Cell. Mol. Biomed. Rep. (ISSN: 2823-2550) 2021, 1(2): 91-97
https://doi.org/10.55705/cmbr.2021.146061.1022

Research Article

Blood Sugar Changes in Patients with Acute Drug Poisoning

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Article info
Received: 02 March 2021
Revised: 07 June 2021
Accepted: 07 Sep 2021

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Keywords:
Acute drug poisoning,
Blood sugar,
Hypoglycemia,
Hospitalization

ABSTRACT

Changes in blood sugar in poisoning can be one of the most important determinants of the outcome of patients with poisoning. Since poisoning is one of the most common and increasing causes of death worldwide and one of the most critical medical emergencies, this study aimed to investigate changes in blood sugar in patients with acute poisoning and how patients' blood sugar can predict the severity and outcome of the disease. The present study was performed on 200 patients with acute drug poisoning referred to the emergency department of Amir Al-Momenin Hospital in Zabol from March 2018 to March 2020. Blood glucose levels of all patients were recorded at the time of admission and every hour to the first 5 hours after admission, and the results were entered in the information form of each patient. Finally, the data were entered into SPSS V22 software and statistically analyzed. The mean age of participants was 23.21 ± 12.80 years, and the minimum and maximum age of patients were 1 year and 77 years, respectively, and only 9.8% of them had a history of diabetes. In this study, the highest rate of intoxication with opioids such as methadone and tramadol was (38%), followed by benzodiazepines (20.5%), NSAIDs (19.5%), and SSRIs (7%) were the most commonly used drugs. The prevalence of hypoglycemia in this study was 3% (6 patients), while no cases of hyperglycemia were reported. In this study, most changes in blood sugar were caused by alcohol poisoning. Also, neuroleptics, NSAIDs, and chemicals had the least changes in blood sugar. However, patients' blood sugar at the beginning of poisoning did not affect patients' prognosis. The present study results showed that changes in blood sugar during treatment during drug intoxication, alcohol, medications(sulfonylurea, glibenclamide), and NSAID are very important, so regular monitoring of blood glucose in intoxication with these cases is essential.

1. Introduction

Poisoning is a medical emergency and one of the leading causes of death, especially in developing countries [1], where it affects most children between the ages of 1-5 and the elderly[2-4]. Despite health programs and prevention and awareness-raising, poisoning remains a common medical problem, with accidental poisoning responsible for 5,000 deaths per year, which can be attributed to over 6,000 annual suicide[5]. Poisoning is incredibly prevalent in Iran, especially intentional poisoning also substance abuse, as poisoning is the most common cause of hospitalization and drug poisoning is the second leading cause of death in patients admitted in Iran, Which one of the main

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reasons for this is easy access to medicines and various chemicals[6, 7]. Therefore, rapid diagnosis and early intervention for the treatment of poisoning is of great importance, So that any patient with multiple organ involvement of unknown cause should be taken into account intoxication unless proven otherwise[8].

In general, biochemical and metabolic abnormalities are expected in any patient with severe intoxication, and the cause can also be due to the effect of the toxin on a particular metabolic pathway and organ dysfunction. Hyperglycemia is not a common finding of overdose. However, hypoglycemia is a common finding, so whenever hypoglycemia occurs, the drug must be considered as the cause. The most common hypoglycemic drugs are sulfonylureas, insulin, ethanol, and other drugs that interfere with gluconeogenesis through hepatic toxicity, such as paracetamol[9, 10].

Both hypo and hyperglycemia are associated with extensive changes in the levels of magnesium, calcium, phosphate, citrate, and cortisol caused by intoxication [11]. Therefore, depending on the type of chemical change created in different types of poisoning, we can expect an increase or decrease in glucose levels or none of them [12]. In this study, we tried to evaluate the blood sugar parameter as a criterion for determining the prognosis in different types of drug poisoning on a large scale and measuring its relationship with the clinical consequences of the disease.

2. Materials and methods

The present study was a retrospective cross-sectional(descriptive-analytical) study on Patients with acute drug poisoning, performed from March 2018 to March 2020 in Amir-Al-Momenin Hospital in Zabol, Sistan-and-Baluchestan province, Iran. In this study, All patients with acute drug poisoning referred to the hospital during the above period were included in the study.

