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Craniocerebral Injuries and the Glasgow Coma Scale Score in the Patients under the Influence of Alcohol Admitted to Hospital Emergency Department

Urazy czaszkowo-mózgowe a punktacja Glasgow Coma Scale u pacjentów pod wpływem alkoholu przyjmowanych do szpitalnego oddziału ratunkowego

Małgorzata Kołpa¹, Aneta Grochowska¹, Agnieszka Gniadek²,
Beata Jurkiewicz¹, Marta Gondek²

¹Department of Nursing, Institute of Health Sciences,
State Higher Vocational School in Tarnów, Poland

²Institute of Nursing and Obstetrics, Faculty of Health Sciences,
Jagiellonian University — Collegium Medicum, Cracow, Poland

Abstract

Introduction. Alcohol abuse constitutes a significant social and health problem in Poland. Consumption of even a small amount of alcohol causes an increase in the probability of the injury.

Aim. The objective of the thesis was to determine the relationship between the scoring in the Glasgow Coma Scale and head injuries in the patients under the influence of alcohol admitted to the Hospital Emergency Department in an urgent mode.

Material and Methods. On the basis of the retrospective analysis the group of 210 intoxicated patients of the Hospital Emergency Department of the University Hospital in Cracow (167 men and 43 women) who sustained head injuries during the period from 1st May 2011 to 1st May 2012 was examined. The data included in the medical documentation, such as: age, gender, result of the scoring in the Glasgow Coma Scale, blood alcohol level, sustained head injuries on the basis of the CT examination and selected co-existing post-traumatic disorders were taken into consideration.

Results. Among the patients with high blood alcohol level there were people with both high and low results in the Glasgow Coma Scale. The patients with fractures of the facial bones and skull base, epidural haematoma, pericerebral haematoma, subdural haematoma, intracerebral haematoma, subarachnoid haematoma, cerebral edema, displacement of the ventricular system and blood in the location of the cerebellar tentorium had the lower scoring in the Glasgow Coma Scale than other patients. The lowest score in the Glasgow Coma Scale had the patients who fell from height, the highest one — patients after a suicide attempt.

Conclusions. Blood alcohol level did not have an influence on the scoring in the Glasgow Coma Scale. There is a relationship between the scoring in the Glasgow Coma Scale and head injuries. The GCS score depended on the symptoms that co-exist with the head injuries. The mechanism (cause) of sustained head injury determined the score in the Glasgow Coma Scale. (JNNN 2015;4(2):56–61)

Key Words: alcohol, craniocerebral injury, the Glasgow Coma Scale, hospital emergency department

Streszczenie

Wstęp. Nadmierne spożywanie alkoholu jest w Polsce istotnym problemem społecznym i zdrowotnym. Przyjęcie nawet niewielkiej dawki alkoholu powoduje wzrost prawdopodobieństwa urazu.

Cel. Celem pracy było określenie związku pomiędzy punktacją w skali Glasgow a urazami głowy u pacjentów w stanie nietrzeźwości doraźnie przyjmowanych do Szpitalnego Oddziału Ratunkowego.

Materiał i metody. Na podstawie analizy retrospektywnej przebadano grupę 210 nietrzeźwych pacjentów SOR Szpitala Uniwersyteckiego w Krakowie (167 mężczyzn i 43 kobiety), którzy w okresie od 01.05.2011 r. do 01.05.2012 r. doznali urazu głowy. Brano pod uwagę dane dostępne w dokumentacji medycznej: wiek, płeć, wynik punktacji

w skali Glasgow, poziom alkoholu we krwi, doznane obrażenia głowy na podstawie wyniku tomografii komputerowej oraz wybrane współtowarzyszące zaburzenia pourazowe.

Wyniki. Wśród pacjentów z wysokim poziomem alkoholu były osoby zarówno z wysokimi, jak i niskimi wynikami w skali Glasgow. Pacjenci ze złamaniami kości twarzoczaszki i podstawy czaszki, krwakiem nadwardówkowym, przymózgowym, podwardówkowym, śródmózgowym i podpajęczynówkowym, obrzękiem mózgu, przemieszczeniem układu komorowego oraz krwią w lokalizacji namiotu mózdzku, mieli niższą punktację w skali Glasgow niż pozostali chorzy. Najniższy wynik w skali Glasgow miały osoby, które upadły z wysokości, najwyższy — pacjenci po próbie samobójczej.

