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WORK-RELATED RISK FACTORS OF MYOCARDIAL INFARCTION

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Abstract
Objectives: The aim of the study was to find out which occupational factors account for the risk of the myocardial infarction. **Material and Methods:** A questionnaire survey was performed during the period of one calendar year in all patients (1053 subjects, 692 men and 361 women) hospitalized at the Medical University of Łódź because of the first myocardial infarction. The questionnaire was prepared especially for the purpose of this study and consisted of two parts. The first part comprised: demographic data, health status at admittance, traditional risk factors for the ischaemic heart disease and was filled-in by physicians. Part II was done by occupational hygiene specialists and referred to education, job title and characteristics, employment data, self assessment of work-related and general stress, fatigue, socio-economic status, physical activity, alcohol intake, tobacco smoking, dietary habits. **Results:** Mean age in the study group was 59.9±10.4 years (26–85 years), 58.7±10.0 (26–84 years) for men and 62.3±10.7 (32–85 years) for women, employment duration was 32.9±8.8 (4–65 years), for men 34.0±8.6 (5–65 years), for women 30.7±8.8 (4–60 years. Most of myocardial infarction cases both in the group of men and women were noted in the age interval 56–60 years, 22.3% vs. 17.4%, respectively. The majority of examined men were farmers, low and middle management and self-employed workers. Among women prevailed clerks, seamstresses and farmers. The most frequent occupational risk factors were: work-related stress, experienced by 54.2% of the examined subjects, occupational noise (45,5%), dust (41,7%) and various chemical factors (33%). A majority of the study group (76.5% women and 54.4% men) linked the cardiac infarction with stress, while 39.1% men vs. 16.5% women correlated it with physical effort. **Conclusion:** Our studies indicate that, among a wide spectrum of occupational factors, stress, noise and fine particulate dust are major contributors to the increased risk of myocardial infarction.

Key words:
Questionnaire survey, Noise, Dust, Chemical factors, Stress, Cardiovascular diseases

INTRODUCTION

Although the incidence of cardiovascular diseases (CVD) has been decreasing in most countries, including Poland, the predictions still indicate that CVD will constitute the major burden of disease worldwide in the foreseeable future.

The well-recognised conventional risk factors such as: high cholesterol level, diabetes, hypertension, obesity, physical inactivity, unhealthy diet, genetic predisposition and active or passive tobacco smoking are responsible for only about 50% cases of cardiovascular diseases. There are reports on two hundred other factors, including chemical and physical hazards, factors dependent on the

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type of job and work organization as well as psychological and social ones that may be related to the cardiovascular diseases.

The occupational risk factors of CVD comprise chemical and physical hazards and factors dependent on the type of job and working conditions. The chemical factors related to CVD include carbon disulfide, nitroglycol and nitroglycerin, carbon monoxide, lead, dioxin, cobalt, solvents, organophosphates, arsenic, antimony [1–4]. Among the physical risk factors discussed in the literature are electromagnetic fields, noise, heat, and cold. In the group of physical hazards, exposure to electromagnetic fields (EMF) gains significance owing to its ubiquity both in the work and communal environments. The most common sources of that exposure include extremely low frequency EMF, such as 50 or 60 Hz frequency fields and the radio- and microwave frequency EMF (microwave ovens, microwave alarm systems and mobile phones).

When evaluating the impact of work environment on the workers' health, one should take into account the factors related to job characteristics. Relevant literature reports on the significance of psychosocial factors such as work-related stress, effort-reward imbalance, shift work, sedentary work, and other work-related stressors [5].

The studies performed on large populations have demonstrated that adverse psychosocial factors found at workplace, particularly high work demands that the worker cannot cope with, and the low level of control over work tasks are associated with a higher incidence of ischaemic heart disease. The latter was found to be several times as high among workers with the work characteristics quoted above than in workers who performed their duties under optimal psychosocial conditions [6–10].

