

Research Article

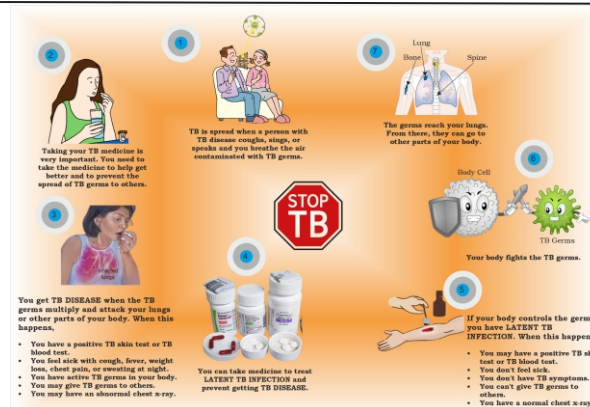
Outcome of Sensitization Programme on Latent Tuberculosis Infection Screening Tests Among Interns – A Questionnaire-Based Study

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HIGHLIGHTS

LTBI: Tubercle bacilli present without symptoms; not contagious; latent.**Progression Risk:** LTBI can progress to active TB, especially in immunocompromised individuals.**Testing:** Diagnosed via TST or IGRAs, crucial for high-risk individuals.**Treatment:** Antibiotics prevent active TB in those with LTBI.**Public Health:** LTBI identification and treatment reduce future TB cases.

GRAPHICAL ABSTRACT

(Image Courtesy: Division of Tuberculosis Elimination, National Center for HIV, Viral Hepatitis, STD, and TB Prevention, Centers for Disease Control and Prevention, U.S. Department of Health & Human Services. www.cdc.gov)

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ABSTRACT

Background: Latent Tuberculosis Infection (LTBI) is a state of persistent immune response to stimulation by Mycobacterium tuberculosis antigens with no clinical evidence of active TB. On an average, 5%–10% of the infected population will develop tuberculosis (TB) disease within the first 2 years. Timely and early detection and prophylactic treatment of people with LTBI are important for controlling TB Disease. Hence it is prudent to have adequate knowledge about the screening tests for diagnosis of LTBI. **Methods:** A total of 89 interns were administered a predesigned questionnaire before the sensitisation programme regarding knowledge, procedure and interpretation of screening tests for LTBI (tuberculin skin test [TST] and interferon-gamma release assay [IGRA]). The same questionnaire was repeated on the completion of the workshop to assess the outcome. **Results:** After statistical analysis, the baseline knowledge among interns was 42.11%, 55.75%, 17.85%, which improved significantly to 93.34%, 96.2%, 88.26% respectively post workshop. A statistically significant difference was observed pre- and post-workshop with respect to the knowledge and interpretation of TST and IGRA ($P < 0.000^*$). **Conclusion:** This questionnaire-based study highlights the importance of training interns on diagnostic modalities for LTBI. Current study findings showed significant improvement in the knowledge of the participants.

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INTRODUCTION

Tuberculosis (TB) stands as a persistent and historic challenge in global health, stemming from the bacterial pathogen *Mycobacterium tuberculosis*. This infectious disease, known for over a century, remains a significant cause of morbidity and mortality worldwide. Despite medical advancements, TB continues to afflict communities, particularly in regions with limited healthcare resources and poor socioeconomic conditions[1-3].

The causative agent, *Mycobacterium tuberculosis*, is a formidable bacterium capable of evading immune responses and establishing chronic infections within the human body. Spread primarily through the air via respiratory droplets, TB presents a communicable threat that can easily disseminate within populations. Once inhaled, the bacteria may colonize the lungs and trigger a cascade of immune reactions, leading to the characteristic symptoms of active TB, such as coughing, fever, weight loss, and fatigue. However, not all individuals exposed to *Mycobacterium tuberculosis* develop active TB disease immediately. Some individuals experience what is termed Latent TB Infection (LTBI), a state where the bacteria remain dormant within the body, eliciting a persistent immune response without causing overt clinical symptoms of TB. LTBI represents a crucial aspect of the TB continuum, as it serves as a reservoir for future disease reactivation and transmission[4-7]. The transition from TB infection to disease is influenced by various factors, including host immunity, pathogen virulence, and environmental conditions. In the case of LTBI, the immune system effectively controls the replication of *Mycobacterium tuberculosis*, preventing the progression to active disease [8]. This containment is often achieved through the formation of granulomas, which encapsulate the bacteria and limit their spread within the body. Despite the absence of symptoms, individuals with LTBI still harbor viable *Mycobacterium tuber-*

