Poisoning Severity Scores of Cases with Mushroom Poisoning Presenting to the Emergency Department

Acil servise mantar zehirlenmesi ile başvuran hastaların zehirlenme ciddiyet skorları

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SUMMARY

Objectives: The aim of this study is the description of mushroom poisoning (MP) cases and evaluate their Poisoning Severity Scores (PSS), outcome and correlation with descriptive and clinical data.

Materials and Methods: Patients were evaluated for gender, age, presenting month, city of residence, first noticed and admission symptoms, vital signs, laboratory studies, disposition, hospitalization period, PSS when first symptoms noticed (PSS-1) and in the ED (PSS-2), and outcome.

Results: PSS-1 was found minor: 271 cases (88.3%), moderate: 33 cases (10.7%), severe: 3 cases (1%). PSS-2 was minor: 203 cases (66.1%), moderate: 77 cases (25.1%), severe: 27 cases (8.8%). The cases older than 65 years of age showed higher mortality and complication rate ($p<0.05$). Twelve of cases (3.9%) had fatal outcome, and 6 cases (2%) had complications. Seventeen of 18 of dead and complicated cases were categorized as minor in PSS-1. Minor grading in PSS-2 had less mortality and complication rates significantly.

Conclusion: We concluded that PSS grading in early period might mislead the clinicians and poison control center staff. Grading the PSS in the ED is more concordant method to predict clinical severity.

Key words: *Mushroom; poisoning; severity score.*

ÖZET

Giriş: *Bu çalışmanın amacı mantar zehirlenmesi olgularının tanımlanması ve zehirlenme ciddiyet skorları (ZCS) ile sonuçların tanımlayıcı ve diğer klinik verilerle kıyaslanmasıdır.*

Gereç ve Yöntem: *Hastalar cinsiyet, yaş, başvuru ayı, oturdukları il, ilk ve acil servis başvuru semptomları, vital bulgular, laboratuvar değerleri, yatış veya taburcu durumları, hastanede yatış süresi, ilk semptomlarına göre ZCS (ZCS-1) ve acil servis başvurusundaki ZCS (ZCS-2) ve ölüm, komplikasyon vb. parametreler açısından değerlendirildi.*

Bulgular: *ZCS-1 271 olguda (%88.3) hafif, 33 olguda (%10.7) orta, 3 olguda (%1) şiddetli olarak bulundu. ZCS-2 ise 203 olguda (%66.1) hafif, 77 olguda (%25.1) orta, 27 olguda (%8.8) şiddetli olarak bulundu. Altmış beş yaş üzerindeki olgular daha yüksek mortalite ve komplikasyon oranına sahipti ($p<0.05$). Olguların 12'si (%3.9) hayatını kaybetti; 6 olguda (%2) komplikasyon gelişti. Hayatını kaybeden veya komplikasyon geliştiren bu 18 olgunun 17'sinde ZCS-1 hafif olarak saptandı. ZCS-2'de hafif olarak saptanan olgularda ölüm ve komplikasyon oranı anlamlı olarak daha düşüktü.*

Sonuç: *Bu sonuçlarla, erken dönemdeki ZCS kategorilendirmesi zehir danışma merkezleri çalışanlarını ve klinisyenleri yanlış yönlendirebileceği kanaatine varıldı. Acil serviste ZCS kategorilendirmesi klinik ciddiyetin belirlenmesi açısından daha doğru bir yöntem olarak görülmektedir.*

Anahtar sözcükler: *Ciddiyet skoru; mantar; zehirlenme.*

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Introduction

Mushroom poisoning (MP) is one of the major seasonal and regional health issues. Unfortunately, it is common behavior to consume wild mushrooms (WM). Although severe and deadly MP cases are well described in the literature,[1,2] fortunately, the majority of mushroom exposures has a benign outcome. In MP, many issues must be considered including the patient's age, type of mushroom, time of ingestion, presenting symptoms, etc. However, the most of the time there is no evidence more than superficial information of mushroom ingestion, presenting symptoms and findings. In addition, considerable individual symptomatology may be observed in MP, and severity of the cases may not be estimated.

