

RISK FACTORS OF CARDIOVASCULAR DISEASES

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RIZIKOVÉ FAKTORY SRDCOVOCIEVNYCH CHORÔB

Abstract

Gerova Z, Panakova I, Matuskova M:
Risk Factors of Cardiovascular Disease
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Background: Cardiovascular diseases are the leading cause of premature mortality of women and men in Slovak republic.

The aim: The occurrence and mean values of major CVD risk factors were assessed in a population of 2480 Bratislava citizens (2/3 of them were women) interested in health promotion and primary CVD prevention activities in Community Health Promotion Center.

Methods: Major CVD risk factors were assessed, using standard methods, and criteria, in accordance with the guidelines of European and national medical societies.

Main results: The greatest proportion of visitors, both women and men, were in their forties. 73 % of all women and 70 % of all men were aged 30–59 yrs. The most frequent risk factors, were overweight and obesity, present in 64 % of men and 59 % of women. Of them, central type obesity was found in 30 % of men, 15 % of women. In 52 % of men and 32 % of women elevated casual blood pressure was assessed at the first visit. Of the total, in 27 % of men and 21 % of women, the BP elevation was within the range of borderline hypertension. In 25 % of men and 11 % women the BP values were within the mild to severe hypertension range. Elevated blood cholesterol was assessed in 53 % of men and 54 % of women, lowered HDL cholesterol in 55 % of men and 43 % of women. Elevated TC/HDL-C ratio was found in 60 % of men and in 35 % of women. Triglyceride level elevation was assessed in 24 % of men and in 17 % of women, with TGL/HDL-C ratio raised in 66 % of these men and in 40 % of these women.

Conclusions: In assessment of CVD risk factors clustering, our results are different from the results of CINDI SR screening from 1992. In our study, only 13 % persons were free of any CVD risk factors. One risk factor was found in 21,1 %, two of them in 29,9 %, three in 29,8 % and four in 6,2 % of the population screened. Evaluation of the effect of complex individual intervention in our

Abstrakt

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Pozadie problému a cieľ: Srdcovocievne choroby (SCCH) sú na Slovensku, podobne ako v iných krajinách strednej Európy, najčastejšou príčinou včasnej úmrtnosti mužov i žien. Práca sleduje výskyt a priemerné hodnoty hlavných rizikových faktorov srdcovocievnych chorôb (SCCH) v súbore 2480 občanov Bratislavy, ktorí prejavili aktívny záujem o podporu zdravia a primárnu prevenciu SCCH v Mestskom centre podpory zdravia Bratislava (MCPZ).

Metódy: Hlavné rizikové faktory sa určovali štandardnými metódami podľa odporúčaní slovenských a európskych lekárskech odborných spoločností.

Hlavné výsledky: Pomer počtu žien k počtu mužov bol 2:1. 73 % žien a 70 % mužov bolo vo veku 30–59 rokov. Najčastejšie sa vyskytujúcim rizikovým faktorom boli nadhmotnosť a obezita zistené u 64 % mužov a 59 % žien. Priemerná hodnota BMI prekročila hodnotu 25 v skupine mužov, resp. hodnotu 24 v skupine žien vo veku 30–39 rokov. Centrálny typ obezity sa vyskytoval u mužov v 30 %, u žien v 15 %. Skupinová priemerná hodnota WHR u mužov prekročila hranicu WHR 0,9 v skupine 40–49-ročných mužov. Hranične zvýšené a zvýšené hodnoty krvného tlaku sa vyskytovali 52 % mužov, a 32 % žien. Priemerná hodnota STK prekročila hodnotu 120 mmHg u mužov vo veku 20–29 rokov, u žien vo veku 40–49 rokov. Priemerná hodnota DTK prekročila hodnotu 80 mmHg u mužov v druhej, u žien vo štvrtej vekovej dekáde. Hladina celkového cholesterolu bola zvýšená u 53 % mužov a u 54 % žien. Hladinu celkového cholesterolu 5,2 mmol/l prekročila priemerná hodnota vo vekovej skupine 30–39-ročných mužov a 40–49-ročných žien. Znížené a nízke hodnoty HDL-cholesterolu sa vyskytovali u 55 % mužov a 43 % žien. Zvýšené hladiny triacylglycerolov sa zistili u 24 % mužov a 17 % žien. Zvýšené hodnoty rizikového indexu I sa vyskytovali v celom súbore mužov v 60 %, v súbore žien v 35 %. Zvýšené hodnoty rizikového indexu II sa vyskytovali u 66 % mužov a 40 % žien.

