



Death following ingestion of wild mushroom: An autopsy-based study

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ABSTRACT

Poisoning by consumption of wild mushroom is a medical emergency. Incidences of such fatal poisoning have been reported daily from different geographical locations. It has been noted among communities with the habit of hunting and cooking the wild variety. Amongst all mushroom species, poisoning caused by Amanita Phalloides is considered to be the fatal one because of its hepato-renal toxicity. Moreover, the toxic principle i.e. amatoxin cannot be destroyed by cooking or freezing. Symptoms usually appear after 6-8 hours of consumption and by the time patient is brought to the emergency, fulminant hepatic failure starts. The study is a retrospective one and was conducted for a period of five years to find out the incidence of mushroom related deaths in and around Dibrugarh district of Assam. The results showed that the incidence of such fatality during the 5 years period to be 1.61%. Victims were mostly female (62.37%) and most common age group was 31-40 years (39.78%). Most of the incidences occurred during rainy season (80.65%). Most common presenting symptom was nausea and vomiting seen in 87.10% cases, following 6-8 hours (88.17%). Autopsy revealed multiple haemorrhagic foci in different internal organs. Histopathological changes were also significant with respect to liver and kidney.

INTRODUCTION

Mushrooms are considered a delicious dish due to its unique taste and nutritional value. Hence, its consumption is increasing day by day. In spite of such nutritional ingredients and taste, toxicity following consumption is also increasing in an alarming rate. Such incidences are because of wild variety of mushrooms and are reported regularly. The earliest report of documented fatal mushroom poisoning was attributed to the Greek poet

Euripides, who described the death of his wife and three children after consuming poisonous mushroom.^[1] Till now, approximately 5000 species of mushroom has been identified globally; out of which 100 are poisonous.^[2] Amongst all, Amanita phalloide is the most toxic variety containing amatoxin. This Amatoxin is not even destroyed by cooking or freezing and have a longer incubation period (usually >6 hours), targeting mainly liver and

kidney.^[3,4,5] Even a single mushroom containing amatoxin can cause death of an individual.^[4] They are actively absorbed from gastro-intestinal tract, binds weakly with proteins and excreted through biliary and renal system. Mechanism of action of amatoxin is inhibition of RNA polymerase II, thereby interfering transcription of DNA; ultimately causing depletion of protein synthesis.^[6] Fatal and non-fatal incidences of mushroom poisoning are increasing in Assam since last few years. Every year, there are 3-4 fatal outbreaks in different locations of Assam. Most of them are reported from tea tribe communities. They have come from different states and settled down in and around tea gardens of Assam. Each group has independent ethnic cultures and is having the habit of hunting and eating wild mushroom.^[7,8] A significant number of cases was reported during spring season in 2008 from a few districts of upper Assam including Golaghat, Sivsagar, Jorhat and Dibrugarh.^[9] Very few studies have been conducted in Assam on fatalities of mushroom poisoning till now. Hence, this study is conducted to find out the pattern of this fatal poisoning in and around Dibrugarh district.

MATERIALS AND METHODS

This is a 5 years retrospective study conducted in the department of Forensic medicine and Toxicology, AMCH, Dibrugarh from 1st January, 2011 to 31st December, 2015. Aim of the study was to find out postmortem incidence of mushroom poisoning in and around Dibrugarh district along with some important socio-demographic variation. All cases of hospital death (including brought dead) with history of mushroom ingestion were included in this study. Cases having history of other clinical or co-morbid conditions were excluded from the study. During this period, a total number of 5782 medico-legal autopsies were conducted; out of which 93 were following mushroom poisoning. Autopsy findings and information were collected from the postmortem reports and inquest papers. Hospital records were consulted for history, clinical findings and treatment. All the data were compiled, tabulated and results were discussed with relevant studies done by different authors on the same field.

RESULTS

During this period, a total number of 5782 medico-legal autopsies were conducted; out of which 93 were following mushroom poisoning. Hence, incidence of mushroom poisoning with respect to total autopsy was 1.61%. Most

