Original paper

Risk factors of cardiovascular diseases in paramedics

Czynniki ryzyka wystąpienia chorób sercowo-naczyniowych u czynnych zawodowo ratowników medycznych

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Słowa kluczowe: czynniki ryzyka, ratownik medyczny, choroby sercowo-naczyniowe.

Abstract

Introduction: Cardiovascular diseases are the most life-threatening in Poland and constitute the most frequent cause of death.
Aim of the research: The evaluation of the frequency of the occurrence of cardiovascular disease risk factors among paramedics of the ŚCRMiTS (Świętokrzyskie Centre of Emergency Medical Services) in Kielce.
Material and methods: The subject study group involved 140 paramedics of the ŚCRMiTS in Kielce, excluding the doctors. The evaluation of their condition of health included the following measurements: blood pressure, biochemical analyses: fasting lipidogram, fasting glycaemia, anthropometric measurements, and a questionnaire interview.
Results: The average body mass index of the group was above the norm and equalled 28.2 ±4.1 kg/m^2. The average blood pressure equalled: systolic – 133.8 ±14.9 mm Hg, diastolic – 83.1 ±9.2 mm Hg. The average fasting glucose concentration was 95 ±33.8 mg/dl in the subject population. The average total cholesterol concentration of the group was 198.6 ±36.6 mg/dl, high-density lipoprotein fraction concentration – 48.4 ±10.5 mg/dl, low-density lipoprotein fraction – 121 ±33.8 mg/dl, triglycerides concentration – 168.9 ±120.7 mg/dl. Fifteen risk factors were analysed altogether.
Conclusions: Cardiovascular disease risk factors are a significant risk for the subject group of paramedics and they generate a disadvantageous picture of a health profile. A vast majority of the subjects had an abnormal body mass, exceeded values of blood pressure, and had bad lipidogram parameters. The spread of risk factors and the degree of exceeding reference norms increases with age. It would be justified to prepare preventive measures aimed mainly at the reduction of body weight and the decrease of other modifiable risk factors for cardiovascular diseases.

Streszczenie

Wprowadzenie: Choroby układu krążenia są największym zagrożeniem życia w Polsce i stanowią najczęstszą przyczynę umieralności. Ważnym problemem naukowym staje się ich identyfikacja i ograniczenie stopnia następstw ich występowania.
Cel pracy: Ocena częstości występowania czynników ryzyka wystąpienia chorób sercowo-naczyniowych u ratowników medycznych ŚCRMiTS w Kielcach.
Materiał i metody: Grupę badaną stanowiło 140 ratowników medycznych ŚCRMiTS bez lekarzy pracujących w systemie ochrony zdrowia. Ocena stanu zdrowia dotyczyła pomiarów ciśnienia tętniczego, analizy biochemicznej: lipidogram na czczo, glikemia na czczo, pomiarów antropometrycznych oraz przeprowadzonego wywiadu kwestionariuszowego.
Wyniki: Średni wskaźnik masy ciała grupy był powyżej normy i wynosił 28,2 ±4,1. Średnie ciśnienie tętnicze wynosiło: ciśnienie skurczowe – 133,8 ±14,9 mm Hg, ciśnienie rozkurczowe – 83,1 ±9,2 mm Hg. Średnie stężenie glukozy na czczo kształtowało się na poziomie 95 ±33,8 mg/dl w badanej grupie. Średnie stężenie cholesterolu całkowitego grupy wynosiło 198,6 ±36,6 mg/dl, frakcji HDL 48,4 ±10,5 mg/dl, frakcji LDL 121 ±33,8 mg/dl, triglicerydów 168,9 ±120.7 mg/dl. Analizowano ogółem 15 czynników ryzyka.

Wnioski: Czynniki ryzyka wystąpienia chorób sercowo-naczyniowych znacząco obciążają badaną grupę czynnych zawodowo ratowników medycznych i generują niekorzystny obraz profilu zdrowotnego. Większość badanych ma nieprawidłową masę ciała, przekroczone wartości ciśnienia tętniczego i niekorzystne parametry lipidogramu. Rozpowszechnienie czynników ryzyka i stopień przekroczenia norm referencyjnych wzrasta z wiekiem. Zasadne byłoby przygotowanie działań profilaktycznych mających na celu głównie redukcję masy ciała oraz obniżenie pozostałych modyfikowalnych czynników ryzyka wystąpienia chorób sercowo-naczyniowych.

Introduction

The current state of knowledge indicates that cardiovascular diseases (CVD) are among the main causes of deaths worldwide among non-infectious diseases [1]. This tendency also concerns Poland. Cardiovascular diseases are definitely the greatest threat to life in Poland and constitute the most frequent cause of death. Almost half of the deaths are caused by cardiovascular diseases. In 2013 cardiovascular diseases were the cause of 46% of all deaths [2]. Cardiovascular diseases occur in the general population, which means they also affect professionally active people. In people aged 25–44 and 45–64 years, cardiovascular diseases are the second most frequent cause of deaths, constituting 16.6% and 29.7% of causes of death [3]. Therefore, the identification of the risk factors for cardiovascular diseases and the greatest possible limitation of their consequences are becoming especially important.