Záver: Pri sledovaní výskytu kumulácie vybraných rizikových faktorov (fajčenie, zvýšená hodnota BMI, TC, TK) boli naše výsledky odlišné od výsledkov skríningu CINDI SR 1992. V našom súbore sa žiadny z uvedených rizikových faktorov nezistil

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center will be the subject of our next study. (Fig. 5, Tab. 5, Ref. 11.)

Key words: cardiovascular disease, risk factors, primary prevention.

Cardiovascular diseases are the major cause of premature mortality in men and women in Slovakia, similar to that in other Central European countries (1). The Health Promotion Centers affiliated to local Public Health Institutes were organized as workplaces of the CINDI Program Slovakia. The presented study provides an analysis of age and gender distribution of CVD risk factors in a group of 2480 persons who visited the Health Promotion Center in Bratislava voluntarily.

Material and Methods

We studied a volunteer population recruited by a local and central mass-media advertisement.

Identification of major CVD risk factors was performed in each person. The total personal burden of CVD risk (risk score) was then assessed according to the Framingham scale. The risk score created the basis for each individual intervention.

Each person filled in a questionnaire with personal data, data on CVD in personal and family history, including history of smoking.

Body weight and height were estimated by an electronic digital balance and body height measuring apparatus and the body mass index was calculated. Index of central obesity (waist to hip ratio) was calculated from values measured by a measuring tape. Blood pressure was measured using a mercury sphygmomanometer, after the person was sitting quietly for 5 minutes. A mean value was calculated from two consequent measurements. Total cholesterol and triglycerides level in capillary blood and HDL cholesterol level in plasma were estimated using the Reflotron (Boehringer Mannheim, Germany). Regular control measurements of "Precinorm" standard samples assured the accuracy of measurements.

All the personal and family history data yielded by the questionnaire, the acquired anthropometric, physiological and biochemical data were entered, registered and statistically treated by PC 486 using the "Healthy Heart Test" software.

Statistics

The mean values, SD and SEM were obtained from the software "Healthy Heart Test". The confidence intervals (CI 95 %) of the mean values were estimated in the EPI INFO 6 program. In EPI INFO 6 were performed also the comparisons of risk factors occurrence in our study population with those of the CINDI Program Slovakia (9) and the project MONICA Czech Republic (10, 11) (χ^2 -test), as well as, comparisons of mean risk factor values of our study population with those of the CINDI Program Slovakia and the project MONICA Czech Republic (unpaired Student t-test).

The persons younger than 20 years of age represent in our study population 1 per cent, persons older than 70 years 5 per

cent, respectively. This was the reason, we did not evaluate these age groups individually in all cases. However, their data were included in statistical analyses of the whole study population.

Criteria and definitions used for the assessment of the risk factors:

smoking and early ex-smoking: current smoking of 1 or more cigarettes daily, or quitting smoking in a period of less than 2 years.

$$\text{body mass index — BMI} = \frac{\text{weight (kg)}}{\text{height (m}^2\text{)}}$$

overweight: men BMI 25—29.9, women BMI 24—28.9

obesity: men BMI \geq 30, women BMI \geq 29

index of central obesity — WHR (waist to hip ratio)

central obesity: men WHR \geq 0.9, women WHR \geq 0.85

blood pressure — 1st measurement — BP (mmHg)

borderline elevation: SBP 140—159 and/or DBP 90—94 mmHg

hypertension: SBP \geq 160 and/or DBP \geq 95 mmHg

total cholesterol — TC (mmol/l)

borderline elevation: 5.17—6.2 mmol/l

elevation: 6.21—7.46 mmol/l

high risk values: >7.46 mmol/l

HDL cholesterol in plasma — HDL-C (mmol/l)

lower values: men 0.8—1.0 mmol/l, women 1.0—1.2 mmol/l

high risk values: men \leq 0.8 mmol/l, women \leq 1.0 mmol/l

Triglycerides — TGL (mmol/l)

elevation: >2 mmol/l

Risk Index I (TC/HDL-C)

elevation: >4.85

Risk Index II (TGL/HDL-C)

elevation: ≥ 1

Results

The population of 2480 persons consisted of 775 men (one third) and 1705 women (two thirds). The age distribution of both genders was identical (Fig. 1). The most numerous groups of wo-

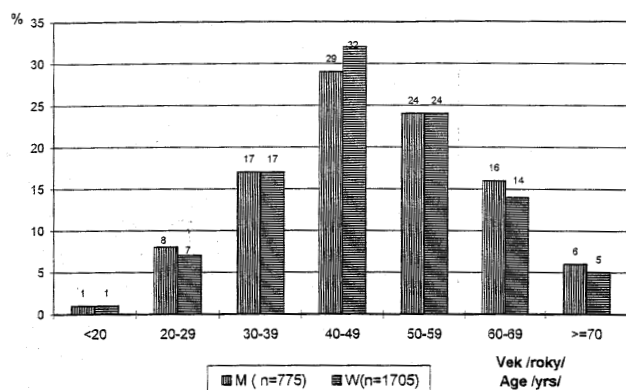


Fig. 1. Visitors of Bratislava Health Promotion Centre (2480 persons) by gender and age.

