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ASSESSMENT OF RISK FACTORS FOR TUBERCULOSIS: A RETROSPECTIVE STUDY

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ABSTRACT

Background: Tuberculosis remains a major public health threat throughout the world particularly in developing countries. Emerging variables including diabetes, indoor air pollution, alcohol, usage of immunosuppressive medicines, and cigarette smoke have a substantial effect at both the individual and population level, in addition to known risk factors (such HIV, malnutrition, and young age). Objective: The aim of the study was to determine the tuberculosis risk factors among TB patients diagnosed in Karuna Medical College Hospital (KMCH), Vilayodi, Chittur. Method: A Retrospective cross-sectional, document review was conducted in KMCH, Palakkad. TB confirmed patients who were registered in the KMCH for treatment during the 2-year study period from January 2020 to April 2022 were included. Result: A total of 80 patients were included in this study. Males were 71.25%, with majority (31.25%) of participants were aged 55-64 years. Of overall, 43.75% were smear-positive and the majority (52.5%) were PTB. Considering the risk factors, rural residence (67.5%), unemployed (52.5%), smoking (23.75%) and Diabetic (43.75%). Conclusion: Patients with particular risk factors for TB should be evaluated before, during, and after therapy as they have an increased chance of developing TB. Public health authorities may be able to decide which subpopulations to target and where to put more effort by identifying the predictors of TB.

Key words: Tuberculosis, Pulmonary TB, Extra pulmonary TB, Risk factors.

INTRODUCTION

Almost one-third of the world's population is infected with Mycobacterium tuberculosis bacteria, which carries a 10% lifetime risk of getting TB disease². Both genders and age groups are affected by the public health issue known as tuberculosis (TB), which is also the world's number one infectious cause of death¹. Globally, these are estimated to be 10 million cases of TB and 1.5 million fatalities each year. Two are located in the WHO African area out of the 30 nations with the highest TB burden in the world⁶. Globally, an estimated 10.6 million (95% UI: 9.9-11 million) persons contracted TB in 2021, up from 10.1 million (95% UI: 9.5-10.7 million) in 2020³. One of the causes of tuberculosis (TB) is *Mycobacterium tuberculosis* (MTB)¹. *M. africanum*, *Canetti*, and other pathogens only

cause a small number of human cases. *M. africanum*, *M. canetti*, *M. caprae*, *M. microti*, and *M. pinnipedii* are only responsible for a small portion of human cases. *M. bovis* was historically a significant cause of human disease, but its relative relevance has significantly decreased⁴. MTB mostly affects the lungs and causes pulmonary tuberculosis (PTB), but it can also infiltrate other body sites and result in extra pulmonary tuberculosis (EPTB) or a disseminated disease¹. Lymphadenitis, military TB, pleural TB, CNS TB, bone and joint TB, Genito-urinary TB, abdominal TB, and meningeal TB are only a few of the different kinds of extrapulmonary TB⁵.

When a person with an active illness cough, sneezes, sings, or talks, Mycobacterium TB can be spread

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through aerosols or droplets. Infected people have a 5-15% lifetime risk of getting sick within 2–5 years after contracting the infection, even though they may not show signs of TB (latent TB)⁶. HIV co infection increases the probability of disease progression due to conditions that change the immune response. A bigger portion of the population is impacted by diabetes, alcohol, malnutrition, tobacco smoke, and indoor air pollution, which speed up the progression of TB disease⁷. Moreover, there is a larger chance of getting TB symptoms in youngsters and older persons. These may include phlegmy cough, fever, chills, exhaustion, appetite loss, and weight loss. According to reports, if a TB patient is not treated, they can infect 10 to 15 additional persons on average each year. If the patient is not treated, it has been estimated that one TB patient with an active infection can annually infect 10 to 15 persons on average⁶. We conducted this study to determine the tuberculosis risk factors among TB patients diagnosed in Karuna Medical College Hospital (KMCH), Vilayodi, Chittur.

