

## Cerebrospinal Fluid Indices in Acute Drug Intoxication; Do They Predict the Patients' Outcome?

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### Abstract

**Introduction:** In some intoxicated patients, cerebrospinal fluid (CSF) is examined due to the prolonged loss of consciousness, focal neurologic findings, and fever of unknown origin. We aimed to evaluate the probable relationship between the different toxicity causes and the CSF indices in poisoned patients and determine if they could predict the patients' outcome.

**Methods:** All patients who had been admitted to the toxicology intensive care unit of Loghman-Hakim hospital between March 2006 and March 2011 and had undergone lumbar puncture (LP) were included into this retrospective study. The patients' demographic data and results of CSF evaluation (level of glucose, lactate dehydrogenase, protein, and white blood cells in CSF fluid) were evaluated. The data was analyzed using SPSS software version 17.

**Results:** A total of 111 patients were evaluated. Mean age of the patients was 37±15 years. Thirteen (11.7%) had deceased. No relation was found between the cause of poisoning (medication involved) and the changes in CSF indices. A statistically significant difference was found between the survivors and non-survivors in terms of CSF protein, LDH, and WBC. However, such a difference was not detected between these two groups regarding CSF glucose.

**Conclusion:** In intoxicated patients with prolonged decreased level of consciousness or prolonged fever, early evaluation of CSF can help early diagnosis of complications such as meningitis and prompt treatment. Also, high level of protein, LDH, and WBC in the CSF can predict higher mortality rates in these patients.

**Keywords:** Toxicity, Cerebrospinal Fluid, Lactate Dehydrogenase, Lumbar Puncture, Poisoning, White Blood Cell.

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### INTRODUCTION

Poisoning with medications/toxins is one of the most common causes of hospital reference and admission worldwide that can cause mortality and severe morbidity in the patients. According to the previously performed studies, acute and chronic toxicities caused by the medications/toxins can be similar to the primary disorders of the central nervous system (CNS) (1). Therefore, in an acutely intoxicated

patient, a complete examination of the CNS is necessary. In a group of these patients, lumbar puncture (LP) may seem necessary due to the reasons including focal neurologic signs or fever of unknown origin. In the previously performed studies, sporadic evaluation of cerebrospinal fluid (CSF) has been performed for the diagnosis (2-6) or sometimes, determination of the prognosis (7). In many of these studies, serum level of the

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medication/toxin in the CSF has been evaluated (8). However, to our best knowledge, no study has been performed to date to evaluate the biochemical indices of the CSF fluid in intoxicated patients. This study was performed to evaluate if there is a relationship between the acute drug toxicity and changes in the analysis of CFS. We also tried to find out if prognosis of the patient could be determined based on the changes in the biochemical indices of the CSF.

## MATERIALS AND METHODS

In this retrospective study, medical charts of all patients who had been admitted to the toxicology intensive care unit (ICU) of Loghman-Hakim poison hospital in Tehran, Iran between March 2006 and March 2011 were identified by the computerized discharge diagnosis (ICD-10) codes. It should be noted that for ethical issues all the information was recorded without name. Only those who had undergone LP during their admission period were included. Their type of intoxication was not important for the inclusion of the patients and a variety of drugs was present. On the other hand, those with any underlying central nervous system (CNS) disorder and those with a concurrent head trauma were excluded. Generally, if fever persisted for a period longer than 72 hours or the patient experienced more than 72 hours of unconsciousness, LP was performed. In most cases, a consult with the infectious disease specialist was performed and he/she was the one who performed LP. The CFS lactatedehydrogenase (LDH), protein, glucose, and white blood cell (WBC) levels were then evaluated. The patients' demographic information, type of intoxication, and outcome were extracted from the medical charts and entered into the standardized data abstraction forms. Statistical analysis was performed using SPSS (Statistical Package for Social Sciences) software (version 17, Chicago,

Ill, USA) and application of Student's t-test. P values less than 0.05 were considered to be statistically significant. Our study was approved by the Regional Ethics Committee.

## RESULTS

A total of 145 patients were first included. These were the patients who had been admitted to the toxicology ICU of Loghman-Hakim hospital and had undergone LP due to either a fever longer than 72 hours experiencing more than 72 hours of unconsciousness. Of them, 34 were excluded because of having an underlying CNS disorder or the history of concurrent head trauma (finally included: 111 patients).

Mean age of the patients was  $37 \pm 15$  years. Fifty-five patients (49.5%) were male. Mean Glasgow coma scale (GCS) of the patients at hospital presentation was  $11 \pm 3$ . A total of 17 (15.3%), 24 (21.6%), 23 (20.7%), 10 (9%), 7 (6.3%), 14 (12.6%), 6 (5.4%), 2 (1.8%), 6 (5.4%), 1 (0.9%), and 1 (0.9%) patients were intoxicated by opium, tricyclic antidepressants, a mixture of medication crack, anticonvulsants, benzodiazepines, tramadol, acetaminophen, methanol, lithium, and non-steroidal anti-inflammatory drugs, respectively. Twenty-one percent of the patients had undergone brain computed tomography which was normal.

Mean level of WBC, LDH, protein, and glucose of the CSF were reported to be  $54 \pm 194$ ,  $23 \pm 8.7$ ,  $52 \pm 83$ , and  $63 \pm 12$ , respectively. Thirteen patients (11.7%) had deceased, 46% had been transferred to the neurology ward, and the rest had been discharged. Of those who had died, 7 had a confirmed diagnosis of meningitis, of whom, 4 were intravenous drug abusers. Level of the CSF glucose was not significantly different between those who had died and those who had recovered ( $P=0.101$ ). In contrast, the level of WBC, LDH, and protein were significantly

different between these two groups of patients ( $P < 0.001$ ,  $=0.001$ , and  $=0.001$ , respectively).

## DISCUSSION

In intoxicated patients with prolonged decreased level of consciousness or fever, LP is generally warranted to rule out the possible meningitis. This procedure is generally performed in toxicology ICU and in the patients who are critically ill. However, the idea of evaluation of CSF indices and their relation with the patients' prognosis seems innovative. To our best knowledge, no specific study has evaluated the CSF indices (including cells, protein, LDH, and glucose) to seek for a relationship between these indices and the patients' diagnosis and/or outcome. However, several studies have been performed to determine the level of medications/toxins in the CSF (4). This study is therefore unique in this regard.

According to our findings, changes in the CSF indices cannot be diagnostic; however, they can be used for determination of the patients' prognosis. For instance, a poisoned patient with increased LDH or protein level in the CSF is more prone to death. This may be due to the possible meningitis at first look. However, in our cases, only 7 had a confirmed diagnosis of meningitis. This maybe shows a critical status of the patient and therefore a higher rate of mortality. However, further studies with larger sample sizes are warranted to evaluate such a relationship.

## CONCLUSION

In intoxicated patients with prolonged decreased level of consciousness or prolonged fever, early evaluation of CSF can help early diagnosis of complications such as meningitis and prompt treatment. Also, high concentrations of protein, WBC, and LDH

in the cerebrospinal fluid of the intoxicated patients predict a poor outcome.

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