of the victims were female (62.37%) with a male female ratio of 0.60. All the victims belong to tea tribe community with a low socio-economic status and 100% incidences were reported inside the garden premises. Most of the victims belong to the age group of 31-40 years (39.78%) and were illiterate. The victims usually presented in group pattern, mostly as members of a family or friends. Most of the incidences were reported during rainy season (80.65%) of which majority (34.41%) were reported during the month of May (table 2). All the victims collected mushrooms from riverbanks and fields with no reported cases of consuming cultivated mushroom. Most of the victims showed signs and symptoms after 6 hours of consumption (88.17%), commonest being gastro-intestinal i.e. nausea and vomiting; seen in 92.47% cases (table 3 & 4). Only 24 (25.81%) cases reported directly to the casualty immediately following first symptom(s). Rest (74.19%) was referred from local hospitals on the same or after 2-3 days of presenting symptoms. Some of the victims (12.9%) were treated as AGE in local hospitals, discharged on the same or next day and reported back to our hospital after 3-4 days in a dehydrated state. Majority of victims (92.47%) died in the ICU after 2 days of admission (Table 5). In post mortem examination, there were no specific findings specific to organs. Organs were congested in all cases. Multiple haemorrhagic foci were seen in different organs of which, liver itself comprised 93.55% (table 6). Ascitis and pleural effusion was seen in 26.88% cases. Erosion of stomach mucosa was noted only in 6.45% cases. Histopathological examination (HPE) and chemical examination were done in all case. HPE showed fatty and necrotic changes in liver and kidney.

DISCUSSION

Mushroom poisoning is a globally affected medical emergency. It is responsible for 50 to 100 deaths per year in Western Europe.^[10] It is rare in most part of England and Jordan, while increasing an alarming rate in china, Poland, Turkey. In Nepal, very few fatal cases have been reported.^[11] It has been reported very often in Assam, mostly in upper Assam districts since last few years because of the habit of eating wild mushroom among some community. Hence, it causes complex and challenging clinical progress with high mortality rate in this region. Exact incidence of mushroom poisoning is unknown because of its underreporting. Moreover, autopsy related study is very negligible worldwide; causing death proportion unknown for us. In the present study it has been found to be 1.61%. Various studies done

in clinical set up illustrated the incidence to be 0.005% in US and 0.05% in Iran.^[12,13] Although, the prevalence of such MP is low; mortality rate has been found to be very high by different studies. It was found to be 17.9%, 21.4% and 12% in Turkey, Istanbul, and Iran respectively.^[2,13] Although, 39.78% was the commonest age group found in this study, anyone can be affected by mushroom poisoning. However, mortality and complication were found to be higher in elderly groups.^[14,15] In some areas it has been reported to be common in children below 6 years.^[16] Mortality was 83% in children below 10 years of age and 100% in elderly above 50 years of age in a study done in Assam.^[9] There was no significant sexual variation with respect to mortality following mushroom poisoning. Females were the commonest group affected, similar to other studies.^[10,16] All cases belong to tea tribe population living inside tea gardens. They were the commonest victim due to their habit of hunting and cooking wild mushroom, which is not usually seen among other population outside the garden premises due to increase level of education and awareness. Such rural preponderance was also noted in a study conducted in Iran.^[3] Most of the incidences were reported between April, May and June (80.65%), the rainy season in Assam; favorable for growing mushroom. Although seasonal variation of poisoning was found by other studies, most of them were reported during rainy seasons.^[15] Hence, month wise distribution of cases was found to be different in different studies because of variation of this rainy season from country to country. Most incidences occur following consumption of wild variety as seen in our study. Some were following eating raw mushroom and some even after taking properly cooked one. This variation is related to species of the mushroom and its toxicity. Another study reported poisoning even after eating cultivated edible variety.^[17] Most common presenting symptom was gastro-intestinal i.e. nausea and vomiting (92.47%). It was also found to be the commonest symptom by different studies.^[10,15,18] The gap between ingestion to appearance of first symptom i.e. incubation period varies from species to species and is considered to be an independent prognostic criterion.^[17] If symptoms start after 6 hours, prognosis is not considered good and the offending agent falls under amanita group; the deadliest one.^[12] Here, clinical presentation usually comprises 3 stages- initially symptomless period of at least 6 hours followed by gastrointestinal symptoms (First stage), then there will be apparent recovery even without any treatment although there is elevation of liver enzymes during 12-48 hours