Severity or clinical scores are very important assistant for clinicians to manage the cases. Scores may affect management and disposition decisions or admission area (intensive care unit or ward). Poisoning Severity Score (PSS) as a grading of acute poisoning was described in a study in the late 90s,[3] and it is used in the toxicologic reports.[4,5] Totally 371 cases and 37 MP (amotoxins) cases were evaluated by 14 centers, and 80% of concordance between centers about grading of poisoning was reported in the study.[3]

To our knowledge, there is lack of studies about MP which used severity scores in the literature. Therefore, the aims of our study were description of MP cases and evaluate their PSS, outcome and its correlation with descriptive and clinical data.

Methods

This descriptive retrospective study was held in a university hospital which has approximately 27.000 Emergency Department (ED) patients annually. The university hospital is a regional center for toxicological and environmental emergencies.

The cases who presented to the ED and diagnosed with MP between July 1, 1994 and June 30, 2004 were evaluated for gender, age, and age categories (age 1 to 12, 13 to 17, and 18 to 64, and 65 or older), presenting month, city, first noticed symptoms, vital signs (evaluated with age based ranges), laboratory results in the ED (Blood urea nitrogen [BUN], Creatinin [Cr], aspartate aminotransferase [AST], alanine aminotransferase [ALT]), hospitalization period, PSS regarding first noticed symptoms by patients (PSS-1) and at the ED by physicians (PSS-2), and outcome. The patients' hospital files were the main source of the information. Data were correlated with PSS and outcome.

PSS was applied to the most severe symptomatology.[3] Severity grades of PSS were described as:

None (grade 0): No symptoms or signs related to poisoning,

Minor (grade 1): Mild, transient, and spontaneously resolving symptoms,

Moderate (grade 2): Pronounced or prolonged symptoms,

Severe (grade 3): Severe or life threatening symptoms,

Fatal (grade 4): Death.

Descriptive analysis, Chi-square, ANOVA, Pearson and Spearman Correlation tests (r values categorized as weak = 0.00 - 0.24, moderate = 0.25 - 0.49, powerful = 0.50 - 0.74 and very powerful = 0.75 - 1.00) were used as appropriate with the computer program "Statistical Package for the Social Sciences (SPSS, version 11.0)".

Results

PSS and outcome of cases

Patients' PSS-1 were found minor (271 cases, 88.3%), moderate (33 cases, 10.7%) and severe (3 cases, 1%) regarding patients' or parents' history. PSS-2 of cases were 203 minor (66.1%), 77 moderate (25.1%), and 27 severe cases (8.8%) at the time they examined in the ED. There is no grade 0 (no effect) and grade 4 (death) in PSS-1 and PSS-2. PSS category of 221 cases (72%) did not change. Eighty two of cases (26.7%) has worsened, 4 (1.3%) of cases has improved. There were 289 (94.1%) completely recovered, 12 (3.9%) dead and 6 (2%) complicated cases. Thirteen of 18 dead and severely complicated (4 renal failure, 1 hepatic and renal failure, 1 seizure) cases were in the patients who have worsened ($p<0.001$). 73 of 82 worsened patients were described in minor category in PSS-1 ($p<0.001$). Only one case of dead and complicated patients group was in the severe category in PSS-1, other 17 were in minor category ($p=0.044$). There was no significant difference in PSS-1 grades for outcome. However, PSS-2 grades had significant difference for outcome ($p<0.001$), and there was a positive correlation ($r=0.248$). Minor grade in PSS-2 significantly had less mortality and complications than that of moderate and severe grades (p values = 0.03 and 0.001, respectively).

Study population, demographics

Three hundred seven MP cases were included in the study. The mean age was 34.2 years (SD: 21.2). There was no significant correlation between age and PSS grades, but weak

correlation between age and outcome (p=0.014, r=0.14). Cases who have complications had significantly higher mean age (61.3, SD: 15.5) than that of recovered (33.7, SD: 20.8) and mortal cases (32.3, SD: 25.1) (p values 0.001 and 0.006, respectively). Age groups and their distribution in gender, PSS-2 and outcome are shown in Table 1.

