

Received: 21 June 2019 // Accepted: 17 August 2019 / Published online: 30 October 2019

UDC 616.12-083.98

AN ANALYSIS OF EMERGENCY CALLS RELATED TO STROKE

Askar M. Abiltayev¹, <https://orcid.org/0000-0003-4127-2347>

Askhat T. Shaltynov¹, <http://orcid.org/0000-0001-5387-3356>

Bakytzhan E. Konabekov¹, <https://orcid.org/0000-0003-0844-3407>

Ulzhan S. Jamedinova¹, <http://orcid.org/0000-0003-1671-289X>

Nicolay V. Mantler²,

Gaukhar T. Mansurova²,

Ayan O. Myssaev¹, <http://orcid.org/0000-0001-7332-4856>

¹ NJSC «Semey Medical University», Semey city, Republic of Kazakhstan;

² Semey Emergency Medical Care Station, Semey city, Republic of Kazakhstan.

Summary

Background: Acute stroke is one of the leading causes of disability and death worldwide. According to WHO, stroke is the second leading cause of death. The key stage for the provision of effective medical care in acute cerebrovascular accident (stroke) is the prehospital stage.

Aim of the study: to study the number of emergency calls regarding a stroke, depending on the time of year, day of the week and time of day.

Materials and Methods: Retrospective analysis of the database of the automated control system “Komek 103” used by the Semey Emergency Medical Station to coordinate the work of ambulance teams and to store information about calls to ambulance teams for the period from September 1, 2017 to August 31, 2018.

Studied variables: date, time of call, duration of the ambulance crew, gender, age, outcome of the call, seasonality.

To compare the two groups of quantitative variables, the Mann-Whitney test was used. For statistical analysis of nominal data, χ^2 Pearson was used. The value of $p < 0.05$ was taken as a statistically significant level.

Results: Monday was a statistically significant peak of ambulance calls for a stroke, from 10AM peak in the morning the afternoon was the busiest time for calls. Spring and summer prevailed in the seasonal distribution of calls.

Conclusions: Identified patterns require additional in-depth study and may be useful to increase the effectiveness of emergency care for stroke patients.

Keywords: stroke, emergency calls.

Резюме

АНАЛИЗ ВЫЗОВОВ СКОРОЙ ПОМОЩИ ПО ПОВОДУ ИНСУЛЬТА

Аскар М. Абильтаяев¹, <https://orcid.org/0000-0003-4127-2347>,

Асхат Т. Шалтынов¹, <http://orcid.org/0000-0001-5387-3356>,

Бакытжан Е. Конабеков¹, <https://orcid.org/0000-0003-0844-3407>,

Улжан С. Джамединова¹, <http://orcid.org/0000-0003-1671-289X>,

Николай В. Мантлер²,

Гаухар Т. Мансурова²,

Аян О. Мысаев¹, <http://orcid.org/0000-0001-7332-4856>

¹ Некоммерческое акционерное общество «Медицинский университет Семей», г. Семей, Республика Казахстан;

² КГКП «Станция скорой медицинской помощи г. Семей» Управления здравоохранения ВКО, г. Семей, Республика Казахстан.

Введение: Острый инсульт является одной из ведущих причин инвалидности и смертности во всем мире. По данным ВОЗ, инсульт является второй по частоте причиной смерти. Ключевым этапом для оказания эффективной медицинской помощи при остром нарушении мозгового кровообращения (ОНМК) является догоспитальный этап.

Цель: изучение количества вызовов скорой медицинской помощи относительно инсульта в зависимости от времени года, дня недели и времени суток.

Материалы и методы: ретроспективный анализ базы данных автоматизированной системы управления «Көмек 103», используемой Станцией скорой медицинской помощи г.Семей для координирования работы бригад скорой медицинской помощи и хранения информации о вызовах бригад скорой медицинской помощи за период с 1 сентября 2017 года по 31 августа 2018 года.

Исследуемые переменные: дата, время вызова, продолжительность работы бригады скорой помощи, пол, возраст, исход вызова, сезонность.

Для сравнения двух групп количественных переменных использовался критерий Манна-Уитни. Для статистического анализа номинальных данных использовался χ^2 Пирсон. Значение $p < 0,05$ было принято за статистически значимый уровень.

Результаты: понедельник явился статистически значимым пиком вызовов скорой помощи по поводу инсульта, с пиковых 10 утра вторая половина дня явилась самым насыщенным на вызовы временем. Весна и лето преобладали в сезонном распределении вызовов.

Выводы: Выявленные закономерности требуют дополнительного углубленного изучения и могут быть полезны для повышения эффективности экстренной помощи инсультным больным.

Ключевые слова: ОНМК, инсульт, скорая помощь.

