

Fatal toxicity due to locally produced unlabeled alcohol consumption: An illustrative case series from Nepal

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Abstract

Locally prepared liquor, which is not standardized or regulated, though cheap can contain various toxic ingredients and even may be fatal. We report a case series of four adult males who died within 18.5 h due to the effect of local liquor consumption in a hilly district of Gandaki Province of Nepal. Methanol toxicity due to illicitly produced alcohol consumption should be managed with adequate supportive care and administration of specific antidotes such as ethanol or fomepizole. Liquor production should be standardized, and quality checks should be done before the sale for consumption.

Keywords

Local liquors, moonshine, methanol toxicity, poisoning

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Introduction

Alcohol is used in various occasions by different communities, from birth celebrations to marriages and mourning. It is one of the most commonly abused substances globally.¹ In most communities, alcohol is socially accepted and produced locally, albeit the legal jurisdictions. Illicit alcohol use is a major public health issue. It is estimated that unrecorded use accounts for 26% of the worldwide total alcohol consumption.¹ Methanol, also popularly known as wood alcohol, is a highly toxic alcohol. It is light, volatile, and colorless liquid similar to ethanol.² Methanol is commonly found in various household and industrial agents such as automobile coolants, deicing solutions, windshield wiper fluids, solvents, cleaners, fuels, perfumes, and sometimes in locally fermented alcohols.³ Although methanol poisoning is rare and sporadic, it is associated with significant morbidity and mortality.⁴ Multiple casualties can occur due to consumption of ethanol-containing methanol. Improper distillation of the “moonshine” or adulteration of ethanol induces methanol toxicity.⁵ Herein, we present a fatal case series of methanol poisoning outbreak due to consumption of locally made liquor in the hills of Gandaki Province in Nepal, explaining the circumstances, clinical features, and autopsy findings.

Case series

Four cases of fatal intoxication due to alleged consumption of alcohol with suspected methanol contamination were

reported from Baglung District, Gandaki Province, Nepal, on 20 July 2021. They were daily wage workers who had allegedly consumed locally produced alcohol in a restaurant at Galkot Municipality and were brought dead to Dhaulagiri Hospital, Baglung District. We recorded details of the cases in case series report forms. The information was obtained from the accompanying family members and friends of the victims. We obtained inquest reports prepared for all the cases by the police representing the jurisdiction and medico-legal autopsy reports from Dhaulagiri Hospital. Autopsy was performed following the national protocol. During the autopsy, samples containing stomach and all of its contents, one half of both kidneys, part of liver, and 10 mL of blood were also obtained from each case and sent to Central Forensic Science Laboratory located at Kathmandu. The samples were analyzed by physico-chemical methods, thin layer chromatography (TLC), and gas chromatography-mass spectrometry

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Table 1. Demographic characteristics of the cases.

Case	Age (years)	Duration of alcohol intake (in years)	Amount of alcohol intake per week (in liters)	Smoking history
A	21	4	3–4	Yes
B	39	20	2–3	Yes
C	30	13	3–4	Yes
D	51	33	3–4	Yes

Table 2. Reported clinical features.

Clinical findings	Case A	Case B	Case C	Case D
Nausea	Yes	Yes	Yes	Yes
Vomiting	Yes	Yes	Yes	Yes
Abdominal discomfort	Yes	Yes	Yes	Yes
Epigastric pain	Yes	Yes	Yes	Yes
Kussmaul breathing	Yes	Yes	Yes	Yes
Headache	Not known	Yes	Yes	Yes
Dizziness	Yes	Yes	Yes	Yes
Altered sensorium	Not known	Not known	Not known	Not known
Malaise	Not known	Yes	Not known	Yes
Agitation	Not known	Not known	Yes	Not known
Generalized weakness	Not known	Not known	Not known	Not known
Paresthesia	Yes	Yes	Yes	Yes
Sensory depression	Not known	Not known	Not known	Not known
Coma	Not known	Not known	Not known	Not known
Seizures	Not known	Not known	Not known	Not known

(GC-MS) techniques for the common pesticides, methyl alcohol, ethyl alcohol, narcotic drugs, and phosphine gas.