There was no difference between gender for PSS-1, PSS-2 and changing in PSS grades of cases. There was no difference between age groups for PSS-1 and changing in PSS grade, but PSS-2 (p=0.016). Group 3 (18-64 years of age) was different from group 1 and 4 (p values 0.005 and 0.040 respectively) because of including more minor cases. There was also a significant difference between age groups for outcome (p=0.007). Mortality and complication rate were higher in age group 4 (65 and older) than that of other 3 groups (p values, 0.002, 0.021, 0.001, respectively). There was no difference between genders for outcome.

Presenting months

There were two monthly peaks of presentation of cases in our region. The first peak was in May (88 cases, 28.7%) and June (139 cases, 45.3%). The second peak was in September (27 cases, 8.8%) and November (28 cases, 9.1%). There was no case in February. January, March, April, July, August, and December had few numbers of cases (4, 2, 1, 3, 1, and 2, respectively).

Distribution of MP cases by cities

The university hospital provides medical care to patients from cities located around Eskisehir (Kutahya, Afyon, Bilecik, Bolu etc). The cases were 136 (44.3%), 79 (25.7%), 79 (25.7%), 12 (3.9%) and 1 (0.3%) from Eskisehir, Kutahya, Bilecik, Afyon, and Bolu, respectively. There was no difference among cities for PSS-1, however, PSS-2 of cases by cities was significantly different, p=0.008. PSS-2 grades of the cases from Kutahya were higher than that of other cities. Twenty three (29.1%) and 15 (19%) of patients' had moderate and severe PSS-2 in Kutahya, respectively. Thirty-two (23.5%) and 7 (5.1%) patients were categorized as moderate and severe in Eskisehir, respectively. Bilecik had 17 (21.5%) and 5 (6.3%) cases in moderate and severe grades. Nine of 12 mortal cases were from Kutahya and it was significant (p=0.003). Four complications were from city of Bilecik (p=0.001). There were 33 (40.2%), 26 (31.7%) and 20 (24.4%) of 82 worsened cases from Kutahya, Eskisehir and Afyon, respectively (p<0.001).

Wild (WM) versus cultivated mushroom (CM)

Two hundred ninety five cases (96.1%) were poisoned by WM. Two hundred seventy four patients (89.3%) were poisoned with WM harvested by theirselves or by parents. Twenty-one cases were poisoned with WM bought from an open local bazaar. Another 12 cases became intoxicated with cultivated mushrooms (CM) bought from the grocery stores. All dead and complicated cases were poisoned with WM. The cases who ingested WM was graded in PPS-2 as 73 cases (39.8%) in moderate, 27 cases (9.9%) in severe grades. There were 4 cases who ingested CM categorized as moderate in PSS-2.

Health centers

Two hundred twenty four (73%) of cases were presented to the second level health centers when the first symptoms noticed. Other cases who presented directly to the primary care offices and the university hospital ED were 29 (9.4%) and 54 (17.6%), respectively. University hospital was second treatment center of 154 cases (50.2%), third treatment center of 93 cases (30.3%), and fourth treatment center of 7 cases (2.3%). All mortal cases were presented to second level health

Table 1. *Age and gender distribution of MP cases and PSS at the time they examined in the emergency department (PSS-2).*

Age groups		Gender			PSS-2 category of cases percentage in age group[#]			Outcome percentage in age groups[*]		
No	Range	Female n (% within gender)	Male n (% within gender)	Total (% within total cases)	Minor	Moderate	Severe	Recovered	Exitus	Complication
1	1–12	28 (16.3%)	39 (28.9%)	67 (21.8%)	39 (58.2%)	16 (23.9%)	12 (17.9%)	63 (94%)	4 (6%)	–
2	13–17	14 (8.1%)	4 (3.0%)	18 (5.9%)	111 (61.1%)	6 (33.3%)	1 (5.6%)	17 (94.4%)	1 (5.6%)	–
3	18–64*	111 (64.5%)	83 (61.5%)	194 (63.2%)	138 (71.1%)	46 (23.7%)	10 (5.2%)	186 (95.9%)	5 (2.6%)	3 (1.5%)
4	≥65	19 (11.0%)	9 (6.7%)	28 (9.1%)	15 (53.6%)	9 (32.1%)	4 (14.3%)	23 (82.1%)	2 (7.1%)	3 (10.7%)
Total•		172 (56.0%)	135 (44.0%)	307 (100%)	203 (66.1%)	77 (25.1%)	27 (8.8%)	289 (94.1)	12 (3.9%)	6 (2%)

