

## Mushroom Poisoning in the Southwest Region of the Caspian Sea, Iran: A Retrospective Study

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### ABSTRACT

**Background:** Mushroom poisoning as a medical emergency can be a challenging problem for physicians. Despite the vast resources of poisonous mushrooms in Iran, few studies have been done in this regard, especially in the southwest region of the Caspian Sea that is very suitable for mushroom growth. Therefore, the aim of this study was to evaluate our experience with mushroom poisoning in this region.

**Methods:** This retrospective study reviewed the records of 102 patients who were admitted to the Emergency Department of Razi Hospital of Rasht, the only referral department in this region, from May 2006 to May 2011. Data were analyzed by Chi-square test, ANOVA, and student's t-test.

**Results:** The patients' age ranged from 13 to 75 years and 47 of them were male and the rest 55 were female. Overall, 57.8% of mushroom poisoning cases occurred in patients from urban areas. Most incidences were reported between September and October, the rainy season in Guilan. Except for four patients with tachycardia, others had stable vital signs. The most frequent symptoms (86.4%) were nausea and vomiting. Complete blood cell count revealed that 28.4% of the patients had leukocytosis but all of them had platelet counts of less than 100000.

**Conclusions:** This study showed that all cases had mild to moderate symptoms that were treated by simple supportive therapies. This suggested that mushroom species in our region are less dangerous but further studies need to establish what toxins and species are responsible for mushroom toxicity.

**Keywords:** Abdominal Pain, Iran, Mushroom Poisoning, Nausea, Transaminases, Vomiting.

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### INTRODUCTION

Although only 3% of mushrooms are poisonous, it is difficult to distinguish them from others. Therefore, rural people usually make errors and consume poisonous mushrooms instead of non-toxic ones (1-3). Mushroom poisoning (MP) is the clinical picture and state of emergency due to eating poisonous mushrooms, and its diagnosis and treatment can be difficult (1,4). In general, four groups of people are susceptible to MP: Children who

unknowingly eat these mushrooms, local people and villagers who collect wild mushrooms for sale in the local market and subsequently their customers, individuals who have attempted suicide or murder, and those who use mushrooms as hallucinogenic substances (4,5).

Recent studies have shown that this type of poisoning is growing in the world, for example, wild mushroom poisoning in Western Europe has a high incidence with 50 to 100 deaths per year (6,7). In the

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United States, the incidence of MP is 0.005% but in Iran it is much higher (0.05%) (1,8). Clinical symptoms of MP vary from mild gastrointestinal symptoms to organ failure and death (5). These symptoms depend on the toxic amount of consumed mushroom, mushroom age, season and geographical location, and the way of preparation (5). Eating poisonous mushrooms can cause different reactions, such as allergic gastroenteritis, mental relaxation, and fatal liver toxicity (9). However, gastrointestinal symptoms can be seen in most cases (10). If symptoms start after six hours, prognosis is not good and the probability of poisoning by highly poisonous mushrooms increases (1).

Despite the vast resources of poisonous mushrooms in Iran, few studies have been done in this regard, especially in southwest region of the Caspian Sea, Guilan province, where mushroom poisoning seems to have a relatively high prevalence due to the specific climate, abundant forests, appropriate climate for fungal growth, local markets, and villagers who collect and sell wild mushrooms in these markets. Therefore, the aim of this study was to evaluate our experience with mushroom poisoning in this region with special attention to different modalities used.

## MATERIALS AND METHODS

This retrospective study reviewed the records of patients who were admitted to the Emergency Department of Razi Hospital of Rasht, the only referral department in this region, from May 2006 to May 2011. Patients managed at other health care centers before admission or those who had associated illnesses were not included in this study.

Diagnosis of mushroom poisoning was based on a history of mushroom ingestion, the time before the appearance of symptoms, clinical conditions of the patients, and laboratory parameters. After consideration of inclusion and exclusion criteria, demographic data, such as the

frequency of wild MP, age, gender, job and habitancy of the patients, season, clinical and laboratory findings, therapeutic measures, duration of hospitalization, and the outcome of patients, were recorded on specially prepared checklist. Laboratory findings included complete blood count, arterial blood gas, serum glucose, electrolytes, creatinine, urea, and liver function tests (AST and ALT). However, it was not possible to determine the type of mushroom and its toxins because chemical analysis was not done in our center.

