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Observational Study

Survey study of the etiology of non-traumatic altered consciousness in the Emergency Department in Suez Canal University Hospital in Egypt

Moussa BS *et al*. Etiology of non-traumatic altered consciousness

Bassant S Moussa, Zeinab M Abd Elatiff, Ghada M Kamal Eldin Elhadary

Abstract

BACKGROUND

Disorders of consciousness including coma in non-trauma patients can be caused by a wide variety of pathologies affecting the central nervous system. They represent a frequent challenge in emergency medicine and are combined with a very high in-hospital mortality. Hence, early treatment of these patients is vital and increases the likelihood of a good outcome.

AIM

To identify the causes of altered consciousness presentation to the Emergency Department at Suez Canal University Hospital.

METHODS

This was a descriptive cross-sectional study conducted on 87 patients with acute non-traumatic disturbed level of consciousness (DLOC) at the Emergency Department.

RESULTS

The mean age of the studied patients was 60.5 ± 13.6 years. Among them, 60% were males and 40% were females. The most common cause of acute non-traumatic DLOC was systemic infection, such as sepsis and septic shock (25.3%), followed by respiratory causes (24.1%) and neurological causes (18.4%).

CONCLUSION
The most common cause of acute non-traumatic DLOC was systemic infections followed by respiratory and neurological causes.

Key Words: Disturbed level of consciousness; Non-traumatic; Emergency department

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Core Tip: Disorders of consciousness including coma in non-trauma patients can be caused by a wide variety of pathologies affecting the central nervous system. This includes life-threatening medical, neurological or neurosurgical emergencies where timely medical intervention is vital. The aim of this cross-sectional observational study was to identify the causes of acute non-traumatic altered consciousness in the Emergency Department at Suez Canal University Hospital. Our study concluded that the most common cause of acute non-traumatic disturbed level of consciousness was systemic infections followed by respiratory and neurological causes.

INTRODUCTION
Disorders of consciousness including coma in non-trauma patients can be caused by a wide variability of pathologies affecting the central nervous system (CNS). This includes life-threatening medical, neurological or neurosurgical emergencies where timely medical intervention is vital[1]. Five–nine percent of all patients in Emergency

Departments (EDs) present with acute non-traumatic disorders of consciousness, and up to two percent of patients are in a coma at admission. Therefore, they represent a frequent challenge in emergency medicine[2,3]. Furthermore, they are combined with a very high in-hospital mortality that accounts for 25%-48% of patients in western populations[4,5].

In a previous study examining the etiology and outcome of non-traumatic coma in a tertiary pediatric ED in Egypt, the most frequent etiologies were metabolic (33%), CNS infection (28%) and intracranial hemorrhage (13%). In the ED, 50% of those patients died[6]. Hypothermia, hypotension, flaccidity and poor Glasgow coma scale (GCS) score at admission correlated significantly with mortality. Forty-eight hours after admission, poor pulse volume, poor GCS, abnormal respiratory pattern/apnea and seizures correlated significantly with mortality[6].

Generally, the underlying pathologies of patients with disturbed consciousness have been classified into primary or focal injury to the CNS and secondary affection of the CNS resulting in a diffuse brain dysfunction, such as in metabolic disorder or intoxication[7]. The reported prevalences of structural *vs* metabolic coma varies from 28%-64% and 37%-75%, respectively[8]. The early treatment of these patients is vital, and diagnoses need to be confirmed or excluded promptly because a good outcome significantly depends on early treatment ("time is brain"), *e.g.*, in meningoencephalitis[9] or basilar artery occlusion[10].

There are no data on the pattern of altered consciousness presentation in the EDs in Egypt, which could make proper preparation of the departments for the potential needs regarding these patients suboptimal. Therefore, in this study, we aimed to identify the causes of altered consciousness presentations to the ED at Suez Canal University Hospital (Ismailia, Egypt).

MATERIALS AND METHODS
Study design

This observational, prospective, cross-sectional study was conducted from January 2021 to January 2022.

Study setting

The study was conducted on data of patients admitted to the ED at Suez Canal University Hospital, Ismailia, Egypt.

Study population

This study comprised 87 patients who were ≥ 18-year-old with acute non-traumatic disturbed level of consciousness (DLOC) *i.e.* GCS < 15. Patients with a history of recent head trauma, or with a history of neurological insult with residual altered consciousness or on medications that caused an altered level of consciousness (ALC) were excluded from the study. All data of the patients included in this study were collected after receiving informed written consent from the patients' first-degree relatives.

