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The burden of ethanol-positive patients in emergency departments: a clinical evaluation

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ABSTRACT

Aims: Alcohol-related emergency department (ED) admissions pose a significant burden on healthcare systems. This study aims to evaluate the demographic, clinical, and biochemical characteristics of ethanol-positive patients and analyze the impact of blood ethanol levels on the ED.

Methods: This retrospective study included 769 patients who presented to a tertiary care ED between November 1, 2023, and April 30, 2024, with a blood ethanol level ≥50 mg/dl. Patients were categorized into two groups (<200 mg/dl and ≥200 mg/dl), and their demographic data, admission reasons, biochemical parameters, and brain computed tomography (CT) findings were compared.

Results: The mean age of the study population was 38.24±13.81 years, and 80% were male. Patients in the ≥200 mg/dl group were significantly older than those in the <200 mg/dl group. Trauma was the leading cause of ED admission (90% of cases), with falls being more common in the ≥200 mg/dl group (19.9% vs. 8.4%, p<0.001) and assaults being more frequent in the <200 mg/dl group (25.5% vs. 18.2%, p<0.001). Biochemical analysis showed significant elevations in AST, amylase, and lipase levels in the ≥200 mg/dl group. Brain CT scans were performed in 54.4% of patients, with no significant differences in intracranial pathology between groups (p=0.427).

Conclusion: Alcohol-related ED visits contribute to both clinical and operational challenges. Patients with ethanol levels ≥200 mg/dl were more advanced in age and had higher rates of trauma-related admissions, particularly falls. Despite increased brain CT utilization in this group, no significant difference was found in intracranial pathology rates. These findings highlight the need for more selective imaging strategies. Additionally, targeted interventions such as alcohol screening protocols, specialized sobering units, and staff training programs are essential to reducing the burden of alcohol-related ED visits and improving patient care.

Keywords: Alcohol consumption, emergency department burden, blood alcohol content, trauma

INTRODUCTION

Emergency departments (EDs) are critical healthcare units that provide 24/7 medical care to patients with a wide range of conditions, from life-threatening emergencies to non-urgent cases.[1] Their open-access nature results in unpredictable patient flow, frequent overcrowding, and increased pressure on healthcare providers.[2] Limited resources, high patient turnover, and the necessity for rapid decision-making further contribute to ED strain.[1] Among the many challenges EDs face, managing patients under the influence of alcohol is particularly complex, as these cases often require prolonged observation, behavioral interventions, and interdisciplinary coordination, further exacerbating ED workload.[3,4]

Alcohol is one of the most widely misused psychoactive substances worldwide and is a major contributor to morbidity and mortality.[5] According to the World Health Organization, excessive alcohol consumption accounts for approximately 2.6 million deaths annually and is one of the top five risk factors for the global burden of disease.[5,6] Beyond its direct toxic effects—such as liver disease, pancreatitis, and cardiovascular complications—alcohol use significantly increases the risk of accidents, violence, and self-harm.[7,8] In many countries, alcohol-related injuries and intoxications constitute a significant proportion of emergency medical admissions, placing an additional burden on healthcare systems.[9]

Studies indicate that alcohol-related cases comprise 5–9% of all ED admissions, with injury-related cases reaching 17–35% in certain settings.[2] These patients not only require

medical stabilization but also pose unique challenges, such as aggressive behavior, impaired cognitive function, and a higher likelihood of repeat ED visits.[10,11] Moreover, alcohol-related cases contribute to prolonged hospital stays, increased healthcare costs, and a heightened risk of occupational hazards for ED staff.[12] Despite their significant impact, many health systems lack comprehensive data on the true burden of alcohol-related ED visits, highlighting the need for targeted interventions and preventive strategies.[13]

This retrospective study aims to evaluate the clinical and demographic characteristics of patients presenting to the ED with positive blood ethanol levels. The study examines the relationship between blood ethanol levels and biochemical parameters, reasons for admission, and radiological findings, providing a comprehensive overview of the burden alcohol-related cases place on emergency services. By identifying key trends and patient profiles, this study seeks to contribute to the development of evidence-based interventions, improved triage strategies, and targeted public health policies to optimize the management of alcohol-related ED visits.

METHODS

This study was approved by the Scientific Researches Evaluation and Ethics Committee of Ankara Etlik City Hospital (Date: 05.06.2024, Decision No: AEŞH-BADEK-2024-530). All procedures were conducted in accordance with the ethical principles outlined in the Declaration of Helsinki.