The first classification of the cardiovascular disease risk factors was made as a result of the Framingham Heart Study. The abovementioned included: a high total cholesterol concentration and its low-density lipoprotein (LDL) fraction, a low concentration of high-density lipoprotein (HDL) cholesterol, high triglyceride concentration, high blood pressure, excessive body mass, low physical activity, smoking tobacco, male gender, and genetic predispositions [4]. The INTERHEART studies distinguish nine factors of coronary artery disease: smoking tobacco, high ApoB/ApoAl protein ratio, hypertension, diabetes, abdominal obesity, psychosocial factors, low consumption of fruit and vegetables, excessive alcohol consumption, and low physical activity [5]. The abovementioned factors are confirmed by the WHO report from 2011 "Global atlas on cardiovascular disease prevention and control" [6].

Aim of the research

The aim of the study was the evaluation of the frequency of the occurrence of cardiovascular disease risk factors among paramedics of the Świętokrzyskie Centre of Emergency Medical Services in Kielce (ŚCRMiTS).

Material and methods

The studies were carried out in the Research Studies Laboratory of the Institute of Medical Sciences, Faculty of Medicine and Health Sciences, Jan Kochanowski University, Kielce in the framework of the conducted research project, financed with statutory research funds entitled 'Professional suitability of emergency medical professionals in the aspect of the selected areas of psycho-physical health – obesity, the sense of coherence'. The studies were approved by the Bioethical Commission, permit no. 14/2014 and the management of ŚCRMiTS in Kielce. The studies were carried out between October and December 2015.

The subject study group comprised emergency medical professionals of the Świętokrzyskie Centre of Emergency Medical Services in Kielce, who agreed to participate in the research and were hired within the labour contract.

The group selection was based on target screening. The inclusion criteria were as follows:
- possessing qualifications which entitle a person to work in emergency medical teams with the exclusion of doctors (the aim was to focus on paramedics themselves, not the emergency teams, which include doctors and/or nurses),
- active performance of the job,
- performing emergency medical activities in out-of-clinic conditions and the Emergency Communication Centre.

The study included 140 paramedics (2 women and 138 men), aged between 23 and 60 years (median: 43 years, average age: 41.5 years, standard deviation: 10.8 years). The age distribution of the subjects was significantly different from the normal distribution ($p < 0.0001$). The oldest age group (50 years old and above) was overrepresented by nearly 50% more compared to the youngest group (up to 29 years old). Because of the small number of women and the lack of differences in the preliminary analysis, further analyses were conducted for the whole group. The scores of our own studies were compared with the results achieved by other researchers in the general population and in the male population.

A degree in the profession of emergency medical services was declared by 133 people (95% of all participants), and 7 people (5%) had a nursing background. Among the people with a degree in the profession of paramedic, the vast majority graduated from a post-secondary school (96/133; 71.2%); the second largest group included people who graduated from first-cycle studies (33/133; 24.8%), and the third – graduates with a MA diploma (4/133; 4.0%). Forty percent of the subject population were people with a degree in the paramedic profession, who graduated from a 2-year post-secondary school (school leaving exam required), the second most numerous (25%) group were graduates of a 2-year postsecondary school (school leaving exam not required), and the third (17.1%) – graduates of first-cycle studies on the faculty of Medical Emergency. The other education categories were represented with the frequency not exceeding 5%.

The level of education was negatively correlated with age ($p < 0.0001$). The observed frequency of post-secondary education in the aged groups up to 29 years old, 30–39 years old, 40–49 years old, and 50–60 years old equalled, respectively, 34%, 65%, 68%, and 88%. The median age of people with a post-secondary education was 47 years and was 15 years higher compared with the median age of people whose education was at least on the level of a Bachelor Degree.

The studies were conducted by a qualified nurse in the treatment rooms of certain Ambulance Stations and Substations of ŚCRMiTS. The procedure involved a questionnaire interview, blood pressure measurements, taking fasting venous blood samples, and anthropometric measurements.

Evaluation of health

Blood pressure measurements were performed according to the recommendations included in the ESH/ESC Guidelines concerning the procedure in cases of blood hypertension in 2013 – the Working Group of the European Society for Hypertension (ESH) and European Society for Cardiology (ESC) for hypertension management [7], by means of a semi-automatic (one model) *auscultatory* sphygmomanometer, at rest, when seated, and on the right upper arm.

The biochemical tests included a fasting lipidogram as well as a fasting glycaemia. Fasting venous samples were collected when the subject was seated, by means of a vacuum system; the transport (max. 2 h) temperature was the same as the temperature of the diagnostic laboratory of the Provincial Polyclinic Hospital in Kielce. The blood samples were coded, the questionnaire interview was designated with the same number. Blood tests were performed by means of the biochemical AU 680 Beckman Coulter analyser. Beckman Coulter reagents were used in order to mark total HDL cholesterol, triglycerides, and glucose. Low-density lipoprotein cholesterol concentration was calculated by means of the Friedewald formula.

