

Methanol Poisoning with Fatality- Case Series in Dhaka Medical College Hospital in Bangladesh

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Abstract

Background: Adulterated methanol is highly toxic and leads to severe metabolic acidosis and blindness and mortality is very high if not treated with specific antidote. The time of ingestion and severity of illness is very short and comprehensive quick assessment and care is crucial for survival of patient. The selective antidote Fomepizole is not available in Bangladesh and pure intravenous ethanol is also out of reach in health care facility. The oral ethanol has its legislative regulation. Occasional clusters of severe methanol poisoning leading to fatality has been observed in recent years in Bangladesh. Here is a case series of 8 cases of adulterated methanol poisoning in a tertiary care hospital with lethality.

Results and discussion: From November 2012 to January, 2013, in sphere of 3 months medicine units of Dhaka Medical College Hospital (DMCH) experienced 8 cases of methanol poisoning with fatality. Six patient presented in unconscious states within 3 to 7 h of consuming methanol while two patient presented within 48 h. All of them had gastrointestinal toxicity with variable episodes of vomiting. Three patients presented with visual impairment while only two out of eight had normal ophthalmoscopy. Respiratory distress was uniformly found in all patients before unstable profound shock. Blood ethanol level was not performed in any patient due to lack of available facility. Seven patients received only supportive measures ranging from steroids to sodium bi carbonate while one patient presented in severe toxicity and died quickly before any supportive measures. Antidote was not prescribed in any patient in the form of fomepizole or intravenous or oral ethanol.

Conclusion: The judicious use of antidote even in the form of oral ethanol and folic acid can save the precious life. A national guideline should be uniformly practiced by the physicians to combat the catastrophic methanol poisoning in Bangladesh.

Keywords: Methanol; Poisoning; Fatal

Introduction

Methanol is methyl alcohol also known as wood alcohol or wood neptha synthesized from coke and water. Industrial methylated spirit consists of 95% ethyl alcohol and 5% methyl alcohol. Mineralised methylated spirit contains 90% ethyl alcohol and 10% methyl alcohol [1]. It is used in many home chemicals, duplicating fluids, varnishes, stains, paint thinners and dyes. Methylated spirit is very cheap and frequently available; hence it is easily adulterated and used as country liquor among some Bangladeshi poor peoples who cannot afford ethyl alcohol for their drink. It becomes highly toxic when it is mixed with ethyl alcohol as it is adulterated. When taken with ethyl alcohol, it is metabolized only after complete metabolism of ethyl alcohol. In course of oxidation, formaldehyde and finally formic acid are formed which are highly toxic [1,2]. Even as small amount as 10 ml can cause permanent blindness [3]. Formic acid is metabolized more slowly and, therefore, accumulates as the generation of formic acid exceeds the capacity to eliminate it [4,5]. A direct correlation between formic acid accumulation and the toxicity of methanol leading to mortality and morbidity is established [5]. Beside the gastrointestinal symptoms of anorexia, nausea, vomiting, diarrhea there may be CNS, eye, respiratory and renal toxicity. Dyspnoea and respiratory failure is the

cause of death in most patient [2,6]. Metabolic acidosis is sometimes refractory and one of important cause of mortality. Lactate is produced as formic acid interferes with intracellular respiration and promotes anaerobic metabolism. As lactate concentrations rise and tissue hypoxia increases, the pH falls further and leads to the generation of more undissociated formic acid [7,8]. Both formate and lactic acid contribute to the anion gap increase seen in methanol poisoning. The early acidosis observed in methanol poisoning may be due to the accumulation of formate, with lactate accumulation occurring in the later stages of poisoning from tissue hypoxia and inhibition of cellular respiration by formic acid [9]. Ethyl alcohol is preferentially metabolized by alcohol dehydrogenase resulting in reduced methanol toxicity. Ethanol competitively inhibits the metabolism of methanol to its toxic metabolite, formate, by occupying the receptor sites of alcohol dehydrogenase. Fomepizole has been shown to be a potent inhibitor of alcohol dehydrogenase in man [10].

From November 2012 to January, 2013, in sphere of 3 months medicine units of Dhaka Medical College Hospital (DMCH) experienced 8 cases of methanol poisoning with fatality. Here is the case series of 8 cases of methanol poisoning with their management and fatal outcome that has been observed in DMCH.