This retrospective study was conducted on patients admitted to the ED of a tertiary care hospital. The study aimed to evaluate the demographic characteristics, reasons for presentation, and clinical outcomes of patients who presented to the ED between November 1, 2023, and April 30, 2024, with positive blood ethanol levels. This threshold was selected based on legal regulations, which define a blood ethanol level of ≥50 mg/dl as the threshold for determining ethanol positivity.[14]

Patient data, including demographic information (age, gender), reasons for admission (traumatic injuries, altered consciousness, alcohol intoxication, etc.), treatment interventions in the ED, and discharge outcomes, were retrospectively retrieved from the hospital's electronic medical record system.

Although there is no universally accepted threshold for severe alcohol intoxication, many studies consider a blood ethanol level of ≥200 mg/dl as indicative of severe intoxication.[15-17] Based on this, patients in our study were classified into two groups:

- Mild to moderate exposure: Blood ethanol level <200 mg/dl
- Severe exposure: Blood ethanol level ≥200 mg/dl

These groups were compared in terms of reasons for admission, Glasgow Coma Scale (GCS) scores, blood test results, and brain computed tomography (CT) findings.

Inclusion Criteria

- Patients aged 18 years and older,
- Patients with blood ethanol level ≥50 mg/dl.

Exclusion Criteria

- Patients younger than 18 years,
- Patients with incomplete or inadequate medical records,
- Patients transferred to another facility before completion of their ED evaluation,
- Patients with confirmed pregnancy.

RESULTS

A total of 769 patients were included in the study, with a mean age of 38.24±13.81 years. Among them, 80% were male. Patients were categorized into two groups based on their blood ethanol levels: <200 mg/dl and ≥200 mg/dl. A total of 346 patients had a blood ethanol level of <200 mg/dL. Patients in the ≥200 mg/dl group were significantly more advanced in age compared to those in the <200 mg/dl group (Table 1).

No significant difference was observed between the two groups in terms of glucose, pH, and lactate levels (p>0.05) (Table 1).

Ninety percent of the patients presented to the ED due to trauma-related causes. The most common reasons for admission were assault, falls, and traffic accidents. Patients in the ≥200 mg/dl group had a significantly higher rate of falls compared to those in the <200 mg/dl group. In contrast, assault-related admissions were more frequent in the <200 mg/dl group (Table 2).

A total of 9.4% of patients presented with alcohol intoxication, while 2.2% were admitted due to suicidal ideation. There was no statistically significant difference between the two groups regarding these admission reasons (p>0.05) (Table 2).

The GCS scores at admission were similar between the two groups, with a median value of 15 (IQR: 15–15). Brain CT was performed in 54.4% of the patients; however, there was no significant difference in CT scan rates between the groups (p=0.077) (Table 3).

Upon evaluation of brain CT findings, 85.5% of the patients had normal results. There was no statistically significant difference between the groups regarding intracranial pathologies (p=0.427). Similarly, no significant differences were observed between the groups in terms of fracture (4.5%), hemorrhage (1.8%), fracture+hemorrhage (0.9%), maxillofacial fracture (3.2%), and other brain CT abnormalities (4.9%) (p>0.05) (Table 3).

DISCUSSION

This study aimed to assess the impact of alcohol consumption on ED by evaluating the demographic, clinical, and biochemical characteristics of patients with positive blood ethanol levels. Our findings indicate that higher ethanol levels were associated with significant alterations in certain biochemical parameters and variations in trauma-related admissions among specific subgroups.

Among our patient cohort, 80% were male, consistent with existing literature, where gender distribution varies significantly by age and geographic region.[18,19] White et al.[2]

