.8% of the TB patients are associated with *DM*. Routine testing for Diabetes is preferred among TB patients. Only few studies were done to determine the relationship TB and Diabetes. This study would be useful for further estimation of the incidence risk of Diabetes in TB patients in India. Large scale study on TB patients with *Diabetes mellitus* taken as a risk factor would be helpful in determining association of TB and *DM* in the south Indian Population. Differential changes in the health care for diagnosis of *DM* in TB patients would also help in changing or increasing the regimen course in TB patients.

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