

**“STUDY OF BIOCHEMISTRY LABORATORY IN A 1200 BEDDED TERTIARY CARE
TEACHING HOSPITAL WITH SPECIAL EMPHASIS ON PRE-ANALYTICAL,
ANALYTICAL AND POST-ANALYTICAL ERRORS ”**

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1. ABSTRACT

1.1 Background

The study was conducted in a 1200 bedded tertiary care teaching hospital in Northern Karnataka. The hospital serves as a referral center to the Northern part of Karnataka. It provides multi-specialty care along with super-specialty care. The Biochemistry Laboratory of the hospital was considered for the study.

In a tertiary hospital, the biochemistry laboratory serves a vital role in patient care by performing diagnostic tests that measure biochemical markers. These tests support disease diagnosis, monitor the effectiveness of treatments, and help detect clinical abnormalities. A laboratory's efficiency depends entirely on how accurately and promptly it can report results. When lab results are delivered accurately and on time, physicians can make better-informed decisions, which in turn improves patient outcomes and the hospital's overall quality of care.

1.2 Objectives

- To study the layout, infrastructure, staffing, & functioning of the Biochemistry laboratory.
- To study the process flow, workload and turn around time of the biochemistry laboratory.
- To identify the errors in the pre-analytical, analytical and post-analytical phases.
- To suggest measures to improve the processes & minimize errors.

1.3 Methodology

Time period of study: 1st January 2024 - 31st December 2024.

The existing biochemistry laboratory was examined in detail—its infrastructure, layout, workflow, equipment, and quality control measures were assessed, along with an in-depth analysis of laboratory errors.

➤ Study Design:

The study employed a descriptive observational (non-interventional) design.

➤ Study participants:

1. Inclusion criteria- The study was conducted on processes at pre-, intra- and post-analytical phases. Requests which were ordered for Clinical Chemistry tests taking into account venous blood samples (serum sample) were included in the study.
2. Exclusion criteria- Urine and other body fluids such as serous fluid, synovial fluid, and cerebrospinal fluid were not included in this study.

➤ **Sampling:** Convenience sampling

➤ **Study procedure:** Descriptive observational study.

1.4 Results

This thesis studies the infrastructure, workflow, staffing pattern, quality control practices, and error distribution in the biochemistry laboratory of a 1200-bedded tertiary care teaching hospital. The laboratory demonstrated a well-structured layout with clearly defined pre-analytical, analytical, and post-analytical zones, supporting efficient process flow. Adequate staffing and shift distribution ensured round-the-clock functioning. Most errors were identified in the pre-analytical phase, predominantly related to sample collection issues, labeling deficiencies, and hemolysis. Analytical errors were minimal due to strict adherence to internal and external quality control protocols, regular calibration, and automation support. Post-analytical discrepancies were mainly associated with critical value communication and delays in communication of critical test results. Overall, the laboratory showed satisfactory compliance with standard quality indicators; however, targeted interventions in sample handling, documentation accuracy, and turnaround time monitoring were recommended to further reduce error rates and enhance diagnostic reliability and patient safety.

1.5 Conclusion

The study concludes that the biochemistry laboratory functions efficiently with strong infrastructure, automation, and quality control systems. However, pre-analytical errors remain the most significant concern. Strengthening staff training, improving sample handling protocols, and closely monitoring turnaround time and critical value reporting will further enhance laboratory quality and patient safety.

1.6 Key words

Biochemistry Laboratory; Tertiary Care Hospital; Pre-analytical Errors; Analytical Errors; Post-analytical Errors; Turnaround Time (TAT); Quality Control (IQC & EQC); Laboratory Information System (LIS); Sample Rejection Rate; Laboratory Quality Assurance