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Ten Year Trends in Cardiovascular Risk Factors in the Federation of Bosnia and Herzegovina

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ABSTRACT

Introduction: Results of routine health statistics show that in the Federation of Bosnia and Herzegovina (FBIH) are the leading causes of death of population are diseases of circulatory system (53% in 2012) namely, cardiomyopathy, heart failure and acute myocardial infarction. This data are red alert for immediate and imminent action. **Methods:** Two cross-sectional population surveys were conducted in 2002 and 2012 in the FBIH among adult population aged 25-64 years for assessment and distribution of major risk factors for cardiovascular diseases (CVD), preferably hypertension, obesity and smoking. **Results:** Overall prevalence of hypertension among adult population in the FBIH in year 2012 was 41%, similar as in 2002. Prevalence of obesity in 2012 among men was higher compared to 2002, stood at 20.3%, while for women it was 24.1%. Total of 61.3% of men and 35.9% of women said they were daily smokers, while the percentage in 2002 was 49.3% among men and 29.8% among women and the difference was statistically significant. **Conclusions:** Distributions of the major risk factors for CVD are worsening in the adult population in the FBIH, especially in middle age men, what can result in serious deterioration of health and increased rates of chronic diseases, especially CVD.

Key words: cardiovascular risk factors, Bosnia and Herzegovina, hypertension, obesity, smoking.

1. INTRODUCTION

Primary and secondary prevention of cardiovascular diseases (CVD) are the effective measures for reducing premature mortality. Premature mortality and morbidity from CVD are related to a common, highly preventable risk factors such as high blood pressure, obesity and smoking and their monitoring allows setting strategic directions and goals, as well as designing preventive intervention programs (1, 2, 3). Premature mortality from CVD generally occurs in countries with low and middle national income and the Federation of Bosnia and Herzegovina (FBIH) is one of these countries (3).

FBIH is ranked among transitional countries with unstable socio-economic indicators which include high unemployment, stopped growth rate of gross domestic product (GDP), large proportion of population with low education levels, inadequacy of social protection systems and social exclusion. Recently data from FBIH showed that overall mortality rate from CVD in FBIH is over then 449/100000 inhabitants. Morbidity rate is over 10880/100000 inhabitants. (4) Results of routine health statistics show that in the FBIH are the leading causes of death of population are diseases of circulatory system (53% in 2012) namely, cardiomyopathy, heart failure and acute myocardial infarction. This data are red alert for immediate and imminent action (5).

In order to prevent early morbidity and mortality it is necessary to establish a system of supervision and monitoring of the highly preventable risk factors for CVD. In this sense, in the last ten years in the FBIH were conducted two large population studies by internationally recommended methodologies and a representative sample of the adult population.

Federal Ministry of Health (FMoH) has launched an initiative for the implementation of significant population research to monitor trends and results from population surveys. Monitoring of risk factors is essential both at strategic level through monitoring trends and distribution and at primary health care level. The great significance of this research is given population monitoring of risk factors, and after ten years it provided a comparison of two time points of measurement, and the results are needed to complete the picture and establishment of courses of action for the future period (6).

There is an imperative need for collecting population data as evidence for creating an interventional control programs of primary and secondary preventions as public health interventions based on actual evidences. In condi-

tions of limited financial resources for health care, health systems need to devise cost-effective programs.

2. METHODS

Data were taken from cross-sectional population surveys on the health status population in the FBIH. Population surveys were conducted by the Federal Ministry of Health (FMoH) and the Federal Public Health Institute (FPHI) in 2002 and 2012 as a part of primary health care reform process in the FBIH with purpose to measure performance in the health care system and public health.

In 2002 the target population was adult population aged 25-64 years, while in the 2012 the target population was adult population aged 18 years and over. In this population were not included collective households such as student homes, children's homes, homes for elderly and pensioners. All participants were informed of the purpose of research, and were explained that the data obtained will be used exclusively for this purpose. During the survey there were also conducted anthropometric measurements (blood pressure, body weight and height), for which the written consent was sought. Comparison of major cardiovascular risk factors was conducted in both studies for adult population of 25-64 years of age.

