Tuberculosis (TB) is one of the leading cause of morbidity and mortality worldwide, affecting one-third of world population. For the study, a total of thousand Ziehl-Neelsen (ZN) smear positive sputum specimens were collected and subjected to direct TTC (2,3,5-triphenyl tetrazolium chloride) assay and direct microscopic drug susceptibility assay (direct MODS assay) and the results were compared with indirect proportion method. Among the 1000 smear positive sputum specimens processed, a total 839 valid results were obtained. Of the valid results (n=839), Indirect LJ PM, Direct TTC assay, Direct MODS assay could detect Isoniazid or Rifampicin susceptible isolates
as \(n=711, n=705\) and \(n=699\), respectively. Among these isolates (indirect LJ PM \(N=711\), direct TTC assay, \(n=705\) and direct MODS assay, \(n=699\)), 41.21\%, 41.42\%, 41.49\% were possessing smear scores (2+) and demonstrated growth within a median time of 62, 9.5 and 7 days, respectively. On the other hand, total susceptible isolates obtained by combination of Indirect LJ PM, Direct TTC assay and Direct MODS assays \((N=730)\), 40.68\% sputum specimens were possessing smear scores (2+) demonstrated growth within 62 (Indirect LJ PM), 9 (Direct TTC assay) and 7 (Direct MODS assay), respectively. However of the Isoniazid or Rifampicin Indirect LJ PM \((n=128)\), Direct TTC assay \((n=134)\), Direct MODS assay \((n=140)\) resistant isolates, 53.91\%, 52.99\%, 52.14\% were possessing smear scores (1+) demonstrated growth within a median time of 86, 18 and 21 days, respectively. Alternatively, resistant isolates obtained by combination of Indirect LJ PM, Direct TTC assay and Direct MODS assay \((N=156)\), 51.92\% sputum specimens possessing smear scores (1+) demonstrated growth within 86 (Indirect LJ PM), 18 (Direct TTC assay) and 21 days (Direct MODS assay), respectively.

The sensitivity, specificity, PPV and NPV of direct TTC assay was: a) for newly diagnosed TB patients 97.54\%, 77.78\%, 98.85\%, 61.76\%, respectively (for INH); 99.26\%, 83.33\%, 99.44\%, 78.95\%, respectively (for RIF); 98.29\%, 76.66\%, 98.67\% 71.88\%, respectively (for both INH and RIF). b) For previously treated TB patients; 93.33\%, 90.8\%, 95.79\%, 85.87\%, respectively (for INH); 95.71\%, 86.11\%, 95.26\%, 87.32\%, respectively (for RIF); 91.3, 87.76\%, 93.33\%, 84.31\%, respectively (for both INH and RIF). The sensitivity, specificity, PPV and NPV of direct MODS assay was: a) for newly diagnosed TB patients: 98.49\%, 85.19\%, 99.24\%, and 74.19\%, respectively (for INH); 99.07\%, 94.44\%, 99.81\%, 77.27\%, respectively (For RIF); 98.1\%, 83.33\%, 99.04\% 71.43\%, respectively (for both INH and RIF). b) for previously treated TB patients: 92.33\%, 90.8\%, 95.79\%, 84.95\%, respectively (for INH); 94.76\%, 87.5
%, 95.67%, 85.14%, respectively (for RIF); 90.22, 88.78%, 93.78%, 82.85%, respectively (for both INH and RIF). Further, cost of each assay was calculated; the sputum processing charges (using NALC-NaOH method) were two rupees fifty paisa for all the assays. The cost of indirect LJ PM, direct TTC assay and direct MODS assay was fifteen rupees fifty paisa, nineteen rupees and eighty eight paisa, thirty nine rupees one paisa (excludes the instrument cost, electricity and labor charges), respectively. In conclusion, the direct TTC assay found to be an economical method for the rapid and accurate detection of INH and RIF resistance directly from AFB smear positive sputum specimens when compared to direct MODS assay and Indirect LJ PM.

Key words: Tuberculosis, Drug Susceptibility Testing, 2, 3, 5 Tri Phenyl Tetrazolium Chloride Assay, Indirect Proportion Method, Microscopic Observation Drug Susceptibility Assay