Obr. 1. Návštevníci Mestského centra podpory zdravia (2480 osôb) podľa pohlavia a veku.

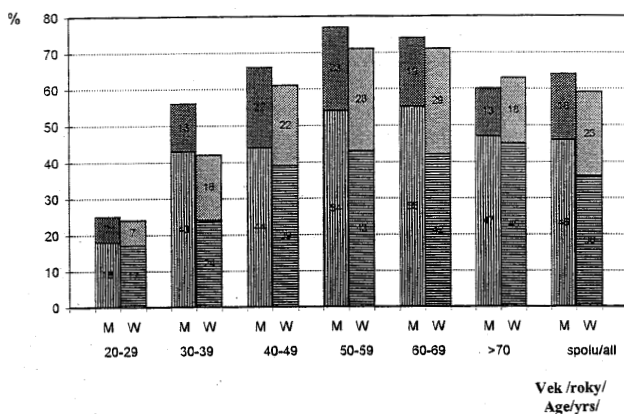


Fig. 2. Percentage of overweight (striped columns) and obese persons (dotted columns) by gender and age.

Obr. 2. Percento osôb s nadváhou (prúžkované stĺpce) a obezitou (bodkované stĺpce) podľa pohlavia a veku.

men and women populations (32 per cent and 29 per cent respectively) were in their fourth decade of age. 24 per cent of men and 24 per cent of women were 50—59 years old, 17 per cent of men and 17 per cent of women were 30—39 years, 8 per cent of men and 7 per cent of women were 20—29 years of age. On the whole, 73 per cent of men and 70 per cent of women were 30—59 years old (Fig. 1). Heart diseases and other vascular diseases (myocardial infarction, coronary by-pass, stroke, peripheral vascular diseases) in *family history* were found in 41 per cent of men and 53 per cent of women.

In the population there were 25 per cent of men and 21 per cent of women *smokers* and early ex-smokers. The most frequent occurrence of smokers and/or early ex-smokers was found in the group of men in the third decade of age (31 per cent). In the second and fourth decade, identically, 28 per cent of men were smokers or early ex-smokers. In the group of women the most frequent occurrence of smokers and early ex-smokers was comparable in the second, third and fourth decade and represented 26 per cent, 25 per cent and 25 per cent respectively.

Tab. 1. Body mass index (kg/m²) by gender and age.

Tab. 1. Body mass index (kg/m²) podľa pohlavia a veku.

muži/men								
vek age	< 20	20-29	30-39	40-49	50-59	60-69	≥70	spolu all
n	8	60	135	225	181	121	45	775
M	-	23,29	25,62	27,13	27,69	27,24	26,51	26,62
SD	-	3,72	3,69	3,98	3,36	3,21	3,79	3,86
SEM	-	0,48	0,32	0,27	0,25	0,29	0,57	0,14

ženy/women								
vek age	< 20	20-29	30-39	40-49	50-59	60-69	≥70	spolu all
n	14	116	298	568	407	222	80	1705
M	-	21,96	24,35	25,82	26,67	27,10	25,86	25,64
SD	-	3,96	5,11	4,57	4,50	4,78	3,89	4,81
SEM	-	0,37	0,30	0,19	0,22	0,32	0,44	0,12

The most frequent risk factors in both men and women groups were *overweight* and *obesity* (Fig. 2, Tab. 1). The normal body weight (BMI in men less or equal to 24.9, in women less or equal to 23.9) was found in 36 per cent of men and 41 per cent of women. *Overweight* was found in men and women in 46 per cent and in 36 per cent, respectively. The occurrence of *overweight* in men increased with age as follows: mean BMI 23.29±3.72 and the finding of *overweight* present in 18 per cent in the second decade of age, however, a mean BMI 27.24±3.21 and the finding of *overweight* present in 55 per cent of men in the sixth decade of age. Similarly in women *overweight* was found in 17 per cent in the group of 20—29 years of age, however, in 45 per cent in the group of 70 and more years old women.