Case Series

Case 1

Mr. T. A. 42-year married, day labour hailing from East Badda, Dhaka admitted into Medicine Unit of DMCH on 3 November 2012 at 2.30 AM with the history of heavy ingestion of Methanol 3 h back followed by severe vomiting (more than 10 times) and unconsciousness with respiratory distress. On examination his pulse was 84/min, BP: 80/60 mm Hg, RR-24/min, Lungs-Clear, Pupil: Dilated, Planter- Bilaterally extensor & GCS: 6. Ophthalmoscopy revealed optic disc oedema. No investigation was done. In the hospital he was treated with. Inj. Sodi-bicarb but the patient was not improved & his condition was rapidly deteriorating. Pulse, BP became unrecordable and Respiration ceased within an hour of arrival. Patient could not be sent to intensive care unit due to lack of available bed. The patient expired due to respiratory failure with clear lungs (metabolic acidosis) at 3.40 AM on that day. Ethyl alcohol as antidote was not given.

Case 2

Mr M. R, 35-year a service holder hailing from Kawranbazar, Dhaka admitted into Medicine Unit of DMCH on 4 November 2012 at 7.00 PM with the history of ingestion of Alcohol 7 hours back. He was a chronic alcohol abuser (3-4 years). Possibly he was taken the out dated methylated spirit. During admission he complaints of respiratory distress & altered level of consciousness & his Pulse 84/min, BP: 120/80 mm Hg, Creps present on both lung fields, RR- 48/min, Pupil: Dilated & poorly reacting, GCS: 3. Here he was managed conservatively with Inj. Amoxicillin, Inj. H2 blocker & I/V fluid. But his condition was deteriorating & he was referred to the ICU but no free respiratory support was available so he was intubated manually & ventilated with ambubag but no further improvement was noticed & expired at 7.30 AM on that day. The antidote ethanol was not given in this patient.

Case 3

Mr. D, 40 years of age married, businessman hailing from Chadpur admitted into Medicine Unit of DMCH on 5 November 12, at 11 pm with the history of ingestion of Alcohol with methylated spirit 6 h back to get pleasure He presented with unconsciousness & respiratory distress. His pulse was 88/min, Blood pressure 100/60 mm Hg, Pupil: Dilated & reacting, inspiratory creps was present on both lung field & GCS was 8. Ophthalmoscopy revealed disc oedema. He was treated conservatively but no improvement noticed & his condition gradually deteriorated, CPR was given. The patient expired on 6 November 12, 6.00 AM due to respiratory failure though the doctors took several life saving attempt. The patient did not receive ethanol as antidote during his hospital stay.

Case 4

Md. J. H., 40 years of age married, rikshaw puller hailing from Sherpur got himself admitted into Medicine Unit of DMCH on 6 November 2012 at 11.30 AM, with the history of ingestion of methanol 2 days back to get pleasure. He presented with disorientation, respiratory distress, profuse vomiting & loss of vision. On examination his pulse was 90/min, BP: 100/70 mm Hg, Heart: S1 + S2 was normal with no added sound, Lungs-Clear, Edema present & GCS-8. Ophthalmoscopy showed optic atrophy. Here he was treated conservatively with i/v fluid, Inj. Frusemide, Inj. Sodcarb, Inj.

Omeprazole, Inj. Berrin & Inj. Oradexon but no improvement noticed & his condition was deteriorating. No investigation was done. The patient was expired 30 min of admission due to irreversible cardio-respiratory failure.

Case 5

Mr. M. H, 55 years of age hailing from Dhamrai, Dhaka got himself admitted into Medicine Unit Orange of DMCH on 13 November 2012 at 10 pm, with the history of ingestion of Alcohol 6 h back to get pleasure. He presented with disorientation & vomiting. On examination his pulse was 100/min, BP: 110/70 mmHg, Pupil: Dilated & reacting, Creps present on both lung fields, RR-24/min, Temperature- Normal & GCS- 12. Ophthalmoscopy examination showed hyperemia in retinal field. Here he was treated conservatively with I/V fluid, Inj. Frusemide, Inj. Hydrocortisone & Inj. Omeprazole but no improvement noticed & his condition gradually deteriorated. No investigation was done & the patient expired on 13 November 2012 at 2.15 AM due to severe metabolic acidosis and respiratory failure.

