

Risk Assessment in Patients with Acute Alcohol Intoxication

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Abstract. *Aim: Patients with acute alcohol intoxication present a serious and still growing problem for pre- and intra-hospital emergency services. Data on the clinical risk assessment of alcohol-intoxicated patients are sparse. The aim of the present work was, therefore, to collect and assess relevant risk parameters. Materials and Methods: At the Mannheim University Hospital, the medical records of 844 alcohol-intoxicated Emergency Department patients were retrospectively studied and evaluated. Results: The patients with alcohol intoxications were predominantly males with an average age of 45 years. Mean blood alcohol concentration was 0.28%. The rate of haemodynamic, respiratory or metabolic complications in these patients was low. In 43% of cases, there was moderately to severely impaired consciousness. About half of the patients were treated on an outpatient basis. Conclusion: Our data demonstrate a low clinical risk for alcohol-intoxicated patients. Nevertheless, it is necessary to provide a defined monitoring standard in order to also be prepared for the few potential complications of alcohol intoxication and the possible differential diagnoses of impaired consciousness.*

Acute cases of alcohol intoxication remain a particular challenge for clinical and non-clinical emergency facilities (1). The portion of acute alcohol intoxication among all patients treated is in the range of 0.6% to 6% of all clinical emergency treatments in Europe (2-5). Our own data from the emergency room of the Mannheim University Hospital show a comparable portion of alcohol intoxication in the emergency population, amounting to 2.6% (6). There is

unanimity in the expectation that the number of alcohol-intoxicated patients – estimated from the observed increase in recent years – will continue to rise even further (7). A similar trend is revealed by recent experience in paediatric emergency medicine with alcohol-intoxicated children and adolescents (8, 9). In general, the actual conditions of acute care for patients with alcohol intoxication are considered to be particularly difficult in many emergency rooms. Patients suffering from alcoholism are often characterized by impaired physical and social life situations, aggressive behaviour and poor compliance. This can cause significant trouble in the regular operations of a clinical Emergency Department (10). Despite this considerable burden on emergency facilities by alcohol-intoxicated patients, there is little knowledge about the clinical risk in this patient population. The cerebral effects of alcohol are manifold and depend primarily – in the context of acute intoxication – on blood alcohol concentration (11, 12). However, in chronic alcohol abuse, the development of tolerance may result in considerable inter-individual variation regarding the severity of symptoms. The correlation of clinical symptoms with blood alcohol concentration is, therefore, only of limited usefulness in clinical practice. A close correlation between alcohol intoxication and trauma is well-documented (13-17). This primarily affects patients from the emergency trauma surgery population, which are very often inebriated, but also primarily alcohol-intoxicated patients, where secondary injuries are not infrequently found during emergency treatment (6). However, little is known about metabolic, haemodynamic or other complications of alcohol intoxication, but there is some evidence of increased alcohol-associated risk for hypoglycaemia, hypotension and hypothermia, as well as electrolyte disturbances (18-20).

The available data regarding alcohol-related symptoms and findings are sparse. The aim of the present study was, therefore, to provide a more accurate risk assessment of alcohol-intoxicated patients, especially with regard to metabolic complications and other prognostically important vital parameters.

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Materials and Methods

Study design. During a period of four years 844 patients with alcohol intoxication had been treated in the emergency room of our Hospital. In the present study, the medical records of these patients were systematically evaluated. The parameters of age, gender, systolic and diastolic blood pressure, heart rate, body temperature, oxygen saturation, laboratory values including blood alcohol concentration, blood glucose, electrolytes, and liver-specific enzymes as well as the degree of consciousness impairment on the Glasgow Coma Scale (GCS) and the further patient management were retrospectively recorded.

Statistical analysis. Continuous variables are expressed as mean, standard deviation (SD), 95% CI and range (min–max). For non-continuous variables, numbers (%) were used. All calculations were performed with InStat (GraphPad Software).

