

Dawid Rumak, Leszek Stefański

Received: 03.11.2015

Accepted: 19.12.2015

Published: 31.12.2015

Sudden neurological states encountered in the line of work of Emergency Medical Service in Rybnik

Nagłe stany neurologiczne spotykane w pracy zespołów ratownictwa medycznego w Rybniku

College of Strategic Planning in Dąbrowa Górnicza, Department of Emergency Medicine. Head of the Department: Leszek Stefański, MD, PhD
Correspondence: Dawid Rumak, Wyższa Szkoła Planowania Strategicznego, ul. Kościelna 6, 41-303 Dąbrowa Górnicza, e-mail: kancelaria@wsps.pl

Abstract

Aim: Sudden neurologic states of various aetiology are the major reason for medical teams to be dispatched and often result in hospitalization of the patient. The purpose of this work was the analysis of the aforementioned neurologic states and pinpointing the type of patients the Emergency Medical Service teams have encountered in Rybnik with respect to the said states. **Method:** Analysed material consisted of Medical Emergency Action cards that were used by Emergency Medical Service Independent Public Healthcare District Hospital No. 3 in Rybnik in the year 2013. Five hundred and twenty-three cases were selected as consistent with sudden neurologic states. **Result:** A higher incidence of studied diseases was noted among male patients, whereas in females presenting with these states, the age was higher, with the exception of syncope. The analysis revealed the presence of characteristic symptoms in relevant emergency conditions. During the evaluation of psychomotor abilities, a prevalence of patients whose state qualified as normal, and in the case of stroke as “slowed down” was recorded. Brain damage in all states except for stroke was classified as mild. The study noted high blood glucose level disparities between measurements. **Conclusion:** Strokes occurred most often in patients over 60 years old. The observed signs were consistent with those described in the literature. Blood glucose test results in some patients allowed suspicion of diabetes, or ruled out hypoglycaemia. The majority of studied patients revealed mild brain injury. Alcohol had a significant effect on the incidence of head injuries and seizures.

Key words: sudden neurologic states, Emergency Medical Service, stroke

Streszczenie

Cel: Nagłe stany neurologiczne o wieloetiologicznym charakterze są głównym powodem zgłoszeń dla medycznych zespołów ratownictwa medycznego i niejednokrotnie bezpośrednią przyczyną hospitalizacji pacjenta. Celem pracy była analiza wyżej wymienionych stanów neurologicznych oraz charakterystyka grup pacjentów zespołów ratownictwa medycznego w Rybniku w odniesieniu do wspomnianych stanów. **Metoda:** Analizowanym materiałem badawczym były karty akcji wykorzystywane w 2013 roku przez Zespoły Ratownictwa Medycznego Samodzielnego Publicznego Zakładu Opieki Zdrowotnej Szpitala Rejonowego nr 3 w Rybniku. Spośród wszystkich zgłoszeń zostały wybrane 523 przypadki jako stany podobne do nagłych stanów neurologicznych. **Wyniki:** Większą częstość występowania chorób notowano wśród starszych mężczyzn niż kobiet. Analizy ujawniły, że charakterystyczne objawy ujawniają się w określonych warunkach. Przy ocenie zdolności psychomotorycznych większość pacjentów cechowała się normalnym stanem, a w przypadku niewielkiej ich części zdolności psychomotoryczne były spowolnione. W badaniu odnotowano duże dysproporcje poziomu glukozy u pacjentów pomiędzy poszczególnymi pomiarami. **Wnioski:** Udary występowały najczęściej u osób powyżej 60. roku życia. Obserwowane objawy były zgodne z tymi, które opisano w literaturze. Ocena glukozy u niektórych pacjentów pozwoliła na podejrzenie cukrzycy lub wykluczenie hipoglikemii. Większość respondentów miała łagodne uszkodzenie mózgu. Alkohol w znaczący sposób wpływał na występowanie urazów głowy i drgawki.

Słowa kluczowe: nagłe stany neurologiczne, zespoły ratownictwa medycznego, udar

INTRODUCTION

The most common disorder of the central nervous system is the vascular ischaemic stroke. Yearly, approx. 60,000 cases occur in Poland, amounting to 80–85% of all disorders related to the nervous system (Kozera *et al.*, 2007).