Sample designing, conducted by the Federal institute of statistics (FIS), was based on the estimated number of people, considering that the last official census in Bosnia and Herzegovina was in the year 1991. In a study from 2002, a three-stage stratified systematic sample was applied. The total number of participants was 2750, with participation rate of 91.5%.

In a survey from 2012 a framework for selection was the "master" sample were survey areas and households from 2009, which was established and updated by the FIS and that facilitated sampling compared to year 2002. It was applied the two-stage stratified systematic sample, where the primary sampling units (first stage units) were survey areas while secondary sampling units (second stage units) were households. Secondary sampling units were selected by systematic method, which ment that choice probabilities were same. Stratification of units was made according to the settlement type (urban / rural). The survey covered a total of 2735 adult population aged 25-64 years, with participation rate of 80%.

Both studies were using current international methodology for this type of research. In 2012 as research instruments were used specially designed and adapted questionnaires based on international methodology (European Health Interview Survey and Health Examination Survey). For the purpose of comparison with indicators of research from 2002, set of questions was used from the recommended international protocols (WHO CINDI Health Monitor Survey, European Health Risk Monitoring Project) (8, 9).

Blood pressure (BP) was measured by mercury sphygmomanometer. BP was read in mm Hg units according to the protocol MONICA research and was measured in patients homes in sitting position, after respondent had to rest for 5 minutes. Two measurements of BP were made in 2002 and three in 2012 within an interval of at least five minutes. Systolic pressure (SBP) was registered separately and diastolic blood pressure separately (DBP). Surveyed persons were classified as hypertensive if their systolic blood pressure was higher than 140 mmHg and / or diastolic blood pressure over 90 mmHg. and / or treated with antihypertensive drugs.

Body weight was measured using digital scales and body height was measured by stadiometer at homes. Values of both body weight and body height were used to calculate the body mass index (BMI in kg/m2). Limit values for overweight is 25 kg/m2 and 30 kg/m2 for obesity.

Smoking status was assessed using a set of questions, according to the European Health Risk Monitoring Project protocol. Subjects were divided into three categories–daily smokers, former smokers and those who never smoked. Based on this, comparison of the results was performed in two separate studies inside a decade.

For values of the main indicators in both studies for the research there were performed same statistical analyzes. Analysis of variance was used to compare average values of continuous variables (BMI) by sex and age. Differences in obesity, prevalence of hypertension and smoking status, as well as the interaction among age and sex groups was tested by a log-linear model.

3. RESULTS

3.1. Blood pressure

Overall prevalence of hypertension in the adult population in the FBIH in year 2012 was 41%, it was higher in men (43.9%) rather than women (37.5%) and generally there were no significant differences compared to the overall prevalence of research in the year 2002. There was a statistically significant prevalence of hypertension in both men and women and it significantly increased with the age ($p < 0.01$). Prevalence of hypertension in men in the previous study of 2002 stood at 41% and was more common in women.

In the men group, in 2012, there was an increase of 8% of hypertension cases compared to 2002 (up from 36% in the 2002 to 44% in 2012). In women, the reverse trend is observed in the 2012, a decline of 8% of hypertension cases compared to 2002. (45% vs. 38%) (Table 1.)

3.2. Body Mass Index

In a study from 2002 there was no statistically significant difference in average body mass index (BMI), which in men was 26.5 kg/m2 and 27.0 kg/m2 in women. BMI has consecutively increased with age in both sexes, and significantly in women ($p < 0.01$). BMI values in the 2012 are lower, and also, there was no statistically significant difference between men and women (26.9 kg/m2 vs. 26.4 kg/m2). BMI increases with age in both sexes ($p < 0.01$). The interaction is presented in Graph 1.