-culosis and thus pose a risk of disease reactivation under certain circumstances. Factors such as immunosuppression (e.g., HIV infection, malnutrition), aging, and comorbidities can weaken the host defenses, allowing latent infections to reactivate and manifest as active TB disease. Consequently, LTBI serves as a crucial target for TB control efforts, as identifying and treating latent infections can prevent future cases of active TB and interrupt transmission chains within communities[9-12].

Fortunately, the management of LTBI offers an opportunity for TB prevention and control. Screening individuals at risk for TB, such as close contacts of active TB cases or individuals residing in high-burden settings, enables early detection of latent infections. Subsequently, targeted interventions, such as preventive therapy with antibiotics like isoniazid or rifampicin, can effectively eliminate latent *Mycobacterium tuberculosis* and reduce the risk of disease reactivation [13-15].

Tuberculosis (TB) remains a formidable global health challenge, with *Mycobacterium tuberculosis* causing significant morbidity and mortality worldwide. Latent TB Infection (LTBI) represents a critical stage in the TB continuum, where individuals harbor dormant bacteria without exhibiting clinical symptoms. While most individuals with LTBI remain asymptomatic and non-contagious, they still pose a risk of disease reactivation, underscoring the importance of targeted interventions to prevent future TB cases and curb transmission within communities. **Figure 1** summarized the basic differences between active TB and Latent TB. Through early detection and treatment of latent infections, TB control efforts can achieve significant strides in reducing the burden of this ancient disease[16-18].

On an average, 5%–10% of the infected population will develop tuberculosis disease within the first 2 years. Risk is higher in children less than 5 years and immunocompromised individuals and risk is increased to >25 times among contacts of bacteriologically confirmed TB patients compared to general population. The need to prevent the development of active disease from LTBI has long been recognized. H-

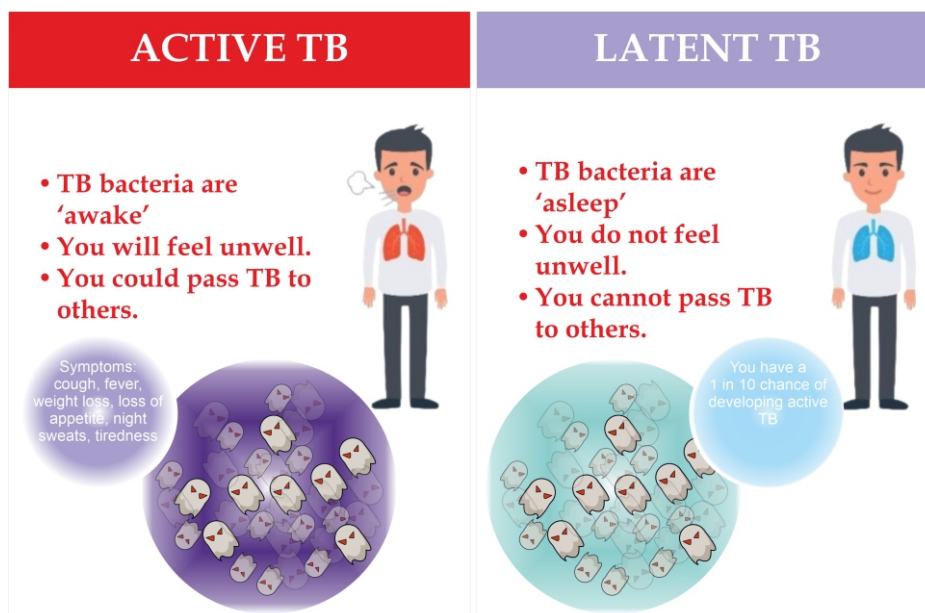


Figure 1: Difference between active TB and latent TB (Image Courtesy: UNISON Centre www.unison.org.uk & The Truth About TB www.thetruthabouttb.org)

-ence, timely and precise identification and prophylactic treatment of people with LTBI are important for controlling M. tuberculosis globally. As per the World Health Organization (WHO) recommendations prophylactic treatment has been administered to high risk populations[19-22].

