Available online at http://www.journalcra.com

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

International Journal of Current Research
Vol. 6, Issue, 03, pp.5749-5752, March, 2014

ISSN: 0975-833X

RESEARCH ARTICLE

CLINICAL AUDIT OF TUBERCULIN SKIN TESTING AMONG MEDICAL AND APPLIED MEDICAL SCIENCE STUDENTS OF KING ABDULAZIZ UNIVERSITY

*[1]Rahila Iftikhar, [2]Razaz Tawfiq and [3]Azra Kirmani

[1]Assistant Professor, Department of Community and Family Medicine, King Abdulaziz University, Jeddah, Saudi Arabia
[2]Consultant Family Physician, Department of General Practice, King Abdulaziz University Hospital, Jeddah, Saudi Arabia
[3]Assistant Professor, Department of Physiology, King Abdul Aziz University Jeddah, Saudi Arabia

ARTICLE INFO

Article History:
Received 21st December, 2013
Received in revised form
19th January, 2014
Accepted 15th February, 2014
Published online 25th March, 2014

Key words:
Tuberculin skin test,
Medical students,
Latent tuberculosis.

ABSTRACT

Between January 2013 and December 2013, the medical records of 602 medical and applied medical students at King Abdulaziz University were audited to determine the risk of *Mycobacterium tuberculosis* infection. Fifty-two students (8.6%) had a positive purified protein derivative (PPD) test. From the positively tested students 27 students (51.9%) had an induration of ≥10 mm, while 25 students (48.1%) had an induration of > 12 mm. Of the students who tested positive, 23 students (44.2%) did not present for follow up or receive treatment; 2 students (3.8%) did not complete treatment. A chest X-ray was done in students with a positive PPD. Of these, 5.76% students had a positive X-ray finding, but they were not offered treatment. Overall, applied medical students at King Abdulaziz University are at risk of contracting tuberculosis. Students should be screened for tuberculosis as early as in the preclinical years to protect both students and patients. Students who test positive should be counseled and treated to prevent infection.

INTRODUCTION

Healthcare workers (HCWs) are at increased risk for latent tuberculosis infection (Garber *et al.,* 2003). In developing countries, *Mycobacterium tuberculosis* infection is an occupational hazard that explains almost five additional cases of tuberculosis per 100,000 individuals among healthcare workers as compared with the general population (Fica *et al.,* 2008). Tuberculosis is a transmissible disease that causes substantial burden to patients and their contacts (Greenaway *et al.,* 2011). *M. tuberculosis* is transmitted by respiratory aerosol. It has two phases, both of which are medically treatable. When *M. tuberculosis* enters the body for the first time, they can cause latent tuberculosis infection, which if left untreated, can progress to active disease (The TB Skin Test (Mantoux) 2004). Tuberculosis has become a major health threat in both developed and developing nations (Murad 2012). According to a report issued by the World Health Organization (WHO), the estimated figure for the burden of tuberculosis in 2009 reached 9.4 million cases and the total deaths hit 1.3 million globally. The report showed that most of the cases were in the Western Pacific regions, Africa and South-East Asia (20%, 30% and 35%, respectively) (*Global tuberculosis report* 2013). Tuberculosis remains a health problem in the Kingdom of Saudi Arabia (KSA)(Abouzeid *et al.,* 2012), and it is still not fully controlled despite great efforts from the Ministry of Health (*Global tuberculosis report* 2013). Following the introduction of effective antibiotic therapy, tuberculosis in health care workers was not considered a serious problem. It only became an issue of focus only after several major nosocomial outbreaks were reported (Menzies *et al.,* 2007). Molecular studies have suggested that only 32 to 42% of tuberculosis cases among HCW were related to occupational exposure. Useful measures to avoid occupational tuberculosis include a number of administrative measures that have proven to be successful over the years in reducing the occurrence of new infections, including clinical tuberculosis cases (Fica *et al.,* 2008). Control of tuberculosis in HCW requires early recognition of contacts, screening for cases of latent tuberculosis, and adoption of efficient preventive measures (Costa *et al.,* 2010).

The tuberculin skin test (TST) is a standard method to screen for *M. tuberculosis*. It is performed by injecting 0.1 mL of tuberculin purified protein derivative (PPD) into the inner skin of the forearm. The skin test response is read between 48 and 72 hours after administration. The response is considered positive or negative based on the diameter of the induration.

Corresponding author: Rahila Iftikhar
Assistant Professor Family and Community Medicine Department, King Abdulaziz University Hospital, Jeddah, Saudi Arabia.