Obesity was detected in 18 per cent of men and 23 per cent of women. The highest frequency of *obesity* in men was found in age groups between 40—49 and 50—59 years (22 per cent and 23 per cent, respectively). Body mass index in the above two age groups was 27.13±3.98 and 27.69±3.36. The highest frequency of *obesity* was found in women aged 50—59 and 60—69 years (28 per cent and 29 per cent, respectively), the corresponding BMI 26.67±4.50 and 27.1±4.78. The mean BMI was in men 26.60 (CI 95 % 26.35—26.89), in women 25.6 (CI 95 % 25.41—25.87). The mean BMI value exceeded the recommended upper limit value (BMI 25) in the group of men 30—39 years old (BMI 25.62±3.69). In this age group the occurrence of *overweight* was 43 per cent and that of *obesity* 13 per cent. The mean BMI value exceeded the recommended upper limit (BMI 24) in the group of women 30—39 years of age (24.35±5.11). In this age group the occurrence of *overweight* was 24 per cent and that of *obesity* 18 per cent.

Central type of *obesity* was detected in 30 per cent of men and 15 per cent of women. The occurrence of this *obesity* type was increasing with age from 20 to 69 years, similarly in men and women.

The mean value of WHR exceeded the recommended upper limit (WHR=0.9) in the group of men 40—49 years old (0.93±0.06). The occurrence of increased WHR values in this age group was found in 28 per cent.

The *elevated blood pressure* levels were detected in 52 per cent of men and 32 per cent of women (Fig. 3, Tab. 2). 27 per cent of men and 21 per cent of women had the blood pressure values in the borderline limits. In 25 per cent of men and 11 per cent of

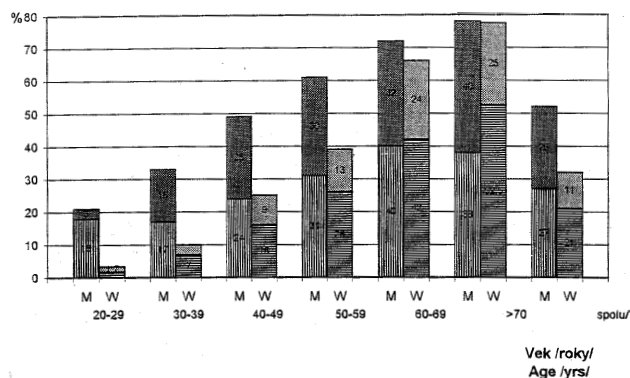


Fig. 3. Percentage of persons with casual borderline (striped columns) or high blood pressure (dotted columns) by gender and age. Obr. 3. Percento osôb s hranične zvýšeným (prúžkované stĺpce) a zvýšeným (bodkované stĺpce) krvným tlakom pri prvom meraní podľa pohlavia a veku.

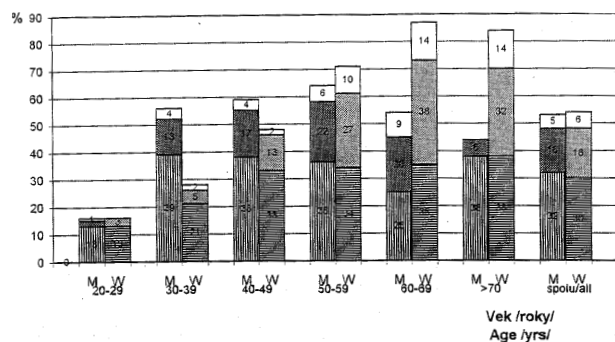


Fig. 4. Percentage of persons with elevated level of total cholesterol by gender and age. Total cholesterol: striped columns — 5.17–6.20 mmol/l, dotted columns — 6.21–7.46 mmol/l, white columns — >7.46 mmol/l. Obr. 4. Percento osôb so zvýšenou hladinou celkového cholesterolu podľa pohlavia a veku. Celkový cholesterol: prúžkované stĺpce — 5,17–6,20 mmol/l, bodkované stĺpce — 6,21–7,46 mmol/l, biele stĺpce — >7,46 mmol/l.

women the blood pressure values exceeded the upper borderline elevation limit. The frequencies of both borderline blood pressure elevation and hypertension grew with increasing age. From the second to the fifth decade of age the numbers of men with borderline blood pressure elevation or hypertension were twice and more times higher than those of women. In the sixth and seventh decade the numbers of borderline blood pressure elevation and hypertension were similar for men and women.

