Original Research

Assessment of risk factors of pulmonary tuberculosis in a known population

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Abstract

Background: Tuberculosis is caused by Mycobacterium tuberculosis. The present study was conducted for assessing risk factors of pulmonary tuberculosis in a known population.

Materials & methods: Individuals aged 18 years and older were evaluated for pulmonary tuberculosis (PTB) based on chest-related symptoms, including a persistent cough lasting two weeks or more, chest pain persisting for one month or longer, fever for a duration of one month or more, and any occurrence of haemoptysis within the past six months. Those exhibiting symptoms underwent sputum smear and culture tests for further investigation. The study encompassed a total of 500 participants. Cases were identified as individuals who tested positive for PTB through sputum smear and/or culture, while those screened and confirmed negative for tuberculosis served as the control group. All findings were systematically recorded in a Microsoft Excel spreadsheet and subsequently analyzed using SPSS software.

Results: A total of subjects 500 were screened in the present study. Among these 500 subjects, PTB was seen in 153 subjects. So, study group comprised of 153 subjects while control group comprised of 347 subjects. Significant higher proportion of subjects of study groups were males and were of rural residence. The study revealed several key risk factors that significantly contributed to the occurrence of pulmonary tuberculosis (PTB). Individuals with lower educational attainment, specifically those who had not completed secondary education, were found to be more susceptible to PTB.

Conclusion: Education qualification of less than secondary, farmer/labourer occupation, poor socio-economic status, history of asthma and tobacco history were found to be significant risk factors for occurrence of PTB. A high degree of clinical awareness of the possibility of TB should be considered in patients with these risk factors, and active screening and prevention should be undertaken.

Key words: Pulmonary tuberculosis, Risk factors

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Introduction

Tuberculosis is caused by Mycobacterium tuberculosis. It has affected humans for thousands of years. According to the Global Tuberculosis Report 2018, there are an estimated 10 million incident cases of tuberculosis, equivalent to 133 cases/100.000 population. The developed countries regard tuberculosis as a disease of the past due to the implementation of effective control strategies with social and economic development. India accounts for 27% of all estimated incident cases worldwide. India under its Revised National Tuberculosis Control Program (RNTCP) adopted the World Health Organization-endorsed Directly Observed Treatment, Short-Course (DOTS) in 1997.¹⁻³

The national X-ray-based TB survey in developing countries in 2010 reported prevalence estimates of 108 per 100 000 population for smear-positive pulmonary tuberculosis (PTB s+) and 277/100 000 population for bacteriologically confirmed pulmonary tuberculosis (PTB b+).^{4, 5} Only two studies have investigated the pulmonary TB (PTB) incidence, both based on screening of respiratory symptoms. A study i in 2013 reported that the incidence of PTB s+ was

214/100 000 person-years and that of PTB b+ was 232/100 000 person-years,6 while another study reported that the incidence of PTB s+ was 311/100 000 person-years.7 Hence; the present study was conducted for assessing risk factors of pulmonary tuberculosis in a known population.

Materials & methods

The present study was conducted for assessing risk factors of pulmonary tuberculosis in a known population.Individuals aged 18 years and older were evaluated for pulmonary tuberculosis (PTB) based on chest-related symptoms, including a persistent cough lasting two weeks or more, chest pain persisting for one month or longer, fever for a duration of one month or more, and any occurrence of haemoptysis within the past six months. Those exhibiting symptoms underwent sputum smear and culture tests for further investigation. The study encompassed a total of 500 participants. Cases were identified as individuals who tested positive for PTB through sputum smear and/or culture, while those screened and confirmed negative for tuberculosis served as the control group. A comprehensive questionnaire was administered to all participants, gathering demographic information, clinical data, and medical history. A body mass index (BMI) of less than 18.5 kg/m² was classified as undernutrition, and a history of asthma was also documented. Additionally, participants were screened for blood glucose levels to exclude diabetes mellitus and assessed for HIV status. Data regarding household characteristics, including household size, type of dwelling, income, overcrowding, use of biomass fuel, and the presence of a household member or relative with tuberculosis, were also collected. All findings were systematically recorded in a Microsoft Excel spreadsheet and subsequently analyzed using SPSS software.

Results

A total of subjects 500 were screened in the present study. Among these 500 subjects, PTB was seen in 153 subjects. So, study group comprised of 153 subjects while control group comprised of 347 subjects. Significant higher proportion of subjects of study groups were males and were of rural residence. The study revealed several key risk factors that significantly contributed to the occurrence of pulmonary tuberculosis (PTB). Individuals with lower educational attainment, specifically those who had not completed secondary education, were found to be more susceptible to PTB. Additionally, occupation played a crucial role, with farmers and laborers being more vulnerable to the disease. Socio-economic status was also a determining factor, with those from poorer backgrounds being at higher risk. Furthermore, a history of asthma and tobacco use were identified as significant risk factors, suggesting that pre-existing respiratory conditions and smoking habits can increase an individual's likelihood of developing PTB. These findings highlight the importance of addressing social determinants of health and managing underlying health conditions to prevent and control PTB.

