Paraquat Poisoning Cases in A Referral Center in Tehran, Iran; A Clinical Inspection

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ABSTRACT

Introduction: paraquat is a cheap and easy access herbicide which its intoxication is limited in Iran. The current study aims to provide some epidemiologic data within paraquat poisoning from the most crowded referral center of clinical toxicology in Iran.

Methods: We investigated the paraquat poisoning patients who were admitted to Loghman-Hakim Hospital in Tehran, Iran from 2008 to 2016.

Results: A total of 12 patients participated in this study, %50 of these patients were between 20-10 years old, %41.7 were between 40-26 years old, and %8.3 were above 55 years old. About %83.3 were male, and %16.7 were female. Treatments which were given in the hospital include cyclophosphamide (%58.3), cortisol (%75), vitamin C (%50), vitamin E (%83.3), N-acetyl cysteine (66.6 .(%83.3 percent of hospitalized patients required invasive measures to preserve their airways, with 3.33 percent undergoing tracheostomy and the same percentage undergoing intubation. There were five fatalities among the patients, three of which were related to pulmonary and renal failure.

Conclusions: This study indicates that the majority are younger than 40 years and males. Prevention and limited access to this substance is necessary in terms of the lack of antidote.

Introduction

Paraquat is a corrosive whose ingestion may result in burns via the gastrointestinal system (1). Unfortunately, there is no effective treatment despite technical advancements (2). Paraquat poisoning is the leading cause of death, with a mortality rate of 60 to 80 percent. There is no known antidote for paraquat poisoning at the present time (3).

The majority of recommended therapies, including dexamethasone, cyclophosphamide, vitamin C, vitamin E, chlorphenamine, N-acetyl cysteine, and even lung transplant, have been deemed ineffective in reviving patients (2,4,5). Studies showed that taking glucocorticoids with cyclophosphamide in addition to standard care may reduce the risk of death in the hospital compared to standard care alone (3). Pulmonary fibrosis is the most important cause of delayed death in the patients who survive the primary poisoning. The precise mech-

anism by which paraquat induces acute lung fibrosis remains unknown. It is mainly in terms of the formation of superoxide ions (oxygen free radicals), NADPH oxidation, and peroxidation of membrane lipids, and destruction of cellular membrane structure (2, 4-6). This study aims to collect information from Iran's most crowded clinical toxicology referral facility, which accepts patients referred from various primary and secondary care institutions. Although not a representative sample of the whole nation, this sample represents the most severe cases submitted to our facility for treatment.

Materials and Methods

This is a case series study among the patients with paraquat intoxication who were admitted to Loghman-Hakim Hospital in Tehran, Iran from 2008 to 2016. The study was approved by the ethics committee in National Institute for Medical Research Development (IR.SBMU.RETECH.REC.1400.765).

A data collection form was designed for this study and filled based on the patients' medical archives under the code of I60.3. In general, regarding the exclusion criteria of multiple drug toxicity, 12 cases of 60 cases were included in our study. The collected data were analyzed by SPSS statistics version 20 with descriptive statistics.

Result

In 12 studied cases, 50% of these patients were between 10-20 years old, 41.7% were between 26-40 years old, and 8.3% were above 55 years old. About 83.3% were male, and 16.7% were female. Almost 75% of the patients were referred from other primary and secondary medical care facilities with most referred from Damavand area (25%) followed by Zanjan province (17%). Mean ingested dose of paraquat was 112 mL (range; 10 to 500 mL). The patients' median vital signs include GCS (Glasgow Coma Scale) 15, SBP (Systolic blood pressure) 120 mmHg, DBP (diastolic blood pressure) 72.5 mmHg, PR (Pulse Rate) 99.5 beats per minute, and RR (Respiratory Rate) 18 breaths per minute. Moreover, of 11, 10 and 6 available data of temperature, SPo2 (oxygen saturation)

and BS (Blood Sugar) median include 37,96.5 and 106, respectively. Patients' clinical manifestations and physical examinations include upper stomach discomfort in one and abnormal lung auscultation (harsh noises, wheezing, and crackles) in five. 41.6 percent of all patients had endoscopic evaluation of the upper gastrointestinal tract, with results indicating that 40 percent were normal, 40 percent had esophageal damage grade 2b, and 20 percent had erythema and esophageal ulcer. Among the cases reported abnormal, 33% consumed about l0cc and 66% consumed more than 40cc. The results of initial laboratory tests are illustrated in table 1.