Case 6

Mr. B. B. 55-year married, hailing from Doudkandi, Comilla admitted into Medicine Unit of DMCH on 17 November 2012 at 7.10 AM with the history of heavy ingestion of Methanol 7 h back. He presented with severe vomiting and unconsciousness. During admission his pulse was 96/min, Blood Pressure 90/60 mmHg, Pupil: Dilated, Lungs- Clear but GCS: 4.Ophthalmoscopy showed disc congestion. No investigation was done. Immediately an i/v channel was opened & he was treated with. Inj.Sodi-bicarb & Inj. Frusemide but his condition was not improved & gradually deteriorating. The patient expired at 7.45 AM on that day due to cardio-respiratory failure.

Case 7

Md. A. A, 35 years of age married, businessman hailing from Monipuripara, Dhaka got himself admitted into Medicine unit of DMCH on 21 December 2012 at 11 pm with the history of ingestion of methanol 2 days back to get pleasure. During admission, he was presented with unconsciousness, vomiting & blurring of vision. On examination his pulse was not palpable, BP not recordable, Lungs-Clear, RR-16/min, Pupil: Fixed & dilated, Ophthalmoscopic examination was normal, Skin: Cold and GCS-5. He was treated conservatively but his condition was deteriorating. No investigation was done. The patient was expired on 22 December at 2.15 am due to severe metabolic acidosis and respiratory failure.

Case 8

Mr. B. H, 50-year, Businessman, married hailing from Mirbagh, Dhaka admitted into Medicine Unit- 7 of DMCH at 9.10 pm on 23 January 13 with the complaints of history of Alcohol poisoning 3 h back. He was bought into DMCH by the local peoples as unconscious and vomiting constantly. Patient was a chronic alcohol abuser, taking alcohol for several years. On admission his GCS was 7, Pulse- 72/min, BP: 100/50 mm Hg, Huge crackles present on both lung fields, Pupil: Dilated but slightly reacting to the light, No abnormality detected in cardiovascular examination. Ophthalmoscopic examination revealed hyperemia of optic disc He was managed conservatively with steroids, bronchodilator and Proton pump inhibitor but his condition was gradually deteriorating. ICU support could not be provided due to lack

of available bed. He died on the next day at 3.30 AM. He did not received any antidote.

Discussion

Eight cases of severe methanol poisoning were observed with fatality within spare of three months in this case series. The age variable showed the incidence more common in range of 35-55 y with cent percent male which has also been found similarly in developed country like USA [11]. Possibly the religion and social bindings lead un -involvement of female in methanol poisoning. The occurrence happens in day laborer to businessman which indicating the ignorance of adulteration of methanol to all class people in Bangladesh. The intention of deliberate self-harm was also similarly found in different case series [12]. The adulteration of mixing ethanol with methanol has been similarly observed in different case series [12,13].

Almost all cases presented with acute gastrointestinal toxicity with abdominal pain, nausea and vomiting. Indeed the number of vomiting has been found to have correlated with rapidity of mortality in this fatal case series. The possibility of pancreatitis was not proven in this case series due to lack of investigations. Although the severity of methanol poisoning was also observed without gastrointestinal involvement [14], the consistent presence of these symptoms in this tertiary care leads to assume the early presence of vomiting links to

fatality an important tool to consider (Table 1). Seven patients presented in unconscious states with variable GCS ranging 3-12. It is to be noted that the initial GCS predicts early mortality is as also proven in this case series where GCS less than 7 had quick mortality than those who had initial GCS more than 7 (Table 2). Possibly cerebral oedema with poor GCS is a leading cause of quick mortality [15]. The initial GCS and follow up GCS is important consideration clinically to monitor the clinical condition of the patient. Although methanol can present with visual disturbance especially when present with prolonged lag period of taking methanol, the cases series was not consistent with this statement. Even in the patient who presented 48 h of lag period, the history was not consistent with visual symptoms. Possibly the lack of consciousness in many patients early could lead to such lack of eye symptoms. The interesting observation was ophthalmoscopic findings ranging from hyperemia to optic atrophy in all fatal cases (Table 2). The regular ophthalmoscopic examination is methanol poisoning should be practiced by every physicians as it dictates the progression of disease and also early intervention. The optic atrophy can be irreversible but the hyperemia and congestions and snow effect also indicates the role of intravenous lecovorin for a possible reversibility [15,16]. The cases series showed no active intervention in this regard which is possibly due to lack of early confirmed diagnosis and also lack of knowledge from the young physicians in emergency.

