

## DIABETES MELLITUS AND HYPERTENSIVE CEREBRAL HEMORRHAGE

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**Key words:** diabetes mellitus, public health, cerebral hemorrhage**\*Correspondence:** Ivan Pangovski, Ss Cyril and Methodius University in Skopje, Faculty of Medicine, Institute of Social Medicine, Skopje, Republic of North Macedonia E-mail: ivan.pangovski@gmail.com**Received:** 30-May-2021; **Revised:** 10-Aug-2021;**Accepted:** 15-Aug-2021; **Published:** 30-Aug-2021**Copyright:** © 2021. Ivan Pangovski. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author(s) and source are credited.**Competing Interests:** The author have declared that no competing interests

Diabetes mellitus is an increasingly common public health problem and affects the population health. In many studies, DM is very often in a close correlation with many cardiovascular diseases and brain hemorrhage in general. The aim of the paper was to determine whether the presence of diabetes mellitus has influence on the occurrence of cerebral hemorrhage. Material and methods: The study included 61 patients diagnosed with hypertensive intracerebral hematoma in the hemispheres of the brain. Results: The prevalence of diabetes in the group of survivors of intracerebral hemorrhage was 26.67%, while in the group of subjects in whom the disease ended lethally diabetes had an insignificantly higher prevalence of 43.75% (Chi-square: 1.61df = 1, p = 0.21). Analysis of the prevalence of diabetes regarding the mobility of the respondents showed that there were no respondents with diabetes in the group of patients who could function independently, while there were 7 (24.14%) respondents with diabetes in the group who required help or aid for accomplishing their daily activities, and 5 (50%) in the group of respondents who were completely dependent on someone else in performing the everyday functioning. Statistical analysis showed these differences as insufficient to be statistically confirmed as significant (Fisher exact test, p = 0.105). Conclusion: In patients who have had cerebral hemorrhage with lethal outcome diabetes mellitus is a very common phenomenon, as well as in patients who have survived but subsequently have decreased mobility. But these differences are not statistically significant. Measures for reduction of the incidence of diabetes mellitus are needed. These measures include early detection of the disease, treatment and prevention of disability.

Јавно здравје

## ДИЈАБЕТЕС МЕЛИТУС И ХИПЕРТЕНЗИВНИ МОЗОЧНИ КРВАРЕЊА

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**Клучни зборови:** дијабетес мелитус, јавно здравје, мозочни крварења**\*Кореспонденција:** Иван Панговски, Универзитет "Св. Кирил и Методиј", Медицински Факултет, Институт за социјална медицина, Скопје, Република Северна Македонија. E-mail: ivan.pangovski@gmail.com**Примено:** 30-мај-2021; **Ревидирано:** 10-авг-2021;**Прифатено:** 15-авг-2021; **Објавено:** 30-авг-2021**Печатарски права:** ©2021 Иван Панговски. Оваа статија е со отворен пристап дистрибуирана под условите на нелокализирана лиценца, која овозможува неограничена употреба, дистрибуција и репродукција на било кој медиум, доколку се цитираат оригиналните(ите) автор(и) и изворот.**Конкурентски интереси:** Авторот изјавува дека нема конкурентски интереси.

Дијабетес мелитус (ДМ) претставува јавноздравствен проблем кој е се повеќе присутен и влијае на здравствената состојба на населението. Во повеќе студии ДМ се доведува до корелација со кардиоваскуларни заболувања, а и мозочните крварења воопшто. Цел на трудот е да се утврди дали присуството на дијабетес мелитус влијае на исходот на мозочно крварење. Материјал и методи: За целите на ова истражување беше формиран примерок од 61 пациент со дијагноза хипертензивен интрацеребрален хематом во хемисферите на мозокот. Резултати: Застапеноста на дијабетесот во групата испитаници кои го преживеале интрацеребралното крварење е 26,67%, додека во групата испитаници кај кои болеста завршила летално дијабетесот има несигнификантно поголема застапеност од 43,75% (Chi-square:1,61df=1,p=0,21). Анализата за застапеноста на дијабетес во однос на мобилноста на испитаниците покажува дека нема испитаници со шеќерна болест во групата пациенти кои можат самостојно да функционираат, додека шеќерна болест имаат 7 (24,14%) испитаници во групата со можност за дневни активности со помош на помагало, и 5 (50%) во групата испитаници кои во обавувањето на секојдневните функции се комплетно зависни од туѓа помош. Статистичката анализа на овие разлики покажа дека не се сигнификантни (Fisher exact p=0,105). Заклучок: Кај пациентите кои имаат мозочно крварење со летален исход почесто е присутен ДМ, како и кај пациенти кои преживале но после тоа имаат намалена мобилност. Но овие разлики не се статистички значајни. Потребни се мерки за намалување на инциденцата на дијабетес мелитус. Овие мерки вклучуваат рано откривање на болеста, лекување и спречување на попреченост.