Among asymptomatic individuals, an induration of ≥ 10 mm is considered positive for tuberculosis infection in the following group of persons: recent immigrants from high-prevalence countries, injection drug users, residents and employees of high-risk congregate settings, infants, children, and adolescents exposed to adults in high-risk categories. On the other hand, indurations of ≥ 15 mm are considered positive in any person, including those with no known risk factors for tuberculosis (CDC 2011). It is necessary to understand the epidemiological and clinical features of tuberculosis in the workforce in order to improve planning and execution of preventive measures against the disease (Abouzeid *et al.,* 2012). The Centers for Disease Control and Prevention (CDC) have developed guidelines to prevent the transmission of *M. tuberculosis* in healthcare facilities. These guidelines, published in 2010, stipulate that surveillance for latent tuberculosis infection should include annual or twice-yearly tuberculin skin tests for HCWs employed in areas with high risk of exposure to active tuberculosis (Garber *et al.,* 2003). In light of these guidelines, medical and applied medical students at King Abdulaziz University (KAU) must get a health certificate before starting clinical rotations. In order to strategize the testing and treatment criteria in this high risk group, it is imperative to identify the prevalence of latent tuberculosis in students in healthcare professions. Hence, the aim of this study was to determine the risk of latent *M. tuberculosis* infection among medical and applied medical students of KAU and to determine how these high risk individuals were followed up for the infection.

METHODS

This was a medical audit conducted between January 2013 and December 2013. All medical and applied medical science students who were enrolled at KAU during the study period were included in the study. Approval to conduct the study was obtained from the Biomedical Ethics Committee of KAU. The medical records, both written and electronic, of the students were reviewed for laboratory and treatment data. Medical history of the students' was recorded, including tuberculosis symptoms and contact with tuberculosis patients. The results of the following laboratory investigations were also recorded: complete blood cell count, liver function tests and erythrocyte sedimentation rate. A two-stage PPD test was performed in all students who were included in this study. Students who had a positive PPD test were followed up with a chest X-Ray (CXR) and advised treatment, if required.

Working Definitions

Positive PPD test result: Indurations of ≥ 10 mm (CDC 2011).

1. Negative PPD test result: Indurations of < 10 mm.

Statistical analysis

The data were analyzed using Excel (Microsoft Corp, Redmond, WA). Descriptive statistics was performed for all variables. Results are expressed as frequency (percent), mean, and range.

RESULTS

A total of 602 students were evaluated for latent *M. tuberculosis* infection. The mean age of the students was 22.7 years (range, 24-20 years).

1. **Purified Protein Derivative Test:** Approximately 8.6% (52/602) of the medical and applied medical science students tested positive for PPD test. Among the students with a positive PPD, 19.2% were males and 80.8% were females (Table 1).

Table 1. Purified Protein Derivative Test Results among Students of King Abdulaziz University

	Cases with Indurations ≥ 10 mm (n = 27)	Cases with indurations ≥ 12 mm (n = 25)
Completed Treatment		
Females	9	13
Males	5	0
Did Not Complete Treatment		
Females	1	0
Males	1	0
Did Not receive Treatment		
Females	10	9
Males	1	3

a. **Indurations of ≥ 10 mm:** About 51.9% of the students had a PPD induration of ≥ 10mm. Of these, 40.7% did not receive treatment, whereas 7.4% of the students did not complete treatment (Figure 1).

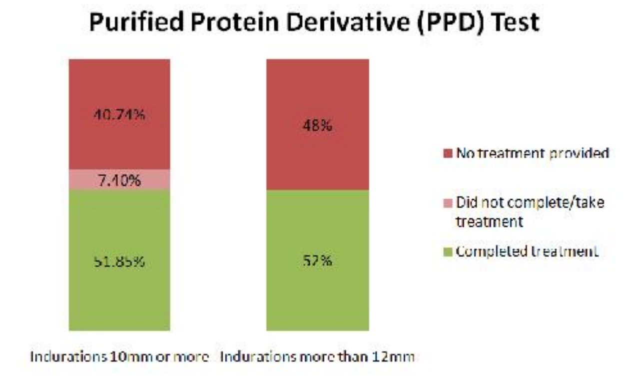

Figure 1. Proportion of students with an induration of ≥ 10 mm and > 12 mm, and positive cases of latent tuberculosis who required treatment

b. **Indurations of ≥ 12 mm:** Approximately 48.1% of the students had an induration of ≥ 12 mm; 48.0% of these students did not receive any treatment.

2. **Chest X-Ray:** In about 11.5% (6/52) of the students (all females), a CXR was not performed; among those 1 student was treated for latent tuberculosis, 5.76% (3/52) of the students had a CXR finding consistent with granuloma, but they did not receive treatment, while 29 % (15/52) of the students with normal chest ray did not receive treatment and 4% (2/52) did not complete the latent tuberculosis treatment. The remainder students i.e. 50% (26/52) of the total screened positive on PPD and were found to have normal CXR; these students received and completed treatment. (Figure 2).

