

## Clinical, Demographic and Prognostic Evaluation of Patients Admitted the Emergency Department with Mushroom Poisoning

Mantar Zehirlenmesi ile Acil Servise Başvuran Hastaların Klinik, Demografik ve Prognostik Açından Değerlendirilmesi

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### ABSTRACT

Fungal intoxications can lead to a variety of conditions ranging from simple gastroenteritis to severe neurological manifestations, and even fatal liver and kidney failure. In this study, we aimed to evaluate the diagnosis, treatment, prognosis and demographic data of patients admitted to the emergency department due to fungal intoxication. The aim of this study was to conduct a retrospective evaluation of examination findings, laboratory investigations, duration of treatments, hospitalization rates, and mortality rates in patients admitted to our emergency department due to fungal intoxication between October 01, 2017 and October 01, 2018. Of the 40 patients included in the study, 25 (62.5%) were female, with a mean age of 44.83 ± 17.00 years and a range of 18 to 82 years. Nausea and vomiting had the highest frequency (28 patients) among the presenting complaints of the patients. Only 11 (27.5%) patients underwent gastric lavage and decontamination with activated charcoal, whereas 29 (72.5%) patients had no gastric decontamination. The highest frequency of admissions was recorded in November. The highest frequency of patient admissions was between 01:00 and 02:00. It was concluded that there was a low rate of the administration of gastric decontamination in patients admitted to the emergency department, especially those admitted to the ward. In our study, the majority of patients with fungal intoxication had early-onset mild symptoms. Particular attention should be paid to early diagnosis and adherence to appropriate treatment algorithms in emergency departments, particularly in patients presenting with late-onset symptoms that may result in mortality.

**Keywords:** Mushroom poisoning, Emergency department, Fungal intoxication.

### ÖZET

Mantar zehirlenmesi basit gastroenteritten başlayarak ciddi nörolojik bulgulara, ölümcül karaciğer ve böbrek yetmezliğine kadar değişebilen durumlara yol açabilir. Biz çalışmamızda mantar zehirlenmesi ile acil servise başvuran hastaların tanı, tedavi, demografik veriler ve prognoz açısından değerlendirilmesini amaçlanmıştır. 01 Ekim 2017-01 Ekim 2018 tarihleri arasında acil servise "Mantar Zehirlenmesi" tanısı ile başvuran hastaların, muayene bulguları, laboratuvar değerleri, tedavi süreleri, yatış oranları ve mortalitelerinin geriye dönük incelendi. Çalışmaya dahil edilen 40 hastanın 25(%62,5)'i kadındı. Yaş ortalaması 44,83±17,00 dağılım aralığı 18-82 idi. Hastaların geliş semptomlarına bakıldığında en sık bulantı-kusma (28 hasta) şikâyet olmuştur. Hastaların sadece 11(%27,5) tanesine mide lavajı ve aktif kömür ile gastrik dekontaminasyon uygulaması yapılmış 29(%72,5) hastaya herhangi bir dekontaminasyon uygulanmamıştır. En sık başvuru Kasım ayıdır. Başvuru saatlerine bakıldığında en çok saat 01:00-02:00 saatleri arasında başvuru dikkati çekmektedir. Acil servise başvuran hastalarda gastrik dekontaminasyonun yeterince uygulanmadığını özellikle acil servisten yatış verilen hastalarda bu oranın daha da düştüğünü gözlemlendi. Çalışmamıza aldığımız mantar zehirlenmesi olgularının çoğunluğu erken belirti veren hafif bulgularla seyreden hastalardan oluşmuştur. Acil serviste özellikle geç bulgu veren mortalite ile sonuçlanan vakalara karşı erken tanı ve uygun tedavi algoritmaları açısından dikkatli olunmalıdır.