Wnioski. Poziom alkoholu we krwi nie miał wpływu na wynik punktacji w skali Glasgow. Istnieje zależność pomiędzy punktacją w skali Glasgow a obrażeniami głowy. Punktacja GCS zależała od objawów współtowarzyszących obrażeniom głowy. Przyczyna doznanego urazu głowy determinowała wynik punktacji w skali Glasgow. (PNN 2015; 4(2):56–61)

Słowa kluczowe: alkohol, uraz czaszkowo-mózgowy, skala Glasgow, szpitalny oddział ratunkowy

Introduction

Alcohol abuse constitutes a significant social and health problem in Poland [1]. The data collected by World Health Organization suggest that alcohol use results in the death of 2.5 million people in the world per year where about 320.000 are young people within the age group of 15–29. Alcohol is related mainly to deaths caused by injuries, neoplasms, cardiovascular diseases and liver cirrhosis [2].

According to relevant literature, consumption of even a small quantity of alcohol within 6 hours preceding the occurrence of the accident increases its probability by at least 1.5 times [3] whereas consumption of 60 grams of alcohol by as many as 3–4 times [4].

Currently, the most common scale applied to assess the patient after head injury is Glasgow Coma Scale (GCS) that is used for qualitative determination of the level of consciousness [5,6]. Contrary to initial assumptions stating that alcohol supposedly considerably decreased GCS score in patients after the head injury, this hypothesis has not been clearly confirmed. Alcohol lowers the GCS results only to a negligible clinically insignificant extent. It must be emphasized that assignment of low GCS scoring only to intoxication significantly delays the start of diagnostics and treatment as well as it worsens the prognoses of the patients [7]. Literature states that in all cases of consciousness disorders it is necessary to perform computed tomography (CT) examinations [8].

Withdrawal from the performance of the immediate CT examination may be justified only by the necessity of urgent performance of another life-saving surgery [9].

With the lack of clear symptoms of the intracranial injury the clinical condition of the patient is estimated for 13–14 points in the Glasgow Coma Scale due to intoxication. Assessment of the condition of the person under the influence of alcohol is more difficult as the parameters used in the neurological evaluation do not apply. As the literature states the intracranial injuries

detected in the CT examination in this group of patients reach 8.4% [10].

The objective of the thesis was to determine the relationship between the scoring in the Glasgow Coma Scale and head injuries in the patients under the influence of alcohol admitted to the Hospital Emergency Department in an urgent mode.

Material and Methods

On the basis of the retrospective analysis the group of 210 intoxicated patients who were admitted to Hospital Emergency Department of the University Hospital in Cracow during the time period from 1st May 2011 to 1st May 2012 due to the head injury were examined. In the examined group men (n=167, 79.52%) aged from 19 to 76 prevailed whereas the age range of women was from 18 to 74 (n=43, 20.48%). The average age of the respondents was 43.22 (± 15.47). The medical documentation was analyzed taking into account such data as: age, gender, scoring in the Glasgow Coma Scale, blood alcohol level, sustained head injury on the basis of the result of the CT examination and selected co-accompanying post-traumatic disorders.

The following tests were applied to the statistical analysis: the Mann-Whitney test, chi-square test, the Kruskal-Wallis test and Spearman's rank correlation coefficient. The results for which materiality level was lower or equalled 0.005 were considered to be statistically significant.

Results

The average scoring in the Glasgow Coma Scale among respondents was 13.83 (± 2.07). The lowest result was 3 points, the highest result was 15 points. The level of ethyl alcohol in the blood in the examined group was

on average 2.58% (± 1.11). This range fluctuated from 0.22‰ to 6.29‰.

On the basis of the conducted analysis it was proved that the most common causes of the injury in the examined group was fall on even surface ($n=97$, 46.19%) and battery ($n=36$, 17.14%). In the event of 4 people (1.90%) the head injury was a result of the suicide attempt (Figure 1).

The following most frequently accompanied the head injury: arousal and confusion ($n=36$, 17.14%), afterwards loss of consciousness ($n=33$, 15.71%) as well as dizziness and headaches ($n=30$, 14.29%). Peri-traumatic amnesia affected 24 respondents (11.43%), pathological pupillary response — 19 respondents (9.05%), whereas nausea/vomiting — 17 respondents (8.10%). 12 patients were completely unconscious (5.71%), 11 patients (5.24%) with bloody discharge from the ear/nose, 10 patients (4.76%) with periorbital ecchymosis. Wounds of the skin integuments were noted in 64 patients (30.48%).