Patients with the unknown nature of the poisoned drug and the unknown amounts of the drug were excluded from the study. Finally, 200 patients were evaluated. Patients' information, including age, sex, level of education, duration of drug consumption, type of drug, routine medications, glucose on arrival, laboratory changes, and underlying disease, were collected through an information form.

This project was approved by the ethics committee of Zabol University of Medical Sciences, and informed consent was obtained from patients before their enrollment (IR.ZBMU.REC.1398.152).

2-1. Laboratory Investigation

BS was recorded for all patients at admission and every hour until the first 5 hours after admission. Besides, all clinical and laboratory measurements were recorded at admission, every six hours thereafter for the first 72 hours, and then every 24 hours until discharge. If necessary, certain variables were assessed more frequently, depending on the clinical condition of the patient. All patients received standard supportive treatment, including gastrointestinal decontamination (i.e., gastric lavage) and other basic medical care emergencies. All patients with hypoglycemia were treated by rapid intravenous infusions of two units of 100 ml of 25% dextrose solution and then maintained with 5% dextrose, titrated according to electrolyte levels and glycemic status.

2-3. Statistical analysis

The correlation between categorical variables was estimated using the Spearmen correlation coefficient. All statistical actions were performed using SPSS version 22 software. Age, Complications, and other laboratory and demographic information were expressed as mean ± standard deviation. The student T-test was used to compare categorical data. The significant level was set at $p<0.05$, and the prognostic value was expressed as the corresponding 95% confidence interval (CI).

3. Results

In this study, out of 200 patients, 52.6% were male, and the rest were female. The mean age of participants was 23.21 ± 12.80 years, and the minimum and maximum ages of patients were 1 year and 77 years, respectively. Of the total patients studied, 20.5% (n = 41) had an underlying disease, the most common of which were underlying neurological problems (80.4%), heart disease (9.8%), and diabetes (9.8%).

In this study, the highest poisoning was with drugs such as methadone and tramadol (38%). Then benzodiazepines (20.5%), NSAIDs (19.5%), and SSRIs (7%) were the most commonly used drugs. The types of drugs used by participants in this study are listed in Table 1.

Sixteen patients (8%) had seizures before referral, while 87.5% had no previous seizures. In this study, 6 patients (3%) developed hypoglycemia, and 3 patients had coma. Four patients (2%) also died. No cases of hyperglycemia were observed in patients (Table 2).

The mean blood sugar of patients in different hours after intoxication showed that changes in blood sugar at the beginning and end of treatment in drug, chemical, and NSAUD poisoning, as well as alcohol and neuroleptics, were statistically significant.

Also, the difference between the mean blood sugar between the users of different drugs in the third time and after was statistically significant, but at the beginning of intoxication and after that, there was no difference in the mean blood sugar of patients with different drugs (Table 3). In this study, it was found that most of the changes were caused by alcohol poisoning. Also, neuroleptics, NSAIDs, and chemicals had the least changes in blood sugar. Figure 1 shows the trend of changes in patients' mean blood sugar by type of intoxication.

The findings of our study indicated that there were no cases of hypoglycemia in drug poisoning, NSAIDs, antihistamines, or SSRIs. However, the prevalence of hypoglycemia in alcohol, sulfonylurea, anticonvulsant, and benzodiazepine poisoning was 100%, 50%, 10%, and 2.4%, respectively (Table 4). In this study, it was found that patients with normal primary blood sugar and patients with hypoglycemia were not significantly different in terms of disease outcomes; therefore, the patient's blood sugar at the beginning of poisoning did not affect patients' prognosis.

Table 1. Frequency of the type of drug used in patients with acute drug poisoning

Type of drug used	N	%
Narcotics(Methadone, Tramadol, and others)	76	38%
Oil, detergents, concentrated Varnish, Organophosphate	9	4.5%
NSAID	39	19.5%
Antihistamine	5	2.5%
SSRI	14	7%
Anticonvulsant	10	5%
Sulfonylurea	4	2%
Alcohol	2	1%
Benzodiazepine	41	20.5%
Total	200	100%

Table 2. Clinical complications and consequences of patients with drug poisoning

Complications		N	%
Seizure	Before admission	16	8%
	On admission	4	2%
	After admission	3	1.5%
Hypoglycemia		6	3%
Coma		3	1.5%
Death		4	2%

