ANALYSIS OF SUICIDES IN THE PROVINCE OF VOJVODINA, REPUBLIC OF SERBIA, DURING THE 2001-2015 PERIOD

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SUMMARY - Suicide is an act of intentionally causing one's own death. Every year, approximately 800,000 people commit suicide. The average suicide rate in Serbia is around 19 per 100,000 people, which puts Serbia in the upper half on the list of European countries. The aim of this study was to define the number of suicides committed in the 2001-2015 period in the Province of Vojvodina, the male to female ratio of suicides, the most commonly used method of execution, the proportion of complex suicide, and distribution of suicides according to age groups, seasons, and days of week. This study was conducted as a descriptive retrospective study in the Center for Forensic Medicine, Toxicology and Molecular Genetics, Clinical Center of Vojvodina, by examining autopsy medical records. All suicide cases were divided according to age, gender, method of execution, season of the year, and day of the week. For statistical analysis, χ^2 test included in Statistical Package for the Social Sciences (SPSS) version 23.0 was used, where the value of p<0.05 was considered statistically significant. During the 2001-2015 period, in the Province of Vojvodina, suicide was committed by 2241 people, 1812 men and 429 women. The highest number of suicides was recorded in the 45-54 age group in men and in the ≥75 age group in women. The most commonly used method was hanging in both genders. The proportion of complex suicides was 0.4%. There was no statistically significant difference in the number of suicides committed in different seasons. The highest number of suicides was committed on Friday. This research suggests that there is a need for intensive work on the prevention of suicides, especially among males aged 45-54 and females older than 75, especially in certain months and days when the suicide rate is higher.

Key words: Suicide; Complex suicide; Epidemiology; Methods of suicide

Introduction

Suicide (*suicidium*) is an act of intentionally causing one's own death. The term suicide originates from the Latin words *sui* – self and *occidere* – kill. In order to be able to speak about suicide in the legal and medical sense, three preconditions have to be fulfilled, i.e. awareness, intention, and the fact that the person per-

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forms the whole procedure of committing suicide without anyone's help¹. There are approximately 800,000 suicides *per* year at the global level, while in Europe that number is about 160,000. It is considered that the number of people who attempt suicide is even higher. According to data obtained from relevant studies, every committed suicide is followed by 8 to 25 attempts to commit it². It has been established that the number of suicides in Serbia has shown a growing tendency since the 1950s; the number almost doubled in the 1950-2016 period³. The average rate of suicides in Serbia is currently approximately 19 *per* 100,000 people, which puts Serbia in the upper half of the list of

European countries, together with Lithuania which is, judging by the statistical data from 2012, the leading European country with the suicide rate of 34/100,000, together with Belarus, Croatia, Estonia, Latvia, Hungary, Russia, Slovenia and Ukraine, which also have very high rates of suicide⁴. The rate of suicides is especially high in the territory of Vojvodina, where it is even 2-3 times higher than in the central and southern parts of Serbia, while the north part of Vojvodina, around the town of Subotica, is the area with an extremely high rate of suicides⁵.

Suicides are the consequence of the interaction of social, psychological and biological factors. The biggest importance is placed on mental diseases, such as mood swings (depressive disorders), addictive disorders (alcoholism and abuse of psychoactive substances), schizophrenia, personality disorders, and neurotic disorders such as generalized anxiety disorder. Certain personal characteristics also play a role in the etiology of suicides, such as aggressiveness and impulsiveness, and they can act independently from mental diseases or together with them⁶. There is also a strong influence of conditions such as malignant diseases, chronic obstructive lung disease, stroke, coronary ischemic disease, diabetes, and chronic pain. Family analyses have shown that there is an increased risk of suicides in the families where there have already been some suicides, which initiated a number of studies of twins and adopted people, all in order to establish the role of genetic material in committing suicides. On revising the studies on a large number of the above mentioned twins, it has been established that the impact of genetics on suicidal thoughts, acting and attempts varies from 33% to 55%. Special attention was paid to the suicides committed by celebrities and sensational reports about them in the media, and it has been proven that there is a significant connection between these two phenomena and that the suicides committed by celebrities and the reports that appeared thereafter were followed by so-called 'copycat' suicides, predominantly among younger population⁸⁻¹⁰.

Apart from that, research has also included climate variations and meteotropic character of suicides. The peak of suicides, according to some research, is early spring and summer, while, according to other research, the number of suicides is highest in spring and autumn. The majority of studies in this field agree that the smallest number of suicides occur during cold win-

ter months, which is related to the least variations in daily temperatures¹¹⁻¹⁴.

