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# Outbreak of Mushroom Poisoning in Iran: April–May, 2018

Kambiz Soltaninejad

## Abstract

Department of Forensic Toxicology, Legal Medicine Research Center, Legal Medicine Organization, Tehran, Iran



From April 28 to May 28, 2018, more than 1200 patients with impression of mushroom poisoning were referred to hospital emergency departments in 13 west and northwestern provinces, Iran; 112 (8.9%) patients were hospitalized and 19 were expired (*ie*, a fatality rate of 1.5%). The outbreak began in Kermanshah province with increasing number of patients presenting with severe abdominal pain, nausea, vomiting, and diarrhea soon after consumption of wild mushrooms. *Lepiota brunneoncarnata*, *Hypholoma fasciculare*, and *Coprinopsis atramentaria* have been involved in this outbreak. To prevent similar outbreaks, raising public awareness about risky behaviors of collecting and consuming wild self-picked mushrooms is of paramount importance. Herein, we present our experience with this outbreak.

**Keywords:** Mushroom poisoning; Disease outbreaks; Epidemics; Iran

## Outbreak

From April 28 to May 28, 2018, more than 1200 patients with impression of intoxication due to ingestion of wild poisonous mushrooms were referred to hospital emergency departments in 13 west and northwestern provinces, Iran. Of these 1247 patients, 112 (8.9%) were hospitalized; 19 were expired, translating to a fatality rate of 1.5% (95% CI 0.8% to 2.2%) (Table 1).<sup>1–3</sup>

The outbreak began on April 28 in Kermanshah province with increasing number of patients presenting with severe abdominal pain, nausea, vomiting, and diarrhea soon after consumption of wild mushrooms. After 10 days, 46 patients with mushroom toxicity including one fatality, were reported in Kermanshah. Thereafter, several health care centers, mostly in western and northwestern provinces, reported hundreds of patients with impression of mushroom poisoning ad-

mitted to their Emergency Departments. On suspicion of facing an epidemic of mycetism in these provinces, the Ministry of Health and Medical Education prepared a guideline on the diagnosis and treatment of toxic mushroom poisoning.<sup>4</sup>

All poisonings were accidental and ingestion with suicidal, recreational or criminal intent was not reported in anyone. Accidental poisoning occurred in those who ingested self-picked wild mushrooms from suburban areas, farms, gardens, hillsides and forest or purchased the wild mushrooms (as edible mushrooms) from local markets of these provinces. In May 2018, due to optimal climatic conditions for growth of mushrooms, *ie*, plenty of rainfall, sunlight, optimum environmental temperature (27–31 °C), and soil moisture in the western and northwestern Iran, an extensive growth of edible and toxic mushrooms was observed. Self-harvesting of wild mushrooms and their sale in local markets in western and northwestern

Correspondence to  
 Dr. Kambiz Soltaninejad, Associate Professor, Department of Forensic Toxicology, Legal Medicine Research Center, Legal Medicine Organization, Khayyam Ave, Behesht St, Tehran 1114795113, Iran  
 Tel: +98-21-5561-3731  
 E-mail: kamsoltaninejad@gmail.com

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**Table 1:** Number of patients treated for mushroom poisoning and fatality rate at hospitals during the outbreak in Iran (April 28 to May 28, 2018)

Province	Total cases	Number of out-patients (%)	Number of in-patients (%)	Number of deceased patients	Fatality rate (%)
Kermanshah	478	424 (88.7)	46 (9.6)	8	1.7
Lorestan	321	308 (95.5)	9 (4.1)	4	1.24
Kordestan	198	170 (85.8)	25 (14.2)	3	1.51
West Azerbaijan	93	81 (87)	10 (12.9)	2	2.1
Zanjan	95	83 (87)	12 (12.6)	0	0
Ilam	33	33 (100)	0 (0)	0	0
Kohgiluyeh and Boyer-Ahmad	10	10 (100)	0 (0)	0	0
Ardabil	7	0 (0)	7 (100)	0	0
Qazvin	4	2 (50)	2 (50)	0	0
Chaharmahal and Bakhtiari	4	4 (100)	0 (0)	0	0
Fars	1	1 (100)	0 (0)	0	0
Markazi	2	0 (0)	1 (100)	1	50
Hamadan	1	0 (0)	0 (0)	1	100
<b>Total</b>	<b>1247</b>	<b>1116 (89.5)</b>	<b>112 (8.9)</b>	<b>19</b>	<b>1.5</b>

provinces was therefore increased.