Body height in a standing position with an accuracy of 1 cm and body mass with accuracy of 0.1 kg were performed by means of approved electronic medical scales with a height rod from the RADWAG company, model REF WPT 60/150 OW S/N: 300963/10. On this basis, the body mass index (BMI) indicator was calculated according to the formula: BMI = body mass [kg]/body height^2 [m^2] [kg/m^2]. Waist circumference was measured with an approved Baseline anthropometric tape. The measurement was performed when the subject was in an upright position, between the costal margin and iliac wings. The evaluation of health, diet, and physical activity was performed on the basis of a questionnaire. The questionnaire consisted of four introductory questions (gender, age, level of education), six closed questions (concerning subjects' diagnosed diseases, family history of diseases in first-degree relatives, eating habits – frequency and their basic content, physical activity, and smoking cigarettes), and three elements, which should be completed with the scores of anthropometric measurements and blood pressure.

Statistical analysis

For data compilation, a Microsoft Excel 2010 worksheet was used. The statistical analysis was performed by means of MS Excel, Statistica (StatSoft, Inc. [2014] programs. Statistica [data analysis software system], version 12. www.statsoft.com), and R in 3.1.2 version (R Core Team [2014]. R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria, URL http://www.R-project.org/).

In order to present quantitative data, the minimum, maximum, average, median, and standard deviation were applied. The distributions of qualitative data were described by means of absolute values and percentages. The normality of the distributions was evaluated with the use of the Shapir-Wilk Test. In the case of qualitative data for the assessment of the significance of differences between the groups, the analysis of variance or the Kruskal-Wallis test was applied (when ANOVA assumptions were not met). After rejecting the hypothesis on a lack of differences between the groups, multiple comparison tests were used (the post-hoc Tukey Test or the signed-rank test). The correlation between the qualitative data was analysed by means of the Pearson linear correlation coefficient or the Spearman's rank correlation coefficient. The association between the qualitative data was determined by means of the χ^2 test or the Fisher's Exact Test. All applied statistical tests were two-tailed. Statistical significance was confirmed when the *p*-value was lower than 0.05.

Results

Examination findings presented in the study are part of a more comprehensive project relating to the professional suitability of paramedics.

Anthropometric data

The average BMI was above the norm and equalled 28.2 ±4.1 kg/m^2 (median: 27.7; min. 19.4, max. 43.4), which is evidence of obesity in the study group (Table 1). Only 20.7% of the study participants had a BMI within the norm (29 people), every third subject was obese (BMI = 30 kg/m^2 and higher) (Table 2).

Table 1. Anthropometric data of the study participants

Evaluated parameter	Median	Min.	Max.	Mean	Standard deviation
Height [cm]	176.5	163.0	195.0	177.1	6.7
Body mass [kg]	85.8	57.0	147.0	88.6	14.5
BMI [kg/m^2] Body mass index	27.7	19.4	43.4	28.2	4.1
Waist circumference [cm]	94.0	65.0	125.0	93.8	11.1

Table 2. Body mass index (BMI) in the subject population and age groups

Subject population/ age groups	BMI [kg/m^2] to 24.9		BMI [kg/m^2] 25.0–29.9		BMI [kg/m^2] 30.0–34.9		BMI [kg/m^2] 35 and higher		In total
	n	%	*n*	%	*n*	%	*n*	%	
All subjects	29	20.7	64	45.7	39	27.9	8	5.7	140
Up to 29 years old	7	24.14	17	58.62	5	17.24	0	0.00	29
30–39 years old	10	32.26	8	25.81	10	32.26	3	9.68	31
40–49 years old	3	8.11	22	59.46	10	27.03	2	5.41	37
50–60 years old	9	20.93	17	39.53	14	32.56	3	6.98	43

A BMI within the range of 30 kg/m^2 and higher was observed in all age groups, but least frequently among people up to 29 years old. A BMI within the range of 35 kg/m^2 and higher was noted in 5.7% of all subjects, while such a high BMI was not observed in the youngest age group (Table 2). Body mass index ≥ 40 kg/m^2 – morbid obesity – was noted in one case, and it concerned a 40-year-old man. Due to the requirements of statistical analysis (the necessity to provide sufficiently numerous expected frequencies), further analysis was conducted for three BMI ranges (ranges 30.0–34.9 kg/m^2 and 35 kg/m^2 and higher were combined in one range "30 and higher"). Individual age groups were different in the scope of BMI distributions (p = 0.029). The lowest percentage of obesity was found in the youngest age group – 17.24%, while the highest was among paramedics aged between 30 and 39 years – 41.94%. The lowest percentage of individuals with a normal BMI was noted in the age group 40–49 years – 8.11%. The age group of 30–39 years was characterised by the highest percentage of people with a normal BMI and at the same time – the highest percentage of subjects with obesity, at 41.94%. No significant differences between BMI in the age groups were obtained.

The average waist circumference in the subject group equalled 93.8 ±11.1 cm (median: 94.0, min. 65.0, max. 125 cm). According to the criterion, women at least 80 cm, men at least 94 cm: waist circumference was exceeded from the norm in 51.4% of the subjects (72 people) (1 woman and 71 men). The average waist circumference increased with age, but the differences were not statistically significant in the adopted age ranges. In the analysed groups, up to 29, 30–39, 40–49, and 50–60 years old, it equalled, respectively: 89.6 ±9.4; 93.1 ±12.9; 94.6 ±9.7; 96.5 ±11.4.

