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Mushroom Poisoning of 1151 People in Iran; the Lessons Learnt: A Brief Report of Cases and the Literature Review

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Abstract

Background: In Spring 2018, due to intense rainfalls in Iran, plenty of mushrooms had grown, some of which were poisonous and their consumption had induced poisoning in people of different provinces; 1151 mushroom poisoning cases were reported within 25 days from 12 May to 9 July 2018.
Objectives: This study aimed to address this issue from the public health perspective. The study further aimed at reporting the mortality and morbidity associated with mushroom poisoning and ascertaining the reasons behind the increase in the numbers of the affected persons.
Methods: This report was based on the review of official reports and a field assessment in the areas affected by mushroom poisoning in the western part of Iran.
Results: There were 1151 mushroom poisoning cases, out of which 1133 (98.4%) were hospitalized, and unfortunately, 18 (1.56%) died. Kermanshah province had the highest rate of mushroom poisoning casualties, out which seven people died. A total of 12 provinces were affected.
Conclusions: Lack of knowledge of local people about the types of mushroom and their inability to differentiate between the toxic and non-toxic mushrooms, as well as lack of a swift and convenient immediate warning system has caused this incident of massive mushroom poisoning. However, planning and proper management can help to resolve these problems.

Keywords: Agaricales, Amanita Phalloides, Hepatic Failure, Iran, Liver Transplantation, Mortality, Mushroom Poisoning, Mycotoxicosis, Poisons, Public Health

1. Background

Environmental hazards are considered as situations in which environmental elements affect humans, vegetation, or the environment. For example, mushrooms, due to having poisonous and non-poisonous types in nature can make the plant to be classified as poisonous (1). Currently, there are more than 5,000 known types of mushrooms in the world, out of which only 20% - 25% have been named and classified, and 3% are poisonous. More than 95% of the cases of mushroom poisoning occur due to the inability of people to distinguish between the poisonous and non-poisonous types. In addition, most of the fatal cases have been associated with the types that include amatoxin (2). Based on the type of the wild mushroom consumed, different clinical symptoms occur in humans. The first signs are not specific; they are only alimentary signs; therefore, diagnosis is not possible at this stage. This makes hazard evaluation and mushroom poisoning management a challenge for the emergency doctors (3). All poisoned patients, immediately after gastrointestinal signs and before acute liver failure, need to be visited by a Gastroenterologist or liver transplant physicians. However, not all patients develop acute liver failure, and their condition can improve by supportive treatments. Some others need a liver transplant (4, 5).

Iran, with a rich geographical climate and vegetation, is a good environment to grow various types of mushrooms both in the forests and mountainous areas, including the northern and western forests of Iran (6). Since, gen-

erally, people prefer organic products due to their nutritional values, they prefer buying from these local collectors. On the other hand, since the local people are mostly gathering, collecting or buying these mushrooms in local markets, there is no assessment or knowledge regarding distinguishing between the poisonous and non-poisonous mushrooms; cooking and processing do not decontaminate the mushrooms (7), the possibility of cases of poisoning among people is high. This is the responsibility of public health systems and governments to announce them in such cases.

2. Objectives

This report was prepared in view of the 1151 mushroom poisoning cases recorded in Iran in 2018, with the goal of ascertaining the reasons behind the increase in the numbers compared to the previous years.

3. Methods

This report is based on the review of official reports and a field assessment in the areas affected by the mushroom poisoning in the western part of Iran during 25 days of the Spring 2018.

4. Results

On the 12th of May 2018, after long hours of spring precipitation and decrease in temperature to 18 and 20°C in the western part of Iran, as well as the northern and southern parts, cases of mushroom poisoning started to increase and lasted till 19 July 2018. A total of 1151 cases were reported in 12 provinces of Iran, including 1037 treated and discharged cases, 96 hospitalized cases and 18 deceased cases (8). The details of the numbers in different provinces are reported in Table 1. In addition, Figure 1 shows the extent of death, hospitalization and discharge due to mushroom poisoning on the map of Iran.

The first cases were reported on the 28th of April 2018 in Kermanshah province, west of Iran near the border of Iraq. After an intense rainfall, in one day, 98 poisoning cases were reported out of which, three deceased cases were reported. Many of the patients visited the emergency centers with signs of diarrhea, vomiting, abdominal pain and low level of consciousness. Since the symptoms were among the first signs of digestive disorder and food poisoning, the emergency management system requested the treatment centers to identify the common cause of the disorder (9).