(Second stage), finally the patient will develop fulminant hepatic failure and its complications (Third stage).^[6] In this study, majority of cases have incubation period more than 6-8 hours (88.17%); similar to the findings of other authors.^[4,20] In a series, first symptoms even appeared after 2 days following consumption of wild mushroom of amanita variety.^[21] Usually, victims reach health care delivery system late following consumption of mushroom because of longer incubation period. Moreover, the first symptoms often simulate acute gastroenteritis causing a confused diagnosis. In some situations, patient is discharged home in the second stage i.e. after apparent recovery. Hence, by the time patient is referred to tertiary care centre, he/she already develops fulminant hepatic and renal failure. In our study, majority cases were referred from PHC/CHE already after development of fulminant hepatic failure. Usually, in mushroom poisoning there is no specific autopsy finding. Some authors have described jaundice appearance, pleural effusion and ascitis along with findings suggestive of coagulopathy.^[21,22,23] There is usually congestion of internal organs. Bleedings is because of decreased synthesis of clotting factors by already compromised liver. Liver involvement is seen after 48 hours.^[23] In our study, multiple foci of bleeding were seen in internal organs mostly liver, lungs, kidney and intestine. There was intensely yellow liver with creamy consistency and diffuse sub-capsular hemorrhage was the most significant liver findings. Most of the cases can be diagnosed by histopathology. In HPE varying degree of necrosis of liver and kidney can be found. In some cases vacuolization of kidney was noted.^[21,22] Diagnostic typing of mushrooms is a difficult task and can be possible only with the help of an expert mycologist. There are also no particular descriptions of mushroom type by patients or relatives. In this study, due to high case fatality and long incubation period it can be commented that the responsible strain may fall under amanita group. Amanita phalloides toxicity is responsible for 90% cases of fatal mushroom poisoning.^[24]

CONCLUSION

High mortality of mushroom poisoning is because of its delayed diagnosis. Hence, when a patient is brought with history of acute gastroenteritis every physician should consider mushroom poisoning as a differential diagnosis especially during rainy seasons. They should transfer the patients as soon as possible to tertiary care centers before development of fulminant hepatic failure. Public awareness is also an important preventive measure.

There must be provision for banning wild mushroom sale in local markets. Communities, where hunting and eating of wild mushroom is a traditional custom should be educated and awareness programs must be organized. There is usually marginal difference between edible and

nonedible variety of mushroom. Moreover, some species of previously edible mushroom may turn into toxic in due course of time. Hence, they should always be brought from authorized centers.

Table 1: Year-wise distribution of cases:

Year	Total number of autopsy	Total number of mushroom poisoning deaths, n (%)
2011	927	31 (3.34)
2012	992	12 (1.21)
2013	1192	19 (1.59)
2014	1225	22 (1.80)
2015	1446	09 (0.62)
Total	5782	93 (1.61)

Table 2: Month-wise distribution of cases:

Month	2011	2012	2013	2014	2015	Total
January	0	0	0	4	0	04 (4.30)
February	2	0	1	0	0	03 (3.23)
March	1	0	0	1	0	02 (2.15)
April	9	8	3	7	2	29 (31.18)
May	13	2	9	4	4	32 (34.41)
June	3	2	4	2	3	14 (15.05)
July	0	0	0	0	0	00 (00)
August	0	0	0	4	0	04 (4.30)
September	0	0	2	0	0	02 (2.15)
October	1	0	0	0	0	01 (1.08)
November	2	0	0	0	0	02 (2.15)
December	0	0	0	0	0	00 (00)
Total	31	12	19	22	09	93 (100)

Table 3: Time of appearance of first symptom(s):

Time (hours)	Number, n (%)
<6	11 (11.83)
6-12	36 (38.71)
>12	46 (49.46)
Total	93 (100)

Table 4: Nature of first symptom(s):

Symptom(s)	Number, n (%)
Nausea	05 (5.38)
Nausea & Vomiting	58 (62.37)
Abdominal pain	02 (2.15)
Diarrhea	01 (1.08)
Vomiting & abdominal pain	09 (9.68)
Vomiting & diarrhoea	02 (2.15)
Abdominal pain & Diarrhoea	04 (4.30)
Vomiting, abdominal pain, diarrhoea	12 (12.90)
Total	93 (100)

Table 5: Survival period after appearance of first symptom(s):

Survival period	No of cases, n (%)
< 1 day	02 (2.15)
1-2 days	04 (4.30)
2-3 days	17 (18.28)
1-5 days	46 (49.46)
>5 days	24 (25.81)
Total	93 (100)

Table 6: Widespread hemorrhagic foci in internal organs:

Organs	No of cases, n (%)
Liver, Kidney	08 (8.60)
Liver, Lungs	10 (10.75)
Liver, Kidney, Bowel mesentery	16 (17.20)
Liver, Kidney, Bowel mesentery, Omentum	12 (12.90)
Liver, Kidney, Bowel mesentery, Peri-pancreatic fat	29 (31.18)
Liver, Kidney, Lungs, Heart	07 (7.53)
Bowel mesentery, Stomach mucosa	06 (6.45)
All abdominal & thoracic organs	05 (5.38)
Total	93 (100)

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