Түйіндеме

ИНСУЛЬТ БОЙЫНША ЖЕДЕЛ ЖӘРДЕМ ШАҚЫРУЛАРЫН ТАЛДАУЫ

Аскар М. Абильтаев¹, <https://orcid.org/0000-0003-4127-2347>,

Асхат Т. Шалтынов¹, <http://orcid.org/0000-0001-5387-3356>,

Бакытжан Е. Конабеков¹, <https://orcid.org/0000-0003-0844-3407>,

Улжан С. Джамединова¹, <http://orcid.org/0000-0003-1671-289X>,

Николай В. Мантлер²,

Гаухар Т. Мансурова²,

Аян О. Мысаев¹, <http://orcid.org/0000-0001-7332-4856>

¹ КеАҚ «Семей медицина университеті», Семей қ., Қазақстан Республикасы;

² ШҚО Денсаулық сақтау Басқармасының «Семей қаласының жедел шұғыл медициналық жәрдем станциясы» ҚКМК, Семей қ., Қазақстан Республикасы.

Кіріспе: Жедел инсульт бүкіл әлемде мүгедектік пен өлімнің басты себептерінің бірі болып табылады. ДДСҰ мәліметтері бойынша инсульт екінші орында. Ми қан айналымының жедел бұзылуында тиімді медициналық көмек көрсету үшін негізгі кезең (ЖЖМК) емдеуге дейінгі кезең болып табылады.

Мақсаты: Медициналық жедел жәрдем инсультқа қатысты жылдың, аптаның, тәуліктің күндерінің шақырулар санына байланысты зерттеу.

Материалдары мен әдістері: Жедел медициналық жәрдем және сақтау бригадаларының жұмысын ұйымдастыру үшін Семей қаласының Жедел медициналық жәрдем станциясы пайдаланатын "Көмек 103" автоматтандырылған басқару жүйесінің деректер базасын ретроспективті талдау және жедел медициналық жәрдем бригадаларын шақыру туралы ақпарат 2017 жылғы 1 қыркүйектен бастап 2018 жылғы 31 тамыз аралығы.

Зерттелетін айнымалылар: шақыру күні, уақыты, жедел жәрдем бригадасы жұмысының ұзақтығы, жынысы, жасы, шақыру нәтижесі, маусымдылығы.

Сандық айнымалылардың екі тобын салыстыру үшін Манна-Уитни критерийі қолданылды. Номиналды деректерді статистикалық талдау үшін χ^2 Пирсон қолданылды. $P < 0,05$ мәні статистикалық маңызды деңгей үшін қабылданды.

Нәтижелері: Дүйсенбі инсульт үшін жедел жәрдем шақыруының статистикалық маңызды болды, таңертеңгі 10-дан күндізгі қоңыраулар үшін ең көп уақыт болды. Көктем мен жаз мезгілдік шақыруларда бөлуде басым болды.

Қорытынды: Анықталған үлгілер қосымша терең зерттеуді қажет етеді және инсультпен ауыратын науқастарға шұғыл көмек көрсету тиімділігін арттыруда пайдалы болуы мүмкін.

Негізгі сөздер: ЖЖМК, инсульт, жедел жәрдем.

Библиографическая ссылка:

Абильтаев А.М., Шалтынов А.Т., Конабеков Б.Е., Джамединова У.С., Мантлер Н.В., Мансурова Г.Т., Мысаев А.О. Анализ вызовов скорой помощи по поводу инсульта // Наука и Здоровье. 2019. 6 (Т.21). С. 34-40.

Abiltayev A.M., Shaltynov A.T., Konabekov B.E., Jamedinova U.S., Mantler N.V., Mansurova G.T., Myssaev A.O. An analysis of emergency calls related to stroke // *Nauka i Zdravookhranenie* [Science & Healthcare]. 2019, (Vol.21) 6, pp. 34-40.

Абильтаев А.М., Шалтынов А.Т., Конабеков Б.Е., Джамединова У.С., Мантлер Н.В., Мансурова Г.Т., Мысаев А.О. Инсульт бойынша жедел жәрдем шақыруларын талдауы // Ғылым және Денсаулық сақтау. 2019. 6 (Т.21). Б. 34-40.

Background

In 2016, stroke was the second largest cause of death in the world after coronary heart disease (5.5 million deaths per year). Stroke was also the second most common cause for disability adjusted live year (DALY) [10]. Eastern Europe, East Asia and parts of Southeast Asia, Central Asia, and sub-Saharan Africa have the highest stroke mortality rates [5].

According to official statistics, despite the general trend of a decrease in stroke mortality in the East Kazakhstan region, indicators remain above the national average (Figure 1).

