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ANALYSIS OF CRITICAL VALUES AT EMERGENCY BIOCHEMISTRY LABORATORY IN A TERTIARY CARE TEACHING HOSPITAL IN NORTH INDIA

Biochemistry

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ABSTRACT

Objectives: This study aimed to analyze the critical values data at a tertiary care hospital in New Delhi , India in the emergency laboratory setting and compare it with the available data from previous studies.

Material and methods: The critical values data of several biochemical parameters generated from the testing of samples on Beckman Coulter Olympus AU 480 .during three months period were analyzed.

Results Total 183056 tests were analyzed and 11875 critical alerts were generated the incidence of which varied from 0.8% for glucose (children) to 10.6% for serum potassium in children.

Discussion: Frequency of critical values for serum Potassium is highest followed by serum sodium. Also, critical values for serum Potassium in paediatric patients is higher than adults.

Conclusion: Further studies of critical values in emergency labs is required to observe trends, identify the underlying causes and suggest suitable remedial measures if any.

KEYWORDS

Critical Value, biochemistry , emergency laboratory, pre-analytical errors.

INTRODUCTION :

A critical value can be 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". One of the important functions of a clinical biochemistry laboratory is clear, accurate, and rapid communication of a critical value to clinicians.[1] Critical value reporting is one of the requirements for laboratory accreditation. Defining and mandating a universal set of thresholds for tests, however,is a difficult task given the scarcity of outcomes based data on critical value thresholds. [2]Critical value lists that are too inclusive (or that have critical value thresholds that require excessive notification) place an unnecessary burden on laboratory staff , annoy clinicians and create a negative attitude toward important laboratory services.[3,4] On the other hand, lists that are too exclusive (or with thresholds that are too high or low) might not prevent adverse clinical outcomes, as a delay in the recognition of life threatening laboratory results by clinicians can be disastrous.[6] To establish or modify critical values, it is important to compare with previously published lists, practice parameters, and consensus documents because these sources have been refined with the benefit of time, institutional comparison, and clinical performance.[7,8] Most reports have analyzed only a few analytes for short periods or have reviewed a small number of critical values in different institutions.[9] This study aimed to analyze the critical values data at a tertiary care hospital in New Delhi , India in the emergency laboratory setting and compare it with the available data from previous studies.

METHODOLOGY:

The current study was conducted at the Biochemistry laboratory of New emergency building of Safdarjung Hospital, New delhi, India. This laboratory receives blood samples from all the emergency wards as well as non-routine samples for inpatient patients from rest of the wards of the hospital.. Parameters done on blood samples in emergency laboratory include glucose, urea, creatinine, total bilirubin, direct birubin, ALP, ALT, AST, amylase, sodium, potassium, chloride, creatine kinase, creatine kinase-MB and lipase. All samples are run on Beckman Coulter Olympus AU 480 . Data was collected from entry registers and rejected samples registers. A Retrospective study of of emergency biochemistry samples were evaluated over a period of two months from July 2019 to September 2019 and total of 183056 tests were studied. The parameters which were choosen by the lab director to be notified for critical values were glucose,serum creatinine, blood urea , serum sodium, potassium, chloride,CSF glucose and CK-MB in adults and total bilirubin, serum potassium, creatinine, glucose and CSF glucose in children and newborn patients.

The critical value result is checked for analytical reliability, then after checking and ruling out the pre- analytical errors as a potential cause of critical values, the sample is run again. Once the result is validated, the result is considered as a true critical value and it is notified by the doctor on duty telephonically to the clinicians in the respective wards and the same is recorded in a register. The list of critical values and their biological limits are presented in table 1. These limits were designed based on available literature and by consultation of the clinicians of our hospital.

Table 1: Critical value limits range in our laboratory

TEST	LOWER LIMIT	UPPER LIMIT
ADULTS		
Glucose	40mg/dl	450 mg/dl
Sodium	120 meq/l	160 meq/l
potassium	2.8 meq/l	6.2 meq/l
S.chloride	80 meq/l	120 meq/l
Urea		171 mg/dl
Creatinine		5 mg/dl
CSF Glucose	40 mg/dl	100 mg/dl
CK-MB		25U/L
NEWBORN		
T.bilirubin (newborn)		>15 mg/dl
S.potassium (newborn)	2.8 meq/l	7.8
creatinine		3.8
Glucose (children)	46 mg/dl	445 mg/dl
Glucose (newborn)	30 mg/dl	325 mg/dl
CSF glucose (children)	31 mg/dl	
CSF protein (children)		188 mg/dl

Statistical analysis was conducted using Microsoft Excel 2016 program..Calculations of critical values of biochemistry lab was presented as number and percentage.