The analysis of the self-evaluation of physical fitness showed that the subjects were a physically fit group. Only two persons declared that they were definitely not physically fit. Sport or relaxation exercises lasting at least 20–30 min every day in free time, was done by 15.7% of all subjects (22 people), 57.9% (81 people) exercised 1 – 4 times a week, 19.3% (27 people) a few times a year at most, and 5 subjects (3.6%) did not do any exercise. Most individuals in each age group declared that they did not do any daily physical exercise, but they exercised at least once a week. Doing exercise everyday was declared by people aged 30–39 years, and most often by people between 40–49 years. Doing exercise less frequently than once a week or not at all was declared most often by people aged 50–60 years.

Health of the study subjects: diagnosed diseases

The most frequently diagnosed chronic disease was hypertension, which was mentioned by 12.8% (18/141) of study participants, and the next was diabetes (4/141; 3.1%). The other conditions occurred occasionally, and 80% of study participants (112/140) did not state any diagnosed chronic diseases in the interview.

Health of the study subjects: blood pressure and results of the laboratory tests

In the subject group, the average blood pressure equalled: systolic – 133.8 ±14.9 mm Hg (median: 135;

Table 3. Blood pressure in the subject group

All subjects/ age groups	Systolic blood pressure [mm Hg]					Diastolic blood pressure [mm Hg]				
	Mean	Standard deviation	Min.	Max.	Median	Mean	Standard deviation	Min.	Max.	Median
All subjects	133.8	14.9	92	180	135	83.1	9.2	46	100	80.5
Up to 29 years old	129.3	13.5	92	150	130	79.7	10.6	46	100	80
30–39 years old	129.6	14.2	100	180	130	81.3	7.8	65	100	80
40–49 years old	135.8	13.6	110	180	135	85.5	8.0	70	100	87
50–60 years old	138.0	16.0	100	180	140	84.7	9.3	60	100	87

Table 4. Average differences in age ranges

Evaluated parameter		Up to 29 years old	30–39 years old	40–49 years old	50–60 years old	*P*-value
Systolic blood pressure [mm Hg]	Mean	129.3	129.6	135.8	138.0	0.015*
	Standard deviation	13.5	14.2	13.6	16.0	
Diastolic blood pressure [mm Hg]	Mean	79.7	81.3	85.5	84.7	0.008**
	Standard deviation	10.6	7.8	8.0	9.3	

**There were statistically significant differences between the age groups: 30–39 years old and 50–60 years old (p = 0.029 in the post-hoc test); **in the post-hoc test there were no statistically significant differences between any of the analysed age groups.*

min. 92; max. 180 mm Hg), diastolic – 83.1 ±92 mm Hg (median 80.5; min. 46; max. 100 mm Hg) (Table 3). An increasing tendency was observed in the average values of systolic and diastolic blood pressure with age. The age groups of 30–39 and 50–60 years ($p = 0.029$ in the post-hoc test) were statistically different in the scope of average values of systolic blood pressure (Table 4). In our own studies, reference norms were adopted in accordance with the IDF/2009 guidelines (International Diabetes Federation) for the MetS assessment – systolic ≥ 130 mm Hg or diastolic ≥ 85 mm Hg. The adopted values were exceeded in 75% of all subjects (Table 5).

The concentration of the following five laboratory parameters was measured in the blood serum: glucose, cholesterol, triglycerides, HDL, and LDL. Detailed scores are presented in Table 6.

The average fasting glucose concentration was within the norm and equalled 95 ±33.8 mg/dl in the subject population. The values above the norm (100 mg/dl) were present in 20% (28 people). In post-hoc tests there were statistically significant differences between the following age groups: up to 29 years and 40–49 years ($p = 0.03$), up to 29 years and 50–60 years ($p < 0.0001$), 30–39 years and 50–60 years ($p = 0.004$) (Table 7).

The average total cholesterol concentration of the group equalled 198.6 ±36.6 mg/dl. In 47.1% (66 people) values exceeding the norm were obtained (130–200 mg/dl). Age groups up to 29 years and 50–60 years ($p = 0.02$ in the post-hoc test) (Table 7) were statistically different. The average concentration of the HDL fraction equalled 48.4 ±10.5 mg/dl, and LDL fraction 121 ±33.8 mg/dl. Too high a concentration of HDL fraction (35–65 mg/dl) was present in 7.1% (8 subjects). In 32.9% (46 individuals) LDL fraction concentration exceeded the recommended value (135 mg/dl). In an average concentration of LDL fraction the age groups up to 29 years and 50–60 years ($p = 0.04$ in the post-hoc test) were statistically different (Table 7).

The average triglyceride concentration in the whole group equalled 168.9 ±120.7 mg/dl, and in 45% (63 individuals) was above the norm (40–150 mg/dl).

Only in 22.9% (32 people), no deviation from the norms of the above laboratory parameters was found. In other subjects the number of deviations was between 1 and 5 (Figure 1). The results of the laboratory tests out of the range of the norm most often concerned cholesterol and involved more than 50% of the subjects. Least frequently observed abnormalities were related to HDL cholesterol – in this case 87.1% of the subjects were within the norm.

Smoking cigarettes, alcohol

In the subject group 54.3% of individuals had never been habitual smokers, and 35% of the subjects were active smokers. Among the current active smokers, people who smoked no more than 10 cigarettes a day were dominant, and they comprised 19.3% of the subjects, more than half a packet and a packet was smoked by 11.4%, and 4 (2.9%) people smoked more than 20 cigarettes a day.