Table 1: Demographic data

Variable	Study group	Control group	p-value
Mean age (years)	46.5	41.9	0.25
Males	103	176	0.001 (Significant)
Females	50	171	
Rural residence	95	162	0.001 (Significant)
Urban residence	58	185	

Table 2: Kisk factors						
Risk factors	Study group	Control group	p-value			
Educational qualification less than secondary	62.09	35.45	0.002*			
Farmer/labourers	76.47	48.41	0.000*			
Lower socio-economic status	64.05	29.11	0.001*			
Joint family	36.60	27.67	0.125			
Diabetes	39.87	34.87	0.084			
History of asthma	73.86	31.12	0.001*			
Tobacco history	59.48	16.14	0.003*			
*: Significant						

Table 2. Risk factors

Discussion

As a major global health problem, tuberculosis (TB) is a serious chronic infectious disease caused by Mycobacterium tuberculosis (MTB). TB occurs mostly in the lungs, leading to pulmonary TB (PTB). The 2021 Global TB reported that there were approximately 9.87 million new TB patients worldwide with an incidence rate of 127 per 100,000

in 2020. Although substantial efforts have contributed to the decline in the global TB epidemic, the pace of progress needs to be speed up to curb TB burden and achieve goals of WHO's "End TB strategy".^{8, 9}The prevention of TB disease by the treatment of TBI is largely undervalued but remains as an important component of the National Strategic Plan 2017-25 for Ending TB in India by 2025, five year ahead of the

sustainable development goals. The lancet commission on TB mentions that the diagnosis and treatment strategies to end TB would be ineffective unless TB preventive treatment (TPT) is included in the comprehensive strategy.^{10, 11}Hence; the present study was conducted for assessing risk factors of pulmonary tuberculosis in a known population.

A total of subjects 500 were screened in the present study. Among these 500 subjects, PTB was seen in 153 subjects. So, study group comprised of 153 subjects while control group comprised of 347 subjects. Significant higher proportion of subjects of study groups were males and were of rural residence. The study revealed several key risk factors that significantly contributed to the occurrence of pulmonary tuberculosis (PTB). Individuals with lower educational attainment, specifically those who had not completed secondary education, were found to be more susceptible to PTB. Additionally, occupation played a crucial role, with farmers and laborers being more vulnerable to the disease. Socio-economic status was also a determining factor, with those from poorer backgrounds being at higher risk. Furthermore, a history of asthma and tobacco use were identified as significant risk factors, suggesting that pre-existing respiratory conditions and smoking habits can increase an individual's likelihood of developing PTB. These findings highlight the importance of addressing social determinants of health and managing underlying health conditions to prevent and control PTB.Cheng J et al. conducted a study to assess the incidence of tuberculosis (TB) and its associated risk factors in individuals aged 65 years and older. During a two-year follow-up, 215 new cases of active TB were recorded, with 62 cases confirmed as bacteriologically positive. The incidence rates for active TB and bacteriologically confirmed TB were found to be 481.8 per 100,000 person-years and 138.9 per 100,000 person-years, respectively. Notably, the number of cases identified through active case finding was significantly higher. Factors such as being male, belonging to a non-Han ethnic group, having a history of TB treatment, being a current or former smoker, and having a body mass index (BMI) below 18.5 were identified as independent predictors of TB disease. Among these, the most significant predictor for bacteriologically positive TB was selfreported smoking status (18.06%). In contrast, the leading risk factor for active TB was non-Han ethnicity (35.40%), followed by male gender (26.80%) and age 75 years or older (10.85%). The findings indicate a high incidence of TB among the aging population, suggesting that the National TB Program (NTP) should prioritize interventions for the elderly.¹²In another previous study conducted by Fahdhienie F et al, authors assessed the risk factors of pulmonary tuberculosis. A comprehensive evaluation identified 16 risk factors. Hierarchical multivariable logistic regression models were employed to investigate the relationship between these risk factors

and the incidence of tuberculosis (TB). The study comprised 196 cases and an equal number of controls. Through multivariable logistic regression analysis, 11 independent predictors for TB occurrence were determined after adjusting for potential confounders. Individuals residing in homes with inadequate light exposure exhibited a 77-fold increased likelihood of developing TB compared to those in well-lit environments. Additionally, the findings indicated that individuals with close contact to TB patients, limited knowledge about TB, existing comorbidities, inadequate food utilization, negative preventive behaviors. low educational attainment, and insufficient humidity in housing were linked to a heightened risk of TB. Conversely, factors such as employment status, income exceeding the minimum wage, and adequate nutritional intake were found to be protective against the development of TB.¹³

Conclusion

Education qualification of less than secondary, farmer/labourer occupation, poor socio-economic status, history of asthma and tobacco history were found to be significant risk factors for occurrence of PTB.A high degree of clinical awareness of the possibility of TB should be considered in patients with these risk factors, and active screening and prevention should be undertaken.

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