Targeted testing is an essential TB prevention and control strategy that is used to identify and treat individuals with LTBI who are at high risk for developing TB disease. Identifying individuals with LTBI is essential to the goal of TB elimination because the treatment of LTBI can prevent infected individuals from developing TB disease and thereby stop the further spread

of TB to others. There is no gold standard test for LTBI, available screening tests provide indirect information on the presence of LTBI. Historically, the diagnosis of LTBI has relied on the use of the tuberculin skin test (TST). **Figure 2** summarized the diagnosis methods of latent TB infection. Studies have reported that sensitization programme on screening tests among health care workers had significant impact on knowledge and interpretation of screening tests and subsequent categorization for Tuberculosis preventive therapy. Studies have reported that the preventive effects of isoniazid preventive therapy last for many years[23-26].

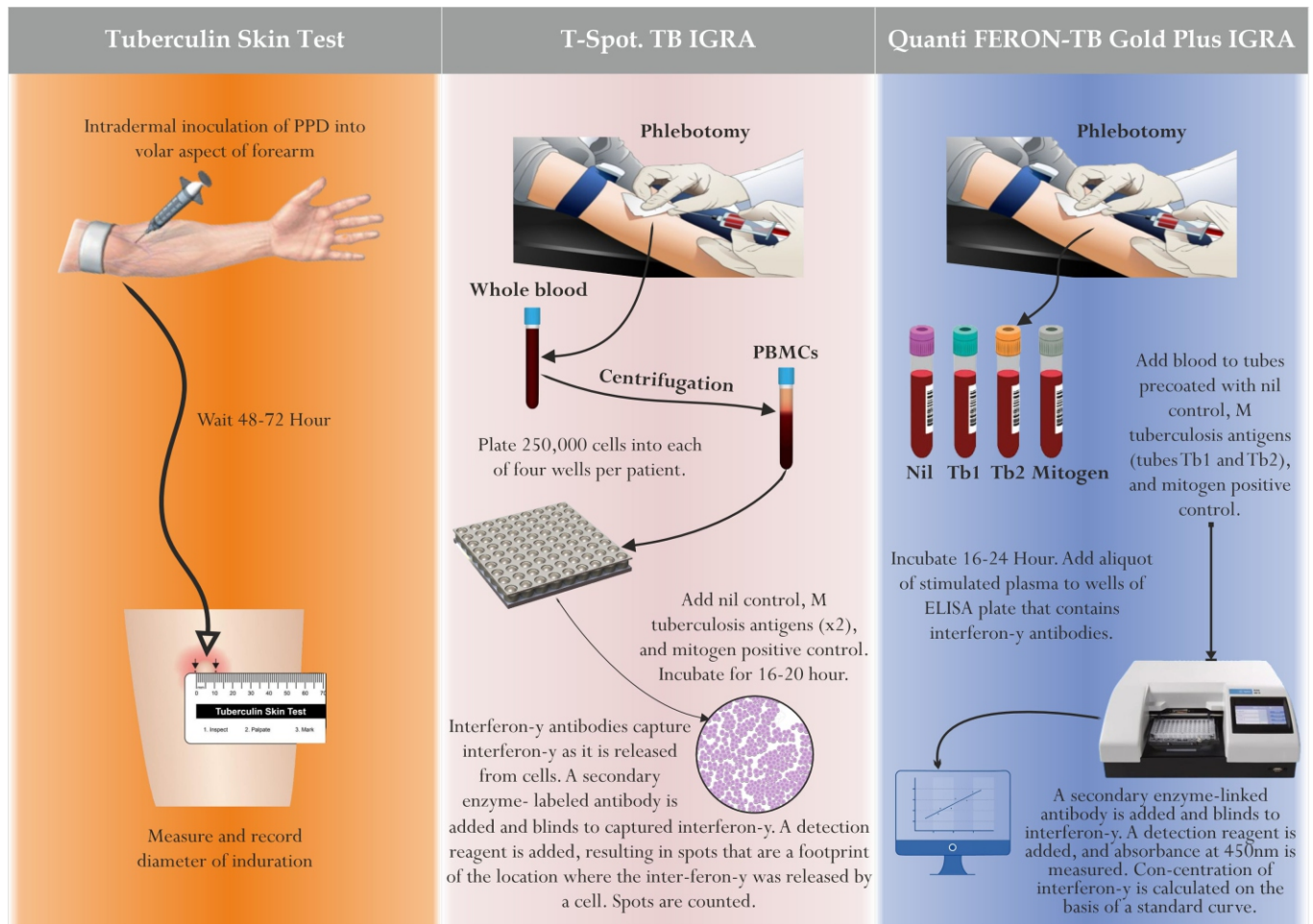


Figure 2: Latent Tuberculosis Diagnosis (Image Courtesy: Carpenter, S.M. and Bold, T.D., 2022) [27]

It is important that the health care workers and doctors to have the latest and adequate knowledge about these diagnostic modalities. However, knowledge among health-care workers has been found to be lacking, which could hinder the goal to stop TB in the country. By considering all these factors, this study was intended to assess the baseline knowledge of the participants(interns)about the screening tests for LTBI and to identify the lacunae in knowledge gap. The objective of the present study is to assess the baseline knowledge of the participants (interns) and impact of sensitisation about the screening tests for LTBI[28].

MATERIALS AND METHODS

Study Setting: This hospital based cross sectional study was conducted in rural tertiary care hospital, Sullia, Dakshina Kannada District of Karnataka, India. Approval was obtained from Institutional Ethics Committee dated 22/12/2023.

Methods: In this prospective, questionnaire-based study, A total of 89 interns was sensitized in 3 batches in December 2023. An oral informed consent was obtained from the participants before their participation in the study. Participants (interns) posted in various departments were asked to respond to a 25-item questionnaire before the sensitization programme (workshop) regarding knowledge, procedure and interpretation of screening tests for LTBI (tuberculin skin test [TST] and interferon-gamma release assay [IGRA]). The same questionnaire was repeated on the completion of the workshop to assess its impact. A-

