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A STUDY ON RELATIONSHIP BETWEEN LABORATORY PARAMETERS AND DEGREE OF POISONING IN A TERTIARY CARE HOSPITAL

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ABSTRACT

Introduction: Acute poisoning is one of medical emergency conditions in all hospitals.[1] Laboratory parameters are important in providing adequate treatment for intoxicated patients. In this study, we aimed to analyze the laboratory parameters in a different type of poisoning and how it helps in identifying the condition of the patients. We have used the Glasgow Coma Scale (GCS) for assessing the patient's conscious level. **Methods:** We selected 204 study population for our study during the period of September 2018- February 2019. The collected data reviewed and recorded in a designed data collecting form. **Results:** Out of 204 patients 66% were males and most cases detected in the age group of 25-34years. We found an abnormality in the mean values of Pulse Rate (PR), Respiratory Rate (RR), White Blood Cells (WBC), Random Blood Glucose (RBG), Alanine Phosphatase (ALT), Aspartate Phosphatase (AST) and Pseudo-cholinesterase level. There was a significant variation in laboratory parameters when relating to GCS. PR, RR, WBC, neutrophils, RBG, serum urea, serum Creatinine, and ALT increased gradually with a decrease in GCS scores. Only SpO2, lymphocytes, RBC and pseudo-cholinesterase declined with a decrease in GCS score. There were no significant variations among other parameters. Stomach wash was the initial treatment given for all type of poisoning except in the case of corrosive substances poisoning. **Conclusion:** We concluded our study by pointing out a significant variation in laboratory parameters when it was related to with the consciousness level of patient by using a severity scale.

KEYWORDS: laboratory parameters, Glasgow coma scale.

INTRODUCTION

Intoxication occurs either accidentally or intentionally. It became a significant contributor to mortality and morbidity.[2] As per the WHO estimate 2012, there were 193,460 deaths by unintentional poisoning and 370,000 deaths by intentional poisoning globally. Also, there were 800,000 poisoning cases yearly.[3] Pesticides were the major substance responsible for intoxication in India. It may be due to ease availability of fertilizers as India is an agricultural country.

Identifying the type of poison ingested without any data is a difficult task. In the time of presentation, there may not be specific signs and symptoms or may have symptoms which may lead to a false diagnosis.[4] Before getting the laboratory test data it is necessary to provide initial treatment to the patient.

The initial treatment can be carefully chosen by completing different queries which include physical examination, interviewing the patients or patient attenders, symptoms, etc. Laboratory parameters are important in providing further treatment for any disease. In case of poisoning cases the data about liver functioning, kidney functioning, level of pseudo-cholinesterase, etc. helps in diagnosing the condition in a correct manner. In some cases, the agents responsible for poisoning remains in the body for a longer time but some of them rapidly get eliminated by metabolic activity.[4] Using laboratory data in combination with signs and symptoms a physician can provide definitive treatment for the patients.

AIM AND OBJECTIVES

The current study aims to analyze the relationship between the laboratory parameters and the degree of poisoning. The objective of this study was to determine the relationship in laboratory parameters and the degree of poisoning. The secondary objective was variation in signs and symptoms in a different type of poisoning.

METHODOLOGY

This is an observational retrospective study of acute poisoning cases admitted in the medical emergency ward of Krishna Rajendra Hospital Mysore. The study was conducted from October 2018- March 2019. It is a 1200 bedded tertiary care teaching hospital providing all kind of relevant treatment for all patients. All data were obtained from case records, case files and asking to patients and patient's attenders. Data were extracted into a structured data collection form. Collected data include patient demographics, types of poisoning, signs, and symptoms, laboratory parameters and initial treatment given. We have included all acute poisoning cases except those with incomplete data. The poisoning cases under age 15 were excluded from this study. The ethical committee approval was obtained from the Mysore medical college and research institute ethical committee. The collected data were analyzed by using IBM SPPSS software version 20.0. Obtained results are expressed as means (±SD) and percentage. Descriptive analysis was expressed by using significance by a p-value < 0.05. A number of 204 cases were collected including cases brought into the Intensive Care Unit (ICU).

RESULTS

During the period of 6months (October 2018- February 2019), 204 patient brought to the hospital as ingested poisoning except for excluded criteria. We found that males (66%) were more while comparing with females (34%). An age group of 25-34 was dominant in poisoning. 91% of the cases were intentional and 9% were accidental and others. There were 58% of patients consumed with alcohol and only 41.7% without alcohol intake. Table 1 shows the above results.

