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Conversion of Tuberculin Skin Test in Adults

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ABSTRACT

Background: Tuberculosis is a major public health hazard. The tuberculin skin test is one of the diagnostic tools in this regard. Since BCG vaccination is performed during infancy in Iran, a positive tuberculin skin test (PPD) may confuse the physician. For this reason we performed this study on adults.

Materials and Methods: A descriptive study was performed on 433 soldiers between 2006 and 2007. Demographic data like age, level of education, family history of tuberculosis, place of residence, cigarette smoking, and chronic cough for more than 3 weeks, were collected from each patient. All patients had a history of BCG vaccination during infancy and its scar was detected in all of them. Purified protein derivative (PPD) test was performed. A 0.1 ml of 5TU PPD solution was injected intradermally into the volar face of the forearm and after 72h transverse diameter of the induration was measured in millimeters with a transparent ruler. Induration size greater than 10mm was considered a positive reaction. All patients were followed for one year and participated again in the second phase of PPD injection after one year. Data were analyzed by using SPSS software ver.13. Paired t-test and Chi-square test were used for statistical evaluation.

Results: All soldiers were male with a mean age of 23.2 ± 1.8 yrs. Twenty-three cases (5.3%) had positive tuberculin skin tests after one year. The highest level of education was high school diploma in 288 soldiers (66.5%). There was no significant correlation between the educational background and positivity of the tuberculin skin test ($p=0.219$). Twenty-two cases (5%) had a history of cigarette smoking which was significantly related to positive tuberculin skin tests ($p=0.001$). There was chronic cough in 44 (10.6%) soldiers which did not have any significant correlation with tuberculin skin test results ($p=0.6$).

Conclusion: This study showed that the prevalence of new cases of tuberculosis was more than 5% per year. Therefore, performing tuberculin skin test in BCG vaccinated adults is important. (Tanaffos 2008; 7(4): 55-59)

Key words: Tuberculin skin test, BCG, PPD, Soldiers, Tuberculosis, Iran.

INTRODUCTION

Tuberculosis (TB) is a major public health hazard in the world. It has been enhanced by human

immunodeficiency virus (HIV) epidemics because multi-drug resistant tuberculosis has developed after HIV epidemics (1). Based on CDC reports, there are 8 million new cases of tuberculosis per year (2). In developing countries, children are routinely vaccinated against tuberculosis due to its high prevalence rate which has resulted in decrease of

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severe forms of tuberculosis like meningitis and miliary tuberculosis. However, this vaccination has no long-term efficacy and adults will be susceptible to develop TB again (3). TB infection can be only evaluated by performing tuberculin skin tests and infected patients have no clinical manifestations like cough, sputum or fever and no risk of spreading the disease. Furthermore, tubercle bacillus can not be isolated. We use the term of "tuberculosis" when an individual has clinical signs and symptoms of tuberculosis and if she/he has cavitary pulmonary tuberculosis, the infection may be disseminated to closely-exposed individuals and making the diagnosis is possible by isolating *Mycobacterium tuberculosis*. One of the important methods to control tuberculosis is to find and treat TB patients in the community which is problematic. Since tuberculosis will not be diagnosed until the patient is symptomatic, tuberculin skin test can be an appropriate diagnostic tool for detection of latent tuberculosis infection in human beings (4).

When conversion of tuberculin skin test occurs in some cases, it can be used as a diagnostic method and will prevent spreading the disease (5). In Iran, BCG vaccination is performed during infancy; therefore, the positivity of PPD test may confuse the physician (6).

That is why we performed this study on adults to evaluate the probable conversion of PPD reaction for detection of new cases of TB each year.

MATERIALS AND METHODS

A descriptive study was performed on 433 soldiers with negative tuberculin skin test from 2006 to 2007.

Demographic data including age, level of education, family history of tuberculosis, place of residence, history of cigarette smoking and history of chronic cough for more than 3 weeks were collected from each participant. Those individuals who had a

history of close contact with a TB patient, had used immunosuppressive drugs like steroids, had a history of HIV infection, malignancies or active viral infection during the study period and those in whom tuberculin skin tests had been performed recently, were excluded from the study. All cases had a history of BCG vaccination during infancy and its scar was detected and recorded. PPD (Pasteur Institute, Iran) is a purified protein derivative of *Mycobacterium tuberculosis* which was injected to each subject using 26-gauge needle. A 0.1 mL of 5TU PPD (Tween 80, RT23) was injected intradermally into the volar face of the forearm and 72h after inoculation, the transverse diameter of the induration was measured with a transparent, plastic millimeter scale ruler by an experienced physician (7). Induration size more than 10 mm was considered a positive reaction (8). Those cases who had negative PPD test were followed-up for one year and then PPD test was repeated for them if they still had the same inclusion criteria. The results of first and second PPD tests were recorded in the questionnaires and analyzed by SPSS software ver.13. Paired t-test and Chi-square test were also used for statistical evaluation. A $p \leq 0.05$ was considered significant.