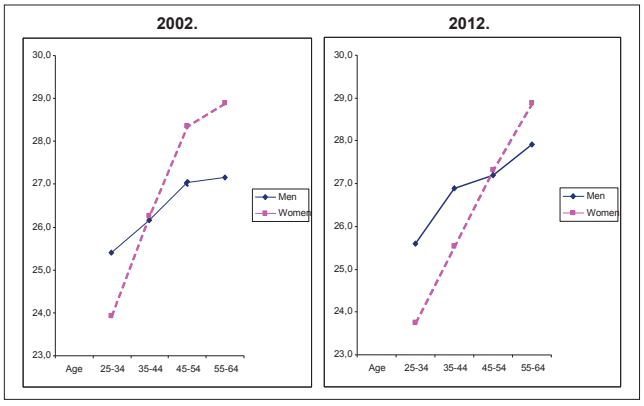
In men, there is a statistically significant increase in BMI in the 2012 compared to 2002.($p < 0.01$). Analysis based of the simple main effect of age for men shows that in the group of men, by increasing age there is a proper, statistically significant increase in body mass index in both years of measurement ($p < 0.01$). According to measurement year, in a group of women it is coming to the statistically significant decline in BMI in the 2012 compared to 2002. ($p < 0.01$) Increase in age leads to proper, statistically significant increase in body mass index. ($p < 0.01$) (Table 2)

Year	Sex	Age	Hypertension			
			Normotensive		Hypertensive	
			N	%	N	%
2002.	Men	25-34	145	87.9%	20	12.1%
		35-44	254	74.7%	86	25.3%
		45-54	190	59.6%	129	40.4%
		55-64	120	43.2%	158	56.8%
		Total	709	64.3%	393	35.7%
	Women	25-34	277	87.9%	38	12.1%
		35-44	318	71.5%	127	28.5%
		45-54	182	43.5%	236	56.5%
		55-64	100	23.6%	324	76.4%
		Total	877	54.7%	725	45.3%
	Total		1586	58.7%	1118	41.3%
2012	Men	25-34	253	83.2%	51	16.8%
		35-44	202	65.8%	105	34.2%
		45-54	175	51.2%	167	48.8%
		55-64	79	25.5%	231	74.5%
		Total	709	56.1%	554	43.9%
	Women	25-34	288	89.2%	35	10.8%
		35-44	269	80.5%	65	19.5%
		45-54	228	54.7%	189	45.3%
		55-64	106	30.1%	246	69.9%
		Total	891	62.5%	535	37.5%
	Total		1600	69.5%	1089	40.5%
Total			3186	59.1%	2207	40.9%

Table 1. Prevalence of hypertension, by sex and age, 2002. and 2012.

Hierarchical log-linear analysis with backward elimination effects

Years*Sex*Hypertension	df=1	Partial χ^2=50.4	p<.001
Sex*Age group*Hypertension	df=3	Partial χ^2=19.5	p<.001
Year*Age group*Hypertension	df=3	Partial χ^2=3.8	p>.05
Age group*Hypertension	df=3	Partial χ^2=1051.1	p<.001
Years*Hypertension	df=1	Partial χ^2=0.1	p>.05
Sex*Hypertension	df=1	Partial χ^2=1.5	p>.05
Hypertension	df=1	Partial χ^2=178.7	p<.001



Graph 1, Body mass index, by year and sex

Prevalence of obesity (BMI> 30 kg/m2) in 2002 was 16.5% among men and 21.7% among women and it significantly increased with age in both sexes. In 2012, prevalence of obesity in men was higher compared to 2002, stood at 20.3%, while for women it was 24.1%. Increase in prevalence of obesity increases significantly with age, with an increase steeper in women. In women, prevalence of obesity in 2012 decreased in the age group 35-54 compared to the results of 2002, while in similar age group in men that percentage increased.