All deceased cases were co-workers at local construction company and stayed together. At 8:00 p.m., 20 July 2021, they allegedly consumed approximately 1000 mL of locally fermented alcohol each procured from the same shop. Table 1 describes the epidemiological characteristics of these cases. All of them were males, with age ranging from 21 to 51 years, regular consumer of alcohol during their lifetime, and smokers. They mostly used to consume locally produced alcohol because of low price and easy availability of local liquors in rural Nepal.

At around 9:30 p.m., 20 July 2021, they were carried to a local health center near the place of incidence of intoxication. At the time of presentation to a local health center, all cases were conscious. After the administration of intravenous fluids, the local healthcare center referred them to the tertiary care center, that is, Dhaulagiri Hospital of Baglung District located at 6-h travel distance from the local health center for specific treatment. The patients were conscious during the time of referral from the local health center. During the 6-h travel to access in Dhaulagiri Hospital, their condition deteriorated. They were declared dead when brought to the emergency department of this hospital.

Table 2 illustrates the clinical features developed by those cases. They felt sick acutely and the onset of symptoms was

within an hour of liquor consumption. The common symptoms were nausea, vomiting, abdominal pain, epigastric pain, kussmaul breathing, dizziness, and paresthesia.

After declaring their deaths, autopsy was performed a day after by a medical doctor, at the completion of all the necessary legal documentation at the same hospital. All the bodies were kept in the cooling chamber before autopsy. External examination findings at autopsy are summarized in Table 3.

On internal examination, most of the findings were non-specific. The most common finding was congestion of the kidneys bilaterally in all the cases. Positive findings on internal examination are summarized in Table 4.

The qualitative analyses of samples from the stomach and its contents, the kidneys, and the liver from all the cases revealed positive test for methanol. Furthermore, analyses of the blood samples from these four cases had positive test for ethanol and methanol. The samples of alleged alcoholic beverage consumed by the deceased also showed positive test for methanol. However, the concentration (quantity) of methanol could not be demonstrated.

Discussion

The victims in our case series had a clear history of consumption of local and unlabeled liquor containing methanol. The reported clinical features (Table 2), positive test of

Table 3. External examination at an autopsy.

Features	Case A	Case B	Case C	Case D
Length (cm)	162	153	162	155
Weight (kg)	60	65	65	65
Post-mortem hypostasis	Bluish purple, fixed and at the back	Bluish purple, fixed and at the back	Bluish purple, fixed and at the back	Bluish purple, fixed and at the back
Signs of decomposition	Absent	Absent	Absent	Absent
Injuries	None	None	None	Laceration of 0.5 cm × 0.5 cm at left supraorbital region

Table 4. Autopsy findings in internal examination.

Case A	Case B	Case C	Case D
- Both kidneys congested	- Anthracotic pigments deposition in the lungs	- Black cystic lesion 3 cm × 3 cm present in left lower lung lobe	- Anthracotic pigments deposition in the lungs
- 30 mL clear urine in the bladder	- Both kidneys congested	- Both kidneys congested	- Both kidneys congested
	- 30 mL clear urine in the bladder	- 30 mL clear urine in the bladder	- 30 mL clear urine in the bladder

methanol from obtained samples, and volume of local liquors that they consumed suggested that methanol toxicity caused their deaths. It is evident that as little as one teaspoon of ingested methanol can produce severe toxicity and ingestion of 1 g/kg methanol is considered fatal.⁶ A typical case presented with sedation or coma, epigastric pain, Kussmaul respiration, hypotension, seizures, visual abnormalities, and even blindness suggest methanol toxicity.⁷ The methanol toxicity causes a high anion gap, metabolic acidosis with low serum bicarbonate levels (usually below 8 mEq/L), and a persistently elevated osmolal gap (often more than 25 mOsm/L).⁸ This incidence highlights the urgent need of strengthening primary care services and the establishment of a proper referral system in Nepal and worldwide where limitations of healthcare facilities and practices of drinking unapproved alcoholic beverages are common. In this context, we recommend to manage such cases with an adequate supportive care, correction of acidosis by bicarbonates and even hemodialysis, and administration of specific antidote such as ethanol or fomepizole depending on the availability.⁹ Despite regulatory approval of fomepizole in Nepal, it is rarely available due to its high cost.¹⁰ The government should facilitate its availability, at least in major tertiary care centers across the country. In the absence of fomepizole, the administration of ethanol can also be done, and its availability in therapeutic form should be ensured in health care facilities of Nepal. Furthermore, we suggest timely provision of protocols for the firsthand as well as definitive management of suspected cases of poisoning after local beverage consumption. Our case also highlights how important it is to establish a well-functioning system of emergency medical service, including that of well-equipped ambulance with trained paramedical team as a first line of contact. This will indeed facilitate initial

resuscitation and transport of patients to proper center and, in turn, save many more lives.

