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THE ISSUE OF RISK FACTORS FOR SUBARACHNOID HEMORRHAGE

The article discusses the problem of occurrence of subarachnoid hemorrhage (SAH), the statistical data on the incidence together with the most frequent causes of mortality. It has been described the risk factors for SAH in detail, depending on the division into two large categories of modifiable and non-modifiable, and analyzed from the standpoint of evidence-based medicine with the indication of authenticity.

Key words: acute ischemic stroke, subarachnoid hemorrhage, risk factors

Subarachnoid hemorrhage (SAH) – one of severe, life threatening kind of the hemorrhagic stroke that occurs frequently and makes out nearly 5% of all strokes. According to the research data of the World Health Organization disease incidence of SAH diversifies tenfold from 2 cases per 100 000 humans in Beijing to 27 per 100 000 humans in Japan. High level of the disease incidence is observed in Finland - 22 per 100 000 of population [1-5]. Disease incidence in the North America (USA and Canada) is 10,5 per 100 000 of population [6-9]. Taking into account the patients who died in the early terms after hemorrhage, prevalence of SAH in Japan reaches 32 per 100 000 of population [3, 10]. Generally, from 10 to 20% of the SAH patients have fatal outcome on the way to hospital, and approximately 25% of sufferers die within the first 24 hours [11, 12].

According to statistical collection of the Ministry of Health of the Republic of Kazakhstan (RK) "Health of the Republic of Kazakhstan and activities of public health organizations in 2013", index of the global population incidence by category “Diseases of blood circulation» is 13391.6 per 100 000 of population [13]. Cerebral stroke morbidity in the RK is 3.7 per 1000 of population, 52% of which goes for acute stroke [14]. Stroke mortality rate is equal to 1.08 per 1000 of population, which is considered as 26% from total mortality in Kazakhstan. Also stroke «leaders» for reasons of disability in the RK and reaches 104,6 per 100 000 of population.

Worldwide population research results testify the fact that for the last 40 years prevalence of SAH has not changed essentially. Disease incidence increases with age, reaching its peak at

the age from 49 to 55 [1-3, 10, 15, 16]. Women suffer for 1,6 per cent more frequently than men, although given inequality fluctuates in various populations [1-4, 17]. Certain researchers consider that hormonal status explains that kind of inequality. Also there are race differences, for example, in the North America SAH risk ratio of black men to white population is 2,1:1, besides this black and latino Americans are considered to have high SAH incidence rate than white Americans [17-19].

The main causes of SAH, excluding injury, are a rupture of saccular brain aneurysm 85%, perimesencephalic hemorrhage 10%, arteriovenous malformations, spontaneous dissection of the cervical arteries and others 5% [20-22]. Intracranial aneurysms are usually single in 70 to 75% of cases, but they can be multiple in 25 to 50% of cases [23, 24]. Aneurysmal SAH are the most commonly caused by vascular lesion of the following systems: the anterior communicating artery and forebrain 40-50%, the internal carotid artery and posterior communicating artery 15-20%, the middle cerebral artery 15-20%, the main and posterior cerebral arteries 3-5%, other arteries 4-9%. The frequency of the formation of new intracranial aneurysms among patients treated for aneurysmal SAH is 1-2% per year. Patients with multiple intracranial aneurysms are more susceptible to the formation of new aneurysms; however, the causing factors - whether they are genetic or acquired - are not identified. Causes of mortality in aneurysmal SAH are listed in table 1 [23, 24, 25, 26].

Table 1

Causes of the fatal outcomes of the patients with aneurismal SAH

Causes	Fatal outcomes %	Disability %	Total %
Direct blood influence	7.0	3.6	10.6
Vasospasm (VS)	7.2	6.3	13.5
Repeated hemorrhaging	6.7	0.8	7.5
Acute hydrocephalus	0.3	1.4	1.7
Other complications	1.3	1.0	2.3
Surgical complications	1.7	2.3	4.0
Complications during the	0.7	0.1	0.8

course of the treatment			

It has been studied many potential factors of SAH, but only some of them have been reliably established [2, 29-38]. All risk factors can be divided into two large categories: modifiable and non-modifiable (changing and constant) [39].