A haemorrhagic stroke is characterized by high morbidity. In our country, it is as much as 15–20% of the remaining pool for spontaneous internal bleeding. Subarachnoid haemorrhage constitutes 2.5–5% of all strokes (Ćwiok, 2005).

Faintings also have vascular aetiology. The incidence of the first syncope in the patient's life was estimated in Framingham Heart Study at 6.2/1,000 people per year. It is worth noting that as many as 14–18% of those syncopes are of unexplained nature (Leńska-Mieciek, 2008).

Epileptic seizures are rarely life-threatening. They represent 1% of check-ins at emergency departments, and despite applying optimal treatment, up to 25–55% of patients suffer recurrent episodes. Frequently, they are associated with epilepsy, whose incidence is estimated at 6/1,000 inhabitants (Henry *et al.*, 2003). The occurrence of status epilepticus is estimated to be 50/100,000 yearly within the general population. Among patients with epilepsy, 9.4–25% experience status epilepticus, and 15–50% of them suffer recurring episodes (Mańka and Piechrzała, 2010).

AIM OF THE STUDY

The aim of the study was to analyse emergency neurological conditions, and determine what patients the Emergency Medical Service (EMS) encountered in a given condition, based on a study carried out in Rybnik.

MATERIAL AND METHODS

The analysed material consisted of Medical Emergency Action cards used by EMS Independent Public Healthcare District Hospital No. 3 in Rybnik in the year 2013.

Five hundred and twenty-three cases were selected. The inclusion criterion for the study was the occurrence of symptoms such as transient ischaemic attack (TIA), stroke, seizures, status epilepticus, fainting, head injuries, and spinal injuries. When analysing the collected documentation with respect to personal data, the following information was secured: age, sex, symptoms, contributory factors, assessment of pupil reaction, assessment of muscle strength, blood glucose test results, psychomotor assessment, and evaluation of the patient according to Glasgow Coma Scale (GCS). The data were statistically analysed, and on the basis of the analysis statistical information as to what patients EMS teams can expect to encounter on site was obtained.

RESULTS

When analysing the medical records in terms of age and sex (Tab. 1), it can be noted that the incidence of each of the states is higher in males. A detailed analysis of the data shows a slight imbalance in the data associated with cerebral perfusion, more pronounced in seizures and status epilepticus, as well as injuries.

When comparing patients in terms of age using both the arithmetic mean and the median, it is visibly higher for women in all presented states except syncope. By analysing the standard deviation, large fluctuations in the age of the patients studied can be found.

Only symptoms encountered in patients (Tab. 2) during the study have been included here. The presence of the same symptoms in different disease entities may be noticed. Usually, however, the highest percentages of given symptom manifestations appear in one or two of them which they are consistent with. Special attention should be paid to the analysis of fainting, as all the identified symptoms were present in these cases, except aphasia and abnormal muscle strength on the left side of the patient's body. Spine injuries in up to 75% of the victims were located in the lumbar spine. The rest of the patients experienced an equal share of injuries in the thoracic and cervical spine. Cervical injuries were often accompanied by a head injury.

	Seizure		Status epilepticus		Stroke		TIA		Syncope		Head injuries		Spine injuries	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Incidence [%]	72.56	27.44	60	40	51.02	48.98	52.63	47.37	53.93	46.07	66.67	33.33	58.33	41.67
Average age [years]	42.94	42.51	30	56	64.36	73.70	65.40	78.22	63.57	56.56	39.67	54.93	50.36	65
Standard deviation [years]	18.96	18.76	0	26.87	15.98	13.95	12.89	9.73	21.54	24.26	21.44	26.67	15.58	19.92
Median age [years]	40	47	30	56	66	78	64.5	78	72	62.5	33	60	53	72

Tab. 1. Comparison of the age and sex of patients who experienced sudden neurological conditions

