

## **Tuberculosis Screening Among University Female Students in an Academic Educational Setting in Saudi Arabia**

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**Abstract:** Screening is a fundamental approach for control and prevention of tuberculosis (TB). The aim of the current study was to determine the prevalence of TB among university female students in an educational setting in Saudi Arabia and to implement TB prevention and control program. A sample of 209 university female students completed the study. A cross-sectional design was used for tuberculosis screening. The study was conducted at an academic educational setting in the center region of Kingdom of Saudi Arabia (KSA). Two tools were applied for the study (1) a questionnaire which includes (a) socio-demographic data sheet, (b) Tuberculosis data sheet. And (2) a tuberculin skin test was used. The study results showed that 91% of the studied sample was tuberculin negative (-ve) while 9% was tuberculin positive (+ve). In comparison between tuberculin -ve and +ve female students, the study revealed tuberculin +ve female students were significantly older than tuberculin -ve ones. Moreover, cough was significantly prevalent among tuberculin +ve female students than tuberculin -ve ones. Infection control programs should be reinforced in the practical curricula of health sciences students. Applied control and prevention programs have a significant role in increasing the awareness of health sciences students regarding TB.

**Key words:** Control and prevention programs, health students, screening, tuberculosis.

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### **I. Introduction**

Tuberculosis (TB) continues to be a major health threat worldwide including developed countries. The World Health Organization (WHO), reported that approximately one-third of the world's population is infected with the bacillus mycobacterium tuberculosis. It ranks TB as the second leading cause of death from a single infectious agent, after the human immunodeficiency virus (HIV) and among the top three causes of death for women aged 15 to 44. However, WHO announced an urgent action plan against TB called Global Plan to Stop TB 2011-2015 [1].

In Kingdom Saudi Arabia (KSA), according to statistics issued by Saudi Ministry of Health (MOH) in the world tuberculosis day, 2014, the pulmonary tuberculosis incidence rate reached 9.31 cases per 100,000 persons whereas the non-pulmonary tuberculosis rate reached 4.34 cases per 100,000 persons [2]. A research has proved that KSA is facing an increasing public health threat from African and Asian immigrants with TB. There is a risk from people that are drawn to KSA for work and jobs that often bring immigrants in close contact with local people. For instance, many of Indonesian and Filipino migrants live in KSA households, as maids, cooks or drivers. The researchers contend that this close proximity is having an impact on the TB epidemiology in KSA with transmission more frequent in households that employ immigrants [3].

Control measures and programs should be able to manage those who are suspected to have the disease and provide assessment and diagnostic services [4]. Screening for tuberculosis is a key strategy for controlling and preventing infection in college and university campuses. Screening refers to the process of identifying persons at high risk for TB infection and disease. Early detection provides an opportunity to promote the health of the affected individuals and who are suspected to have the disease through prompt diagnosis and management while preventing spread to others [5].

According to ACHA guidelines, implementation of screening program is conducted through questionnaire and targeted testing procedure for diagnosing a latent TB infection (LTBI) using tuberculin skin test (TST) or interferon gamma release assays (IGRA) [6]. At present time, the Mantoux or (TST) is the only acceptable TST although the majority of researchers agree that there is possible cross-reactivity between TST and a Bacilli Calmette-Guerin (BCG) that may lead to false-positive results. A history of BCG vaccination shouldn't preclude TST but it may be preferable to using IGRA with persons who have received BCG

vaccination and persons unlikely to return for TST reading [7]. Identification and treatment of persons with LTBI is an essential part of effective tuberculosis control and programs in developing and developed countries [8]. So, to diagnose LTBI, the reaction is measured by TST. TST is recommended as a crucial first step diagnostic screening tool among high-risk groups such as people who interact with persons with active TB disease and health care workers who work with high risk population [9-10].