Suicide can be committed by one method, when we talk about simple suicide, or by using two or more methods, which is called complex suicide. Complex suicides can be primarily complex, when a person plans in advance two or three methods of taking their lives, as a way of ensuring that if the first method fails, the second or every other will be successful. Secondarily complex or unplanned suicides are suicides in which the first planned method was not successful because it was too painful to be performed until the end, or the agony was prolonged and death postponed, so the person right then and there thinks of a new method that will be successful¹⁵.

As the number of suicides is constantly increasing, suicidology is a special topic of multidisciplinary scientific research. Suicide accounts for 1.4% of deaths *per* year at the global level, and it is a significant health problem. So, it is very important to work on its prevention, examine risk factors, search for mental disorders in people, recognize them on time and help, all because precautionary measures significantly influence the reduction of the number of suicides.

The aim of this study was to define the number of suicides committed in the 2001-2015 period, the male to female ratio of suicides, the most commonly used method of execution, the proportion of complex suicide, and the distribution of suicides according to age groups, seasons, and days of the week.

Material and Methods

This work was conducted as a descriptive retrospective study at the Center for Forensic Medicine, Toxicology and Molecular Genetics, Clinical Center of Vojvodina, by examining autopsy medical records in the 2001-2015 period. The study included 2241 cases in which it was undoubtedly confirmed that it was a suicide. Cases of some drowning and railway accidents were excluded from the research since the autopsy could not make definitive conclusion whether it was an accident or a suicide, and data on the circumstances of those events are not always available. Suicides in which there was no general information about the case were excluded from the research as well. All suicide cases were divided according to age, gender, method of execution, season of the year, and day of the week. On

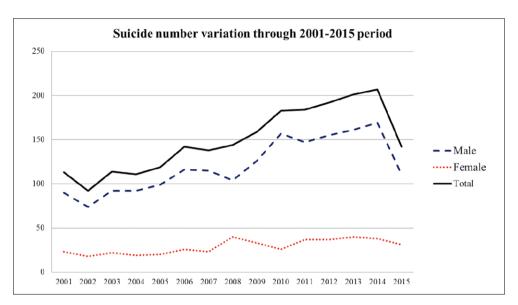


Fig. 1. Variation in the number of suicides according to years.

statistical analysis, χ^2 -test included in Statistical Package for the Social Sciences (SPSS), version 23.0 was used, where the value of p<0.05 was considered statistically significant.

Results

According to study results, on the territory of Vojvodina, suicide was committed by 2241 persons in the 2001-2015 period. Suicide was committed by 1812 men, while the number of women having committed suicide was about four times lower (n=429). Variation in the number of suicides according to years is shown in Figure 1.

The mean age of the people who committed suicide was 51.5 years, the youngest person who committed suicide was aged 12, while the oldest one was aged 99 years. Table 1 shows the number of people who committed suicide according to age groups and gender. The highest number of suicides among males was recorded in the 45-54 age group, i.e. 360 people, or 19.87% of the total number of males having committed suicide. In women, the highest number of suicides was recorded in the ≥75 age group, accounting for 23.08% of the total number of women having committed suicide. There was a statistically significant difference in the percentage of men and women from the 35-44 and >75 age groups.

The most frequently used method of suicide in both genders was hanging. In total, 1340 (59.79%)

persons used this method, i.e. 1051 (58%) men and 289 (67.37%) women. The second most frequently used method among men was using firearms and explosives (n=597, 32.94%), while among women it was poisoning (n=42, 9.79%). The third most frequently used method among men was jump from height (n=49, 2.7%), while among women it was using firearms and explosives (n=37, 8.62%). In case of poisoning, the most frequently used substances were medicaments, pesticides, corrosive substances, while two men used carbon monoxide and concrete paint. Nine of 2241 people (7 men and 2 women) used two methods of suicide, so the share of complex suicide was 0.4%. There was a statistically significant difference between men and women who committed suicide using hang-

Table 1. Number of suicides according to age groups

Age	Women	Men	Total	_
group	(n,%)	(n,%)	$(\Sigma, \%)$	p
<15	0 (0)	10 (0.55)	10 (0.45)	NS
15-24	26 (6.06)	111 (6.13)	137 (6.11)	NS
25-34	38 (8.86)	203 (11.21)	241 (10.75)	NS
35-44	36 (8.39)	223 (12.31)	259 (11.56)	0.02
45-54	77 (17.95)	360 (19.87)	437 (19.50)	NS
55-64	78 (18.18)	348(19.2)	426 (19.01)	NS
65-74	75 (17.48)	256(14.13)	331 (14.77)	NS
≥75	99 (23.08)	301 (16.6)	400 (17.85)	0.002