Table 3. Changes in blood sugar at different times after hospitalization in the study population

Time / drugs	BS on admission	BS 1 h after admission	BS 2 h after admission	BS 3 h after admission	BS 4 h after admission	BS 5 h after admission	P value
Narcotics	91.76 ± 10.22	92.44 ± 11.99	98.48 ± 8.69	100.18 ± 8.74	99.03 ± 7.49	100.22 ± 7.30	<0.001
Chemicals	95.33 ± 8.50	100.11 ± 11.47	99.66 ± 8.01	105.00 ± 6.89	100.33 ± 6.49	104.44 ± 6.02	0.018
NSAID	98.87 ± 21.01	100.53 ± 21.56	103.56 ± 12.88	106.74 ± 12.66	104.82 ± 10.50	104.58 ± 8.78	0.001>
Neurological drugs	100.56 ± 23.80	100.76 ± 27.75	102.53 ± 15.53	106.63 ± 11.91	103.50 ± 12.94	104.13 ± 11.20	0.010
Alcohol	63.50 ± 0.70	68.00 ± 11.31	83.50 ± 4.94	89.00 ± 2.82	100.50 ± 2.12	105.00 ± 7.07	0.005
Others	87.22 ± 21.96	83.44 ± 17.28	86.44 ± 5.50	94.33 ± 5.02	93.55 ± 7.10	93.00 ± 5.76	0.196
P value	0.0080	0.0081	<0.001	<0.001	0.004	0.003	

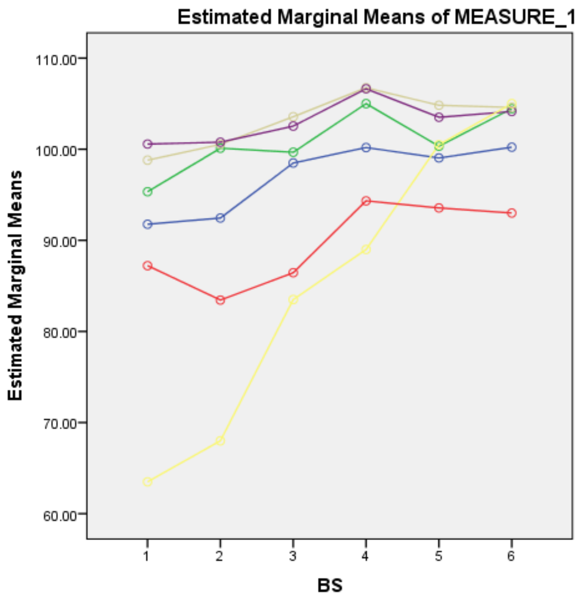

Fig. 1. Changes in blood sugar by type of medication

4. Discussion

Since drug abuse mainly affects people of working age, these days, it is one of the most important threats in many countries, including Iran, which affects the government and society [13]. There are relatively few studies that have examined a parameter such as blood sugar as a criterion for determining the prognosis of various types of drug poisoning on a large scale, So this study aimed to investigate changes in blood sugar in patients with acute drug and chemical poisoning and to determine to what extent patients' blood sugar at admission and afterward could predict the severity and outcome of the disease.

In the present study, the highest rate of drug intoxication, including methadone and tramadol, was (38%), followed by benzodiazepines (20.5%), NSAIDs (19.5%), and SSRI (7%) were the most common drugs used by patients. In this study, only 3% of patients had hypoglycemia at the time of admission, while no hyperglycemia was observed in any patients.

No cases of hypoglycemia were observed in drug poisoning, NSAIDs, antihistamines, and SSRIs. However, the prevalence of hypoglycemia in alcohol, sulfonylurea, anticonvulsant, and benzodiazepine poisoning was 100%, 50%, 10%, and 2.4%, respectively. These findings are similar to the results of most studies that have shown that the most common drug poisonings that cause hypoglycemia include sulfonylureas, followed by alcohol, propranolol, and salicylates [14]. In a study of the prevalence of hypoglycemia in people with metformin intoxication, Shadnia et al [15]. Reported that only 23% of patients experience hypoglycemia occasionally during hospitalization. Also, hypoglycemia due to sulfonylureas can be long-term and recur, So hospitalization of these patients is of particular importance. However, in this study, it was found that patients with normal primary blood sugar and patients with hypoglycemia were not significantly different in terms of disease outcomes; Therefore, the patient's blood sugar at the beginning of poisoning did not affect patients' prognosis.