Computed tomography of the head in the majority of patients did not confirm post-traumatic changes within the osseous structures ($n=158$, 75.24%). In the remaining patients the injury caused fracture of facial bones ($n=37$, 17.62%), basal skull fracture ($n=9$, 4.29%), temporal bone fracture ($n=6$, 2.86%) and skull fracture with invagination ($n=6$, 2.86%).

Furthermore, in most of the patients the signs of intracranial haemorrhage ($n=177$, 84.29%) were not detected in the CT examination. What is more, post-traumatic intracerebral changes were detected in 33 patients (15.71%): focal cerebral contusion ($n=13$, 6.19%), subdural haematoma ($n=10$, 4.76%), epidural haematoma ($n=9$, 4.29%), displacement of the ventricular system ($n=8$, 3.81%), subgaleal haematoma ($n=6$, 2.86%), pericerebral haematoma ($n=6$, 2.86%), intracerebral haematoma ($n=5$, 2.38%), cerebral edema ($n=5$, 2.38%), subarachnoid haemorrhage ($n=3$, 1.43%) and blood in the location of the cerebellar tentorium ($n=3$, 1.43%).

Vast majority of the patients was brought by emergency medical services ($n=159$, 75.71%) whereas 51 people reached Hospital Emergency Department in a different way (24.29%).

Neurosurgical consultation were provided for 46 patients (21.90%) and a large majority of the patients did not have any indications to consultation ($n=164$, 78.10%).

In the examined group the majority of respondents did not require hospitalization ($n=162$, 77.14%). 48 patients (22.86%) were admitted to hospital for further treatment whereas 18 patients (8.57%) were admitted to the Department of Traumatology of the Emergency

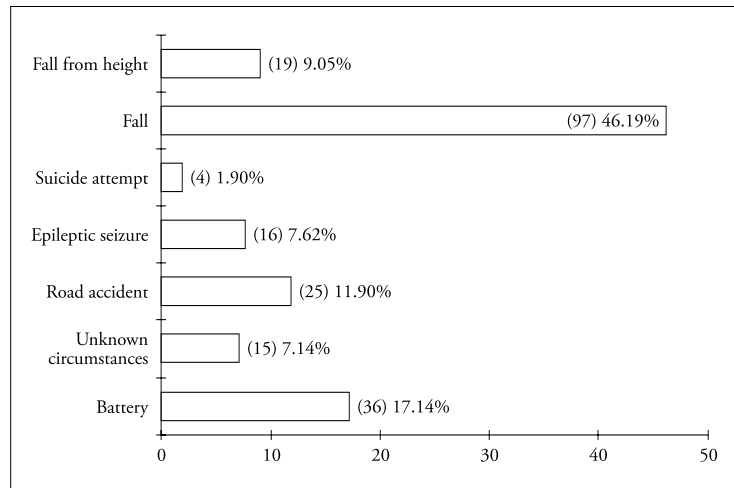


Figure 1. Mechanism (Cause) of the head injury among the examined people

Medicine Clinic, 17 patients (8.09%) to the Department of Neurosurgery and Neurotraumatology, 7 patients (3.33%) to the Intensive Care Unit, 4 patients (1.9%) to the Department of Toxicology and 2 patients (0.95%) to the Clinic of Psychiatry.

Relationship between the scoring in the Glasgow Coma Scale and head injuries, such as: fracture of the facial bones and basal skull, epidural haematoma, pericerebral haematoma, subdural haematoma, intracerebral haematoma and subarachnoid haematoma as well as cerebral edema, displacement of the ventricular system and blood in the location of the cerebellar tentorium was observed. The patients who sustained the above-mentioned injuries had the lower scoring in the Glasgow Coma scale than other patients ($p<0.05$) (Table 1).

Significant relationship ($r=-0.122$, $p=0.077$) between blood alcohol level and scoring in the Glasgow Coma Scale was not confirmed.

However, the relationship between the scoring in the Glasgow Coma Scale and the presence of particular symptoms that co-accompany the head injury, including: loss of consciousness, confusion, bloody discharge from the ear/nose, lack of consciousness and pathological pupillary response to light ($p<0.05$) was proved. The patients who had the above-mentioned symptoms had the lower scoring in the Glasgow Coma Scale than those who did not have these symptoms (Table 2).