The time before the onset of mushroom toxicity symptoms was divided into early (within 6 hours after ingestion) and delayed (6 hours to 20 days) and the age was grouped into ten-year clusters from infancy up to seventy years old and those over seventy were considered as one group. Results were expressed as mean  $\pm$  standard deviation or as percentage. Normality of the variables distribution was tested by one sample Kolmogorov-Smirnov test. Analysis was performed by the Chi-square test, ANOVA and student's t- test. All statistical analyses were done using SPSS software version 20 and a P-value < 0.05 was considered statistically significant.

## RESULTS

Of the 102 patients reviewed, 47 (46.1%) were male and 55 (53.9%) were female. The male to female ratio was 0.85:1 and the mean age was  $36.10 \pm 15.63$  years ranging from 13 to 75 years. Most poisonings occurred in urban areas (57.8%) and all patients had foraged for mushrooms in nature (hills, riverbanks, and fields) and were unintentionally poisoned by the consumption of wild mushrooms.

The majority (88.2 %) of the cases occurred between September and October, the rainy season (autumn) in Guilan. In 87.1% of the patients, the first symptoms appeared within six hours after ingestion of mushroom as early toxicity. The demographic features and initial symptoms of the patients are shown in Table 1.

**Table 1.** Baseline characteristics of the patients with mushroom poisoning.

<b>Characteristics of patient</b>	<b>result</b>
Age	36.10±15.63
Most Age group	26-35 (26.5%)
Sex(m:f)	0.85:1
<b>Distribution of patients according to season</b>	
-Spring	2.9
-Summer	8.8
-Fall	88.2
-Winter	0
<b>First symptom after consumption</b>	
-Presentation less than 6 hours	87.1%
-Presentation More than 6 hours	12.9
Vomiting	86.4
Nausea	83.5
Diarrhea	16.1
Abdominal pain	55.4
Abdominal tenderness	11.3
Fatigueness	19.3
Dizziness	18.2
Loss of consciousness	7.5
Decreased appetite	3.8
<b>Lab data</b>	
-AST	24.49±12.363
-ALT	19.59±10.462
-PT	13.17± 1.03
-PTT	32.87±4.45
-BUN	14.13±4.65
-Creatinine	0.85±0.20
Duration of hospital stay(less than 24 hr)	49(48%)
Mortality	0
Recovery	100

Except for four patients with tachycardia, others had stable vital signs. The most frequent complaints upon admission were vomiting and nausea, which were noted in 86.4% and 86.4% of the patients, respectively.

The most frequent finding on physical examination was epigastric tenderness (11.3%) which correlated with other gastrointestinal symptoms, such as diarrhea, abdominal pain, nausea and

vomiting ( $P < 0.0001$ ). Initial laboratory tests at the emergency department (ED) were essentially normal. The mean levels of lab data are summarized in Table 1. Complete blood cell count revealed that 28.4% of the patients had leukocytosis though all of them had platelet counts of less than 100000. The assessment of liver function tests also revealed ALT and AST increases in 5.9% and 9.8% of patients, respectively.

Kidney function tests, including BUN and creatinine, were normal in all cases and most patients had normal serum sodium and potassium levels.

The first therapeutic step for management of the patients with vomiting was to put them on NPO diet. Overall, H<sub>2</sub> blockers were administered to 63 cases. Some patients had diarrhea and 16.1% needed IV fluids to compensate for their dehydration. Oral fluid administration was advised to the patients that could tolerate it. Therapeutic modalities are summarized in Table 2. Fortunately, all cases recovered and discharged from hospital with no serious complications.

**Table 2.** Therapeutic approach to mushroom poisoning (percent).

NPO	64(62.7%)
Iv fluid	4(3.9%)
Gastric lavage	53 (52%)
Activated charcoal	69 (67.6%)
Antibiotic therapy	84.3%
Metronidazole	69 (68.3%)
Ceftriaxone	27(26.5%)
H <sub>2</sub> blockers	6(5.9%)
Cimetidine	(27.5%)(28)
Ranitidine	34.5%(35)
Hyoscine	2.9%(3)
Plasil	52.9%(54)

## DISCUSSION

Although there are more than 5000 mushroom species throughout the world, one out of 50 of them are poisonous (4). Due to its convenient geographical environment, south coast of the Caspian Sea, especially Guilan province, is very suitable for mushroom growth. Based on our observation, it seems that poisoning by wild mushrooms is prevalent in this region; hence, we decided to study the frequency of MP in Razi Hospital of Rasht, Guilan province, Iran.

