



Original article

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DESCRIPTIVE EPIDEMIOLOGICAL CHARACTERISTICS OF MYOCARDIAL INFARCTION IN THE AREA OF NIŠ

SUMMARY

The paper objective was to determine descriptive epidemiological characteristics of myocardial infarction in the area of Niš. The data on patients were obtained from the municipal population register of myocardial infarction. The research included all the registered myocardial infarction affected patients in the territory of the City of Niš during the period of 1999–2003. The descriptive epidemiological study was applied. Unstandardized and standardized incidence rates were calculated, while the population data were taken from the Census of 2002. Rates were calculated per 100 thousand inhabitants, both for the entire city population and for the population over 30 years of age, in which myocardial infarction is generally registered. The direct standardization method was applied and standardization was carried out according to the European standard population. The total registered number was 1804 cases, out of which 1136 were male and 668 female patients. The average annual unstandardized incidence rate was 144.2 per 100 thousand inhabitants (185.7 in male and 104.2 in female population). The standardized incidence rate was 111.3% for the observed five-year period. The average annual incidence rate in the city population over 30 years of age was higher for the same period, and it amounted to 227.0% (298.7 in men and 161.2 in women). On the average, men suffered from myocardial infarction by 1.9 times more than women. Annual rates are increasing slightly but continuously. The number of affected urban population (1431; 76.8%) was three times greater as compared to the rural one (432; 23.2%). The male patients were 61.8 years old and the female ones had 65 years on the average. Myocardial infarction is registered in both sexes after the age of 30, it is highly increased after the age of 49 and it reaches its maximum after the age of 70. The greatest number of male patients belonged to the age group of 60–69, while it was in the age over 70 for female patients. The highest sex difference is among younger patients, up to the age of 40 (the m/f ratio of 4.1:1), while the lowest sex difference regarding myocardial infarction appears after the age of 70 (the m/f ratio of 1.4:1). The number of patients older than 65 was 49.7% of the total number of affected population. The average annual unstandardized incidence rate was 583.7 in patients over 65 years of age.

Among the patients, most were retired persons – 46.1%, there were almost equal numbers of white-collar (25.2%) and blue-collar workers (25.7%), while the group of housewives made 3% of the diseased. The average profession-based incidence rate was the same among all group of workers (227%). The registered number of patients coming from urban areas was three times greater as compared to the patients from rural settlements. The difference in coming down with the disease between urban and rural population is statistically significant ($\chi^2=14.04$ $p=0.000$).

Key words: myocardial infarction, register, epidemiology, incidence

INTRODUCTION

Niš population register of myocardial infarction was abstracted from the population records related to the ischemic heart disease in 2002, upon a retrograde filling up of the data on patients. The population register of the ischemic heart disease has existed in the Department of Epidemiology since 1986. The Register was formed on the legal grounds of the Rules of Register Form and Keeping, Entry Form and Procedure of Registering and Canceling Registration of Specific Diseases (Official Gazette of the SRS, No 2/80).

The data to be entered into the Register originate from the following sources: the records of the coronary units (CU) at the Clinic of Cardiology of the Clinical Center in Niš and the Institute for the Prevention, Treatment and Rehabilitation of Rheumatic and Cardiovascular Diseases in Niška Banja, reports on the disease from public health institutions in the territory of Niš, death certificates (DM-2 forms) from the Republic Bureau of Statistics – Branch Office in Niš.

This paper aimed at establishing the descriptive epidemiological characteristics of myocardial infarction (MI) in the territory of Niš for the period of 1999–2003.

METHODS

The data on patients have been derived from the MI Population Register of Niš, which was formed through active working on identification and registration of MI affected during the period of 1999–2003. The descriptive epidemiological study was implemented. Unstandardized and standardized incidence rates were calculated, based on the Census of 2002. The assessment of the incidence rate against profession was based on the facts published in

the study “State of health, medical necessities and health-care utilization of the population in the Republic of Serbia”(1).

Rates were calculated per 100 thousand inhabitants, both for the entire city population and for the population over 30 years of age, in which MI is generally registered. The direct standardization method was applied and standardization was carried out in accordance with the European standard population.

