

Detection of *Mycobacterium tuberculosis* and rifampicin sensitive - resistant patients diagnosed by the GeneXpert MTB/RIF test in Al-Diwaniyah province

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Abstract

To date, tuberculosis (TB) is still a disease of big concern to humanity because it leads to losses in various life aspects such as people lives and economics. Because the long time and hard efforts needed to diagnose the disease, we have conducted this study to better detect the disease in patients in Al-Diwaniyah province, Iraq. Moreover, we have also launched this research to identify rifampicin-sensitive and -resistant patients. To fulfill our aims, we have recruited GeneXpert system for performing the Xpert MTB/RIF test that identifies specific DNA sequences of *Mycobacterium tuberculosis* (MTB) and rifampicin-resistant patients. For this, 179 patients who visited The Chest and Respiratory Clinic Diseases, Diwaniyah, Iraq, were referred to submit sputum specimens to the GeneXpert. After the test had been run, 157 (87.7%) samples were negative, and 22 (12.3%) were positive to the bacterium. Out of 22 patients, 17 (77%) patients were sensitive, and 5 (23%) patients were resistant to the rifampicin. Our results indicate that the disease is still affecting the life of people in the province but has low percentage of rifampicin resistance in those patients. This keeps encouraging the continuous use of this drug against this bacterium. Moreover, the results attract the health facilities to use GeneXpert as reliable tool to diagnose MTB and whether it is resistant or sensitive to rifampicin.

Keywords: GeneXpert, *Mycobacterium tuberculosis*, Xpert MTB/RIF, Rifampicin

Introduction

To date, TB is still a disease of big concern to humanity because it leads to losses in various life aspects such as people lives and economics (1). Even with the continuous and advanced work that tries eliminating this disease, it keeps ranking number one among diseases that threatening public health especially in the countries that have bad health system and low hygienic awareness of people in these countries (2). Iraq is considered as one of the countries in the world that are endemic with this disease. However, in countries like United Kingdom, the disease cases keep rising every year, and this phenomenon reasons belong to lack of care to some people for example homeless, human immunodeficiency virus (HIV) patients, people who use drugs, diabetic people, and people exposed to immunotherapy (3, 4,

5). These difficulties in treatment and increasing the incidence of the disease are resulted from issues such as resistance of MTB to many drugs (6). The bacterium also escapes host immune response which adds extra obstacles of curing the disease (7, 8). Controlling of the disease gains too much difficulty due to the missing of the useful vaccine (9). Using the conventional methods such as culturing, conventional polymerase chain reaction (PCR), and acid-fast stain to diagnose TB involve long time, multiple-step processing, and false results (10, 11). To overcome the diagnosis hustle, we have conducted Xpert MTB/RIF test on GeneXpert to specifically diagnose the presence of MTB and whether it is resistant or sensitive to rifampicin.

Materials and Methods

Sampling and the Xpert MTB/RIF test

In The Chest and Respiratory Clinic Diseases, Diwaniyah, Iraq, Sputum from 179 patients were collected and assigned to acid-fast test (AF) and then GeneXpert that operates an automated real-time PCR to detect MTB and its resistant strains, Xpert MTB/RIF test. The test uses rpoB gene to

identify these resistant strains. The test employs a fluorescent probe named Beacon. The test runs for 90 minutes. The whole test was carried out based on Cepheid GeneXpert system, USA, and the manufacturer protocol was followed. <https://www.meta-chart.com/pie> was used to generate the pie charts.

Result

To illustrate the results, 157 (87.7%) samples were negative, and 22 (12.3%) were positive to the bacterium. Only 6 out of 22 patients were positive by AF. Out of 22 patients, 17 (77%)

patients were sensitive, and 5 (23%) patients were resistant to the rifampicin, table 1 and figure 1 and 2

Table 1: The result of the study

Total Number of patients	+ve patients	-ve patients	Resistant strain to rifampicin	Sensitive strain to rifampicin
179	22 (12.3%)	157 (87.7%)	5 (23%)	17 (77%)