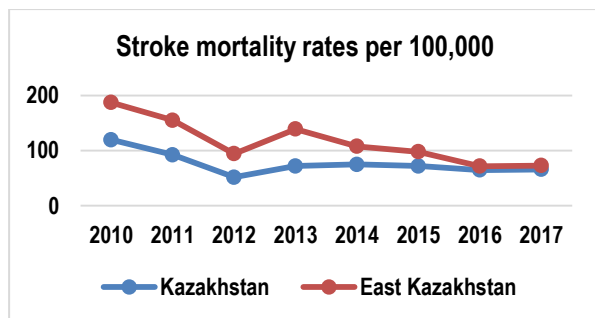


Figure 1. Stroke mortality rates per 100,000 population.

Regardless of the age or severity of the stroke, and despite the increased risk of fatal hemorrhage during the first few days after treatment, timely therapeutic measures significantly improve the overall chances of a good stroke outcome (survival, disability, 90 day survival) if the patient was not delivered by ambulance later than 4.5 hours after an episode of stroke [7].

Various studies contradict the identification of significant factors associated with delays in the delivery of ambulance services for stroke patients, but they agree that it is necessary to increase awareness of the symptoms of stroke, to increase the availability and quality of ambulance [3,9,11,13,15,16].

In addition, a very interesting and controversial factor is the seasonal pattern of stroke. Many studies conducted around the world indicate the existence of such a relationship, while others deny this fact [17].

The aim of our study is to study the number of calls for emergency medical care regarding stroke, depending on the time of year, day of the week and time of day.

Materials and Methods

Study design: retrospective observational study.

The data taken from the database of the Komek 103 automated control system used by the Semey Emergency Medical Care Station to coordinate the work of ambulance teams and to store information about calls by ambulance teams for the period from September 1, 2017 to August 31, 2018. Studied variables: date, time of call, duration of the ambulance crew, gender, age, outcome of the call, seasonality.

The duration of the ambulance crew's work was calculated in minutes, the call time was divided by the hours of the day, seasonality was divided into 4 categories:

spring, summer, autumn, winter, where March, April and May were included in the spring, June, July and August in the summer, September, October and November in the autumn, December, January, February in the winter.

Sample size: A retrospective analysis included all patients who received emergency medical care. The following diagnoses were included: stroke, not specified as hemorrhage or infarction (I64), intracerebral hemorrhage (I61), subarachnoid hemorrhage (I60), occlusion and stenosis of basilar artery (I65.1), occlusion and stenosis of vertebral artery (I65.0), cerebral infarction (I63), transient cerebral ischemic attacks and related syndromes (G45), transient cerebral ischemic attack, unspecified (G45.9). Patients who were taken home or to the train station or to the airport were excluded from the analysis.

Statistical analysis.

In the article, the data are presented in absolute values, in percent and frequencies. To compare the two groups of quantitative variables, the Mann-Whitney test was used. For statistical analysis of nominal data, χ^2 Pearson was used. The value of $p < 0.05$ was taken as a statistically significant level. The analysis was carried out for the entire sample, so individually for each group. To assess the trend of emergency calls, we used a polynomial trend. SPSS version 20.0 for Windows was used for statistical analysing.

Results

From September 1, 2017 to August 31, 2018, 2698 cases were recorded. Of these, 2621 were included for analysis, since 77 cases met the exclusion criteria. The mean age of the patients was 61.50 years (SD = 15.4).

Table 1.

Age and gender characteristics.

Characteristics	Men	Women	Total
Gender, % (n)	60,5 (1562)	39,5 (1019)	100 (2621)
Age, Me (IQ), years	61 (18)	64 (22)	62 (19)

As can be seen from table 1, in this population the percentage ratio of men was more than women, male patients were younger, this difference was statistically significant ($p < 0.001$).

The average duration of one call from receiving a call to the release of the ambulance crew was 80.97 minutes (SD = 29.8).

An analysis of the data yielded the following results: the most significant percentage of cases (87.8%) occurred in stroke, unspecified as hemorrhage or infarction; the second position after stroke, unspecified as a hemorrhage or infarction, takes transient cerebral ischemic attack, unspecified (3.3%); followed by intracerebral hemorrhage (2.6%) and cerebral infarction (2.5%). The shares of subarachnoid hemorrhage and transient cerebral ischemic attacks and related syndromes were 1.3% and 1.6%, respectively. At the same time, the shares of occlusion and stenosis of basilar and vertebral arteries were 0.6 and 0.2%, respectively.

Data on the outcome of the calls gave the following values (Table 2):

Table 2.

Outcomes of calls.