Symptoms	Seizure	Status epilepticus	Stroke	TIA	Syncope	Head injuries	Spine injuries
Seizures	73.58%	80.00%	6.12%	0.00%	8.99%	0.00%	8.33%
Aphasia	1.26%	20.00%	43.88%	44.44%	0.00%	0.00%	0.00%
Vomiting	3.14%	0.00%	12.24%	0.00%	15.73%	8.53%	0.00%
Diarrhoea	0.00%	0.00%	0.00%	0.00%	7.87%	0.78%	0.00%
Bleeding	3.77%	0.00%	1.02%	0.00%	3.37%	62.79%	0.00%
Oedema	0.63%	0.00%	3.06%	0.00%	3.37%	7.75%	4.17%
Fainting	36.48%	100.00%	44.44%	39.80%	84.27%	22.48%	4.17%
Weakness/Paresis R	1.89%	20.00%	11.11%	0.00%	1.12%	0.00%	0.00%
Weakness/Paresis L	1.89%	0.00%	22.22%	0.00%	0.00%	0.78%	4.17%
Abnormal pupillary width	4.40%	0.00%	6.12%	0.00%	8.99%	4.65%	0.00%
Abnormal pupillary response to light	6.29%	20.00%	6.12%	0.00%	10.11%	3.14%	0.00%

Tab. 2. The incidence of symptoms in sudden neurological conditions

During the psychomotor evaluation, a vast majority of patients (Tab. 3) behaved normally. Most of the stroke patients were "slowed down." The difference, however, was only 3.06%. "Slowed down" patients constituted the second largest group in the other states. Agitated patients were mostly found in the head injury group, as were aggressive patients.

When analysing the incidence of brain lesions evaluated with GCS (Tab. 4), it was noted that in the assessed patients mild brain injuries prevailed. The most common score they received was 15 (median value of 15.00). Mean value and standard deviation, however, show that the differences in the assessment were quite large. Only in the group of patients with transient cerebral ischaemia, mild brain injury was the sole entity observed.

Psychomotor assessment	Seizure	Status epilepticus	Stroke	TIA	Syncope	Head injuries	Spine injuries
Normal	55.35%	80.00%	46.94%	61.11%	53.93%	67.44%	83.33%
Slowed down	39.62%	20.00%	50.00%	38.89%	39.33%	23.26%	12.50%
Agitated	5.03%	0.00%	3.06%	0.00%	6.74%	7.75%	4.17%
Aggressive	0.00%	0.00%	0.00%	0.00%	0.00%	1.55%	0.00%

Tab. 3. The incidence of adequate psychomotor assessment with respect to emergency neurological state

GCS score	Seizure	Status epilepticus	Stroke	TIA	Syncope	Head injuries	Spine injuries
13–15 points	89.31%	60.00%	73.47%	100.00%	92.13%	94.57%	95.83%
9–12 points	9.43%	0.00%	22.45%	0.00%	2.25%	2.33%	4.17%
3–8 points	1.89%	40.00%	4.08%	0.00%	5.62%	3.11%	0.00%
Average	14.16	11.40	13.47	14.72	14.09	14.46	14.83
Standard deviation	1.87	5.13	2.33	0.57	2.56	1.75	0.65
Median	15	15	15	15	15	15	15

Tab. 4. The incidence of a particular GCS score in relation to a given emergency neurological state

Glucose level	Seizure	Status epilepticus	Stroke	TIA	Syncope	Head injuries	Spine injuries
Average	139.88	109.33	159.91	129.81	155.28	111.62	116.87
Standard deviation	39.06	20.03	59.62	46.40	78.46	19.02	54.32
Median	133	108	154	112	140	113	160

Tab. 5. Blood glucose level with regard to emergency neurological state

	Seizure	Status epilepticus	Stroke	TIA	Syncope	Head injuries	Spine injuries
Patients under the influence of alcohol	18.24%	20.00%	1.02%	0.00%	2.25%	50.39%	4.17%

Tab. 6. The incidence of intoxication in patients during emergency neurological states

Based on the value of the standard deviation, it can be concluded that blood glucose (Tab. 5) test results show high volatility in all states. The largest disparity occurs with fainting and strokes, where the standard deviation for syncope is as high as 78.46. During the analysis of the median and the arithmetic mean, it can be seen that in those states the measured values were the highest. The lowest values of the measurements and the smallest disparities occurred in patients with head injury.

The analysis of the frequency with which the patients were under the influence of alcohol while suffering the described sudden neurological conditions (Tab. 6) shows the highest percentage of head injuries, up to 50.39%. A high share can also be observed in seizures and status epilepticus. 11.95% EMS dispatches were to patients diagnosed with diagnosed epilepsy, yet none of these patients were under the influence of alcohol.