Studies have shown that TB is prevalent among persons who interact with persons with active TB disease, health care workers and health professional students. In a study carried out in an adult education center in the United States, 48 (18.5%) among a total of 259 adult learners involving educators, health providers and students of the education center had positive TB skin testing [11]. In a study among children in Greenland to examine the risk factors for mycobacterium tuberculosis infection (MTI) among children for the purpose of identifying those at highest risk of infection, MTI was diagnosed in 26.7 % of the children with TB contact as opposed to 6.4 % of children without such contact [12]. Another study carried out among nursing professionals in central Brazil, showed that a positive TST was detected in 69.5% [13].

In the western region of KSA, a study was conducted to determine the prevalence of TB infection by TST testing, a marked increased TST positivity was found in the age group of 15 to 24 years (19% in BCG negative and 30% in BCG positive subjects) [14]. In a study carried out to determine reaction to a TST among health care workers in four hospitals in Riyadh from 2008 to 2009, 11 % of the studied population had a positive TST ( $\geq 10$  mm) [15]. Another study was implemented to determine the prevalence of a positive TST among female health sciences in Jeddah. The results showed that 35 (12%) of a total 296 had a positive test reactivity ( $\geq 10$  mm) [16].

In the light of this review, it can conclude that TST has been widely used as a screening test in identifying high risk population for LTBI. Knowledge of the prevalence of LTBI in different populations provides useful information to clinicians for deciding who will benefit most from LTBI treatment and also is an essential part of effective TB control and prevention programs [17].

### **1.1 Significance of the study**

Literature review showed that increasing prevalence of TB in recent years makes this disease a topic of universal concern. Key actions to detect TB cases and LTBI and ensure that they get the right treatment and care include rapid testing, recording and reporting care services throughout health system and different organizations [18]. Moreover, TB is a medical health problem entails a social and community stigma that will contribute to non-compliance to treatment and lengthy delays in seeking professional care. Early identification and management in a confidential atmosphere related to cultural background of KSA will enhance better adherence for prevention and control of tuberculosis. Therefore, the aim of this study is to determine the prevalence of TB among university female students in an academic educational setting in the central region of KSA and to implement TB control and prevention program to them.

### **1.2 Aim of the study**

The aims of the current study were:

- 1- To determine prevalence of tuberculosis among female university students.
- 2- To implement a tuberculosis prevention and control program.

## **II. Subjects And Methods**

### **2.1 Research Design**

A cross-sectional study was used for tuberculosis screening to determine the prevalence of tuberculosis among the studied group.

### **2.2 Study Setting**

The study was carried out at an academic educational setting in the central region of Kingdom of Saudi Arabia (KSA).

### **2.3 Sample**

A convenient sample of 209 female university students from 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> grade of an academic educational setting was the target group (after exclusion of non-respondants). A written consent form was signed by each participant after explaining the aim of the study.

## **2.4 Tools for data collection**

Data were collected using two tools in order to achieve the aims of the study. The tools were developed by the researcher after reviewing the related literature. The tools were submitted to a jury of 7 members who are experts in medical-surgical nursing field and community medicine field for its content validity. The validity for the various items varied between 80% & 98%. Reliability was assessed by applying the tools twice on 21 students who were excluded from the study. The two tools were:

**1-Questionnaire sheet:** It was designed by the researcher to cover data about students' socio-demographic characteristics, and the tuberculosis data.

**a-Sociodemographic data:** Including age in years, academic grade, nationality, marital status, number of family members and family income.

**b- Tuberculosis data:** It includes presence of risk factors of TB (i.e. history of a positive TB skin test or IGRA, history of BCG vaccination, ill-ventilated house, overcrowded bed room, living with open TB case), signs and symptoms of tuberculosis (i.e. night sweat, night fever, loss of weight, anorexia, persistence cough for more than 2 weeks not responding to treatment), family history of TB and other chronic diseases (i.e. diabetes mellitus, asthma).

**2-Tuberculin skin test (TST):** TST result was recorded as actual millimeters (mm) of induration by transverse diameter. A positive TST was defined as an induration reaction to tuberculin of  $\geq 10$  mm.

## **2.5 Administrative and ethical Considerations**

An official written approval letter to carry out the study was obtained from the administration of the educational setting prior to data collection and after explaining the significance of the study and its purpose. Also, a written consent form was signed for participation in the study by all studied female students after explaining the purpose, benefits and risks of the study, and assuring that the confidentiality would be maintained throughout the study.

