Misdiagnosis of tuberculosis: Sputum culture is a useful diagnostic tool in Quetta, Pakistan

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Accepted 5 November, 2012

Tuberculosis (TB) is a major contagious disease caused by Mycobacterium tuberculosis and is endemic in many countries of the world. It is estimated that worldwide one third human population are infected with TB. There is little use of sputum culture regarding diagnosis of tuberculosis in TB endemic areas. The undertaken study evaluated the importance of TB sputum culture than other diagnostic tools among the doctors, and patients affected from active infectious pulmonary tuberculosis. The study was carried out at Fatima Jinnah General and Chest Hospital Quetta, Balochistan from January 2008 to December 2008. A total of 2237 suspected TB patient’s samples were sent for the TB diagnosis. Among the suspected TB samples, 244 (10.9%) samples were subjected for TB culture and smear microscopy, in which 119 (48.7%) samples were from female patients, while 125 (51.3%) were obtained from male patients. Of the 244 TB culture samples, 93 (38.11%) were positive, while the remaining 151 (61.8%) cases showed negative culture result. 82 of the 93 culture-positive patients were positive for acid fast bacilli (AFB) on sputum smear microscopy; however 11 samples were negative for AFB on smear analysis but positive for TB culture. Among the 244 samples, 91 (37.2%) cases were smear positive, while 153 (62.7%) were smear negative. These findings highlight the importance of suggesting sputum culture in the diagnosis of tuberculosis in the high prevalence area of Quetta.

Key words: Tuberculosis, misdiagnosis, sputum culture.

INTRODUCTION

Tuberculosis (TB) is an important health problem in the world with more than 8 million new cases and almost 2 million deaths each year (Dye et al., 2002; WHO, 2000). Pakistan is among the high-burden tuberculosis countries in the world (WHO, 2009; WHO, 2011). The detection and management of pulmonary tuberculosis (PT) is critical for tuberculosis control programs. The routine TB diagnostic strategy in disease endemic and resource-limited vicinity is based on symptoms screening, chest radiograph and sputum smear examination (Ismail, 2004). However, smear-negative pulmonary tuberculosis (SNPT) is an increasing clinical and epidemiological problem particularly in areas that are disease endemic. Diagnosis of SNPT is a difficult task, and in developing countries, the majority of these cases have been diagnosed only on the basis of clinical and chest radiographic findings (Ismail, 2004). The lack of accurate, rapid, and inexpensive tests for the diagnosis of pulmonary tuberculosis remains a foremost trouble in TB control, especially in high TB burden countries of Sub-Saharan Africa and South East Asia (Lucian et al., 2010). Though, the majority of tuberculosis patients are diagnosed by a direct smear examination of sputum (WHO, 2007), how-ever, culture based diagnosis is more sensitive, and simultaneously allows for drug susceptibility (Moore et al., 2006).

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Therefore, clinicians may refer the TB suspected patients for sputum culture investigation in low-income countries. The culture based approach for TB diagnosis is crucial to control the rate of multi-drug resistant tuberculosis (MDR-TB) and extensively drug-resistant tuberculosis (XDR-TB) (Gandhi et al., 2006). Findings from the present study will be helpful for the better management of TB in the most prevalent TB area in Pakistan.

MATERIALS AND METHODS

Study setting

The study was conducted at Fatima Jinnah General and Chest Hospital Quetta, a referral laboratory of TB for Balochistan province. The hospital provides in-patient and out-patient services, including care and treatment for TB and general patients. The patient populations belonged to different cast; the majorities were from the rural areas of the province, where the health facilities were rare, while there was also a major number of Afghan refugees affected from Tuberculosis were examined. The study was approved by the institutional ethical committee.

Study population

All persons with the age above 14 and older suspected as TB were included in this study. A total of 2237 patient’s samples were sent for the TB diagnosis. In which 2069 (92.48%) samples were obtained from out-patient department (OPD) while 168 (7.52%) indoor patients were included in the study. Out of 2237 patient samples, 244 samples were subjected for TB culture in which 119 (48.77%) samples were of female, while 125 (51.23%) were of male. Study samples were collected from January 2008 to December 2008.

Sputum smear microscopy

Spot sputum smear were prepared and then processed for Ziehl-Neelsen (ZN) stain as described by (Cheesbrough, 1984). Following ZN staining, identification of acid fast bacilli (AFB) was performed under bright field microscope.