Outcomes	Frequency (n)	Percent (%)
Left in place	182	6,9
Delivered for special assistance	902	34,4
Delivered to hospitalization	1505	57,4
Transferred to another crew	14	0,5
Death before arrival	16	0,6
Death in the presence of the crew	2	0,1
Total	2621	100,0

The analysis of the number of calls during the day (Fig. 2) showed the following pattern: the peak of the call falls from 9 a.m. to 12 p.m., after which there is a decline in

calls, where the smallest number of calls is noted from two in the morning to five in the morning. This difference is statistically significant ($\chi^2 = 863.816, p < 0.001$)

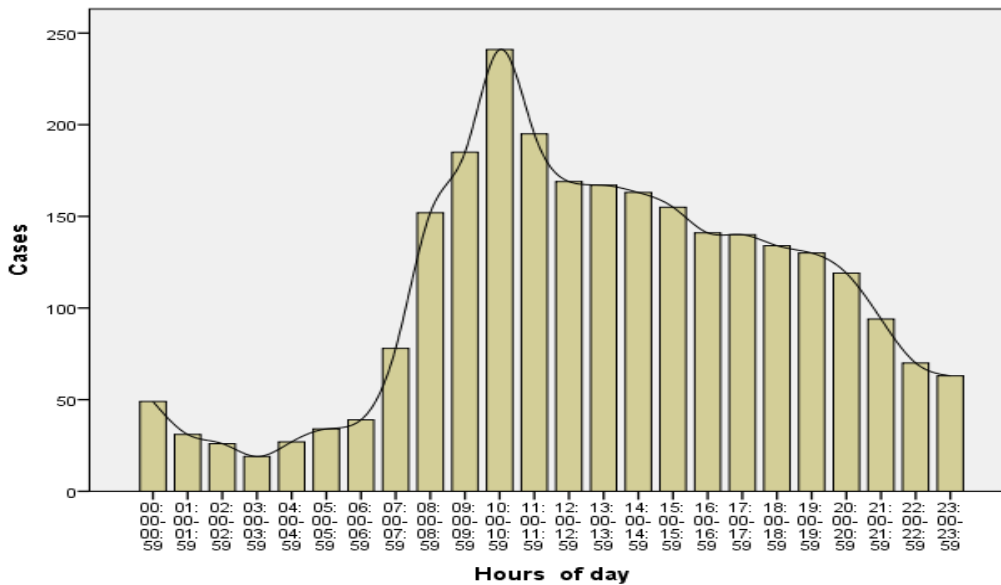


Figure 2. Number of calls during the day

Data regarding weekly call distribution is shown in Figure 3.

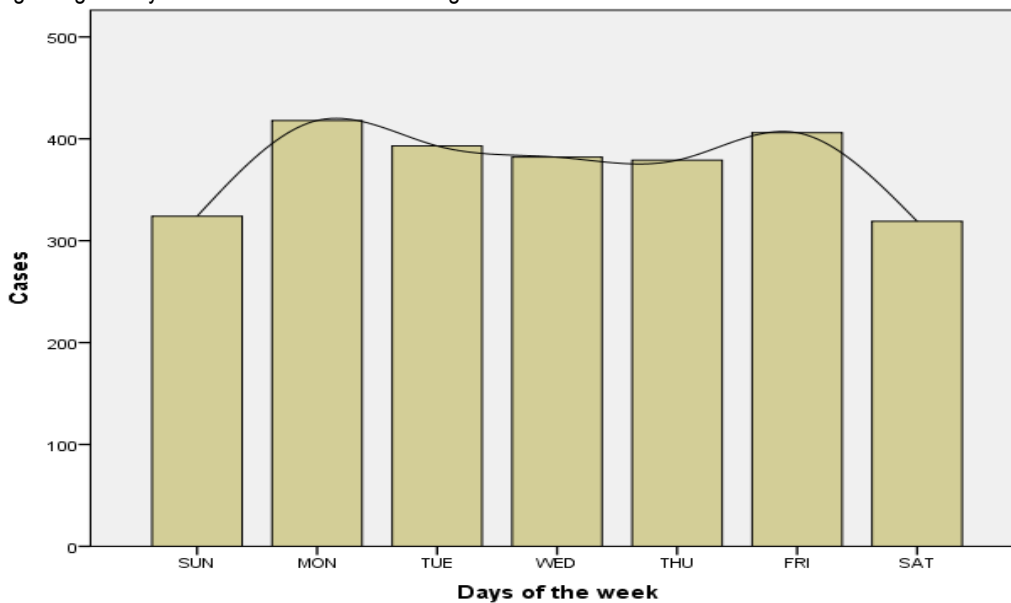


Figure 3. Number of calls per days of the week.

As can be seen from Figure 3, two emergency peaks were on Monday and Friday, while the decline was on Saturday and Sunday. On Tuesday, Wednesday and Thursday, the indicators were at a stable high level. These

differences are statistically significant ($\chi^2 = 23.86, p < 0.001$).