## **2.6 Pilot study**

It was carried out before data collection on 21 students (who aren't included in the study) to evaluate the tentative developed tools for clarity and applicability and to estimate the time needed to collect data then necessary modifications were carried out accordingly.

## **2.7 Procedure**

- 1- Once official permission was granted from the administration of the educational setting and the consent forms were signed by the participants, the researchers initiated data collection.
- 2- Data were collected from the beginning of October 2010 till the end of December 2010.
- 3- Students who agreed to participate in the study from any of the three grades included in this educational setting were our target.
- 4- Each student was interviewed separately, to fill out the questionnaires of sociodemographic characteristics as well as tuberculosis data, to ensure privacy and confidentiality.
- 5- Tuberculin test: was done for all students by the researchers. Five IU of purified protein derivative (PPD) was injected intra-dermally in the forearm and the induration was read 48-72 hours after. Negative result means induration below 5 mm, positive result was expected with induration  $\geq 10$  mm, however, induration between 5- $<10$  mm was doubtful. For induration  $\geq 10$  mm or between 5- $<10$  mm, a referral letter was sent to the main general hospital in the city for further investigations. In the hospital TST positive female student was followed up by a chest specialist where sputum culture and chest x-ray were required.
- 6- Health education sessions about tuberculosis: were held for all students accompanied by models, a video and posters regarding:
  - Anatomy of the chest, common chest diseases, TB causative agent, mode of transmission, high risk population, importance of screening, signs and symptoms, management and prognosis.
  - Methods of tuberculosis prevention and control.
  - Breathing exercises.
  - Importance of proper ventilated environment in both houses and classrooms.

The previous topics were explained into 2 sessions. Each session ranged from 50 – 60minutes. The total number of the sample 209 students were divided by 42 students per week. So the total number of sessions were 10 sessions. The objectives of these sessions were to explain to students tuberculosis in details and the program of prevention and control of it. Each session was followed by a period of discussion with students. 7-A feedback letter from the main general hospital was received with detailed information about the investigations done, diagnosis, treatment if any and the recommended actions to be taken by the educational setting administration if any.

### 2.8 Statistical design

The collected data were analyzed using statistical software package of social science (SPSS) program version 20. Qualitative data were expressed as number and percentage (NO & %) and analyzed by using chi-square ( $\chi^2$ ) test. The difference was significant at P-value <0.05.

### III. Results

Fig. 1. Shows that 91% of the studied sample had negative tuberculin test while 9% had positive tuberculin test. Table 1. Shows that tuberculin +ve female students were significantly older than tuberculin –ve ones ( $P < 0.05$ ). Table 2. Reveals that there was no statistical significant difference between those with +ve and –ve tuberculin test in relation to comorbidity either for diabetes mellitus or bronchial asthma. Regarding manifestation of tuberculosis, table 3. shows that night sweat, night fever, anorexia, presence of sputum and cough were more prevalent among those with +ve tuberculin test than those with –ve tuberculin test, reaching a significant level only for the latter manifestation ( $< 0.001$ ). Regarding corticosteroid intake and family history, table 4. shows that, there was non-significant difference between female students with tuberculin +ve and –ve test results ( $P > 0.05$ ).