RESULTS

The total registered number was 1804 MI cases, out of which 1136 were male and 668 female patients. The average annual unstandardized incidence rate was 144.2 per 100 thousand inhabitants (185.7 per 100 thousand males and 104.2 per 100 thousand females).

The average annual unstandardized incidence rate in the city population over 30 years of age was higher compared to the entire population, and it amounted to 227.0 (298.7 in men and 161.2 in women).

The average annual standardized incidence rate was 111.3 for the period of 1999–2003.

During the period of 1999–2003, the share of MI affected persons in the total number of ischemic Heart Disease (IHD) patients varied from 50.4% to 57.1%, or 53.8% on the average.

Table 1 shows the number of diseased, as well as the annual unstandardized and standardized incidence rates.

Annual incidence rates manifest a slight but steady increase. The lowest annual unstandardized rate was recorded in 1999 (188.7), while the highest one was observed in 2003 (269.2). The standardized incidence rates were lower than the unstandardized ones during the entire observed period.

The table 2 presents unstandardized annual incidence rates and sex-specific rates for the observed five-year period in the territory of Niš.

Table 1. Number of MI patients*, unstandardized and standardized rates of incidence in the territory of Niš for the period 1999–2003 1/100 000

Year	Total		
	Number	Unst. rate	St. rate
1999	300	188.7	95.6
2000	352	221.4	112.5
2001	366	230.2	114.4
2002	358	225.2	119.5
2003	428	269.2	125.6
Total	1804	227.0**	111.3**

* the analysis included only the patients with complete data available

** average annual unstandardized and standardized incidence rates

Table 2. Number of MI affected people and unstandardized sex-specific rates in the city of Niš during the period 1999–2003

Year	Total		Men		Women	
	Number	Rate	Number	Rate	Number	Rate
1999	300	188.7	175	230.1	125	150.8
2000	352	221.4	227	298.4	125	149.6
2001	366	230.2	237	311.6	129	155.6
2002	358	225.2	235	309.0	123	148.4
2003	428	269.2	262	344.5	166	200.2
Total	1804	227.0*	1136	298.7*	668	161.2*

* the average annual incidence rate

The lowest MI incidence rate in male patients was registered in 1999 (230.1), while the highest rate was in 2003 (344.5). As for female patients, the lowest rate was recorded in 2002 (148.4) and the highest in 2003 (200.2).

On the average, men suffered from myocardial infarction 1.9 times more commonly than women. According to the value of χ^2 test ($\chi^2=189.28$, $p<0.000$), there is a statistically significant difference between sexes in coming down with the disease.

A triple number of MI affected was registered in urban (1385 or 76.8%) as compared to rural settlements (419; 23.2%). Considering the fact that some 73% of the population live in the city and 27% of them in the villages, the difference in the disease occurrence between urban and rural inhabitants is statistically significant ($\chi^2=14.04$ $p=0.000$).

The table 3 shows the registered numbers of diseased by age groups and average unstandardized specific rates according to the sex and age factors.

The MI disease is registered in both sexes after the age of 30, it abruptly increases after the age of

49, reaching its maximum in patients over 70. The lowest average incidence rate occurs in the age group 30–39 (19.6), and highest in the patients over 70 years of age (511.6).

The largest number of male patients belongs to the age group of 60–69, while the largest number of female patients is registered in the group of women over 70. The highest average age-specific incidence rates are recorded in both men and women of over 70 years of age (627.8; 426.0).

The largest disease occurrence difference between sexes is observed in younger patients (up to 40 years of age). The average age-specific incidence rate was 4.12 times higher in males compared to females of the same age group. The smallest MI occurrence difference between sexes is noted in patients older than 70 years (m/f ratio: 1.4:1).

The males over 70 years of age are 19.7 times more prone to MI than those belonging to the age group of 30–39, while this ratio is much higher in women; i.e. the women older than 70 come down with MI 59.2 times more often than those 30–39 years old.