The modifiable factors include such factors as smoking and hypertension, which are the most important ones, and such as alcoholism, abuse of cocaine and caffeine, nicotine contained in pharmaceutical products, the use of NSAIDs [30-36, 40-45]. Contrary to traditional beliefs, in respect to factors such as the use of oral contraceptives, hypercholesterolemia and physical activity, the convincing cohesion with an increased risk of SAH is not proven [31, 32, 39, 46].

Not-modifiable risk factors include a family history of occurrence of SAH at the first-degree relatives, female gender, low education levels, low body mass index and some genetic factors [11, 24, 31, 37]. A number of genetic syndromes are associated with the development of SAH, they include autosomal dominant polycystic kidney disease, Ehlers-Danlos syndrome, alphaantitrypsins deficiency, sickle cell anemia, elastic pseudoxanthoma, hereditary hemorrhagic telangiectasia, neurofibromatosis of the first type, tuberous sclerosis (Bourneville-Pringle disease), fibromuscular dysplasia and coarctation of the aorta [11, 24, 47-50].

If there is a family history of SAH in the immediate relatives, it is the most important non-modifiable risk factor. In the first-degree relatives of patients with SAH the risk of SAH is 3-7 times higher than that of second-degree relatives or in the general population [11, 24, 37, 44, 50]. Being a woman is no less important non-modifiable risk factor for SAH. The reasons for the increased risk for women are possibly menstruation and hormonal changes [11, 16, 46, 51-54]. For example, a woman who gave the first-birth to a child in a later age, and those who lad later onset of menarche (<13 years), have a lower risk of SAH. Retrospective studies have shown that the risk of SAH among postmenopausal women who took hormone replacement therapy, is reduced compared with women who did not take hormone replacement therapy [51-54].

Also it has been studied metrological, seasonal and temporary risk factors. Seasonal changes in SAH differ depending on age and gender. Seasons affect the occurrence of SAH: it occurs less often in summer than in winter, mostly during January [54, 56, 57]. Regarding the time of occurrence: usually from 7 to 10 am and from 5 to 8 pm, and the most dangerous period is from 10 pm to 6 am, but not all studies confirm this [3, 55-58]. Japanese scientists have studied the differences in the incidence of stroke depending on the kind of the stroke among the days of the week, and found that cerebral strokes are more common on Monday than Sunday, regardless of age or sex. They also found that there was no significant difference in the

occurrence of cerebral hemorrhage and SAH between days of the week [59]. There is evidence of a correlation of atmospheric pressure, ambient temperature and humidity with the incidence of SAH [55-58, 60, 61]. Daily drop in ambient temperature on 1˚F and cold daily temperatures increase the risk of SAH [62]. Decreasing daylight and reducing the relative humidity were associated with an increased incidence of hospitalization of patients with ruptured cerebral aneurysm; yet had no connection with hospital mortality [60]. However, there is an assumption that the external atmospheric factors can cause hormonal and homeostatic changes in the body that affect the risk of rupture of cerebral aneurysms, and therefore more research is needed to confirm and better understand these relationships.

The question of whether the treatment results in the risk factors to reduce the incidence of SAH purposefully in randomized trials has not been studied. Therefore, the existing data are from observational and cohort studies. It is believed that the control of the major risk factors have a significant impact on the likelihood of developing SAH in the young patients to a greater extent than in the elderly.

AH is a strong risk factor for SAH [30-32, 34-36]. Thus, the reduction in diastolic blood pressure (BP) by 6 mmHg led to a 42% decrease in the incidence of stroke. On the other hand, despite an improvement in control of blood pressure in the general population in recent years, the incidence of SAH has not changed. Control of BP reduces the severity of SAH, and untreated AH is a predictor of adverse outcome of SAH.