The ratio of the numbers of borderline blood pressure elevation findings to those of hypertension was 1:1 in men and 2:1 in women in all age groups.

The mean value of systolic blood pressure in men was 135.10 mmHg (CI 95 % 133,76–136,40), in women 128.30 mmHg (CI 95 % 127,41–129,23). The mean value of systolic blood pressure exceeded the recommended value (120 mmHg) in the group of men 20–29 years of age (124.70±10.51 mmHg). In this age group 18 per cent of men had borderline blood pressure elevation and

Tab. 2. Casual blood pressure (mmHg) by gender and age.

Tab. 2. Krvný tlak (mmHg) pri prvom meraní podľa veku a pohlavia.

muži/men		STK/SBP							
vek	age	< 20	20-29	30-39	40-49	50-59	60-69	≥70	spolu all
n		8	60	135	225	181	121	45	775
M		-	124,70	125,23	131,97	137,92	147,09	152,18	135,08
SD		-	10,51	12,68	15,82	17,34	20,02	26,11	18,80
SEM		-	1,37	1,10	1,06	1,29	1,83	3,94	0,68

		DTK/DBP								
M	SD	SEM	< 20	20-29	30-39	40-49	50-59	60-69	≥70	spolu all
-	-	-	80,85	85,39	88,84	90,87	90,58	87,20	88,09	
-	-	-	7,62	10,23	10,72	10,46	10,79	15,26	11,24	
-	-	-	0,99	0,88	0,72	0,78	0,99	2,30	0,40	

ženy/women		STK/SBP							
vek	age	< 20	20-29	30-39	40-49	50-59	60-69	≥70	spolu all
n		14	116	298	568	407	222	80	1705
M		-	115,28	116,83	124,71	132,43	145,40	150,33	128,32
SD		-	10,20	11,58	14,41	19,20	20,63	18,58	19,14
SEM		-	0,95	0,67	0,60	0,95	1,38	2,09	0,64

		DTK/DBP								
M	SD	SEM	< 20	20-29	30-39	40-49	50-59	60-69	≥70	spolu all
-	-	-	74,66	77,43	82,24	84,65	87,08	68,80	82,23	
-	-	-	8,21	8,94	9,30	10,38	10,82	10,82	10,32	
-	-	-	0,77	0,52	0,39	0,51	0,69	1,22	0,25	

Tab. 3. Serum cholesterol level (mmol/l) by gender and age.

Tab. 3. Hladina celkového cholesterolu (mmol/l) podľa pohlavia a veku.

muži/men									
vek	age	< 20	20-29	30-39	40-49	50-59	60-69	≥70	spolu all
n		8	60	135	225	181	121	45	775
M		-	4,21	5,26	5,50	5,73	5,53	5,09	5,38
SD		-	0,98	1,17	1,13	1,10	1,37	0,80	1,21
SEM		-	0,13	0,10	0,08	0,08	0,12	0,12	0,04

ženy/women									
vek	age	< 20	20-29	30-39	40-49	50-59	60-69	≥70	spolu all
n		14	116	297	568	407	222	80	1705
M		-	4,42	4,74	5,26	5,93	6,31	6,28	5,45
SD		-	0,71	0,98	1,01	1,17	1,19	1,16	1,22
SEM		-	0,07	0,06	0,04	0,06	0,08	0,13	0,03

3 per cent had hypertension. In women the mean systolic blood pressure value exceeded the value recommended in the age group of 40–49 years. The mean value of systolic blood pressure of this age group was 124.71±14.41, with the occurrence of 16 per cent of borderline SBP elevation and 9 per cent of hypertension values.

The mean value of diastolic blood pressure in men was 88.10 mmHg (CI 95 % 87,30–88,88). The mean value of diastolic blood pressure exceeded the recommended value (80 mmHg) in men of the second age decade (80.85±7.62 mmHg) and women in the fourth age decade (82.24±9.30 mmHg).

The elevation of total cholesterol level (Fig. 4, Tab. 3) occurred in 53 per cent of the group of 774 men and 54 per cent of the group consisting of 1707 women. Indeed, 32 per cent of men and 30 per cent of women had the borderline total cholesterol level elevation, 16 per cent of men and 18 per cent of women had the level of total cholesterol elevated. High risk total cholesterol level was found in 5 and 6 per cent of men and women, respectively.

