ORIGINAL ARTICLE

Demographic and epidemiologic evaluation of mushroom-poisoning: a retrospective study in 4-year admissions of Razi Hospital (Qaemshahr, Mazandaran, Iran)

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ABSTRACT

Aim Wild mushroom intoxication is a public health problem, which causes a wide range of symptoms: from mild gastrointestinal symptoms to multiple organ failure and death. The present study aims to evaluate the epidemiology of mushroom intoxication in 4-year admissions of Razi Hospital, Qaemshahr, Mazandaran, Iran.

Methods Medical records of all identified cases of mushroom poisoning admitted during the period between 2015 and 2018 were extracted and patients' demographic data including age, sex, latency period, season of poisoning, clinical presentations, laboratory findings, prognosis, duration of hospitalization and therapeutic interventions were recorded.

Results A total of 65 mushroom poisoning cases were identified (mean age of 35.68 years), of which 32 (49.2%) were females. Latency of ≤ 6 hours was seen in 63 (96.4%) cases. The most prevalent season of intoxication was spring (60.7%). The most frequent symptoms were nausea and vomiting (86.5%) and abdominal pain (51.2%). No case required intensive care unit (ICU) care or mechanical ventilation. Mean hospital stay was 1.89 days without any mortality. Mean aspartate aminotransferase (AST) level was 21.89 (±9.55), but the disturbance of liver function tests (LFTs), coagulopathy, elevated level of bilirubin and/or platelet was not noted. In 93% of patients ranitidine, in 7% Penicillin G, and in 3.6% cefaclor and ceftriaxone was administrated.

Conclusion People and health care providers must be educated about mushroom poisoning. Prompt transfer of suspicious cases with history of wild mushroom ingestion to the emergency department is crucial since patients showing toxicity symptoms after 6 hours might have worse and mortal prognosis despite treatment.

Key words: epidemiology, intoxication, poisoning, wild mushroom

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INTRODUCTION

Poisoning is one of the most important causes of acute illness in developed countries. Unintended poisoning considered is as the fifth cause of death secondary to accidental injuries (1). Currently, there is an increasing worldwide trend in acute poisoning and subsequent mortality, increased mortality due to drug abuse and an increase in the number of intentional poisoning (2). Commonly, poisoning seen in young adults is acute and in children it is usually accidental. In all world countries including Iran, a significant proportion of referrals and admissions to paediatric hospitals are poisoning cases, which are mostly accidental (3). Consequently, a number of children die due to drug and non-drug related poisoning. Incidents such as poisoning are the most common cause of death in children aged 1-14 years (4,5).

Wild mushroom intoxication is one of the rare causes of poisoning. There are about 5,000 species of mushrooms, of which only 25-30% are named and 3% are toxic, which are more spotted in rural areas and in some countries (6-11). Wild mushroom intoxication depends on factors such as maturity of mushroom, seasonal poisoning, geographical area, total amount consumed, and preparation technique before consumption (9,10). Wild mushroom intoxication produces a wide range of symptoms in patients, ranging from mild gastrointestinal symptoms to multiple organs failure and death, according to the type of mushroom (6). Latency is often below 8 hours and the problem could be accurately diagnosed provided a complete history. Given that identification of mushroom type after poisoning may be difficult and sometimes impossible, prompt treatment of patients based on their clinical symptoms is crucial (7).

Wild-mushroom poisoning is relatively common in Iran and it is expected to increase in line with industrialization and population growth plans. In a study conducted in Loghman-Hakim Hospital (Tehran, Iran) the prevalence of mushroom poisoning was represented with 37 out of 7,421 cases of all poisoning. However, in recent years, mortality rate of poisoning especially in paediatric patients has significantly decreased due to increasing awareness about the significance of prompt transfer of patients to poison treatment centres (2).

The most important chemicals in wild mushroom which cause intoxication are amatoxins and phallotoxins (12). After absorption from the digestive tract and entering the bloodstream, these toxins enter the hepatic cells, and by inhibiting the RNA Polymerase II enzyme (which is involved in DNA transcription and cell metabolism), cause damage to the hepatic cells and ultimately hepatic failure (13). The severity of toxicity depends on the amount of toxin in the mushroom itself, which in part is influenced by the genetic characteristics of the mushroom, climate conditions and the geographical location of the mushroom (12,13).

Due to lack of antidote for this type of poisoning, the treatment is based on supportive care and symptomatic management only, including hydration and electrolytes replacement, administration of activated charcoal, penicillin G (in high doses), antioxidants (such as N-acetylcysteine and penicillin), and in cases of severe hepatic failure, liver transplantation (14).

Although mushroom intoxication is not a common cause of poisoning in the world, due to relatively high mortality rates in poisoning with some types, it is imperative to provide appropriate information for the public and define prevention strategies in higher scales (15).

Due to dispersed statistical information about the prevalence of mushroom poisoning along with a high mortality risk for the exposed population, subsequent costs are directly and indirectly imposed on the health system (16-18). It seems that a general overview of the documentation associated to different types of wild mushroom poisoning, using simple statistical analysis methods, provides more accurate overview about the issue for applying well-planned and evidence-based policies (16-19), which will lead to a more comprehensive picture of the dimensions of this problem in Iranian society.

