



ORIGINAL RESEARCH PAPER

Anesthesiology

SODIUM BICARBONATE AS IMPORTANT ADJUNCTIVE TREATMENT IN METHANOL INTOXICATION

**KEY WORDS:** Methanol Poisoning, Sodium Bicarbonate, Hemodialysis

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<b>ABSTRACT</b>	<b>Background</b> Herein we report present number of methanol poisoning cases with adequate management and good outcome that has been observed in our emergency department. However sodium bicarbonate as adjunctive treatment is still controversy
	<b>Case Presentation</b> Six patient had heavy ingestion of methanol few days before followed by headache, blurred vision, respiratory distress, vomit and unconscious. Treatment were sodium bicarbonate injection, ethanol 10% as antidote, rehydration with kristaloid, intubation and ventilator support and emergency hemodialysis. Improvement achieved 2-3 days after treatment
	<b>Conclusion</b> We present this case to support initial treatment as sodium bicarbonate administration as an important treatment beside dialysis.

**BACKGROUND**

Methanol is methyl alcohol also known as wood alcohol. Methanol is colorless, odorless, and bitter alcohol that is found in various solvent, varnish, anti freeze, and denature alcohol. Methanol is a toxic alcohol that can cause serious poisoning, even when taken in low doses orally, by inhalation or dermally.

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 poor peoples who cannot afford ethyl alcohol for their drink.

When taken with ethyl alcohol, it is metabolized only after complete metabolisation 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. 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 22 april to 09 mei 2018, in Soetomo's hospital experienced 6 cases of methanol poisoning with good outcome. Here is the case series of 6 cases of methanol poisoning with their management and good outcome that has been observed in soetomo hospital.

**CASE SERIES**

Mr. S. 49-year married, Laborer from Surabaya admitted into Emergency Medicine Unit of Soetomo hospital on 22 April 2018 with the history of heavy ingestion of Methanol 2 day before followed by severe vomiting and unconsciousness with respiratory distress. On examination his pulse was 94/min, BP: 100/60 mm Hg, RR-33/min, Lungs-Clear, Pupil: Dilated, Planter- Bilaterally extensor & GCS: 10. Ophthalmoscopy revealed optic disc hyperemia. Blood gas analysis has showed heavy metabolic acidosis with pH 7,08 ,Base excess -23 and HCO<sub>3</sub> 4,5 . In the hospital he was treated with. Inj. Sodi-bicarb, inj antidote Ethanol 10%, rehydration with kristaloid and emergency hemodialysis. The patient was improved & his condition was rapidly become normal consciousness and Respiration become normal.

Mr. G. 53-year married, Laborer from Surabaya admitted into Emergency Medicine Unit of Soetomo hospital on 23 April 2018 with the history of heavy ingestion of Methanol 2 day before followed by blurred vision and respiratory distress. On examination his pulse was 74/min, BP: 150/60 mm Hg, RR-33/min, Lungs-Clear, Pupil: isokor normal, Ophthalmoscopy revealed optic disc hyperemia. & GCS: 15. Blood gas analysis has showed heavy metabolic acidosis with pH 7,04 ,Base excess -25 and HCO<sub>3</sub> 4,3 . In the hospital he was treated with. Inj. Sodi-bicarb, inj antidote Ethanol 10%, rehydration with kristaloid and emergency hemodialysis. the patient was improved & his condition was rapidly become normal consciousness and Respiration become normal.

Mr. W. 42 -year married, Laborer from Surabaya admitted into Emergency Medicine Unit of Soetomo hospital on 23 April 2018 with the history of heavy ingestion of Methanol 3 day before followed followed by headache, blurred vision and respiratory distress. On examination his pulse was 94/min, BP: 100/60 mm Hg, RR-25/min, Lungs-Clear, Pupil: normal ishokor & GCS: 15. Ophthalmoscopy revealed optic disc hyperemia. Blood gas analysis has showed heavy metabolic acidosis with pH 6,95 ,Base excess -26,8 and HCO<sub>3</sub> 5,3. In the hospital he was treated with. Inj. Sodi-bicarb, inj antidote Ethanol 10%, rehydration with kristaloid and emergency hemodialysis. the patient was improved & his condition was rapidly become normal consciousness and Respiration become normal.