Figure 4 shows the data of ambulance calls for months during the year.

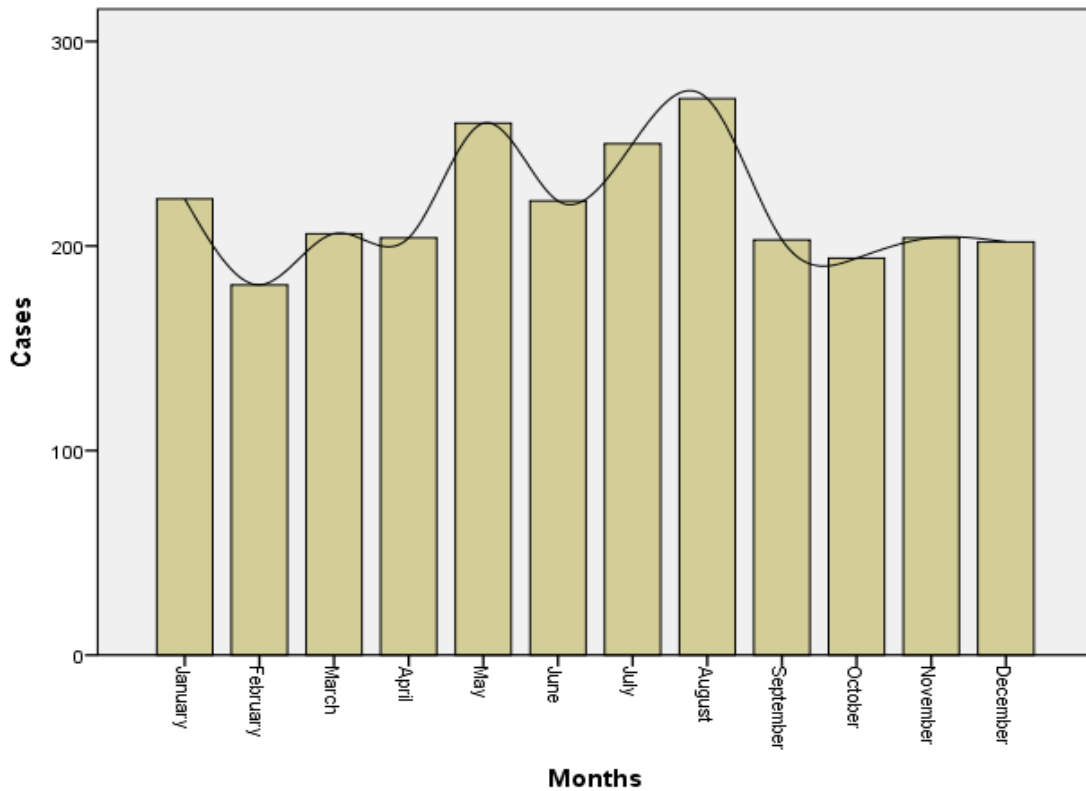


Figure 4. The number of appealability during the year by month.

As can be seen from Figure 4, the peaks of calls were in May and August, while the lows were in February and October. This difference was statistically significant ($\chi^2 = 39.86, p < 0.001$).

Results of seasonal appealability analysing are presented in Figure 5.

