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EPIDEMIOLOGICAL CHARACTERISTICS OF SUICIDE IN THE AUTONOMOUS PROVINCE OF VOJVODINA

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Summary

Introduction. Suicide is defined as a conscious and deliberate taking of one’s own life, or a self-destructive behavior with a fatal outcome. Every year, millions of people are affected by suicide or the feeling of grief. The aim of our research was to review the basic epidemiological characteristics of suicide in the Autonomous Province of Vojvodina, in order to assist in targeted prevention programs. Material and Methods. A retrospective, observational study was conducted. The data were analyzed in chronological order and in accordance with different demographic characteristics and topographic distribution. Basic statistical indicators were used as parameters: non-standardized, standardized and specific mortality rates. Results. During the observed period, from 1991 until the end of 2010, in the Autonomous Province of Vojvodina, the average annual non-standardized suicide rate was 27.9/100,000 inhabitants. The highest suicide rate was recorded in 1992 and 1993 (33.7/100,000 and 34.5/100,000, respectively) and in 1999 (31.5/100,000). The highest age-specific suicide rate was recorded in ≥ 80 year-old age group (120.5/100,000). The suicide rates were significantly higher among males, while the most common suicide method for both sexes was by hanging (69.9%). The highest average annual suicide rate was recorded among widowers (176.9/100,000) and widows (37.8/100,000). The lowest number of suicides was recorded in persons with higher level of education. Conclusion. Since in the Autonomous Province of Vojvodina persons at increased risk for suicide include males, the elderly population, persons with low education levels, and people who lost their partners, suicide prevention strategies should target these groups, including primary and secondary prevention measures.

Key words: Suicide; Epidemiology; Risk Factors; Demography; Social Class; Education; Age Factors; Cause of Death

Sažetak

Uvod. Samoubistvo se definiše kao svesno i namerno uništenje sopstvenog života uz samodestruktivno ponašanje sa fatalnim ishodom. Svake godine milioni ljudi su pogodišni iskustvom samoubistva ili tugoanjem. Cilj ovog istraživanja je bio sagledavanje osnovnih epidemioloških karakteristika samoubistava u Autonomnoj Pokrajini Vojvodini, što bi doprinelo ciljanom usmerenju preventivnih programa. Materijal i metode. Sprovedena je deskriptivna epidemiološka studija. Podaci su analizirani hronološki, prema različitim demografskim karakteristikama i topografskoj distribuciji. Kao parametri korišćeni su osnovni statistički pokazatelji: nestandardizovane, standardizovane i specifične stope mortaliteta. Rezultati. U posmatranom periodu od 1991. do kraja 2010. godine u Autonomnoj Pokrajini Vojvodini prosečna godišnja nestandardizovana stopa samoubistava iznijela je 27,9/100.000 stanovnika. Najviše stope mortaliteta usled samoubistava zabeležene su 1992. i 1993. godine (33,7/100.000 i 34,5/100.000) i 1999. godine (31,5/100.000). Najviša uzrasta specifična stopa smrtnosti usled samoubistava zabeležena je u starosnoj grupi ≥ 80 godina (120,5/100.000). Stope smrtnosti usled samoubistava bile su značajno veće kod muškaraca, dok je najčešći metod samoubistva kod oba pola bio vešanjem (69,9%). Najveća specifična godišnja stopa samoubistava zabeležena je kod udovaca (176,9/100.000) i udovica (37,8/100.000). Najmanji broj samoubistava registriran je kod osoba sa višim stepenom obrazovanja. Zaključak. Kako su u Autonomnoj Pokrajini Vojvodini muškarci, starije osobe, osobe sa niskim nivoom obrazovanja i osobe koje su izgubile svog partnera imale povećan rizik od samoubistva, preventivni programi bi trebalo da budu usmereni na te grupe, uključujući mere primarne i sekundarne prevencije.