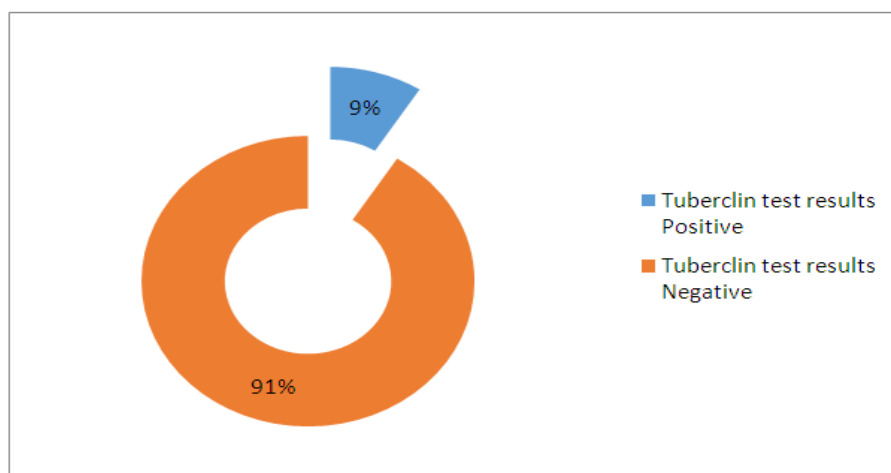


Figure 1. Percentage of results of tuberculin test.

Table 1. Comparison between girl students with +ve and –ve tuberculin test regarding sociodemographic characteristics.

Socio-demographic characteristics	Result of tuberculin test		$\chi^2$	P-value
	+ve (No= 19) No(%)	-ve (No=190) No (%)		
<b>Age in years:</b>				
• 18-20	6(31.6)	117 (61.6)	6.42	*0.01
• >20	13(68.4)	73 (36.4)		
<b>Grade:</b>				
• 1 <sup>st</sup>	0(0)	30 (15.8)	4.8	0.09
• 2 <sup>nd</sup>	6 (31.6)	71(37.4)		
• 3 <sup>rd</sup>	13(68.4)	89(46.8)		
<b>Marital status:</b>				
• Single	15(78.9)	155 (81.6)	0.08	0.78
• Married	4 (21.1)	35 (18.4)		
<b>Family income:</b>				
• Unsatisfied	8 (42.1)	81(42.6)	0.002	0.96
• Satisfied	11 (57.9)	109(57.4)		

\*significant

**Table 2. Comparison between girl students with +ve and -ve tuberculin test regarding comorbidity.**

Comorbidity	Result of tuberculin test		$\chi^2$	P-value
	+ve (No= 19) No (%)	-ve (No=190) No (%)		
<b>Diabetes mellitus:</b>				
• Present	0(0)	3(1.6)	0.3	0.58
• Absent	19 (100)	187 (98.4)		
<b>Bronchial asthma:</b>				
• Present	3(15.8)	53 (27.9)	1.29	0.26
• Absent	16 (84.2)	137(72.1)		

**NB: no student has hypertension.**

**Table 3. Comparison between girl students with +ve and -ve tuberculin test regarding manifestations of tuberculosis.**

TB manifestations	Result of tuberculin test		$\chi^2$	P-value
	+ve (No= 19) No(%)	-ve (No=190) No (%)		
<b>Loss of weight:</b>				
• Present	1 (5.3)	18(9.5)	0.37	0.54
• Absent	18 (94.7)	172(90.5)		
<b>Night sweat:</b>				
• Present	3 (15.8)	28 (14.7)	0.01	0.90
• Absent	16(84.2)	162 (85.3)		
<b>Anorexia:</b>				
• Present	2 (10.5)	18(9.5)	0.22	0.88
• Absent	17 (89.5)	172(90.5)		
<b>Cough:</b>				
• Present	9 (47.4)	33(17.4)	9.68	0.002*
• Absent	10 (52.6)	157(82.6)		
<b>Night fever:</b>				
• Present	3 (15.8)	28 (14.7)	0.01	0.90
• Absent	16 (84.2)	162 (85.3)		
<b>Sputum:</b>				
• Present	2(10.5)	10 (5.3)	0.88	0.34
• Absent	17 (89.5)	180(94.7)		

\*significant

**Table 4: Comparison between girl students with +ve and -ve tuberculin test regarding drug and family history.**

Drug intake and family history	Result of tuberculin test		X <sup>2</sup>	P-value
	+ve (No= 19) No (%)	-ve (No=190) No (%)		
<b>Corticosteroid administration:</b>				
• Yes	0 (0)	3(1.6)	0.3	0.58
• No	19(100)	187 (98.4)		
<b>Family history of TB:</b>				
• Yes	4 (21.1)	38 (20)	0.01	0.91
• No	15 (78.9)	152 (80)		

#### IV. Discussion

TB is an important public health problem in the Eastern Mediterranean Region of the World Health Organization. Every year, the disease kills 136,000 people and affects 630,000 in that region [18]. Health care workers (HCW) are at high risk of tuberculosis infection. The accurate diagnosis of latent tuberculosis infection (LTBI) is an important component of any tuberculosis control program and depends largely on tuberculin skin testing. So that, periodic screening of health workers for both TB disease and infection can play a critical role in TB infection control [19].

