International Journal Dental and Medical Sciences Research
Volume 3, Issue 4, July-Aug 2021 pp 717-720 www.ijdmsrjournal.com ISSN: 2582-6018

Serum CPK; As a Prognostic Marker in Children Poisoning.

Dr. Minni Rani Akhouri, Dr. Bhardwaj N. Chaudhary, Dr. Priyanka Bhagat
MD(PED),MD(BIOCHEM), DNB(PED), CHCWM, Professor & HOD, Department of Neonatology
MD, Senior Resident, Department of Pediatrics and Neonatology
MD, Junior Resident, Department of Pediatrics and Neonatology
Rajendra Institute of Medical Sciences, Ranchi ,Jharkhand

Submitted: 01-08-2021 Revised: 14-08-2021 Accepted: 17-08-2021

ABSTRACT: Poisoning in children, being a preventable cause of morbidity and mortality, is an important pediatric emergency globally. Developing severity prediction tool for screening of these children is one of the interesting field of research. Some studies have reported creatinine phosphokinase (CPK) as a new emerging way in predicting the outcomes of poisoned patients. The aim of the study was to assess whether the admission serum CPK level in children at the time of admission with acute poisoning could be a predictive factor for the outcome. This prospective cohort study was performed on the children with poisoning admitted or referred to the emergency department .The admission serum CPK level was recorded and the patient was followed for the outcome(development of any complication, mortality). Our study aimed to evaluate relation between the serum CPK level at admission and the outcome. The mean of serum CPK level at the admission under study was 708.65±862.93 (min-52;max-2642). The study shows significant correlation between the serum CPK level and the severity of poisoning such as the need of ICU admission, dialysis and mortality($P< 0.05$). It concludes that the admission serum CPK level could be considered as an acceptable predictor for the severity of poisoning.

I.INTRODUCTION

Poisoning in children have been one of the major and preventable cause of emergency department admission in developing countries and is responsible for the considerable rate of morbidity and mortility. So there is a need of new , cheaper and easily quantifiable biomarkers for these patients. This has lead to the research of developing some “outcome prediction tool” which will help in the early screening for these children.

There could be various complications such as rhabdomyolysis i.e destruction of skeletal muscle and several mechanisms that increases the serum creatinine phosphokinase (CPK) level in these intoxicated patients .[1,2] Some studies have reported that serum creatinine phosphokinase (CPK) level may become a newly emerging way in prediction of poisoning severity and outcome.[3-5].Some possible mechanisms that result in increased CPK level in these intoxicated patients are prolonged immobilisation and muscle fibre necrosis, circulatory shock and muscle hypoxia, hyperthermia and muscle damage, drug-induced delirium, choreoathetosis, dystonic reactions and seizures.[1,6] Toxic serum level of any drug, muscle necrosis following substance overdose, seizure and serotonergic and neuroleptic syndromes may be some of the possible causes of increase in the CPK level in these children. [6,7]

Our study aimed to evaluate the serum CPK level at admission in the patient of acute poisoning and relation between CPK level and patient's outcome.

II.METHOD

A. Study design and setting:

This prospective cohort study was performed in department of Pediatrics and Neonatology, Rajendra Institute of Medical Sciences ,Ranchi in our Unit from January 2019 to December 2019.

B. Participants:

Inclusion criterion; Children with poisoning directly admitted or referred to emergency department admitted in our unit were included in the study. The serum CPK level at the time of admission was recorded; and correlated with the outcome for all patients.

Exclusion criterion; Patients with cerebrovascular accident (CVA), renal or hepatic diseases, ischemia and infarction, infections, hyperthermia, electrolytic disorders and diabetic ketoacidosis , were excluded.

C. Data gathering:

Patients’ data including gender , type of poisoning , presenting level of consciousness , poisoning severity, CPK level in first 24 hours of presentation to emergency department and result of the laboratory tests were collected as per the pre-

International Journal Dental and Medical Sciences Research
Volume 3, Issue 4, July-Aug 2021 pp 717-720 www.ijdmsrjournal.com ISSN: 2582-6018

designed checklist. Patients were followed for the outcome such as need for dialysis, need for intensive care unit admission, development of any complication and mortality.
Serum CPK level above 500U/L is taken as the cutoff level in this study as some studies consider serum CPK level >500U/L as rhabdomyolysis.[7]

D. Statistical analysis : Data were analysed with the help of SPSS version 21. Data were expressed as mean valves ± standard deviation.
Chi square test was undertaken for finding the relationship between serum CPK level in the first 24 hours and baseline characteristics as well as outcomes of the poisoning .
P< 0.05 was considered significant.