Table 5. The spread of cardiovascular risk factors in the subject population

Risk factors	Number (%) of individuals with risk factors					*P*-value
	All subjects	20–29 years old	30–39 years old	40–49 years old	50–60 years old	
Hypertension (HT) or antihypertensive treatment (≥ 130 mm Hg or ≥ 85 mm Hg)	105 (75.0)	20 (69.0)	19 (61.3)	30 (81.1)	36 (83.7)	0.10
High total cholesterol	66 (47.1)	9 (31.0)	11 (35.5)	18 (48.7)	28 (65.1)	0.016
Low HDL cholesterol	8 (5.7)	0 (0.0)	3 (9.7)	2 (5.4)	3 (7.0)	0.43
High LDL cholesterol	46 (32.9)	7 (24.1)	8 (25.8)	10 (27.0)	21 (48.4)	0.06
High triglycerides concentration	63 (45.0)	11 (37.9)	11 (35.5)	19 (51.4)	22 (51.2)	0.39
Diabetes	4 (2.9)	1 (3.5)	0 (0.0)	1 (2.7)	2 (4.7)	0.84
Glucose (above the norm)	28 (20.0)	2 (6.9)	1 (3.2)	6 (16.2)	19 (44.2)	< 0.0001
Overweight/obesity	111 (79.3)	22 (75.9)	21 (67.7)	34 (91.9)	34 (79.1)	0.10
Abdominal obesity	72 (51.4)	11 (37.9)	16 (51.6)	19 (51.4)	26 (60.5)	0.32
Habit of consuming alcohol (> 500 g of pure alcohol per month)	45 (32.1)	7 (24.1)	13 (41.9)	11 (29.7)	14 (32.6)	0.51
Nicotinism (current smokers)	49 (35.0)	11 (37.9)	11 (35.5)	11 (29.7)	16 (37.2)	0.88
Low physical activity (sport or recreation 20–30 min < 1 once a week)	37 (26.4)	6 (20.7)	8 (25.8)	9 (24.3)	14 (32.6)	0.70
Low consumption of fruit and vegetables (< 2 times a day)	106 (75.7)	19 (65.5)	26 (83.9)	32 (86.5)	29 (67.4)	0.08
Consuming fatty food	109 (77.9)	21 (72.4)	26 (83.9)	31 (83.8)	31 (72.1)	0.43
Family history of risk factors	79 (56.4)	13 (44.8)	11 (35.5)	27 (73.0)	28 (65.1)	0.006

Table 6. Scores of laboratory tests (mg/dl) in the subject group

Evaluated parameter	Whole subject population							
	Median	Min.	Max.	Mean	Standard deviation	Below the norm, *n* (%)	Within the norm, *n* (%)	Above the norm, *n* (%)
Glucose (65–100)	87.0	47.0	349.0	95.0	33.8	3 (2.1)	109 (77.9)	28 (20.0)
Cholesterol (130–200)	197.5	76.0	300.0	198.6	36.6	5 (3.6)	69 (49.3)	66 (47.1)
Triglycerides (40–150)	142.0	26.0	948.0	168.9	120.7	1 (0.7)	76 (54.3)	63 (45.0)
HDL (35–65)	46.5	30.0	83.0	48.4	10.5	8 (5.7)	122 (87.1)	10 (7.1)
LDL (0–135)	120.5	11.0	222.0	121.1	33.8	0	94 (67.1)	46 (32.9)

The questionnaire on drinking alcohol revealed 14.3% of teetotallers. The most commonly consumed alcoholic beverage was beer, indicated by almost 80% of subjects drinking alcohol (94/120, 78.3%). The second most often shown was vodka (65/120, 54.2%), while wine was mentioned least frequently (41/120, 34.2%). In the group with individuals drinking wine, red wine was consumed most often (34/41, 83%). Every fourth person among those drinking alcohol indicated that they consumed beer, wine, and vodka.

Among subjects consuming alcohol, the most dominant were those who consumed up to 500 g of pure alcohol per month (75/120, 62.5%), while three times less frequent were the subjects who consumed

Table 7. Differences between lipid profiles in the subject population

Age groups	Total cholesterol		LDL		HDL		Triglycerides		Glucose	
	x ± SD	*P*-value	*x* ± SD	P-value	*x* ± SD	*P*-value	*x* ± SD	*P*-value	*x* ± SD	*P*-value
To 29	182.6 ±43.9	0.015*	106.8 ±42.7	0.03**	49.3 ±7.7	0.53	138.7 ±90.5	0.10	89.8 ±50.5	< 0.0001***
30–39	191.5 ±26.5		117.6 ±25.9		46.0 ±9.4		145.1 ±66.4		86.0 ±20.1	
40–49	204.8 ±32.5		125.2 ±28.0		48.6 ±10.7		188.9 ±136.2		91.9 ±14.9	
50–60	209.3 ±37.1		129.6 ±34.2		49.3 ±12.2		189.1 ±148.0		107.7 ±36.7	

**There were statistically significant differences between the age groups up to 29 years old and 50–60 years old (p = 0.02 in the post-hoc test); **there were statistically significant differences between the age groups up to 29 years old and 50–60 years old (p = 0.04 in the post-hoc test), ***in the post-hoc tests there were statistically significant differences between the following age groups: up to 29 years old and 40–49 years old (p = 0.03), up to 29 years old and 50–60 years old (p < 0.0001), 30–39 years old and 50–60 years old (p = 0.004).*

more than 1000 g of pure alcohol per month. Non-smoking teetotallers comprised 10% of the subject group, whilst the percentage of those smoking cigarettes and drinking alcohol equalled 30.7%.

