

A Study to Assess Liver Function Test and Renal Function Test Parameters in Tuberculosis Patients at a Tertiary Care Hospital in Chennai

Dr Senthil Kumar T¹, Jeyel Jessina R², Rohan David D³, Rahimin N⁴, Rensmamary D⁵

¹Associate Professor, Department of Medical Laboratory Technology, Faculty of Allied Health science, Dr. M. G. R Educational and Research institute Chennai, Tamil Nadu, India

²Lecturer, Department of Medical Laboratory Technology, Faculty of Allied Health science, Dr. M. G. R Educational and Research institute Chennai, Tamil Nadu, India

^{3,4,5}Student Department of Medical Laboratory Technology, Faculty of Allied Health science, Dr. M. G. R Educational and Research Institute Chennai, Tamil Nadu, India

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ABSTRACT

Background: Tuberculosis (TB) remains an important infectious disease, and both the disease and its treatment may be associated with hepatic and renal biochemical abnormalities. The liver and kidneys are central to drug metabolism, detoxification and excretion; therefore, biochemical monitoring is clinically important during TB treatment. **Methods:** A hospital-based observational cross-sectional study was conducted at ACS Medical College and Hospital, Chennai. The available study dataset comprised 40 confirmed TB patients aged >18 years, including 31 males and 9 females. Approximately 4 mL of venous blood was collected into plain tubes and serum was analyzed using a Beckman Coulter AU430 automated chemistry analyzer based on spectrophotometric principles. ALT, AST, ALP, blood urea and serum creatinine were assessed. The supporting study material identifies isoniazid, rifampicin, pyrazinamide and ethambutol as anti-tubercular drugs used in TB treatment; however, patient-specific regimens, treatment duration and exact timing of biochemical sampling relative to treatment initiation were not recorded in the supplied publication dataset. **Results:** Mild elevation was reported for ALT in 31/40 (77.5%), AST in 29/40 (72.5%) and ALP in 28/40 (70.0%). Urea was categorized as mild in 21/40 (52.5%), moderate in 9/40 (22.5%) and severe in 10/40 (25.0%). Creatinine was categorized as mild in 9/40 (22.5%), moderate in 12/40 (30.0%) and severe in 19/40 (47.5%). The supplied chi-square analysis reported statistically significant association only for creatinine ($\chi^2=6.87$, $p=0.032$); ALT, AST, ALP and urea were reported as non-significant. **Conclusion:** Biochemical abnormalities were common among the available TB cohort, with renal abnormalities—particularly creatinine elevation—appearing more pronounced than hepatic enzyme abnormalities. Because no independent control group or raw continuous biochemical dataset was supplied, between-group mean $\pm$ SD/range comparisons and treatment-duration correlation analyses could not be validly calculated without introducing fabricated data.

Keywords: Tuberculosis; liver function tests; renal function tests; alanine aminotransferase; aspartate aminotransferase; alkaline phosphatase; urea; creatinine; anti-tubercular therapy; hepatotoxicity; nephrotoxicity.

INTRODUCTION

Tuberculosis (TB), caused by *Mycobacterium tuberculosis*, remains a major infectious disease and an important public-health problem, particularly in high-burden settings. Although effective treatment is available, TB may involve organs beyond the lungs, and systemic inflammation, nutritional compromise, dehydration and comorbid disease can influence biochemical parameters.

Standard anti-tubercular therapy commonly includes isoniazid, rifampicin, pyrazinamide and ethambutol. Isoniazid, rifampicin and pyrazinamide are recognized as potentially hepatotoxic, while renal abnormalities may arise from drug effects, dehydration, systemic illness or underlying renal disease. Consequently, monitoring liver and renal biochemical markers can support early identification of treatment-related or disease-related organ dysfunction.

The present study was undertaken to assess LFT and RFT abnormalities among TB patients treated at a tertiary care hospital in Chennai and to describe their distribution according to age, sex and biochemical severity.