Sabzghabaee et al., in a study of 345 patients with intoxication, showed that blood glucose levels at the time of admission might be related to the severity of intoxication and their clinical outcomes. It was observed that there is a significant difference between patients with normal blood sugar and hyperglycemic patients($P < 0.001$). Thus, hyperglycemia due to acute poisoning could be a poor predictor of intoxication and clinical consequences for patients [16]. Shadnia et al. Also emphasized in their study that coma, $PaCO_2$, and hyperglycemia could be used as strong predictors of the poor outcome when admitting patients with drug poisoning [15]. Moon JM et al. [17] Also examined 184 patients without DM who had a history of OP poisoning and showed that hyperglycemia was independently associated with an increased risk of mortality.

Table 4. Comparison of changes in blood sugar in poisoning with different drugs

BS \ Drugs		Sulfonylurea	Antihistamine	Benzodiazepine	Alcohol	Anticonvulsant	SSRIs	NSADs	Oil, detergents, concentrated Varnish, Organophosphate	Narcotics	P value
Normal	N	2	5	40	0	9	14	39	9	76	< 0.001
	%	50%	100%	97.6%	0%	90%	100%	100%	100%	100%	
Hypoglycemia	N	2	0	1	2	1	0	0	0	0	
	%	50%	0%	2.4%	100%	10%	0%	0%	0%	0%	
Total	N	4	5	41	2	10	14	39	9	76	
	%	100%	100%	100%	100%	100%	100%	100%	100%	100%	

These results were inconsistent with the findings of this study because, in this study, none of the patients with various drug poisoning had hyperglycemia at the time of admission, So that in this study, the patient's blood sugar at the beginning of poisoning did not affect patients' prognosis. These findings were similar to those of Arvind Sharma et al., who studied 116 patients with ALP poisoning and reported that the role of changes in blood glucose levels in predicting patient outcomes in cases of aluminum phosphide poisoning was ineffective [12].

In this study, we also examined and compared patients' blood glucose levels at different hours after admission. It was found that most changes in blood glucose levels were caused by alcohol poisoning. Also, neuroleptics, NSAIDs, and chemicals had the least changes. During treatment, changes in blood sugar were statistically significant in drugs, sulfonylureas(glibenclamide), alcohol, and NSAIDs poisoning($P<0.050$). Also, the difference in mean blood sugar between users of different drugs at different times was statistically significant ($p <0.050$).

In fact, it can be caused by the severity of the poisoning and is of particular importance in treatment planning. Changes in blood sugar in poisoning with different drugs are due to different effects on blood sugar-regulating systems in the body So that some drugs do not change blood sugar due to not affecting blood sugar-regulating systems, but some drugs(sulfonylureas, Organophosphates, etc.) due to direct and long-term effect(up to 72 hours) lead to large changes in blood sugar. Due to the adverse effects of hypoglycemia on the brain and in case of prolongation of this condition, its irreversible effects, these cases raise the importance of paying more attention and checking blood sugar at regular intervals in intoxication with the above drugs especially alcohol and sulfonylureas.

5. Conclusions

The present study results showed that changes in blood sugar during the course of treatment are important in drugs, alcohol, medications (sulfonylurea, glibenclamide), and NSAID poisoning, so regular monitoring of blood sugar in poisoning with these cases is essential.

Conflict of interest

The authors declare no conflict of interest.

Consent for publications

The authors read and proved the final manuscript for publication.

Availability of data and material

All data generated during this study are included in this published article

Funding

This research was supported by Zabol University of Medical Sciences.

Ethics approval and consent to participate

The study protocol was approved by the Ethics Committee of Zabol University of Medical Sciences.

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How to Cite This Article:

Saravani K, Afshari M, Aminisefat A, Bameri O (2021) Blood Sugar Changes in Patients with Acute Drug Poisoning. Cellular, Molecular and Biomedical Reports 1(2):91-97. doi:10.55705/cmbr.2021.146061.1022

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