**Analysis of Critical Biochemistry Values in Medical College Hospital.**

**Authors:**

Dr Leela P1, Dr ShivarajGowda2, Dr Chandrakant KH3, Dr Shreedhar AM4

1.Associate Professor, Department of Biochemistry, Subbaiah Institute of Medical Sciences, Shivamogga, Karnataka. leelapleela@gmail.com

2.Professor, Department of Biochemistry, Subbaiah Institute of Medical Sciences, Shivamogga, Karnataka. drshivaraj@yahoo.com

3.Prof & Head, Department of Biochemistry, Subbaiah Institute of Medical Sciences, Shivamogga, Karnataka. drckh14@gmail.com

4.Anaesthesiologist, Department of Health and Family Welfare, General Hospital, Channagiri, Karnataka. aanklasam@gmail.com

Corresponding Author: Dr. Leela P1

**ABSTRACT:**

**Background:** One of the important functions of a clinical biochemistry laboratory is clear, accurate, and rapid communication of a critical value to clinicians. Critical values are important and patients require immediate treatment. Patient safety is a cornerstone of healthcare quality, including clinical laboratory services. The present study was aimed to analyse the critical values data in the laboratory settings and compare it with the available data from other studies.

**Materials and methods:** The present study was conducted at a Subbaiah institute of medical sciences, Shimoga , Karnataka, India over a period of 6 months. The critical values data of several biochemical parameters were obtained from the critical value register. All information accessed was analysed with the main laboratory register of the biochemistry department. The data thus generated was expressed in terms of percentage and presented in tabular form.

**Results:**  A total of 24588 tests were done in our hospital during the study period and 313 critical alerts were generated. Percentage of critical values for each parameters and total tests were recorded. Our results indicated that the mean percentage of critical values was 1.2% of total tests. This was compared with the other studies which has a value of 2.6% and 6.4% as shown in the table 2.

**Conclusion:** Though our results support the patient safety programregarding regular monitoring and evaluation on the management of laboratory critical values, we still need further studies of critical values in larger scale.

**Keywords:**Critical value, Clinical laboratory, Patient safety.

**INTRODUCTION**

A critical value is defined as “a laboratory test result that represents a pathophysiologic state at such variance with normal as to be life-threatening unless something is done promptly and for which some corrective action could be taken”.1One of the important requirements for laboratory accreditation isCritical value reporting.2,3

Patient safety is a cornerstone of healthcare quality, including clinical laboratory services. Management of patients related to the patient safety includes all aspect of services, which covers the process of diagnosing, giving therapy, and predicting the prognosis.4

Laboratory professionals are often challenged with many hindrances in the reporting of critical values, including establishing clinically relevant criteria for critical values, resolving difficulties in finding the doctor who ordered the report when a critical value is obtained, and confirming that the doctor understands the severity and implications of a critical result. Critical value is important and requires immediate notification and immediate treatment or more intensive care.5

The aim and objective of the present study was to analyse the critical value reporting of our laboratory tests and to compare with the critical values of other studies.

**Materials & Methods:**

The current retrospective study was conducted over 6 month period from January 2022 to June 2022 at the Central Laboratory, Subbaiah Institute of Medical Sciences and Hospital, Shimoga. Our study was approved from the Institutional Ethics Committee. Informed consent and permission was taken from Lab Director. The tests done were from the emergency wards and other departments of the hospital. Data was collected from theCentral Laboratory by using Simple Random SamplingTechnique.As we were analysing the critical values of all the parameters irrespective of patients and hence there were no inclusion and exclusion criteria. Data for patients that had critical results were obtained from the critical value register.

**Results:**

All information accessed was analysedfrom main laboratory register of the biochemistry department.A total of 24588 tests were done and 313 critical alerts were generated. Statistical analysis was done using SPSS version and percentage was calculated and presented in tabular column. The percentage of critical values for each parameter with the total tests was done. The mean percentage wasof critical values were 1.2 %. The list of critical values and their biological limits of various parameters as per the international standards6,7 are shown in table 1. The comparisons of our results with other studies are shown in table 2. The mean percentages of critical values of other studies are 2.6 % and 6.4 % as shown in the table 2.