		Year					
		2002.			2012.		
Sex		N	M	SD	N	M	SD
Men	25-34	173	25.40	3.74	301	25.60	3.11
	35-44	347	26.15	3.41	302	26.88	3.58
	45-54	321	27.03	3.44	338	27.19	3.73
	55-64	277	27.14	3.79	303	27.90	3.68
	Total	1118	26.53	3.62	1244	26.90	3.63
Women	25-34	322	23.92	4.06	305	23.74	4.04
	35-44	449	26.25	4.47	333	25.53	4.35
	45-54	420	28.35	4.94	414	27.31	5.15
	55-64	422	28.88	4.72	345	28.87	5.33
	Total	1613	27.02	4.94	1397	26.49	5.14

Table 2. Body Mass Index, by sex and age, 2002. and 2012.

*Analysis of Variance (ANOVA)

Sex	SS=3.7	df=1	MS=3.7	F=0.2	p>0.001
Age group	SS=8439.9	df=3	MS=2813.3	F=157.7	p<0.001
Year	SS=0.2	df=1	MS=0.2	F=0.0	p>0.001
Sex*Age group	SS=1643.9	df=3	MS=548.0	F=30.7	p<0.001
Sex*Year	SS=289.7	df=1	MS=289.7	F=16.2	p<0.001
Age group*Year	SS=115.6	df=3	MS=38.5	F=2.2	p>0.001
Sex*Age group*Year	SS=50.5	df=3	MS=16.8	F=0.9	p>0.001

In the men group, during both years of measurement, the largest percentage of respondents, nearly 50% was in the category of BMI 25-29 kg/m2 followed by categories <25 kg/m2 (35% 2002 and 30% in 2012) and categories of> 30 kg/m2 (17% and 20% respectively in 2012). Among women, the frequency of subjects in the categories of BMI in both years, proper declining from category of <25 kg/m2 to category <30 kg / m2.

Smoking

In the FBiH in 2012, 61.3% of men and 35.9% of women said they were daily smokers, while the percentage in 2002 was 49.3% among men and 29.8% among women and the difference was statistically significant (p <0.01). Prevalence of daily smokers in 2012 increased with age, especially in men, while in 2002 the prevalence of smoking decreased with age in both men and women. Within the two youngest age groups (25-44), the percentage of daily smokers in both sexes has remained almost the same in both years of measurement. On the other hand, in the age group 45-64, the percentage of daily smokers significantly increased from 2002 to 2012 in both sexes, particularly in men. The prevalence of people who have never smoked in the study from 2012 was lower than in 2002 study and there were more women. In the younger groups, the percentage of smokers in 2012 had increased (approximately 3% in men aged 25-34 and almost 13% in women aged 25-34).

In older age groups the percentage dropped in 2012 compared to 2002, about 7% in men aged 45-54 and almost 10% in men aged 55-64, and 13% among women aged 45 -54 and about 9% in women aged 55-64. Prevalence of former smokers in both men and women stood at

Year	Sex	Age	Body Mass Index (kg/m²)					
			<25 kg/m²		25 kg/m²-29 kg/m²		>30 kg/m²	
			N	%	N	%	N	%
2002	Men	25-34	86	49.7%	67	38.7%	20	11.6%
		35-44	130	37.5%	170	49.0%	47	13.5%
		45-54	93	29.0%	169	52.6%	59	18.4%
		55-64	81	29.2%	137	49.5%	59	21.3%
		Total	390	34.9%	543	48.6%	185	16.5%
	Women	25-34	222	68.9%	79	24.5%	21	6.5%
		35-44	202	45.0%	167	37.2%	80	17.8%
		45-54	112	26.7%	169	40.2%	139	33.1%
		55-64	87	20.6%	168	39.8%	167	39.6%
		Total	623	38.6%	583	36.1%	407	25.2%
	Total		1013	37.1%	1126	41.2%	592	21.7%
2012	Men	25-34	128	42.5%	149	49.5%	24	8.0%
		35-44	92	30.5%	153	50.7%	57	18.9%
		45-54	91	26.9%	168	49.7%	79	23.4%
		55-64	59	19.5%	151	49.8%	93	30.7%
		Total	370	29.7%	621	49.9%	253	20.3%
	Women	25-34	218	71.5%	64	21.0%	23	7.5%
		35-44	172	51.7%	113	33.9%	48	14.4%
		45-54	144	34.8%	144	34.8%	126	30.4%
		55-64	81	23.5%	125	36.2%	139	40.3%
		Total	615	44.0%	446	31.9%	336	24.1%
	Total		985	37.3%	1067	40.4%	589	22.3%
Total			1998	37.2%	2193	40.8%	1181	22.0%

