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Emergency medicine

Periodic fluctuations in the prevalence of epilepsy in adults

Łukasz Szarpak[1], Zbigniew Kopański[1,2], Marcin Madziała[1], Joanna Jadczak[1], Anna Maria Patynowska[1], Dariusz Timler[3]

[1] Collegium Masoviense – College of Health Sciences in Żyrardów, Poland
[2] Jagiellonian University Medical College, Poland
[3] Emergency Department, Medical University of Lodz, Poland

Author's address:
Łukasz Szarpak, Collegium Masoviense – College of Health Science, ul. G. Narutowicza 35, 96-300 Żyrardów, Poland; phone: (+48) 500 186 225, e–mail: lukasz.szarpak@gmail.com

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Summary:

Introduction: Epilepsy is one of the most common diseases of the nervous system. Due to high mortality it is a serious clinical problem from the viewpoint of emergency medicine.
Material and methods: The analysis of the patients over 18 years of age treated for epilepsy in Nicolas Copernicus Provincial Specialist Hospital in Lodz in 2008. The analysis was based on medical records. The following parameters were analyzed: patients' age and gender, time of day and year, type of epilepsy and duration of hospitalization as well as mortality till hospital discharge.
Results: Among 360 treated patients (146 women, 214 men) aged 18 – 97 years (mean age 16.72 ± 48.46 years) an epilepsy incident was the cause of hospitalization.
Conclusions: Epilepsy incidents are observed more frequent in men who suffered from epilepsy at a younger age than women. The mean age of patients with epilepsy is slightly higher than in the studies of foreign authors. Maximum seizures were observed in the morning between 12:00 and 12:59 and in August as well.

Key words: epilepsy, sudden condition, hospitalization, mortality.

Introduction

Epilepsy is defined as a clinical syndrome characterized by the occurrence of recurrent seizures [1]. The term 'attack' refers to an incident of paroxysmal nervous activity, which begins in the gray matter of the brain, interrupting its operation, giving the characteristic symptoms. Attacks may or may not be accompanied by convulsions. Depending on the hyperactive centers location as well as the scope and the speed of discharges spread, seizures may take varied clinical form [2,3].

The diagnosis of epilepsy should be based on an accurate determination of the type of epileptic seizure, with particular emphasis on the elimination of other causes of disorders that cause organic changes that damage the central nervous system including, e.g. the decrease in blood glucose level [3,4].

Prevalence of epilepsy in the world is very diverse. Prevalence rate ranges from 1.5 (Japan) to 37 (Nigeria) in 1000 persons [5,6]. In Poland it is about $^{7}/_{1000}$ inhabitants.

Thesis aim

The aim of the thesis is the trial to assess the incidence of epileptic seizures among adult patients

hospitalized in Nicolas Copernicus Provincial Specialist Hospital in Lodz from 1 January 2008 to 31 December 2008.

Material and methods

The thesis retrospectively analyzed cases of epileptic seizures in patients over 18 years of age based on hospital cards of Nicolas Copernicus Provincial Specialist Hospital in Lodz. The following parameters were analyzed: patients' age and gender, time of day and year, type of epilepsy and duration of hospitalization as well as mortality till hospital discharge.

The analysis covered the period of the year 2008 and was based on medical records. It was carried out in complying with the law on personal data protection.

Normality of distribution of variables were tested using the p significance level of the Shapiro-Wilk test. In the case of normal distribution, the mean differences were tested with the pair test of t-Student. In other cases, non-parametric Wilcoxon test was used, and the obtained results were described and presented graphically with the median.

The test of relationship between the incidence of the tested variables in the analyzed sections were tested with the chi-square independence test with the accepted level of significance p = 0.05. For cross tables the dependence power between variables was additionally tested with V-Cramer factor.

Results

Among 360 patients treated for epilepsy in Nicolas Copernicus Provincial Specialist Hospital in Lodz, men were dominant and they represented 59% of patients.

