



## Prevalence of Positive Tuberculin Skin Test (TST) Results among Pre-clinical and Clinical Medical Students during their Educational Course in Mashhad, Iran

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### Authors' contributions

This work was carried out in collaboration between both authors. Author FH designed the study, supervised whole study and data analysis. Author AH managed the literature searches, data collection and writing first edition of manuscript. Both authors read and approved the final manuscript.

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### ABSTRACT

**Background:** Tuberculosis is an endemic and critical public health issue in Iran and many developing countries. Healthcare workers, including medical students are at a great risk of exposure. This study is conducted in order to determine the prevalence of latent tuberculosis infection in medical student in different stages.

**Materials and Methods:** This is a cross sectional study, conducted between August and December 2013. 195 medical students from different stages (preclinical, externship and internship) enrolled in this study. Tuberculin skin testing (TST) was used to determine the prevalence of infection with TB and the induration was measured. A standardized questionnaire was collected for risk-assessment analysis.

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**Results:** Among the 195 participant, 118 (60.5%) had indurations lower than 10 mm and 77 (39.5%) had indurations more than 10 mm. Induration  $\geq 10$  mm was taken as positive (P-value $<0.0001$ ).

**Conclusion:** TST positive results increase among medical students as they advance in their training program. The screening programs of healthcare student before clinical training can be useful for early identification and treatment of the sporadic cases of latent tuberculosis.

*Keywords: Medical students; prevalence; tuberculosis; tuberculin skin test.*

## 1. INTRODUCTION

Tuberculosis (TB) has become a major cause of morbidity and mortality, which can be an important risk to health care workers (HCWs) as well as susceptible patients. TB transmission occurs through droplet nuclei aerosolized by patients with infectious pulmonary TB and inhalation by other people. Several studies have suggested a high potential risk of infection by TB among medical students due to exposure to the virus during training in their senior years of study as well [1-4].

However, medical students in the basic phase of their training are not involved in patients' examinations or treatment. Moreover, risk of transmission to the medical students depends on the hospital ward, type of patients being treated and the effectiveness of infection control policies. The risk is the highest among personnel who are in contact with smear positive patients [5-6].

The health care system requires periodic screening of HCWs and medical students [2,7]. Tuberculin skin test (TST) is one of the most common and least invasive screening methods, which uses Mycobacterium, purified protein derivative (PPD), and is widely applied for the detection of Latent TB Infection (LTBI) (1).

Lack of knowledge about TB transmission, preventive precautions and diagnosis of the infection and disease has been reported among professionals and students of healthcare settings. Students can be exposed to occupational risks similar to those of HCWs. Therefore, the screening for LTBI in both healthcare workers and undergraduate students is highly recommended [8-9].

Hence, a study is carried out to compare the prevalence of TST conversion among undergraduate medical students at preclinical and clinical stages in City of Mashhad, Iran.

## 2. MATERIALS AND METHODS

A cross-sectional study was carried out between August and December 2013 to estimate the prevalence of positive TSTs among medical students in different stages. The study was approved by research ethics committee of the Azad medical university of Mashhad, Iran.

195 students participated in this study at different stages, (65 pre-clinical, 65 externship and 65 internship students). A questionnaire was completed by medical students to obtain information about age, gender, history of contact with Tuberculosis patients, household contact and BCG vaccination history. Tuberculin skin test was performed using the Mantoux method. The Mantoux test is given in the volar surface of the forearm using 0.1 (5 IU) (Span Diagnostics Ltd, India).

All participants were advised to return 72 hours after injection for measurement of skin reaction to Tuberculin, Then the widest transverse diameter of skin induration was measured in millimeters by ruler after 72 hours by a single investigator, the results were then entered into each student's questionnaire: induration  $\geq 10$  mm was taken as positive.

Statistical analysis was performed using the SPSS software (version 20).

P values less than 0.05 was considered statistically significant. Chi-square or the Fisher Exact tests were used to compare categorical variables whenever appropriate.

## 3. RESULTS

Of 195 examined students, 59 were male and 136 were female. Their ages spanned from 18-30, no student was lost during the follow up. 77 (39.5%) showed positive TST results making the overall prevalence of positive TST results of 39.5%, 7.6% of which were strongly positive (induration  $> 15$  mm) (Table 1).

**Table 1. Characteristics of pre-clinical and clinical medical students participating in the study**

	Positive	Negative	Total
Externship	32	33	65
Preclinical	10	55	65
The odds ratio	<b>OR=6.03</b>		
95%	<b>CI 95% (2.63 – 13.85)</b>		
The probability	<b>P-value&lt;0.0001**</b>		
	Positive	Negative	Total
Internship	34	31	65
Preclinical	10	55	65
The odds ratio	<b>OR=5.67</b>		
95%	<b>CI 95% (2.47 – 13.02)</b>		
The probability	<b>P-value&lt;0.0001**</b>		
	Positive	Negative	Total
Internship	34	31	65
Externship	32	33	65
The odds ratio	<b>OR=1.06</b>		
95%	<b>CI 95% (0.53 – 2.11)</b>		
The probability	<b>P-value=0.861</b>		
	Positive	Negative	Total
Externship+	66	64	130
Internship			
Preclinical	10	55	65
The odds ratio	<b>OR=5.67</b>		
95%	<b>CI 95% (2.66 – 12.08)</b>		
The probability	<b>P-value&lt;0.0001**</b>		

Among the students 26.2% had close contact with a known tuberculosis patients. The

prevalence of positive TST results among preclinical and clinical students included 10 (15.4%) preclinical students, 34 (52.3%) externship students and 33 (50.8%) internship students had (Fig. 1).