In Poland, for many years already, cardiovascular diseases have been responsible for about 50% of total fatal cases and continue as the major health hazard among the general population of Poland, while the mortality indices have been twice as high as in other EU countries [11]. It is also of great concern that every fifth death is recorded among the people at the age of occupational activity (younger than 65). Łódź holds the sad record of the highest-in-Poland total mortality (13.7 cases per 100 000 citizens), while circulatory diseases are responsible for the highest percentage (43.5%) of those deaths [12].

The aim of the study was to determine factors, including the environmental and occupational ones, that could affect the risk of first myocardial infarction (MI) in population of Łódź, the city with the highest rate of cardiac death in Poland (6 per 100 000 inhabitants). This paper reports the first results obtained in examined group with reference to the general population of Poland and the population of Łódź.

This type studies have not been yet performed in Poland. Data bases enabling such analyses are not accessible either.

MATERIALS AND METHODS

Study Protocol

Questionnaire survey was conducted among patients hospitalized due to first myocardial infarction at the Cardiac Clinics, Medical University of Łódź during the period of 12 months. All patients hospitalized for their first myocardial infarction during the study period were invited to participate in the study. The original group comprised 1053 subjects, including 361 (34.3%) women and 692 (65.7%) men. As much as 816 people (77.4% of all hospitalized people), among them 550 men (67.4% of the hospitalized men) and 266 (32.6%) women responded to the questionnaire. One hundred six people (10%), 60 men (56.6%) and 46 women (43.4%) refused to participate. Fifty seven people (5.4%), 37 men (64.9%) and 20 women (54.1%) were transferred to other wards, 56 people (5.3%), 32 men (57.1%) and 24 women (42.9%) were unable to participate due to poor condition of health. Eighteen patients (1.7%), 5 women and 13 men died within first 24 h of hospitalization. All patients gave their formal consent prior to inclusion to study. The protocol was approved by the Regional Biomedical Ethics Committee.

The questionnaire was prepared specifically for the purpose of this study and consisted of two parts: part I was filled in by cardiologists responsible for the treatment of the patients in the hospital ward and comprised:

demographic data, patient's clinical condition at admittance (arterial pressure, heart rate, Killip cardiac insufficiency index, onset of the complaint before admittance to hospital — single episode, recurrent pain, duration of the most severe pain), risk factors for the ischaemic heart disease such as e.g. concentrations of cholesterol and glucose, hypertension, diabetes etc., enzyme levels (troponin I, CK-MB, AlAT, AspPAT), fibrinogen concentration, results of ECG, etc.

Part II comprised 59 questions classified into thematic groups, which included: demographic data, education, financial status, physical activity, alcohol consumption, tobacco smoking, dietary habits, health condition based on self-assessment, symptoms preceding the myocardial infarction, family history of metabolic and cardiovascular diseases, and employment data. Most of questions were related to job characteristics, and included information about occupational factors:

— chemical factors: lead, cadmium, arsenic, nitroglycerin, carbon disulfide, carbon monoxide, organic solvents, aromatic hydrocarbons and other, fine particulate dusts (origin of dust);
— physical factors: noise, hot or cold microclimate, considerable temperature variation (due to shifting from one location to another), draughts, moisture, electromagnetic fields (from 50 Hz high voltages or currents in power lines and associated equipment), high-frequency fields (dielectric heaters, welders, induction ovens, etc.), general or local vibration;
— psychosocial factors: excessive workload, improper work organisation, monotony, no chances for advance, risk of conflict situations, risk of accident, responsibility for human safety or life, tight work schedule, difficult decisions, lack of success, financial liability.

Respondents were asked also about their self evaluation of work-related and general stress.

RESULTS

Mean age of study group was 59.9±10.4 years (26–85 years), men 58.7±10.0 years (26–84 years), women 62.3±10.7 years (32–85 years).