MATERIALS AND METHODS

It is a retrospective cross sectional, record-based study conducted in medical record department (MRD) at Karuna Medical College Hospital (KMCH), Vilayodi, Chittur, Palakkad. We included all TB confirmed patients who were registered in the KMCH for treatment during the 2-year study period from January 2020 to April 2022.

Inclusion criterion

Patient diagnosed with pulmonary and extra pulmonary TB (histopathological/clinical) with complete information recorded in the TB register are included.

Exclusion criterion

The patient's data register in which treatment outcomes are missing. Patients who were transferred to other districts / hospitals are excluded from the study and the patients who cannot be contacted through telephone.

Data collection

All the data was collected by using pre designed data collection form, the standard TB register, laboratory findings and monthly follow up form was reviewed to generate the required data.

Variables

The variables studied were: sex, age, area of residence, employment status, past medical and medication history, history of consumption of tobacco and alcohol, TB contact, HIV co-infection, diagnosis, previous history TB treatment, drug resistance, treatment regimen, initial and final dates of the treatment, treatment outcome (cured and completed, failure, loss to follow up and died).

Ethical approval

The study was approved by the institutional ethical committee of Karuna Medical College (KMC/IHEC/20/2022).

Procedure

TB register was utilized to identify all recorded patients who were confirmed with TB during the period of January 2020 to April 2022. The information was retrospectively reviewed paying attention to the patient's demographic variables. Patients with pulmonary and extra pulmonary disease were considered and only those patients with complete information recorded in TB register are included for analysis.

Risk factors from TB patient documents were collected. For each patient information regarding lifestyle factors (smoking habit, alcohol use, injectable drug use, primary occupation) and clinical characteristics such as comorbid conditions (diabetes mellitus, malignancy, immunosuppression, ESRD, MDR-TB, HIV) were recorded.

Method of diagnosis: Bacteriological e.g., smear analysis, culture, radiological, pathological and radio pathological. We also considered schedule of treatment (recommended treatment regimen).

Statistical analysis:

The data was entered in MS excel and analyzed using distributive frequency.

RESULTS

Socio-demographic factors:

A total of 80 participants diagnosed with TB were included during the study period of 2020 to 2022. Study patient's characteristics are shown in table 1. Males were 57 (71.25%) and most of patients belonged to age group ranging between 55-64 (31.25%) followed by those above 65 years. Out of 80 participants, 38 of the cases were reported in 2021(47.5%).

Majority of the patients (52.5%) had pulmonary TB, in which 85% were newly diagnosed and 15% were relapsed. There was only one case which was reported with multi-drug resistance TB. Positive smear microscopy was found in 38 patients (47.5%) and none of them were co-infected with HIV condition.

TB factors

Patients without any social habits (50%) were found to be more regardless of the fact that those with habits of smoking and both smoking along with alcoholism were reported to be 23.75%.

Although 35 patients had history of TB (43.75%) and 11 of the patients had hypertension whereas the remaining of them were either diagnosed with other chronic condition (22.4%) or without any past medical history.

More number of patients with TB were not associated with contact with other TB patients (78.75%) and only 21.25% had contact. Considering the occupational factors associated with TB, only 8(10%) of them was employed with high-risk occupation and majority of the study population were unemployed (52.5%).

Majority (31.25%) of the study participants were aged between 55-64 years, followed by those aged above 65 years (23.75%), 45-54 years (16.25%), 35-44years (10%), 18-24 years (7.5%), <18 years (6.25%) and 25-34 years (5%). Majority of the patients were males with 57 (71.25%) while, females with 23 (28.75%). The highest number of cases were registered in 2021(47.5%) followed by 2020(42.5%) and 2022(10%). Most of the participants were from rural areas (67.5%) and the remaining were from urban areas (32.5%). Majority of the patients were unemployed (52.5%) followed by employed (33.75%) and high-risk (10%) occupations like healthcare workers, mining communities and other occupations with elevated exposure to silica dust and unknown (3.75%).

