

Mycobacterium tuberculosis infection and resistance to rifampicin with GeneXpert®MTB/RIF: a single-center experience on bronchoalveolar lavage samples in renal failure patients

Maria Iqbal,¹ Bushra Jamil,² Mohammad Tauseef Mukhtar Bukhari,³ Azhar Saeed,⁴ Dawar Majeed Bhatti,⁵ Ateeq Ur Rehman Muhammad,⁶ Zakir Hussain,⁷ Shahid Ahmad Abbasi,⁸ Ammar Ahmed⁹

Abstract

Patients with end-stage renal disease (ESRD) are immunocompromised and are more at risk to develop and acquire Mycobacterium tuberculosis (MTB) infection. However, risk assessment is uncertain. The objective of current research was to study the frequency of MTB infection in ESRD patients. For this purpose, bronchoalveolar lavage (BAL) samples were evaluated for the presence of MTB by using GeneXpert®MTB/RIF test. We analysed 350 clinical samples of BAL collected from a tertiary care hospital in Pakistan, from September, 2015 to July, 2016. We performed the GeneXpert®test on each sample. According to our results prevalence of MTB was observed in 1.7% of bronchoalveolar lavage (BAL) samples taken from patients with chronic kidney diseases. All the positive samples were susceptible to rifampicin. There is a low prevalence of MTB infection (pulmonary tuberculosis) in patients with chronic kidney disease in our setup. Suspected patients can be diagnosed by using GeneXpert®MTB/RIF testing on bronchoalveolar lavage samples.

Keywords: GeneXpert®MTB/RIF; bronchoalveolar lavage; Mycobacterium tuberculosis; End-stage renal disease

Introduction

Mycobacterium tuberculosis (MTB) is the etiological agent of tuberculosis (TB). Tuberculosis was considered to be the most lethal infectious disease in the history of mankind. Though the situation has improved but still tuberculosis has remained amongst the top ten major causes of death. In only 2016 it affected almost 10.4 million people and was responsible for 1.7 million deaths.¹

Many individuals carry tubercle bacilli without disease symptoms however they have a tendency of 5-15% to

develop tuberculosis. Likewise, individuals with immunocompromised status have also a greater tendency.¹

Tuberculosis (TB) was considered to be curable since many decades after the discovery of anti TB drugs with the condition that the drugs are taken regularly and according to standard protocol. Improper adherence to treatment protocol may lead to drug resistance. Resistance against anti-TB medicines have been reported from almost every country. When there is resistance against isoniazid and rifampicin then it is known as multi drug resistant (MDR) TB. More severe form of MDR TB is extensively drug resistant (XDR)-TB when there is no safe treatment option. There is a global rise in XDR-TB. According to a recent estimate 6.2% new cases of XDR-TB were reported in 2016. First and foremost, significant step to control TB is early and timely detection. Late detection is not only associated with dissemination but also a major cause of poor prognosis. Because of lack of a rapid and reliable diagnostic test, many cases remain undiagnosed. WHO has therefore recommended active screening of all suspected TB patients.²

A variety of different tests are available to detect TB, however, WHO has recommended GeneXpert®test as the gold standard. It not only detects M. tuberculosis with high accuracy but can also be used to determine drug resistance against rifampicin simultaneously.³

Patients with kidney diseases particularly, dialysis patients have a higher tendency to develop MTB infection.⁴ In the current study, we evaluated the MTB infection rate among ESRD patients. We used the bronchoalveolar lavage (BAL) samples to evaluate the presence of MTB infection in ESRD patients.

Method and Results

A cross sectional study was conducted from September 2015 to August 2016 in the Molecular diagnostic

1,4-9Al-Sayed Hospital (Pvt) Ltd., Rawalpindi, 2National University of Medical Sciences (NUMS), Rawalpindi, 3Yusra Medical and Dental College, Al-Sayed Hospital (Pvt) Ltd. Rawalpindi.

Correspondence: Bushra Jamil. e-mail: bushra.jamil@numspak.edu.pk

laboratory, Kidney centre, Al-Sayed Hospital, Rawalpindi, Pakistan. Specimens of bronchoalveolar lavage (BAL) were collected from these patients. A total of 350 samples were included during the period of study. GeneXpert®MTB/RIF test was performed on each sample.

One mL of BAL sample was mixed with 2mL GeneXpert®MTB/RIF reagent and it was vortexed and incubated for 15 minutes with seldom stirring. Whole mixture was then added in the cartridge of GeneXpert®MTB/RIF. It was then scanned and placed in GeneXpert machine for two hours.

GeneXpert®MTB/RIF test was performed on 350 samples out of these 6 were positive. Only one sample was high positive, another was medium positive whereas three were low positive and one was very low positive. Thus the overall prevalence was 1.7%. Whereas, none of the samples was resistant to rifampicin.

Discussion

MTB is the most common opportunistic pathogen after organ transplantation with a high risk of mortality.⁵ The prevalence of MTB has been reported from 0.5-15% depending upon endemic areas.⁶ Marouane et al., tested 153 samples on GeneXpert®MTB/RIF. Out of them 53 (34.6%) were positive for MTB whereas all were susceptible to rifampicin.⁷

In another study 283 renal transplant recipients were tested for MTB. Only 10 were MTB positive. According to them extra pulmonary TB was more common in kidney transplant patients.⁸

In developed Western countries, the prevalence of MTB in renal transplant recipients ranges from 1% to 4%, whereas prevalence up to 11.5% have been reported from developing countries. A study was conducted on 1350 kidney transplant recipients (TRs). Out of them 52(3.9%) had TB diagnosed in various organs. The most common form was pleuropulmonary.⁹

Zhang et al., revealed the presence of MTB in 1.3% of solid organ transplant patients. In a study conducted in Pakistan 259 samples were collected from clinically suspected patients and MTB was detected via Zeihl Neelsen (ZN) microscopy, BACTEC MGIT liquid culture and GeneXpert assay. The study revealed GeneXpert to be most reliable and accurate.¹⁰

In the present study prevalence of MTB was monitored 1.7% that is in accordance to the previously reported data.

Conclusion

There is a low prevalence of MTB infection (pulmonary tuberculosis) in patients with chronic kidney disease and renal transplants in our setup. Suspected patients can be diagnosed by using GeneXpert®MTB/RIF testing on bronchoalveolar lavage samples. The GeneXpert®test is a simple and rapid real-time PCR technique allowing for better sensitivity in the detection of *M.tuberculosis* complex. Further testing on extra pulmonary samples would give a true prevalence of MTB infection in such patients.

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