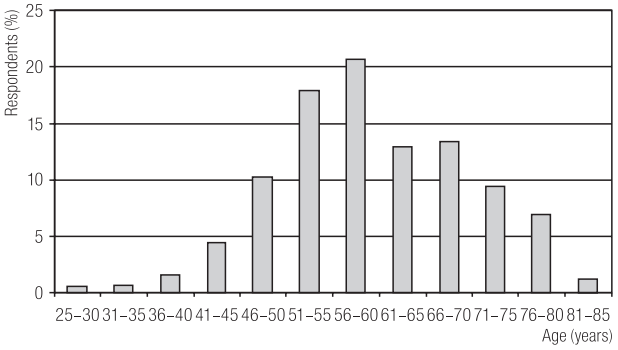


Fig. 1. Age distribution in the examined population.

Myocardial infarction cases, both in the group of men and women, were most frequent in the age interval of 56–60 years (Fig. 1).

Education level in examined group

The greatest number, 259 (31.7%) of people in the study group had secondary level education, while 244 (29.9%) had basic vocational, 216 (26.5%) had primary (elementary) and only 87 (11%) of the people had university education (Fig. 2).

The distribution of educational level in the study group was different than in the general populations of Łódź and Poland; the secondary education dominated (32%) and it was similar to the corresponding number for the general population of Poland (34.5%) but lower than that for the general population of Łódź. Only 11% of the study group had university level education, while corresponding numbers for Łódź and Poland were 17% and 16%, respectively. About 30% of the subjects had basic vocational education, which was similar as in Poland (27%) but more

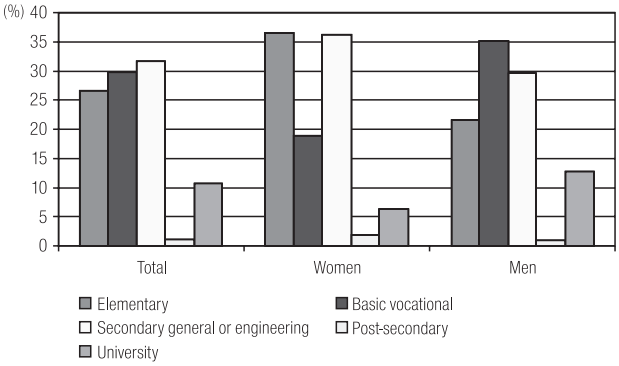


Fig. 2. Distribution of educational level among patients examined.

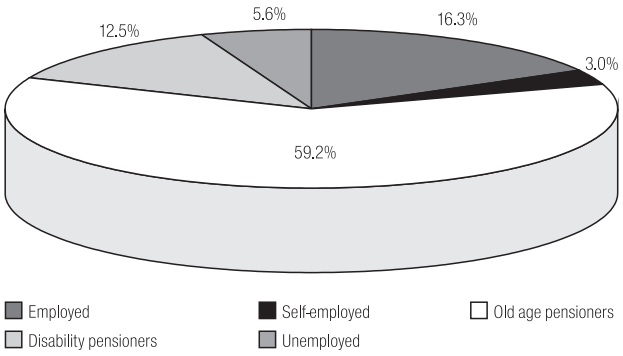


Fig. 3. Employment status in the group examined.

than in Łódź (23%). As much as 27% of the study group had elementary education, and this was more than in the Polish (15%) and Łódź (17%) populations [13].

Employment status

In the study group 293 patients (36%) were employed at the time of the study (full- or part-time or self-employed), among them 51 women (6.3%), mean age: 51.2±6.9 (33–73 years), and 242 men (29.7%), mean age: 52.5±7.1 (26–77 years). As much as 346 of the patients (42.4%) were old age pensioners, 157 women (59.2%), mean age: 67.3±8.0 (49–85 years), and 189 men (34.3%), mean age: 68.4±6.7 (37–84 years). One hundred fourteen patients (14%) were disability pensioners, including 33 women (12.5%), mean age: 60.2±10.3 (39–79 years), 81 men (14.7%) mean age: 58.2±6.2 (43–80 years). Fifty one patients (6.3%) were unemployed, including 15 women (1.8%), mean age: 49.2±7.9 (32–62 years), and 36 men (4.4%), mean age: 52.7±6.7 (40–69 years). For details see Figure 3.