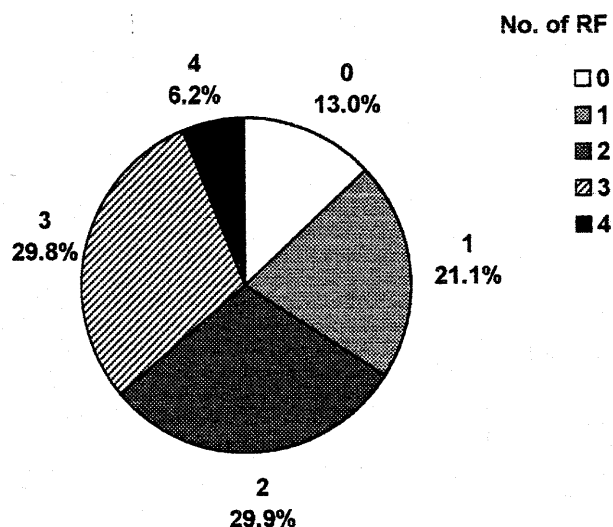


Fig. 5. Percentage of persons with clustering of CVD risk factors: smoking, overweight, hypertension, elevated total cholesterol level.
Obr. 5. Percento osôb s kumuláciou viacerých rizikových faktorov SCCH: fajčenie, nadváha, hypertenzia, zvýšená hladina celkového cholesterolu.

Raising of total cholesterol with age was found in women: between 20—29 years of age, the mean TC value being 4.42 ± 0.71 mmol/l and 60—69 years old, with the mean TC value 6.31 ± 1.19 mmol/l. The most frequent occurrence of elevated and high risk TC values was found in men between 50—59 years of age (mean value 5.73 ± 1.10 mmol/l) with a declining tendency in further aging. Thus the occurrences of borderline elevated, elevated and high risk TC values were more frequent in men of 20—49 years, in comparison to women. On the other hand, the occurrences of elevated and high risk TC values were more frequent in women 50 and more years of age.

The mean value of total cholesterol 5.38 mmol/l (CI 95 % 5.29—5.47) was found in men and in women the respective value was 5.45 mmol/l (CI 95 % 5.39—5.51). The mean value of TC exceeded the recommended upper limit (TC 5.2 mmol/l) in men 30—32 years old (5.26 ± 1.17 mmol/l). In the above age group the borderline TC elevation was found in 39 per cent, elevation in 13 per cent and high risk TC level in 4 per cent. Comparing the TC level in women, only in the group of 40—49 years of age it exceeded the recommended upper limit (5.26 ± 1.01 mmol/l). In this age group borderline TC elevation occurred in 33 per cent, elevation in 13 per cent, and high risk level in 2 per cent.

Lowered HDL—cholesterol levels were found in 53 per cent of the group consisting of 363 men and in 43 per cent of the 994 women group (Tab. 4). 33 per cent of men and 20 per cent of women had HDL-cholesterol in the limits of lower values, 20 per cent of men and 23 per cent of women had high risk HDL-cholesterol values. The occurrences of lower and high risk levels of HDL-cholesterol were similar in all age groups of women. However, in men of all ages, the occurrence of lowered HDL-cholesterol levels were more frequent than the occurrence of high risk level of HDL-cholesterol.

The mean HDL—cholesterol level in men was 1.04 mmol/l (CI 95 % 1.01—1.07), in women 1.32 mmol/l (CI 95 % 1.29—1.35).

Tab. 4. HDL-cholesterol level (mmol/l) by gender and age.
Tab. 4. HDL-cholesterol (mmol/l) podľa pohlavia a veku.

muži/men								
vek age	< 20	20-29	30-39	40-49	50-59	60-69	≥70	spolu all
n	3	31	66	105	90	52	16	363
0,8-1,0 mmol/l (%)	-	42	38	36	29	21	-	33
< 0,8 mmol/l (%)	-	10	21	23	16	29	-	20
M	-	10,3	1,00	1,01	1,08	1,04	-	1,04
SD	-	0,24	0,32	0,30	0,34	0,35	-	0,32
SEM	-	0,04	0,04	0,03	0,04	0,05	-	0,02

ženy/women								
vek age	< 20	20-29	30-39	40-49	50-59	60-69	≥70	spolu all
n	5	67	156	352	262	117	35	994
1,0-1,2 mmol/l (%)	-	21	21	17	21	26	-	20
< 1,0 mmol/l (%)	-	24	21	25	20	27	-	23
M	-	1,26	1,29	1,33	1,35	1,26	-	1,32
SD	-	0,37	0,35	0,43	0,41	0,40	-	0,41
SEM	-	0,05	0,03	0,02	0,03	0,04	-	0,01