Table 3. Number of diseased and average sex- and age-specific incidence rates in the city of Niš in the period of 1999–2003

1/100 000

Age	Total		Men		Women	
	Number	Rate	Number	Rate	Number	Rate
30-39	33	19.6	26	31.8	7	7.2
40-49	175	91.2	118	217.3	57	64.8
50-59	433	250.5	327	385.6	106	120.4
60-69	581	393.2	362	509.3	219	285.5
>70	582	511.6	303	627.8	279	426.0
Total	1804	226.97*	1136	298.71*	668	161.15*

* average unstandardized rates according to sex and age

The share was equal, with 32%, for the age groups of over 70 and of 60–69. The lowest number of MI affected (only 2%) appeared in patients below 40 years of age. On the average, MI affected males had 61.8 years of age, while the corresponding females had 65.0 years.

The data presented in the table 4 point out that in patients older than 65 the highest annual unstandardized MI incidence was recorded in 2003 (577.4 per 100 thousand people of over 65 years of age) and the lowest one in 1999 (398.3). The year of 2003 showed the rate increase as compared to the previous years. The mean annual unstandardized incidence rate amounted to 583.7.

The percentage of patients older than 65 was 49.7% of the total number of registered MI cases. During the whole observed period, the incidence rates of patients over 65 years of age were higher in men than in women, and the men of this age were coming down with the disease by averagely 1.5 times more than women.

Most of the patients were retired persons –46.1%, there were almost equal numbers of white-collar (25.2%) and blue-collar workers (25.7%), while the group of housewives made 3% of the diseased.

The average profession-based incidence rate was calculated as highest in industrial workers –227.6 per 100 thousand workers, then in office and administrative workers – 227.2, while the incidence rates in retired persons and housewives were equal, amounting to 227.0.

DISCUSSION

The data on MI incidence and prevalence are acquired mainly by targeted population research. During the 1980s, some of the most developed European countries (Germany, Sweden, Denmark, Norway) started to establish their national MI registers,

which continuously collect the data on MI illness and death cases apart from of other specific studies.

Notwithstanding its numerous limitations, the extent and incidence of heart and blood-vessel diseases is mainly analyzed on the basis of data taken from the *MONICA Project* (Multinational Monitoring of Trends and Determinants in Cardiovascular Disease), which includes the population of the ages ranging from 35 to 64 in 35 countries in the world (2, 3).

The only source of data on MI in the population of the city of Niš is the Population Register of MI kept by the Public Health Institute in Niš. The Population MI Register contains the records of all the patients treated in the CUs at the Clinic of Cardiology of the Clinical Center in Niš and in the Institute for the Prevention, Treatment and Rehabilitation of Rheumatic and Cardiovascular Diseases in Niška Banja, as well as the disease/death reports from public health institutions in this municipality. A number of people who died outside the medical institutions and for whom the diagnosis of MI was entered into the death certificates (DM-2 forms) is also included into the Register.

There are no data on the MI patients treated in the CU of the Military Hospital and on the patients who suffered from MI and were taken care of outside the city area. However, it can be said that over 90% of the patients affected by MI who turned to medical professionals during the observed period have been entered into the Population MI Register of the city of Niš.

For the observed five-year period, the total number of 1804 MI cases (1136 men and 668 women) was registered in the territory of the city of Niš. The mean unstandardized annual incidence rate was 144.0 per 100 thousand inhabitants (185.7 in male per 100 thousand men and 104.2 in female patients per 100 thousand women). The average standardized annual incidence rate was 111.3.

Table 4. Number of diseased and unstandardized incidence rates by the factor of sex in patients over 65 years of age 1/100 000

Year	Men		Women		Total	
	Number	Rate	Number	Rate	Number	Rate
1999	73	436.7	77	367.4	150	398.3
2000	98	586.1	62	294.9	160	425.0
2001	117	699.8	81	389.6	198	529.2
2002	96	598.1	77	370.3	173	462.4
2003	104	622.0	112	538.7	216	577.4
Total	488	583.7*	409	393.4*	897	479.5*

* the average annual unstandardized rate

The lowest rate for the observed period was registered in 1999 (188.7), while the highest one was recorded in 2003 (269.2). The mean unstandardized annual incidence rate in the Niš population over 30 years of age was higher and amounted to 227 (298.7 in men and 161.2 in women).

There were 361 new MI cases on the average during the observed period. A continual increase in annual incidence rates was registered.