Eating habits

The participants indicated most often that they have three or four meals a day (respectively, 46.4% and 31.4% of the subjects). Occasionally there were individuals declaring they consume one or as many as seven meals (1.4% each). The majority of the subjects – 61.4%, declared they ate their fill and followed a diverse diet compliant with the recommendations of dieticians – 55%. Almost 80% of the subjects admitted consuming fatty dishes. Plant fats were consumed by 6.4% of the group, only animal fats – 4.3%, mixed – 88.6%, and one person declared none of these. Potatoes and flour-based dishes prevailed in a diet of more than 60% of the subjects. Fruit and vegetables were most often consumed by the subjects once a day and it concerned 70% of the paramedics. The frequency of consumption twice a day equalled only 15%, and three times – 9.3%.

Family history

The level of incidence of cardiovascular diseases or cerebral stroke equalled 27.1% in fathers, 12.9% in mothers, and in both parents 5%. Hypertension occurred most frequently in mothers – 18.6%, in fathers 8.6%, in both parents 3.6%. Type 2 diabetes was also present in mothers more often – 6.4%, in fathers – 2.1%, and it was not noted in both parents.

Frequencies and co-occurrence of the studied risk factors

A detailed comparison of the frequency of occurrence of the discussed risk factors is presented in Table 5. Among the clinical risk factors, overweight and

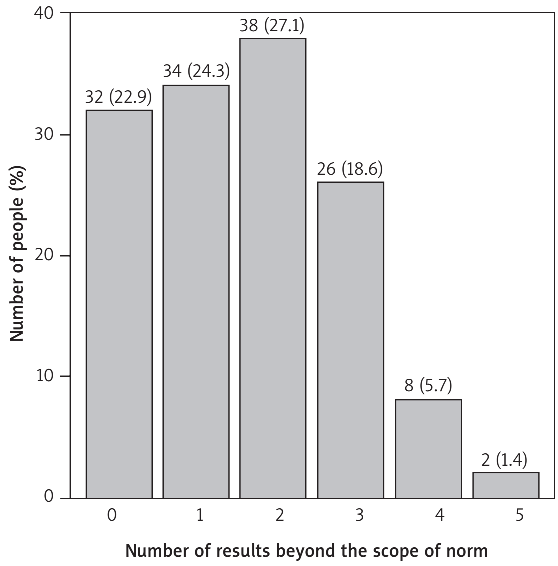

Figure 1. The subject group according to the number of laboratory test scores outside the reference range

obesity were the most frequent – 79.3% of the subjects, and exceeded values of blood pressure – 75%. A poor diet prevailed among other adjustable risk factors. Consumption of fatty dishes – 77.9% and a low consumption of fruit and vegetables – 75.7%. Fifteen risk factors were analysed altogether. There was not a single person without at least one risk factor, and none of the subjects were diagnosed with all 15 risk factors. The average number of risk factors per person was 6.6 (standard deviation: 2.3), and median 7. A statistically significant correlation was found between the age and the number of risk factors (Spearman's rank correlation coefficient: 0.41, $p < 0.0001$). Moreover, statistically significant differences were revealed between the distributions of the number of risk factors in the four considered age groups ($p = 0.009$) (Table 8). In each age group, people with the number

Table 8. The number of risk factors depending on the age group

Age groups	Min.	Max.	Median	Mean	Standard deviation	*P*-value
Up to 29 years old	2	9	5	5.5	2.1	0.0009*
30–39 years old	1	11	6	6	2.1	
40–49 years old	4	11	7	7	1.8	
50–60 years old	2	12	8	7.5	2.5	
All subjects	1	12	7	6.6	2.3	

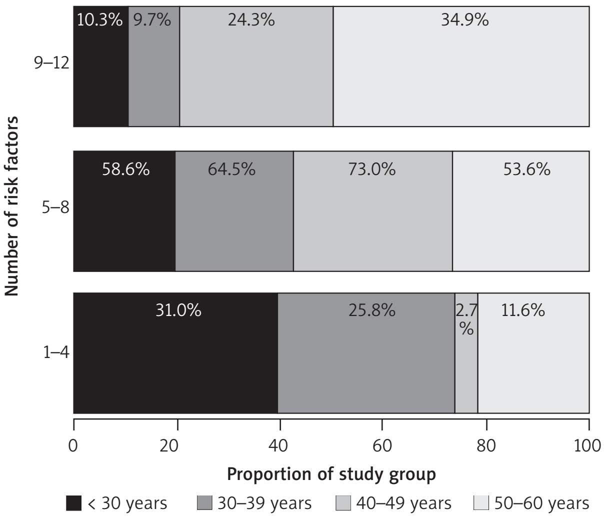

Figure 2. Co-occurrence of risk factors depending on the age group

of risk factors from five to eight were dominant, but in the younger age groups, the number of individuals with the number of risk factors above eight oscillated around 10%, while in the older age groups it was two or even three times higher. A small number of the factors (up to four) was present more often in younger than in older groups (Figure 2).