**Anahtar Kelimeler:** Mantar zehirlenmeleri, Acil servis, Mantar intoksikasyon.

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## INTRODUCTION

Fungi (mushrooms), which are easily found in nature, are an important source of nutrients. Although most are innocent, there are some types that contain chemicals that have the potential for high levels of toxicity.<sup>1</sup> There are about 100.000 species of fungi known around the world, with 800 species of fungi being identified each year.<sup>2</sup> Furthermore, about 100 of these species are known to be toxic to humans. Newly identified species may include fungi that are toxic to humans. In addition, it is known that some species previously reported as innocent have been included in the class of poisonous fungi.<sup>3</sup>

In Turkey, the rate of fungal intoxications among all types of intoxications ranges from 9.3% to 10.9%, while this rate is much lower

in America (0.6%) and European countries.<sup>3-5</sup> Seasonal factors and the amount, type and manner of preparation of fungi are some of the factors that may affect the severity of fungal intoxication. An accurate medical history is of great importance in terms of diagnosis and treatment. The identification of the type of fungus can be a guide for treatment.<sup>4</sup> Clinical manifestations in patients presenting with fungal intoxication may range from simple gastroenteritis to severe neurological symptoms, and even fatal liver and kidney failure.

In this study, we aimed to evaluate the diagnosis, treatment, prognosis and demographic data of patients admitted to the emergency department due to fungal intoxication.

## MATERIALS AND METHODS

This study was conducted in the emergency department of a secondary state hospital with an average daily and annual admission of 600 and 220.000 patients, respectively. The study was initiated after the approval of the institutional ethics committee. The aim of this study was to conduct a retrospective evaluation of examination findings, laboratory investigations, duration of treatments, hospitalization rates and mortality rates in patients admitted to our emergency department due to fungal intoxication between October 01, 2017 and October 01, 2018. We included patients over the age of 18 who had complete data on patient files and the hospital automation system, whereas we excluded patients with incomplete data or under 18 years of age.

### Statistical Analysis:

Data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 17.0. Continuous variables with

normal distribution were expressed as mean  $\pm$  standard deviation (SD) and those with non-normal distribution were expressed as median (minimum-maximum), whereas categorical variables were expressed as numbers and percentages. For continuous variables, Mann-Whitney U-test was used in the groups with non-normal distribution, whereas Student's t-test was used in the groups with normal distribution to determine the significance of the difference between the means of the groups. Pearson's Chi-Square test and Fisher's Exact Test were used to test the significance of differences between categorical variables. All calculations were performed in two ways. The level of statistical significance was set at  $p < 0.05$ .

### Limitations of the study:

Our study has some limitations, including a regional retrospective study design, a low number of patients, and absence of identification of type and genus of fungi.

## RESULTS AND DISCUSSION

Of the 40 patients included in the study, 25 (62.5%) were female, with a mean age of  $44.83 \pm 17.00$  years and a range of 18 to 82 years.

Of all patients, 22 (55%) were hospitalized in the ward, whereas 18 (45%) were discharged from the emergency department. Laboratory studies showed significantly higher CRP values in patients treated in the emergency department than those transferred to the wards ( $p=0.007$ ), with comparable levels of other laboratory parameters between the two groups (Table 1).

**Table 1. Comparison of Laboratory Values of Patients Treated in Emergency Department and Transferred to Wards**

	Treated in the Emergency Department (n: 18)	Transferred to the Ward (n: 22)	p value
Urea	$34.17 \pm 11.11$	$32.32 \pm 13.06$	.479
Creatinine	$1.81 \pm 2.62$	$0.85 \pm 0.22$	.055
ALT	$25.72 \pm 13.76$	$260.14 \pm 961.86$	.488
AST	$28.67 \pm 7.93$	$291.00 \pm 982.76$	.487
LDH	$243.50 \pm 92.85$	$417.32 \pm 795.10$	.924
GGT	$23.72 \pm 14.09$	$66.41 \pm 103.05$	.242
CRP	$9.99 \pm 15.43$	$3.08 \pm 4.02$	.007
INR	$1.05 \pm 0.08$	$1.53 \pm 1.90$	.050
WBC	$9.51 \pm 3.04$	$10.29 \pm 4.42$	.673

Nausea and vomiting had the highest frequency (28 patients) among the presenting complaints of the patients. Other symptoms on admission included abdominal pain (7 patients), diarrhea (4 patients) and headache (1 patient).