III.RESULT:

A total of 26 patients were taken in the study. Among them 18(69.2%) were male and 8(30.8%) were female. Table 1 and table 2 show the baseline characteristics of the participants. Snake bite (30.7%) followed by organophosphorous poisoning(23%) are common in our unit.

Table1.Distribution of sex and types of poisoning:

Sex:	**Number(Percentage)**
Male	18(69.2%)
Female	8(30.8%)

Type of Poisoning:	**Number(Percentage)**
Snake Bite	8(30.7%)
Scorpion Bite	1(3.8%)
Organophosphorus Poisoning	6(23%)
Kerosene oil	2(7.6%)
Phenyl Poisoning	3(11.5%)
Louse killer	1(3.8%)
Rat killer	1(3.8%)
Carbamazepine	2(7.6%)
Battery Water	1(3.8%)
Turpentine oil	1(3.8%)

Table2. Distribution of patients on different outcomes of poisoning:

Loss of conciseness

Yes	5(19.2%)
No	21(80.7%)

Dialysis:

Yes	1(3.8%)
No	25(96%)

ICU Admission:

Yes	7(26.9%)
No	19(73%)

Recovery:

With complications	3(11.5%)
Without Complications	23(88.4%)

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Mortality:

Yes	2(7.6%)
No	24(92.3%)

Table3. CPK levels in different outcomes of poisoning:

Variable	LOC	Dialysis	ICU	Mortality	Complications
No of Patient	5	1	7	2	3
CPK level Mean±SE (IU/L)	1242.4± 1074.8		1628± 1098.24	2274.5± 392.44	2103.33± 847.87
P Value	0.184	0.161	0.017	0.043	<0.001

SD: Standard Deviation- P>0.05: Non significant , P<0.05:Significant

The mean CPK level during the first 24 hour of admission in emergency department was 708.65±862.93 .There was significant relationship between the serum CPK level in the first 24 hr of presentation and the need of ICU(p=0.017), mortality(p=0.043) and development of complications(p<0.001).Whereas it has no significant association with patients presenting with loss of consciousness (p=0.184) and need of dialysis (p=0.16) .

IV.DISSCUSSION:

Our study shows significant relation between the serum CPK level in first 24 hrs with the need of ICU , mortality, and development of complications(p<0.05).Many studies have shown that skeletal muscle injury causes CPK leak into the circulation [3-8]. Serum CPK is the best biomarker for assessing skeletal muscle injury.[1-2] Elevation of serum CPK level in acute poisoning is mainly due to muscle fibre necrosis.[1-2]

Table4: Comparison between the present and previous studies:

Reference Study	Serum CPK range (U/L)	Serum CPK mean (U/L)
Present study	52-2642	708.65±862.93
Eman et al (2019)	13-4452	769.81±1095.54
Pajoum et al (2018)	35–89480	4693.1 ± 10303.8
Mural et al(2017)	91-2324	339±483.8
Dadpour et al.(2017)	NA	3702.85 ± 6375.29
Dubey et al(2016)	NA	1124.78 ±357.1
Mousavi et al (2015)	980-66500	5996 ± 892
Eizadi et al (2012)	414-74520	7796±1239.76
Bhattacharya(2011)	NA	NA

Eizadi et al (2012) proposed that serum CPK level might be helpful in predicting the risk of complications and mortality [9]. In another study Mousavi (2015) performed a retrospective study in which found a significant relation between serum CPK level and death. [10]

A study conducted by Pajoum et al (2018) , showed that Serum CPK level could be considered as a tool for screening the intoxicated patients in need for ICU admission and at risk for AKI.[8]

Eman et al (2019) showed that high serum CPK level achieved 92% sensitivity and 87% specificity in mortality predicting .[11]

In contrast, Dadpour et al. (2017) found no significant relation between ,serum CPK level in the first 24 hours and mortality of intoxicated patients.[12]

Whereas many studies such as Bhattacharyya et al (2011)[3] , Dubey et al(2016) [4] have concluded that serum CPK level correlate well with the severity of organophosphorous poisoning .

The present study differ from other studies in terms that the study group belongs to the pediatrics age group. Our study demonstrates that the serum CPK level in the intoxicated children had a significant association with the outcome. These findings were similar to other studies where they have tried to develop serum CPK as a tool for screening the severity of poisoning.[3-5]

Hence CPK being easily available , easy to process and easily quantifiable can be used as a biomarker for predicting the severity of acute poisoning in children.

V.LIMITATION:

Even though our study shows the relationship between serum CPK level and intoxicated children's outcomes , it needs to be confirmed with larger sample size and multivariate analysis models .

VI.CONCLUSION:

We concluded that the admission serum CPK level of poisoned children can be considered as a predicting tool for the outcome in these poisoned children.

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