Our case series indicated “methanol poisoning outbreak” in Baglung District in July 2021. A clinical consensus statement from an international panel of clinical toxicologists recommended that as few as three methanol toxic cases within 72 h appearing in the same city should be considered a “methanol poisoning outbreak.”¹¹ Therefore, using the definition of this outbreak, public health and government authorities should find active cases due to use of existing stock of adulterated or improperly distilled alcohol (if any) which may affect several lives if unchecked. Overall, this report has significant policy implication in Nepal as well as in low- and middle-income countries where methanol poisoning occurs due to consumption of low-grade alcohol. Moreover, because alcohol is socially accepted in many communities across Nepal, if policies that regulate the local production by ensuring legalization of qualitative production are formed, not only will it eliminate the health hazards of toxic alcohol, but it will also help in generation of revenue through implementation of taxation systems and foreign export on a commercial basis.

Our cases had nonspecific findings at autopsy. This nonspecificity might be influenced by factors such as time since methanol consumption to death, treatment, and resuscitative interventions.^{2,12} Findings in early deaths are minimal and nonspecific while in those with delayed deaths, major findings include congestion of internal organs, brain changes such as parenchymal softening, cerebral infarcts and hemorrhages, renal changes such as tubular degeneration and necrosis, as well as fatty changes in the liver.^{2,12} In Nepal, medico-legal autopsies are mostly restricted to gross examinations during dissection, and histopathological tests are seldom done due to the lack of definite protocol and constraints in resource and

trained manpower. The nonspecific and minimal findings in autopsy in our observation can be attributed to the fact that fatality in our case series occurred rapidly. The histopathological tests were not conducted and hence the findings could not be presented in our cases. There were other incidental findings in our observations; two cases had anthracotic deposits in the lungs, which indicates either smoking or exposure to other dusts or smokes in the lifetime. In one case, there was a cystic lesion in the lower lobe of the left lung. Although there were no specific findings demonstrated in the autopsy, we could rule out any significant injuries and other pathologies causing death in all the four cases. The establishment of definitive cause of death in methanol poisoning depends on the methanol levels obtained from blood and other specimens collected post-mortem.

Although available laboratory report contained no quantitative analysis for methanol, the qualitative test results showed the presence of methanol in liquor which they consumed. Because definitive diagnosis of methanol poisoning, be it antemortem or postmortem, depends on tissue methanol level, provision of its detection in hospital as well as forensic laboratories should be made available and strengthened. It will help in triaging and treating clinical cases, and in case of fatality, it will also help in establishing the cause of death. In our case, methanol poisoning seems the likely cause of death. But it is important to also effectively rule out other toxic adulterants and contaminants when chemical analysis is performed in such cases. Additional testing to the existing available ones should be weighed against the added financial cost and laboratory services should be bolstered. Strengthening legal and clinical autopsy services is also imperative in this regard.

Conclusion

A “Methanol poisoning outbreak” occurred in Baglung district of Nepal, indicating challenges to the Nepalese healthcare system and authorities who monitor quality of liquor produced in our country. Our findings have significant policy implication for Nepal and other countries with similar socio-economic status and cultural practices. The primary healthcare personnel should be trained to identify, triage, and effectively manage such cases of poisoning by administering antidotes such as ethanol to prevent the deterioration of victims’ health condition and refer them following proper referral system. The timely provision of protocols for the firsthand as well as definitive management of suspected cases of poisoning after local beverage consumption is essential because local liquor production is rampant and inadequately monitored in Nepal. So, regulation of the locally produced liquors to ensure eliminating the health hazards of toxic alcohol is essential. Furthermore, preventing the public from consuming toxic alcohol by increasing awareness is of paramount importance in Nepal and elsewhere.

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