Results

Patients' characteristics. The records of 844 patients were evaluated. Of these, 649 were male (77 %) and 195 were female (23 %). A mean age of 45 years was determined, with the youngest patient being 15 years old and the oldest patient 85. Patients' characteristics are shown in Table I.

Hemodynamic parameters. Mean systolic blood pressure was 121 mmHg (range 60-230 mmHg). Twenty-one patients (2.1 %) had a systolic blood pressure <100 mmHg and 46 patients (5.4 %) had a systolic blood pressure >140 mmHg. Mean diastolic pressure was 75 mmHg. Mean heart rate was 88 bpm with a range of 50-190 bpm. Eighty-two patients (9.7%) demonstrated tachycardia at admission with a heart rate >100 bpm. Three patients (0.04 %) had a heart rate <60 bpm). The values for oxygen saturation amounted to an average of 95% (range=50-100%). Ten patients (1.2 %) had an oxygen saturation at admission <90% (Table I).

Laboratory results. Mean blood alcohol concentrations (BAC) was 0.28%. The maximum was 0.535%. In our patient population, the portion of severe or potentially life-threatening alcohol intoxications (BAC >0.3%) was 36 %. 64% of the patients had BAC levels <0.3% (Figure 1). The blood glucose values were on average at 114 mg/dL. Only one patient (0.1 %) had a blood glucose value <60 mg/dL. The glucose value of this patient was 52 mg/dL within the meaning of a moderate hypoglycaemia. The highest value was 411 mg/dL. The portion of patients with values >140 mg/dL was 14%. Mean values for sodium and potassium were within the normal range. Increased mean values were found for the liver-specific enzymes alanine aminotransferase (ALT mean 79 U/L, maximum 1539 U/L), aspartate aminotransferase (AST mean 142 U/L, maximum 4936 U/L) and lactate dehydrogenase (LDH mean 291 U/L, maximum 841 U/L). Mean normal values were documented for bilirubin. Table I shows the documented laboratory values.

Table I. Baseline characteristics, hemodynamic parameters and blood values of 844 patients with alcohol intoxication.

Characteristic	All patients (n=844)
Age, years	
Mean	45±13
Range	15-85
Gender	
Male, n (%)	649 (77)
Female, n (%)	195 (23)
Heart rate, beats/min	
Mean±standard deviation	88±28
Range	50-190
95% confidence interval	94-110
Systolic blood pressure, mmHg	
Mean±standard deviation	121±27
Range	60-230
95% confidence interval	123-144
Diastolic blood pressure, mmHg	
Mean±standard deviation	75±12
Range	50-130
95% confidence interval	93-110
Oxygen saturation, %	
Mean±standard deviation	95±2
Range	50-100
95% confidence interval	95-98
Temperature, °C	
Mean±standard deviation	36.8±0.8
Range	33.0-39.0
95% confidence interval	36.9-37.5
Baseline laboratory values	
Ethanol, %	
Mean±standard deviation	0.28±0.035
Range	0.03-0.5
95% confidence interval	0.09-0.35
Glucose, mg/dL	
Mean±standard deviation	114±57
Range	52-411
95% confidence interval	126-156
Alanine aminotransferase (ALT), U/L	
Mean±standard deviation	79±68
Range	8-1539
95% confidence interval	59-97
Aspartate aminotransferase (AST), U/L	
Mean±standard deviation	142±115
Range	16-4936
95% confidence interval	105-166
Lactate dehydrogenase (LDH), U/L	
Mean±standard deviation	291±152
Range	43-841
95% confidence interval	179-369
Bilirubin, mg/dL	
Mean±standard deviation	1.2±1.3
Range	0.12-7.95
95% confidence interval	1.0-1.4
Sodium, mmol/L	
Mean±standard deviation	4.0±0.49
Range	2.3-5.7
95% confidence interval	3.9-4.0
Potassium, mmol/L	
Mean±standard deviation	140±4.9
Range	119-162
95% confidence interval	139-140

