

Methanol Poisoning: Evaluation of 28 Patients in a 6 Months Period

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Abstract: Methanol is a toxic liquid and its taste and appearance are similar to ethanol. Oral intake or skin contact with methanol can cause methanol poisoning. In this cross-sectional study, hospitalized patients with methanol poisoning in the general hospital of Lorestan University of Medical Sciences were evaluated between March and September, 2010. In the expired patients the methanol level of alcoholic beverages and the vitrus and blood sample had been evaluated by gass chromatography. Researchers used mean and standard deviation and the SPSS software, V. 12 for analyzing the collected data. In this time period, 28 patients with methanol poisoning were admitted. The mean age of the patients was 25.21 ± 9.58 years old. In the study span, 3 patients expired in the hospital. At the end of hospitalization span, 4 patients had loss of vision. The methanol levels of blood samples of expired patients were 37, 21.9 and 30.6 mg dL⁻¹. The methanol level of vitrus samples of 2 ones of expired patients were 31.5 and 18.8 mg dL⁻¹. Also, the methanol level of alcoholic beverage was 80 mg dL⁻¹. Although in some literature, the lethal blood methanol level is reported as 80-100 mg dL⁻¹, the minimal lethal level of blood methanol is not known yet. However, the lethal blood methanol levels in the study were lower than the usual amounts. This may due to the delay in admission to the hospital and the clinical status of the patients on admission.

Key words: Methanol, methyl alcohol, poisoning, hospital, gass chromatography, Iran

INTRODUCTION

Methanol (Methyl alcohol) is a toxic liquid and its taste and appearance are similar to ethanol (Blanco *et al.*, 2006). Oral intake or skin contact with methanol can cause methanol poisoning (Chen *et al.*, 2010). Methanol is present in antifreezes and cleaning liquids or industrial solvents or adulterine alcoholic beverages (Blanco *et al.*, 2006). Methanol toxicity depends on time and concentration (Lanigan, 2001). Methanol ingestion causes metabolic acidosis (Yang *et al.*, 2005; Blanco *et al.*, 2006; Fauci *et al.*, 2008; Chen *et al.*, 2010; Jammalamadaka and Raissi, 2010). In poisoning with methanol, free radicals and lactic acid make cell hypoxia (Chen *et al.*, 2010). Metabolites of methanol are formaldehyde and formic acid (Fauci *et al.*, 2008). These metabolites draw on toxicity and clinical symptoms (Jammalamadaka and Raissi, 2010).

Formic acid and formaldehyde can cause severe damages in central nervous system and optic nerves (Fauci *et al.*, 2008; Chen *et al.*, 2010). Blindness and

death can occur after methanol poisoning (Yang *et al.*, 2005; Blanco *et al.*, 2006; McMahon *et al.*, 2009; Chen *et al.*, 2010).

MATERIALS AND METHODS

In this cross-sectional study, hospitalized patients with methanol poisoning in Shohada-ye Ashayer hospital (the general hospital of Lorestan University of Medical Sciences) were evaluated between March and September, 2010. Date of admission, age, patient's symptoms on admission, the time of alcohol consumption, patient's complications on admission, the outcome of poisoning and the laboratory findings were recorded for each patient. In the expired patients, the methanol level of alcoholic beverages and the vitrus and blood sample had been evaluated in the Laboratory of Legal Medicine Organization of Khorramabad. The methanol level of the vitrus and blood sample was evaluated by gass chromatography (Shimadzu/GC14B). The 80/100 mesh was injected to the column of gass chromatography

instrument. Standard 0.4% methanol was used. The setting of the instrument was 140, 160 and 210°C for injection, column and the detector, respectively. The methanol level was calculated as follows:

$$\text{Methanol level} = \left(\frac{\text{The area of the sample}}{\text{The area of standard 0.4\% methanol}} \right) 320$$

Researchers used mean and standard deviation for analyzing the collected data. The statistical analyses were done using the SPSS software, V. 12.

RESULTS AND DISCUSSION

In this time period, 28 patients with methanol poisoning were admitted (Table 1). One of these patients was female. The mean age of the patients was 25.21±9.58 years old. The youngest one was 17 and the oldest one was 63 years old. None of the patients had a suicidal aim. In these patients, methanol intoxication was due to fraudulent adulteration of alcoholic beverages. The patients were treated using ethanol, folic acid, sodium bicarbonate and dialysis. Total 9 of the intoxicated patients were dialyzed.