The data on the MI incidence in our country are scarce. According to the facts given in the MONICA Project, the AMI incidence in the areas of Novi Sad and Sremski Karlovci stagnated in the period of 1983–1990, whereas it markedly increased in 1991 and 1992. There were 511 newly registered cases (4).

In Yugoslavia, the acute myocardial infarction (AMI) incidence rate of 2 per 1000 citizens was recorded in the period of 1968–1978 (5).

The MI incidence in 1994 was 456 per 100 thousand inhabitants on the world scale. The highest incidence of 915 was found in Finland, while China recorded the lowest incidence of 76. The incidence in female population was 104 (3, 6).

In the same year, the standardized MI incidence rate in Japan was 26 per 100 thousand citizens. In India, the MI incidence related to the population of the age ranging from 25 to 64 was 3.6 per 1000 in men and 2.2 per 1000 in women (6).

During the period of 1988–1995 in Quebec (Canada), the unstandardized incidence rate was reduced from 148 to 137 per 100 thousand citizens (4, 7).

The observed five-year period (1999–2003) in the city of Niš is characterized by a decrease in the difference between sexes regarding MI. The incidence rates in men were higher in all the monitored ages, and on the average men suffered from MI 1.9 times more often than women.

In the period of 1974–1994, the MI incidence rate in the area of Niš was three times higher in males than in females, i.e. the typical disease ratio was 3:1 (m:f) (8).

An increase in the MI incidence rate was recorded for both sexes in the period of 1999–2003 compared to the period 1974–1994. On the average, the incidence rate grew 1.5 times in men and 2.4 times in women.

According to the data of the Swedish National MI Register, a continual decrease in incidence rate has been recorded in Sweden since 1986, where the average annual rate decrease was 2% in men and 1.4% in women (9–12).

Similar facts have been established by the researchers in Denmark as well (13).

The average age of patients affected by MI in the period of 1999–2003 was 63.4. MI affected men

were 62.0 and women 65.0 years old, on the average. The MI affected women were older than the disease-struck men.

There are similar data in the literature (7–9). Regarding the observed period, the diseased of both sexes were older than those in the period of 1974–1994, when the mean age was 57.51 for men and 63.66 for women (8).

The highest specific rates for the period of 1999–2003 were registered in patients over 70 years of age (511.6) and in the age group 60–69 (393.2). The observed period is characterized by higher rates in all the monitored age groups compared to the period 1974–1994.

The sex difference among the diseased was reduced regarding the group of less than 40 years of age. In the period 1999–2003, the incidence rate ratio for the age group 30–39 was 4.4:1 (m:f), while this ratio was 6:1 in the period of 1974–1994.

Patients over 65 years of age constituted 49.7% of the total number of MI diseased individuals. The highest annual unstandardized MI rate in patients over 65 years of age was recorded in 2003 (577.4 per 100 thousand people over 65 years of age), while this rate was lowest in 1999 (398.3). The mean unstandardized annual incidence rate was registered at 583.7.

Among the patients, most of them were retired persons of both sexes – 46.1%, there were 25.2% white-collar and 25.7% blue-collar workers, while the group of housewives constituted 3% of the diseased. The average profession-based incidence rates were similar in all groups of workers (about 227%), while the incidence rates registered in retired persons and housewives were equal, amounting to 227. Other authors have stated a similar profession-related structure of diseased, as well (8, 14).

Among the MI affected patients, a three times greater number was registered in urban (1431 or 76.8%) as compared to rural settlements (432; 23.2%). This difference is significant in statistical terms.

CONCLUSION

Annual MI incidence rates indicate a slight but steady increase. The disease has been registered in both sexes after 30 years of age, its incidence is highly increased after the age of 49 and it reaches its maximum in patients older than 70. The MI affected women were older than the disease-struck men (65.0:62.0). Patients under 65 years of age constituted 50.3% of the MI affected people. On the average, men suffered from myocardial infarction 1.9 times more often than women. An increase in inci-

dence rates was registered in both sexes, as well as a decrease of incidence difference between male and female patients. The average profession-related incidence rates were similar in all groups of workers,

while the incidence rates in retired persons and housewives were equal, amounting to 227%. A triple number of the MI affected was registered in urban compared to rural settlements.