DISCUSSION

Among all the presented disease groups male patients prevailed. This result seems to be valid for both the TIA and stroke due to the epidemiology of these conditions (Nowacki and Bajer-Czajkowska, 2009). The same applies to seizures, but here it is related to the greater incidence of epilepsy among males (Terczyński, 2008). On the other hand, when the patients' age is analysed, it becomes evident that in almost all the states except syncope, the age of female patients was higher. This is due to the fact that women tend to live longer than men.

A particular relationship between age and neurological status is visible in the strokes and transient ischaemic attacks, where the median age of female patients for each of these states is 78. This result is confirmed by the data concerning the epidemiology of these disease entities, according to which the incidence increases with age, especially beginning with the 8th decade of life. The percentage of TIA suffered prior to stroke in as many as 5–20% instances is also significant (Nowacki and Bajer-Czajkowska, 2009).

In most emergency cases, the prevalent symptoms were those specific for a given condition, rendering the diagnosis non-problematic. In the case of epileptic seizures, the symptoms are seizures as such, occurring in as many as 73.58% of patients, and fainting, which was recorded in 36.48% of cases. These observations are consistent with facts concerning a generalized seizure, in which the above mentioned symptoms present (Kowalski, 2012). The prevalence level of these symptoms shows that in the rest of the patients these symptoms did not occur, therefore a different type of seizure was at stake (Terczyński, 2008), or the Medical Rescue Service team arrived on site after the withdrawal of seizure activity. For status epilepticus, the symptoms were present in 100% of cases. It is associated with their prolonged presence, more than 30 minutes for this disease entity (Mańka and Piechrzała, 2010).

The presence of aphasia in nearly 44% of cases, fainting in approx. 40% of patients, and left and right sided paresis in 20% and 10% of patients respectively, was observed in stroke. These data are consistent with the list of symptoms characteristic for these sudden neurological conditions (Kozera *et al.*, 2007). Vomiting that occurred in 12% of patients was in all probability the response to the blood pressure lowering attempt, and can be considered normal when the relationship between the occurrence of stroke and cardiovascular diseases, particularly hypertension, is considered (Zalisz, 2009).

The prevalent symptom in patients with head injury was external bleeding, observed in up to 62.79% of cases. Just like swelling, this symptom is related to the mechanism of origin of the condition. Abnormalities were found in the assessment of pupillary width in only approx. 4.5% of respondents, and in 3.14% in pupillary reaction to light.

A study of data concerning patients with spinal injuries showed that slightly more than 8% of patients with trauma presented with convulsions. It is not a characteristic symptom of the condition. Some of the convulsion episodes may be associated with physical activity often referred to as involuntary movement, that is observed during fainting and syncope (Henry *et al.*, 2003), in our study noted in approx.

4% of patients. The presence of paralysis or paresis in this group of patients can be associated with a spinal cord injury. Similarly to head traumas, the swelling manifesting here is related to the mechanical nature of the injury.

The symptom which was observed in the largest percentage of patients with a diagnosis of syncope was fainting, present in nearly 84% of cases. The result lower than 100% in this disease entity is explained by the rapid disappearance of symptoms, a fact accounted for in the very definition of syncope (Lelonek, 2011). Vomiting, occurring in 15% of patients, may be related to the sense of nausea experienced prior to an episode of syncope, one of the characteristic symptoms of this condition (Leńska-Mieciek, 2008). Seizures, experienced by nearly 9% of patients, will be linked with the aforementioned involuntary movements (Henry *et al.*, 2003).

More than half of the patients studied were assessed as normal in psychomotor evaluation, with the exception of stroke patients. Most of brain stroke patients, in turn, were classified as "slowed down." This assessment was also the second most common in other states. In the case of stroke, such distribution may be indicative of slowly resolving symptoms associated with cognitive function. The observed changes are thus consistent with the definition of stroke, stating that its symptoms last more than 24 hours (Zalisz, 2009).

GCS, the diagnostic tool for patients who suffered head trauma, showed as many as 94.57% of them to have experienced injuries classified as mild. More serious injuries were discovered only in 5.14% of the said patients. It may thus be concluded that the vast majority of patients were not in life-threatening danger or threatened by neurological complications of the nervous system. This is more or less consistent with the results of studies conducted in the United States, where it is estimated that as many as 90% of patients brought into emergency departments experience mild traumatic injuries, and only 10% experience moderate and severe injuries (Henry *et al.*, 2003).