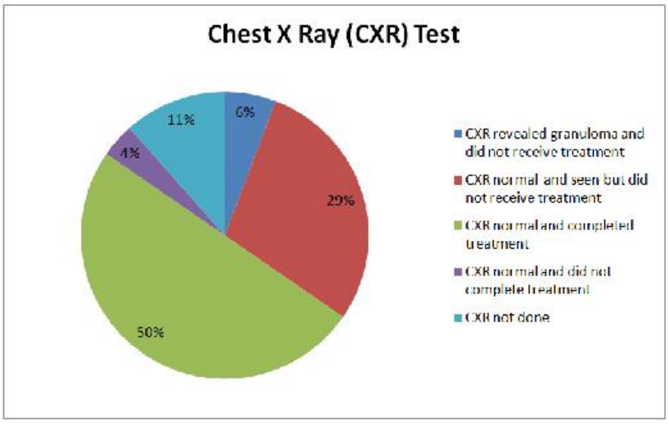

Figure 2.

DISCUSSION

In a healthcare institution, it is vital to ensure that the personnel is protected from infectious diseases. It is also important to identify immunization gaps. Tuberculosis remains a very important occupational risk for healthcare workers. The risk appears to be particularly high when there is increased contact, combined with insufficient infection control measures (Menzies *et al.,* 2007). It can be labor-intensive and costly to intervene when healthcare workers have been exposed to tuberculosis. Therefore, in order to improve planning and implementation of tuberculosis preventive measures (Abouzeid *et al.,* 2012), it is necessary to understand the epidemiological and clinical features of the tuberculosis problem in the workforce. This will consequently lead to fewer loss of days and fewer hospitalizations as well as follow-up surveys after exposure. When the records of KAU medical and applied medical students were evaluated to determine latent *M. tuberculosis* infection among medical and applied medical students, 8.6%had a positive PPD Test, which is lower than the 12.0% reported for the same population in Saudi Arabia in 2010 (Murad 2012). The latent Tuberculosis infection rate falls in the high TB incidence population (>100/100,000 population) country rate (Baussano *et al.,* 2011). Our study revealed that among the students who tested positive, with a PPD induration of ≥ 10 mm, 41.0% did not receive any treatment, while 7.4% did not complete treatment. Furthermore, among students who had an induration of ≥ 12mm, 48% did not receive any treatment. We also found that a CXR was not done for 11.5% of the students who tested positive for PPD, and no treatment was provided to around 6% of the individuals who had granuloma on CXR. This suboptimal performance is the result of losses and dropouts at the many different steps in the process, such as failure to present for or complete screening, failure to report for medical evaluation if screening test was positive, physicians' failure to prescribe empirical therapy to those who were eligible, and patients' denial to start treatment and non-compliance.

Obstacles to undertake screening and complete treatment for latent tuberculosis infection include a mixture of patient, provider and institutional factors. Patient barriers include shame or disgrace and the perceived association between tuberculosis and HIV (Munro *et al.,* 2007; Young *et al.,* 2008). Provider barriers to offer screening are related to insufficient knowledge of who should be screened or how they should be followed up (Shieh *et al.,* 2006). Low adherence to treatment for latent tuberculosis infection is associated with barriers to screen for latent tuberculosis. These include cultural taboos and stigmatization, low knowledge level, perceived low risk of progressing from latent tuberculosis infection to active disease, belief that positive tuberculin skin test results are due to the Bacillus Calmette–Guérin (BCG) vaccine, refusing to have venipunctures, and financial issues (Munro *et al.,* 2007). Further insight into the issues and reasons for missed opportunities to screen for and treat latent tuberculosis infections in our region is required through cross-sectional surveys and cohort studies. This audit is limited by the fact that only PPD testing was done, and hence some false positive cases, due to previous BCG vaccination or non-tuberculosus mycobacteria infection (Bierrenbach *et al.,* 2001; Cobelens *et al.,* 2007), may have been included in the analysis. In addition, we did not perform interferon-gamma release assays, which have been reported to have a higher specificity than PPD tests (95% as against 88% for PPD tests) (Lee *et al.,* 2011). However, Interferon-γ release assays should be used cautiously in healthcare workers in order to balance the benefits and risks (Dorman *et al.,* 2014).

