A Study Of Clinical Profile and Treatment Outcome of Mushroom Poisoning – A Hospital Based Study

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Abstract
Introduction: The popular interest in gathering and eating uncultivated mushrooms has been associated with an increase in incidents of serious mushroom-related poisonings. This prospective study was conducted to observe the clinical presentations, laboratory data, histopathological findings, treatment modalities and prognostic factors in cases of mushroom poisoning coming to a tertiary referral center for treatment.

Materials and methods: All cases with a history of falling ill after ingestion of mushroom and coming to the departments of Medicine and Pediatrics of Assam Medical College and hospital were included in the study. A proper history was taken. Histopathological correlation was done in cases whenever possible. Course of the disease and treatment modalities were correlated with mortality data.

Results and observations: A total number of 48 cases were included in the study which came in 17 clusters. 27 (56.25%) were males and 21 (43.75%) were females. 8 (16.6%) cases were children below 12 years of age. 21 (43.75%) cases expired within hospital stay. It was seen that mortality was 83% in children below 10 years of age and 100% in those above 50 years of age. 10 (83%) out of 12 cases who took par boiled mushroom died whereas 11 (30%) out of 36 cases who took fully cooked mushroom died. Mortality was directly related to the four stages of presentation of the cases and increased from 0%, 30%, 54% and 100% respectively. The most common organ failures were acute liver failure or acute kidney injury, coagulopathy secondary to hepatic failure being a dangerous complication. Haemodialysis, forced diuresis showed significant benefit in management of patients. Fluid & electrolyte balance, Vit K & Fresh frozen plasma also had significant positive outcome in patients coming in stages 2 and 3.

Conclusion: Though mushrooms are commonly ingested, lack of proper knowledge about the poisonous and non poisonous varieties of the same, interest in growing and collecting wild mushrooms, lack of knowledge of the signs of such poisonings have led to frequent mortality, especially in the monsoon seasons in few districts of Upper Assam. Early detection and intervention are key to survival.

Keywords:- Mushroom poisoning, Acute liver failure, steatohepatitis, Toxic hepatitis, renal failure.

INTRODUCTION:
A mushroom is the fleshy spore-bearing fruiting body of a fungus, typically produced above ground on soil or on its food source. Typical mushrooms are the fruitbodies of members of the order Agaricales, whose type genus is Agaricus and type species is the field mushroom, Agaricus campestris. However, in modern molecularly defined classifications, not all members of the order Agaricales produce mushroom fruitbodies, and many other gilled fungi, collectively called mushrooms, occur in other orders in the class Agaricomycetes. Edible mushrooms are used extensively in many cuisines. Though mushrooms are commonly thought to have little nutritional value, many species are high in fiber and provide vitamins such as thiamine, riboflavin, niacin, biotin, cobalamin, ascorbic
acid. Mushrooms are also a source of some minerals, including iron, selenium, potassium and phosphorous.

The popular interest in gathering and eating uncultivated mushrooms has been associated with incidents of serious mushroom-related poisonings. This is very common in the monsoon seasons in our part of the country in north east India where awareness about the poisonous mushrooms is less and this contributes to a great deal of morbidity and mortality. Alarming number of cases were reported in the spring of 2008 from a few districts of upper Assam including Golaghat, Sivasagar, Jorhat and Dibrugarh. This prospective study was conducted to observe the clinical presentations, laboratory data, histopathological correlation, treatment modalities and prognostic factors in cases of mushroom poisoning coming to a tertiary referral center, Assam Medical College and Hospital for treatment.

**Methods and materials**

All case with a history of falling ill after ingestion of mushroom and coming to the departments of Medicine and Pediatrics of Assam Medical College and hospital were included in the study. A proper history was taken. A sample of mushroom was collected from gastric lavage whenever it was possible and sent for analysis. Routine blood test including renal and hepatic function tests were done and recorded. Histopathological examination was done in cases whenever possible. Their progress was monitored and treatment modalities were correlated with mortality data. A rough estimate of the prognostic factors was sought after taking all the parameters into consideration.