[*]p=0.014; [#]p=0.016; [*]p=0.007; •% within total cases.

centers first. Complications occurred in cases who presented first to second level health centers (5 cases) and primary care offices (1 case).

The first initial symptoms

The most common first noticed symptoms were gastrointestinal system (GIS) symptoms (200 cases, 65.1%). The GIS symptoms were nausea in 152 (76.0%), vomiting in 29 (14.5%), and abdominal pain in 18 (9.0%) cases, and only one case described diarrhea as a first noticed symptom. Eighty-six cases (28.0%) showed neurologic complaints as the first noticed symptoms such as dizziness (44 cases, 49.4%), confusion (23 cases, 25.8%), and coma (7 cases, 7.8%). Distribution of first noticed symptoms of cases for PSS-1 and PSS-2 categories were significantly different ($p<0.001$ and $p=0.007$, respectively). Regarding to PSS-1, most of the moderate (32 of 33 cases, 97%) and severe (3 cases) cases had neurologic symptoms. In PSS-2 there were 77 moderate and 27 severe cases. The most of the cases had neurologic (29 moderate, 14 severe) and GIS (43 moderate, 13 severe) symptoms in PSS-2. Ten of dead and 5 of 6 complicated cases had GIS symptoms first. However, there was not any significant difference and correlation between first noticed symptoms and outcome.

Vital signs

Vital signs of most cases were in normal range. There were 3 hypotension, 58 hypertension, 47 tachycardia, 5 bradicardia, and 42 tachypnea. In PSS-2, 56 of 77 moderate and 21 of 27 severe categorized cases had normal blood pressure, 51 of 77 moderate and 19 of 27 severe categorized cases had normal pulse ($p<0.001$). Fifty-four of 77 moderate and 24 of 27 severe categorized cases had normal respiratory rate, ($p<0.001$). There was significant correlation of pulse and respiratory rate with PSS-2 grades ($p<0.001$, $r=0.210$ and $r=0.207$ respectively). There was not any significant difference and correlation of vital signs for outcome.

Laboratory results

Mean laboratory results in the ED of the cases were; BUN: 17.1 (SD: 14.10, min: 4, max: 138), Cr: 1.14 (SD: 1.9, min: 0.2, max: 17.4), AST: 234.5 (min: 9, max: 9368), ALT: 255 (min: 3, max: 9322). Regarding the first noticed symptoms, PSS-1 grades had no significant difference for BUN, Cr, AST and ALT levels. However, PSS-2 grades had significant difference for AST and ALT levels (both $p<0.001$) and positive correlation ($r=0.254$ and $r=0.258$, respectively). Mean AST was 37.3, 511.2, and 842.3 and mean ALT was 33.3, 575.2, and 905.8 in minor, moderate and severe cases, respectively. Moderate and severe cases had significantly higher levels of transaminases than that of minor ($p<0.001$).

Mean BUN levels were 15.4, 35.1, and 63.3, mean Cr levels were 0.9, 4.2, and 7.1, mean AST levels were 57.4, 4172.3, 333.8, and mean ALT levels were 60.3, 4472.8, and 551.3 in outcome categories (recovered, mortal, complication), respectively. Although complicated cases had more elevated renal function tests, mortal cases had more elevated liver function tests. There was a significant positive correlation between laboratory levels and outcome categories ($r=0.541$ for BUN, $r=0.537$ for Cr, $r=0.443$ for AST, $r=0.455$ for ALT).