Table 1. Comparison of groups based on ethanol levels

		<200 mg/dl	≥200 mg/dl	p value/ 95% CI
Age		32 (24-43)	40 (30.5-53)	<0.001*
Gender	Female (n, %)	82 (23.7)	72 (18.0)	0.051†
	Male (n, %)	264 (76.3)	351 (82.0)	
Ethanol (mg/dl)		153.00 (126-177.8)	262.00 (228.00-318.00)	<0.001*
Glucose (mg/dl)		101.00 (89.0-118.7)	102.00 (91.00-117.00)	0.322*
pH		7.37 (7.32-7.39)	7.37 (7.32-7.40)	0.133*
Bicarbonate (mmol/L)		22.20 (20.20-24.00)	22.80 (20.60-24.75)	0.008*
Base excess (mmol/L)		-3.03±4.05	-2.40±3.32	0.028/(-1.138- -0.063) ‡
Lactate (mmol/L)		2.52 (1.90-3.37)	2.55 (1.93-3.43)	0.996*
AST (U/L)		27.00 (21.00-36.00)	30.00 (24.00-49.50)	<0.001*
ALT (U/L)		22.00 (17.00-34.00)	24.00 (16.50-37.00)	0.372*
Amylase (U/L)		61.80 (48.50-79.00)	64.00 (51.00-90.00)	0.024*
Lipase (U/L)		31.70 (23.85-42.95)	38.40 (26.30-61.40)	<0.001*

*Mann Whitney U test, median (25-75%), †Pearson Chi-square test, n (%), ‡Independent Samples test, mean±SD, AST: Aspartate aminotransferase, ALT: Alanine aminotransferase

Table 2. Comparison of admission reasons and brain CT utilization between groups

Admission reason		<200 mg/dl	≥200 mg/dl	p
Traffic accident		52 (15.1)	48 (11.2)	<0.001†
Assault		88 (25.5)	78 (18.2)	
Falls		29 (8.4)	85 (19.9)	
Other		129 (37.3)	157 (36.7)	
Lacerations		10 (2.9)	7 (1.6)	
Suicide attempt		8 (2.3)	9 (2.1)	
Alcohol intoxication		29 (8.4)	44 (10.3)	
Admission GCS		15.0 (15.0-15.0)	15.0 (15.0-15.0)	
Brain CT performed?	Yes	176 (50.9)	245 (57.2)	0.077†
	No	170 (49.1)	183 (42.8)	

†Pearson Chi-square test, n (%), GCS: Glasgow Coma Scale, CT: Computed tomography

Table 3. Comparison of brain CT findings between groups

Brain CT findings	<200 mg/dl (n, %)	≥200 mg/dl (n, %)	p
Normal	294 (85.0)	368 (86.0)	0.427†
Fracture	21 (6.1)	14 (3.3)	
Hemorrhage	5 (1.4)	9 (2.1)	
Fracture+hemorrhage	4 (1.2)	3 (0.7)	
Maxillofacial fracture	12 (3.5)	19 (4.4)	
Other	10 (2.9)	15 (3.5)	

†Pearson Chi-square test, n (%), CT: Computed tomography

reported a 68% male predominance in a 9-year analysis of alcohol-related ED admissions in the United States. Similarly, Lotfipour et al.[19] found that 55% of alcohol-positive ED patients were male. The high proportion of male patients in our study may be attributed to the younger age distribution and the predominance of trauma-related admissions. Furthermore, 57% of male patients and 47% of female patients were classified as heavy alcohol users, a finding that aligns with previous studies.[19]

Analysis by age revealed a statistically significant increase in heavy alcohol consumption with advancing age. Lotfipour et al.[19] similarly reported a progressive increase in alcohol intake with age. This trend is consistent with both sociocultural expectations and previous research, which suggest that individuals tend to consume more alcohol as economic stability improves and tolerance develops due to regular alcohol use.[5,19,20]

When evaluating biochemical parameters, our results demonstrated that higher ethanol levels were associated with significant changes. In particular, aspartate aminotransferase (AST), amylase, and lipase levels were significantly elevated in the high-ethanol group, in line with previous studies linking alcohol consumption to hepatocellular damage, elevated pancreatic enzyme levels, and metabolic acidosis.[22-24] Approximately 70% of pancreatitis cases are reported to be alcohol-related.[25] Despite these biochemical findings, no major clinical pathology related to heavy alcohol consumption was detected in our cohort. This may be attributed to the fact that nearly 90% of patients presented due to trauma, while only a small proportion sought medical attention for alcohol intoxication or suicide attempts. Although our study did not specifically assess acute versus chronic alcohol consumption, the high proportion of trauma-related admissions suggests that acute alcohol effects were predominant.