Ključne reči: samoubistvo; epidemiologija; faktori rizika; demografija; socijalni status; starost; uzrok smrti

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Introduction

The term suicide is used for a self-directed injurious behaviour with intent to die as a result of the behaviour [1]. Every year, more than 800,000 people die by suicide, while the number of attempted suicides is much greater. Globally, suicide is the second leading cause of death among people aged between 15–29 years, and in 2015 it accounted for 1.6% of all deaths in the world, making it the 17th leading cause of death [2].

The psychological and social impact of suicide on the family and society is immeasurable. On average, one suicide intimately affects at least six other persons. If it takes place at school or in the workplace, it affects hundreds of other people [3]. The American Centre for Disease Control and Prevention in Atlanta has assessed that annually the community costs related to suicide amount to about 56.9 billion dollars. On average, each suicide costs about 1.287.5 million dollars [4].

Europe has the highest suicide rates in the world. According to the latest World Health Organization (WHO) data, in 2015 the highest suicide rates (per 100,000 inhabitants) were recorded in Lithuania (32.7), Kazakhstan (27.5) and Belarus (22.8), while the lowest rates were recorded in Azerbaijan (3.3) and Albania (4.3). Serbia, with a suicide mortality rate of 17.0 per 100,000 inhabitants, was in the 12th place in Europe [5].

The study of Milicinski and Mravlje from 1990, “Yugoslav suicide paradox” presented significant variations in suicide rates between different parts of former republics of Yugoslavia. Northern areas (Slovenia, Croatia, Vojvodina) showed a ten times higher suicide rates than the areas in the South (Kosovo, Macedonia) [6]. Serbia, one of the former republics of Yugoslavia, has different regional suicide rates; on average, the APV has 2 – 3 times higher suicide rate than Central Serbia, during the 20th century and at the beginning of the 21st century [7].

Suicide is a complex phenomenon affected by a large number of factors. Mental illnesses, especially affective disorders, are considered to be the most significant risk factors for serious suicide attempts and suicide [3, 8, 9]. It is estimated that their elimination would reduce the risk of serious attempts of suicide by up to 80% [9]. In almost all countries, with the exception of some countries in the East, committed suicides are more common among males. The risk factors that significantly increase the risk of suicide are more common in males: substance abuse, particularly of alcohol, as well as association of affective disorders with substance abuse. Men react more strongly to changes in socioeconomic conditions. They are more impulsive and more often choose more lethal methods when attempting suicide [10, 11]. Epidemiological data indicate that the risk of suicide attempt resulting in death is highest among the elderly almost everywhere in the world. Suicide mortality rates are highest among the elderly people, especially among men. Depression is a major risk factor for suicide among the elderly [12].

Suicide is a serious public health problem that may have lasting harmful consequences on individuals, their families and the entire community. Prevention programs should be developed at global, national and local levels, based on a multisectoral approach. The goal of suicide prevention is to reduce the factors that increase the risk and stimulate resistance factors [13].

The objective of this paper is to review the basic epidemiological characteristics of suicide in the Autonomous Province of Vojvodina (APV), in order to assist in targeted prevention programs.

Material and Methods

A descriptive epidemiological study was conducted with chronological and demographic analyses. Basic statistical indicators were used as parameters: non-standardized, standardized and specific mortality rates. The age standardized rates were calculated by using the direct standardization method based on the world standard population, and population of the APV (including age and sex) using the official data of the Statistical Office of the Republic of Serbia, based on census data and projections for a particular year. The number and rates of committed suicides were retrospectively reviewed by gender from 1991 to 2010, while data on age, methods of suicide, education level, and marital status were available for the period from 2001 to 2010. The overall non-standardized and gender-specific suicide rates were calculated based on the census data in the Republic of Serbia (1991, 2002) and projections for a particular year, while specific suicide rates in terms of age, marital status and municipalities were calculated based on the 2002 census in the Republic of Serbia. Chi-square test was used for comparison of different education levels and sex distribution of persons who committed suicides. We have used the data obtained from the Office for Vital Statistics of the Statistical Office of the Republic of Serbia on committed suicides during the period 1991–2010 in the APV.