Disposition

Two hundred fourty (78.2%) cases were admitted to the hospital, 62 (20.2%) cases were observed in the ED, and 5 cases were transferred to another hospital. The mean hospitalization period was 3.2 (SD: 4.7, 1 to 59) days. One hundred forty nine of 203 (73.4%) minor, 65 of 77 (84.4%) moderate, 26 of 27 (96.3%) severe cases were admitted. Eleven moderate cases were observed in the emergency department because of no empty beds in the inpatient clinics. Death and complications (15 of 18 cases, 83.3%) were seen in most of the admitted patients. A case who was moderate in PSS-2 observed in the emergency department and a case who was severe in PSS-2 transferred to a different hospital deceased. Table 2 shows the characteristics of the 12 fatal and 6 complicated cases.

Discussion

Most of the cases were categorized as minor in PSS-1. However, the number of moderate and severe cases increased in PSS-2. The vast majority of cases (89%) who have worsened symptoms were described as minor grade in PSS-1. Some of dead and complicated cases in our study have presented in different levels of health centers and they have been directly discharged or treated and discharged, re-admitted, and finally transferred to our hospital (Table 2). These process means that clinicians may have a difficulty in describing severe cases with first initial symptoms. Additionally, only a case in dead and complicated group was categorized as severe in PSS-1. Therefore, our study showed that patients' PSS depending on first initial symptoms (named as PSS-1 in the study) may mislead the clinicians' estimation about outcome and their management on cases. This is also important for poisoning information centers who have phone services to the public and medical facilities. However, PSS grading in the ED

Table 2. *Summary of mortal and complicated cases.*

No	Age	Gender	City	Month	First noticed symptom	PSS-1	The day of transfer to our med. c.	Symptoms and findings in the ED	Vital signs	PSS-2 in ED	Comment, explanation
Mortal cases											
1	14	F	Kutahya	October	Nausea	Minor	3	Coma, vomiting	Normal	Severe	Hepatic and renal failure
2	36	M	Kutahya	October	Nausea	Minor	2	Coma, vomiting	Tachypnea only	Severe	Hepatic and renal failure
3	27	F	Eskisehir	June	Nausea	Minor	5	Confusion, hypersalivation	Hypotensive only	Moderate	Hepatic failure
4	3	F	Kutahya	June	Vomiting	Minor	5	Confusion, vomiting, convulsions	Tachycardia only	Severe	Hepatic and renal failure
5	46	M	Afyon	June	Abdominal pain	Minor	2	Nausea, abdominal pain, icterus	Normal	Moderate	Hepatic failure
6	44	M	Kutahya	September	Nausea	Minor	2	Confusion, abdominal pain, diarrhea	Normal	Moderate	Hepatic and renal failure
7	12	F	Kutahya	September	Nausea	Minor	5	Coma, convulsion, diarrhea	Normal	Severe	Hepatic and renal failure
8	2	M	Kutahya	September	Vomiting	Minor	2	Confusion, convulsion, vomiting	Tachycardia only	Severe	He had been fed with mushroom 2 days consecutively. Renal failure
9	47	F	Kutahya	September	Nausea	Minor	2	Vomiting, abdominal pain, diarrhea	Tachicardia only	Moderate	Patient refused admission at her first presentation. Hepatic and renal failure
10	71	M	Kutahya	October	Fatigue	Minor	3	Confusion, vomiting, fatigue	Tachicardia, tachypnea	Moderate	Cardiac arryhthmia and hepato renal failure
11	75	F	Eskisehir	May	Nausea	Minor	3	Nausea, vomiting, abdominal pain	Normal	Minor	Hepatic and renal failure
12	10	F	Kutahya	May	Headache	Minor	2	Vomiting, abdominal pain, oliguria	Tachypnea	Moderate	Hepatic failure
Cases with complications											
1	50	F	Eskisehir	June	Loss of conciousness	Severe	2	Loss of conciousness, myosis	Hypertension only	Severe	Renal failure
2	74	F	Bilecik	September	Nausea	Minor	3	Vomiing, abdominal pain, diarrhea	Hypertension, tachypnea	Moderate	Hepatic and renal failure, then recovered
3	75	M	Bilecik	September	Nausea	Minor	2	Diarrhea, vomiting, vertigo	Normal	Minor	Renal failure
4	70	F	Kutahya	October	Nausea	Minor	2	Nausea, vomiting, abdominal pain	Normal	Minor	Renal failure
5	63	M	Bilecik	October	Nausea	Minor	2	Confusion, nausea	Tachycardia	Moderate	Seizure, dizartria
6	36	F	Bilecik	October	Nausea	Minor	2	Nausea, vertigo	Normal	Minor	Renal failure, then recovered