Conclusion

Targeted tuberculin testing is a strategic constituent of tuberculosis control that identifies persons at high risk, who could benefit from treatment. Given the gaps identified through this audit, we recommend targeted tuberculin testing programs among groups at high risk. Infected persons who are considered to be at high risk for developing active tuberculosis should be offered treatment for latent tuberculosis, irrespective of age (CDC 2000). Enlightening patients and practitioners to recognize subgroups that would benefit from targeted screening and treatment for latent tuberculosis infection can be vital to avoid any opportunities being missed for the prevention of tuberculosis, especially among high risk groups. We also recommend that students should be educated about the importance of follow up in positive cases of PPD and on the importance of completing treatment as prompt treatment of latent tuberculosis is an effective measure in curbing the risk of developing tuberculosis and its spread (Madhavi *et al.,* 2013). A reminder system may also be set up to remind students about follow up visits. In addition, future studies should be conducted to investigate students' noncompliance to treatment.

REFERENCES

Garber E, Lambert L, Saiman L. A survey of latent tuberculosis infection among laboratory healthcare workers in New York City, 2003:801-6.

Fica C A, Cifuentes D M, Ajenjo H MC, *et al*. (Tuberculosis in healthcare workers). Rev Chilena Infectol. 2008 Aug; 25(4):243-55. Spanish.

Greenaway CS, Vissandjee A, Kitai A, *et al*. Canadian Collaboration for, Immigrant Refugee, Health. Tuberculosis: evidence review for newly arriving immigrants and refugees. CMAJ: Canadian Medical Association journal, 2011, 183(12):E939-51.

The TB Skin Test (Mantoux). Minnesota Department of Health, 2004 (http://www.health.state.mn.us/divs/idepc/diseases/ tb/factsheets/tsteng.pdf, accessed 16 January 2014).

Murad MA. Tuberculosis screening among health sciences students in Saudi Arabia in 2010. Ann Saudi Med, 2012 Sep-Oct,32(5):527-529.

Global tuberculosis report 2013. Geneva, Switzerland: World Health Organization, 2013.

Abouzeid MS, Zumla AI, Felemban S, *et al*. Tuberculosis trends in Saudis and non-Saudis in the Kingdom of Saudi Arabia--a 10 year retrospective study (2000-2009). PLoS One, 2012, 7(6):e39478.

Menzies D, Joshi R, Pai M. Risk of tuberculosis infection and disease associated with work in health care settings. Int J Tuberc Lung Dis, 2007 Jun, 11(6):593-605.

Costa JT, Silva R, Sá R, *et al*. Tuberculosis - Risk of continued transmission in healthcare workers. Rev Port Pneumol, 2010 Jan-Feb, 16(1): 5-21.

CDC. TB Elimination-Tuberculin Skin Testing. October 2011:1-2.

Baussano I, Nunn P, Williams B, Pivetta E, Bugiani M, Scano F. Tuberculosis among health care workers. Emerg Infect Dis. 2011 Mar;17(3):488-94

Munro SA, Lewin SA, Smith HJ, *et al*. Patient adherence to tuberculosis treatment: a systematic review of qualitative research. PLoS medicine, 2007, 4(7):e238.

Young DB, Perkins MD, Duncan K, *et al.* Confronting the scientific obstacles to global control of tuberculosis. The Journal of clinical investigation, 2008, 118(4):1255.

Shieh FK, Snyder G, Robert Horsburgh C, *et al*. Predicting non-completion of treatment for latent tuberculous infection: a prospective survey. *American Journal of Respiratory and Critical Care Medicine*, 2006, 174(6):717-21.

Bierrenbach AL, Cunha SS, Barreto ML, *et al*. Skin test reactivity to mycobacterial antigens parallels the phylogenetic structure of their genus. *Int J Tuberc Lung Dis*, 2001, 5:656–663.

Cobelens FG, Menzies D, Farhat M. False-positive tuberculin reactions due to non-tuberculous mycobacterial infections. Int J Tuberc Lung Dis, 2007, 11: 934–935;author reply 935.

Lee JE, Kim HJ, Lee SW. The clinical utility of tuberculin skin test and interferon-γ release assay in the diagnosis of active tuberculosis among young adults: a prospective observational study. BMC Infect Dis. 2011 Apr 18, 11:96.

Dorman SE *et al*. Interferon-γ release assays and tuberculin skin testing for diagnosis of latent tuberculosis infection in healthcare workers in the United States. Am J Respir Crit Care Med 2014 Jan 1; 189:77. (http://dx.doi.org/10.1164/rccm.201302-0365OC.

CDC. Targeted Tuberculin Testing and Treatment of Latent Tuberculosis Infection: U.S. Department of Health & Human Services Centers for Disease Control and Prevention (CDC) Atlanta, GA 30333; June 9, 2000 / Vol. 49 / No. RR-6.

Madhavi J. Parekh and Neil W. Schluger Treatment of latent tuberculosis infection Ther Adv Respir Dis 2013) 7(6) 351–35.

****