Blood glucose analysis revealed no significant difference between patients with heavy and light alcohol intake. While alcohol consumption is known to predispose individuals to hypoglycemia, our findings suggest that blood glucose levels should be evaluated independently of alcohol intake when assessing patients in the ED.[26-28]

Regarding presentation patterns, our results indicate that approximately 90% of patients presented due to trauma, with only 2.2% due to suicidal ideation and 9.4% due to alcohol intoxication. Among trauma cases, falls were more common in the severe ethanol group, whereas assault-related admissions were more frequent in the mild ethanol group. This finding is consistent with the negative effects of alcohol on motor coordination and balance, which have been well-documented in the literature.[2,29,30] Previous studies have shown that acute alcohol intoxication increases the risk of falls by two to three times.[31,32] Our findings align with these reports, as heavy alcohol intake was associated with suppressed consciousness and heightened neurological impairment, leading to more frequent falls, whereas mild alcohol consumption was more often linked to aggressive behavior and assault cases.[10,11,33]

Evaluation of brain CT scans revealed that 58% of those undergoing imaging were in the severe ethanol group. However, approximately 85% of both mild and severe cases had normal CT findings, and the incidence of intracranial hemorrhage or fractures did not differ significantly between groups. The remaining 15% of cases exhibited similar pathology distributions. It is noteworthy that, despite a higher proportion of CT imaging in severe cases, no significant differences were observed in outcomes. While more severe cases naturally require central nervous system evaluation, these findings raise important questions regarding cost-effectiveness and the necessity of routine neuroimaging in alcohol-intoxicated patients.[17,30] The lack of significant difference in GCS scores between mild and severe cases further supports this observation. Although this study did not aim to evaluate neuroimaging criteria specifically, our results may serve as a valuable reference for future research on the appropriateness of CT scanning in alcohol-intoxicated patients.

The relationship between excessive alcohol consumption and severe head trauma remains controversial in the literature. While some studies suggest that high blood alcohol levels exacerbate traumatic brain injury severity, others propose that alcohol may exert a neuroprotective effect via cerebral vasodilation.[34-36] Stuke et al.[37] analyzed the GCS scores of over 55.000 patients with positive blood alcohol levels and found that alcohol presence did not significantly reduce GCS scores in head trauma cases compared to alcohol-negative patients. These findings have been corroborated by other studies.[36,38] Conversely, Pandit et al.[35], in their study of 23.000 patients, found no evidence supporting a neuroprotective effect of alcohol and reported that ethanol-positive patients experienced a higher incidence of complications. This highlights the need for further studies to strengthen the existing literature in this field.

When considered collectively, these results suggest that the burden of alcohol-related ED admissions extends beyond clinical challenges to operational and economic concerns. Patient aggression, personnel safety risks, prolonged ED stays, and the increased demand for radiological imaging pose significant challenges to ED efficiency.[10-12,39] We believe that various strategies could be implemented to optimize the management of alcohol-related ED visits, including; expanding alcohol screening protocols in EDs, establishing specialized sobering units for severe alcohol intoxication cases, providing ED staff with training on aggressive patient management, enhancing public awareness and preventive public health programs. By implementing these strategies, the strain on ED resources can be mitigated, patient care can be improved, and the overall burden of alcohol-related admissions on healthcare systems may be reduced.

Limitations

This study has several limitations. First, its retrospective design limited data collection, preventing the evaluation of additional variables based on patient histories. Second, the study was conducted in a single center, which may limit the generalizability of the results. Future multicenter studies will provide a more robust foundation for these findings. Third, long-term clinical outcomes were not assessed, and patient status following ED discharge remains unknown. Finally, a blood ethanol level of ≥50 mg/dl was used as the threshold, but given the variability in threshold definitions across the literature, this factor should be considered when interpreting the results.

CONCLUSION

This study examined the effects of high ethanol levels by evaluating the clinical, biochemical, and radiological characteristics of alcohol-positive patients presenting to the ED. Our findings indicate that patients with ethanol levels ≥200 mg/dl were more advanced in age, exhibited significant alterations in biochemical markers, and had a higher incidence of falls. The implementation of targeted strategies for alcohol use can help alleviate the burden of alcohol-related ED admissions, enhance patient care, and optimize healthcare resource utilization.

ETHICAL DECLARATIONS

Ethics Committee Approval

This study was approved by the Scientific Researches Evaluation and Ethics Committee of Ankara Etlik City Hospital (Date: 05.06.2024, Decision No: AEŞH-BADEK-2024-530).

Informed Consent

Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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