

# Research Paper: Evaluation of Prognostic Factors of Methanol Poisoning in Patients Referred to Shahid Rajaei Hospital in Karaj



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## ABSTRACT

**Background:** Methanol poisoning is a life-threatening condition that requires accurate prognosis and treatment. This study aims to evaluate the predictive value of laboratory and clinical variables in methanol poisoning.

**Methods:** This was an observational retrospective study performed on patients with methanol poisoning. Variables were determined based on the literature review, and patient data were extracted from the patient's file. The data was analyzed by SPSS software.

**Results:** There were significant differences between survived group and the dead group in GCS, heart rate, PH and HCO<sub>3</sub>, serum potassium, serum creatinine, and blood sugar levels, neurological symptoms, requiring intubation, and hemodialysis. Significant differences were not observed in the number of hemodialysis sessions, respiratory rate, age, gastrointestinal symptoms, and PCO<sub>2</sub> levels between survived and non-survived groups.

**Conclusion:** In our study, mortality was significantly associated with low GCS, high heart rate, low PH and HCO<sub>3</sub>, high potassium, creatinine, blood sugar levels, neurological symptoms, intubation, and hemodialysis. Despite other studies in this study, there was no association between the number of hemodialysis sessions, respiratory rate, age, gastrointestinal symptoms, and PCO<sub>2</sub> levels with mortality.

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### 1. Introduction

Methanol is toxic alcohol found in numerous household and industrial raw materials [1]. Methanol poisoning is usually caused by accidental or intentional ingestion. Sometimes, the epidemic is due to errors in the distillation and fermentation process and contamination of beverages [2]. The treatment of methanol poisoning is challenging, and identifying essential factors predicting mortality in these patients is critical for aggressive treatment or referral to poisoning centers [3]. The present study aimed to evaluate prognostic factors in patients with methanol intoxication.

### 2. Materials and Methods

This study was performed on the patients with methanol poisoning who were referred to Shahid Rajaei Hospital from 03/2018 to 02/2019. It was approved by the Ethics Committee of Alborz University of Medical Sci-

ences (Code: IR.ABZUMS.REC.1399.119). Patients with methanol poisoning were included in the current study. The exclusion criteria were as follows: the lack of access to tests and patients' final outcome, and dissatisfaction to participate in the study. In total, 117 subjects were considered as the required sample size. A checklist was prepared based on the variables to be examined in this project; the checklists were completed based on the patients' records. Moreover, the obtained data were processed for statistical analysis.

Statistical analysis was performed using SPSS. The Chi-squared test was used to analyze the qualitative variables; the t-test was used to compare the quantitative data between the study groups. The best cut-off points were determined by calculating the area under the Receiver Operating Characteristics (ROC) curve.  $P < 0.05$  was considered to indicate statistical significance.

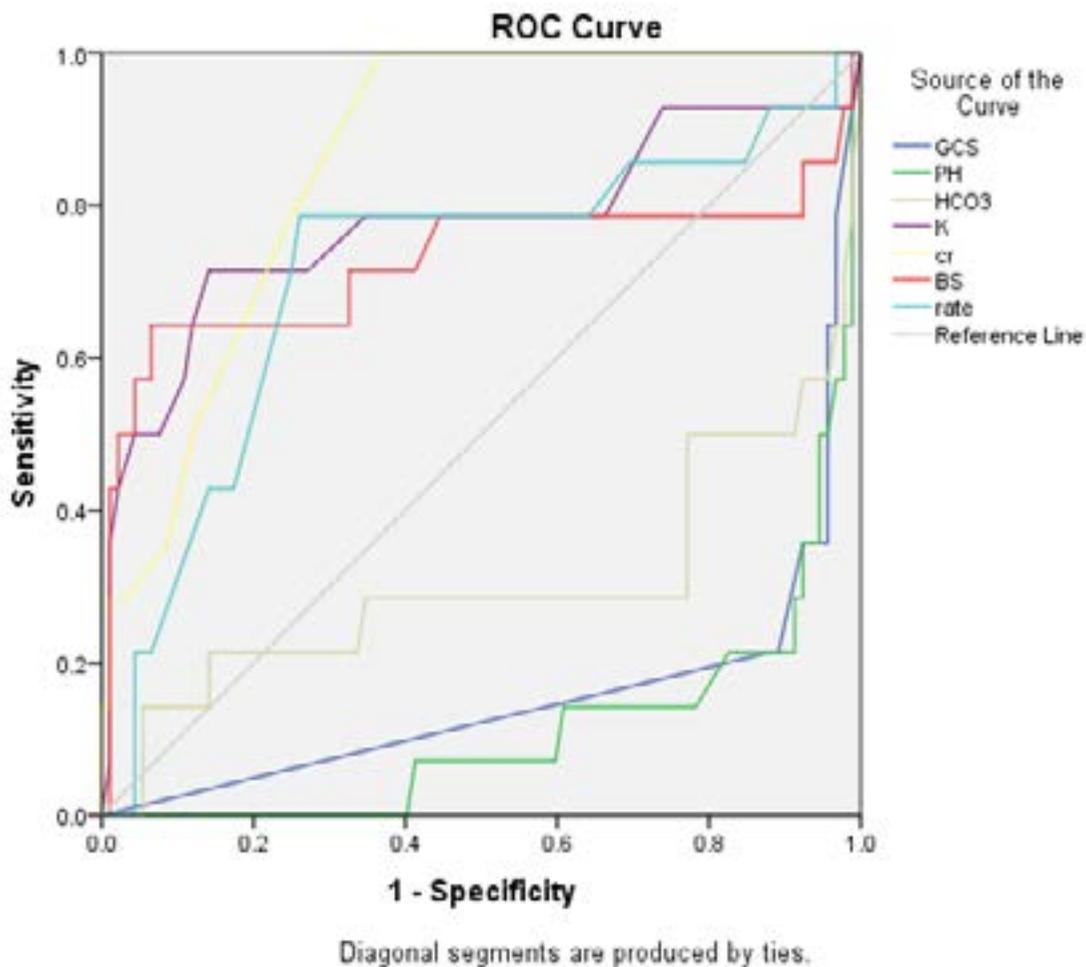


Figure 1. Sensitivity, specificity, and cut off values for GCS, Heart rate, pH, HCO<sub>3</sub>, K, Cr, and BS