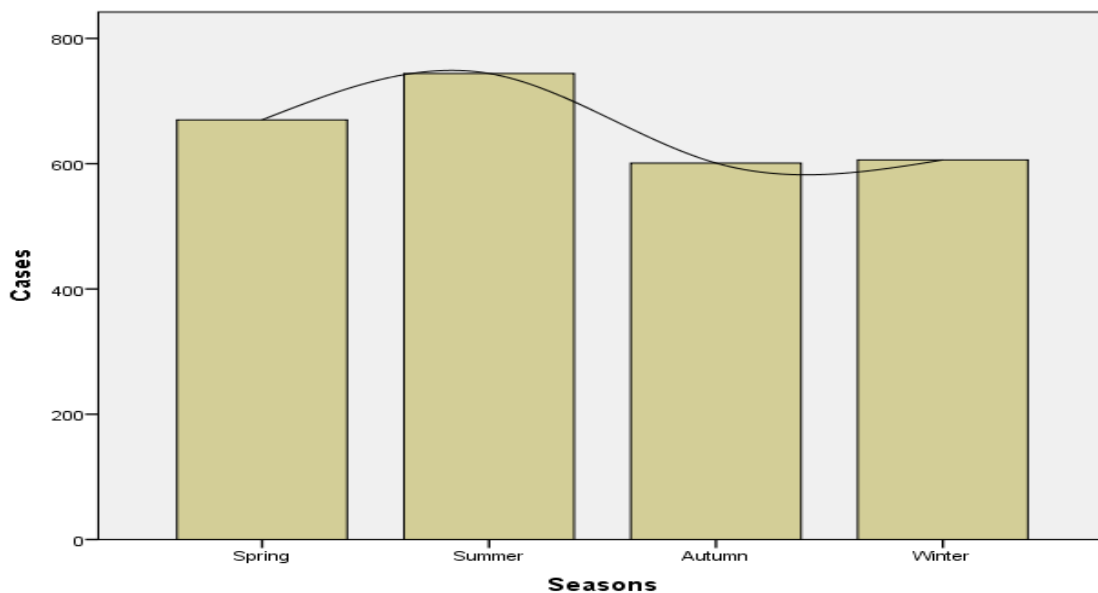


Figure 5. The number of appealability during the year by season.

As can be seen from Figure 5, the following pattern is noted: the peak of calls for ambulance came in the summer, then following by the spring period and there was a decline in the autumn-winter period. This difference was statistically significant ($\chi^2 = 20.55, p < 0.001$).

Discussion

In our study, we identified Monday and Friday as two peaks in the number of stroke calls, which does not

contradict the findings of studies on stroke registers Finstroke and Kyoto stroke [8,19]. Therefore, in both studies, Monday was the peak of stroke cases, and in the Finnish study, the relationship between the occurrence of stroke and the socio-economic situation of patients revealed. In a study conducted by domestic authors, Monday and Tuesday were the peak days of ambulance calls for a stroke [1]. Identification of stroke patterns based

on the Framingham study showed that Monday is the peak day of the week for all types of stroke and especially among working men [12].

At the same time, our results regarding temporal patterns are somewhat contrary to major international studies. So if in the Margaret Kelly-Hayes et al. study the peak of calls occurred between 8 and 10 a.m., in the Elliott study it was reported that most calls occurred from 6 a.m. to noon, then in our study the peak was at 10 a.m. and most of the calls were made in the second half [6,12]. Call peaks between 10 AM and 12 PM were reported by Marler et al [14].

The revealed pattern of ambulance calls in the spring and summer periods does not contradict the authors from Novosibirsk (Russia) and Takashima (Japan), but nonetheless contradicts other studies [2,20,21]. Most foreign authors report a lack of seasonal patterns in the occurrence of strokes [4,17,18].

Литература:

1. Мухаметзянов А.М., Зиганшин М.М., Киреева Э.Ф. Динамика вызовов скорой медицинской помощи при острых нарушениях мозгового кровообращения // Фундаментальные исследования. 2014. Т. 7. № 5. С. 1002–1005.
2. Хаснулин В.И., Воевода М.И., Артамонова М.В. Зависимость частоты вызовов скорой помощи к пациентам с гипертоническими кризами, инфарктами миокарда, острыми нарушениями мозгового кровообращения от сочетанного действия температуры воздуха, атмосферного давления и геомагнитных возмущений в г. Новосибирск // Современные проблемы науки и образования. 2015. Т. 4. С.406
3. Ashraf V.V., Maneesh M., Praveenkumar R., Saifudheen K., Girija A.S. Factors delaying hospital arrival of patients with acute stroke // Ann. Indian Acad. Neurol. 2015. Ch.18. №2. pp.162-166.
4. Bahonar A., Khosravi A., Khorvash F., Maracy M., Saadatnia M. Seasonal and Monthly Variation in Stroke and its Subtypes-10 Year Hospital-Based Study // Mater. Socio Medica. 2017. Ch.29. № 2. p. 119.
5. Benjamin E.J., Muntner P., Alonso A., Bittencourt M.S., Callaway C.W., Carson A.P., Chamberlain A.M., Chang A.R. et al. Heart Disease and Stroke Statistics-2019 Update: A Report From the American Heart Association // Circulation. 2019. Ch.139. №10 p. e56-e528.
6. Elliott W.J. Circadian variation in the timing of stroke onset: A meta-analysis // Stroke. 1998. Ch.29. №5 p. 992-996.
7. Emberson J., Lees K., Lyden P., Blackwell L., Albers G., Bluhmki E., Brott T., Cohen G. et al. Effect of treatment delay, age, and stroke severity on the effects of intravenous thrombolysis with alteplase for acute ischaemic stroke: A meta-analysis of individual patient data from randomised trials // Lancet. 2014. Ch.384. №9958. p. 1929-1935.
8. Jakovljević D. Day of the week and ischemic stroke: Is it Monday high or Sunday low? // Stroke. 2004. Ch.35 №9 p. 2089-2093.
9. Jin H., Zhu S., Wei J.W., Wang J., Liu M., Wu Y., Wong L.K., Cheng Y., Xu E., Yang Q., Anderson C.S., Huang Y. Factors associated with prehospital delays in the presentation of acute stroke in urban China. // Stroke. 2012.