NS = nonsignificant

Table 2. Number of people having committed suicide and method of execution

Method	Men (n, %)	Women (n, %)	Total $(\Sigma, \%)$	p
Hanging	1051 (58)	289 (67.37)	1340 (59.79)	0.0003
Other methods of asphyxiation	1 (0.06)	2 (0.47)	3 (0.13)	NS
Poisoning	43 (2.37)	42 (9.79)	85 (3.79)	<0.0001
Medicaments	22 (1.21)	25 (5.83)	48 (2.14)	<0.0001
Corrosive substances	3 (0.16)	9 (2.1)	12 (0.53)	<0.0001
Pesticides, insecticides, herbicides	16 (0.88)	8 (1.86)	24 (1.07)	NS
Carbon dioxide	1 (0.06)	0 (0)	1 (0.05)	NS
Concrete paint	1 (0.06)	0 (0)	1 (0.05)	NS
Jump from height	49 (2.7)	36 (8.39)	85 (3.79)	<0.0001
Gunshot wounds and explosive devices	597 (32.94)	37 (8.62)	634 (28.3)	<0.0001
Cuts	41 (2.26)	13 (3.03)	54 (2.41)	NS
Stabs	21 (1.16)	5 (1.16)	26 (1.16)	NS
Electric shock	1 (0.06)	0 (0)	1 (0.05)	NS
Burns caused by self-igniting	1 (0.06)	3 (0.7)	4 (0.18)	0.004
Two or more methods	7 (0.39)	2 (0.47)	9 (0.4)	NS

NS = nonsignificant

Table 3. Distribution of suicides according to season and gender

Season	Men (n,%)	Women (n,%)	Total $(\Sigma, \%)$	p
Spring	508 (28.03)	136 (31.70)	644 (28.74)	NS
Summer	478 (26.38)	103 (24.01)	581(25.92)	NS
Autumn	429 (23.68)	105 (24.48)	534 (23.83)	NS
Winter	397 (21.91)	85 (19.81)	482 (21.51)	NS

NS = nonsignificant

ing, poisoning, medicaments, corrosive substances, jumping from height, firearms, and burning (Table 2).

The largest number of suicides was committed during spring and summer among men, while among women it was in spring and autumn (Table 3). However, results of statistical analyses showed that there was no statistically significant difference in the percentage of men and women having committed suicides in various seasons (χ^2 =1.1202; p=0.14).

The largest number of suicides in both genders were committed on Friday (15.48%). The most fre-

Table 4. Distribution of suicides according to days of the week and gender

Day of the week	Men (n, %)	Women (n, %)	Total (Σ, %)	p
Monday	282 (15.56)	59 (13.75)	341 (15.22)	NS
Tuesday	260 (14.35)	70 (16.32)	330 (14.73)	NS
Wednesday	249 (13.74)	75 (17.48)	324(14.46)	0.048
Thursday	218 (12.03)	52 (12.12)	270 (12.05)	NS
Friday	280 (15.45)	67 (15.62)	347 (15.48)	NS
Saturday	248 (13.69)	52 (12.12)	300 (13.38)	NS
Sunday	275 (15.18)	54 (12.59)	329 (14.68)	NS

NS = nonsignificant

quent day for male suicides was Monday (15.56%), then Friday (15.45%) and Sunday (15.15%). In women, the largest number of suicides happened on Wednesday (17.48%), followed by Tuesday (16.32%) and Friday (15.62%). There was a statistically significant difference between genders in the rate of suicides committed on Wednesday (Table 4).

Discussion

According to our research, there were 2241 suicides in Vojvodina during the 2001-2015 period. This number is not final and it would be even higher if the research also included drowning and railway accidents, which would definitely contain a certain percentage of suicides.

At the global level, the male to female ratio in suicides varies, from 4 in Europe, 3.6 in the USA, to 1.1 in eastern countries16. According to our research, the number of men who committed suicide in this period was 1812, while the number of women was 429. The ratio ranged from 2.60 (in 2008) to 6 (in 2010), 4.28 on average. This is in concordance with most research according to which male gender is an important demographic risk factor for suicide^{17,18}. It is clear that there are some paradoxes here, taking into account the fact that women suffer from depression and other mood changes more often, and are more likely to have suicidal thoughts and behavior. However, women talk about their problems freely and more often, and they show more readiness to seek professional help if they have some problems related to their mental health, as well as certain conditions specific for female population such as pregnancy and motherhood, to act protectively and decrease the risk of committing suicide¹⁹⁻²¹. However, men are more prone to being victims of suicide because they resort to more lethal measures such as hanging or firearms, due to their stronger desire and determination to finish their lives at all costs^{22,23}. Nine persons who committed complex suicide, combined the following methods: gunshot wound to the head and poisoning by medicines, gunshot wound to the head and poisoning by corrosive substances, stab wounds in the abdominal and chest area and cuts in the neck area, cuts in the neck area and stab wounds in the chest area, hanging and gunshot wound to the head (three people), cuts in the area of forearm and poisoning by insecticides, and cuts in the area of forearm and hanging. Complex suicides are especially significant from the aspect of forensic medicine because they suggest that maybe there was an interference of a third person in the act of suicide, helping it, or maybe even it was a case of homicide which was afterwards falsely presented as a suicide, so detailed analysis of the case circumstances is necessary, including reconstruction of events, detailed autopsy, and toxicologic analysis^{15,24}.