Table 2: Critical values of different parameters tested

TEST	TOTAL	CRITICAL VALUES	LOWER	UPPER	PERCENTAGE(%)
ADULTS					
Glucose	7312	525	95	430	7.1
Sodium	35331	2566	1078	1488	7.2
Potassium	35331	2933	1425	1508	8.3
S.Chloride	35	2	2	0	5.7

Urea	33512	1145			3.4
Creatinine	33509	2010			5.9
CSF Glucose	1018	47	27	20	4.6
CK-MB	108	6			5.5
NEWBORN					
T.bilirubin (newborn)	10345	1080			10.4
S.potassium (newborn)	11234	1195			10.6
Creatinine	10976	321			2.9
Glucose (children)	1831	15	10	5	0.8
Glucose (newborn)	2023	18	7	11	0.9
CSF glucose (children)	254	5	2	3	1.9
CSF protein (children)	237	7	4	3	2.9
TOTAL	183056	11875			6.5

RESULTS :

Total 183056 tests were analyzed during the study period and 11875 critical alerts were generated by the Olympus AU 480 analyzer in total during this period, which is 6.5 % of total tests done. Both lower critical values and higher critical values of all the eligible parameters were recorded separately and total percentage of critical values for each parameters were recorded.

DISCUSSION :

Our study comprised of total 183056 tests analyzed during three months period. Studies from other laboratories had sample size ranging from 548786 done by sarita et al[10] to 5105336 studied by Anand Dighe[12] et al. It is evident from our study that the incidence of critical values in our lab varies from as low as 0.8% for glucose (children) to as high as 10.6% for serum potassium in children. Critical values of serum creatinine is 5.9% and it is 3.4% for blood Urea. Sarita et al have reported the critical values frequencies of creatinine and urea as 6.59% and 28.78% respectively.As we can see, the frequency of critical values of renal function tests are much lower in our laboratory.

It is evident from the comparative study that the critical values of electrolytes are lower than study of sarita et al but it is much higher than study done by A.Dighe and AA-Rocha et al[11]. It is also observed that incidence of critical values in serum potassium is more in paediatric patients as compared to adults. This could be attributed to the fact that there is more risk and of hemolysis while drawing sample in children and newborn.These results also points towards the need of further studies in emergency laboratories to see the prevalence of critical values of serum electrolyte parameters in these patients to observe a pattern of serum electrolyte values in paediatric patients. Critical values of Serum total bilirubin was 10.4% in our study and it was 8.54% in the study done by sarita et al. This highlights the need for study of frequency of critical values in emergency laboratories to identify the parameters with maximum critical values and also recognize the underlying causes for the same and take suitable measures, if necessary.

CONCLUSION :

It is observed in this study that the frequency of critical values for serum Potassium, is highest followed by serum sodium. Also, critical values for serum Potassium in paediatric patients is even higher than adults. These values show that these critical biochemical values can be detrimental to these patients and timely notification to the clinician is very important so that necessary actions could be taken to correct them. Further studies of critical values in emergency labs is required to observe trends and identify the underlying causes and suggest suitable remedial measures if any.

REFERENCES

1. College of American Pathologists. Laboratory Accreditation checklist. Available at: http://www.cap.org/apps/cap.portal.
2. Lundberg GD. When to Panic over Abnormal Values. Med Lab Observer 1972;4:47-54.
3. Joint Commission on Accreditation of Healthcare Organizations. International Patient Safety Goals 2007.
4. Genzen JR, Tormey CA. Pathology consultation on reporting of critical values. Am J Clin Pathol. 2011; 135: 505-13.
5. Lum G. Assessment of a critical limit protocol for point-ofcare glucose testing. Am J Clin Pathol. 1996;106:390-395.
6. Emancipator K. Critical values: ASCP practice parameter. Am J Clin Pathol. 1997;108:247-253.
7. Burtis C, Ashwood E, Bruns D, eds. Tietz Textbook of Clinical Chemistry and Molecular Diagnostics. 4th ed. St Louis, MO: Elsevier Saunders; 2006
8. Howanitz PJ, Steindel SJ, Heard NV. Laboratory critical values policies and procedures: a College of American Pathologists Q-Probes study in 623 institutions. Arch Pathol Lab Med. 2002;126:663-669.
9. Kuperman GJ, Boyle D, Jha A, et al. How promptly are inpatients treated for critical laboratory results? J Am Med Inform Assoc. 1998;5:112-119.
10. Sarita Jagdishbhai Mangukiya et al / International Journal of Biomedical and Advance Research 2015; 6(08): 617-622.
11. Ariadna Arbiol-Roca, Analysis of laboratory critical values at a referral Spanish tertiary university hospital, Biochem Med (Zagreb). 29(1): 010704. Volume-8 | Issue-11 | November - 2019 PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
12. Anand S. Dighe et al, Analysis of Laboratory Critical Value Reporting at a Large Academic Medical Center, Am J Clin Pathol 2006;125:758-764.