Name	TA	M.R	Mr D	J.H	M. M	B.B	A.A	B.H
Age in yrs	30	35	40	40	55	55	35	50
Unconsciousness	+	+	+	+	-	+	+	+
Nausea	-	+	+	+	+	+	+	+
Vomiting(times)	4	5	3	6	6	10	4	12
Visual disturbance	-	+	-	-	+	-	+	-
Respiratory distress	-	+	+	+	-	-	-	+
Abdominal Pain	-	+	+	+	+	-	-	
Diarrhoea	-	-	-	-	-	+	-	-
Lag period	3 h	48 h	7 h	6 h	48 h	6 h	7 h	3 h

Table 1: Symptoms of importance in eight cases.

In this cases series, the lag period of presence in health care setting from the time of ingestion varies ranging from 3 h to 48 h. The variable time of lag period indicates patients and attendants lack of appropriate knowledge and possibly social prestige to bring the news open. Three patients presented in a state of shock while others were having fair vitals during presentation. The vitals did not show the rapidity of fatality in this cases series. But the consistent findings in all cases were metabolic acidosis and acidotic breathing. The severe metabolic acidosis with acidotic breathing had the quickest fatality in this case series and the physicians had only 3-6 h to deal with this dangerous sign [17,18]. So the dysnoea with clear lungs and acidotic breathing should make the physicians promptness to refer the case to ICU support which was totally lacking in this case series. The awareness and quick clinical diagnosis was also a question in this case series as actual antidote was not attempted in any of the cases.

The big surprise of this case series was lack of investigations. As the poisoning is a neglected disease in Bangladesh, there is a tendency of physicians not to do any investigations even in cases like severe methanol poisoning. The metabolic acidosis was not confirmed through arterial blood gas analysis and the specific test to identify methanol in the blood was lacking in the case series. No attempt was also observed to identify the biochemical and radiological changes of these severe methanol cases. The quickness of death and severity may be a reason to avoidance of investigations as the physicians were just busy with resuscitation only. The lack of team effort was obvious in this fatal case series. Two cases died within half hour of admission while 4 cases died within 4 h of resuscitation. Only two cases had survived upto 12 h of admission although attempt to give ICU support and antidote was not obviously clear in observation. Lack of adequate bed in ICU may be also a factor of reluctance in doing prompt referral for better care.

Name	TA	M.R	Mr D	J.H	M. M	B.B	A.A	B.H
Age in years	30	35	40	40	55	55	35	50
GCS	6	3	8	8	12	4	5	7
Pulse	84/m	100/m	80/m	90/m	100/m	96/m	NP	72/m
BP	80/60	120/80	100/60	100/70	110/70	90/60	NR	100/70
Ophthalmoscopy	Disc Oedema	Optic Atrophy	Disc Oedema	Optic Atrophy	Hyperemia	Disc Congestion	Optic Atrophy	Hyperemia
Lungs Crackles	-	+	+	+	-	-	-	+
Acidotic Breathing	+	+	+	+	+	+	+	+
Shock	+	-	-	-	-	+	+	-

Table 2: Important clinical sign observed in the case series.

The surprising findings in these 8 fatal cases is lack of antidote treatment. Although fomepizole is not available in the local market, still the attempt to give Intravenous or oral ethanol as antidote was missing in this case series. The oral ethanol dose and effectiveness although vary in different literatures [4,18], still it is recommended in different national guidelines [1,4]. The reluctance to give or attempt to start oral ethanol may be due to lack of knowledge or confidence from primary care physicians. The use of oral ethanol as medicine is also not accustomed by the junior physician in our setting. There has been case report of saving valuable life in methanol poisoning by using oral ethanol even with the one manufactured by local market [19].

Conclusion

A comprehensive training and awareness is crucial to manage methanol poisoning cases in Bangladesh even in tertiary care centre. The poisoning corner in tertiary care centre with adequate trained personnel having prompt diagnostic facility and treatment is a time demand issue of this raising deadly poisoning.

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