The common cause of poisoning among the patients with similar symptoms was consumption of wild mushrooms, which was identified as Amanita phalloides known as the “death cap” or “destroying angel” in the European countries. Consequently, the health system swung into action by setting-up special committees in the health centers of the affected provinces (Kermanshah, Lorestan, Kordestan, West Azerbaijan, Ilam, Zanjan, Kohgiluyeh and Boyer-Ahmad, Chahar Mahall and Bakhtiari, Qazvin, Fars, Markazi, Hamedan) in order to educate and inform the public, especially the villagers of the need to stop gathering, selling and buying mushrooms (10). Also, they started broadcasting jingles in TV stations, social media, local radio stations, as well as sending instant messages besides their duties of identification, treatment, supportive actions and relocation of the poisoned patients.

5. Discussion

Amatoxin poisoning is a medical emergency that is identified by gastrointestinal and hepatotoxic signs despite a delay in its manifestation, and may sometimes lead to coma and death. An important element in the prediction is the delay in time, from the consumption of the mushroom until the symptoms manifest.

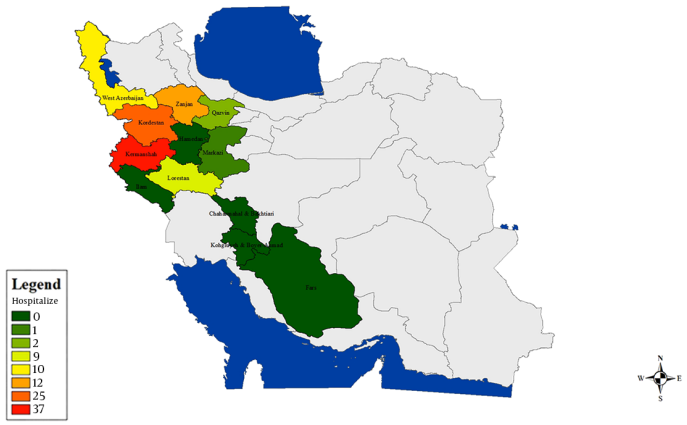
Most of the cases of poisoning by mushrooms exceed the benign periods. However, in some cases, dangerous amatoxin poisoning appears, which should be considered by doctors in patients who present with gastrointestinal signs 6-hours or more after consumption of the mushroom (7).

Mushroom poisoning in Iran is not a rarity; it has happened in previous years. For example, last year, 2017, only 50 people exhibited some gastrointestinal signs and poisoning symptoms, which were cured within a short time. The recent poisoning event with at least 18 mortalities within 25 days is happening for the first time in several decades. The previous similar mushroom poisoning case due to wild mushroom consumption occurred in 2006 and led to nine mortalities.

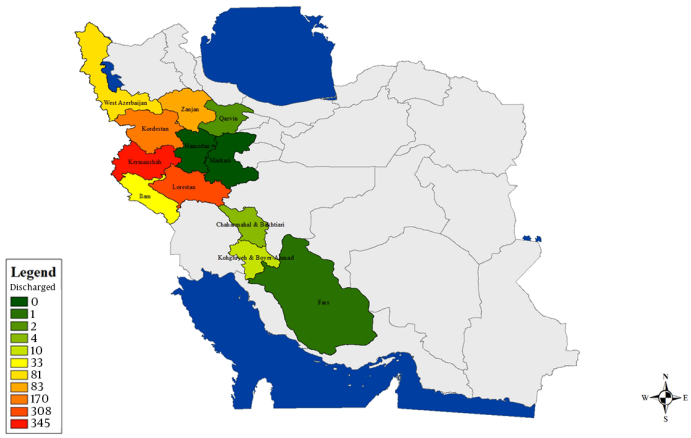
According to a study by Chan et al. 62 cases of mushroom poisoning were recorded in Hong Kong between July 1st, 2005 and June 30th, 2015, out of which 60 cases (90%) showed gastrointestinal signs and symptoms (7).

Also, in a cohort study conducted by Karyellas et al. in North America (2016) between 01/1998 and 12/2014 on 2224 cases of mushroom poisoning, it was shown that among 18 patients with Amatoxin poisoning, five received liver transplant and two died (11). Moreover, from January 1997 to

Map Title: Break down of the number of hospitaliz due to mushroom poisoning in Iran during spring 2018



Title: Break down of the number of discharged due to mushroom poisoning in Iran during during spring 2018



Map Title: Break down of the number of deceased due to mushroom poisoning in Iran during spring 2018

Figure 1. Hospitalized, discharged, and deceased due to mushroom poisoning in Iran during spring 2018

Table 1. The Number of Hospitalized, Discharged, and Fatalities Due to Mushroom Poisoning in Provinces of Iran Between 12 May - 9 July 2018