Results

During the observed period, a total of 11,166 persons (7,940 males and 3,226 females) died of suicide. The average annual mortality rate for males (40.8/100,000) was by almost three times higher than in females (15.6/100,000). During the period from 1991 to the end of 2010, the annual suicide mortality rate in the APV ranged from 22.7 to 34.5 per 100,000 inhabitants, while the average annual non-standardized rate was 27.9/100,000. The high-
Suicide rates were recorded in 1992 and 1993 (33.7/100,000 and 34.5/100,000, respectively) and in 1999 (31.5/100,000). The lowest suicide rates were recorded during the last three years of the study period (23.4/100,000, 24.6/100,000 and 22.7/100,000, respectively). There was a linear declining trend in the overall suicide rates and gender specific rates in the observed period (Graph 1).

During the ten-year period (2001–2010), the highest standardized rate for males was recorded in 2004 (29.7/100,000), while the highest standardized rate for females was recorded in 2001 (8.6/100,000) (Graph 2). The suicide rate increases with age. The highest age-specific suicide mortality rate was recorded in the ≥ 80 year olds (120.5/100,000) (Graph 3).

In regard to the level of education and gender, there was a statistical difference between males and females for all levels of education. Except for those without any education (p < 0.173), much more males committed suicide (p < 0.000; p < 0.010), regardless of the level of education. After examining differences between individual education levels in relation to the total number of suicides for each level of education, the difference was statistically significant (p < 0.001). Most suicides were committed by persons with high education (1,770), followed by persons with elementary (1,522) and incomplete primary education (1,203), while the lowest number of suicides was recorded in persons with university education (155) and college (119) education (Table 1).

The highest average annual suicide rate was recorded among widowers (176.9/100,000) and widows (37.8/100,000), while the lowest suicide rate was recorded (Table 1).

**Graph 1.** Overall and gender specific suicide rates in the APV, 1991–2010

**Grafikon 1.** Opšte i rodno specifične stope samoubistava u Autonomnoj Pokrajini Vojvodini, 1991–2010

**Graph 2.** Age- and sex-standardized suicide mortality rates in the APV, 2001–2010

**Grafikon 2.** Uzrastno-standardizovane rodno specifične stope samoubistava u Autonomnoj Pokrajini Vojvodini, 2001–2010

**Graph 3.** Age-specific suicide mortality rates in the APV, 2001–2010

**Grafikon 3.** Uzrasno specifične stope mortaliteta samoubistava u Autonomnoj Pokrajini Vojvodini, 2001–2010

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| Table 1. Number of deaths by suicide with gender and education level distribution in the APV, 2001–2010 |
|--------------------------------------------------------|
| **Level of education** | **No education** | **Incomplete elementary school** | **Elementary school/Osnovna škola** | **High School** | **College** | **University** |
|------------------------|-----------------|-------------------------------|--------------------------------|----------------|-------------|--------------|
| **Total**              | 238             | 1203                          | 1522                          | 1770           | 119         | 155          |
| **Ukupno**             | 4.7%            | 23.7%                         | 30.0%                         | 34.8%          | 2.3%        | 3.1%         |
| **Males**              | 108             | 720                           | 1162                          | 1434           | 98          | 128          |
| **Muškarci**           | 2.9%            | 19.5%                         | 31.4%                         | 38.7%          | 2.7%        | 3.5%         |
| **Females**            | 130             | 483                           | 360                           | 336            | 21          | 27           |
| **Žene**               | 9.4%            | 34.9%                         | 26.1%                         | 24.3%          | 1.5%        | 2.0%         |
| **χ² test**            | 1.85            | 46.30                         | 421.55                        | 679.89         | 50.24       | 64.52        |
| **p**                  | 0.173           | <0.0001                       | <0.0001                       | <0.0001        | <0.0001     | <0.0001      |

Legend: Chi-Square (DF) = 1, for all χ² tests (Yates correction)

Legenda: Broj stepeni slobode (DF) = 1, za sve χ² testove (Jejtsova korekcija)
corded among unmarried males (34.8/100,000) and females (9.1/100,000) (Table 2).