Mr. R. 19 -year married, Laborer from Surabaya admitted into Emergency Medicine Unit of Soetomo hospital on 22 April 2018 with the history of heavy ingestion of Methanol 3 day before followed followed by headache, blurred vision, respiratory distress and unconsciousness. On examination his pulse was 114/min, BP:

120/60 mm Hg, RR-28/min, Lungs-Clear, Pupil: dilated & GCS: 10. Ophthalmoscopy revealed optic Hyperemia. Blood gas analysis has showed heavy metabolic acidosis with pH 7,05 ,Base excess -21,8 and HCO<sub>3</sub> 4,2. In the hospital he was treated with. Inj. Sodi-bicarb, inj antidote Ethanol 10%, rehydration with kristaloid and emergency hemodialysis. the patient was improved & his condition was rapidly become normal consciousness and Respiration become normal.

Mr. A. 37 -year married, Laborer from Surabaya admitted into Emergency Medicine Unit of Soetomo hospital on 3 mei 2018 with the history of heavy ingestion of Methanol 3 day before followed followed by headache, blurred vision, respiratory distress and unconsciousness. On examination his pulse was 104/min, BP: 84/45 mm Hg, RR-30/min, Lungs-Clear, Pupil: dilated & GCS: 8 and deteriorating. Ophthalmoscopy revealed optic disc congestion. Blood gas analysis has showed heavy metabolic acidosis with pH 7,08 ,Base excess -27 and HCO<sub>3</sub> 3. In the hospital he was treated with. Inj. Sodi-bicarb, inj antidote Ethanol 10%, rehydration with kristaloid, intubation and support ventilator and emergency hemodialysis. the patient was improved & his condition was rapidly become normal consciousness and Respiration become normal.

Mr. D. 24 -year unmarried, Laborer from Surabaya admitted into Emergency Medicine Unit of Soetomo hospital on 9 mei 2018 with the history of heavy ingestion of Methanol 3 day before followed followed by headache, blurred vision, respiratory distress and unconsciousness. On examination his pulse was 84/min, BP: 120/75 mm Hg, RR-30/min, Lungs-Clear, Pupil: dilated & GCS: 10 and deteriorating. Ophthalmoscopy revealed optic disc hyperemia. Blood gas analysis has showed heavy metabolic acidosis with pH 7,03 ,Base excess -25 and HCO<sub>3</sub> 3,4. In the hospital he was treated with. Inj. Sodi-bicarb, inj antidote Ethanol 10%, rehydration with kristaloid, and emergency hemodialysis. the patient was improved & his condition was rapidly become normal consciousness and Respiration become normal.

**DISCUSSION**

Six cases of moderate-severe methanol poisoning were observed with better outcome within spare of 3 weeks in this case series. The age variable showed the incidence in range of 19-55 years. All of them is labor in some factory in Surabaya and has low educated, its mean they were drank the *oplosan* drink.

In our hospital doesn't has laboratory to check methanol in plasma, so we diagnostic intoxication methanol based on clinical symptom and blood gas analysis. Our hospital is tersier medical unit, most of our patient referral from the primary hospital or primary clinics. Most of the variable get therapy from the previous hospital.

Name	Mr. S	Mr. G	Mr. W	Mr. R	Mr. A	Mr. D
Age in year	49 years	53 years	42 years	19 years	37 years	24 years
pH	7,08	7,04	6,95	7,05	7,08	7,03
HCO <sub>3</sub>	4,5	4,3	5,3	4,2	3	3,4
pCO <sub>2</sub>	12	13	24	15	10	15
pO <sub>2</sub>	79	109	72	80	154	98
BE	-23	-25	-26,8	-21,8	-27	-25

The results of blood gas analysis laboratory test showed average pH was 6,95-7,08. BE was -21,8 to 27. HCO<sub>3</sub> was 3,4-5. That clinical and laboratory shows heavy acidosis metabolic condition. All of that signs mean they come to our emergency unit in the late phase of methanol metabolism. It because the metabolism most of methanol in the body has been generate to formic acid. So the therapy must be decide to hemodialysis and give the ethanol 10 % as antidote methanol toxicity to the patient.

After hemodialysis and given the antidote, all the patient has better outcome. Respiratory become normal, consciousness state patient become normal and also the blood gas analysis. It because time to diagnose and time to therapy its not to late. And also hemodialysis department and emergency unit has prepare to this case.

Name	Mr. S	Mr. G	Mr. W	Mr. R	Mr. A	Mr. D
Age in year	49 years	53 years	42 years	19 years	37 years	24 years
Unconsciousness	-	-	-	-	-	-

Headache	-	-	-	+	+	-
Vomiting	-	-	-	-	-	-
Visual disturbance	+	+	+	+	+	+
Respiratory distress	-	-	-	-	-	-

**CONCLUSION**

Methanol poisoning can be mortal if not treated properly. Physicians of the emergency unit should consider the possibility of methanol poisoning if a patient who cannot give a good history presents with altered consciousness and a high anion gap, and proper treatment should be started accordingly .

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