Table 1: Laboratory tests upon arrival of patients

Lab test	Frequency	Median
BS	12	123.50
BUN	12	49.00
Cr	12	1.40
Ca	6	8.85
Mg	6	2.15
Na	12	138.5
K	12	3.85
AST	12	40.0
ALT	12	27.5
ALP	12	252.50
Bili T	10	1.30
Bili D	10	0.30
PT	12	12.9
PTT	12	30.550
INR	12	1.1750

Among the hospitalized patients, 66.6% of the patients needed invasive interventions to maintain the airways, of which 3.33% underwent tracheostomy and the same amount underwent intubation. Treatments which were given in the hospital are indicated in chart 1. 83% of patients received N-acetylcysteine for treatment. Two patients were discharged from the hospital with personal consent. Five patients died of whom three died in terms of renal and pulmonary failure.
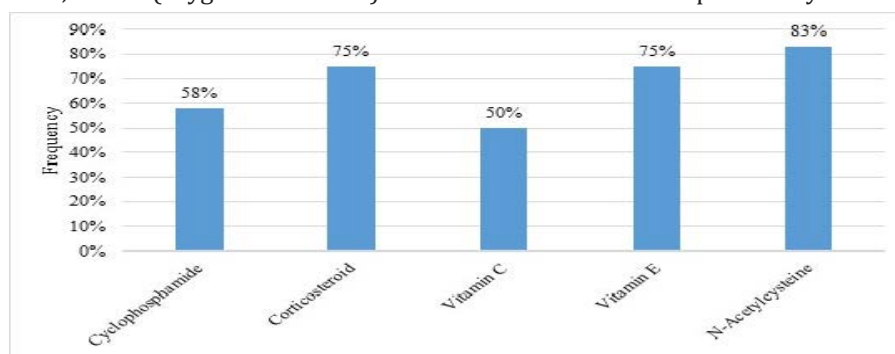

Chart 1: Hospital Treatment

Discussion

Our results show that most of the patients are younger than 40 years with most of them younger than 25 years and 83.3% of patients were male. Kavoosi-Gharbi and colleagues had shown that most of their paraquat-poisoned patients were females younger than 20 and males between 20 and 30 (7). In the study conducted by Delirrad et al. mentioned a mean age of 31.6 years all emphasizing the fact that most of the victims of this herbicide are young (8). In a 2018 research conducted in French Guiana by Elenga et al., the median age of adults was 31 years while the median age of children was 13.4 years (10).

This may be related to the ease with which males may get agricultural pesticides. In prior investigations in Iran, 92.9% and 48.4% of cases of paraquat poisoning were associated with suicidal thoughts (11, 12).In a study on the effect of Edaravone on the treatment of paraquat poisoning, researchers showed that there was no significant difference in gender, age, temperature, heart rate, respiratory frequency, mean arterial blood pressure, blood pH, plasma paraquat concentration, time of poisoning, severity index score of paraquat poisoning, and Glasgow coma score between two groups (9).

In the study conducted by Delirrad et al. had reported 9.8% loss of consciousness and 9.8% fever in their patients, while we had no such presentations in our patients although they were referred in most of the cases (8). This may show that these patients are currently referred to referral centers earlier than before although it seems that this approach has not increased their survival. In the study of paraquat poisoning in Ahvaz, Iran, on-admission clinical findings include GI manifestations (39%), leukocytosis (23%), respiratory distress (20%), Renal dysfunction (19%), liver dysfunction (16%) and coma (3%) (10).

A study of paraquat poisoning in the Kerman province of Iran revealed significantly higher frequency of drooling, respiratory distress and abnormal lung sounds in no survivors; Also, in this study the same as our study, treatments which a total of 126 patients received include Methylprednisolone (83.3%), Vitamin E (81.7%), Vitamin C (80.9%), Cyclophosphamide (72.2%), N-acetylcysteine (71.4%) beside hemodialysis (79.4%), gastric lavage (77%), Charcoal sorbitol (62.7%) and phlebotomy (19%) (11). Endoscopy revealed erythema in the entire esophagus, the body, and the antrum of the stomach, as well as erosion in the lower part of the esophagus in a 29-year-old healthy man with accidental consumption of 90 ml of PQ 20% with chief complaint of several episodes of vomiting, physical examination of throat ulcer and erythema, LUQ and epigastric tenderness without rebound guarding, erythema in the whole The treatments include N-Acetyl Cysteine, methylprednisolone, vitamin c, cyclophosphamide, pantoprazole, metoclopramide, fluid therapy beside 2 steps of 5-hour hemoperfusion treatment (HA230 hemoperfusion cartridge), and 4-hour hemodialysis by high flux filter.

This study indicated the importance of early diagnosis with prompt treatment of PQ poisoned patient with hemoperfusion to decline the mortality rate (12). None of these studies discussed Calcium, Magnesium, Sodium, Potassium, PT, PTT, INR, and BS which all have been examined in the current study. Regarding the increase in serum creatinine level in Delirrad's study, 61% of patients had increased creatinine, in which the average was 3.9 and increased creatinine was considered higher than 1.6 (8). In the study of Elenga et al., The mean serum creatinine was significantly higher on admission in the deceased patients (81.7µmol/L±34.4 vs 159.7µmol/L±42.8).

50% of adult patients with creatinine > 120µmol/L on admission, died. Treatment was performed in 31 cases (50%) with corticosteroids, 36 cases with cyclophosphamide (58%) and 44 cases with N-acetylcysteine (71%). Only one patient underwent hemodialysis (13). In the study conducted by Delirrad 39% of patients received intubation and 22% received mechanical ventilation and also 46.6% of patients died in this study (8).

Conclusion

it seems that suicide by paraquat is widespread in Iran among males under the age of 40. The epidemiologic and clinical findings of the present investigation are also congruent with those of previous research. Due to the lack of an antidote for this toxin, prophylaxis is required.

Acknowledgments

Conflict of interest

The authors declared no competing interests.

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