## Introduction

WHO point to an increasing number of population with all types of diabetes each year. It is of great concern the fact that more and more children are facing with diabetes at an early age. According to many authors, this, among other things, is due to the fact that there is a daily increase in the number of people in the world population who have weight problems or rapid weight gain and it's considered to be one of the most influential factors in a person's ability to develop lifelong diabetes<sup>1,2</sup>.

In addition, other factors such as hereditary, irregular physical activity, unhealthy and fast diet, increased stress levels in the population, which indicate that diabetes is becoming a public health problem in RN Macedonia. The occurrence of diabetes mellitus may in itself be a risk factor for onset of some cardiovascular diseases such as cerebral hemorrhages.

DM is a major public health problem worldwide. Current global estimates show that this condition affects 415 million people and is expected to escalate to 642 million by 2040. Other 193 millions of people with diabetes remain undiagnosed due to the mild or asymptomatic nature of the condition, especially in type 2 DM (T2DM). The Middle East region and North Africa (MENA), which include all Arab states, are currently burdened with recurrence of the highest incidence of diabetes (10.7%, age-adjusted) and in North America and the Caribbean it is 11.5%. This scenario is likely to continue for the next two decades, and possibly wider.

According to the definition of the American Diabetes Association, DM is a metabolic disease characterized by hyperglycemia caused by a disorder in insulin secretion, a disturbance in its action or the presence of both of these disorders<sup>1</sup>.

DM has been known since the time of ancient Greece, and today, because of the dramatic increasing in prevalence, it takes the form of a pandemic and may in the future become one of the leading causes of morbidity and mortality. Today, DM is considered a chronic progressive disease, affecting more than 170 million people worldwide, and the forecast is that this number will double in 10 years. The median incidence of diabetes is 2-5%, the lowest in rural China (< 1%) and highest among Pima Indians in North America (about 50%). There are no reliable data on the frequency in Serbia, but it is estimated that about 600,000 people suffer from this disease and that every year 16,000 new patients are discovered<sup>3</sup>.

In the Republic of North Macedonia, diabetes mellitus is one of the most common diseases and according to the data from the National System for Electronic Records in the field of health, about 85,000 patients have been diagnosed with diabetes mellitus.

- ♦ Diabetes mellitus - type 1 - This type of diabetes commonly occurs in younger age and is present in about 3,000 people.

Diabetes mellitus type 2 covers 96% of all diagnosed cases of which 47% are on insulin therapy, and the rest use oral antidiabetic therapy<sup>4,5</sup>.

The number of registered people with diabetes who are currently on insulin therapy in North Macedonia is 40,000, of which 3,000 are people with type 1 diabetes and 37,000 with type 2. This number is growing every year. According to the data from the International Diabetes Federation, total prevalence (diagnosed and undiagnosed diabetes) of diabetes is 9.8% of the population aged 25-70 years<sup>5</sup>.

Intracranial hemorrhage (ICH) is a significant medical event that covers up 15% of strokes. The incidence of ICH is approximately 25 per 100,000 persons per year and has a mortality rate of 40% within one month of its manifestation. ICH may appear in multiple intracranial compartments and may be caused by a variety of pathologies. Neuroimaging is essential for the treating physician to understand the location and the extent of bleeding, the risk of impending brain injury and direct treatment of most often emergency patients. Stroke is a focal (or global) circulation disorder in the cerebral parenchyma caused by occlusion or rupture of

a blood vessel and insufficient oxygen supply to the brain parenchyma with consequent death of brain cells. From a clinical point of view, stroke is a sudden development of signs focally (or globally) lasting more than 24 hours or leading to death without apparent cause of death other than vascular<sup>6</sup>.