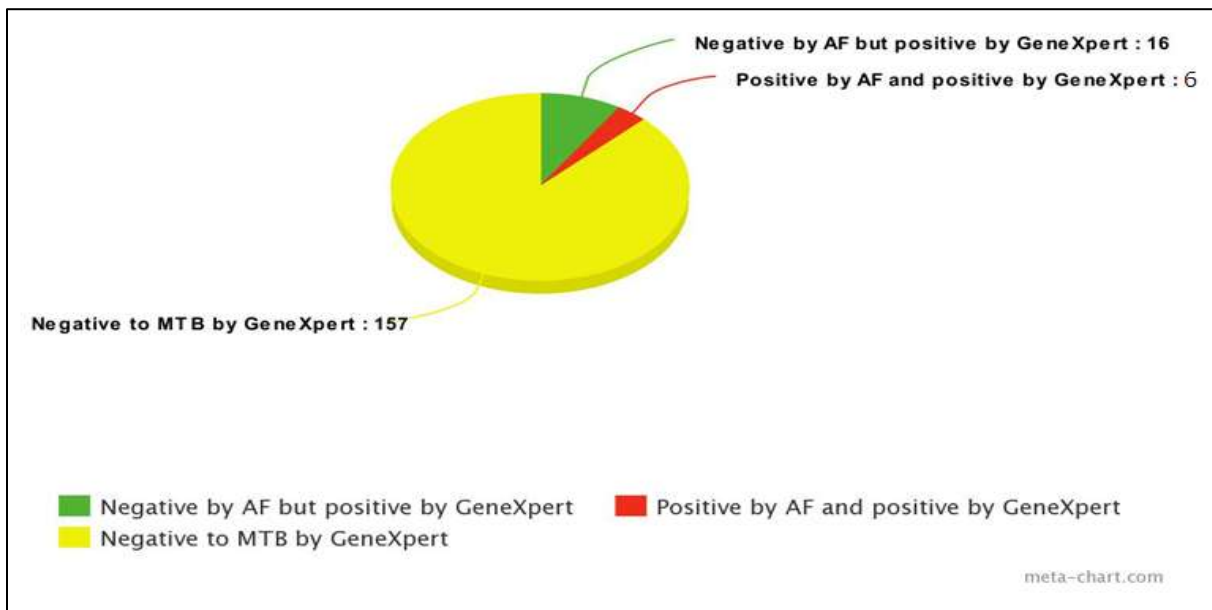


Figure 1: Positive and negative Mycobacterium patients

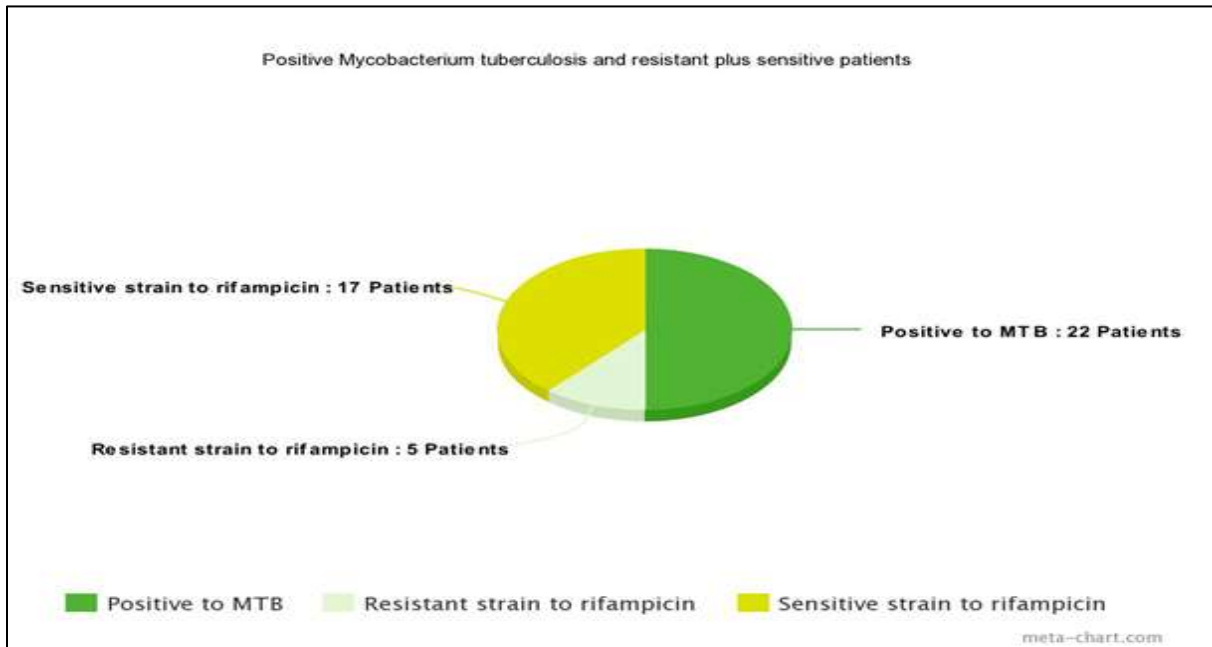


Figure 2: Positive MTB and resistant plus sensitive patients

Discussion

Tuberculosis is still a major disease that concerns humanity because it leads to losses in various life aspects such as people lives and economics (1). Using the conventional methods such as culturing, conventional polymerase chain reaction (PCR), acid-fast stain to diagnose TB involve long time, multiple-step processing, and false results (10, 11). This encouraged us to use a better with high accuracy technique that could identify both the bacterium and its resistance status in relatively short time. By using the GeneXpert, our results indicate that 157 (87.7%) samples were negative, and 22 (12.3%) were positive to the bacterium. Only 6 out of 22 patients were positive by AF. Out of 22 patients, 17 (77%) patients were sensitive, and 5 (23%) patients were resistant to the rifampicin, table 1 and figure 1 and 2. Our results agree with (12) who found that using Xpert MTB/RIF test gave highly accurate results that overcome the

MTB-negative smears. Moreover, our results come in agreement with (13) who declared that Xpert MTB/RIF is sensitive and specific test to diagnose MTB and the resistant strains in short period of time. Using Xpert MTB/RIF, (14) had found that the test was accurate and reliable in detecting MTB which matches our results. The current study results agree with (15) that recognized that Xpert MTB/RIF test was effective and sensitive in detecting MTB and RIF-resistant Mycobacteria in muscles. Our results come in agreement with (16) who found that the use of Xpert MTB/RIF gave high accurate result. Study results showed by (17) indicate the high accuracy of the Xpert MTB/RIF test which agrees with our study results. The Xpert MTB/RIF test performed using GeneXpert gives big hope of fast and accurate detection of MTB and rifampicin - resistant mycobacteria for better treatment.

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