Annexures I and II show the pre- and post-test questionnaire items to assess the knowledge. The questionnaire was pre-designed, self-administered consisting of questions related to technical aspects of screening tests for LTBI and centered mainly on TST (14 questions) and IGRA (11 questions).

Statistical Analysis

Data were presented in percentages and mean ± standard deviation for correct answers from the total answers received. A paired t-test was employed to compare the knowledge level among participants before and after the workshop. A P < 0.05 was considered statistically significant. Data was compiled and analyzed using the statistical software Excel version 20 (IBM Corp, Armonk, NY, USA).

RESULTS

Participants in this study were 89 interns (34 male and 55 female) posted in various departments. Baseline mean number of pre and post workshop answers attempted correctly by the study participants were 37.48±2 and 83.08±0.6 respectively (**Table 1**). **Table 2** represents pre and post workshop answers attempted correctly regarding tuberculin skin test.

Table 3 represents pre and post workshop answers attempted correctly regarding interferon-gamma release assay. **Figure 3** represents Distribution of pre and post workshop percentage of answers overall attempted on tuberculin skin test, interferon gamma release assays among interns. Statistically significance level was observed (<0.0001[†]) between pre and post workshop percentages among all the interns regarding knowledge of screening tests for LTBI.

Table 1: Pre and Post workshop answers attempted correctly by the study participants

Pre-Workshop	Post Workshop	t value	P-value	95% CI
37.48 ± 2.80	83.08 ± 0.66	9.5673	<0.0001*	45.02-64.64

Data are presented as Mean ±Standard deviation

Table 2: Pre and post workshop answers attempted correctly regarding tuberculin skin test

Pre-Workshop	Post Workshop	t value	P-value	95% CI
40.87 ± 2.32	85.62 ± 0.34	7.5853	<0.0001*	36.95-63.31

Data are presented as Mean ±Standard deviation

Table 3: Pre and post workshop answers attempted correctly regarding interferon-gamma release assay

Pre-Workshop	Post Workshop	t value	P-value	95% CI
15.88 ± 2.36	78.55 ± 0.81	8.8673	<0.0001*	43.67-81.57