On the basis of the analysis of the material collected, the relationship between the scoring in the Glasgow Coma Scale and mechanism of injury ($p<0.001$) was proved. People who fell from height had the lowest scoring in the Glasgow Coma Scale, people after the road accident and patients who sustained the injury in unknown circumstances had slightly higher scoring. Patients after the fall, suicide attempt, epileptic seizure and battery had the highest scoring in the Glasgow Coma Scale (Figure 2).

Table 1. Scoring in the Glasgow Coma Scale and specificity of sustained head injuries

Injuries	GCS in the people without injuries		GCS in the people with injuries		The Mann-Whitney test
	median	range	median	range	
Wound of the skin integuments	15	3–15	15	7–15	W=4674 p=0.995
Skull fracture with invagination	15	3–15	14	7–15	W=742.5 p=0.309
Fracture of the facial bones	15	3–15	14	7–15	W=3812 p=0.037
Basal skull fracture	15	7–15	10	3–15	W=1422 p=0.001
Temporal bone fracture	15	3–15	14.5	8–15	W=686.5 p=0.561
Epidural haematoma	15	7–15	12	3–15	W=1282.5 p=0.015
Pericerebral haematoma	15	3–15	10	8–13	W=1123 p<0.001
Cerebral edema	15	3–15	8	7–13	W=938 p<0.001
Displaced ventricular system	15	7–15	9	3–11	W=1555.5 p<0.001
Blood in the location of the cerebellar tentorium	15	7–15	7	3–7	W=620 p=0.001
Subgaleal haematoma	15	3–15	14.5	8–15	W=713 p=0.431
Foci of cerebral contusion	15	3–15	14	8–15	W=1593.5 p=0.092
Subdural haematoma	15	3–15	10	8–13	W=1880.5 p<0.001
Intracerebral haematoma	15	7–15	7	8–15	W=863 p=0.003
Subarachnoid haematoma	15	3–15	10	8–13	W=557.5 p=0.007

Table 2. Scoring in the Glasgow Coma Scale and the symptoms co-accompanying the head injury

Symptom	GCS in the people without the symptom		GCS in the people with the symptom		The Mann-Whitney test
	median	range	median	range	
1	2	3	4	5	6
Peri-traumatic amnesia	15	3–15	14.5	11–15	W=2421.5 p=0.439
Loss of consciousness	15	3–15	13	8–15	W=3914.5 p<0.001
Dizziness and headaches	15	3–15	15	10–15	W=2599.5 p=0.709
Confusion	15	3–15	13	10–15	W=4559.5 p<0.001
Blood discharge from the ear/nose	15	7–15	10	3–15	W=1911 p<0.001
Periorbital ecchymosis	15	7–15	14	3–15	W=1263.5 p=0.108

Table 2. Continued

	1	2	3	4	5	6
Lack of consciousness		15	10–15	8	3–10	W=2370.5 p<0.001
Nausea/vomiting		15	3–15	15	12–15	W=1351 p=0.168
Pathological pupillary response		15	7–15	10	3–15	W=3324.5 p<0.001
Arousal		15	3–15	15	8–15	W=2893.5 p=0.411
Epileptic seizure		15	3–15	15	10–15	W=1548.5 p=0.986

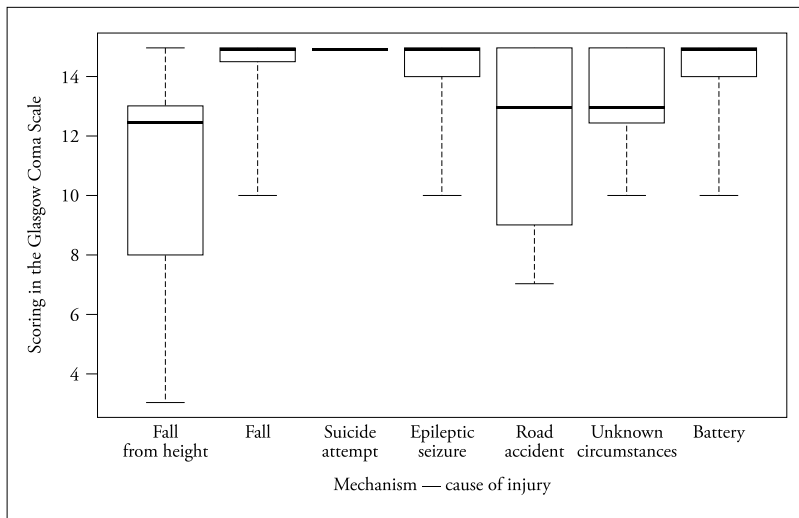


Figure 2. Scoring in the Glasgow Coma Scale and mechanism (cause) of injury

Discussion

People under the influence of alcohol constitute a significant percentage of trauma patients. These people are more exposed to injuries — one of the most dangerous ones — head injuries [11].