The aim of this study was to determine whether the presence of diabetes mellitus affects the occurrence of cerebral hemorrhage.

### Material and methods

For the purposes of this study, a sample of 61 patients with a hypertensive intracerebral hematoma in the hemispheres of the brain was analyzed. The sample was randomly selected including patients with localized hypertensive intracerebral hemorrhage supratentorially, treated at the University Clinic for Neurosurgery at the Clinical complex Mother Theresa in Skopje. The statistical analysis was made by the statistical programs Statistica 7.1 and SPSS 13.0.

**Table 1.** Gender structure of study group

Variable	N (%) mean ± SD
men	34 (55.74%)
women	27 (44.26%)
age	59.56 ± 8.3 rank 45-78

The gender structure of the respondents consisted of 34 (55.74%) men and 27 (44.26%) women. 73% of re-

spondents who participated in the study had a live and 26% dead outcome due to cerebral hemorrhage.

**Table 2.** Presence of diabetes in relation to the functional outcome of respondents

variable	group	
	Alive n=45	Dead n=16
DIABETES MELLITUS		
no	33 (73.33%)	9 (56.25%)
yes	12 (26.67%)	7 (43.75%)

Of those respondents who survived the bleeding, 26% had and 73% did not have some type of DM. Of those who did not survive the bleeding, 43% had and 56% did not have any type of diabetes.

**Table 2.** Prevalence of diabetes in terms of mobility of respondents

variable	group		
	Independently n = 6	with aid n = 29	Nailed N = 10
DIABETES MELLITUS			
no	6 (100%)	22 (75.86%)	5 (50%)
yes	0	7 (24.14%)	5 (50%)

Table 3 shows the distribution of respondents in relation to their mobility and the emergence of DM. The prevalence of diabetes in the group of respondents who survived intracerebral hemorrhage was 26.67%, while in the group of subjects in whom the disease ended lethally diabetes had an insignificantly higher prevalence of 43.75% (Chi-square: 1.61df = 1, p = 0.21). The analysis of the prevalence of diabetes regarding the mobility of the respondents showed that there were no respondents with diabetes in the group of patients who could function independently, while there were 7 (24.14%) respondents with diabetes in the group who required help or aid for performing daily activities, and 5 (50%) in the group of respondents were completely dependent on someone else in performing everyday functioning. The statistical analysis showed these differences to be insufficient in order to be statisti-

cally confirmed as significant (Fisher exact p = 0.105).

## Discussion

Diabetes mellitus had insignificantly higher representation of 43.75% which may be a non-significant representation but still relatively high in patients with lethal outcome. In the literature there are several studies that discuss the same or similar topic with different sample and methodology as in our study. One of the studies included 135 patients with the mean age of patients with cerebral hemorrhage 67.5 ± 12.7 years and of the control group 70.5 years. Diabetes mellitus was found in 39 patients with cerebral hemorrhages (33.1%) and in 30 (22.2%) control subjects (p = 0.054). The prevalence of diabetes mellitus in patients younger than 60 years was 7.4% in the control group and

27.8% in the group with cerebral hemorrhage ( $p = 0.042$ ). The study did not find a significant relationship between diabetes mellitus and cerebral hemorrhage (except in patients under 60 years of age) and diabetes mellitus did not cause bleeding in certain areas of the brain. However, more studies are needed to correlate diabetes mellitus and intracerebral hemorrhage in the same population to reach a definitive conclusion<sup>2</sup>. Also, it has to be pointed out that in the examined sample some of the respondents were smokers and regular consumers of alcohol as well as persons exposed to stress and other risk factors that can be directly related to cerebral hemorrhage. Thus, it cannot be determined with certainty, at least in this sample of patients that diabetes was a direct cause of cerebral hemorrhages.

## Conclusion

Diabetes is more common in patients with lethal cerebral hemorrhage, as well as in patients who have survived but subsequently have reduced mobility. Measures are needed to reduce the incidence of diabetes mellitus. These measures include early detection of the disease, treatment, and prevention of disability. It is especially important to take prevention measures at the population level, epidemiological and public health methods such as: monitoring the trend at the population level (register, epidemiological studies), political-health-educational measures, tax reduction of healthy food, continuing education for taking steps to a healthy lifestyle.

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