The most frequent suicide methods among males were by hanging (70.1%) and firearms and explosives (15.7%), whereas among females the dominant suicide methods were by hanging (69.7%) and poisoning by solid or liquid substances (12%) (Table 3).

In the APV municipalities, the average annual suicide rate per 100,000 inhabitants ranged from 14.4 (Novi Sad) to 41.8 (Kanjiža) in the ten-year period (2001–2010) (Figure 1).

Discussion

Our research shows that the suicide mortality rate in the APV was high during the last decade of the 20th century, while since 2000 it has shown a moderate decline. In the APV, during the observed period (from 1991 to the end of 2010), the average annual non-standardized suicide mortality rate was 27.9/100,000 inhabitants, while global average crude (non-standardized) suicide rates for both sexes ranged from 12.2/100,000 in 2002 to 11.2/100,000 in 2010. Non-standardized suicide rate for both sexes in Europe was 14.1/100,000 in 2015 [14].

According to the WHO data, in our neighboring countries in 2000, the crude suicide rates for both sexes ranged from 6.0/100,000 (Albania) and 9.8/100,000 (Bosnia and Herzegovina), to 21.1/100,000.

Table 2. Suicide mortality rates per 100,000 inhabitants aged 15 years and over with gender and marital status distribution in the APV, 2001–2010

|                | Unmarried  | Married  | Widower  | Divorced  |
|----------------|------------|----------|----------|-----------|
|                | Neoženjen/| Oženjen/ | Udovac/  | Razveden/ |
|                | Neudata    | Udata    | Udovica  | Razvedena |
| Total/Total    | 24.1       | 22.5     | 63.6     | 67.2      |
| Males/Males    | 34.8       | 35.9     | 176.9    | 118.6     |
| Females/Females| 9.1        | 9.2      | 37.8     | 32.9      |

Table 3. Suicide methods and gender distribution in the APV, 2001–2010

| Suicide methods                                      | Males/Muškarci (n = 3 698) | Females/Žene (n = 1382) | Total/Ukupno (n = 5080) |
|------------------------------------------------------|-----------------------------|-------------------------|-------------------------|
| Hanging, strangulation, suffocation                   | 2590 (70.1%)                | 963 (69.7%)             | 3553 (69.9%)            |
| Drowning, submersion                                  | 94 (2.5%)                   | 94 (6.7%)               | 188 (3.7%)              |
| Jumping from a high place                            | 46 (1.2%)                   | 25 (1.9%)               | 71 (1.4%)               |
| Jumping or lying before moving object                 | 10 (0.3%)                   | 3 (0.3%)                | 13 (0.3%)               |
| Skakanje ili leganje ispred predmeta u pokretu        |                            |                         |                         |
| Firearms, explosives                                  | 581 (15.7%)                 | 39 (2.8%)               | 620 (12.2%)             |
| Sharp and blunt objects                               | 80 (2.2%)                   | 24 (1.8%)               | 104 (2.0%)              |
| Smoke, fire, flame and steam                          | 7 (0.2%)                    | 3 (0.2%)                | 10 (0.2%)               |
| Motor vehicle crash                                   | 18 (0.5%)                   | 6 (0.4%)                | 24 (0.5%)               |
| Poisoning by solid or liquid substances               | 157 (4.2%)                  | 166 (12.0%)             | 323 (6.4%)              |
| Trovanje čvrstim i tečnim supstancama                 |                            |                         |                         |
| Poisoning by exposure to gases                        | 11 (0.3%)                   | 4 (0.3%)                | 15 (0.3%)               |
| Other and unspecified means                           | 105 (2.8%)                  | 54 (3.9%)               | 159 (3.1%)              |