Studies conducted by Piłśniak and Ślusarz confirm that the most common causes of the craniocerebral injury in people under the influence of alcohol are road accidents (38.60%) [12]. According to the analysis of authors' own research, fall on an even surface (46.19%) contributed to the head injury in the majority of the respondents whereas road accident affected 11.90% of patients with the craniocerebral injury.

The phenomenon of alcohol consumption pertains to younger and younger age groups. This problem was discussed by Skotnicka-Klonowicz and others in the analysis concerning the cases treated due to alcohol poisoning at Children's Clinic of Emergency Medicine. The authors' observations show that during the year 64 children were admitted to the clinic due to alcohol poisoning and 6 of them sustained the head injury [13].

In the American studies it was proved that people with the positive toxicological test result (for the presence of alcohol and other psychoactive substances) obtained the lower scoring in the Glasgow Coma Scale [14]. Furthermore, on the basis of the analysis of the authors' own research significant relationship between blood alcohol level and scoring in the Glasgow Coma Scale was not observed; among the patients with high level of alcohol there were people with both high and low scores in the Glasgow Coma Scale.

In the study conducted by Sienkiewicz regarding the influence of, among other things, ethyl alcohol on the head and trunk injuries it was proved that the scoring in the Glasgow Coma Scale corresponded to skull fracture and intracerebral haematomas [7]. In the performed author's own studies the patients who sustained the fracture of facial bones and basal skull fracture as well as epidural haematomas, pericerebral haematomas, subdural haematomas, intracerebral haematomas and subarachnoid haematomas, cerebral edema, displacement of the ventricular system and the presence of blood in the location of the cerebellar tentorium had the lower scoring in the Glasgow Coma Scale than other patients.

Diagnosis between head injury and drunkenness constitutes undoubtedly a difficult diagnostic challenge. Making the mistake and missing primary changes of the brain damage leads to irreversible changes in the central nervous system. The application of the Glasgow Coma Scale as the only criterion in the assessment of the patient's condition and qualification to perform the CT examination is not recommended. There are cases of severe intracerebral injuries with simultaneous high scoring in the Glasgow Coma Scale. According to the guidelines of the Neurological Committee of The World Federation of Neurosurgical Societies all patients with head injuries who are under the influence of alcohol are classified in the high-risk group [7,10,15].

Conclusions

1. Blood alcohol level does not have an influence on the scoring in the Glasgow Coma Scale.
2. Mechanism of the head injury determines the scoring in the Glasgow Coma Scale.
3. There is a relationship between the scoring in the Glasgow Coma Scale and occurrence of short-term loss of consciousness, confusion, bloody discharge from the ear/nose, condition of being unconscious and pathological pupillary response.
4. There is a relationship between the scoring in the Glasgow Coma scale and fracture of the facial bones and basal skull fracture as well as: epidural haematoma, pericerebral haematoma, subdural haematoma, intracerebral haematoma and subarachnoid haematoma, cerebral edema, displacement of the ventricular system and the presence of blood in the location of the cerebellar tentorium.

Implications for Nursing Practice

The key task in the prevention of dangerous brain injuries is to inform and raise awareness of the society regarding the consequences of the head injuries and the main factors leading to their occurrence with particular focus on the effect of alcohol. Implementation of preventive actions may contribute to the reduction the number of the disabled people and fatalities as well as to the decrease of the costs of care related to craniocerebral injuries.

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Corresponding Author:

Małgorzata Kołpa
State Higher Vocational School
Department of Nursing, Institute of Health Sciences
ul. A. Mickiewicza 8, 33-100 Tarnów, Poland
e-mail: malgorzatakolpa@interia.pl

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Author Contributions: Małgorzata Kołpa^{C, E, H}, Aneta Grochowska^{C, E, H}, Agnieszka Gniadek^{A, G}, Beata Jurkiewicz^{E, F}, Marta Gondek^{B, D}

(A — Concept and design of research, B — Collection and/or compilation of data, C — Analysis and interpretation of data, D — Statistical analysis, E — Writing an article, F — Search of the literature, G — Critical article analysis, H — Approval of the final version of the article)

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