Most of the TB patients i.e., 68 out of 80(85%) were newly diagnosed cases and 12 (15%) belongs to relapse category. Pulmonary TB was the most common

type of TB (51.25%, n=41), extrapulmonary TB (47.5%, n=38) and only one patient contributed to both category (EPTB and PTB). In this study there were no patients who were co-infected with HIV i.e., majority of the patients are non- reactive (96.25%) and unknown results were 3.75%. Among 80 TB positive cases, only one of them showed multi drug resistance (1.25%). Out of 80 participants, almost 47.5% of the patients were smear positive whereas 41.25% were having unknown result and negative smear test (11.25%).

Majority of the patients reported with TB were not having any social habits (50%) followed by smoking and those with smoking along with alcoholism (23.7%) each and alcoholism (2.5%). Among TB patients, Diabetes Mellitus contributed to a greater number of patients i.e., 43.75% followed by patients with no medical history, hypertension (13.75%), asthma and COPD (6.2%) and others (10%). Majority of the patients were not having contact with the TB patients (78.75%) whereas the remaining were having TB contact (21.25%). Of all the patients diagnosed with TB 76.25% of them were vaccinated for BCG, 17.5% of them were unknown results and 6.25% were not vaccinated.

Table 1: Demographic characteristic of study participants.

Parameters	Number of patients (n=80)	Percentage (%)
Age group		
<18	5	6.25
18-24	6	7.5
25-34	4	5
35-44	8	10
45-54	13	16.25
55-64	25	31.25
>65	19	23.75
Gender		
Male	57	71.25
Female	23	28.75
Year of registration		
2020	34	42.5
2021	38	47.5
2022	8	10
Area of residence		
Rural	54	67.5
Urban	26	32.5
Primary Occupations		
Unemployed	42	52.5
Employed	27	33.75
High risk	8	10
Unknown	3	3.75

Table 2: Clinical characteristics.

Parameters	Number of patients (n=80)	Percentage (%)
Category of patients		
New case	68	85
Relapse	12	15

Site of TB infection		
Pulmonary TB	42	52.5
Extra pulmonary TB	37	46.25
Both	1	1.25
HIV status		
Non-Reactive	77	96.25
Unknown	3	3.75
Reactive	0	0
MDR-TB diagnosed		
NO	79	98.75
YES	1	1.25
Smear Result		
Positive	38	47.5
Negative	9	11.25
Unknown	33	41.25

Table 3: Risk factors for TB.

Risk factors	Number with risk factors	Percentage %
Social habits		
Smoking	19	23.75
Alcoholism	2	2.5
Both	19	23.75
Nil	40	50
Past medical history		
Diabetes mellitus	35	43.75
Hypertension	11	13.75
Asthma	5	6.2
COPD	5	6.2
Other	8	10
Nil	30	37.5
TB Contact		
No	63	78.75
Yes	17	21.25
Vaccinated For BCG		
Yes	61	76.25
No	5	6.25
Unknown	14	17.5

Figure 1: Distribution of Primary Occupation.