Tab. 5. Serum triglyceride level (mmol/l) by gender and age.
Tab. 5. Sérová hladina triacylglycerolov (mmol/l) podľa pohlavia a veku.

muži/men								
vek age	< 20	20-29	30-39	40-49	50-59	60-69	≥70	spolu all
n	2	29	84	158	133	82	31	519
> 2 mmol/l (%)	-	3	26	31	25	16	-	27
M	-	1,13	1,76	1,89	1,71	1,64	-	1,73
SD	-	0,50	1,32	1,33	0,97	1,15	-	1,18
SEM	-	0,09	0,15	0,11	0,08	0,13	-	0,05

ženy/women								
vek age	< 20	20-29	30-39	40-49	50-59	60-69	≥70	spolu all
n	6	49	191	428	324	169	58	1225
> 2 mmol/l (%)	-	4	12	15	20	21	-	17
M	-	1,02	1,22	1,38	1,53	1,65	1,64	1,43
SD	-	0,33	0,64	0,78	0,86	0,94	0,89	0,82
SEM	-	0,05	0,05	0,04	0,05	0,07	0,12	0,02

Elevated triglycerides (TGL) level was found in 27 per cent of the group of 519 men and in 17 per cent of the group of 1225 woman (Tab. 5). The highest mean TGL value in men was found in the age of 40—49 years (1.89 ± 1.33 mmol/l) with the occurrence of elevated TGL values found in 31 per cent. In women the frequency of increased TGL level grew with age. The occurrence was 4 per cent in the age group of 20—29 years (TGL 1.02 ± 0.33 mmol/l) and 21 per cent in the age group of 60—69 years (1.65 ± 0.94 mmol/l).

The mean value of triglycerides in men was 1.73 mmol/l (CI 95 % 1.63—1.83), in women 1.43 mmol/l (CI 95 % 1.38—1.48 mmol/l).

Elevated values of risk index I (RI-I) were found in 62 per cent, 63 per cent and 66 per cent of the third, fourth and fifth decade respectively in the group of 363 men. In the group of 994 women the occurrence of increased RI-I correlated with age: 18 per cent was found in the second, 52 per cent in the sixth decade.

Elevated values of *risk index II* (RI-II) were found in 66 per cent of 519 men and in 48 per cent of 1225 women.

In comparisons of major CVD *risk factors clustering*, the CINDI criteria were used, except of two parameters: (1) On the contrary to the CINDI method we considered smokers together with early ex-smokers (maximum 1 year period of quitting smoking). (2) In the contrast to the CINDI method we considered as a risk factor systolic blood pressure equal to or higher than 130 mmHg and diastolic blood pressure equal to or higher than 85 mmHg.

The occurrence of the four major risk factors clustering: smoking, the body mass index elevation, the blood pressure elevation and the total cholesterol elevation is presented in Fig. 5. In 13 per cent of examined persons no major risk factor was detected. In 87 per cent one or more risk factors were found. One risk factor was detected in 21.1 per cent of persons, two risk factors in 29.9 per cent, three risk factors in 29.8 per cent and four risk factors in 6.2 per cent of persons.

Discussion

The presented study evaluates the occurrence and mean values of the major CVD risk factors in a population of 2480 persons.

Eventually, in the study we compare our data with those of the CINDI Program Slovakia (9) and the MONICA project of Czech Republic (10). We are, however, aware of different ways of recruiting the population in the above mentioned studies.

The frequency of smokers and early ex-smokers in our population of men is significantly lower ($p=0.0004$) than the corresponding prevalence of CINDI and of MONICA.

The frequency of overweight in our population of women (36 %) and men (46 %) is comparable with the corresponding prevalence found in CINDI. The occurrence of obesity in our population of men (18 %) is comparable with the prevalence of MONICA (18.6 %), however, significantly lower ($p=0.015$) than that found in CINDI (23.3 %). Our finding in women is comparable with the corresponding prevalence found in CINDI (22.4 %) but significantly lower ($p=0.0047$) than that found in the MONICA population (28.2 %).

The occurrence of borderline elevated blood pressure values (27 %) and elevated blood pressure values (25 %) in our population of men were significantly higher than the corresponding prevalence of the CINDI population (21.5 %, $p=0.018$ and 20.7 %, $p=0.035$, respectively). In women we found a significantly higher occurrence of borderline elevated values (21 %), but a significantly lower occurrence of elevated values (11 %) than was the corresponding prevalence found in CINDI (16.9 %, $p=0.008$ and 17.8 %, $p=0.004$, respectively).