**Results and observations**

A total number of 48 cases were included in the study which came in 17 clusters or incidents with one cluster including a family of 10 people. 27 (56.25%) cases were males and 21 (43.75%) cases were females. 8 (16.6%) cases were children below 12 years of age. 21 (43.75%) cases expired within hospital stay. Rest of the patients improved and was discharged. They were followed up for 6 weeks and were found to be in good health.

It was seen that Mortality was 83% in children below 10 years of age and 100% in elderly above 50 years of age. This shows that mortality was high in the extremes of age. Moreover 10 (83%) out of 12 cases who took parboiled mushroom died whereas 11 (30%) out of 36 cases who took fully cooked mushroom died. This signifies the fact that probably parboiled mushroom had more toxic effects than fully cooked preparations. Quantity of mushroom taken was also directly related with the mortality of the patients. In 3 clusters, where they had taken more than one bowl full of mushroom, 13 (86%) out of 15 cases expired. In rest of the cases, 8 (24%) out of 33 cases had expired.

**Chart 1 : Mortality (%) in relation to age of patients**

There are 4 stages of presentation of mushroom poisoning, dehydration, hypotension and if left untreated may lead to shock. Stage 3 is a late latency phase where the diarrhea improves and the patient seems to be improving. Stage 4 is where the hepatic and renal functions are deranged, coagulation factors drop drastically and eventually the patient may land up with acute liver failure and acute kidney injury.

Our study showed that 2 (100%) out of 2 cases who came in stage 1, 19 (70%) of 27 cases who presented in stage 2, 6 (46%) of 13 cases who came in stage 3 survived and none of the 6 cases who presented in stage 4 survived during the hospital stay. Hence the mortality was directly related to the stage of presentation of the cases and increased from 0%, 30%, 54% and 100% respectively in 4 stages.
Chart 2: Number of cases expired in relation to stage of presentation to hospital

The patients who expired had a higher bilirubin level (mean 7.17 mg/dl) than those who survived (mean 2.58 mg/dl). The prothrombin time was also higher (mean 16.5) in compared to patients who survived (11.85). Liver enzymes were also elevated (AST mean 1323, ALT mean 2435) in patients who expired in comparison to those who survived (AST mean 224, ALT mean 324). The mean serum creatinine was also elevated in patients who expired (9.7) in comparison to those who survived (3.8). This showed that deranged hepatic and renal function tests were directly related to mortality of the patients.

Chart 4: Laboratory tests (LFT and S. creatinine)

In patients who expired post mortem analysis was done and histopathological examination of tissues were done. There was severe gastric erosions and petechiae in stomach and intestines. Lung showed edema and necrosis. Heart showed petechiae and coronary artery obstruction.

Liver tissue showed fatty infiltration and enlargement. In one patient who died within 4 days of ingestion of mushroom, liver was enlarged and 1800 grams in weight. Whereas, in another patient who died 18 days after ingestion of mushroom, the liver was small, shrunken and weighed only 400 grams.

Figure 1. The 1800 gm liver in a patient who died 4 days after ingestion of mushroom (left) and small shrunken, 400 gm liver in a patient who died 18 days after ingestion of mushroom (right)

Macroscopic and microscopic picture of liver showed fatty infiltration, which can be seen even with naked eye. Microscopic study of the liver showed large fat globules and lymphocytic infiltration. There were focal signs of inflammation and ballooning of hepatocytes. The picture resembles with that of non-alcoholic steatohepatitis (NASH).

Figure 2. (histology of liver showing features of NASH)
In relation to the treatment it depended on the stage of presentation to the hospital. If the patient had presented early to the hospital, gastric lavage was done and if any pieces of mushroom found they were sent for analysis. In early cases of presentation activated charcoal was also given. Vitamin K injection was given routinely in all cases intramuscularly for 3 days. In patients who presented in stage 2, they were adequately rehydrated and serum electrolytes were corrected whenever required. Silymarin 140mg in tablet or liquid form was given in patients showing signs of hepatic derangement. N-acetylcystine was also used in patients coming in stage 2 or later. In patients with bleeding manifestations, fresh frozen plasma was used along with vitamin K injections.

