Head injuries have always accompanied the man. Cranio-cerebral injuries are the most common and often can lead to an imminent threat to life.

The aim of the study was the analysis of interventions of Emergency Medical Service teams in respect of patients manifesting symptoms indicative of suffered cranio-cerebral injuries.

Material and methods. We analyzed the emergency intervent card (protection medically Piaseczno and Otwock in 2009) – the cranio-cerebral injuries (CCI).

Results. We analyzed 1049 cases of CCI. Twice as likely to cranial injuries – brain affected men population. Most accidents happened in the afternoon (13-18) and in the summer months (June – August). Falls from height were the most common cause of cranio-cerebral injuries, but most cases related to the superficial bruising of the head.

Conclusions. Cranio-cerebral injuries are the predominant group among all the injuries. Men twice as likely to suffer injury –cranial cerebral compared to women. Most CCI suffer economically active people of 30-39 years age bracket. The most common cause of injury – cranial brain are falls from height, also traffic accidents and falls at the same level. Contusion skins, open wound of the head and concussion injuries are the most common forms of cranio-cerebral injuries.

Key words: head injuries, epidemiology,prehospital care, emergency medical service

Cranio-cerebral injuries constitute a particularly difficult diagnostic problem in modern pre-hospital medical assistance (1, 7). They may coexist with injuries to many other body parts, including chest and musculoskeletal system. Common diagnostic and therapeutic difficulties are caused by victim’s intoxication and the fact that severe and dangerous head trauma is not always accompanied by external injuries to the head and face indicative it (25).

Bidziński defines cranio-cerebral injuries as sequelae of trauma in this body region, the force of which exceeds the compensation potential of the body (3). Globally, they constitute the main cause of trauma-related death and acquired neurological disorders (6).

Scientific publications quote a number of classification systems for cranio-cerebral injuries (CCI). One of them is the CCI classification according to the injury type, distinguishing open (with damage to dura mater) and closed injuries (in which dura mater remains intact) (9).

In the late 20th century, significant advances were made in the management of patients with cranio-cerebral injuries. The factors responsible for the unfavourable treatment results were identified at the time, while prevention of secondary brain injury became the main objective of patient management at the early stage of trauma (14). The above approach gave rise to another CCI classification, grouping the injuries depending on the mechanism of post-trauma body damage into primary (e.g. concussion or brain contusion) and secondary ones (e.g. intracranial haemorrhage or cerebral oedema) (19).

A patient post cranio-cerebral trauma may manifest various symptoms, including loss of consciousness, disorders of consciousness, drowsiness, headache, vomiting, anisocoria,
convulsions, cranial nerve palsy, meningism or liquorrhoea (6). The clinical symptoms, their intensity and domination of ones over the others depends to a large extent on the type and severity of trauma, which in consequence determines the diagnostic and therapeutic methods used in a patient with CCI.

The aim of the study was the analysis of interventions of Emergency Medical Service teams in respect of patients manifesting symptoms indicative of suffered cranio-cerebral injuries.

MATERIAL AND METHODS

The study involved a retrospective analysis of cranio-cerebral injury cases based on the emergency intervention cards of Emergency Medical Service teams operating in the Piaseczno and Otwock Counties.

There were analysed the patient age and gender, time of day, season, type of the dispatched team (“S” or “P”), cause of and type of injury, and symptoms associated with the cranio-cerebral trauma.

The analysis covered the year 2009, was based on medical documentation and was conducted in due compliance with the Act on personal data protection.

The analysis employed the Student’s t-test, Wilcoxon signed-rank test, chi-squared goodness of fit test, chi-squared test for contingency tables, and Cramér’s V.

All tests were performed at the significance level of α = 0.05.

RESULTS

In the analysed year 2009, the Emergency Medical Service teams (EMSTs) operating in the Piaseczno and Otwock Counties executed a total of 17,967 interventions, of which a group of 2,988 met the criteria of trauma. The number of cranio-cerebral injury cases was 1,049, i.e. 35% of all trauma-related interventions of EMSTs.

Among the above 1,049 cases, males constituted a significantly predominating group with 696 medical interventions (66.35%) – as opposed to 353 interventions due to CCI in females. The chi-squared test indicated a significant association between the patient gender and type of trauma (p < 0.001) (fig. 1).