In some reports, females were affected more (53.3%) (1) while in others the majority of victims were men (8,11). In

our study, MP was slightly more prevalent in females (53.9%). This is likely to be due to their motherhood and involvement in cooking.

Previous studies reported that people affected by this condition were mostly young (12). Similarly, our patients' mean of age was 36.10±15.63 years and most of them (51%) were between 16 to 35 years. However, it should be noted that our overall age range was from 13 to 75 years; hence, anyone can be affected by mushroom poisoning.

Mushroom poisonings typically occur in autumn and spring. A study performed in Japan reported that most mushroom poisoning cases occurred in autumn (13). Yilmaz *et al* also reported that 67.9% of MPs occurred in spring (14). In a similar study performed by Eren *et al.*, 58.8% of mushroom poisoning cases presented in early summer time (5). Our findings also confirmed most cases (88.2%) occurred from September to October, the rainy season (autumn) in Guilan.

A review of literature illustrated that although most MPs are caused by wild mushrooms, poisoning by cultivated edible mushrooms had also been reported in some studies (15). For example, Yilmaz *et al.* reported that 10% and Eren *et al.* reported that 6.2% of mushroom poisonings were caused by commercially cultivated mushrooms (5,14). In another study in Turkey, 5.6% of the patients were poisoned with cultivated mushrooms (16). All of the patients in the present study had consumed wild mushrooms collected from the forest. This difference arose from the fact that gathering and consumption of wild mushrooms and selling them in local markets is a traditional culture in this region. This habit is also wide spread in many European, American, and other Asian countries.

Clinically, mushroom toxicity is divided into early (within 6 hours after ingestion) and delayed (over 6 hours) (9). Late toxicity can be dangerous and life threatening because mushrooms that

develop poisoning with long incubation periods usually cause higher mortality and induce liver and renal damage (17). For example, symptoms of MP with amatoxine producing mushrooms start six to twenty hours after ingestion (18). *Amanita Phalloides* is the most poisonous mushroom which contains amatoxin that can cause death (19); cooking or freezing does not destroy this toxin (12, 20).

In our study, the majority of the subjects (87.1%) had early toxicity symptoms and only 12.9% presented with delayed symptoms. Yilmaz *et al.* also reported that most patients had the symptoms within the first hour of consumption (14). Therefore, mushroom species in our region are less dangerous.

Symptoms of MP vary from mild to severe digestive involvement depending on the species, the amount consumed, season, geographic location where the mushroom grew, the preparation method, and individual's response to the toxins (9).

Similar to previous studies, most cases were admitted with nausea and vomiting and the most common first-noticed symptoms were gastrointestinal (5, 14). None of the patients demonstrated severe symptoms, indicating the low toxicity of mushrooms in the region.

In the study performed by Nordt *et al.* in California, elevated transaminase levels were reported in 0.5% of patients (21). Eren *et al.* reported increases in ALT and AST levels in 8.1% of the cases (5). Similarly, in our study 9.8% and 6.7% of the cases were found to have increased levels of AST and ALT, respectively.

Identification of mushroom from description or fragment available is often not possible (22) and the culprit species in most cases cannot be identified.

It has been demonstrated that stomach irrigation and administration of activated charcoal is useful for management of mild clinical presentations. Adding penicillin G, other antibiotics, and atropine are useful for severe cases (5, 14). Some studies have shown that penicillin G

does not allow the toxin to bind with hepatocytes (23). A similar mechanism is also considered for some other drugs such as silibinin that blocks the lysosomal protease (4). It seems that hemodialysis, hemoperfusion, and MARS (molecular albumin reabsorbent system) are more effective than other modalities (4). The only effective treatment in patients with fulminant hepatic failure is liver transplantation (24, 25).

In our study, abdominal tenderness in some patients was severe enough to make surgical consultation imperative. NGT was inserted for 73.6% of the patients and charcoal+sorbitol was, then, administered. Those who had slighter symptoms did not need any lavation and just oral charcoal+sorbitol was used. Although some researchers believe that charcoal should be used in patients who consumed the mushroom less than 1 hour before admission, in our center, charcoal was used for most of the patients (since they mostly had clinical presentation for less than 6 hours). Totally, charcoal+sorbitol was used in 83.1% of the patients.

## CONCLUSION

In summary, this study showed that all mushroom poisoning cases in this region had mild to moderate symptoms, which could be treated by simple supportive therapies. Such evidence suggested that mushroom species in this region are less dangerous. However, further toxicological studies need to be performed to establish what toxins and species are responsible for mushroom toxicity.

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