	Total Poisonings	Hospitalized, No. (%)	Discharged, No. (%)	Deceased, No. (%)	Case Fatality Rate, %
Kermanshah	389	37 (9.5)	345 (88.6)	7 (1.8)	1.79
Lorestan	321	9 (2.8)	308 (95.9)	4 (1.2)	1.24
Kordestan	198	25 (12.6)	170 (85.8)	3 (1.6)	1.51
West Azerbaijan	93	10 (10.7)	81 (87)	2 (2.1)	2.15
Ilam	33	0 (0)	33 (100)	0	0
Zanjan	95	12 (12.6)	83 (87.3)	0	0
Kohgiluyeh and Boyer-Ahmad	10	0 (0)	10 (100)	0	0
Chahar Mahall and Bakhtiari	4	0 (0)	4 (100)	0	0
Qazvin	4	2 (50)	2 (50)	0	0
Fars	1	0 (0)	1 (100)	0	0
Markazi	2	1 (50)	0 (0)	1 (50)	50
Hamedan	1	0 (0)	0 (0)	1 (100)	100
Total	1151	96 (8.3)	1037 (90)	18 (1.6)	1.56

December 2014 in California, 27 patients were poisoned by mushrooms within 24 hours (5).

Furthermore, in Switzerland, 87 cases of mushroom poisoning within the space of 11 years were reported (3). The mortality and morbidity cases due to mushroom poisoning studied in Hong Kong, North America, California and Switzerland are presented in Table 2.

The first question is what has changed in the habitat of the mushrooms? Also, what influenced the changes in the propagation, type and toxicity of the mushrooms? Did climate change play a role in the mutation of the mushrooms e.g., changes in the toxicity or mortality?

Climate affects the growth, propagation and distribution of the species. It also controls part of the formation of the ecosystems (11).

According to the study by Kauserud et al. in Norway, the time of growth of mushroom has changed significantly. These changes are different among various types of mushrooms, and climate change has changed the phenology of the mushrooms (12). The toxicity of mushrooms sometimes occurs due to the environmental pollutions (13).

The second hypothesis for the recent mushroom poisoning case in Iran is the impact of genetically modified mushrooms containing radioactive compounds brought by winds from Iraq and carried to the western and southern parts of Iran when assessed in terms of higher toxicity. This hypothesis is based on the fact that Iraq has been under intense military actions since 1991, especially in the south, where the accumulation of radioactive substance from radioactive warfare has increased the radioactivity of the region (14).

In a study by Pourimani et al. showed that while the amount of natural nuclides in the soil was close to the global average, artificial radioactivity, which can only be released by nuclear accidents or weapon test was found in all the examined soil samples. This suggests that the pollution of the studied regions is from radioactive dust (15). In other studies conducted on the wild mushroom called truffle, which grow in the Samawa desert near southwest of Iraq, the extent of radioactivity was shown to be under the global acceptable level (14). Thus, the second hypothesis of radioactive effect on the growth of the recent poisonous mushroom needs more investigations. In addition, since there were no reported cases of mushroom poisoning in the regions close to the border in Iraq, the possibility of this hypothesis decreased. Furthermore, a bioterroristic hypothesis for this event needs a detailed and specific investigation because of the proximity of the affected regions to the borders of Iraq and terrorist groups such as ISIS.

5.1. Conclusions

The recent mushroom poisoning event in Iran shows that despite the presence of food-related illness surveillance system and nutrition laws, these illnesses can still become a public health issue. It also highlights the fact that quantitative studies, data analysis, epidemiological outbreak studies and cause assessment are imperative for both the provision of guidance proposals and prevention and control of these issues in Iran.

Table 2. Mortality and Morbidity Due to Mushroom Poisoning in Other Studies

	Hong Kong (7)	North America (11)	California (5)	Switzerland (3)
Number of poisoned	62	2224	27	87
Gastrointestinal symptoms in less than 6-hours	53	-	-	65
Gastrointestinal symptoms after 6-hours	7	-	-	23
Recovering in a short time	53	2206	23	76
Severe poisoning	7	18	9	11
Liver transplant	2	5	1	0
Deceased	1	2	3	0
Fatality rate	1.61	0.08	11.1	0

In this case study, patients showed similar gastrointestinal symptoms at the beginning, but in cases with longer hospitalization, patients' situation became severe, and most of them suffered from acute liver failure as an irreversible outcome. Consequently, doctors need to consider mushroom poisoning scenario when they are assessing patients who might have consumed local products in all the regions that are prone to this mushroom poisoning quagmire. We suggest that doctors and medical staff should double their efforts to save patients in the early stages of diagnosis, especially in cases that require special care, such as organ transplant.

Footnotes

Authors' Contribution: Hamidreza Aghababaeian and Abbas Ostadtaghizadeh conceived and designed the study. Hamidreza Aghababaeian, Maryam Kiarsi and Ladan Araghi conducted the analysis of data and drafted the manuscript. Hamidreza Aghababaeian, Maryam Kiarsi, Abbas Ostadtaghizadeh and Mona Khaleghy coordinated the study and collected data.

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