Only 11 (27.5%) patients underwent gastric lavage and decontamination with activated charcoal, whereas 29 (72.5%)

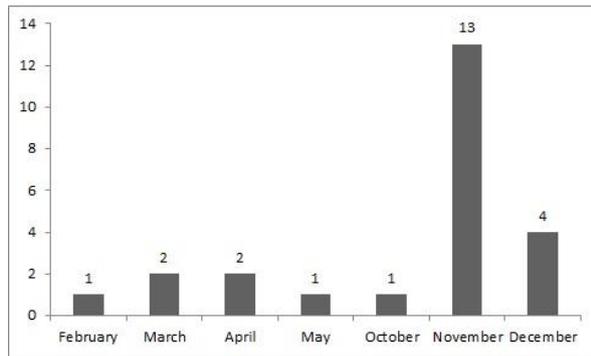
patients had no gastric decontamination. Laboratory studies showed lower mean values of ALT and AST in patients who had gastric lavage and decontamination with activated charcoal than who did not, with no statistically significant difference (Table 2).

**Table 2. Comparison of Laboratory Values Between Patients Who had Gastric Decontamination and Who did not**

	Patients not undergoing Gastric Decontamination (n: 29)	Patients undergoing Gastric Decontamination (n: 11)	p value
Urea	$35.00 \pm 13.19$	$28.27 \pm 6.93$	.148
Creatinine	$1.17 \pm 1.52$	$1.59 \pm 2.47$	.858
ALT	$202.72 \pm 839.30$	$27.91 \pm 28.83$	.090
AST	$226.10 \pm 858.95$	$32.82 \pm 28.85$	.074
LDH	$385.14 \pm 691.87$	$217.73 \pm 97.25$	.338
GGT	$45.86 \pm 76.45$	$50.73 \pm 89.75$	.743
CRP	$12.61 \pm 6.76$	$4.68 \pm 6.08$	.976
INR	$1.41 \pm 1.66$	$1.05 \pm 0.06$	.241
WBC	$9.70 \pm 3.56$	$10.58 \pm 4.59$	.835

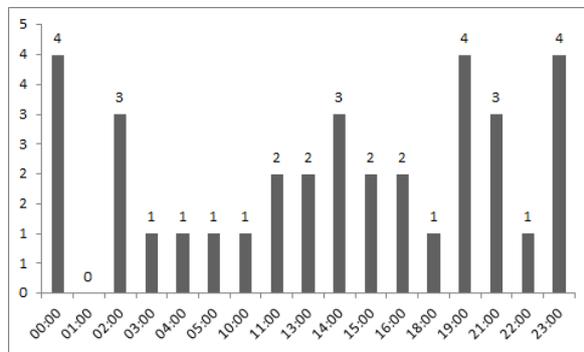
Gastric decontamination was performed in 8 (44.40%) of the 18 outpatients in the emergency department, whereas in only 3 (13.6%) of 22 patients transferred to the wards. This difference was statistically significant ( $p = 0.034$ ).

The highest frequency of admissions was recorded in October and November (Figure 1).



**Figure 1. Distribution of the Number of Cases by Months**

The highest frequency of patient admissions was between 01:00 and 02:00 (Figure 2).



**Figure 2. Distribution of the Number of Cases According to the Hours of Admissions**

The longest duration of hospitalization was 9 days, with no stay in the intensive care unit. None of the patients included in the study had mortality.

In fungal intoxications, identification of the species, genus and toxin of the fungus plays an important role in treatment planning. A complete medical history, the earliest possible diagnosis, a multidisciplinary approach and appropriate treatment can be life-saving.<sup>5</sup>

Literature studies have shown a higher incidence of fungal intoxications in females.<sup>6-9</sup> In our study, 62.5% of the patients were female.

Although the frequency of patient admissions due to intoxications varies between seasons, the highest frequency of admissions was reported in the spring and autumn months, which was also supported by the studies carried out in Turkey.<sup>6,7,10,11</sup> In our

study, the highest frequency of admissions was recorded in October and November.