We found borderline total cholesterol level elevation in 32 % of men and 30 % of women in our study population. Both above findings are significantly lower than the corresponding prevalence found in CINDI (5.2–6.49 mmol/l), 43.6 % in men ($p<0.00001$), 39.6 % in women ($p<0.00001$), respectively.

The occurrence of high total cholesterol levels in men (21 %) and women (24 %) of our population was lower than the corresponding prevalence of CINDI 24.4 %, NS, 28.1 % in women, $p=0.015$) and significantly lower than that of MONICA (30.6 % in men, $p<0.00001$ and 30 % in women, $p=0.00029$).

The occurrence of high risk HDL-cholesterol levels in men of our population (20 %) was significantly lower than the corresponding prevalence of CINDI (37 % in the group 64 years old, $p<0.00001$).

Elevated triglycerides levels were observed in 24 % of men and 17 % of women in our population. Both occurrence values were significantly lower than the corresponding prevalence values found in the CINDI population of 15–64 years of age (37 % men, $p<0.00001$ and women 24 %, $p=0.0026$).

Using a modified definition of major CVD risk factors, only 13 % of our visitors were free of any of them. This is a significantly lower proportion compared to CINDI (28.7 %, $p<0.00001$). One CVD risk factor was detected in 21.1 % of our population, whilst in 36.8 % ($p<0.00001$) in CINDI. The clustering of two risk factors was observed in 29.9 % in our population, but only in 24.9 % in CINDI ($p=0.05$). The combination of three risk factors was found with significantly higher frequency in our population (29.8 %) than was the corresponding prevalence in CINDI (8.4 %, $p<0.00001$). Eventually, the combination of four CVD risk factors was significantly more frequent in our population (6.2 %) in comparison with CINDI (1.1 %, $p=0.001$).

The mean BMI values in women and men in our population exceeded the recommended upper limit. The mean BMI in the women population (25.6) was significantly higher than that of CINDI (24.5, $p<0.00001$), however, significantly lower than that of MONICA (26.5, $p<0.001$).

The mean SBP and DBP values in both women and men populations exceeded the recommended upper limit. In our men the mean SBP (135 mmHg) and DBP (88 mmHg) exceeded the corresponding values in CINDI (SBP 133 mmHg, $p=0.025$ and DBP 84 mmHg, $p<0.00001$), as well as in MONICA (SBP 131.0 mmHg, $p=0.02$ and DBP 86.0, $p=0.026$). Similarly, in our women the mean DBP value was significantly higher than that of CINDI (DBP 80.0 mmHg, $p<0.00001$).

The mean total cholesterol levels of our population exceeded the recommended upper limit. The mean TC levels in men (5.38 mmol/l) and women (5.45 mmol/l) were significantly lower than those found in CINDI (men 5.8 mmol/l, $p<0.00001$, women 5.8 mmol/l, $p<0.00001$) and in MONICA (men 5.91 mmol/l, $p<0.00001$, women 5.87 mmol/l, $p<0.00001$).

The mean HDL-cholesterol levels found in our population of men (1.04 mmol/l) and women (1.32 mmol/l) were lower than the recommended lower limit. The mean value found in our men was significantly lower than that found in CINDI (1.3 mmol/l, $p<0.00001$).

The mean triglycerides levels found in men (1.73 mmol/l) and women (1.43 mmol/l) were significantly lower compared with those found in CINDI (men 2.2 mmol/l, $p<0.00001$, women 2.2 mmol/l, $p<0.00001$).

Conclusions

Similarly to other studies, the mean values of the major biological CVD risk factors in our population increase with age. Of interest, however, were the different age groups of women and men, in which the major risk factors exceeded the recommended limits. In men it was the age group 30–39 years (BMI, TC, TGL) and 20–29 years respectively (SBP, DBP). In contrast, in women the exceeding of recommended values occurred with a ti-

me delay of one decade, i.e. in the age groups 40—49 (SBP, DBP, TC) and 30—39 years (BMI).

Compared to CINDI Slovakia, the most important characteristics of our population were as follows: (1) Significantly lower frequency of findings of elevated total cholesterol and a significantly lower mean total cholesterol levels in women and men. (2) Significantly lower occurrence and significantly lower mean values of triglycerides in men and women. (3) Significantly lower occurrence of smoking and early ex-smoking in our men. (4) However, we found a significantly higher rate of clustering of two, three and four risk factors in our population.

Besides the identification of unrecognized major CVD risk factors in apparently healthy persons, the center of our efforts is a complex individual life-style intervention. The evaluation of the effects of the intervention will be presented next. *

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