

# Tuberculosis screening among health sciences students in Saudi Arabia in 2010

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Ann Saudi Med 2012; 32(5): 527-529

DOI: 10.5144/0256-4947.2012.527

**BACKGROUND AND OBJECTIVES:** Tuberculosis (TB) is a major health threat in both developed and developing nations. The aim of this study was to determine the prevalence of reactivity to the Mantoux test or tuberculin skin test (TST) among health sciences students after an open case of TB infection was detected in one of the students.

**DESIGN AND SETTING:** A cross-sectional screening survey among students of the Health Sciences College for Girls in Jeddah conducted in June 2010.

**SUBJECTS AND METHODS:** Students were screened using a standardized TST, and the bacillus Calmette-Guérin (BCG) scars were later inspected.

**RESULTS:** Of 320 students, only 296 (92.5%) participated in the survey. Thirty-five (12%) had a positive test reactivity ( $\geq 10$  mm). Seventy-six (25.7%) students had no BCG vaccination scar.

**CONCLUSIONS:** The prevalence of a positive TST was high among students when considered as a primary diagnostic method for latent *Mycobacterium tuberculosis* infection. Strengthening infection control measures is recommended during students' health care training.

Tuberculosis (TB) is a major health threat in both developing and developed nations. The World Health Organization (WHO) reports that TB infects one-third of the world's population.<sup>1</sup> WHO aims to dramatically reduce the global burden of TB by 2015. TB is one of the top ten leading causes of death.<sup>2</sup> The WHO announced an urgent action plan against TB called Global Plan to Stop TB 2011-2015.<sup>3</sup> TB control programs should be able to manage those who are suspected to have the disease and provide assessment and diagnostic services.<sup>4</sup> To diagnose a (latent) TB infection, the reaction is measured by the Mantoux or tuberculin skin test (TST).<sup>5</sup> TST is recommended for diagnostic screening among high-risk groups such as people who interact with persons with active TB disease and health care workers (HCWs) who work with high-risk population.<sup>6</sup>

Studies have shown that TB is prevalent among HCWs and health profession students. In a study carried out in Dicle University Hospital in Turkey, the incidence of hospital-acquired TB was 274.4 per 100 000 among nurses who work in high-risk departments.<sup>7</sup> The mean incidence among doctors was 127.1 per 100 000 and among paramedics it was 160.2 per 100 000. In a

study among HCWs in Italian hospitals conducted to determine the prevalence of a positive TST among employees of the hospitals, 274 of the 2210 employees who completed the screening program had a positive test (12.4%).<sup>8</sup> Another study was carried out among Swiss medical students to assess TST reactivity; 130 (83.9%) students had received a bacillus Calmette-Guérin (BCG) vaccination during childhood.<sup>9</sup> Of the 155 (59.2%) subjects, 12 (7.7%) students showed a positive TST reactivity. The results from a study to determine TB risk among nursing professionals in central Brazil showed that a positive TST was detected in 69.5%.<sup>10</sup> In Sweden a study showed a positive correlation between BCG vaccination scar and TST reactivity in a low prevalence of TB population.<sup>11</sup>

In Saudi Arabia the incidence rate of pulmonary and extrapulmonary TB was 15.56 per 100 000 in 2009.<sup>12</sup> The total number of cases reported in Jeddah was 29% (n=1145). In a study conducted in the western region of Saudi Arabia in 1992 to determine the prevalence of TB infection by TST testing, a marked increased Mantoux positivity was found in the age group of 15 to 24 years (19% in BCG negative and 30% in BCG positive subjects) in 1824 subjects.<sup>13</sup> Two studies have been

conducted among HCWs in Saudi Arabia. One study was carried out in King Abdulaziz University Hospital in Jeddah to determine reaction to a TST among healthcare workers. The results showed a positive TST ( $\geq 10$ mm) in 78.9% of healthcare workers overall; 60.0% among Saudi Arabian HCWs and 81.8% among non-Saudi Arabian HCWs.<sup>14</sup> In another study in four hospitals in Riyadh from 2008 to 2009, 11% of the study population had a positive TST.<sup>15</sup>

The general objective of the current study was to determine the prevalence of a positive TST among female health sciences students in Jeddah in 2010 after a confirmed open case of pulmonary TB infection was detected in one of the students who got hospitalized. The specific objective for this study was to raise awareness about TB infection control measures among health professions. This screening is the first test in this group of students, and the first TB screening study conducted among health sciences students in Saudi Arabia.