RESULTS

In this study, 433 soldiers of Baqiyatallah Medical Science University participated in our study. They were males with a mean age of 23.2 ± 1.8 yrs (range 20-31 yrs). Twenty-three (5.3%) cases had positive tuberculin test after one year and were considered as new cases of TB infection.

Most cases ($n=288$, 66.5%) had a high school diploma out of which 15 cases showed a positive PPD but there was no significant correlation between the level of education and conversion of PPD test ($p=0.219$).

Twenty-two cases (5%) had a history of cigarette smoking out of which 5 showed a positive PPD and

this correlation was statistically significant ($p=0.001$).

Forty-four soldiers (10.16%) complained of chronic cough. There was no statistically significant correlation between chronic cough and positive conversion of PPD ($p=0.6$). Demographic data and their relation to TB have been shown in Table 1.

Table 1: Variables and their relation to tuberculin skin test in soldiers

Variables		PPD positive	PPD negative	P-value
Level of education	Under diploma	5(3.8%)	126(96.1%)	0.214
	Diploma	15(5.15%)	276(94.8%)	
	Above diploma	3(4.9%)	58(95%)	
Cigarette smoking	Positive	5(22.73%)	17(77.27%)	0.001
	Negative	18(4.38%)	393(92.62%)	
Chronic cough	Positive	6(8.2%)	41(93.18%)	0.6
	Negative	23(5.14%)	369(94.86%)	
Fever	Positive	1(16.67%)	5(83.33%)	0.212
	Negative	22(5.15%)	405(94.85%)	
Family history of TB	Positive	0	3(100%)	0.681
	Negative	23(5.65%)	393(94.65%)	

DISCUSSION

This study showed that about 5.3% of the study group had conversion PPD test after one year which means that new TB cases had developed. Since soldiers sleep in the same sleeping quarters, TB infection can spread more easily. This finding is similar to that of other studies indicating that group living in indoor environments for long periods of time is a predisposing factor for development of tuberculosis. Thus, people who live together in an indoor environment for a long time are in danger of TB exposure even with a history of BCG vaccination during infancy. Annual screening for new cases of TB should be done for such people and anti-TB chemoprophylaxis should be administered if necessary (9, 10). In our study, all cases had a history of BCG vaccination during infancy. Although BCG

vaccination prevents severe forms of tuberculosis, we found that tuberculin skin test result is not influenced by BCG vaccination in a long period of time and it converts to negative resulting in risk of contracting TB in adults.

In TB endemic countries a positive PPD over the years after BCG vaccination indicates high possibility of new TB infection and should not be related to prior BCG vaccination during infancy (11, 12). Most studies considered induration size of >10 mm as positive; however, some studies considered an induration size >15 mm as a positive PPD test with a 100% possibility of new TB infection. In our study, more than 2% of cases had induration size of PPD test more than 20mm which indicated a 100% possibility of new TB infection (13, 14).

Cigarette smoking is a known factor in developing pulmonary diseases. Smokers persistently complain of cough. Whether bacterial infection or TB is the cause of producing cough, cigarette smoking is usually the more common cause of this problem. There was a significant correlation between a positive tuberculin skin test and cigarette smoking with a higher incidence of new TB infection among smokers in our study. Thus, TB should be considered in the differential diagnosis of respiratory signs and symptoms in smokers (15).

Chronic cough lasting for more than 3 weeks is a major symptom in patients with active pulmonary tuberculosis. However, there was no significant correlation between chronic cough and a positive PPD test in our study which was different from the results of other studies. Therefore, we should consider diseases other than TB in cases with chronic cough (16).

The educational background and place of living did not have significant correlations with positive tuberculin skin test but transmission of TB was seen more among illiterates or villagers because of

delayed referring for treatment (17, 18). In other studies a long and close contact with a patient with active pulmonary TB is a major factor for transmission of tuberculosis. Those who are in close exposure to TB patients should be evaluated for TB and sometimes an appropriate anti-TB treatment is also done for them. However, there was no significant relation between family history of TB and a positive tuberculin skin test in our study which can be due to the inadequate number of TB cases in the patients' family (19).

A prolonged fever is one of the symptoms of tuberculosis and a high percentage of patients with a fever of unknown origin (FUO) have TB especially in endemic areas. However, there was no significant association between fever and a positive PPD test in our study which may be due to non-tuberculous and short-term fevers in this group (20, 21).

This study indicated that the incidence of new TB infection in our study group was more than 5% per year. Therefore, having information about status of tuberculin skin test in adults in endemic countries is important for screening of TB and in case of confirmation of new TB infection, an early chemoprophylaxis can be done. An annual tuberculin skin test can identify new TB infection in high risk populations.

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