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Comparative Analysis of Phenotypic and Genotypic Examination Methods of Determining Anti-Tuberculosis Drug Resistance

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Objectives: Tuberculosis infection remains a severe problem in Azerbaijan. One of the key solutions to this problem is early detection and timely treatment of tuberculosis. Rapid diagnostic microbiological methods allow timely detection of tuberculosis mycobacteria (MBT) and determining anti-tuberculosis drug resistance. MBT inspection is also carried out by culture (BactecMGIT liquid media and Levenstein-Yensen solid media) and is considered to be the "Gold Standard". In addition to identifying secreted VMB, it also defines the 1st and 2nd line of resistance to anti-tuberculosis drugs. The results of the test become available after a long time (30-90 days). WHO recommends molecular-genetic methods that examine the resistance of the MBT to anti-tuberculosis drugs. GenXpert MTB/RIF method that determine the resistance of the MBT for the immediate (within 2 hours) duration and the resistance of the first and second line of TB drugs for a short period of time (3-7 days) - GenoType MTBDRpl and GenoType MTBDRsl methods. The use of molecular-genetic methods similar to phenotypic methods for sensitivity and specificity allows patients to join early treatment.

Methods: In accordance with the laboratory algorithm, sputum samples of tuberculosis patients have been sequenced by molecular-genetic methods. MBT detection and Resistance to Rifampin have been studied by means of the GenXpert MTB/RIF test. As a result of this study, 300 sputum samples examined for resistance to anti-tuberculosis drugs were selected for the next research phase. The samples found to be resistant were undergone a phenotypic study (BactecMGIT and Levenstein-Yensen culture). Microbial cultures obtained as a result of seeding (BactecMGIT) were examined by GenoType MTBDRpl (rifampicin and isoniazid) and GenoType MTBDRsl (fluorhynolones and II line injection drugs) tests.

Results: Resistance to isoniazid was identified in 97.3% by phenotypic and in 95% by genotypic methods. Resistance to rifampicin was identified in 83% of cases during phenotypic and 89% - by genotypic methods. For Fluorhynolones the indicators were 56.3% for phenotypic and 55.7% for genotypic examinations; also 29.3% and 30% respectively for second-line injection drugs. The analysis has shown that resistance indicators determined by phenotypic and genotypic methods are often slightly different from each other.

Conclusion: The phenotypic and genotypic examination methods that determine resistance to anti-tuberculosis drugs have been compared and, in most cases, the same results were obtained. Genotypic methods show more sensitivity to rifampicin if resistance is established. The use of molecular-genetic methods is preferable for a timely treatment of tuberculosis following a patient's diagnostics.

Keywords: Tuberculosis, phenotypic and genotypic examination, anti-tuberculosis drug resistance