Table 3. Prevalence of obesity, by sex and age, 2002. and 2012.

Hierarchical log-linear analysis with backward elimination effects			
Year*Sex*BMI	df=2	Partial $\chi^2 = 22.7$	p<.001
Sex*Age*BMI	df=6	Partial $\chi^2 = 40.8$	p<.001
Year*Age*BMI	df=6	Partial $\chi^2 = 5.707$	p>.05
Sex*BMI	df=2	Partial $\chi^2 = 125.7$	p<.001
Age*BMI	df=6	Partial $\chi^2 = 512.5$	p<.001
Year*BMI	df=2	Partial $\chi^2 = 1.944$	p>.05
BMI	df=2	Partial $\chi^2 = 343.6$	p<.001

5.4% in 2012 and was significantly lower than in the study from 2002 when it stood at 8.3%. (Table 4.)

4. DISCUSSION

CVD are the prominent causes of death and disability in the world, and estimates for the prevalence of risk factors for their formation and development is necessary for creating promotional and prevention programs, especially in the work of primary health care. Leading risk factors for CVD are behavioral, in the first place increased body weight, obesity and smoking, and also increased uncontrolled blood pressure which makes a significant pathophysiological risk factor (2, 3).

In the FBIH, a total of 41% of the respondents were registered as hypertensive and there was no significant change in prevalence in relation to the 2002 study. (9,10) Prevalence of hypertension in the FBiH in comparison with the countries of this part of Europe is similar, particularly in comparison with Croatia and Slovenia, while

Year	Sex	Age	Smoking status					
			Daily smokers		Former smokers		Non-smokers	
			N	%	N	%	N	%
2002.	Men	25-34	92	53.2%	9	5.2%	72	41.6%
		35-44	192	55.3%	24	6.9%	131	37.8%
		45-54	157	48.9%	31	9.7%	133	41.4%
		55-64	111	39.8%	56	20.1%	112	40.1%
		Total	552	49.3%	120	10.7%	448	40.0%
	Women	25-34	123	37.6%	30	9.2%	174	53.2%
		35-44	163	36.1%	33	7.3%	255	56.5%
		45-54	122	29.2%	22	5.3%	274	65.6%
		55-64	75	17.6%	22	5.2%	329	77.2%
		Total	483	29.8%	107	6.6%	1032	63.6%
	Total		1035	37.7%	227	8.3%	1480	54.0%
2012.	Men	25-34	155	51.0%	12	3.9%	137	45.1%
		35-44	193	62.9%	5	1.6%	109	35.5%
		45-54	218	63.7%	9	2.6%	115	33.6%
		55-64	208	67.1%	8	2.6%	94	30.3%
		Total	774	61.3%	34	2.7%	455	36.0%
	Women	25-34	101	31.3%	7	2.2%	215	66.6%
		35-44	117	35.0%	5	1.5%	212	63.5%
		45-54	189	45.3%	11	2.6%	217	52.0%
		55-64	105	29.8%	7	2.0%	240	68.2%
		Total	512	35.9%	30	2.1%	884	62.0%
	Total		1286	47.8%	64	2.4%	1339	49.8%
Total			2321	42.7%	291	5.4%	2819	51.9%

Table 4. Smoking prevalence, by sex and age, 2002. and 2012.