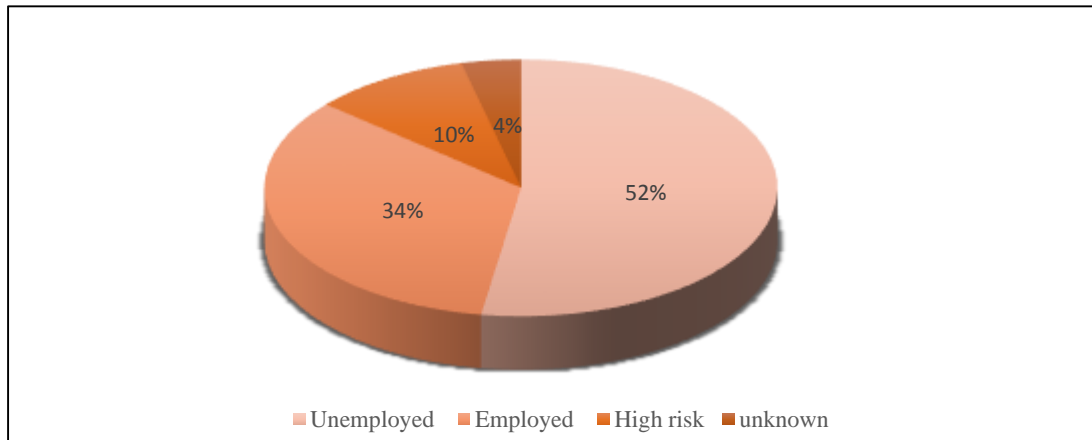
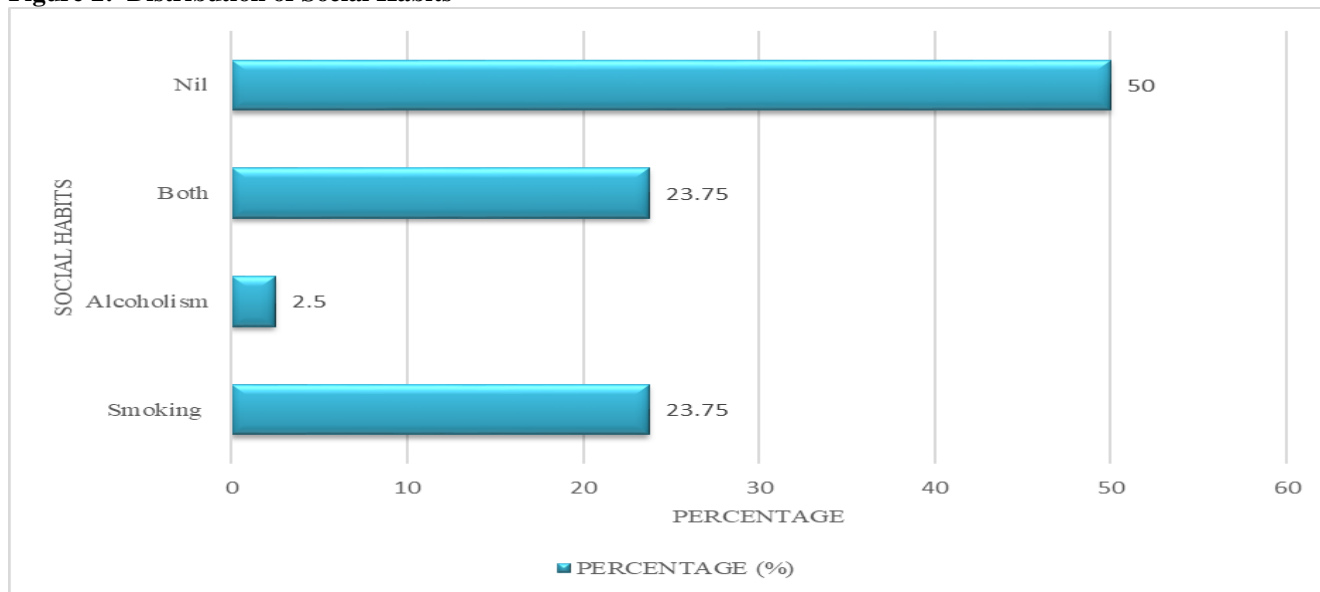


Figure 2: Distribution of Social Habits



DISCUSSION

The risk of progression to infection and disease is two different aspects and proper understanding of these factors is essential for planning TB control strategies.⁸ The risk of developing TB after exposure is primarily influenced by exogenous variables, which include the infectiousness of the source case, the closeness to contacts, and social and behavioral risk factors like smoking, alcohol use, and indoor air pollution.⁷ Several studies have supported the strong confounding effects of age and sex on the incidence of TB globally and in India.⁹⁻¹⁰ Studies from South India have also shown that the prevalence of TB was higher in males than females at all ages: it was low in children under 10 years of age, increasing appreciably with age and reaching a peak between 20 and 40 years of age.¹¹⁻¹²

The elderly is particularly susceptible to the tuberculosis (TB) epidemic, and thus people age, the notification rate gradually rises. The majority of elderly TB cases are associated with the reactivation of the dormant lesions. The immune system’s aging related alterations, particularly the decreased capacity to reactivate previously acquired immunity, or other variables are to account for the emergence of these lesions¹³.

