EVALUATION OF PARAQUAT POISONING SIDE EFFECTS

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ABSTRACT

Introduction: Poisoning by pesticides is a public health concern in developing countries. Paraquat is widely used as a means of suicide in third world countries because it is available at very low cost and has low-dose toxicity and ten milliliters of it is fatal. This study is designed to report cases of paraquat poisoning. Material and Method: all cases of paraquat poisoning hospitalized in Razi hospital within the period of early 2004 to late 2014 were studied. Accordingly a checklist included patients’ demographic data (age, gender, location, occupation, educational level, marital status), information on patients’ records (history of a particular disease, history of using paraquat, suicide), information on poisoning (mode of poisoning, type of use, nausea after usage and organ damage) and information on treatment and therapy programs (the interval between the usage and getting to the hospital, interval between the hospitalization and receiving the first hemodialysis, patients’ treatment plan, length of hospitalization, result and complications associated with treatment) that is filled based on the records. In order to analyze the data using descriptive statistics including frequency tables, diagrams and numeric indices the variables will be described. Data analysis will be done by SPSS V 18 software.

Results: The symptoms observed in patients were associated with nausea and vomiting, mouth ulcers, sore throat, epigastric pain, respiratory distress and intubation and organ damage that nausea and vomiting was the most common complication. Finally 58 cases (95.1%) of the poisonings led to death and 3 patients (4.9%) were discharged with normal
condition. **Conclusion:** the level of deliberate poisoning with Paraquat is much higher in single men and paraquat has high and fast mortality, thus it is important to train people to forbid them from storing and keeping it away from the vulnerable people.

**KEYWORD:** Paraquat, Pesticide, Poisoning Toxicology, Suicide.

**INTRODUCTION:** One of the major concerns of human health is the deliberate poisoning.[1] Poisoning by pesticides, that is the cause of up to a third of cases of suicide, is a public health concern in developing countries.[2] Paraquat is an herbicide that is widely used to eliminate the weeds.[3] More than 90 percent of deaths due to paraquat have been associated with committing suicide.[4] It occurs mostly in developing countries and it is reported as 20 cases per million. This amount is lower in the developed countries, such as Japan (11 per million) United Kingdom (0.66 per million) and the United States of America (0.004 per million).[5] Paraquat is widely used as a means of suicide in third world countries because it is available at very low cost and has low-dose toxicity and ten milliliters of it is fatal.[6] There are ongoing health campaigns for control and banning Paraquat. There are activities to limit access to paraquat through keeping in warehouses monitored by the organization and the reduced use through public education.[7] Paraquat poisoning mechanism is in its accumulation in the lungs as the target organ. Lung injury is caused by converting paraquat by intracellular oxidases into free oxygen radicals.[8] The most common type of suicide with paraquat is oral consumption. Clinical symptoms of paraquat poisoning are classified into three categories: 1) mild poisoning (less than 20 mg/kg) in which the patient has mild gastrointestinal symptoms and is usually fully recovered, 2) severe poisoning (20-40 mg/kg) the patient develops renal failure, acute lung injury, progressive pulmonary fibrosis and respiratory failure 2 to 3 weeks after taking that leads to death and 3) fulminant poisoning (more than 40 mg/kg) that the patient develops multi-organ failure that leads to death within a few hours to a few days depending on the dose and the patient’s power.[9] Various methods are employed for the treatment of paraquat poisoning including preventing the absorption by gastrointestinal tract, cleansing the bloodstream from toxins, preventing accumulation in the lungs, oxygen free radicals scavenging and preventing pulmonary fibrosis.[10-12] Also cases of immunosuppressive, radiotherapy, dialysis and hemoperfusion are mentioned.[13-14]

However, effective treatment is still not confirmed and the patients’ result is usually determined by the degree of exposure to paraquat. So to prevent paraquat poisoning and progress it is necessary to remove these pesticides.[15] Since paraquat poisoning is still a
major public health concern and a high mortality of its poisoning is reported in the emergency departments, this study is designed to report cases of paraquat poisoning, analyze the various determinants of the deceased people and in case of observing preventable factors, the intervention is proposed to the relevant authorities.

MATERIAL AND METHOD
After obtaining permission from the Ethics Committee of Ahvaz Jundishapur University of Medical Sciences all cases of paraquat poisoning hospitalized in Razi hospital within the period of early 2004 to late 2014 were studied. Accordingly a checklist included patients’ demographic data (age, gender, location, occupation, educational level, marital status), information on patients’ records (history of a particular disease, history of using paraquat, suicide), information on poisoning (mode of poisoning, type of use, nausea after usage and organ damage) and information on treatment and therapy programs (the interval between the usage and getting to the hospital, interval between the hospitalization and receiving the first hemodialysis, patients’ treatment plan, length of hospitalization, result and complications associated with treatment) that is filled based on the records. In case of incompleteness of some records of the patients, connections were made with the patients and if it was not possible for any reason or the patient did not have any detailed information about the intended cases, that file was excluded from the study. All data of the deceased and survived patients were compared. It should be noted that in order to maintain confidentiality of patients, the file code is used rather than their names. In order to analyze the data using descriptive statistics including frequency tables, diagrams and numeric indices the variables will be described. Data analysis will be done by SPSS V 18 software.