Figure 1. Non-standardized suicide rates per 100,000 inhabitants by municipalities of the APV, 2001–2010

Figure 1. Stope samoubistava na 100.000 stanovnika u opštinama, Autonomne Pokrajine Vojvodine, 2001-2010.
(Croatia) and 32.4/100,000 (Hungary), and the same range but slightly lower rates in 2010 in those countries [5]. All of this indicates that the APV belongs to a group of countries with a high suicide rate.

The suicide mortality rate in low-income and middle-income countries is lower than in high-income countries (11.2 vs. 12.7 per 100,000 people) and 78% of deaths by suicide occur in low-income and middle-income countries [15].

The highest suicide mortality rates in the APV were recorded during three years (1992, 1993 and 1999). The mentioned period coincides with crisis, war and socio-economic disintegration in the former Yugoslav republics, as well as the NATO bombing of Serbia. This indicates a significant impact of the economic crisis, social instability, fear for one’s own life and livelihood on the increase of suicides. These findings are in line with other studies that show rise in suicide rates during war and their decline after the war, linking this phenomenon with increased availability of firearms during the war and its reduction after the war. Also, increased alcohol consumption during the war was associated with higher suicide rates [16–18]. According to the data of Mušć et al. [19], there were no differences in total suicide rates in BiH and Sarajevo in the pre-war and post-war period, but during the war data were unavailable, at the time when the highest suicide rates were recorded in the APV. This could be linked with a forced migration [20] of a large number of people from BiH to other countries during the mentioned period.

Several epidemiological studies are based on the analysis of correlation of the post-traumatic stress disorder (PTSD) and suicidal behavior, mainly on the sample of Vietnam veterans and displaced persons [21–23]. The PTSD is frequently comorbid with major depressive disorder, and in that case, the risk for suicidal behaviour is enhanced [22]. According to the Veterans Health Study, the prevalence of significant depressive symptoms among veterans was 31%, higher than among the general United States population [24]. The assessment and treatment of these comorbid conditions are likely to contribute to the reduction of suicide risk in this vulnerable population [22], but there is still an open question to what extent other factors may be associated with high suicide rates, such as divorce or separation, migration across state lines, cultural and economic factors or exposure to mass media [23].

A study conducted in 4 centres (Croatia, Serbia, Germany, and the United Kingdom) ten years after the war-related trauma in a sample from the former Yugoslavia, found that older age, more traumatic war-events, lower education, and living in post-conflict countries were associated with higher rates of current PTSD [25].

A decrease of suicide rates after the war may be linked to effective psychiatric and psychology therapy, and better socioeconomic conditions in our country. We can see that in 1999 there was an increase of suicide rates and the country was again facing a socio-economic crisis. On the other hand, causes may be in reduced access to firearms, and the displacement of the population from the territory of the former Yugoslavia.

Similar to the results of countries worldwide [5, 26] the suicide mortality rate in APV is significantly higher among males. The ratio of the mortality rate (from 1991 to 2010) between males and females was 3 : 1, and it was generally stable over the time. The difference in the male-to-female ratio shows that females are affected by different cultural and racial characteristics in regard to the individual populations [18, 26].

Suicide rates increase with age, which is in line with the global data of the WHO member countries [2]. We found that the highest specific suicide rates were recorded in the ≥ 80 year-old age group, and in the 75–79 year-old age group. According to the data from 2006, in the Republic of Serbia, almost every second deceased person who died by suicide was older than 60 (48.7%) and every third person was older than 70 years (33%) [27]. In addition to this trend, along with the increase in suicide rates from younger to older age, contrary to the results of our research, in some countries there is a higher incidence of suicide among young people in the 15–24 year age group [18]. Older people lose economic security, spouse, children leave the family, and physical and mental illness are more common at this age. Functional disability was shown to be associated with suicidal behaviour in older adults [28]. The low living standard of this group of inhabitants in our country with difficult access to healthcare, especially in rural areas where most of the elderly live, may be linked to high suicide rates.