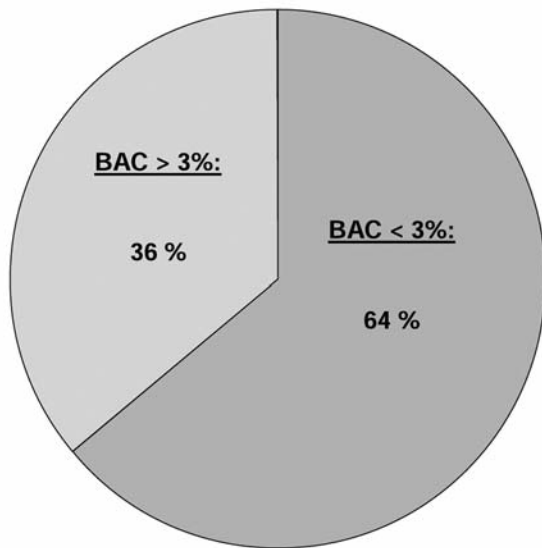


Figure 1. Blood alcohol concentrations (BAC) (%) of patients presenting with alcohol intoxication at the emergency room (n=844).

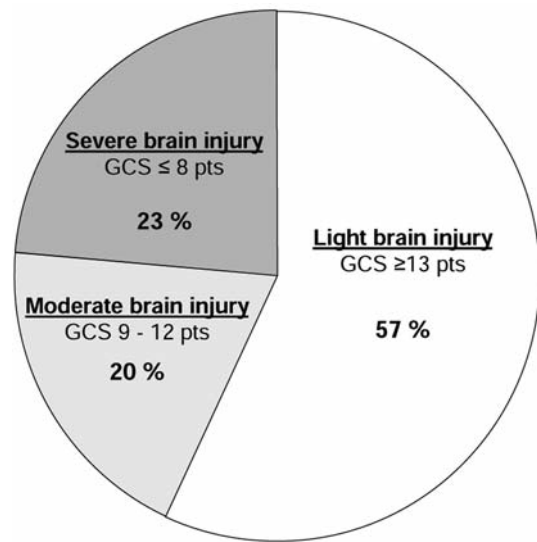


Figure 2. Impairment of consciousness of patients presenting with alcohol intoxication at the emergency room (n=844).

Glasgow coma scale. In Figure 2 the GCS values of the alcohol-intoxicated patients are presented. 57% of the patients exhibited only slight, 20% moderate and 23% severe impairment of consciousness. All patients with higher degrees of consciousness impairment recovered without complications over the further course. Coma-induced respiratory failure necessitating mechanical ventilation was not registered in any case.

Patient management. Figure 3 shows the further management of the patients. 71% of the alcohol-intoxicated patients could be discharged from the emergency room without complications. 26% of the patients were hospitalized on a medical and 3% on a psychiatric ward.

Discussion

The care of patients with acute alcohol intoxication is becoming more and more difficult for emergency medical services as well as for many emergency rooms. Nevertheless, knowledge of the risks and complications of alcohol intoxication is very limited. There is an almost complete lack of generally applicable standards or recommendations for the diagnostics and therapy of these patients in accordance to the risks. Thus, the aim of the present study was to provide a more accurate assessment of the clinical risk of these patients with special emphasis on metabolic, haemodynamic and respiratory vital parameters.

In our study the files of 844 patients with alcohol intoxication and associated conditions were analyzed with

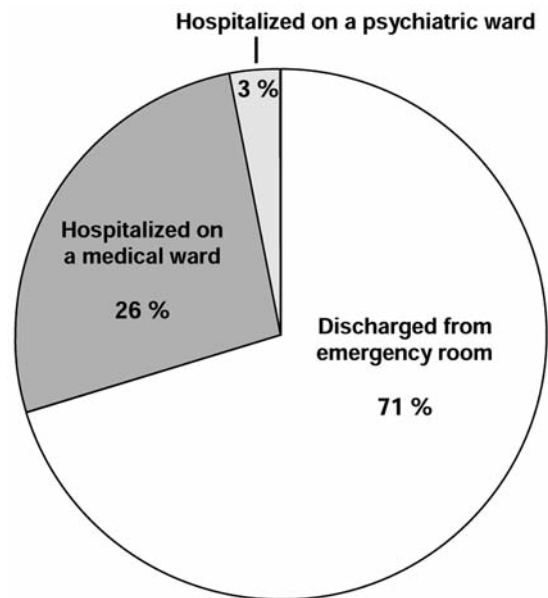


Figure 3. Patient Management of patients presenting with alcohol intoxication at the emergency room (n=844).