RESULTS
A total of 61 patients poisoned with paraquat with a mean age of 26±22 were evaluated. Among them 37 subjects were male and 24 subjects were female and 41 were single and 21 were marries. Also 36 patients were urban and 25 patients were rural citizens. None of the patients had a history of suicide or the use of paraquat. The symptoms observed in patients were associated with nausea and vomiting, mouth ulcers, sore throat, epigastric pain, respiratory distress and intubation and organ damage that nausea and vomiting was the most common complication. Finally 58 cases (95.1%) of the poisonings led to death and 3 patients (4.9%) were discharged with normal condition.
Figure 1. Gender Status

Figure 2. Marital Status

Figure 3. Side effect Observed in Patient
DISCUSSION AND CONCLUSION

Paraquat is widely produced and used around the world because of its unique characteristics. Paraquat is one of the most common herbicides used in agriculture that can cause severe poisoning in humans and animals. The most important paraquat target is the lungs but several studies have reported neural poisoning among the individuals in contact with it.\cite{16} In paraquat poisoning the respiratory, cardiovascular, central nervous, endocrine, digestive, skin and generally all body systems are affected depending on the taken dosage. However, the poisoning effects of this poisoning usually start with lung involvement and then appear as the respiratory distress syndrome. The poisoning starts with the ingestion of +20 mg/kg of body weight and usually the serum levels greater than 1.0 mg/ml within and more than 0.1 mg/ml will lead to death within 24 and 48 hours.\cite{17} Studies have shown that pulmonary fibrosis caused by paraquat can be prevented or delayed by some antioxidants, melatonin, iron chelators and blood pressure medication such as Captopril in recent years. Also apoptosis induction in cells by angiotensin and Angiotensinogen has been reported. Recent studies have shown that these medicines and Captopril in particular have anti-fibrotic and apoptosis inhibition in lung alveolar epithelial cells.\cite{18-20} However, the thing that is more important than any other subject is the knowledge of the complications caused by paraquat poisoning and familiarity with the morbidities and mortalities caused by this toxic substance and obviously performing epidemiological studies with a greater range can increase the level of awareness of this type of poisoning. As has been observed in the results, most people who attempted suicide by paraquat have been in the range of less than 30 years old and it has been more applied by single male urban citizens that have deliberately used edible paraquat. The most important observed symptoms have been nausea and vomiting and observed patients’ mortality was 95.1%. Although the obtained data present a good knowledge of paraquat poisoned patients’ conditions, it is necessary to address the studied conducted by other researchers to further understand the side effects and compare them with other paraquat poisoned patients. For example Afzali et al (2007) studied the effect of methylprednisolone and cyclophosphamide combined therapy on edible paraquat poisoning. During the two-year study of 45 patients with edible paraquat poisoning admitted to Sina hospital in Hamedan it was observed that 20 subjects had moderate to severe poisoning. The mean ages of the first and second group were 25 and 26. There were 3 female and 8 male subjects in the first group and one female and eight male subjects in the second group. The rate of mortality was 81.8 and 33.3% in the first and second groups.\cite{21} In fact most patients were male in their study as well and observed high mortality, however, due to the combined administration of
methylprednisolone and cyclophosphamide the mortality rate is significantly reduced. Sabzghabaee et al (2010) carried out a study on mortality due to paraquat poisoning. In this study all patients who had referred to the emergency room of University Hospitals of Esfahan Medical sciences were analyzed. A total of 29 patients were studied. The mortality rate in the hospital was 55.2%. There was a significant relationship between patients’ nausea and their treatment outcome.\textsuperscript{[22]} Their mortality rate was much lower than the present study that is associated with the dosage, the duration of getting to hospital and support measures. Many studies are carried out in other countries for example Seok et al (2009) studied edible Paraquat poisoning in people who had consumed it to commit suicide. In this study, 250 patients including 143 men and 107 women were studied. Patients were classified into the purchased and available paraquat subgroups. Women had used the purchased paraquat more than men (66\% vs. 22\%). The number of single men was higher than single women (23.9\% vs. 9.3\%) and they were more divorced or living separate lives (11.3\% vs. 4.6\%). 38.4\% of people had selected paraquat deliberately and consciously and 61.6\% had not selected it deliberately. Therefore, two third of people had not spent money on it and used it because of its availability Thus it is necessary to control the availability of paraquat.\textsuperscript{[15]} In fact, this study has addressed access to paraquat that is not addressed in the present study but the results obtained in their study are consistent with the present study including the fact that most of the subjects were male and single. More attention to the present study and the reviewed studies suggest that the level of deliberate poisoning with Paraquat is much higher in single men and paraquat has high and fast mortality, thus it is important to train people to forbid them from storing and keeping it away from the vulnerable people. Also the obtained information indicates that the international organizations should challenge the production and distribution of this toxin with novel approaches.

REFERENCES