Smoking is also a strong risk factor for SAH [30-34, 40, 41, 44]. Studies have shown that patients who have history of smoking in the past and never smokers but exposed to tobacco smoke at home, too, has a strong risk factor for SAH [41, 53].

Because of the high prevalence of asymptomatic intracranial aneurysm, on the one hand, and adverse outcomes of SAH, on the other, the feasibility of selective screening is a matter of debate. During evaluation of the clinical effectiveness of screening of asymptomatic intracranial aneurysms should weigh the cost and likely outcomes of SAH [64-67]. According to the literature, screening to identify asymptomatic aneurysms in the general population is not currently supported. Among smokers and patients who abuse alcohol, there is a higher incidence of SAH; however, the occurrence of aneurysms is not different from that of the general population. Cost-effectiveness of screening patients with a positive family history of the presence of aneurysms was not carried out, although it is known that these patients are more likely to have intracranial arterial aneurysms. In contrast to the asymptomatic individuals, the frequency of the formation of new aneurysms in patients after aneurysmal SAH is 1-2% [68]. Therefore, some authors consider reasonable radiological examination of patients.

The American Heart Association and American Stroke Association [69] developed

recommendations to ensure the best possible treatment and study of risk factors for SAH based on the principles of the scientific evidence, which are annually reviewed, updated and supplemented. [70] According to the recommendations, concerning risk factors for SAH it is recommended:

1. To carry out the treatment of high blood pressure with antihypertensive drugs for the prevention of ischemic stroke, intracerebral hemorrhage and organ damage (class I, level of evidence A).

2. Elevated blood pressure should be controlled, as treatment of hypertension reduces the risk of SAH (Class I, level of evidence B).

3. To reduce the risk of SAH it is reasonable quitting smoking and drinking (class I, level of evidence B).

4. It is recommended to conduct a non-invasive screening for patients with a family history of occurrence of the SAH, especially in first-degree relatives (class IIb, level of evidence B).

5. Consumption of food rich in vegetables reduces the risk of SAH (class IIb, level of evidence B).

Advances in medical science and practice over the past 20 years repeatedly increased diagnostic capabilities in neurology, neurosurgery, anesthesiology and intensive care. Microsurgical and endovascular operations in SAH reduced the incidence of complications and mortality, but the initial brain damage as a result of hemorrhage remains a major cause of persistent neurological deficits, and a factor of disability of patients. In connection with this problem of prevention of risk factors for SAH is always relevant, requiring constant analysis of the situation, new discoveries and evidence.

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СУБАРАХНОИДАЛЬДЫ ҚАНҚҰЙЫЛУ: ШЫҒУ ҚАУПІ ТУРАЛЫ СҰРАҚҚА ҚАЙТА КЕЛГЕНДЕ

Мақалада субарахноидальды қанқұйылулардың (САҚ) шығу мәселесі талқыланады, әлемдегі жиі кездесетін өлім-жітімнің неден болатынын көрсететін статистикалық мәліметтер келтіріледі. САҚ шығу қаупі факторларының екі үлкен топқа бөлінуіне қатысты модифицирленген және модифицирленбеген категориясы толық сипатталады және нақтылық көрсетілген дәлелді медицина ұстанымы арқылы талқыланады.

Негізгі сөздер: Ми қанайналымының жіті бұзылыстары, субарахноидальды қанқұйылулар, қауіп факторлары.

РЕЗЮМЕ

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К ВОПРОСУ О ФАКТОРАХ РИСКА ВОЗНИКНОВЕНИЯ СУБАРАХНОИДАЛЬНОГО КРОВОИЗЛИЯНИЯ

В статье обсуждается проблема возникновения субарахноидальных кровоизлияний (САК), приведены статистические данные по заболеваемости в мире с указанием наиболее частых причин летальности. Подробно описаны факторы риска возникновения САК в зависимости от разделения на две большие категории модифицируемые и немодифицируемые, и проанализированы с позиций доказательной медицины с указанием достоверности.

Ключевые слова: Острое нарушение мозгового кровообращения, субарахноидальное кровоизлияние, факторы риска.

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