Discussion

According to the Framingham Heart Study, the occurrence of at least one risk factor significantly increases the probability of coronary artery disease [8]. Among the subject paramedics, the co-occurrence of several risk factors was observed and their number statistically significantly increased with age. In the group 40–49 years old, in as many as 73% of the subjects 5–8 risk factors were noted, and in the 50–60-year-olds 9–12 factors were observed in almost 35% of the subjects, which constitutes a significant risk for the subject group of paramedics.

The authors have not encountered any other study similar to theirs done on a sample of paramedics.

The most frequently found deviation from the reference values was abnormal body weight (BMI ≥ 25 kg/m²), and it concerned 79.3% of the subjects, and abdominal obesity (≥ 94 cm (M), and ≥ 80 cm (F)) was present in 51.4% of the subjects. In the PONS study (Polish-Norwegian Study), in the group of inhabitants of the Świętokrzyskie Province aged 45–54 years, a BMI ≥ 25 kg/m² was found in 84% of men [9]. Among paramedics from this region the lowest percentage with a normal BMI was related to the 40–49-year-olds – 8.11%, but the highest percentage of individuals with obesity (BMI ≥ 30 kg/m²) was revealed among the 30–39-year-olds – 41.94%. In the study among 126 Polish police officers aged 37.8 ±7.3 years, average BMI equalled 27.6 ±4.1 [10], and a comparable level was achieved in the subject group of paramedics 28.2 ±4.1 (average age: 41.5 years). The scores of the Pol-MONICA studies, involving people aged between 35–64 years, showed that in Poland overweight occurs in 45.2% of men, and obesity in 22.4% [11]. In our own studies overweight was found in 45.7%, and obesity in 33.6% (including 5.7% with BMI ≥ 35 kg/m²). A BMI ≥ 30 kg/m²was observed in all age groups, least often among individuals up to 29 years of age. The reasons for obesity in the subject group could involve poor eating habits and lipid disorders. In the subject group, 61.4% of paramedics ate their fill, and 77.9% of the subjects consumed fatty dishes. Animal and plant oils prevailed in the diet – 88.6% of the subjects. Potatoes and flour-based dishes were dominant in 40.7% and a low consumption of fruit and vegetables – 75.7% of the subjects.

An increased concentration of cholesterol in the blood increases the risk of cardiovascular disease and cerebral stroke. According to the data of the WHO, the occurrence of an increased total cholesterol concentration in blood in 2008 in Europe equalled 54% for women and men [12]. NATPOL 2011 studies (age group 18–79 years of age) evaluate the occurrence of hypercholesterolaemia (≥ 190 mg/dl) in Poland at the level of 61.1%, and average total cholesterol concentration in 2011. According to these studies, in men it equalled 197.9 mg/dl [13]. POLSCREEN studies indicate an increased total cholesterol concentration in 65.1% of men aged between 35–44 years, and in 69.7% of men 45–54 years of age [14]. In the subject group of paramedics, a significant percentage of paramedics obtained values exceeding the norm, but lower than the values of the above cited studies (30–39 years old –

35.5%; 40–49 years old – 48.7%). The total cholesterol above the norm was achieved in 47.1% of the subjects, and the average concentration 198.6 mg/dl. Taking into consideration that the adopted values above the norm in our own studies equalled ≥ 200 mg/dl, the obtained scores constitute a considerable risk factor. Values higher than in the subject group of paramedics were obtained in the studies involving Polish police officers, where 69% of the subjects exceeded 200 mg/dl total cholesterol concentration. The LDL fraction concentration above the norm (135 mg/dl) of police officers was 55% [10], and for paramedics 32.9%, with the same adopted norm. Triglyceride concentration in the population of Polish police officers exceeded in 28% (200 mg/dl). The NATPOL 2011 studies revealed that the incidence of hypertriglyceridaemia (≥ 150 mg/dl) for men equalled 27.7% [13]. In our own studies the norms were exceeded by as many as 45% of the subjects (≥ 150 mg/dl).

Abnormal values of glycaemia above ≥ 100 mg/dl were found in 20.0% of the subject group of paramedics. In the studies conducted among the residents of Lower Silesia, (the average age for men 67.2 years) hyperglycaemia (101–125 mg/dl) was revealed in 36.6% of men (751 aged 40 years, and 501 aged 50 years) [15].

Summarising the scores of biochemical studies (Figure 1), only in 22.9% (32 people) was no deviation from the recommended values found. In the rest of the subjects the number of deviations was between 1 and 5. Two parameters co-occurred most frequently (27.1%) and five the least often (1.4%). The results of the laboratory tests that were not within the norm most often concerned cholesterol, and were related to more than 50% of the subjects. The least frequently observed abnormalities concerned HDL cholesterol – in this case 87.1% of the subjects were within the norm. It should also be highlighted that all analysed parameters of lipidogram increased unfavourably with age. There were statistically significant differences in the scope of total cholesterol, LDL fraction, and glucose between young paramedics up to 29 years of age vs. the group of the oldest colleagues aged 50–60 years.

