Higher Incidence of Stroke on the Last Day of the Month in Hungary—a Role for Psychosocial Factors and Financial Insecurity?

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Background: The seasonal cumulation of acute ischemic stroke events is a well-known phenomenon. Critical days are determined by both biological and psychosocial factors. We hypothesized that the financial stability of those with a monthly income living in an economically unpredictable environment rises upon the arrival of their salary and decreases in the preceding days, leading to anxiety and existential insecurity, which may increase the incidence of acute ischemic stroke. *Methods:* We assessed the daily average number of thrombolytic treatments due to acute ischemic stroke in Hungary between December 1, 2005, and November 30, 2013, calculating the ratio of thrombolytic treatments on the last day of the month (irrespectively whether it was the 28th-31st days) to thrombolytic treatments on the other days, and determined 95% confidence intervals. *Results:* In this period, 7880 thrombolytic treatments were performed nationwide (2.70/day), out of which 1867 occurred on the last day of the month (19.45/day). If the 28th, 29th, or 30th was not the last day of the month, 15.8, 20.6, and 22 times less thrombolytic treatments, respectively, were performed than on the last day of that month. *Conclusion:* We propose that financial insecurity on the days prior to the receipt of a salary might play a role in the elevation of stroke incidence observed on the last day of the month in Hungary. Further analysis of this phenomenon and its psychosocial effects is needed to adequately allocate healthcare resources and to take preventive measures in the high-risk population. **Key Words:** Acute ischemic stroke—financial security—last day of the month—psychosocial risk.

Introduction

Acute ischemic stroke (AIS) is among the most common causes of morbidity and mortality worldwide. Therefore, the workload on stroke units is large, but rather unpredictable. These units must be equipped with high-value instruments as well as highly trained professionals. It is easier to ensure the availability of these resources if the incidence rate and patient load are predictable. Therefore, the identification of factors that can predict the incidence of AIS at a certain time point is of utmost importance. The relevance of these factors can only be determined if the onset of AIS is precisely documented. Currently, the only reliable way to do so

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is to collect data of patients who underwent thrombolytic treatment (TT) from a national database, as the narrow therapeutic window guarantees a specific time frame. Based on the time of TT, the onset of AIS can be assessed with an accuracy of up to 4.5 hours. Although with this approach only a certain percentage of AIS cases are included and hemorrhagic stroke cases cannot be assessed, it provides reliable data in ischemic stroke.

Certain environmental factors, such as unfavorable meteorological circumstances and air pollution, are known to increase the risk of AIS; however, their effect is largely variable in different regions.[1-5] Therefore, the number of cases that are statistically comparable is low, even in larger countries. For instance, the incidence and mortality of AIS are higher in the cold winter season on the northern hemisphere.[1,2] Summer heat waves are also known to increase the mortality related to cerebrovascular events.[5] Changes in the atmospheric pressure affect blood pressure and thus hemorrhagic and ischemic cerebrovascular events.[3]

On the other hand, the most predominant sociocultural factors are usually prevalent nationwide. In most countries, the psychological state of the citizens is affected by financial stability, which largely depends on the average monthly income. We hypothesized that the secure standard of living and the financial stability of those with a monthly income rise upon the arrival of their salary at the beginning of the month and decrease in the days directly prior to this, resulting in anxiety, which may contribute to an increase in the incidence of AIS.

Methods

We assessed the daily average number of TTs due to AIS in Hungary between December 1, 2005, and November 30, 2013, calculating the ratio of TTs on the last day of the month (irrespectively whether it was the 28th-31st days) to TTs on the other days, and determined 95% confidence intervals.[6] In this method of calculation, higher R values represent lower prevalence of AIS compared to the last day of the given month.

We hypothesized that psychosocial factors concerning secure standard of living may affect women and men to a different extent; therefore, we also evaluated the data separately based on gender.

Salary in Hungary arrives on the fifth day of each month. Pensioners receive their pensions between the 10th and 12th days. The data of the Hungarian Central Statistical Office indicate that for the period between 2005 and 2013, up to 55%-57% of the population between the ages of 15 and 74 years are employed or receiving pension. People aged more than 74 years are dependant on pension. The rate of unemployment in this period was between 7.5% and 10.2%.[7]

Results

A total of 7880 TTs were performed in Hungary between December 1, 2005, and November 30, 2013 (2.70/day), out of which 1867 were performed on the last day of the month. This corresponds to an average of 19.45 TTs, which is 7.2 times higher than the average on all days.

If the 28th, 29th, or 30th was not the last day of the month, 15.8, 20.6, and 22 times less TTs, respectively, were performed than on the last day of the given month (Table 1). The 26th and 27th days were also characterized by low TT numbers: 16 and 18.7 times less TTs were performed, respectively, compared to the last day of the month.

Table 1. *Ratio (R) of the number of thrombolytic treatments due to acute ischemic stroke on the last day of the month to the number on other days between December 1, 2005, and November 30, 2013, in Hungary and 95% CIs*

Day of month	Ratio (R)	95% CI
1	6.5	.97
2	8.4	1.56
3	8.1	1.15
4	10.6	1.30
5	8.3	1.10
6	9.5	1.69
7	9.0	1.33
8	9.5	1.89
9	8.7	1.19
10	8.1	1.29
11	8.2	1.09
12	9.9	1.78
13	8.4	.99
14	10.0	1.64
15	9.3	1.44
16	9.3	1.24
17	10.0	1.58
18	9.2	1.26
19	11.1	1.74
20	10.8	1.63
21	10.8	1.83
22	11.4	2.08
23	13.2	1.83
24	13.1	1.98
25	13.1	2.09
26	16.0	2.82
27	18.7	2.86
28	15.8	2.88
28 last day	1.0	NA
29	20.6	3.45
29 last day	1.0	NA
30	22.0	5.06
30 last day	1.0	NA
31 last day	1.0	NA

Abbreviations: CI, confidence interval; NA, not applicable.