The suspected cases of mushroom poisoning were diagnosed based on their history of wild mushroom consumption, clinical presentations, and paraclinical findings. The most common clinical presentations were gastrointestinal (nausea, vomiting, diarrhea, and abdominal pain), fatigue, and malaise. Those with severe [and fatal] conditions developed either a delayed hepatorenal syndrome (*ie*, hypoglycemia, elevation of liver enzymes, jaundice, hyperammonia, hepatic encephalopathy, confusion/stupor/coma, metabolic acidosis, coagulopathy, and oliguria/anuria) or multi-organ failure. In those with severe toxicity, the gastrointestinal signs/symptoms initiated with after a delay of 6–12 hours after consumption of the mushroom.

### Treatment

In this type of poisoning, there are no specific antidotes and the treatment is mostly based on supportive and symptomatic measures. Gastric and intestinal decontamination with administration of multiple-dose activated charcoal (20–40 g every 3–4 hours for 48 hours) is recommended. Fluid therapy, correction of any electrolyte imbalances, and standard treatments for coagulopathy, hypoglycemia and acute hepatic and renal failure are cornerstones of therapy. Intravenous penicillin G (1 000 000 IU/kg/day), N-acetyl-cysteine (NAC) (300 mg/kg/day, administered in three divided doses) and silymarin (140 mg po, tid) have been recommended.<sup>4,5</sup> Liver transplantation in severe cases with sever hepatic failure should be considered.<sup>4,5</sup> Among 23 liver transplantation candidates, three under-



*Lepiota brunneioncarnata*

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went the procedure.

#### Mortality

Sixty-seven percent of fatal cases were male. Mortality occurred 2–10 days post-ingestion. Mushroom poisoning was confirmed as the cause of death in all victims by forensic medicine practitioners based on their history, autopsy and post-mortem histopathological examinations. In gross autopsy, congestion of internal organs was reported. The main post-mortem histopathological findings were fatty degen-

eration, centrilobular necrosis and hemorrhage in liver, and acute tubular necrosis and proximal tubules damage in kidneys (unpublished data, Iranian Legal Medicine Organization, May 2018).

#### Mushrooms

To determine the species of toxic mushrooms involved in this outbreak, laboratory investigations on mushrooms samples used by patients and samples collected from local markets, were performed under the auspices of expert mycologists, Iranian Plant Pathology Research Institute, Tehran, Iran. The results showed that from a total of 50 species of toxic mushrooms identified in Iran, at least three species, *ie*, *Lepiota brunneioncarnata* (Kermanshah province), *Hypholoma fasciculare*, and *Coprinopsis atramentaria* (Kohgiluyeh and Boyer-Ahmad province) have been involved in this outbreak (see Figures).<sup>6</sup>

*L. brunneioncarnata*, the leading cause of fatality in this mushroom outbreak, is a cyclopeptide-containing mushroom. It is known to contain lethal amounts of  $\alpha$ -amanitin and is responsible for the fatal delayed-onset hepatorenal syndrome with initially gastrointestinal symptoms 6–10 hours after consumption of the mushroom.<sup>5</sup>

*H. fasciculare* is also a toxic mushroom and causes nausea, vomiting, diarrhea, and abdominal pain. Clinical presentations may be delayed for 5–10 hours after its consumption and generally resolve within a few days. In fatal cases, fulminant hepatitis with kidney and myocardium damage have been reported.<sup>5</sup>

*C. atramentaria* is a toxic mushroom with low fatality. It contains coprine, a protoxin, which inhibits acetaldehyde dehydrogenase causing a disulfiram-like reaction if ethanol is ingested within 30 minutes to 3 days after mushroom ingestion. The clinical presentations after co-ingestion of the mushroom with ethanol in-



*Hypholoma fasciculare*

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clude gastrointestinal (nausea, vomiting, abdominal pain), nervous (headache, dizziness) and cardiac (tachycardia, hypotension, palpitations) signs and symptoms, flushing, diaphoresis, and dyspnea.<sup>5</sup>

### Control of the Outbreak

To control the outbreak, the Ministry of Health, Drug and Poison Information Centers and medical universities tried to raise public awareness about poisonous mushrooms through media. The sale of wild mushrooms in local markets was banned by health authorities. Thereafter, the outbreak has been subsided, gradually.

### Discussion

Mycetism (mycetismus) or toxic mushroom poisoning is referred to the clinical toxic syndrome due to exposure to poisonous mushrooms. It is associated with high morbidity and mortality rates, particularly in Europe and Asia.<sup>7-10</sup> Approximately, 140 000 species of mushrooms have been identified in the world. About 2700 species considered safe for human and have nutritional value and medicinal properties; 100 species are considered toxic to human.<sup>5,11</sup>

