



MUSHROOMS INTOXICATIONS

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ABSTRACT

Purpose: To perform a retrospective analysis of mushroom poisonings in Varna region for 25 years (1991-2015). Mushroom poisonings account for 10.7% of hospitalizations associated with acute exogenous intoxication. Poisoning with *Amanita phalloides*, *Amanita pantherina*, *Amanita muscaria* and various fungi that cause only gastrointestinal symptoms are of greatest importance for the clinical toxicology in the Republic of Bulgaria.

Material/Methods: Objects of the study were 1872 patients who received treatment at the Clinic for Intensive Treatment of Acute Intoxications and Toxicallergies, Naval Hospital – Varna, Military Medical Academy, Bulgaria after eating mushrooms.

Results: Patients with irritative gastroenteritis – 1703 (91%) were with the highest frequency, followed by those with *Amanita phalloides* intoxication - 147 (7.8%). *Amanita phalloides* poisonings are not common and have a low relative share to all mushroom intoxications, but they are characterized by severe course and high lethality. Poisonings with *Amanita pantherina* and *Amanita muscaria* are even less common – 22 (1.2%). Patients accepted for treatment were both male (50.5%) and female (49.5%). Patients in age between 25 and 60 years were prevalent – 1171 (62.6%). A fatal outcome was registered in only 25 patients with *Amanita phalloides* intoxications, which represents 17% of all patients with *Amanita phalloides* poisoning and 1.3% of all patients with mushroom intoxications.

Conclusion: Mushroom poisonings causing irritant gastroenterocolitis and those with *Amanita pantherina* and *Amanita muscaria* have a good prognosis. *Amanita phalloides* intoxications are characterized by the development of life-threatening organ damages and high lethality.

Keywords: mushroom poisoning, *Amanita phalloides*, *Amanita pantherina*, *Amanita muscaria*

INTRODUCTION

Poisonings with mushrooms have an important position in the ethology of acute exogenous intoxication and are one of the main reasons for hospitalization. They occur throughout the world, including the Balkan Peninsula. In Turkey, mushroom poisoning comprises the main part of the plant and fungal toxicities [1]. The most important mushroom poisoning for toxicological practice in Southeast Europe is those with *Amanita phalloides* mushrooms. Mushroom poisoning by *Amanita phalloides* is a rare but potentially fatal disease [2]. Death cap (*Amanita phalloides*) poisoning is a serious medical condition, causing organ failure with potentially fatal outcome [3]. It is a toxic mushroom responsible for the majority of deaths occurring after mushrooms ingestion [4, 5]. *Amanita phalloides* is the most dangerous, poisonous mushroom species. It is the cause of 90-95% of all deaths due to mushroom poisoning [6, 7]. Mushroom poisonings with fly agaric (*Amanita muscaria*) and panther cap (*Amanita pantherina*) are rather rare [8] and have a good prognosis [9-11].

In this regard, we aimed to examine the mushroom poisonings in Varna region for 25 years – from 1991 to 2015, analysing their frequency, distribution by sex and age, clinical course, therapeutic behaviour and lethality.

MATERIALS AND METHODS

The objects of the study were 147 patients treated at the Clinic for Intensive Treatment of Acute Intoxications and Toxicallergies, Naval Hospital – Varna, Military Medical Academy, Bulgaria. The study was a retrospective covering 25 year period (1991-2015). The histories of disease, personal ambulant cards of the accepted for treatment patients and medico-legal protocols from autopsies of the deceased patients were analysed. The diagnosis was based on a history of consumption of mushrooms, the presence of a latent period of varying duration, clinical symptoms and interpretation of laboratory test results.

RESULTS AND DISCUSSION

During the 1991-2015 period, in the Clinic of toxicology 1872 patients with mushroom poisoning have received treatment. Their relative share to all patients with acute intoxication is 10.7%. We classified poisonings with mushrooms into 3 groups according to etiological indication:

- mushrooms that cause irritative gastroenteritis;
- *Amanita phalloides* intoxications;
- intoxications with *Amanita pantherina*, and

Amanita muscaria.

Mushroom poisoning causing irritative gastroenteritis were with the highest frequency - 1703 (91%). Here are included patients who have consumed edible mushrooms, but due to the presence of concomitant diseases of the gastrointestinal tract, such as ulcer disease, chronic gastritis and colitis have developed symptoms characteristic of the mushroom poisoning. Consumption of mushrooms containing a lot of hardly digestible substances is an error in the diet for those patients. On the second position by frequency are patients with *Amanita phalloides* intoxications - 147 (7.8%). Poisonings with *Amanita pantherina* and *Amanita muscaria* were most rarely observed - 22 cases (1.2%).

All poisoning with *Amanita phalloides*, *Amanita pantherina*, and *Amanita muscaria* are the result of the consumption of wild mushrooms instead of edible ones. The toxicity of *Amanita phalloides* is due to two groups of toxins - phallotoxins and amatoxins. Phallotoxins damage the cell membrane of enterocytes and cause manifestations of the gastrointestinal tract - nausea, vomiting, and diarrhoea. Amatoxins - alpha-, beta- and gamma-amanitin are resistant to high temperatures, and alpha-amanitin has the highest toxicity [1, 10, 13, 14]. Intestinal mucosa, hepatocytes and proximal tubules of the kidney are the main target structures which are damaged by toxins of *Amanita phalloides* mushrooms [4, 15, 16, 17]. Amatoxins directly interact with the enzyme RNA polymerase II in eukaryotic cells, inhibit transcription, prevent protein synthesis and cause cell death [15, 18]. The main toxins of *Amanita pantherina* and *Amanita muscaria* are ibotenic acid and muscimol [19, 20]. They are rapidly absorbed in the gastrointestinal tract and cause psychotropic effects [10, 11]. Ibotenic acid acts as an excitatory amino acid at the glutamate receptors, and muscimol acts as an agonist of the gamma-aminobutyric acid receptors [21]. Male patients were 945 (50.5%) and prevailed insignificantly over the female - 927 (49.5%). The analysis of the distribution of mushroom intoxications by age indicates that the most affected age group was from 25 to 44 years - 634 cases (33.2%) and the frequency in patients up to 24 years was very low (20.2%), as well as in patients above 60 years (17.2%) - Table 1. The majority of mushroom intoxications were in the age range from 25 to 60 years - 1171 cases (62.6%).