The average value of age was 48,46 years ± 16,72, while men were average 7 years younger than women (Figure 1). The comparison of the average age of men and women showed a statistically significant difference at p = 0.0001 (Figure 2). In the research material the age range for men was 18-93 years, and for women 19-91 years old. The epilepsy among men were found most frequently in the age group 50-59 years (23%), followed by 30-39 years (22%), the peak incidence for women

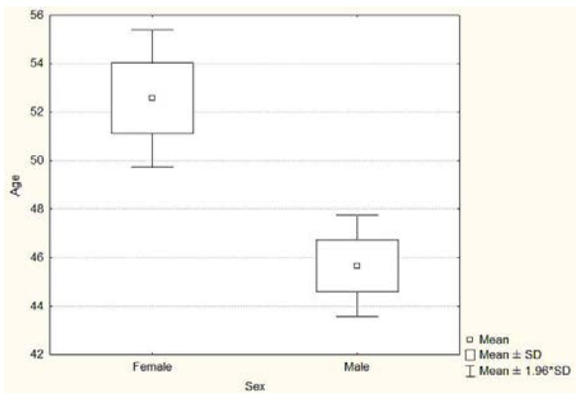

Figure 1: Box-and-whisker diagram – average age of women and men.

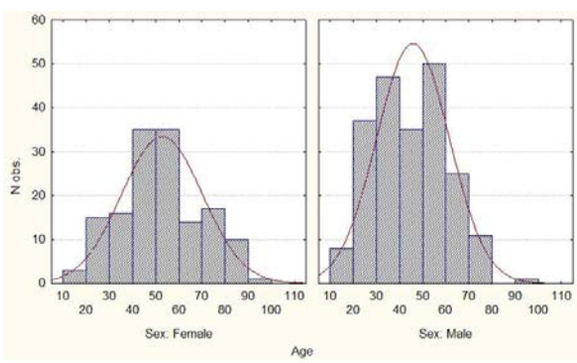

Figure 2: The layout of age of research population.

Table 1: Characteristics of each group of patients with injuries.

Sex	Number of patients [N]	Number of patients [%]	Age [Mean±SD]	P value
Male	214	59	45,66 15,63	0,0007
Female	146	41	52,57 17,46	0,0098
Total	360	100	48,46 ± 16,72	0,00006

equally concerned age range 30-39 years as well as 40-49 years (24% for each interval). The characteristics of patients are summarized in Table1.

The research material was analyzed with regard to the incidence of epilepsy including the circadian cycle. The peak of the observed incidence of epilepsy in the whole research material fell in the period between 12:00 and 12:59 (n = 27, 8%), the decrease in the number of cases concerned the period between 3:00 and

6:59. During this period only 15 cases occurred (p = 0.0000, Figure 3). For the men group peak incidence fell for the period between 12:00-12:59 and 13:00-13:59 (n = 16, 7% – for each period). In the period of 3:00-4:59 there were only two cases of epilepsy in men (p = 0.0000). In the women group the largest number of cases of epilepsy was observed during 8:00-8:59 and 12:00-12:59 (11 cases for each time period). 6:00-6:59 period was characterized by lack of cases (p = 0.0015). Comparison using the

Table 2: The prevalence of epilepsy in treated groups relative to the time of day.

Time of day	Male (n=214)	Female (n=146)	Total (n=360)
0:00 – 5:59	23 (11%)	11 (14%)	44 (12%)
6:00 – 11:59	49 (23%)	38 (26%)	87 (24%)
12:00 – 17:59	71 (33%)	46 (32%)	117 (33%)
18:00 – 23:59	71 (33%)	41 (28%)	112 (31%)
P value	0,0000	0,0000	0,0000

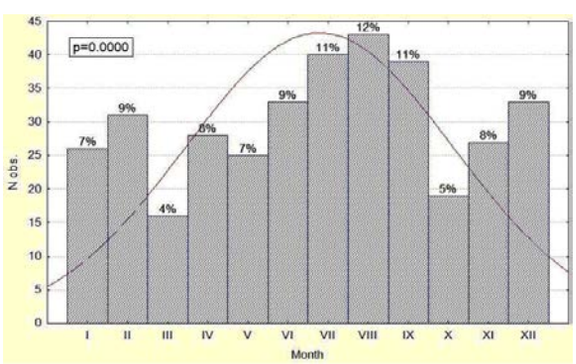

Figure 3: The layout of incidence of epilepsy in the annual cycle.