Fungal intoxications can be classified as early-onset (<6 hours), late-onset (6-24 hours), and delayed-onset (>24 hours) intoxications based on the time of onset of symptoms. Patients with a time of admission of less than 6 hours usually have gastrointestinal and allergic symptoms, whereas hepatotoxic and nephrotoxic symptoms are manifested in patients with a time of admission between 6 and 24 hours. Furthermore, hepatotoxic, nephrotoxic, delayed neurotoxic and rhabdomyolytic symptoms are prominent in later admissions.<sup>3</sup> In our study, a review of the time of the admissions showed a higher frequency in the 6-hour period after dinner.

Fungi of the same species may not produce the same clinical findings in all patients. Fungi can cause toxidromes ranging from simple gastroenteritis to many toxidromes resulting in hepatotoxicity and nephrotoxicity and even mortality.<sup>3</sup> None of the patients included in the study had mortality.

The most frequent symptoms reported by studies on fungal intoxications included nausea, vomiting, abdominal pain, diarrhea, headache and dizziness.<sup>5,12-15</sup> In our study, nausea and vomiting were reported as the most common symptoms of admission to the emergency department.

The toxins detected in fungal intoxications are cyclic octapeptides. *Amanita phalloides* is responsible for approximately 95% of deaths due to intoxications.<sup>16</sup> This toxin has alpha and beta subgroups, with the highest frequency of toxicity due to alpha amanite. They are heat-resistant, resulting in maintenance of toxicity levels during the cooking process.<sup>17</sup> These toxins are absorbed from the gastrointestinal tract and delivered to the liver by portal circulation. Up to 60% of the absorbed alpha toxin is excreted in the bile and returned to the liver by enterohepatic circulation. In addition, the kidneys are susceptible to this toxin, except for the liver. It is filtered from the glomeruli and re-absorbed from the proximal tubules, causing acute tubular necrosis in the kidneys. It has a

very low protein-binding rate, is excreted through the urinary and gastrointestinal tracts within 48 hours and can be detected in urine and stool.<sup>18</sup>

Today, many treatment methods, some of which are controversial, are in use in the management of fungal intoxications.<sup>19</sup> Symptomatic patients should be hospitalized and kept under observation until symptoms are improved. Although serious and fatal intoxication cases have been reported in the literature, most patients recover without complications.<sup>20</sup> Gastric lavage should be ranked first among gastrointestinal decontamination procedures in early-admitted patients. The gastric content obtained during gastric lavage can be subjected to toxicological examination. Repeated doses of activated charcoal should be administered in patients with fungal intoxication. The dose of activated charcoal may be 0.5 grams/kg (maximum dose of 50 grams) every 4 hours for 4 days after ingestion. Optimum benefit can be achieved if repeated doses of activated charcoal are commenced within the first 24 hours after ingestion. The toxins are excreted in bile and then recirculated.<sup>21</sup> The excretion in the bile can last up to 5 days after ingestion.

Activated charcoal binds toxins and ensures their excretion in faeces.<sup>21</sup> A review of 2.100 patients treated for fungal intoxication, comparing patients receiving supportive therapy alone and patients receiving repeated dose activated charcoal, showed a mortality rate of 47% in the group receiving supportive therapy alone and 10% in the group receiving supportive treatment with repeated dose of activated charcoal.<sup>22</sup> The administration of penicillin G, silymarin and silibinin, N-acetylcysteine and cimetidine, and Hemodialysis and Hemoperfusion are currently recommended treatment modalities based on the clinical status of patients following gastric decontamination and fluid resuscitation.<sup>18</sup> In our study, only 11 patients underwent gastric decontamination, and 2 patients received penicillin G and N-acetylcysteine.

It was concluded that there was a low rate of the administration of gastric decontamination in patients admitted to the emergency department, especially those admitted to the ward. Especially in the spring months, medical history is of great value in fungal intoxications that can be mistaken for other diseases.

## CONCLUSION AND RECOMMENDATIONS

In our study, the majority of patients with fungal intoxication had early-onset mild symptoms. Particular attention should be paid to early diagnosis and adherence to

appropriate treatment algorithms in emergency departments, particularly in patients presenting with late-onset symptoms that may result in mortality.

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