The aim of this study was to determine the prevalence of wild-mushroom intoxication and describe epidemiological characteristics and clinical findings in 4-year admissions at Razi Poisoning Treatment Centre (Qaemshahr, Mazandaran, Iran).

PATIENTS AND METHODS

Patients and study design

This descriptive cross-sectional study was conducted in Razi Poisoning-Treatment Centre, Qaemshahr, Mazandaran, Iran, upon retrospecti-

ve investigation of medical records of poisoning cases from 2018 to 2018.

A study protocol was approved by the Ethics Committee of Mazandaran University of Medical Sciences and it was performed in accordance with the ethical standards of the 1964 Declaration of Helsinki. Patients' anonymity is preserved.

Inclusion criteria were patients with discharge diagnosis of mushroom poisoning admitted to Razi Hospital during 2015 to 2018. Patients with vague symptoms, non-conclusive diagnosis or incomplete profiles were excluded from the study.

Methods

Using hospital administrative information system, medical records of all identified cases who met the inclusion criteria were extracted and demographic and clinical data were recorded.

Demographic data included age, gender, occupation, residential place, latency and season of poisoning. Clinical data included symptoms, laboratory findings (hepatic, renal, hematologic and coagulation profile: aspartate aminotransferase – AST, prothrombin time (PT), partial thromboplastin time (PTT) and international normalized ratio (INR), prognosis (death, discharge, Intensive Care Unit (ICU) care, and mechanical ventilation), duration of hospitalization and therapeutic interventions (hydration, activated charcoal, penicillin G, and silymarine).

Final diagnosis was made by poisoning specialists and toxicologist of Razi Poisioning-Treatment Centre, based on patients' history, clinical symptoms and epidemiologic data.

Statistical analysis

Data were transferred to computer for statistical analysis. Categorical data were presented as counts and percentages, continuous variables as mean ±SD or median range. Data comparison was made using student t-test and $\chi 2$ test. A $p \leq 0.05$ was considered statistically significant. Non-parametric Kolmogorov-Smirnov test was used for the analysis.

RESULTS

A total of 65 cases of mushroom poisoning were identified. Mean age of patients was 35.68 years, ranged between 11-75 years. The cases predominantly involved ≤31 years of age patients (50%). The first and third quartiles were 22.5 and 48.75 years, respectively. The prevalence of poisoning under 31 years of age was twice as higher than others.

Thirty-two cases (49.2%) were females and 33 (51.8%) were males.

Mean age of male and female patients was 35.93 and 35.43 years, respectively, indicating an insignificant difference between genders. Likewise, there was no significant relationship between poisoning and gender.

The two most prevalent seasons for wild-mushroom intoxication was spring, 34 (60.7%) and autumn, 15 (28.6%) cases; the least prevalence was noted in winter, two (3.6%) cases. There seemed to be a significant relationship between climate humidity and mushroom poisoning.

The most frequent symptoms were nausea and vomiting, 56 (86.5%), followed by abdominal pain, 33 (51.2%) and diarrhoea, 10 (16.1%) cases. No case showed a decreased level of consciousness.

No case required either ICU care or mechanical ventilation.

No mortality was recorded and all patients were discharged from the Centre.

Mean hospital stay was 1.89 days ranging between 1-6 days. The cases predominantly involved ≤2 days of hospitalization, 51 (78.6%) (Table 1).

Table 1. Demographic and clinical data of the patients with mushroom poisoning

Variable		No (%) of patients
Mean age (years)	35.68	-
Gender	Males	32 (51.2)
	Females	33 (49.8)
Season of poisoning	Spring	39 (60.7)
	Summer	5 (7.1)
	Autumn	18 (28.6)
	Winter	3 (3.6)
Latency (Hours)	≥6	60 (96.4)
	≥6	2 (3.6)
Intensive care and/or ventilation	Yes	0
	No	65 (100.0)
Mean hospitalization (days)	1.89	
Clinical symptoms	Nausea and vomiting	56 (86.5)
	Diarrhoea	10 (16.1)
	Abdominal pain	33 (51.2)
	Decreased loss of consciousness	0

Mean AST was 21.89 (±9.55), which proved to be normally distributed. However, abnormally distributed laboratory tests for ALT, PT, PTT and

INR were detected at p≤0.05. Disturbance of liver function tests, coagulopathy or elevated level of bilirubin and/or platelet was not noted in any patient (Table 2).

Table 2. Mean values of laboratory results of the patients with mushroom poisoning

Variable	Reference values	Mean (±SD)	p
International Normalized Ratio	1.0	1.09 (±0.13)	0.006
Partial thromboplastin time	30-40 seconds	38.14 (±8.79)	0.05
Prothrombin time	9.5-13.5 seconds	13 (±1.17)	0.035
Alanine aminotransferase	20-60 IU/L	26.07 (±21.97)	0.003

In 60 (93%) patients ranitidine, in four (7%) penicillin G, and in two (3.6%) cefaclor and ceftriaxone were administrated. However, seven (10.7%) patients with severe clinical manifestations were treated with atropine, as well as administration of activated charcoal.