In the study span, 3 patients expired in the hospital. They expired 4-5 days after methanol consumption. At the end of hospitalization span, 4 patients had loss of vision. The 3 of them improved in the 1st month but one has not improved until now. The area of standard 0.4% methanol was 379210. The area of the blood sample of the expired patients was 43851, 25953 and 36256 for a-c patients, respectively. The area of the vitrus sample was 37390 and 22287 for a and b patients, respectively. The area of vitrus sample of c patient was not recorded. The methanol levels of blood samples were 37, 21.9 and 30.6 mg dL⁻¹ in a-c patients. The methanol level of vitrus samples was 31.5 and 18.8 mg dL⁻¹ in a and b patients. Also, the alcoholic

beverage was evaluated. The area of standard 0.4% methanol was 403892 and for alcoholic beverage it was 102188.

The pH of blood in a-c patients was 6.9, 7.2 and 6.9 mEq L⁻¹, respectively. PCO₂ was 48, 44 and 50 and PO₂ was 64, 45 and 66 in a-c patients, respectively. Methanol intoxication can cause metabolic acidosis and severe damages in central nervous system and optic nerves (Fauci *et al.*, 2008; Chen *et al.*, 2010).

Death and blindness can occur after sever intoxication with methanol. The taste and appearance of methanol are similar to ethanol (Blanco *et al.*, 2006). This resemblance is the reason of unintentional intoxication with methanol. In the study span (6 months), 28 patients with methanol intoxication were admitted to Ashayer hospital.

The 4 cases of them had loss of vision and 3 cases expired. The methanol levels of blood samples were 37, 21.9 and 30.6 mg dL⁻¹ in a-c patients. The methanol levels of vitrus samples were 31.5 and 18.8 mg dL⁻¹ in a and b patients. The methanol level of alcoholic beverage was 80 mg dL⁻¹. Although in some literature, the lethal blood methanol level is reported as 80-100 mg dL⁻¹, the minimal lethal level of blood methanol is not known yet. However, the lethal blood methanol levels in the study were lower than the usual amounts. This may due to the delay in admission to the hospital and the clinical status of them on admission.

The symptoms of methanol poisoning were exhibited 1.7±0.6 days after methanol consumption. Yang *et al.* (2005) reported that in methanol poisoning, the onset of the symptoms is usually delayed for 12-24 h (Yang *et al.*, 2005). The interval between methanol consumption and the onset of the symptoms in the study is more than Yang *et al.* (2005)'s study. This may due to the amount of ingested methanol. Thus, the methanol level of alcoholic beverage was 80 mg dL⁻¹. No other toxic substances were detected in the blood.

Table 1: The data about the 28 poisoning patients

Date of admission	No.	The symptoms of patients on admission						The time of alcohol consumption (days before admission)	The outcome of poisoning consciousness			
		Mean of age (years)	Nausea and vomiting	Visual disturbance	Nausea and visual disturbance	Loss of consumption	Other symptoms		Without significant complication	Loss of vision	Death	Other complications
26/3/2010	4	26.7±10.4	1	-	3	-	-	2	1	-	-	-
29/3/2010	1	22	-	1	-	-	-	1	1	-	-	-
21/4/2010	1	40	1	-	-	-	-	2	1	-	-	-
24/5/2010	1	63	1	-	-	-	-	2	1	-	-	-
7/6/2010	1	21	-	-	-	-	1	1	1	-	-	-
15/6/2010	1	20	-	-	-	-	1	2	1	-	-	-
16/6/2010	1	17	1	-	-	-	-	2	1	-	-	-
19/9/2010	2	27.5±4.9	-	-	-	2	-	1.5±0.7	-	-	2	-
20/9/2010	15	22.8±3.9	3	2	5	1	4	1.8±0.7	10	3	1	1
24/9/2010	1	19	-	-	-	1	-	1	-	1	-	-
Total	28	25.21±9.58	7	3	8	3	7	1.7±0.6	21	4	3	1

CONCLUSION

None of the study patients had a suicidal aim. In the study methanol intoxication was due to the consumption of fraudulent adulteration of alcoholic beverages. All the expired patients had acidosis and it is in accord with the reviewed literature.

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