The age of patients with cranio-cerebral injuries was between 3 months and 95 years (tab. 1). The mean patient age was 42; the mean age of female patients was 47.08 and was higher than the mean age of male patients – 38.81. Individuals aged 20-29 constituted the largest age group – 157 cases (14.97%), followed by those aged 50-59 – 140 cases (13.35%), and 30-39 – 136 cases (12.96%). The smallest aged group comprised patients aged above 90 – 16 individuals (1.53%). The analysis indicated a statistically significant difference in the patient age (p < 0.001) (fig. 2).

The studied sample was divided into 24 hours, according to the time of day of executed intervention (tab. 2). Cranio-cerebral injuries occurred most often in the afternoon, between 1 pm and 6 pm – 483 cases (40.89%), while during night-time (2 am to 8 am) the number of CCI cases was small – 36 individuals (3.43%) (fig. 3). The chi-squared goodness of fit test indicated a statistically significant difference

Table 1. CCI patient age

<table>
<thead>
<tr>
<th>Age</th>
<th>n</th>
<th>%</th>
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<tbody>
<tr>
<td>0-9</td>
<td>81</td>
<td>7.72</td>
</tr>
<tr>
<td>10-19</td>
<td>107</td>
<td>10.20</td>
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<td>20-29</td>
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<td>30-39</td>
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<td>12.96</td>
</tr>
<tr>
<td>40-49</td>
<td>98</td>
<td>9.34</td>
</tr>
<tr>
<td>50-59</td>
<td>140</td>
<td>13.35</td>
</tr>
<tr>
<td>60-69</td>
<td>63</td>
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<tr>
<td>70-79</td>
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<td>6.29</td>
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<td>80-89</td>
<td>60</td>
<td>5.72</td>
</tr>
<tr>
<td>90+</td>
<td>16</td>
<td>1.53</td>
</tr>
<tr>
<td>Total</td>
<td>1049</td>
<td>100</td>
</tr>
</tbody>
</table>
An additional analysis was performed on months grouped into seasons. A statistically significant difference in CCI incidence was found between the seasons ($p = 0.003$).

When analysing the circumstances of cranio-cerebral injury occurrence, it was found that the majority of CCI cases were caused by a fall from a height – 304 individuals (29%). The next reason for EMST interventions due to cranio-cerebral injuries was a traffic accident – 220 individuals, i.e. 21% of all medical interventions in CCI patients. Another cause of CCI was a fall on the same level – 178 cases (17%). Battery constituted the cause of cranio-cerebral injury in 84 patients (8%), while 74 individuals (7%) sustained CCI as a result of

![Fig. 2. Age distribution of patients with cranio-cerebral injuries](image)

![Fig. 3. Incidence of cranio-cerebral injury depending on the time of day](image)

in interventions depending on the time of day ($p < 0.001$).

The analysed sample was divided into 12 months, depending on the date of executed intervention (tab. 3). Statistically significant differences were observed in cranio-cerebral injuries between months. The largest number of CCI cases was observed in August – 116 individuals (11.06%), followed by June – 102 cases (9.72%), and the smallest number was found to occur in January – 57 cases (5.43%)

![Fig. 4. Incidence of cranio-cerebral injury depending on the month](image)

<table>
<thead>
<tr>
<th>Month</th>
<th>January</th>
<th>February</th>
<th>March</th>
<th>April</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>August</th>
<th>September</th>
<th>October</th>
<th>November</th>
<th>December</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>57</td>
<td>74</td>
<td>76</td>
<td>95</td>
<td>81</td>
<td>102</td>
<td>90</td>
<td>116</td>
<td>87</td>
<td>97</td>
<td>80</td>
<td>94</td>
<td>1049</td>
</tr>
<tr>
<td>%</td>
<td>5.43</td>
<td>7.05</td>
<td>7.24</td>
<td>9.06</td>
<td>7.72</td>
<td>9.72</td>
<td>8.58</td>
<td>11.06</td>
<td>8.29</td>
<td>9.25</td>
<td>7.63</td>
<td>8.96</td>
<td>100</td>
</tr>
</tbody>
</table>
hitting an object. Other causes were responsible for CCI in 189 individuals (18%). The analysis indicated a statistically significant difference in CCI depending on the trauma circumstances (p < 0.001).