Irrespective of gender, the largest number of suicides was recorded in the 45-54 (19.50%) and 55-64 (19.01%) age groups. In Europe, the largest number of suicides commit people aged 49-59 of both genders, which means that suicide data from our territory fit in the European standard²⁵.

The present research showed that the number of suicides in winter months was lower by about 7% in comparison to spring, or by about 4.5% in comparison to summer; however, it was found that there was no statistically significant difference among the numbers of suicides committed in various seasons. Even though we did not establish a statistically significant difference for various seasons, we believe that the impact of seasons and climate factors should be taken into consideration when estimating suicidal risk factors, especially in the countries with a high suicidal rate, since the majority of authors of various types of research agree that suicides, as well as suicidal attempts, have a meteotropic character and that meteorological changes can be a trigger factor for the people who are more prone to committing suicide^{11-13,26}.

Results of some studies that examined distribution of suicides according to days of the week have shown that Monday is the day with the highest number of suicides, which was not the case in our research²⁷⁻³⁰. In case of both genders, according to our results, the highest number of suicides was recorded on Friday with 347 (15.48%) suicides, followed by Monday with 341 (15.22%) suicides.

Conclusion

Having done this research, we can draw the following conclusions: there were 2241 suicides during the above mentioned 15-year period in Vojvodina; men committed 4 times more suicides in comparison to women; the highest number of suicides was committed by men aged 45-54, whereas among women the highest number was recorded in the ≥75 age group; hanging was the most frequently used method of execution; the share of complex suicides in the total num-

ber of suicides was 0.4%; even though there was an increased number of suicides in spring and summer months, still there was no statistically significant difference in the number of suicides committed in various seasons; in case of both genders, the highest number of suicides was recorded on Friday.

According to the number of suicides, as well as recognized suicidal factors, it is necessary to point out that there is a need for increased measures of suicidal prevention, especially among men aged 45-65 and women older than 75, and that precautionary measures are especially recommended in the months and days when the numbers of suicides are increased.

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Sažetak

ANALIZA SAMOUBOJSTAVA NA TERITORIJU POKRAJINE VOJVODINE U RAZDOBLJU OD 2001. DO 2015. GODINE

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Samoubojstvo predstavlja čin svjesnog i namjernog oduzimanja vlastitog života. Na godinu u svijetu oko 800.000 osoba izvrši samoubojstvo, a smatra se da još veći broj ljudi pokuša izvršenje istog. Prosječna stopa samoubojstava u Srbiji iznosi oko 19 na 100.000 osoba, što je stavlja u gornju polovinu liste europskih zemalja. Cilj istraživanja bio je utvrditi broj izvršenih samoubojstava u razdoblju od 2001. do 2015. godine, odnos broja samoubojstava osoba muškog i ženskog spola, najčešće primijenjenu metodu izvršenja, udio kompleksnih samoubojstava i distribuciju samoubojstava prema dobnim skupinama, godišnjim dobima i danima u tjednu. Istraživanje je provedeno kao deskriptivna, retrospektivna studija u Centru za sudsku medicinu, toksikologiju i molekularnu genetiku Kliničkog centra Vojvodine, uvidom u medicinsku dokumentaciju. Statističke analize izvršene su pomoću χ²-testa u sklopu programa *Statistical Package for the Social Sciences* (SPSS) verzija 23.0, uz vrijednost statističke značajnosti p<0,05. U razdoblju od 2001. do 2015. godine na teritoriju Vojvodine samoubojstvo je izvršila 2241 osoba, pri čemu 1812 muškaraca i 429 žena. Najveći broj samoubojstava među osobama muškog spola zabilježen je u dobnoj skupini od 45-54 godine, a među ženama u dobnoj skupini od 75 i više godina. Najčešće primijenjena metoda kod oba spola bila je vješanje. Udio kompleksnih samoubojstava bio je 0,4%. Nije bilo statistički značajne razlike u broju samoubojstava izvršenih u različitim godišnjim dobima. Najveći broj samoubojstava kod oba spola izvršen je petkom. Potrebne su pojačane mjere prevencije samoubojstva, prije svega među osobama muškog spola u dobi od 45-54 godine te ženskog spola starijih od 75 godina, naročito tijekom određenih mjeseci i dana kada su samoubojstva učestalija.

Ključne riječi: Samoubojstvo; Kompleksno samoubojstvo; Epidemiologija; Metode samoubojstava