**Table no 1. Critical values of different parameters tested**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Lower limit | Upper limit | Total | No.of Critical values | Percentage |
| FBS | mg/dl | <50 | >350 | 1759 | 32 | 1.8% |
| Urea | mg/dl |  | >80 | 3582 | 54 | 1.5% |
| Creatinine | mg/dl |  | >5 | 4648 | 30 | 0.6% |
| Sodium | mmol/L | <120 | >150 | 2804 | 7 | 0.2% |
| Potassium | mmol/L | <2.8 | >6.2 | 2804 | 34 | 1.2% |
| T. Bilirubin | mg/dl |  | >10 | 2453 | 26 | 1.05% |
| D. Bilirubin | mg/dl |  |  | 2453 | 26 | 1.05% |
| SGOT | U/L |  |  | 94 | 44 | 46.8% |
| SGPT | U/L |  |  | 94 | 23 | 24.46% |
| ALP | U/L |  |  | 45 | 16 | 35.5% |
| Amylase | U/L |  | >500 | 402 | 10 | 2.48% |
| Cholesterol | mg/dl |  |  | 1554 |  |  |
| Triglyceride | mg/dl |  |  | 1554 | 8 | 0.5% |
| Calcium | mg/dl | <6 | >13 | 342 | 3 | 0.8% |

FBS- Fasting Blood Glucose, SGOT- Serum Glutamic Oxaloacitic Transaminase, SGPT- Serum Glutamic Pyruvic Transaminase, ALP- Alkaline phosphatise.

**Table no 2. Comparison of critical values in different studies**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Percentage of critical values in our study | Percentage of critical values in Abhishek et al8 | Percentage of critical values in Nambrata et al9 |
| FBS | mg/dl | 1.8 | 2.61 | 7.1 |
| Urea | mg/dl | 1.5 | --- | 3.4 |
| Creatinine | mg/dl | 0.6 | 0.81 | 5.9 |
| Sodium | mmol/L | 0.2 | 4.04 | 7.2 |
| Potassium | mmol/L | 1.2 | 6.13 | 8.3 |
| T. Bilirubin | mg/dl | 1.05 | 1.87 | --- |
| D. Bilirubin | mg/dl | 1.05 | --- | --- |
| SGOT | U/L | 46.8 | --- | --- |
| SGPT | U/L | 24.46 | --- | --- |
| ALP | U/L | 35.5 | --- | --- |
| Amylase | U/L | 2.48 | 4.87 | --- |
| Cholesterol | mg/dl | --- | --- | --- |
| Triglyceride | mg/dl | 0.5 | --- | --- |
| Calcium | mg/dl | 0.8 | 6.65 | --- |

**Discussion:**

In the analysis of the critical values, we found one of the interesting research publications by Saritaet al10. In this study, the sample size was 1548786 in one year. Similar such study was done by AnandDigheet al11 which had a sample size of 5105336 in one year. Our study comprised of total 24588 samples received during six months period. It is noticed that number of upper limit values are more when compared with the number of lower limit values in all parameters. It is evident from our study that the incidence of critical values in our lab varies from as low as 0.2% for serum sodium to as high as 46.8% for SGOT. For serum electrolytes, critical values for potassium were on higher side than sodium. When we compared with the other studies in table 2 percentage of critical values for each parameter are higher than our studies. The other studies were of one year with more number of samples indicating the higher percentage and this will guide us to take up our study with more samples and duration. Different studies have demonstrated thatthe notification of critical values varies between tests, with percentages varying from 0.7% to 9%,similar to that found in our study.12

In reporting the critical value, the first step taken is to recognize the critical value done by laboratory staff. Then, it is necessary to write clearly whether the results have been repeated or not repeated. Furthermore, the critical value is reported to the doctor who is responsible for taking care of the patient by telephone or other media.13