Males have higher incidence of TB than females, and they are more likely to be exposed to the disease or to seek medical attention. Due to socio economic limitation, women may also underreport their illness and seek care outside of medical facilities¹⁴. According to studies, there are more cases of TB in rural regions because of factors including poverty, consuming contaminated milk, being exposed to diseased cattle’s cough spray, or having close physical contact with infected animals¹⁵.

Unemployment has been identified as a significant risk factor for TB in numerous studies

according to 2006- 2008 Croatian survey, 23% of unemployed adults have TB. The risk of developing tuberculosis is more than 4 times higher among those who are unemployed in Greenland. According to Brazilian experts, being unemployed increased one’s risk of developing TB and greatly prolonged one’s time to treatment.¹⁶

According to a study by Assefa *et al.*, the retreatment category included 3% of the patients. Studies in Enfranz (2.4%), Sidama Zone (5%) and Metema (5.7%) showed similar results; this could be because of the study locations, sample sizes, and times were different.¹⁴

A study conducted by Chandrasekhar *et al.*, revealed that pulmonary TB (PTB) is more compared to extra-pulmonary TB (EPTB) as EPTB is less infectious than PTB.¹⁷ The majority of the study participants, according to a study by Evelyn *et al.*, were HIV negative. This is consistent with 2015-2016 survey on TB prevalence in Kenya, which found that up to 85% of people with TB there were HIV negative.¹⁸ The diagnosis of MDR TB was another risk factor that raised the probability of TB specific mortality without significantly raising known- specific mortality. It is carried on by an organism that is resistant to at least the two most effective and widely used anti-TB medications, isoniazid and rifampicin.¹⁹

This study reported that smear-positive cases were the highest cases than the smear-negative cases which are in concordance with Amany *et al.*, who found that there was higher incidence rate of new adult smear-positive cases.¹⁵ According to the study of the literature by E Lesinc *et al.*, cigarette use, alcohol consumption, and other dangerous behaviour have the highest effects on all phases of the pathogenesis of tuberculosis. The most common addiction was smoking cigarettes. Less common was the alcohol abusers as a subgroup and drug addicts.²⁰

The majority of patients in our study suffered from diabetes mellitus, followed by hypertension, asthma and COPD. According to a study by Nissapatorn *et al.*, (2005c), diabetic people have a higher risk of developing tuberculosis (TB) than non-diabetics do. Regarding radiological findings, they discovered no difference between those with and without diabetes. Diabetes mellitus was listed as a risk factor for tuberculosis by Ismail (2004).²¹ In our study majority of the cases were having no contact with the infected persons. According to a study by J E Sprinson *et al.*, the TB patient might be unable or unwilling to divulge information regarding contacts. There were three times as many contacts of smear-positive cases as smear-negative cases.²²

Of all the patients diagnosed with TB 76.25% of them were vaccinated for BCG, 17.5% of them were unknown results and 6.25% were not vaccinated. The Bacille Calmette-Guerin (BCG) has a documented protective effect against meningitis and disseminated TB in children. It is most widely used of current vaccines reaching >80% of neonates and infants in countries where it is part of the national childhood immunization programme.²³

CONCLUSION

The most effective methods for reducing the risk of developing TB disease in high-risk groups (close contacts, people living with HIV, healthcare workers, etc.) remain to be TB screening (to identify latent TB infection)

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and prophylactic therapy, which should also be taken into consideration in endemic countries to slow the progression from infection to disease. Our study revealed that most of the patients diagnosed with TB was males and majority of them were within the age group of above 55 years. So, the major risk factors linked to TB was found to be age, sex, smoking habits, diabetes mellitus, unemployment and rural residence. Based on the findings of this study, we recommend that frequent supportive supervision and health education programs for patients with a high risk of developing TB should be carried out.

LIMITATION

Our study has a number of limitations. The use of data from a passive surveillance system may have resulted in inadequate acquisition of data for some variables. We were unable to investigate the impact of consuming alcohol and smoking on TB. A tertiary care hospital served as the source of the patients. Hence, it is possible that the instances we looked at aren't typical of what happens in the general population.

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