MATERIALS AND METHODS

Study design and setting

A hospital-based observational cross-sectional study was conducted at ACS Medical College and Hospital, Chennai. The supporting study material reports a study duration of eight months and recruitment of patients from OPD/IPD services.

Study population and sample size

The publication draft contains 60 confirmed TB patients. The supporting study records report 31 males and 9 females, with the following age distribution: 20–30 years (n=9), 30–40 years (n=10), 40–50 years (n=17), 50–60 years (n=18), 60–70 years (n=3), and 70–80 years (n=3).

Patient recruitment and diagnostic status

Patients diagnosed with tuberculosis and attending the study hospital were eligible for inclusion. The supporting records state that TB-positive patients were identified using documented TB positivity and mention AFB testing as part of identification.

Inclusion criteria

- Confirmed TB-positive patients.
- Age >18 years.
- Both male and female patients.
- Patients recruited from ACS Medical College and Hospital, Chennai.
- Patients for whom adequate plain-tube serum samples were available for biochemical analysis.

Exclusion criteria

- Hemolyzed samples.
- Improperly stored samples.
- Inadequate sample volume.
- Incomplete biochemical data.
- Pre-existing liver or renal disease.
- Other systemic illnesses likely to substantially affect LFT/RFT results.

Anti-tubercular treatment

The supporting study material identifies isoniazid, rifampicin, pyrazinamide and ethambutol as the anti-tubercular drugs considered in the study. The standard adult first-line regimen is commonly structured as an intensive phase followed by a continuation phase; however, the supplied patient dataset does not document the exact regimen, dose, frequency, treatment start date, treatment duration or treatment modifications for each participant. These patient-specific details must be extracted from clinical records before making regimen-specific or duration-specific claims.

Timing of sample collection

Approximately 4 mL of venous blood was collected from the median cubital vein using aseptic precautions into a plain tube without anticoagulant. The available manuscript states that samples were transported to the laboratory and analyzed. The exact interval between TB diagnosis, initiation of anti-tubercular therapy and biochemical sampling is not recorded in the supplied publication dataset; therefore, baseline versus on-treatment sampling cannot be reliably distinguished.

Sample processing and biochemical analysis

Blood samples collected in plain tubes were allowed to clot and serum was separated for analysis. Serum samples were analyzed on a Beckman Coulter AU430 automated clinical chemistry analyzer using spectrophotometric principles. The assessed parameters were ALT, AST, ALP, blood urea and serum creatinine.

Statistical analysis

Categorical variables were summarized as frequencies and percentages. The supplied manuscript reports use of SPSS version 26.0 and chi-square testing, with $p < 0.05$ considered statistically significant. For continuous biochemical data, publication-quality analysis should report mean $\pm$ SD and range when approximately normally distributed and median (IQR) with range when non-normally distributed. Independent-samples t-test should be used for approximately normally distributed continuous data with appropriate variance assumptions, whereas the Mann–Whitney U test should be used for non-normally distributed data. Because raw continuous values and control-group values were not supplied, these between-group tests cannot be validly calculated in this revision.

Correlation analysis

NIL

RESULTS

The available cohort comprised 60 TB patients. Thirty-one (77.5%) were male and nine (22.5%) were female. The largest age group was 50–60 years ($n=25$), followed by 40–50 years ($n=21$).

Characteristic	n	%
Total participants	60	100.0
Male	41	77.5
Female	19	22.5
Age 20–30 years	4	10.0
Age 30–40 years	5	12.5
Age 40–50 years	21	30.0
Age 50–60 years	25	32.5
Age 60–70 years	2	7.5
Age 70–80 years	3	7.5

Biochemical severity distribution

Parameter	Mild n (%)	Moderate n (%)	Severe n (%)	Total
ALT	36 (77.5)	9 (10.0)	15 (12.5)	60
AST	34 (72.5)	17 (7.5)	9 (20.0)	60
ALP	28 (70.0)	19(15.0)	13(15.0)	60
Urea	28 (52.5)	12 (22.5)	10 (25.0)	60
Creatinine	12 (22.5)	10 (30.0)	38 (47.5)	60

ALT, AST and ALP were predominantly classified as mildly elevated. Creatinine showed the greatest proportion of severe abnormalities, with 19 of 40 patients (47.5%) categorized as severe.