T test – the men group with the women group for the prevalence of epilepsy in the circadian cycle showed no statistically significant difference (p = 0.1455).

In addition, hours were grouped into four disjoint intervals (0:00-5:59, 6:00-11:59, 12:00-17:59, 18:00-23:59), which allowed to demonstrate differences in the frequency of incidence of epilepsy in relation to the time of day (Table 2).

While analysing the occurrence of epileptic seizures during the year it was observed that in the men group the episodes of epilepsy were seen the most frequent in August (n = 26, and 12%) and least frequent in March (n = 9, 4%, p = 0.0000). In the women group the peak incidence was observed in June and August (17 cases per month), in March, May and October the largest decrease in the number of patients treated for epilepsy was observed (n = 7 for each month, p = 0.00001). The distribution of the incidence of epilepsy in the whole research material is presented in Figure 4. The result of the comparison of the men group with the women group concerning the incidence of epilepsy in the annual cycle was not statistically significant (p = 0.3917).

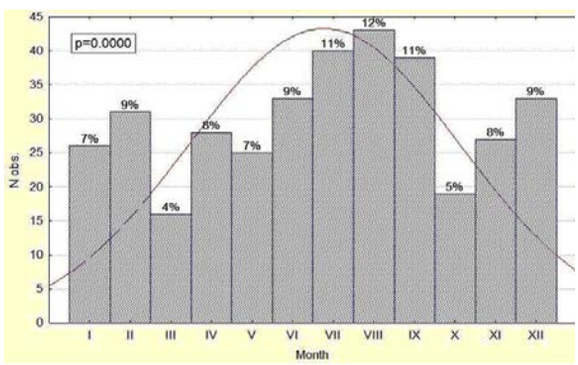

Figure 4: The layout of incidence of epilepsy in the circadian cycle.

Table 3: The prevalence of epilepsy in treated groups relative to the time of year.

Season	Male (n=214)	Female (n=146)	Total (n=360)
spring	46 (21%)	23 (16%)	69 (19%)
summer	66 (31%)	50 (34%)	116 (32%)
autumn	50 (23%)	35 (24%)	85 (24%)
winter	52 (24%)	38 (26%)	90 (25%)
P value	0,0000	0,0000	0,0000

Comparative analysis of the men group with the women group also showed no statistically significant difference in the time of the year in which there was an incidence of epilepsy (p = 0.3917). The results of this analysis are presented in Table 3.

Crucial parameter, namely the length of hospitalization of patients was subjected to the analysis as well. Mean length of hospitalization for the entire research group was 5.6 days on 6.8, with the longest duration of hospitalization for epilepsy in the research material amounted to 46 days. Mean hospital stay of men was 5 days and it was shorter than the duration of hospitalization of women (6.6 days). The comparison of the men group and the women group in time of hospitalization showed a statistically significant difference at p = 0.0364 (Figure 5).

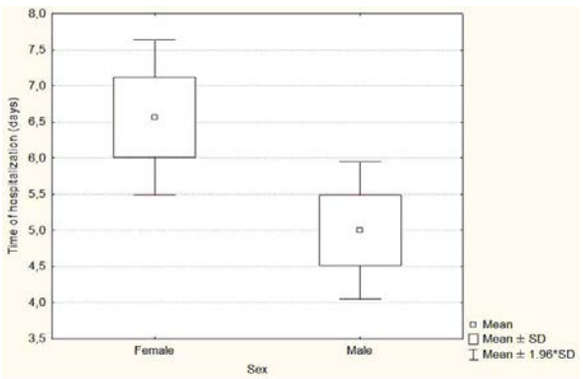

Figure 5: Box-and-whisker diagram of patients' hospitalization time considering sex.

Table 4: Characteristics of mortality in the research material.