Patients coming in stage 3 and 4 with raised creatinine were subjected to forced diuresis and when indicated hemodialysis was done. Patients who presented with hepatic encephalopathy were treated with lactulose, L-ornithine-L-aspartate, mannitol, glucose, oxygen inhalation and supportive treatment. The following chart shows the percentage of patients receiving a particular treatment who improved or expired during their stay in hospital.

**Chart 6: (Percentage (%) of patients receiving a particular treatment who improved or expired)**

In a study from Texas, 742 exposures occurred during the study period 2005-6. All exposures were acute and intentional. Of these exposures, 59 (7.9%) were admitted to the hospital, with 17 (28.8% of admissions) requiring admission to a critical care unit. Four cases required inpatient psychiatric admission. The average age of admitted exposures was 20.5 years, with a male-to-female predominance of 3.3:1. Eleven (22%) of the admitted exposures were identified, with Psilocybin being the most common agent (n = 10, 91%). Among the admissions, co-infections were identified with the mushroom ingestion in eleven patients (40.7%). The most common symptoms in admitted patients were vomiting (n = 34, 57.6%), nausea (n = 19, 32.2%), altered mental status (n = 17, 28.8%), abdominal pain (n = 13, 22%), and diarrhea (n = 10, 16.9%) 

In a study from Pakistan, of the 18 patients with mushroom poisoning, fifteen were above five years of age. Fifteen patients developed hepatic failure and three patients developed renal failure. Thirteen patients expired. They concluded that to start timely management, Mushroom poisoning should be considered in the differential diagnosis in such cases and referral to a high center is needed. The initial assessment and management of severe mushroom poisoning may significantly influence the outcome. Patients who presented in stage 1 and 2 had the best chance of survival compared to those who presented in stage 3 and 4. Hence the role of educating the primary care physician and early referral to a higher center plays a great role in preventing mortality and morbidity. Unfortunately, most of the cases of mushroom poisoning are from rural or remote areas and their ignorance of medical science is as per their unawareness of poisonous mushrooms coupled with poor communication and transport system.

Elevated serum bilirubin, liver enzymes, serum creatinine and prothrombin in time were associated with high

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**Discussion:**

There are very few published case study reports of mushroom poisoning. In a study from northern California, nine persons required hospitalization after eating Amanita phalloides (i.e., “death cap”) mushrooms; two of these persons died. A study on circumstances of exposure and patterns of toxicity from Switzerland showed the mortality of confirmed amatoxin poisonings was high (5/32) compared to other reports.
mortality rates and can be well used as a bad prognostic factors in hospitalized patients. Those with previous liver disease or chronic alcoholics were more likely to go into hepatic encephalopathy and had a bad prognosis.

Histopathological study showed signs of internal bleedings and petechies probably secondary to hepatic failure and raised prothrombin time. Liver showed fatty infiltration and inflammation similar to the picture in non-alcoholic seatohepatitis (NASH). Further study is required to know the mechanism and nature of hepatic injury in such patients.

Haemodialysis, forced diuresis had significant benefit in management of patients. Fluid & electrolyte balance, Vit K & Fresh frozen plasma had also significant positive outcome in patients coming in stage 2 and 3. Gastric lavage and activated charcoal were effective only in early stages of presentation, mostly within hours of ingestion of mushroom.

**Conclusion:**

Though often mushrooms are ingested, lack of proper knowledge about the poisonous and non poisonous varieties of the same, interest in growing and collecting wild mushrooms, lack of knowledge of the signs of such rare poisonings have led to frequent mortality, especially in the monsoon seasons in few districts of Upper Assam. This study was an observational case study report of 48 cases of such mushroom poisoning. Early detection and intervention was key to survival. The liver and kidney was the most affected organ and the nature of injury is mostly acute liver failure or acute kidney injury, bleeding disorder secondary to hepatic failure being a dangerous complication. Further research will help in formulating better management of such patients.

**REFERENCE :**


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