**Table 1.** Comparing the study variables between the research groups

Variable	Mean±SD		P
	Survived	Non-Survived	
Age, y	28.86±9.387	30.00±7.082	0.353
Time between consumption to arrive emergency department	41.35±17.873	36.64±11.202	0.435
GCS* at entry	14.41±2.130	9.14±4.383	<0.001
Male sex (%)	88.3	11.7	0.647
Female sex (%)	85.7	14.3	0.647
Systolic blood pressure (mmHg)	129.33±16.749	127.43±27.723	0.973
Diastatic blood pressure (mmHg)	84.72±17.675	82.00±17.716	0.899
Heart rate (per minute)	84.43±18.774	97.64±19.856	0.016
Respiratory Rate (per minute)	18.34±2.936	17.86±6.515	0.94
PH	7.19±0.155	6.87±0.207	<0.001
PCO <sub>2</sub> (mmHg)	32.91±11.527	33.59±18.274	0.734
HCO <sub>3</sub> (mEq/L)	13.78±6.229	10.03±7.597	0.01
Serum Potassium (mmol/L)	4.35±0.571	5.24±0.944	0.001
Serum Sodium (mmol/L)	139.34±3.152	140.57±4.450	0.068
BUN† (mg/dL)	26.88±9.121	32.29±11.384	0.101
Creatinine (mg/dL)	1.32±0.259	1.81±0.478	<0.001
Blood sugar (mg/dL)	117.45±54.923	223.50±124.371	0.007

\*Glasgow Coma Scale; †Blood Urea Nitrogen.

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### 3. Results

Totally, 117 patients with methanol poisoning were included in this study. The Mean±SD age of the examined subjects was 29±12.9 years (range: 15-57 years). Furthermore, 103(88%) were male, and 14(12%) were female. The Mean±SD duration of methanol consumption to refer to the emergency department was 78.4±17.24 (3-96 hours); also, the Mean±SD Glasgow Coma Scale (GCS) score of the patients equaled 13/3±77/01 (4-15). There were significant differences between the survived and expired groups in GCS, heart rate, PH and HCO<sub>3</sub>, serum potassium (K), serum creatinine (Cr), blood glucose levels (BS), neurological symptoms, requiring intubation, and hemodialysis (Table 1). Mortality in patients with neurological symptoms was significantly higher than in patients without neurological symptoms (17.8% vs. 2.3%) (P=0.016). Mortality in patients requiring intubation was significantly higher than that in the patients

without intubation (68.4% vs. 1%) (P<0.001). Moreover, mortality in patients requiring hemodialysis was significantly higher than that in patients without hemodialysis (15.2% vs. 0%) (P<0.05). There was no significant difference in the mean length of hospital stay in the studied patients based on mortality (P>0.05). The cut-off values determined by the receiver operating characteristic curve were as follows: GCS=13.50, Heart rate=94.5, pH=7.05, HCO<sub>3</sub>=8.25, K=4.95, Cr=1.35, and BS=178 (Figure 1).

### 4. Discussion

In our study, most of the patients were male, i.e., consistent with other studies [3-5]. Death was significantly associated with low GCS, high heart rate, low pH and HCO<sub>3</sub>, high potassium, creatinine, blood sugar levels, neurological symptoms, required intubation, and hemodialysis. The respiratory rate at the time of arrival in the emergency department in other studies between the surviving and dead

groups was significantly different [5, 6]; however, our study did not observe this. The findings of a retrospective study on the association of mortality with neurological symptoms, creatinine, glucose, pH, and bicarbonate, and the need for hemodialysis [7] were similar to our study; however, in contrast to our research, the study found that age, gastrointestinal symptoms, and frequency of hemodialysis are also associated with mortality.

Our study determined that blood sugar above 178 mg/dL was associated with higher mortality, i.e., consistent with a survey conducted by Sanaei-Zadeh and associates [8]. In one study, pH less than 7, coma, and PCO<sub>2</sub> more than 31 were the strongest predictors of poor outcome [3]. However, in our research, PCO<sub>2</sub> levels were not associated with mortality. In a study, the poor prognosis was associated with pH less than 7 and coma, i.e., consistent with our findings.

## 5. Conclusion

In our study, mortality was significantly associated with low GCS, high heart rate, low PH and HCO<sub>3</sub>, high potassium, creatinine, and blood sugar levels, neurological symptoms, intubation, and hemodialysis.

## Ethical Considerations

### Compliance with ethical guidelines

This study was approved by the Ethics Committee of Alborz University of Medical Sciences (Code: IR.ABZUMS.REC.1399.119).

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### Author's contributions

All authors equally contributed to preparing this article.

### Conflict of interest

The authors declared no conflicts of interest.

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