(PSS-2) was more concordant with outcome. Although history taken directly from patients, physical examination, vital signs etc. might help to physicians' decision about severity of poisoning, it should be evaluated with prospective studies. Most of the cases (94.1%) recovered, but our mortality and complication rates were higher than more comprehensive reports.[6,7]

Nordt et al.,[6] reported their results by using outcome definitions similar to PSS. It is the only report we found using a severity score in a MP case. They categorized the cases with American Association of Poison Control Centers' severity scale.[8] In their report, the cases categorized as no effect (49.6%), minor (10.1%), moderate (4.2%), major (0.3%) and death (0.02%) were different from our results. Admission rates (ICU and non-ICU) were also different from our results (2.5% versus 78.2%).

A significant percentage (63.2%) of MP was in the group 18-64 years of age. However, this is different than the reports in the literature.[6,7] Nordt et al.[6] reported that most of the MPs were in children younger than 6 years. As we reported before[9] we think this difference was coming from socio-cultural and meal habits difference of countries. People could be more conservative and passive about using mushrooms in meals for children in our country. In addition, we found that mortality and morbidity showed difference between age groups. Elderly patients have higher mortality and complication rates than other age groups, which mean elderly need more careful evaluation, management and close follow up. Death and severe poisoning of children from MP were reported as a very rare situation in the literature.[6,7,10] However, we had reported higher mortality rates in children.[9] Another important issue about the mortality is the treatment modalities in our country. Unfortunately, liver transplantation is

very rare modality in use for these poisoning in our region.

Spring and fall rains, warm and wet seasons are perfect weather conditions for mushrooms.[11,12] The west part of central Anatolia is approximately 600-800 meters above sea level, and gets spring and fall rains starting in April and May through November. The region is wet and warm between May and October, but warm and dry in late August and September. Therefore, there were two peaks of case incidence in our region.

Kutahya had 9 of 12 mortal cases, and had 33 of 82 (40.2%) worsened cases. The cases showed mortality and morbidity from Kutahya city had 2 to 5 days delayed presentation or transfer to our hospital (Table 2). These results means that regional level of education of public, management of cases by health centers might have some differences, and it may affect outcome. Therefore, education of health personnel about poisonous mushrooms' type, their clinical course, early diagnostic methods, and treatment options and transfer protocols are important. Prevention of MP by information to the public will also be continuous action. Campaigns in the media, when the mushroom season starts, can be useful to reduce severe poisoning, mortality and complications.

Majority of the presenting cases were WM poisoning. However, CM poisoning can have a similar presentation. Nausea, vomiting and other GIS symptoms can be seen in patients who ingested CM which are not produced in suitable conditions.[13] Total 49.7% of cases who ingested WM were in moderate and severe category. In our study, there was no complication and mortality with CM. With these results, CM may have moderate symptoms and findings. However, it is unusual that they show any bad outcome.

MPs may be difficult to diagnose because they may produce non-specific and delayed clinical symptoms. GIS symptoms are the most common presentation of MP and other food poisoning. Therefore, clinicians must distinguish MP from other diseases showing GIS symptoms. As described in previous reports,[6,14] GIS symptoms were the most common first initial symptoms by patients in our study. *Amanita phalloides* is well-known WM which start its clinical course with GIS symptoms, and is responsible for 90% of lethal MP's.[14] Delayed symptoms with *Amanita phalloides* is also a reason of higher mortality. However, GIS symptoms also happen with other species.[8] As we reported before,[9] *Amanita*, *Gyromitra*, *Inocybe* and *Omphalotus spp* could have been responsible for MP in our region. Although the most of the cases describing GIS symptoms as a firstinitial symptom, the most of the patients categorized as moderate and severe in PSS-1 have neurologic symptoms. In addition, the majority of mortal and complicated cases categorized as minor in PSS-1. These results showed that dangerous mushroom poisoning with GIS symptoms can be categorized as minor in early period. Therefore, PSS depending on first initial symptoms may mislead the clinicians and poisoning control center operator (PCCO) to estimate outcome, management and dispositions decision.

