GeneXpertMTB/RIF: Observed error rates and invalid results after twelve months of regular use

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Background

- Nigeria population: 174,507,539(2013)
- TB incidence rate:108/100,000
- Total notified cases: 100,401(17.5%) 2013
- MDR among new cases: 2.9%
- MDR among previously tested cases 14.3%

Introduction

- Tuberculosis (TB) continues to exert enormous toll globally especially in high HIV burden settings.
- It is one of the leading cause of death among people living with HIV.
- Low sputum smear positivity of PTB in HIV patient makes the diagnosis of the disease difficult
- XpertMTB/RIF was recommended by WHO in 2010 for rapid detection of MTB and RIF resistance.

Introduction

- GeneXpert is a sensitive assay that can detect <100 bacilli/ml of sputum compared to the > 1000 bacilli/ml for ZN /SM

- Rifampicin resistance diagnosis with XpertMTB/RIF is under 2hours while liquid DST takes 30days.

- The XpertMTB/RIF is one of the two molecular methods approved by the World Health Organization for the rapid detection of TB and 80% drug resistance.

- There are 54 GeneXpert testing sites in 32 states of Nigeria. The majority of these sites are situated within TB/HIV care centers.

GeneXpert equipment

XpertMTB/RIF 4 module

System installed in our facility

AIMS

- We sought to observe the pattern and frequency of ‘Errors or inconclusive results’ obtained at our facility with a view to assess the possible implications.

Method

- We tested a total of 476 sputum specimen from February 2013 to December 2013 and noted the rates of ‘error or inconclusive’ results.

- Each sputum specimen was received and processed the same day according to specified standard methods indicated by the manufacturer (Cepheid, France)

Method

- Results obtained were classified in respective formats according to the manufacturer's specified codes as one of five possibilities;
- 'MTB detected',
- 'MTB not detected',
- 'Error',
- 'Invalid'
- 'No result'.
- Troubleshooting procedures were performed as specified following consultation with Cepheid, France.

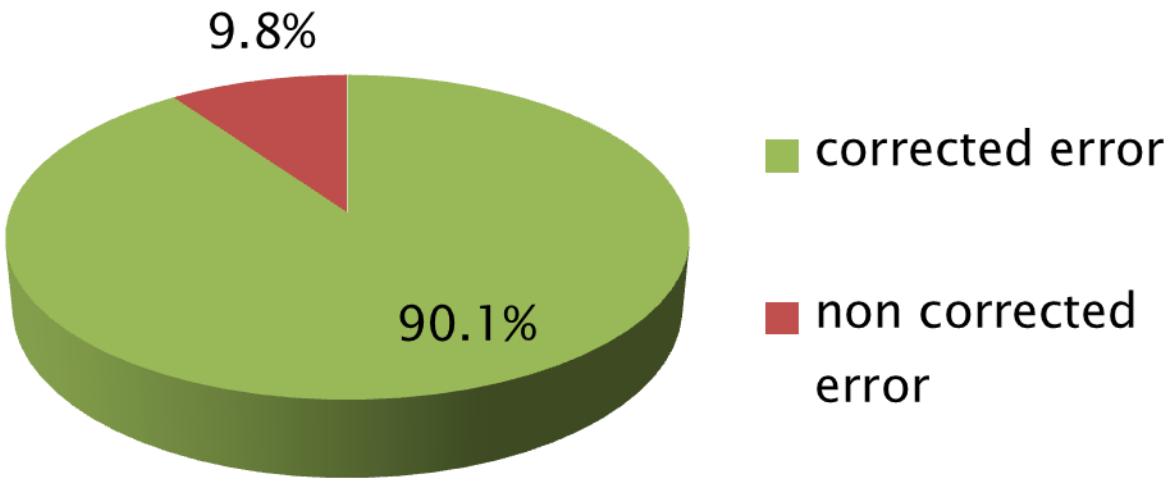
Results

- The total rate of inconclusive results was 51/476 (10.7%);
- ‘E5011’: (35%) (Signal loss in amplification curve)
- ‘Invalid’ (17.6%)
- ‘E5007’: (13.7%) (Probe check error)
- ‘E2008’: (9.8%) (Syringe pressure reading exceeds the protocol limit).

Results

- Following troubleshooting and implementation of corrective actions;

46/51(90.1%) were corrected for errors while 5/51 (9.8%) of repeated tests reproduced same results.



TROUBLESHOOTING RESULTS

Error rate		Corrected error rate		
Error code	%	%	Manufacturer corrective actions	Indigenous corrective actions
E5011	35.2	0.4	Use a new cartridge and ensure cartridge tube is airtight.	same as manufacturer's.
E5007	13.7	0.2		Reduced standard sample vol by half and doubled buffer volume.
E2008	9.8	0.8	Wait for extra 10mins after	We waited longer than the specified time.
INVALID	17.6	0	Ensure sample is without particles.	Picked the topmost part of digested sample.

Discussion

- Total rate (10.7%) of inconclusive findings was higher than <3 % recommended by the Foundation for innovative new diagnostics (FIND)
- Similar error rate were reported in some studies – Andre 2013
- Error rate reduced significantly following corrective action
- High error rates have obvious consequences in cost and turnaround time for instance the need to use extra cartridges to retest specimen increase the cost of testing per patient.
- Patients may also be required to produce fresh specimens.

Conclusion

- Strict compliance to procedural requirements is necessary for maximum attainment and sustainable system function.

- Despite the user friendly procedure of Xpert MTB/RIF, the equipment used is very sensitive and must be maintained as specified by the manufacturer.

- Continuous monitoring of error rates is crucial in order to ensure prompt and efficient usage of the equipment and reduced waiting time of patients.

Reference

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