A pre-organized questionnaire was prepared, which included age, sex, onset of DLOC, and chronic illnesses. Clinical assessment of the patients included vital signs and grading of level of consciousness using the GCS. The appropriate laboratory and radiological investigations were completed to determine etiology of the DLOC. The outcome of the patients was determined as survival or death, and the mortality rate was calculated.

Statistical analysis

Statistical analysis was performed using Statistical Package for the Social Sciences for Windows version 22 (IBM Corp., Armonk, NY, United States). P values < 0.05 were considered statistically significant. The confidence interval was set at 95%.

RESULTS

Baseline characteristics of the study population

The present study showed that the mean age of the studied patients was 60.5 ± 13.6 years (range: 18-93 years). The majority of patients (64.5%) were ≥ 60 years, and 23% of the patients were between the ages of 50-59 years. The majority of the patients (60.0%) were males, with a male to female ratio of 1.5:1. All characteristics are presented in Table 1.

Chronic illnesses of the cohort
Reported chronic illnesses among the patients is shown in Table 2. Hypertension (HTN) and diabetes were the most common chronic illness (43.7% and 34.5%, respectively).

Distribution of the patients according to GCS
The majority of the patients (42.5%) had GCS between 6 and 11, followed by 33.3% of patients with GCS between 11 and 14, and 24.2% of patients with GCS between 3 and 5 (Table 3).

Radiological investigations of the cohort
Computed tomography (CT) was primarily used for radiological investigations. CT of the brain showed that 53.0% of the patients had normal CT findings, while 23.0% of patients had abnormal CT findings. CT was not performed in 24.0% of patients.

Distribution of the causes of non-traumatic DLOC
The most common cause of acute non-traumatic DLOC was systemic infection such as sepsis and septic shock (n = 22, 25.3%), which included urinary tract infection, cellulitis, infected bedsores and sepsis. The next most common causes were respiratory (n = 21, 24.1%) and neurological (n = 16, 18.4%). Among the respiratory causes, coronavirus disease 2019 (COVID-19) accounted for 15.0% of patients (n = 13) and pneumonia accounted for 3.5% of patients (n = 3). Among the neurological causes, stroke represented 8.1% of patients (n = 7) followed by intracranial hemorrhage (7.0%, n = 6); meningitis and status epilepticus were also present at lower rates. Metabolic causes were also found

(11.5%), consisting primarily of diabetic ketoacidosis and dehydration associated with electrolyte disturbances. Further causes are shown in Table 4.

The mortality rate was 25.3% (n = 22), of which 41.0% of the patients died due to systemic infection followed by 31.8% due to respiratory causes (primarily COVID-19) and 13.6% due to oncological causes.

DISCUSSION

This cross-sectional study aimed to determine the causes of non-traumatic disorders of consciousness. We observed that the mean age of these patients was 60.5 ± 13.6 years, with range of 18-93 years, and that more male patients were eligible for participation in this study than females. Our findings were similar to Jung *et al*[11], in which they observed a mean age of 68.81 ± 16.40 years in patients with ALC in the ED. Most of those patients were in their 80 s, accounting for 27.09% of the patients with ALC in the ED; the patients in their 70 s and 80 s also accounted for 53.49% of their study population. Cherukuri and Dhanawade[12] studied patients in the ED of Christian Medical College Hospital, Vellore (India), a tertiary medical care center, from January 2013 to April 2013; moreover, their study population was exclusively > 18 years of age, presenting with acute undifferentiated altered mental state (AMS) *i.e.* GCS < 15, with onset of symptom(s) being no more than 1 wk before ED presentation. Patients with chronic AMS and traumatic brain injuries were excluded from the study. Ultimately, in that study, the mean age was 52.3 ± 17.84 years and they observed a male predominance (62.3%).

Our study observed several chronic diseases, including HTN, diabetes, chronic kidney disease, chronic liver disease, coronary artery disease and cerebrovascular stroke. HTN and diabetes were the most common chronic illnesses (43.7% and 34.5%, respectively). Our findings agreed with Cherukuri and Dhanawade[12], in which 40% of their patients had type 2 diabetes mellitus and 36.8% had systemic HTN. History of smoking was recorded for 11%. These results were similar to the results of the study by Sarker *et al*[13], in which HTN, diabetes, ischemic heart disease, chronic kidney disease and chronic liver disease were identified as chronic illnesses among their study

population. HTN and diabetes mellitus were also the most common (26% and 17%, respectively) in their study.