Regarding to our results, vital signs were not valuable in MP cases because most of the cases categorized in moderate and severe in PSS-2 have normal vital signs. Normal vital signs are common in mushroom poisoning, even in patients with moderate and severe PSS grades. Although we found significant positive correlation of pulse and respiratory rate with grades in PSS-2, these are weak correlations and need further evaluation with prospective studies about their clinical importance.

MP poisoning may present with varying degrees of laboratory results depending on the type and quantity of the mushroom ingested, and phase of the poisoning. The most dramatic effect of poisonous mushrooms is on the liver.[1,15] As we found in our study, most of the fatalities and complications are associated with high levels of transaminases and renal function tests, respectively. The prognostic value of laboratory tests such as ALT, AST for assessing hepatic function to predict irreversible hepatic failure is low. AST and ALT were significantly higher in moderate and severe grades of PSS-2. In addition, dead and complicated cases had significantly higher transaminase levels. The degree of correlation of PSS-2 and transaminases was found to be moderate in our study. Therefore, PSS in the ED may help to clinicians to estimate possible rise of transaminases and outcome of cases, but there is a need for further evaluation for clinical importance.

We found very high admission rate for MP than in other reports.[6] This is because of regional risk about deadly MP depending on previous experiences. Therefore, commend on relation between PSS-2 and admission rates may be misinterpreted.

All mortal cases in the study were categorized as minor in PSS-1, neurologic and GIS symptoms were major symptoms in the ED, most of them have delayed presentation from 2 to 5 days and dead from hepatic and renal failure (Table 2). When hepatic coma develops, the changes the survival rate of patients with medical therapy alone are low,[16] and liver transplantation is indicated.[1] GIS symptoms were dominant in complicated cases in the ED. Mortalities are uncommon with MP.[6,7] However delayed presentation and inappropriate treat-

ment is a factor for mortality. Clinicians have to pay attention to the cases who have neurologic symptoms and delayed presentations to the ED.

PSS reported by Persson et al.[3] is intended to provide a simple but relatively reliable system for describing a poisoning in qualitative terms to define its ultimate severity. Its' successfully use at admission was reported.[3,17] The authors mentioned that use of PSS normally requires a follow-up of all cases, but may be used on admission or other times during the course of poisoning.[3] We agree with using PSS on admission. However, using PSS on other times, especially in early period of poisoning would be unreliable depending on our results on MP cases. In addition, in our results we found that PSS grades performed in the ED (PSS-2) is more concordant with patient's situation because of time passing till symptoms of MP become more evident. Therefore, close follow-up of all cases is necessary as the authors recommended. In addition, outcome estimation with PSS is also less described issue. We think that with further studies PSS could be showed that has a significant role to estimate outcome for most of the poisoning.

Limitations of the study

This is a retrospective study. We excluded 57 (15.6%) cases because of deficiencies in patient's charts. We did not control of recent condition of complicated cases which may affect real final outcome rates in the study. Outcome may also confound by comorbid state and physiologic reserve, and the treatment modalities which we could not mention in the study because of variety of treatment modalities used in transferring hospitals. In addition, we could not define the exact type of the mushrooms, but we described the potential poisonous mushrooms in the region in previous reports.[9]

In summary, education of public and health personnel is important. The problem of MP is further compounded by delayed presentation and recognition of symptoms and lack of controlled trials for effective therapy. Regarding to our results, PSS in early period may mislead the clinicians' and PCCO's estimation of outcome and management of MP. Observation or follow up of suspicious cases are necessary. However, grading of severity of cases in the ED is more reliable method. Although there are some positive significant correlations between PSS and outcome, laboratory, and vital signs, PSS needs further evaluation in this matter to become more efficient grading scale for poisoning, and to predict outcome.

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