### SUBJECTS AND METHODS

All 320 females Health Sciences College students within the specializations of dental assistance, physiotherapy, midwifery, nursing and radiology from King Abdulaziz University Jeddah, Saudi Arabia, were involved in this study. A TST was performed by trained personnel using 5 units of tuberculin purified protein derivative (Mantoux technique). The cut-off point for TST reactivity was an induration of 10 mm.<sup>16</sup> A physician inspected arms of students for the presence of a BCG scar. Demographic data and study variables were collected. We planned to give services after the screening to those students with a positive TST. Data was analyzed using SPSS (IBM Corp, Armonk, New York, United States). A chi-square test was used to check proportions of students from different departments.

A 95% confidence level and cut-off for the *P* value of .05 was applied. Verbal informed consent was asked from the students. Written ethical approval was obtained from the Research Ethics Committee of King Abdulaziz University.

### RESULTS

Three students refused to have the TST because they were pregnant. In addition 10 students refused to have the test done for other reasons and 11 missed the appropriate reading time of the TST (17 nursing and 4 midwifery students). In total, 296 students had test results; 20 in the preparatory year, 50 in the dental assistance department, 38 in physiotherapy, 44 in radiology, 108 in nursing and 36 in midwifery (**Table 1**). Nursing students had a high rate of positive tests (19, 17.6%). The association between college department and test results was significant ( $P=.047$ ). Exploring the relation between BCG vaccination scar and TST, results showed a highly significant relation ( $P=.01$ ), meaning that those with a BCG scar (18, 8.2%) had a much lower chance of a positive TST than those without a BCG scar (17, 22.4%) (**Table 2**).

### DISCUSSION

The high rate of participation in the survey (92.5%) was probably because of the efforts done to make students aware of the study. This is the first study (after searching web-based articles) in which health sciences students in Saudi Arabia are screened for TB infection. Moreover, no recent published studies were found to assess TB infection among HCW.

A limitation is the study was carried out in female colleges only. The education system in Saudi Arabia does not permit mixing of males and females, so this may limit the generalizability of the results. When comparing the results of this study with other studies among HCWs, the positive rate in this study of 11.8% was in line with that of the Italian study among HCWs (12.4%). A Brazilian study, however, found

**Table 1.** Mantoux tuberculin skin test results by department (n=296).

Department	TST result categories		Total
	<10 mm	>10 mm	
Preparatory year	17 (85.0)	3 (15.0)	20 (100.0)
Dental assistants	49 (98.0)	1 (2.0)	50 (100.0)
Physiotherapy	34 (89.4)	4 (10.5)	38 (100.0)
Radiology	42 (95.5)	2 (4.5)	44 (100.0)
Nursing	89 (82.4)	19 (17.6)	108 (100.0)
Midwifery	30 (83.4)	6 (16.7)	36 (100.0)
Total	261 (88.2)	35 (11.8)	296 (100.0)

Values are n (%). Chi-square  $P=.047$

**Table 2.** BCG vaccination scar versus tuberculin skin test results, (n=296).

BCG Vaccination scar	TST Result		Total
	Negative	Positive	
Present	202 (91.8)	18 (8.2)	220 (100.0)
Absent	59 (77.6)	17 (22.4)	76 (100.0)
Total	261 (88.2)	35 (11.8)	296 (100.0)

Values are count and percent within BCG scar. Chi-square  $P=.01$ .

a much higher rate among nursing professionals (69.5%), but this was in line with the study conducted among HCWs in the hospital in Jeddah. A study conducted in Turkey also found the highest incidence of TB among nurses. In the current study, nursing students also had the highest rate of positive reaction to TST, which may be due to the exposure of this high-risk group (nurses) in clinical training or it may also be related to exposure to classmates who were diagnosed with open TB and hospitalized earlier. All the participants with a positive TST were referred to a specialized TB center for further investigation and management, and chest x-rays were taken. Those that showed clear lung field were sent back, despite the fact that

disease could have been extra-pulmonary TB (which causes 30% of cases in Saudi Arabia).<sup>17</sup>

The findings of this survey highlight the importance of TB infection in healthcare students. As stated by the American College Health Association:<sup>17</sup> "screening and targeted testing for TB is a key strategy for controlling and preventing infection on college and university campuses". Therefore, strengthening infection control measures is strongly recommended to prevent TB infection during health care training. Further studies are recommended to assess the adherence and knowledge of health professionals managing clients of health professions who are exposed to TB infections.

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