Ch.43. №2 p.362-370.

10. Johnson C.O. et al. Global, regional, and national burden of stroke, 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016 // Lancet Neurol. 2019. Ch.18. №5 p.439-458.
11. Kamel H., Navi B.B., Fahimi J. National trends in ambulance use by patients with stroke, 1997-2008 // JAMA - J. Am. Med. Assoc. 2012. Ch.307. №10 p. 1026 - 1028.
12. Kelly-Hayes M., Wolf P.A., Kase C.S., Brand F.N., McGuirk J.M., D'Agostino R.B. Temporal patterns of stroke onset: The framingham study // Stroke. 1995. Ch.26. №8 p.1343-1347.
13. Lacy C., Suh D., Bueno M., Kostis J. Delay in presentation and evaluation for acute stroke: Stroke time registry for outcomes knowledge and epidemiology (S.T.R.O.K.E.) // Stroke. 2001. Ch.32 №1 p. 63-69.
14. Marler J., Price T., Clark G., Muller J., Robertson T., Mohr J., Hier D., Wolf P., Caplan L., Foulkes M. Morning increase in onset of ischemic stroke 284 // Stroke. 1989. Ch.20. № 0039–2499 (Print). p. 473–476.
15. Mosley I., Nicol M., Donnan G., Patrick I., Dewey H. Stroke symptoms and the decision to call for an ambulance // Stroke. 2007. Ch.38 №2. p. 361-366.
16. Mosley I., Nicol M., Donnan G., Patrick I., Kerr F., Dewey H. The impact of ambulance practice on acute stroke care // Stroke. 2007. Ch.38. №10. p. 2765-2770.
17. Oberger A., Ferguson J., McIntyre L., Horner R. Incidence of stroke and season of the year: Evidence of an association // Am. J. Epidemiol. 2000. Ch.152 №6 p.558-564.
18. Rothwell P., Wroe S., Slattery J., Warlow C. Is stroke incidence related to season or temperature? // Lancet. 1996. Ch.347 №.9006 p. 934-936.
19. Shigematsu K., Watanabe Y., Nakano H. Weekly variations of stroke occurrence: An observational cohort study based on the Kyoto Stroke Registry, Japan // BMJ Open. 2015. Ch.5. №3. p. 1-6.
20. Takizawa S., Shibata T., Takagi S., Kobayashi S. Seasonal Variation of Stroke Incidence in Japan for 35631 Stroke Patients in the Japanese Standard Stroke Registry, 1998-2007 // J. Stroke Cerebrovasc. Dis. 2013. Ch.22. №1. p. 36-41.
21. Turin T.C., Kita Y., Murakami Y., Rumana N., Sugihara H., Morita Y., Tomioka N., Okayama A., Nakamura Y., Abbott R.D., Ueshima H. Higher stroke incidence in the spring season regardless of conventional risk factors: Takashima Stroke Registry, Japan, 1988-2001 // Stroke. 2008. Ch.39. №3. p. 745-52.

References:

1. Mukhametzyanov A.M., Ziganshin M.M., Kireeva E.F. Dinamika vyzovov skoroy meditsinskoy pomoshchi pri ostrykh narusheniyakh mozgovogo krovoobrashcheniya [The dynamics of emergency calls in acute cerebrovascular accidents]. *Fundamental'nye issledovaniya* [Basic research]. 2014. T. 7. № 5. p. 1002–1005. [in Russian]
2. Khasnulin V.I., Voevoda M.I., Artamonova M.V. Zavisimost' chastoty vyzovov skoroy pomoshchi k patsientam s gipertonicheskimi krizami, infarktami miokarda, ostrymi narusheniyami mozgovogo krovoobrashcheniya ot sochetannogo deystviya temperatury vozdukha, atmosfernogo davleniya i

geomagnitnykh vozmushcheniy v g. Novosibirsk [The dependence of the frequency of emergency calls to patients with hypertensive crises, myocardial infarction, acute cerebrovascular accident on the combined effects of air temperature, atmospheric pressure and geomagnetic disturbances in Novosibirsk]. *Sovremennye problemy nauki i obrazovaniya* [Modern problems of science and education]. 2015. T. 4. p.406 [in Russian]

3. Ashraf V.V., Maneesh M., Praveenkumar R., Saifudheen K., Girija A.S. Factors delaying hospital arrival of patients with acute stroke. *Ann. Indian Acad. Neurol.* 2015. Ch.18. №2 p.162-166.

4. Bahonar A., Khosravi A., Khorvash F., Maracy M., Saadatnia M. Seasonal and Monthly Variation in Stroke and its Subtypes-10 Year Hospital-Based Study. *Mater. Socio Medica.* 2017. Ch.29. № 2. p. 119.