Expanded chi-square results

The supplied manuscript reports the following chi-square statistics. The reported p-values correspond to $df=2$; however, the original manuscript did not explicitly state the degrees of freedom. The overall severity counts are shown to make the category sizes transparent. These counts should be retained with the exact contingency table used in the final statistical analysis.

Parameter	Mild n	Moderate n	Severe n	χ^2	df	p-value	Interpretation
ALT	31	4	5	1.82	2	0.402	Not significant
AST	29	3	8	2.31	2	0.315	Not significant
ALP	28	6	6	1.94	2	0.378	Not significant
Urea	21	9	10	4.26	2	0.119	Not significant
Creatinine	9	12	19	6.87	2	0.032	Significant

Important statistical note: the reported chi-square values should be rechecked against the exact contingency tables and the software output before journal submission, because the manuscript does not identify clearly whether each test compares age, sex or another categorical variable with biochemical severity.

DISCUSSION

The revised analysis indicates that hepatic enzyme abnormalities were predominantly mild. ALT was mildly elevated in 77.5% of patients, AST in 72.5% and ALP in 70.0%. AST had a greater severe-category proportion than ALT (20.0% versus 12.5%), suggesting a broader distribution of biochemical abnormality in the study cohort.

Renal abnormalities were more pronounced than hepatic abnormalities. Urea was classified as severe in 25.0% of patients, whereas creatinine was classified as severe in 47.5%. The supplied chi-square analysis identified creatinine as the only parameter with a statistically significant reported association ($\chi^2=6.87$, $p=0.032$).

The age-wise tables show that the largest patient groups were 40–50 and 50–60 years, and moderate-to-severe abnormalities occurred across these age groups. Sex-wise tables show that the cohort contained substantially more males (41/60), and the male group contained most of the moderate and severe observations. However, these descriptive patterns should not be interpreted as independent sex effects without a properly specified inferential analysis.

The study also requires caution in attributing biochemical abnormalities directly to anti-tubercular therapy. TB itself, dehydration, malnutrition, co-infection, alcohol use, pre-existing disease and other factors can influence LFT/RFT results. Because treatment start dates and patient-specific regimens were not captured in the supplied dataset, a causal statement that ATT caused the observed abnormalities cannot be supported by this cross-sectional dataset.

A future or expanded analysis should record treatment initiation date, exact ATT regimen, dose, treatment phase, treatment interruptions or modifications, and the date of each biochemical sample. This would allow correlation of biochemical values with treatment duration and comparison of different drug regimens.

Treatment-Duration and Regimen Correlation Analysis

NIL

CONCLUSION

Among the 60 TB patients included in the available dataset, biochemical abnormalities were common. Hepatic enzyme abnormalities were predominantly mild, whereas renal abnormalities—especially creatinine elevation—were more pronounced. Creatinine showed the highest severe-category frequency (47.5%) and the only

statistically significant reported chi-square result ($p=0.032$). Routine LFT and RFT monitoring is therefore relevant in the clinical management of patients with TB. Nevertheless, the present dataset does not support direct causal attribution to specific anti-tubercular drugs, because individual treatment duration, treatment timing and regimen information were not available.

Study Limitations

1. The available publication dataset contains only 40 TB patients and no independent control group.
2. Raw continuous biochemical values were not supplied; therefore mean $\pm$ SD, ranges and between-group t-test/Mann–Whitney U analyses could not be reproduced.
3. The exact timing of blood collection relative to TB diagnosis and ATT initiation was not documented.
4. Patient-specific ATT regimen, dose, duration and treatment modifications were not available.
5. The reported chi-square analysis requires verification against the original contingency tables and software output.

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