Sex	Number of patients [N]	Number of patients [%]	Age [Mean±SD]	P value
Male	7	70	42,57 9,14	0,0833
Female	3	30	7130,41	0,1572
Total	10	100	51,1 21,21	0,00005

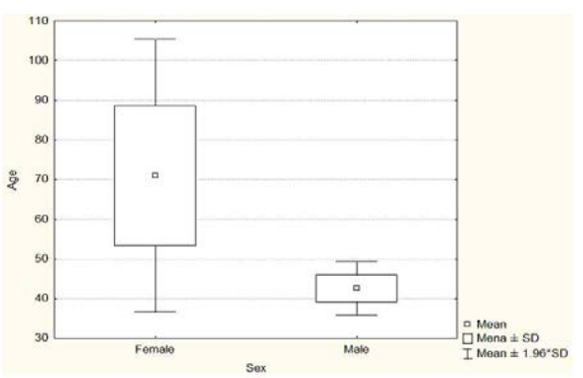

Figure 6: Box-and-whisker diagram of patients' hospitalization time considering sex.

Among 360 patients treated for incidents of epilepsy deaths were found in 10 cases, representing 3.6% of the group. In 350 cases, therapeutic treatment was successful and the patient was discharged home. The characteristic of patients, among whom death was declared is presented in Table 4.

The comparison of age of men and women whose therapeutic process finished with death showed a statistically significant difference (p = 0.0429). The average age of these patients is illustrated in Figure 6. Mean length of hospitalization for patients whose therapeutic process finished with death was 4.8 days ± 10.44, and it was higher by more than three days for men (5.8 ± 12.57) than women (2.6 days ± 2.2).

Discussion

Epilepsy is a syndrome of symptoms, whose an essential feature are clinical seizures as an expression of pathological activity over groups of nerve cells of the brain. It is one of the most common, and the most common as far as children are concerned, disease of the nervous system. The epidemiological data show that epilepsy is a prevalent symptom in the world, statistically estimated 0.5-1.5% of the population. Mortality due to generalized seizures according to various authors ranges from 0.5% to even 12.2%. In the research material mortality was observed in 10 cases, representing 3.6% of the group. Lower mortality rate was reported in the study of Seymoir (0.5%) [7], Ackers (2.4%) [8], and Mu (2.9%) [9]. The higher mortality rate was reported by Terra (5.3%) [10] and Chang (12.2%) [11]. The result closest to the proprietary research was obtained by Geerts (3.6%) [12].

In the proprietary research material the men group was dominant constituting as much as 59%. The result confirms the global study in which foreign authors also demonstrated the predominance of men: Guinhouya 53% [13], Quinones 53% [14], Guekht 59% [15] and Panagariya 66% [16]. The predominance of women was received by Matsuoka 56% [17].

In the foreign literature the average value of the age of patients with epilepsy, respectively in their study was received by: Alemany-Rosales – 36

years [18], Costa – 38.81 years [19], Quinones 40.79 years [14], Crizzle – 44.3 years [20], Hitomi – 46.6 years [21]. These results were slightly lower than the results obtained in the proprietary research, where the average age of the study population was 48.46 years.

National authors such as Janus, Zajewska and Nowak based on their research have observed that many different characteristics and expressions of the life of human body demonstrate variation intensity in both the circadian cycle and an annual one [22-24]. Therefore, one can safely conclude that many features of the human body including the nervous system can be characterized by reproducible changes in the different time cycles. The confirmation of this phenomenon can be observed in the research of Schipel *et al.* [24]. According to the research team a maximum seizures attributed to the night time (22:00-5:59). In the proprietary research, the maximum occurrence of epilepsy attributed to the afternoon hours (12:00-17:59), when there were 33% of all cases. The 22:00-5:59 period was characterized by the presence of only 20% of cases.

Discussed fluctuations in the circadian cycle is just one example of periodically recurring changes of the nervous system functions. The scientific literature also presented an annual seasonal pattern of occurrence of epilepsy – its peak fell in the winter months (December and January) [25]. In our own research, most cases of incidents of epilepsy were observed during the summer (32%). The winter period was characterized by the occurrence of 25% of all cases.

Conclusions

1) Incidents of epilepsy concern men more frequent.

2) The mean age of patients with epilepsy is slightly higher than in the research of foreign authors, and the men suffer from epilepsy at a younger age than women.

3) Maximum seizures were observed in the morning between 12:00 and 12:59 as well as in August.

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