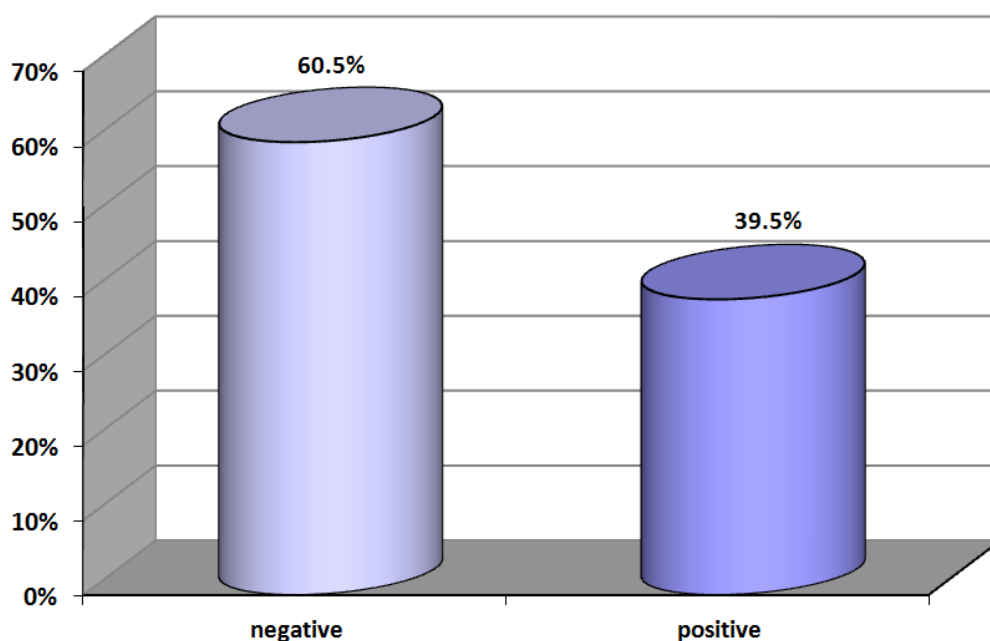
Positive TST result was found to correlate with contact with TB patients (P value< 0.001). No significant correlation was found between positive TST results and gender or age (p value = 0.587).

Preventive therapy was offered to all students with TST conversion, chest radiography was performed for strongly positive TST. There was no case of active TB among students with positive TST results.

#### 4. DISCUSSION

It is predicted that the total nationwide TB cases for 2014 will be about 16.75 per 100.000 people [10]. The incidence of TB has recently risen again due to increasing migrations and a higher rate of direct transmission such as occupational contacts and etc. [11].

In this cross-sectional study an attempt was made to determine the risk of infection and to correlate risk factors contributing to a positive Tuberculin skin test among medical students at pre-clinical and clinical stages.



**Fig. 1. Tuberculin skin test result**

Apart from health care workers, students involved in clinical training may also be at risk of exposure to Mycobacterium tuberculosis within the hospital setting, and very few studies have addressed this issue [11]. To the best of our knowledge, there are few studies that have investigated, using a large sample, both the prevalence of LTBI and the main risk factors associated with TST positivity among medical students [12]. The participants in this study had neither a previous history of TB nor any signs or symptoms compatible with tuberculosis infection during the study period. Our sample was characterized by a high prevalence of TST positive cases among medical students (39.5%).

In contrast to the study carried out by Durando et al. [8], in which there was no difference in respect to the prevalence of TST positive results comparing pre-clinical with clinical students but our study found a significant difference. In another study, Legesse et al. [13] reported a higher prevalence of TST positive in males than females, but this study showed no association between TST conversion and gender. Joshi et al. [14] also found that the incidence of TB among health care workers was significantly higher than the general population. Prevalence of LTBI among HCWs was 54% (33-79%), which was comparable with our findings.

High rates of positive TST results highlight nosocomial transmission during clinical rotations in medical students. In the hospital, where our study was being conducted, no specific TB infection-control program for medical students was being used. Considering the obtained results and the high transmission risk of TB from the patients, we highly recommend setting infection control measures and TB prevention strategies like annual tuberculin screening.

## 5. CONCLUSION

In summary, our study showed that TB is a significant occupational issue among medical students during their years of clinical studies. Our results confirm that LTBI screening programs should be included in healthcare settings.

## CONSENT

All authors declare that 'written informed consent was obtained from the patient (or other approved parties) for publication of data of this study'.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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