The term critical value was first defined by George D. Lundberg in 1972 as the result of laboratory tests that showed abnormal pathophysiological conditions that threaten the patient's life, so it is necessary to immediately inform the doctor who treats the patient so that an action could be taken.14

This study is at par with other studies regarding identifying the need of critical values in emergency ward and this will help to identify the underlying causes and to take suitable measures for the patients. Moreover, it is also important for laboratories to set the upper and lower limits as per international standards. Hence, it is important to train all laboratory staff including doctors for registering the critical values in the separate registers and to inform the consultants.This small step towards patient care can help to modify clinical management and patient care. The establishment of critical value register has developed a healthy interaction with the clinicians and laboratory specialist. This interaction will help in both academics and patient care. Looking at beneficial aspects, the management of our college has instructed to start the same for outpatients department.

The value of the study can be further enhanced by increasing the duration of the study. Furthermore the critical value reports in the hospital are informed by the most common traditional practice of telephonic system which could be improved by upgraded electronic system.

**Conclusion:**

Critical value reporting is an important phase of the clinical laboratory testing process. Further studies of critical values might be beneﬁcial to observe certain trends and in understanding the effects of treatment on the biochemical proﬁle of these patients.

**References :**

1. Lundberg GD. When to Panic over Abnormal Values. Med Lab Observer 1972;4:47-54.
2. College of American Pathologists. Laboratory Accreditation checklist. Available at: http://www.cap.org/apps/cap.portal. Accessed January 18th 2018.
3. Joint Commission on Accreditation of Healthcare Organizations. International Patient Safety Goals 2007. Available at: http://www.jointcommission.org/PatientSafety/NationalPatientSafetyGoals. Accessed January 8th 2018.
4. Rosita L, Edy. P. Performance of Laboratory Critical Value on Clinical Laboratory Services in Supporting Patient Safety. Advances in Health Sciences Research. 2020;33:27-31
5. Bhatia K, Bhatia P, Udari SN, et al. Study on laboratory critical value analysis in a multi-speciality hospital. MedPulse International Journal of Biochemistry. 2019;12(1):06-09.
6. Arbiol-Roca A, Corral-Comesana S, Cano-Corres R, et al. Analysis of laboratory critical values at a referral Spanish tertiary university hospital. Biochem Med (Zagreb) 2019;29(1):010704.
7. Dighe AS, Rao A, Coakley AB, et al. Analysis of laboratory critical value reporting at a large academic medical center. Am J ClinPathol 2006;125(5):758-64.
8. Kumar A, Parikh B, Shah R. Analysis of critical value data at a large clinical biochemistry laboratory in a tertiary care oncology centre. International journal of scientific research. 2019;8(11):1-2.
9. Bhutani N, Bhutani N. A Study of Analysis of Critical Values at Emergency Biochemistry Laboratory in a Tertiary Care Hospital in India. J. Evolution Med. Dent. Sci. 2020;9(12):957-960.
10. SaritaJagdishbhaiMangukiya et al. International Journal of Biomedical and Advance Research 2015; 6(08): 617-622.
11. Anand S. Dighe et al, Analysis of Laboratory Critical Value Reporting at a Large Academic Medical Center, Am J ClinPathol 2006;125:758-764.
12. Agarwal R, Chhillar N, Tripathi CB. Study of variables affecting critical value notification in a laboratory catering to tertiary care hospital. Indian J Clin Biochem. 2015;30:89-93.
13. Rocha BCB, Alves JAR, Pinto FPD, Mendes ME, Sumita NM. The critical value concept in clinical laboratory. The Journal Brasileiro de Patologia e Medicina Laboratorial. 2016;52(1):17–20.
14. Emancipator K. Critical Values: ASCP Pratice Parameter. American Journal of Clinical Pathology. 1997;369(1):1689–99.