5. Benjamin E.J., Muntner P., Alonso A., Bittencourt M.S., Callaway C.W., Carson A.P., Chamberlain A.M., Chang A.R. et al. Heart Disease and Stroke Statistics-2019 Update: A Report From the American Heart Association. *Circulation.* 2019. Ch.139. №10 p. e56-e528.

6. Elliott W.J. Circadian variation in the timing of stroke onset: A meta-analysis. *Stroke.* 1998. Ch.29. №5 p. 992-996.

7. Emberson J., Lees K., Lyden P., Blackwell L., Albers G., Bluhmki E., Brott T., Cohen G., et al. Effect of treatment delay, age, and stroke severity on the effects of intravenous thrombolysis with alteplase for acute ischaemic stroke: A meta-analysis of individual patient data from randomised trials. *Lancet.* 2014. Ch.384. №9958. p. 1929-1935.

8. Jakovljević D. Day of the week and ischemic stroke: Is it Monday high or Sunday low? *Stroke.* 2004. Ch.35 №9 p. 2089-2093.

9. Jin H., Zhu S., Wei J.W., Wang J., Liu M., Wu Y., Wong L.K., Cheng Y., Xu E., Yang Q., Anderson C.S., Huang Y. Factors associated with prehospital delays in the presentation of acute stroke in urban China. *Stroke.* 2012. Ch.43. №2 p.362-370.

10. Johnson C.O. et al. Global, regional, and national burden of stroke, 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016. *Lancet Neurol.* 2019. Ch.18. №5 p.439-458.

11. Kamel H., Navi B.B., Fahimi J. National trends in

ambulance use by patients with stroke, 1997-2008. *JAMA - J. Am. Med. Assoc.* 2012. Ch.307. №10 p. 1026 - 1028.

12. Kelly-Hayes M., Wolf P.A., Kase C.S., Brand F.N., McGuirk J.M., D'Agostino R.B. Temporal patterns of stroke onset: The framingham study. *Stroke.* 1995. Ch.26. №8 p.1343-1347.

13. Lacy C., Suh D., Bueno M., Kostis J. Delay in presentation and evaluation for acute stroke: Stroke time registry for outcomes knowledge and epidemiology (S.T.R.O.K.E.). *Stroke.* 2001. Ch.32 №1 p. 63-69.

14. Marler J., Price T., Clark G., Muller J., Robertson T., Mohr J., Hier D., Wolf P., Caplan L., Foulkes M. Morning increase in onset of ischemic stroke 284. *Stroke.* 1989. Ch.20. № 0039–2499 (Print). p. 473–476.

15. Mosley I., Nicol M., Donnan G., Patrick I., Dewey H. Stroke symptoms and the decision to call for an ambulance. *Stroke.* 2007. Ch.38 №2. p. 361-366.

16. Mosley I., Nicol M., Donnan G., Patrick I., Kerr F., Dewey H. The impact of ambulance practice on acute stroke care. *Stroke.* 2007. Ch.38. №10. p. 2765-2770.

17. Oberg A., Ferguson J., McIntyre L., Horner R. Incidence of stroke and season of the year: Evidence of an association. *Am. J. Epidemiol.* 2000. Ch.152 №6 p.558-564.

18. Rothwell P., Wroe S., Slattery J., Warlow C. Is stroke incidence related to season or temperature? *Lancet.* 1996. Ch.347 №9006 p. 934-936.

19. Shigematsu K., Watanabe Y., Nakano H. Weekly variations of stroke occurrence: An observational cohort study based on the Kyoto Stroke Registry, Japan. *BMJ Open.* 2015. Ch.5. №3. p. 1-6.

20. Takizawa S., Shibata T., Takagi S., Kobayashi S. Seasonal Variation of Stroke Incidence in Japan for 35631 Stroke Patients in the Japanese Standard Stroke Registry, 1998-2007. *J. Stroke Cerebrovasc. Dis.* 2013. Ch.22. №1. p. 36-41.

21. Turin T.C., Kita Y., Murakami Y., Rumana N., Sugihara H., Morita Y., Tomioka N., Okayama A., Nakamura Y., Abbott R.D., Ueshima H. Higher stroke incidence in the spring season regardless of conventional risk factors: Takashima Stroke Registry, Japan, 1988-2001. *Stroke.* 2008. Ch.39. №3. p. 745-52.

Corresponding author:

Shaltynov Askhat Toktarovich - NCJSC "Semey Medical University" public health program 1st year PhD student.

Postal address: Republic of Kazakhstan, 071400, Semey. Abay st. 103,

Email: askhatts@gmail.com

Telephone: +77055665380