In this study, 9% (n= 209) of the participated health students had positive tuberculin skin test (TST) that is common among age group of more than 20 years. The findings of the current study were consistent with study done by Murad and Abdul-Mageed(2012) [16]who found that 12% (n= 296) of nursing students in Jeddah, KSA have positive TST with ( $\geq 10$  mm). In addition, Ohsaki and Takei (2001) [20] examined eight hundred thirty eight students with two-step tuberculin skin test. Strongly positive reaction was seen in 28 students (3.3%) and one of them underwent prophylactic medication according to her family history of exposure to tuberculosis.

On the contrary, study done by Lopes et al., (2008) [13] found that TST positivity was detected in 69.5% of the nursing professionals (n = 128). This result could be explained in relation to length of professional activity and previous direct contact with TB sputum smear-positive patients.

Regarding the relationship between results of TST and level of education, marital status and participants' satisfaction with their family income, the results of the current study conclude that the majority of students who enrolled in third level of education had positive TST. These findings can be interpreted that third level's health students registered in more advanced and practical courses that requires direct contact with patients when providing direct care. The findings of the current study were consistent with Lainez et al., (1999) [21] who found that TB prevalence is 12% (38/316) among nursing students. They also found statistical significance for being tuberculin positive and age ( $p = 0.002$ ). In addition, Haradaa et al., (2006) [22] examined 304 Health care workers (HCW) with TST. A prevalence of LTBI of 9.9%. of 304 HCWs had an induration diameter of 10 mm or more that positively significantly associated with age and with a history of direct contact with patients.

Regarding comorbidity among those with positive tuberculin test, the current study showed that there was no diabetes mellitus among them. On the contrary, Restrepo, et al., (2011) [4] in their study about prevalence of diabetes among newly-diagnosed tuberculosis cases, they found that one quarter of the cases of TB were attributable to diabetes. This finding in current study may interpreted that the age sample of the current study was young age.

Regarding manifestation of tuberculosis, the present study showed that night sweat, night fever, anorexia, presence of sputum and cough were more prevalent among those with +ve tuberculin test than those with -ve tuberculin test, reaching a significant level only for the latter manifestation ( $<0.001$ ). The findings of the current study were consistent with a cross-sectional study done by Alcantara et al., (2012) [23] on manifestation of pulmonary tuberculosis, they found that cough, weight loss, fever and anorexia are significantly associated with tuberculosis where cough and weight loss could be considered as a strong indicators for pulmonary tuberculosis. In the same line, Tuyisenge et al., (2010) [24] examined 309 pediatric patients to estimate the diagnostic accuracy of symptoms, signs, and para-clinical investigations for tuberculosis and to propose a clinical rule based on the results. They found that cough (83%), weight loss (76%), night sweating (68%), fever (50%) and anorexia (44%) are the strongest predictors in relation to TB infection.

## V. Conclusion

According to the results of the present study, it can be concluded that a tuberculin skin test (TST) has been widely helped as a screening test to target individuals with LTBI to prevent progression to active disease. In addition to, high spot the importance of TB infection in health science students.

## VI. Recommendations

Based on the results of the present study the following recommendations are suggested:

- 1- Strengthening infection control measures during health care training for health science students.
- 2- Appropriate strategies are needed to reduce barriers to the implementation of control and prevention program of TB especially for migrants from epidemic regions.
- 3- Further studies are recommended to assess the adherence and knowledge of health professionals managing clients of health professions who are exposed to TB infections.
- 4- Further control and prevention programs are recommended to be implemented among health science students.

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