Culture identification of Mycobacterium tuberculosis

For mycobacterial culture, sputum samples were first decontaminated using N-acetyl L-cysteine (NALC–NaOH) (Aparna et al., 2010) and then inoculated on Lowenstein Jensen (L. J) medium. The L. J slants were incubated at 37°C for eight weeks to observe the presence of visible colonies. Identification of M. tuberculosis colonies on LJ medium was done by performing nitrate reductase test (NRT) as early described by Paramasivan et al. (2002).

RESULTS AND DISCUSSION

A total of 2237 samples were selected for microbial examination of tuberculosis for the whole year. The patients were of the mean age 44 years (14 to 75 years); among them female patients were 468 (20.92%) with the mean age of 39 years (14 to 65 year) while the total numbers of male patients with suspected TB were 1769 (79.08%) with the mean age of 40 years. In this study, out of 2237 samples, 244 (10.9%) samples were preceded for MTB culture and smear microscopy sputum AFB and it was observed that the sputum AFB positive cases were 91 (37.29%) including 20 (21.97 %) positive samples from male patients while 71 (78.02%) were from female patients. Furthermore, of the 244 cultures, 93 (38.11%) cultures samples were positive.

It was found that among the 93 culture-positive samples, 82 were positive on sputum smear microscopy; however, 11 samples were negative for smear microscopy while nine samples were smear positive, but culture negative (Table 1).

Tuberculosis control programs aim to decline the risk of spreading TB infection. Detection of most of the infectious cases of pulmonary tuberculosis is an indispensable component of the TB control (Rouillon et al., 1976). The diagnosis may be possible by various approaches including sign and symptoms investigations, chest x-ray findings, sputum smear microscopy, sputum culture, and MTB PCR (Lydia et al., 2004). Sputum microscopy is routinely employed for identifying tuberculosis infection; however, TB culture is a gold standard method to diagnose tuberculosis in persons with suspected pulmonary disease (Van et al., 2003). Smear microscopy coupled with sputum culture facility is limited to few hospitals in Pakistan. Quetta, a low socioeconomic area of Pakistan and endemic for TB, also faces poor diagnostic facilities for TB. In the present study, TB culture analysis parallel with smear microscopy was performed. Among the 93 culture-positive samples, 82 were positive on sputum smear microscopy; however, 11 samples were negative for smear microscopy which might be due to the under-reading of the smear microscopy, and can be reduced by altering the smear microscopy with culture for the detection of MTB as culture reading is easier and can be read with naked eyes even in normal day light. Previously, it is reported that the sensitivity of the PCR and culture was 83.0 and 70.7% respectively while less sensitivity (61.5%) of smear microscopy was documented (Prasad

<table>
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<tr>
<th>Parameter</th>
<th>Culture positive</th>
<th>Culture negative</th>
<th>Total</th>
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<tbody>
<tr>
<td>Smear positive</td>
<td>82</td>
<td>9</td>
<td>91 (37.2%)</td>
</tr>
<tr>
<td>Smear negative</td>
<td>11</td>
<td>142</td>
<td>153 (62.7%)</td>
</tr>
<tr>
<td>Total</td>
<td>93 (38.11%)</td>
<td>151 (61.88%)</td>
<td>244</td>
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et al., 2001). Among the 151 culture negative samples, nine samples were positive for AFB on smear analysis which might be due to the false positivity rate of smear microscopy as sputum smear contains particles other than Mycobacterium tuberculosis that are acid-fast and retain red dye treated by the Ziehl Neelsen method (Van et al., 2005). These red particles sometime match with tubercle bacilli and might cause false positive results (Kubica and Dye, 1967; Van et al., 2005). Such misleading diagnosis can be reduced by incorporating TB culture which is a more reliable and accurate method for TB diagnosis (Ridderhof et al., 2007). Moreover, the TB culture allows diagnosis of early stage of the disease and the identification of the mycobacterium species, which are not possible with sputum microscopy (Gandhi et al., 2006).

Conclusion

The undertaken study highlighted the ultimate importance of suggesting sputum culture in the diagnosis of tuberculosis in the high prevalence area of Quetta, where many patients have atypical clinical and radiographic features and a negative sputum smear results.

REFERENCES