Data are presented as Mean ±Standard deviation

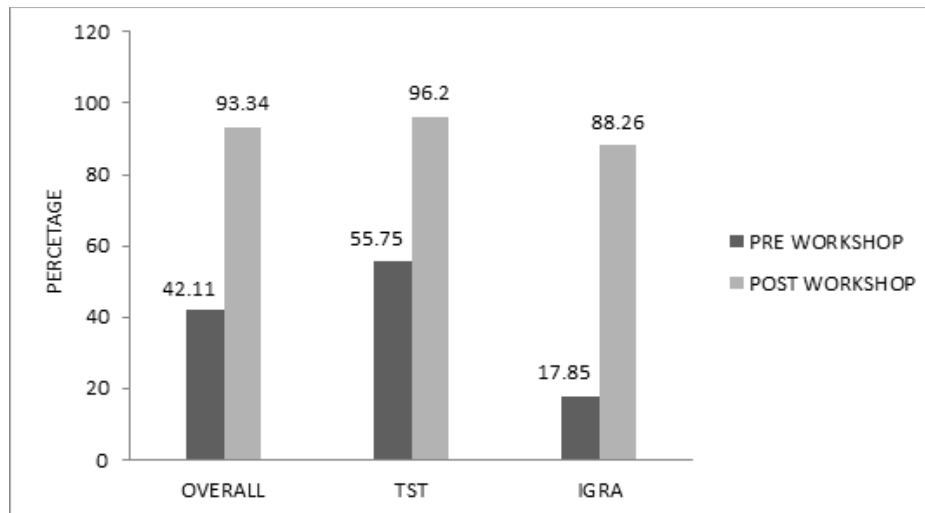


Figure 3: Distribution of pre and post workshop percentage of answers attempted by overall tuberculin skin test, interferon gamma release assays among interns.

(IGRA-Interferon gamma release assay, TST- Tuberculin skin test.)

DISCUSSION

TB in India is a disease of stigma in the community. Studies reported that substantial lack of insights on TB stigma and inability to differentiate between LTBI and TB disease led to the consequent delay in early identification of target groups, despite TB/LTBI sensitization misconceptions embedded in cultural beliefs and transmission and prevention persisted and apprehension of getting infected with TB was the cause for anticipated concealment and self-isolation stigma by participants on LTBI treatment[29-31].

This questionnaire-based study on screening tests for LTBI was conducted to determine the baseline knowledge of the participants (interns) and impact of sensitization. In the current study we found different gaps in the baseline mean knowledge among participants(interns) (42%) which increased significantly post-workshop (93.34%). An observational study done in India (Bengaluru) showed the mean baseline knowledge among technicians, nurses, postgraduates and interns was 42.9%, 42.1%, 51.9% and 53.6%, which improved significantly to 84.2%, 83.4%, 89.4% and 89.5%, respectively after the workshop []. Statistically, a significant difference was observed between pre- and post-workshop proportion of all health-care workers with respect to the knowledge of TST and IGRA and revealed that training increased the knowledge scores of the participants⁸. Study conducted in Udaipur showed the total mean percentage of correct answers were 67.03% which improved to 79.50% post training and revealed that the medical students had poor knowledge on screening tests and simple comprehensive TB training session had a positive impact on knowledge, attitude and preventive practices about TB[35-37]. An Indian study conducted on 200 tertiary care hospital staff nurses showed that 64% were having knowledge below average, 29% had average and only 6.5% were having good knowledge regarding DOTS. In a study conducted among medical interns showed that mean pretest score was 12.9±3 wh-

ich increased to 15.3±2.6 during post test following sensitization and knowledge regarding TB and RNTCP among interns were inadequate and learning tool was found to be effective in improving knowledge as compared to pretest[38-40].

CONCLUSIONS

Our study revealed that sensitization had a significant impact on the knowledge scores of the participants and highlights the importance of training the medical students on diagnostic modalities of LTBI. Current study had its limitations since it is not multi centric findings cannot be generalized to health-care workers of different centers.

ETHICS APPROVAL

All necessary approval including ethical approval has been taken before conducting this study.

AVAILABILITY OF DATA AND MATERIAL

Not Applicable.

CONFLICT OF INTERESTS

Authors declared that there is no conflict of interest.

FUNDING

Research work was not funded.

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