Only 2.9% of all subjects confirmed diagnosed diabetes (3 people – type 2 diabetes and 1 person (0.7%) type 1 diabetes). A similar low level was achieved in the group of Polish police officers, and it concerned 1.6% people with type 2 diabetes [10]. However, taking into account the obtained BMI and waist circumference values, the subject group is significantly predisposed to the risk of developing diabetes and type 2 diabetes. This association is confirmed by scientific publications [16, 17]. The results of the NATPOL 2011 studies emphasise a worrying phenomenon of the last decade – the increase of the percentage of obese individuals, especially in men (by 5%) and the increase of nearly 20% of the number of people suffering from diabetes and at risk of diabetes [18].

In accordance with scientific reports, one of the main risk factors for cardiovascular diseases is hypertension [4, 5, 12]. The results of the NATPOL 2011 studies show that hypertension comprises a 32% incidence in the Polish population and 35% among men [19]. According to the NATPOL PLUS studies [11], 29% of adult men suffer from hypertension. The WOBASZ study [20] revealed that hypertension was more frequent. It was observed in 42.1% of men. In the age groups 35–44 and 45–54 years among participants of the POLSCREEN study, hypertension was present in 54.5% and in 68.9% of men, respectively [21]. In our own study in the groups 30–39 and 40–49 years, respectively, 61.3% and 81.1% was found. Among the inhabitants of the Świętokrzyskie Province (45–64 years old) hypertension was shown in 70.6% of men. The scores of our own studies are similar to the values achieved in the POLSCREEN and PONS studies.

Exceeded extreme values of blood pressure (≥ 130 mm Hg or ≥ 85 mm Hg or administered antihypertensive treatment) were one of the main risk factors present in the subject group of paramedics and concerned as many as 75% of the subject group.

A higher percentage in our own studies results also from the adopted lower critical values than in the cited studies, where ≥ 140 mm Hg or ≥ 90 mm Hg was adopted.

In the literature on the subject of the study, special attention is paid to the importance of physical activity for health as a factor maintaining health and preventing the occurrence of lifestyle diseases. It has a modifying effect on the cardiovascular disease risk factors and arteriosclerotic cardiovascular diseases [22, 23]. Paramedics doing sport or relaxing exercises in their free time for at least 20–30 min every day (15.7% of the subjects) and doing exercise from one to four times a week (57.9%), which is 73.6% of all subjects, were considered physically active by the authors of the study. In comparison with the results of the CBOS study from 2012 ('Poles about their health and health-promoting behaviour and activities 2012'), in which it was found that 61% of the subjects did not do any physical exercise, the obtained level of active individuals was satisfactory [24]. Physical effort, especially aerobic, has a positive effect on the most important cardiovascular disease risk factors. It concerns, among others, hypertension, lipid disorders, carbohydrate metabolism, and obesity [25–27]. In the subject group the listed risk factors, especially obesity, comprised a high risk of heart disease, casting doubt on the self-declared frequency of physical activity. Taking into account the level of risk of cardiovascular disease among paramedics, it is advisable to conduct the tests of physical activity by means of a standardised test, and in the case of poor scores introduce recommendations increasing physical activity and pay attention to the subjects' diet.

Nicotine addiction and alcoholism belong to unhealthy behaviours. The INTERHEART studies indicate double the risk of a myocardial infarction in smokers and former smokers, in comparison with people who never smoked (the region of Western and Eastern Europe) [28]. Referring the scores of our own studies to the above, an increased risk concerns 35% of current smokers and 10.7% of former smokers. The spread of smoking tobacco in the studies of Polish police officers had a similar percentage – 33% [10]. The NATPOL 2011 studies revealed that nicotine addiction concerns 27% of the Polish population [19], and the PONS studies – 21.1% of men aged 45–54 years [29]. The scores of the WOBASZ studies evaluated the frequency of occurrence of nicotine addiction in Poland at 42% among men [30].

85.7% of the subjects admitted drinking alcohol. Beer was consumed most often and it concerned almost 80% of the subjects, followed by vodka – 54.2%. Strong alcohol was consumed by 59% of police officers at least once a week [10]. Wine consumption, in an amount beneficial to health, according to scientific publications, was the lowest – 34.2%. The only positive aspect was the more frequent consumption of red wine compared with white wine. Every fourth among those who consumed alcohol, drank beer, wine, and vodka, and people who consumed up to 500 g of pure alcohol per month were dominant, and 17.1% of the subjects consumed more than 1000 g of pure alcohol.

A family history of heart disease, stroke, or hypertension concerned 56.4% of the subjects. Therefore, we should think that this is a group genetically predisposed to the development of cardiovascular diseases and with a significant risk of the other discussed risk factors. This fact may be surprising due to the awareness and medical education of the subject group and professional experience related to cardiovascular diseases and their consequences.

Study limitations

An obvious limitation of this study is the lack of correlations of the obtained parameters depending on gender. The studied group of paramedics working in emergency medical teams is dominated by men.

Conclusions

Cardiovascular disease risk factors are a significant risk for the subject group of paramedics and they generate a disadvantageous picture of a health profile. A vast majority of the subjects have abnormal body mass, exceeded values of blood pressure, and have bad lipidogram parameters. The spread of risk factors and the degree of exceeding reference norms increases with age. It would be justified to prepare preventive measures aimed mainly at the reduction of body weight and the decrease of other modifiable risk factors for cardiovascular diseases.

Conflict of interest

The authors declare no conflict of interest.

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