In the case of syncope, more than 92% of the patients were given a score of 12 to 15 points. This confirms reports that its symptoms resolve almost instantly, typically within 20–30 seconds (Henry *et al.*, 2003; Lelonek, 2011). This difference increased slightly in patients with epileptic seizures, where a greater number of cases fell in the range of moderate or severe damage that involved a total of 10.69% of the studied patients, and 20% of status epilepticus patients.

The results are related to the gradual disappearance of symptoms and a slower return to a normal state of consciousness than is the case with syncope (Kowalski, 2012). The largest prevalence of documented serious damage to the brain can be seen in data associated with stroke, where as much as 26.53% of patients were classified into groups with moderate to severe brain damage. Also in this case, when discussing the result, the definition of stroke that says the symptoms present for over 24 hours, as well as the mechanism associated with cerebral perfusion should be borne in mind (Zalisz, 2009).

In opposition to stroke is the state presenting with similar symptoms, namely the transient ischaemic attack. During the study, only mild brain injuries were found. This is confirmed by TIA descriptions according to which it is characterized by rapid disappearance of symptoms, tending to resolve within 2–15 minutes (Członkowska, 2013).

Blood glucose test results show that none of the patients had hypoglycaemia or hyperglycaemia. The patients' average results fell within normal blood glucose levels. The high standard deviation results in stroke and syncope, however, raise a suspicion of some patients possibly suffering diabetes.

CONCLUSIONS

The age of the majority of the patients who were diagnosed with stroke and sudden ischaemic attack (TIA) was above 60 years old, which predisposes them to a high stroke risk. The results of psychomotor evaluation and GCS evaluation are linked to the duration of symptoms in given disease entities. According to GCS, most subjects were diagnosed with mild brain injury. Alcohol has a significant impact on the incidence of seizures and head trauma. Blood glucose test results found in some patients with stroke and syncope allowed to raise the suspicion of diabetes, or to rule out hypoglycaemia.

Conflict of interest

The authors do not report any financial or personal links to other persons or organizations that might adversely affect the content of this publication, and/or claim authorship rights to this publication.

References

- Członkowska A: Nowa definicja udaru. *Med Prakt Neurol* 2013; (5): 36–40.
- Ćwiok E: Stany zagrożenia życia związane z ośrodkowym układem nerwowym. In: Misiołek H, Knapik P (eds.): *Pierwsza pomoc medyczna z elementami postępowania specjalistycznego*. Śląska Akademia Medyczna, Katowice 2005: 60.
- Henry GL, Little N, Jagoda A *et al.*: *Stany nagłe w neurologii – od objawu do rozpoznania*. Wydawnictwo Lekarskie PZWL, Warszawa 2003: 241, 244, 246, 298, 325–326.
- Kowalski K: Napad padaczkowy – objaw choroby czy stan zagrożenia życia? *Twój Przegląd Stomatologiczny* 2012; (4): 66–67.
- Kozera G, Ransiszewska E, Gąsecki D *et al.*: Pierwsza pomoc u pacjentów z udarem mózgu. *Forum Med Rodz* 2007; 1: 11–16.
- Lelonek M: Nagła utrata świadomości – praktyczny przewodnik. *Terapia* 2011; 19 (3, z. 2): 6–11.
- Leńska-Mieciek M: Omdlenia w obrazie chorób neurologicznych. *Przew Lek* 2008; 11 (5): 10–13.
- Mańka I, Pierzchała K: Stan padaczkowy. *Obraz kliniczny i postępowanie*. *Aktualn Neurol* 2010; 10: 194–201.
- Nowacki P, Bajer-Czajkowska A: Przejściowe ataki niedokrwienne – sygnał do natychmiastowego działania. *Lekarz* 2009; (12): 44–51.
- Terczyński A: Co powinniśmy wiedzieć o padaczkę. *Ogólnopolski Przegląd Medyczny* 2008; (7): 41–44.
- Zalisz M: Postępowanie przedszpitalne z chorym na udar mózgu (w aspekcie leczenia trombolitycznego). *Pol Ann Med* 2009; 16: 160–167.