DISCUSSION

Mushrooms are commonly consumed by local population and mushroom poisoning presents a major health risk in rural areas (20-22). In a retrospective study by Eren et al, among 294 cases diagnosed with wild mushroom intoxication, who had been admitted in paediatric emergencies mean age varied from 3-72 years with mean age of 28.97 years; 90 patients were younger than 16 years and 173 cases were females, which is consistent with results from our study (mean age of 35.68 years, 50% of cases younger than 31 years and 49.2% were females). In a retrospective observational cross-sectional study by Dadpour et al. (14), among 32 cases with discharge diagnosis of wild mushroom intoxication referred to Imam-Reza hospital (Mashhad, Iran) during 2005 to 2017 with mean age of 24.6 years 59% were females. Findings from our study showed a higher mean age in comparison with Dadpour et al. (35.68 VS 24.6 years) and no statistically significant relationship between age and gender.

Pajoumand et al. (9) found that among 25 cases of mushroom poisoning mean age of patients of 31 years ranged between 12-65, males represented with 68%, more than 80% cases documented during autumn. In our study, gender distribution was almost equal, with mean age of 36.39 years ranging between 11-75 years.

In our study, 60.7% of the patients consumed mushrooms in the spring months, during which mushrooms are more prevalent and their collection is usually increased. However, our findings are not consistent with Eren et al. study, in which the most common season of mushroom poisoning was early summer. In our study relationship between humid climate and mushroom poisoning prevalence seems to be statistically significant, since more than 88% of mushroom poisoning cases were documented during spring and autumn.

In Eren et al. study, the first and most common symptom was gastrointestinal, one which was exhibited during the first 6 hours post-exposure in most cases; hospitalization length varied from 1-10 days and 3 cases expired due to fulminant hepatitis. In our study, none of the patients needed ICU care or mechanical ventilation; all cases were discharged and mean hospitalization was 1.89 day. Mean latency period until symptoms appearance in our study was less than 6 hours in 96.4% of cases. These results are consistent with findings from Eren et al. study (10).

In Dadpour et al. (14) study, only 59% of cases were discharged with full recovery. In addition, statistically significant relationship was found between mortality rate and higher levels of INR, PT and PTT, ICU care, need for mechanical ventilation, serum bilirubin level and liver enzymes. In the present study, no mortality was reported and all patients were discharged. No relationship was found between higher levels of INR, PT and PTT and mortality rate, and laboratory results were not disrupted. Dadpor et al. concluded that although prevalence of wild mushroom intoxication was relatively low (1%), mortality rate was high (≥22%). Nausea and vomiting were first exhibited symptoms and disrupted coagulation factors indicated a poor prognosis (14). In our study, severe complications or death were not recorded and the most exhibited symptom was gastrointestinal (nausea and vomiting, diarrhoea).

Pajoumand et al. (9) found among 25 cases of mushroom poisoning mean age of patients of 31 years, ranging between 12-65, males represented with 68%, more than 80% cases documented during autumn. In our study, gender distribution was almost equal, with mean age of 36.39 years ranged between 11-75 years.

In Pajoumand et al. study (9), latency varied from 0.5 to 12 hours, the most exhibited symptoms were vomiting, nausea, abdominal pain and diarrhoea (60%), jaundice in 40% and hepatic encephalopathy in 50% of patients were noted; duration of hospital stay varied from 1-12 days and 66% of all cases were discharged with full recovery (9). Their findings are consistent with findings from the present research in which the most exhibited symptom was gastrointestinal one without any case of hepatic encephalopathy or jaundice. All patients were discharged.

In an analysis of mushroom case exposures in the United States reported by Trestail (17) to obtain a clearer view of mushroom poisoning epidemiology and outcome, 1581540 cases were diagnosed with poisoning (73% of total poisoning cases in the USA), among which 9208 (0.6%) were cases of mushroom intoxication. The cause of poisoning was determined in 313 cases including 48 types of mushroom, but in the remaining cases (96.6%) no fungal agent was identified: 81% patients were under the age of 6, and 6% were in the age range of 6-17 years, and the remaining 13% of cases were older than 17 years. In 95% of cases, accidental poisoning was detected (21). Just similar to our research, Trestail study has focused on age and gender distribution while pointing out the broad spectrum of wild mushroom poisoning.

He small sample size and consequently low power of the present study limits its generalization along with making it difficult to compare the variables. Further studies with higher power and sample size will enhance validity of results. In addition, studies with the focus on short and long-term adverse effects of mushroom poisoning can be designed and conducted in future.

In conclusion, people and health care providers must be educated about mushroom poisoning. There are numerous species of mushrooms causing various clinical presentations and yet, there are no guidelines about wild mushroom intoxication treatment. Patients showing intoxication symptoms after 6 hours might have worse and end with mortal prognosis despite the treatment. Therefore, prompt transfer of suspicious cases with history of wild mushroom ingestion to the emergency department is crucial.

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TRANSPARENCY DECLARATION

Conflict of interest: None to declare.

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