Tabl. 1. Distribution of *Amanita* intoxication by age

Age, years	Number of patients	Percentage
up to 24	397	20.2
25 - 44	634	33.9
45 - 60	537	28.7
above 60	322	17.2

Mushroom poisonings in Bulgaria are most often in late spring, summer and autumn in relation to climatic conditions. In the period from August to November were recorded 1248 cases (66.7%). The peak of intoxications with mushrooms was in October when 35.4% of all poisonings were recorded - Table 2.

Tabl. 2. Distribution of mushroom intoxication by months

Month	Number of cases	Percentage
January	27	1.4
February	32	1.7
March	39	2.1
April	63	3.4
May	161	8.6
June	188	10.0
July	71	3.8
August	132	7.1
September	303	16.2
October	633	35.4
November	150	8.0
December	43	2.3

Clinical features, course and prognosis of mushroom poisonings are different. They are determined mainly by the species of poisonous mushroom. Mushroom intoxications with irritant gastroenteritis are characterized by mild and short gastrointestinal syndrome. The prognosis is favourable.

Intoxication with *Amanita phalloides* is ongoing in four phases.

a) Asymptomatic lag phase - from the time of ingestion of mushrooms to the appearance of the first symptoms. It continues from 6 to 40 hours [15, 18]. The average duration of the latency period in our study was 11 hours [7-20];

b) Gastrointestinal phase - characterized by heavy gastrointestinal syndrome, causing dehydration, arterial hypotension and electrolyte abnormalities. It lasts for

about 12-24 hours;

c) Apparent convalescence – starts 36-48 hours after ingestion of mushrooms. Gastrointestinal symptoms diminish or disappear, but serum transaminases continued to increase, and jaundice may appear;

d) Acute liver failure – characterized by high levels of transaminases, hyperbilirubinemia, coagulopathy, hepatic encephalopathy, hepatorenal syndrome and acute renal failure. Hepatorenal phase begins after 2-3 days.

Intoxications with *Amanita pantherina* and *Amanita muscaria* begin after a short latency period, usually from 30 minutes to 2 hours [8, 10]. They are characterized by nausea, vomiting, hallucinations growing psychomotor agitation, tachycardia, hypertension, mydriasis, redness of the skin. Acute respiratory failure and comatose state are observed very rarely. Prognosis of the poisoning is generally good and lethal cases are rare [9, 11, 21, 22].

Active treatment begins immediately after the patient's hospitalization and diagnosis. The treatment of mushroom poisoning with irritative gastroenterocolitis and the poisoning with *Amanita pantherina* and *Amanita muscaria* includes gastrointestinal tract decontamination, venous infusions for rehydration and symptomatic treatment [9]. Hallucinations and psychomotor agitation are controlled with benzodiazepines and/or neuroleptics. If small muscarinic symptoms prevail, small doses of atropine are administered [23].

The recommended therapeutic regimen for *Amanita phalloides* poisoning includes gastrointestinal decontamination procedures, rehydration, metabolic acidosis and electrolyte correction, specific therapies (silibinin, N-acetylcysteine, penicillin G, MARS) and liver transplantation [4, 6, 13, 15, 24, 25]. In Bulgaria, silibinin, MARS and Emergency Liver Transplantation were not available

during the study period. In all patients hospitalized up to the 36th hour after consumption, extracorporeal treatment methods were used – hemodialysis, hemosorption or plasmafiltration, although there is no conclusive evidence of their effectiveness in the literature [26, 27]. After the 4th day, hyperbaric oxygenation for faster hepatocyte regeneration was applied. Our experience indicates that the protocol used in our Toxicology unit is effective for amatoxin poisoning because although not all recommended methods are available in Bulgaria, the rate of cured patients is as high as the average for Europe.

A lethal outcome was recorded in only 25 patients with *Amanita phalloides* intoxication, which represents 17% of the patients with such poisoning and 1.3% of all mushroom intoxications. The lethality in the *Amanita phalloides* intoxications is high and reaches 20% [6, 18, 28, 29] or 30% in adults and up to 50% in children [4, 7]. According to our data, *Amanita phalloides* mushrooms cause 11.4% of lethality in acute poisoning cases.

CONCLUSION

Mushroom poisonings in Bulgaria have a high frequency and are responsible for 10.7% of hospitalizations due to acute intoxication. They affect to the same extent both sexes. The majority of patients (62.6%) were the age group from 25 to 60 years. Mushroom intoxications are typical of late spring, summer and autumn, with a peak in October. Mushroom poisoning causing irritant gastroenterocolitis and those with *Amanita pantherina* and *Amanita muscaria* have a good prognosis. *Amanita phalloides* intoxications are characterized by the development of life-threatening organ damages and high lethality. They account for 11.4% of lethality in acute intoxications.

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