Our study showed that the mean GCS was 8.5 ± 3.7. The majority of the patients (42.5%) had moderate DLOC, followed by mild and then severe DLOC. In a study by Sarker et al[13], more than half of the patients (53%) had GCS between 6 and 10 (moderate), followed by 27% with GCS between 3 and 5 (severe) and 20% with GCS between 11 and 14 (mild) at the time of presentation. They observed a mean GCS of 7.7 ± 3.1.

In our study, the most common cause of acute non-traumatic DLOC was systemic infection such as sepsis and septic shock (n = 22, 25.3%), followed by respiratory causes (n = 21, 24.1%) and neurological causes (n = 16, 18.4%). Similarly, Jung et al[11] found that the leading cause of ALC in the ED was systemic infection, which accounted for approximately 30% of the cases. The second most common cause was metabolic (21.07%), and the third most common cause was stroke (18.19%), which was diagnosed when the acute CNS symptoms were compatible with the brain lesions found on neuroimaging. Cherukuri and Dhanawade[12] found that neurological conditions were the most important cause for AMS, accounting for 37.1% of their patients. Other etiologies were metabolic and endocrine causes (18%) followed by infections (13%).

In a study by Schmidt et al[14], the main diagnoses were classified into acute primary brain lesions (39%), primary brain pathologies without acute lesions (25%) and pathologies that affected the brain secondarily (36%). In another study by Braun et al[9], in which 58% of the studied patients had neurological causes for coma (intracranial hemorrhage, stroke, and epilepsy), followed by intoxication (16.6%), cardiovascular cause (5.8%) and respiratory cause (5.5%), respectively. Also in a study by Idro et al[15], infections of cerebral malaria were the primary cause of AMS in a study from Ethiopia. Studies of AMS by Sporer et al[16] found that substance abuse was the primary cause. The etiology and the characteristics of patients with DLOC varies between different countries and depends on many factors including regional or demographic backgrounds, location of the hospital, the national health care system and medical resources. Accordingly, our cohort was comprised of an elderly population with multiple comorbidities. Typically,

elderly people are neglected in our society and do not receive prompt treatment of illnesses, which explains why we observed systemic infections as the most common cause of DLOC. In addition, our study was conducted during the COVID-19 pandemic, which may explain the number of patients that presented with acute DLOC due to respiratory causes (15% of the respiratory causes were due to COVID-19).

In our study, the mortality rate was 25.3% (*n* = 22), of which 41% of the patients died due to systemic infection followed by respiratory causes (primarily COVID-19) and oncological causes. It was similar to a study by Forsberg *et al*[17], in which the total hospital mortality was 26.5%. Kekec *et al*[18] also reported higher mortality of 20.1% in patients with AMS. In contrast to our results, the mortality rate among AMS patients in the study by Cherukuri and Dhanawade[12] was 11.5%. Kanich *et al*[2], Leong *et al*[19] and Xiao *et al*[20] reported mortality rates ranging from 9% to 11%.

There were several limitations to this study. First, as this was a single-center study, the sample size was small as our center is a tertiary care facility and only receives patients 3 d/wk. Second, the scope of this study was limited to clinical practice in the ED with exclusion of traumatic DLOC, psychiatric causes and patients with cardiac arrest on presentation to ED. ALC has a wide variation of causes, and it can be challenging and time-consuming to achieve a definitive diagnosis, which may require additional evaluation that is not available in the ED. Moreover, two or more causes can occasionally be present concomitantly. The study was also carried out during outbreaks of COVID-19, which affected the causes of mortality. These obstacles make it challenging to study ALC in the ED, indicating that further study and analysis are needed.

CONCLUSION

DLOC including coma in non-traumatic patients can be caused by a wide variety of pathologies affecting the CNS. They represent a frequent challenge in emergency medicine with a very high in-hospital mortality. Early treatment of these patients is vital and good outcomes depend on early treatment. This cross-sectional study revealed that systemic infection was the most common cause of DLOC, followed by respiratory causes

and neurological diseases. Patients with systemic infections, COVID-19 and oncological diseases had the highest mortality among our studied patients.

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