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Research Article

Retrospective study of Latent Tuberculosis infection among contacts of tuberculosis patients

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ABSTRACT

Background: Retrospective study of Latent Tuberculosis infection among contacts of tuberculosis patients.
Aims and Objective: To find out the burden of latent tuberculosis infection among contacts of tuberculosis patients.
Material and Method: This retrospective study was conducted by collecting four years data of contacts exposed to tuberculosis patient from Intermediate Reference Laboratory, Tertiary care hospital in Sikkim.Case report form of the patients for a period of four years from January 2022 till December 2025 was analysed. Latent tuberculosis infection was diagnosed by Interferon Gamma Release Assay using Quantiferon Tuberculosis Gold Plus test.
Results: Out of 724 contacts ,295 (40.74%) was found to be positive for latent tuberculosis infection. The sex ratio among positive contacts was (1:1.25) .The age group was ranging from 4 years to 89 years of age.
Conclusion: The Latent tuberculosis infection was found to be about 40.74% among contacts of tuberculosis patients.This study can guide the physician for early diagnosis and treatment of latent tuberculosis infection to reduce the burden of tuberculosis in the society.

Keywords: *LTBI,MTB,TB,WHO.*

INTRODUCTION

Latent tuberculosis infection (LTBI) is defined by the World Health Organization(WHO) as a state of persistent immune response to stimulation by Mycobacterium tuberculosis (MTB) antigens without evidence of clinically manifested active tuberculosis (TB)(1). The US Centers for Disease Control and Prevention defines LTBI as a person who is infected with Mycobacterium tuberculosis but has no clinical signs or symptoms of active tuberculosis(2). It is estimated that 23% of the world's population is infected with MTB and at risk of developing active TB. Latent tuberculosis infection can progress to active TB disease in roughly 5% to 15% of infected individuals over their lifetimes(3) .While most people with latent infection never develop the disease, the risk of progression is highest within the first 2 years after initial infection. Patients with latent TB infection are asymptomatic. Active tuberculosis disease must be excluded before testing for latent TB infection.

This hospital based retrospective study was done to find out the burden of LTBI among contacts of Tuberculosis patients .Chauhan A et al published a systemic review and metaanalysis in the Indian Journal of Medical Research in the year 2023,they analyzed data from 77 studies (including 31 cohort studies) from 2013-2022, there was pooled LTBI prevalence ,irrespective of risk, estimated at 41% (95% CI: 29.5-52.6%) based on community-based cohort studies while the general population prevalence,excluding high-risk was estimated at 36% (95% CI: 28-45%). They depicted a high LTBI burden among groups such as diabetes mellitus, smokers, malnourished, and alcoholics(4).Also in a cross-sectional study done in Rumtek monastery in east Sikkim , the overall LTBI rate was 44.2% (5).

Contact investigation is an essential component of the WHO's TB management algorithms to detect those with LTBI among high-risk groups, and to initiate tuberculosis preventive treatment (TPT). Individuals of all ages who are in contact with patients with active TB infection are at a significantly increased risk of developing a new TB infection. WHO advocates that trained staff should elicit the required information from the index TB patients and counsel patients and their family members on the importance of LTBI testing, TPT initiation and completion.

WHO recommends the tuberculin skin test (TST) or interferon-gamma release assays (IGRA) to detect LTBI. IGRA results in fewer false-positive results than with TST (8). IGRA results are not affected by Bacille Calmettee Gue´rin (BCG)-vaccination and by the majority of environmental mycobacteria; moreover, only one patient-visit is required. However, since these assays are based on an immune response detection, they have a poor sensitivity in children and in immune-compromised subjects furthermore, they do not discriminate between active TB and LTBI and poorly correlate with the risk of developing active disease. Exclusion of active TB is to be done by sputum Catridge based nucleic acid amplification test (CBNAAT) before the diagnosis of latent TB infection is made . Identifying and treating patients with latent tuberculosis infections is critical for NTEP goals.

METHODOLOGY:
This present study was done in Intermediate Reference Laboratory in a tertiary care hospital.The case report form data containing age,sex,demographic details of the contact, past history , any treatment history was collected for analysis from IRL laboratory register from January 2022 till December 2025 for a period of 4 years maintained in the laboratory.
Statistical analysis:Data analysis was done using excel .Categorical variables were presented as percentages .
Institutional Ethics Committee clearence was taken for the study.