Mushroom poisoning is classified based on onset of clinical presentations and the target organ system toxicity.<sup>7</sup> According to the onset of clinical signs and symptoms after exposure, mycetism is classified as “early onset” (<6 hours), “late onset” (6–24 hours), and “delayed onset” (>24 hours). Early-onset mushroom poisoning presents with gastrointestinal, allergic, hallucinogenic, and neurotoxic syndromes. Hepatotoxic, nephrotoxic, and erythromelalgia syndromes have been reported in late-onset poisoning. The delayed toxicities present with nephrotoxic, myotoxic, and delayed neurotoxic syndromes.<sup>7,10</sup> Clinical presentations depend on many factors including the mushroom species; type and amount of toxins presented in the



*Coprinopsis atramentaria*

ingested mushroom; climatic, geographic and genetic variations; route of exposure; amount of mushroom ingested; and age of patient.<sup>5,11</sup>

Most of mushroom poisonings reported are accidental oral ingestion of poisonous mushrooms misidentified for edible species by children or adults who often pick wild mushrooms from nature.<sup>10,11</sup> Morphological characteristics and appearance of many edible species are similar to those of poisonous mushrooms.<sup>10</sup> There is in fact, no particular morphological characteristics that could be used for identifying the toxic nature of a mushroom. There is no simple method to differentiate edible from poisonous mushroom species. The identification needs microscopic examination and chemical analysis by a mycologist in a laboratory setting. Furthermore, different edible and poisonous mushroom species often grow in near proximity in the field. Therefore, collection of mixed edible and poisonous species would happen.<sup>10</sup>

Sporadic cases of poisonous mushroom poisoning are reported from Iran every year during spring and autumn.<sup>12-15</sup> However, mushroom-related mass poisoning has so far not been reported in Iran. To

prevent similar outbreaks, raising public awareness about risky behaviors of collecting and consuming wild self-picked mushrooms is of paramount importance. Continuous medical education for physicians and other health care providers should also be considered in high-risk provinces for early diagnosis and treatment of patients who present with gastrointestinal signs and symptoms >6 hours after mushroom ingestion.

## References

1. Iranian Emergency Organization. [Death of 18 people due to mushroom poisoning]. 2018. Available from [www.emsnews.ir/4506](http://www.emsnews.ir/4506) (Accessed May 24, 2018). [in Persian]
2. [Mushroom poisoning of 7 people in Ardabil province]. Available from [www.ecofars.com/view.php?newsid=169556](http://www.ecofars.com/view.php?newsid=169556) (Accessed May 24, 2018). [in Persian]
3. [Therapeutic measures for mushroom intoxicate cases]. Available from [www.jamaran.ir](http://www.jamaran.ir) (Accessed May 20, 2018). [in Persian]
4. Deputy of Treatment, Shahid Beheshti University of Medical Sciences. [Cyclopeptide Mushroom Poisoning Guideline]. Available from [http://treatment.sbm.ac.ir/uploads/shive\\_gharch.pdf](http://treatment.sbm.ac.ir/uploads/shive_gharch.pdf) (Accessed May 24, 2018). [in Persian]
5. Graeme KA. Mycetism: A review of the recent literature. *J Med Toxicol* 2014;10:173-89.
6. [Iran has 50 Species of Toxic Mushrooms]. Available from [www.ana.ir/news/391845](http://www.ana.ir/news/391845) (Accessed May 25, 2018). [in Persian]
7. Diaz JH. Evolving global epidemiology, syndromic classification, general management, and prevention of unknown mushroom poisonings. *Crit Care Med* 2005;33:419-26.
8. Erguvan M, Yilmaz O, Deveci M, et al. Mushroom poisoning. *Indian J Pediatrics* 2007;74:847-52.
9. Yordan T, Baydin A, Eden AO, et al. Wild mushroom poisonings in the Middle Black Sea region in Turkey: Analyses of 6 years. *Hum Exp Toxicol* 2010;29:767-71.
10. Chan CK, Lam HC, Chiu SW, et al. Mushroom poisoning in Hong Kong: a ten-year review. *Hong Kong Med J* 2016;22:124-30.
11. Lima AD, Costa Fortes R, Carvalho Garbi Novaes MR, Percário S. Poisonous mushrooms: A review of the most common intoxications. *Nutr Hosp* 2012;27:402-8.
12. Omidinia E, Rashidpourai R, Qaderi MT, Ameri E. Mycetismus in Hamadan, of west Iran. *Southeast Asian J Trop Med Public Health* 1997;28:438-9.
13. Pajoumand A, Shadnia S, Efricheh H, et al. A retrospective study of mushroom poisoning in Iran. *Hum Exp Toxicol* 2005;24:609-13.
14. Rahmani F, Ebrahimi Bakhtavar H, Ghavidel A. Acute hepatorenal failure in a patient following consumption of mushrooms: a case report. *Iran Red Crescent Med J* 2015;17:e17973.
15. Dadpour B, Tajoddini S, Rajabi M, Afshari R. Mushroom poisoning in the northeast of Iran; A retrospective 6-year epidemiologic study. *Emerg (Tehran)* 2017;5:e23.