Similar to the reports of many countries [29], the most common method of suicide among males in the APV was hanging (70.1%) and use of firearms (15.7%), and among females hanging (69.7%) and poisoning by solid and liquid substances (12.0%). Until twenty years ago, suicides by firearms were comparatively rare. However, after the start of the socio-economic crisis in Yugoslavia and the availability of large amounts of weapons among the population, this method of suicide has become more dominant. According to the official data, the number of suicides committed by use of firearms has increased by five times in mid-nineties and at the end of nineties compared to the period of the fifties of the last century [30], as described by other authors [16, 17, 19, 31]. During the war and post-war years, the number of suicides by firearms has significantly increased in neighboring Croatia, particularly among males. In 1985, the incidence of suicides committed by firearms in the total number of suicides was 7.2%, while in 1992 and 1995 firearms accounted for about 26%. This suicide method has declined in recent years [32]. The lowest number of suicides in the APV occurred among persons with college or university degrees, while the highest number of suicides occurred among persons with high school education, followed by persons with elementary and incomplete primary education. A lower level of education is associated with lower socioeconomic status, unemployment, alcohol abuse (especially in men), less availability and use of healthcare. The increase in unemployment is associated with poverty, higher inci-
dence of depression and it poses a higher risk of suicide. This is confirmed by the first European comparative study on socioeconomic inequalities in suicide, which includes the data from several European countries (Austria, Belgium, Denmark, Finland, Norway, Spain, Germany and Switzerland). A low level of education was a risk factor for both genders [33]. The highest rate of mortality due to suicide in the observed ten-year period was recorded among widowers and widows, and the lowest among unmarried males and females. It supports the fact that the loss of a spouse causes high psychological stress and consequently an increase in the suicide rates [10, 34].

In the municipalities of the APV, the average annual suicide rate per 100,000 inhabitants in the ten-year period (2001–2010) ranged from 14.4 (Novi Sad) to 41.8 (Kanjiža). There was no municipality in the APV with suicide mortality rate below 10 per 100,000 inhabitants, while 13 (app 30%) municipalities had suicide rates above 30 per 100,000 inhabitants. This distribution and the highest suicide rates in municipalities in the north part of the APV may be explained by the fact that in this territory of the Province a large part of the population consists of ethnic Hungarians, with the highest suicide rates in Serbia around the 2002 census [35]. The WHO highlighted suicide reduction as one of prime health policy goals back in 1984. Following this, and aiming to support suicide prevention, an initiative of the European Network for Suicide Prevention was established in 2000 [36]. After that, many countries have launched national action plans for suicide prevention, such as United Kingdom, Netherlands, Finland, Scotland, Northern Ireland, Austria, Switzerland, and they have achieved positive results [37]. However, a large number of countries have not entered the target suicide prevention process yet.

In 2013, the Mental Health Action Plan was adopted by the WHO, and one of its main objectives is to reduce suicide rate by 10% by 2020 (Preventing suicide: a global imperative). At the same time, the quality of statistical data related to suicide was also emphasized, because in the low and middle-income countries, there is still no good registration of vital statistics [15].

Despite high suicide rates, Serbia (and therefore Vojvodina), belongs to a group of countries that have not yet defined a national strategy for suicide prevention. Researches like this, examining epidemiological, demographic and socio-economic characteristics of suicide, should identify vulnerable groups that require special attention, as well as areas in which preventive actions need to be taken.

**Conclusion**

Since in the Autonomous Province of Vojvodina persons at increased risk for suicide include males, the elderly, persons with low level of education, and people who lost their partners, suicide prevention strategies should target these groups, including primary and secondary prevention measures.

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