Table 1: Demographics of the study population.

Demographics	Frequency	Percentage %
Gender of patient		
Male	135	66.2
Female	69	33.8
Age of patient		
15-24 years	44	21.6
25-34 years	55	27
35-44 years	47	23
45-54 years	30	14.7
55-64 years	8	3.9
>64 years	20	9.8
Type of poison		
Intentional	185	91
Accidental	19	9
Alcoholic status of patient		
Alcoholic	119	58.3
Non-alcoholic	85	41.7

Organophosphate poisoning was the most in number (53.3%) followed by rodenticide (14.7%). There was only a few difference between the symptoms in a different type of poisoning. A Gastro-Intestinal disturbance was the main complaints by a significant group of patients followed by dyspnea, dysphagia.

There was an abnormality in the mean values of laboratory data. Pulse rate 94.9 bpm (± 22.93), Respiratory rate cyl/min 20.46 (± 13.66), WBC 12000.9 cells/cumm (± 5673.3), RBG 142.93 mg/dl (± 71.33), AST 62.45 U/L (± 131.62), ALT 40.56 U/L (± 73.65) and pseudo-cholinesterase 3193.42 U/L (± 6316.52) were the abnormal parameters. Table 2 gives the above results.

Table 2: Laboratory Investigations.

Lab Parameters	Mean Values
Pulse rate (bpm)	94.9 (± 22.93)
Respiratory rate (cyl/min)	20.46 (± 13.66)
Blood pressure (systolic)	117.0 (± 24.36)
Spo2 (%)	90.65 (± 13.21)
W B C (cells/cumm)	12000.9 (± 5673.3)
Neutrophils (%)	73.50 (± 16.58)
Lymphocytes (%)	18.35 (± 11.47)
Platelets (cells/cumm)	268081.0 (± 101196.78)
R B C (cells/cumm)	486654.26 (± 124424.76)
R B G (mg/dl)	142.93 (± 71.33)
Serum urea (mg/dl)	28.52 (± 20.38)
Serum creatinine (mg/dl)	0.953 (± 0.37)
Sodium (mmol/L)	139.54 (± 15.12)
Potassium (mmol/L)	4.133 (± 0.786)
Chlorine (mmol/L)	103.14 (± 70.56)
Total bilirubin (mg/dl)	0.719 (± 0.58)
A S T (IU/L)	62.45 (± 131.62)
A L T (IU/L)	40.56 (± 73.65)
A L P (IU/L)	106.3 (± 118.98)
Pseudo-cholinesterase (IU/L)	3193.42 (± 6316.52)

There were commendable changes in the values of laboratory parameters in various levels of the Glasgow coma scale (GCS).

There was a gradual increase in pulse rate, respiratory rate, WBC, neutrophils, RBG, serum urea, serum Creatinine, and ALT with a decrease in GCS scores whereas SpO2, lymphocytes, RBC and pseudo-cholinesterase seemed to decline decrease in GCS score. There were no significant variations among other parameters. The details of the above data depicted in table 3 given below.

Table 3: Laboratory investigations with the degree of poisoning.

Lab Parameters	Best Response	Comatose Client	Totally Unresponsive	p- value
Pulse rate (bpm)	94.78 (±17.1)	100.37 (±23.8)	92.24 (±33.13)	0.333
Respiratory rate (cycles/min)	17.5 (±7.71)	20.33 (±7.61)	28.00 (±2251)	0.00001
Blood pressure (systolic)	118.1 (±17.7)	121.85 (±28.82)	111.76 (±34.12)	0.160
Spo2 (%)	95.57 (±4.3)	86.74 (±14.85)	80.36 (±19.40)	0.00002
W B C (cells/cumm)	10932.9 (±4845.6)	12026.67 (±4708.12)	14873.64 (±7213.19)	0.00001
Neutrophils (%)	69.73 (±17.34)	80.05 (±17.60)	80.23 (±9.17)	0.000001
Lymphocytes (%)	20.98 (±11.93)	13.61 (±11.0)	13.97 (±7.85)	0.000001
Platelets (cells/cumm)	269924.3 (±89431.6)	222444.4 (±88714.89)	291100.18 (±128240.5)	0.019
R B C (cells/cumm)	514145.3 (±134407.9)	443407.41 (±100880.0)	440090.91 (±83600.8)	0.000001
R B G (mg/dl)	117.1 (±46.88)	162.32 (±49.61)	204.0 (±95.09)	0.000001
Serum urea (mg/dl)	25.03 (±13.83)	27.04 (±17.24)	39.21 (±31.45)	0.00001
Serum creatinine	0.857 (±0.22)	0.92 (±0.36)	1.23 (±0.54)	0.000001