RESULTS :
There was a total of 724 blood samples from suspected contact during the period of four years from January 2022 till December 2025. Out of 724 only 295 (40.74%) blood sample was positive IGRA while out of remaining 429 (59.25%) there was 91 (12.56%) was indeterminate and 338 (46.68%) was negative . (Table 1). In the year 2022, out of 299 samples tested for LTBI, 126 (42.14%) were positive, 161 (53.84%)were negative and 12 (4.01%) were indeterminate.In the year 2023, out of 103 samples tested for LTBI, 34 (33.00%) were IGRA positive, 26 (25.24%) were IGRA negative and 43 (41.74%) were IGRA indeterminate.In the year 2024, out of 132samples tested for LTBI, 53 (40.15%) were IGRA positive, 69 (52.27%) were IGRA negative and 10 (7.57%) were IGRA indeterminate.while in the year 2025, out of 190 samples tested for LTBI, 82 (43.15%) were IGRA positive, 82 (43.15%) were IGRA negative and 26(13.68%) were IGRA indeterminate.

The age group was ranging from 4 years upto 89 years among IGRA positive during the entire four years period.The median age was 33years,29 years,29 years,39years among the 126,34,53,82 IGRA positive in the year 2022,2023,2024 and 2025 respectively.(Table no 2)

The overall male to female sex ratio was (1:1.25) .In the year 2022, out of the 126 IGRA positives, 52/126 (41.26 %) were males, 74/126 (58.73%) were females. In the year 2023, out of the 34 IGRA positives, 16/ 34 (47.05%) were males, 18/ 34(52.94%) were females. In the year 2024,out of the 53 IGRA positives,16/53(30.18%) were males, 37/53 (69.81%) were females.In the year 2025,out of the 82IGRA positives,47/82 (57.31%) were males, 35/82 (42.68%) were females.(Table no.3)

Table 1.Total blood samples tested for IGRA from January 2022 till December 2025

YEAR	IGRA Positives	IGRA Negatives	IGRA Indeterminates
2022	126/299 (42.14%)	161/299 (53.84%)	12/299 (4.01%)
2023	34/103 (33.00%)	26/103 (25.24%)	43/103 (41.74%)
2024	53/132 (40.15 %)	69/132 (52.27%)	10/132 (7.57%)
2025	82/190 (43.15%)	82/190 (43.15%)	26/190 (13.68%)
Total	295/724 (40.74%)	338/724 (46.68%)	91/724 (12.56%)

Table no 2. Age distribution among IGRA Positives :

Age groupsin y ears	2022 Year	2023 Year	2024Year	2025Year	Total
<10	23	3	1	1	28
11-20	25	8	6	5	44
21-30	44	11	20	15	90
31-40	21	7	11	28	67
41-50	9	3	9	9	30
51-60	3	2	4	17	26
>60	1		2	7	10

Table no 3. Sex Distribution

Sex	2022	2023	2024	2025
male	52/126 (41.26%)	16/ 34 (47.05 %)	16/53 (30.18%)	47/82 (57.31%)
female	74/126 (58.73%)	18/34 (52.94%)	37/53 (60.81%)	35/82 (42.68%)
Total IGRA positives	126	34	53	82

DISCUSSION:

The national tuberculosis prevalence survey done in the year 2019 till 2021 estimates that the prevalence of LTBI in India was found to be 33%(6). Studies from Vietnam, Indonesia and Philippines reported LTBI rates from 30% to 50% in high risk groups(7). Similarly a meta analysis done by Chauhan A et al where 41% prevalence was seen in a community based cohort study in population with high risk groups(4). However in our retrospective hospital based study, the LTBI positivity was around 40.74%.

The proportion of infection rises with age especially in Africa and south east region, where there was more LTBI in the younger age groups while in Europe and American regions older age group was affected(8).An increasing trend of TBI was observed with increasing age in India(4).However our study also shows Latent bacterial tuberculosis infection mostly among adult age group.

For detecting LTBI infection ,there are three standard tests namely Tuberculin skin test (TST), Interferon-gamma (IFN-γ) release assays (IGRA) and Cy-TB test. In the present study IGRA was used for diagnosing Latent Tuberculosis infection. Majority of the LTBI individuals (around 90 − 95%) remain latent throughout their life and rest develop active cases of TB. However, deficiency in immunity level can lead an individual to develop active TB(9).LTBI testing and treatment in high-risk groups, such as people living with HIV, and close contacts of TB cases will reduce the burden and subsequent re activation to TB disease. Risk of contracting TBI is significantly greater among household contacts compared to general population (10,11,12).

CONCLUSION:

The present study showed the positivity rate of Latent Tuberculosis Infection was 40.74% among contacts of tuberculosis patients by IGRA. Hence our study can guide the physician the need for prompt diagnosis and treatment of LTBI thereby reducing the burden of LTBI in the contacts and the possibility of re activation to TB disease .

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