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DESKRIPTIVNO–EPIDEMIOLOŠKE KARAKTERISTIKE INFARKTA MIOKARDA NA TERITORIJI GRADA NIŠA

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SAŽETAK

Cilj rada bio je utvrđivanje deskriptivno epidemioloških karakteristika infarkta miokarda na teritoriji grada Niša. Podaci o obolelima dobijeni su iz populacionog registra za infarkt miokarda grada Niša. Istraživanjem su obuhvaćeni svi registrovani oboleli od infarkta miokarda sa teritorije grada u periodu 1999–2003. godine. Primenjena je deskriptivno epidemiološka studija. Izračunavane su nestandardizovane i standardizovane stope incidencije, a podaci o populaciji dobijeni su iz popisa 2002. godine. Stope su izračunavane na 100.000 i to kako u celoj populaciji grada tako i u populaciji starijoj od 30 godina u kojoj je i registrovano obolevanje od infarkta miokarda. Primenjen je metod direktne standardizacije, a standardizacija je izvršena prema evropskom standardnom stanovništvu. Ukupno je registrovano 1804 obolelih, 1136 muškaraca i 668 žena. Prosečna godišnja nestandardizovana stopa

incidencije iznosila je 144.2 na 100.000 stanovnika (185.7 kod muškaraca na 100.000 muškaraca i 104.2 kod žena na 100.000 žena). Standardizovana stopa incidencije u posmatranom petogodišnjem periodu iznosila je 111.3%. Prosečna godišnja stopa incidencije u populaciji starijoj od 30 godina u istom periodu bila je viša i iznosila je 227% (298.7 kod muškaraca i 161.2 kod žena). Muškarci su u proseku 1.9 puta više obolevali od žena. Registrovano je tri puta više obolelih iz urbanih naselja (1431; 76.8%) nego iz ruralnih (432; 23.2%). Obolevanje od infarkta miokarda registrovano je kod oba pola posle 30. godine. Nakon 49. godine obolevanje se naglo povećava i dostiže maksimum kod starijih od 70 godina. Najveći broj obolelih muškaraca je iz uzrasne grupe 60–69 godina, najveći broj žena registrovan je u grupi starijih od 70 godina. Prosek godina obolelih muškaraca bio je 61.8 a žena 65 godina. Najveća razlika u obolevanju među polovima postoji kod mlađih pacijenata, odnosno do 40. godine života (odnos m/ž 4.1:1). Najmanja razlika među polovima u obolevanju je posle 70 godine (odnos m/ž: 1.4 :1). Stariji od 65 godina činili su 49.7% od ukupnog broja obolelih. Prosečna godišnja nestandardizovana stopa incidencije kod starijih od 65 godina iznosila je 583.7. Među obolelima bilo je najviše penzionera 46.1%, službenici 25.2% i radnici 25.7% bili su gotovo podjednako zastupljeni a 3% su činile domaćice. Procenjena prosečna stopa incidencije prema zanimanju bila je slična kod svih grupa radnika (približno 227%), a kod penzionera i domaćica stope incidencije bile su podjednake i iznosile su 227%. Registrovano je tri puta više obolelih iz urbanih naselja nego iz ruralnih. Utvrđena razlika u obolevanju gradskog i seoskog stanovništva je statistički značajna ($X^2= 14.04$ $p=0.000$). Godišnje stope incidencije za infarkt miokarda pokazuju blagi ali kontinuirani porast. Obolevanje se registruje kod oba pola posle 30. godine života povećava se naglo posle 49. i dostiže maksimum kod starijih od 70 godina. Žene koje su obolele od infarkta miokarda bile su u proseku starije od muškaraca (65:61.8). Muškarci su obolevali u proseku 1,9 puta više od žena. Mlađi od 65 godina činili su 50,3% obolelih od infarkta miokarda. Zabeležen je porast stopa incidencije kod oba pola i smanjivanje razlike u obolevanju između muškaraca i žena. Među obolelima najviše je bilo penzionera 46.1%, službenici su bili zastupljeni sa 25.2%, radnici sa 25.7% a sa 3% bile su zastupljene domaćice. Među obolelima od infarkta miokarda bilo je tri puta više obolelih iz urbanih naselja nego iz ruralnih.

Ključne reči: infarkt miokarda, registar, epidemiologija, incidencija