DISCUSSION

Poisoning remains a major role in morbidity and mortality in India. In this study out of 204 study population, there were 66% males followed by 34% females. It gives the idea that males are more exposed to intoxication than females. This was concordant with the study conducted by Pradeep Kushal Mishra.[5] An age group of 25-34 were more intoxicated. In India above 25 is the age where they start to take responsibilities and manage the family. This may consider as the reason for high incidence among these age group. Mehdi Oraie also pointed out the similar data in his study.[6]

91% of the cases were intentional and only 9% were unintentional or others. By this data, we can clearly mention that most of the intoxication was for self-harming and those patients required counseling. Also, intense care was essential for those patients as they had a suicidal tendency.

Among 204 study population, we found that organophosphate poisoning was more (53.3%) followed by rodenticide (14.7%). A study conducted by Zhang Z also disclosed a high prevalence of organophosphate poisoning (61.63%).[7] A study by Pradeep Kushal Mishra revealed the same.[5] We found that most of the patients depend on cultivation as occupations, the ease availability of pesticide may be one of the reasons for the increased incidence of organophosphate poisoning. In minor cases, gastrointestinal symptoms were more observed. The other symptoms were dyspnea and dilated or constricted eye pupils.

58.3% (119) of the patients consumed poison with alcohol. Alcohol controls both voluntary and involuntary response of patients. It may induce suicidal tendency and mental stress. All intoxicated patients with alcohol consumption were intentional poisoning and were provided with proper counseling.

While considering the mean values of laboratory parameters values of pulse rate, respiratory rate, WBC, RBG, AST, ALT, and pseudo-cholinesterase were abnormal. These parameters were helpful in identifying the type of poisoning as well as patient disease status. In accordance with that pseudo-cholinesterase helps in detecting organophosphate poisoning. A study by Ayugan displayed the same.[8] Decreased level of pseudo-cholinesterase considers the presence of organophosphate compound. Acetylcholine esterase (AChE) or pseudo-cholinesterase hydrolyzes acetylcholine (ACh) to choline and acetic acid after its release. Organophosphate compounds (OPC) are the potent inhibitor of AChE leading to elevated ACh level with prolonged stimulation of local receptors and subsequent paralysis of nerve or muscle.[9] OPC's binds to AChE molecule and phosphorylate the serine moiety. This resulting conjugate is enormously more stable than ACh- AChE conjugate. Degradation of phosphorylated enzymes is minimal over days to weeks making AChE inactive.[10] This leads to excess cholinergic activities (both muscarinic and nicotinic) and CNS effect.

In detailed, we considered a GCS for detecting the patient condition in accordance with laboratory parameters. We found a significant decrease in the values like SpO2, lymphocytes, RBG and pseudo-cholinesterase with a decrease in GCS scores and pulse rate, respiratory rate, WBC, neutrophils, RBG, serum urea, serum creatinine, and ALT were increased with GCS scores.

Majority of the intoxicated patient was treated symptomatically. The initial treatment given was stomach wash.[11] Atropine, Pralidoxime, and magnesium sulfate were the antidotes given.

CONCLUSION

In conclusion, the findings of this study recommend that laboratory parameters have a significant role in determining patient severity and aids in treatment. Proper

guidelines and treatment patterns are necessary for the management of poisoning. Appropriate care and counseling should be provided to patients who are more prone to self-harm. Awareness is the best key to reducing the incidence of poisoning. The mortality rate can be reduced to an extent by implementing and enforcing the laws governing prevention and control of the irrational use of poison thereby limiting the abuse of poisonous substances.

AUTHORS CONTRIBUTIONS
All authors contributed equally.

CONFLICT OF INTEREST
None declared.

ABBREVIATIONS
ALP – Alkaline Phosphatase
ALT – Alanine Phosphatase
AST - Aspartate Phosphatase
IBM SPSS– International Business Machine Statistical Package for Social Sciences
ICU – Intensive Care Unit
OP – Organophosphate
RR – Respiratory rate
RBC – Red Blood Cell
RBG – Random Blood Glucose
WBC – White Blood Cell
WHO – World Health Organization

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