regard to defined risk criteria. The patient population comprised predominantly of male and only about a quarter of female patients. The average blood alcohol concentration in our patient population amounted to 0.28% with a maximum value of 0.535%. Thirty-six percent of patients had potentially life-threatening BAC levels >0.3%. These

values demonstrate high alcohol tolerance for many of the patients studied and thus a large portion of chronic alcohol abuse.

On average, the detected patients were haemodynamically stable. Only few cases of hypo- or hypertension and tachycardia were documented. Relevant cases of bradycardia were very rare. These patients could all be stabilized without any problems. Severe hypothermia $<30^{\circ}\text{C}$ was not found – not even in winter. Oxygen saturation as an important respiratory criterion was also within a tolerable range. Only few cases of transitory desaturation were observed, which could be rectified without any complications. In no case patient monitoring on intensive care was necessary due to haemodynamic or respiratory instability.

Another important point concerned the issue of metabolic complications. The portion of uncontrolled blood-sugar levels was surprisingly low in our patient population. Only one case of moderate hypoglycaemia ($<60\text{ mg/dL}$) was observed. The documented values for electrolytes were also normal on average. Increased values were found for the liver-specific enzymes, which is not surprising due to the high portion of alcohol tolerance in chronic alcohol abuse.

Furthermore, consciousness impairment in the context of alcohol intoxication was studied. This is usually assessed using the Glasgow Coma Scale, published in 1976 by Teasdale and Jennett, in order to prognostically assess vigilance impairment specifically in the context of cranio-cerebral trauma (21). Recent studies show, however, that the GCS criteria may be applicable to intoxication-related consciousness impairment as well (22). A Glasgow Coma Score of <8 points usually indicates serious impairment. When documenting alcohol-associated impairment of consciousness, a relatively high portion of moderate to severe impairment amounting to 43% on the Glasgow Coma Scale was demonstrated in the present evaluation.

Thus, our data demonstrate a low alcohol-associated clinical risk. Almost half of the patients could be discharged from the emergency room without complications. About one-quarter of the patients were hospitalized on a medical ward. In most cases hospitalization was necessitated by poor general condition associated with chronic alcohol abuse, in some cases also development of a delirious alcohol withdrawal syndrome over the course of the treatment. 3% of patients were hospitalized on a psychiatric ward – usually with the goal of a withdrawal therapy.

The low clinical risk for patients with alcohol intoxication documented in the context of our study cannot conceal the fact that even the few cases of pathological findings necessitate a safe monitoring standard for these patients. Such a standard should also include those risks that were not considered in our study. These include mixed intoxications with psychoactive drugs and other substances that may potentially exert a synergistic effect with alcohol (4, 23, 24).

Additionally, the various traumatic and non-traumatic differential diagnoses of unclear coma must be taken into account when treating intoxicated patients (25). Such recommendations must also incorporate assistance and support such as psychiatric evaluations with the goal of continuative withdrawal therapies, although such measures can traditionally be implemented only to a limited degree in busy emergency rooms (26). There are a number of specific therapy approaches such as the use of metadoxin which increases ethanol elimination and shortens the effective time of the alcohol (27-29). However, it has not yet been clarified whether metadoxin affects only the time factor or indeed improves patient safety in case of alcohol intoxication. Other approaches include non-clinical care strategies that have been effective in individual cases only (30). Ultimately, thorough clinical and laboratory monitoring primarily remains the most effective and most important mainstay in ensuring the reliable care of patients with alcohol intoxication. The long-term challenge will be to develop, based on the present data, specific standards for the adequate care of these patients.

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