Upon the arrival of the Emergency Medical Service team, trauma patients manifested various clinical symptoms. The most common one was head contusion – 430 cases (41%), followed by concussion – 336 cases (32%). Open head wounds were seen in 220 individuals (21%), while the smallest group comprised patients with skull fractures – 63 cases (6%) (fig. 6).

In compliance with the medical intervention card requirements, the neurological status of each patient was assessed with the use of the Glasgow Coma Scale (GCS). For the purposes of analysis in the present study, a classification into three groups of trauma-related cerebral injury severity was adopted: mild injuries – GCS score of 13-15, moderate injuries – GCS score of 9-12, and serious injuries – GCS score of 8-3. According to the above classification, mild injuries were most prevalent in the studied group – 850 cases (81%), followed by moderate injuries – 105 individuals (10%). Serious injuries requiring endotracheal intubation were observed in 76 individuals (9%) (fig. 7).

**DISCUSSION**

Trauma constitutes a serious health, economic and social problem (10, 11). According to the World Health Organization (WHO), 75 million people worldwide sustain injury each year. The significance of the issue was emphasised by the former Secretary-General of the UN, Kofi Annan, who stated that “There are effective ways to prevent and treat these disabling disorders, but we must act now. Joint diseases, back complaints, osteoporosis and limb trauma resulting from accidents have an enormous impact on individuals and societies, and on healthcare services and economies”. On 13 January 2000, in Geneva, the 2000-2010 decade was named the Bone and Joint Decade by the UN and the WHO. According to the statistics, the incidence of cranio-cerebral injuries in highly developed countries stands at approx. 200 in 100,000 annually. German statistics show that approx. 150-200 thousand patients sustain cranio-cerebral injuries. CCI is given as the cause of death in 70% of fatal cases (11, 15).

The increase in the incidence of injuries results from the continuous progress of civilisation, change of the model of life, pursuit of work, lack of rest, wish to move from one place to another in the shortest time possible, and human carefree behaviour (12, 22, 23).

As the analysis of study material showed, cranio-cerebral injuries constitute a common reason for intervention of the Emergency Medical Service in the Piaseczno and Otwock Counties. The number of EMST interventions due to CCI and their percentage share in the total number of trauma cases are comparable with the results of other analyses conducted in Poland (1, 15, 20, 24).

The observed higher incidence of cranio-cerebral injuries in the males is also in agree-
ment with Polish analyses and with epidemiological data from other countries (8, 13, 15, 18, 24).

When taking into consideration the age of patients with cranio-cerebral injuries, this type of trauma is most often sustained by young individuals, aged below 40, exercising and working (13, 18).

The majority of injuries were observed to occur in summer months, mainly August, and during the hours of increased occupational activity, particularly between 3 pm and 8 pm. Similar results have been reported in other publications (8, 12).

Some authors quote traffic accident as the most common cause of cranio-cerebral injuries, followed by a fall and battery (4, 17). The results of the present study differ from the above: the main cause of CCI was found to be a fall from a height, followed by traffic accident and by fall on the same level – which is in agreement with several other reports (13, 16, 20).

The most common, and at the same time the mildest, injuries include superficial head contusions and concussion. More serious symptoms, such as skull fracture, occur less frequently (3, 11, 13).

Often, cranio-cerebral injuries are mild and the patients do not consent to be transported to the hospital – such patients have the GCS score of 13-15 (2, 17).

A significant factor reducing the trauma consequences is the proper organisation of Emergency Medical Service. The development of management algorithms for both the pre-hospital and hospital setting allows the supposition that mortality and post-trauma disability rates will go down significantly (21). To this end, it seems pertinent to establish trauma centres providing comprehensive diagnostics and treatment to injured patients (5, 22).

Cranio-cerebral injuries as a phenomenon have taken on epidemic proportions, with high incidence and mortality rate. The percentage of CCI in relation to other injuries in Poland is similar to that observed worldwide. The mean age of female patients with CCI is higher than that of males, while CCI is observed more often in males than females. A crucial factor reducing the mortality and post-CCI disability rates is the continuous broadening of knowledge of the medical personnel on the causes and symptoms of cranio-cerebral injuries. The understanding of trauma pathophysiology will undoubtedly enable an efficient and objective assessment of an injured patient and the implementation of proper management.

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