Hierarchical log-linear analysis with backward elimination effects			
Year*Age*Smoking	df=6	Partial $\chi^2 = 52.7$	p<.001
Sex*Age*Smoking	df=6	Partial $\chi^2 = 42.1$	p<.001
Year*Sex*Smoking	df=2	Partial $\chi^2 = 1.285$	p>.05
Year*Smoking	df=2	Partial $\chi^2 = 126.1$	p<.001
Sex*Smoking	df=2	Partial $\chi^2 = 330.4$	p<.001
Age*Smoking	df=6	Partial $\chi^2 = 38.5$	p<.001

it is lower than the results of recently conducted research in Serbia (11-14).

Compared with average prevalence of hypertension in the world in recent estimates, the FBIH is significantly above average. Prevalence of hypertension varies widely in all the countries of the world, but implementation of interventions, well-controlled programs all reduce the prevalence of hypertension as significant risk factor for cardiovascular disease (15,16). Since there is observed increase in prevalence, especially in men, in the FBIH it is necessary to take urgent public health intervention programs aimed at increasing awareness of the population about hypertension, timely detection, treatment and control of high blood pressure, in order that burden of this serious health problem would not increase in the future.

The overall prevalence of obesity was 22% and it was higher among women. In relation to the value of 2002, there has been a slight increase in obesity, especially among men. These are the predictions of the previous research on populations, but values are still lower than in the EU, where it is estimated that over 60% of the adult population is overweight or obese (17).

Overweight and obesity are major risk factors for many chronic diseases, particularly CVD and diabetes mellitus. Transitional countries in southeastern Europe are increasingly faced with the rise of obesity and it is evident in recent research in population. Worrying trends in obesity should initiate intense activities to promote proper nutrition and regular physical activity for all age groups, including younger people, because it is found an increase in overweight and obesity, especially among younger men (19). Good possibility would be a strengthened primary health care in the FBiH and a well-established network of family medicine teams. Public health institutes in the FBiH should take the leading role for these ideas and create interventional programs.

Smoking is a well-known behavioral risk factor in the development of many chronic diseases and the fight against smoking is a long-term activity in all the countries of the world. The prevalence of smoking shows a steady upward trend in the countries of both central and southeastern Europe, as demonstrated by this study in the FBIH. The overall prevalence of smoking in FBIH was 49%, significantly higher in men, even 62%, and showed an increasing trend among the adult population in the last ten years. For males, the prevalence of smoking has dramatically increased in all age groups, while the prevalence of smoking among women was significant in older age groups. Compared to neighboring countries, the FBiH was leading this area. Recent cross-sectional research in both Serbia and Croatia showed significantly lower values, as well as the declining trends in previous years (19, 20).

High prevalence of smoking in the future will have significant implications on the rate of premature morbidity from chronic diseases, on death and disability. Necessary is further continuous research of social and situational variables in developing smoking habits, and also taking a stronger process for smoking cessation and making of positive environmental conditions that will lead to continuous long-term reduction in smoking habits in the population (prohibition of advertising, areas exempted from the cigarette smoke, etc.) Distributions of the major risk factors for CVD are worsening in the adult population in the FBIH, especially in middle age men, what can result in serious deterioration of health and increased rates of chronic diseases, especially CVD.

5. CONCLUSIONS

Trends in major risk factors in the FBIH show a strong need for progressive modifications of lifestyles by setting strong and controlled interventional preventive and promotional programs. As countries with transitional economies in Southeast Europe have similar trends, it opens up the possibility for collaborative studies and interventional programs, exchange of ideas and best practice, what should all be strongly supported.

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CONFLICT OF INTEREST: NONE DECLARED.

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