The percentage of unemployed in the study group was lower than in the general populations of Łódź (8.7%) and of Poland (10%) [13].

Period of employment

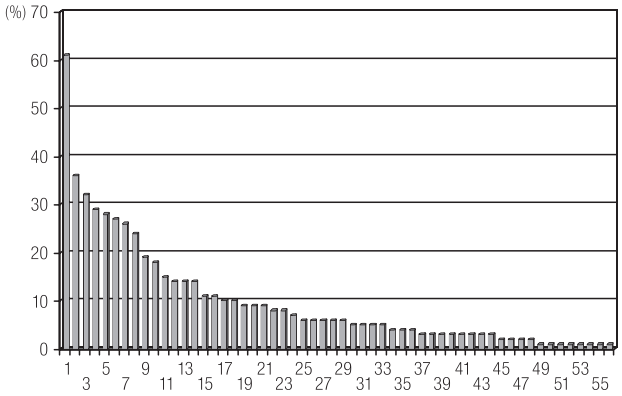
Overall employment time was 32.9±8.8 (4–65 years) — for women: 30.7±8.8 (4–60 years), for men: 34.0±8.6 (5–65 years). Duration of employment longer than 60 years for women and 65 for men was recorded only for the farmers. For the remaining employees, the maximum employment time was 56 years in the group of men (supervisor) and 53 years in the group of women (economist, head of department). For the people who were occupationally active at the time of the study, the time of employment was 31.2±8.2 (5–55 years) — for men: 31.9±8.0 (5–55 years) and for women: 28.0±8.4 (10–53 years).

Occupation of the subjects

Most frequent occupations among the male subjects were farmer, low- and medium-level manager, self-employed. The dominant occupations among the females included clerk, seamstress, farmer. For details, see Figures 4 and 5.

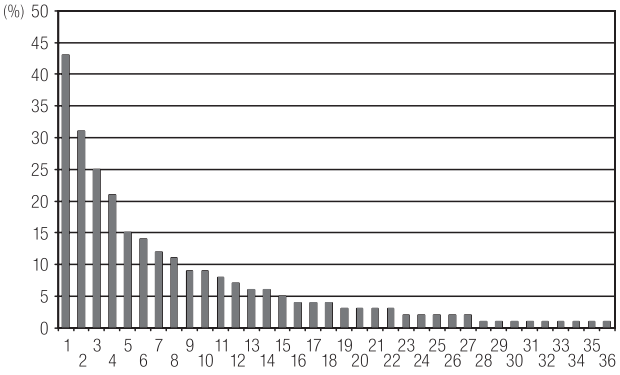
Financial situation

Over half of the respondents (54,2%) assessed their financial situation as average (52.8% women and 54.8% men).



1 — Farmer, 2 — Manager (low- and medium-level), 3 — Electrician, 4 — Self-employed (small and medium-size company), 5 — City driver/deliverer, 6 — Metalworker, turner, 7 — Office worker, 8 — Outdoor construction worker, 9 — Mechanic, 10 — Doorman, 11 — Fitter, operator, 12 — Storekeeper, 13 — Manager/Director, 14 — Hot microclimate worker, 15 — Taxi driver, 16 — Indoor construction worker, 17 — Truck driver, 18 — Auto mechanic, 19 — Schoolteacher, 20 — Welder, 21 — Tractor driver, 22 – Plumber, 23 — Physician, 24 — Carpenter, 25 — Knitter, 26 – Butcher, 27 — Self-employed, 28 — Police, ticket inspector, 29 — Sales agent, messenger, 30 — Weaver, 31 — Janitor, 32 — Baker, 33 — Bus driver, 34 — Blue collar worker, 35 — Shoemaker, 36 — Customer services worker, 37 — Shop salesman, 38 — Light manual jobs, 39 — Printing shop worker, 40 — Tram driver, 41 — Teacher (physical education), 42 — Painter/varnish sprayer, 43 — Woodcutter, 44 — Telecommunication, technician, 45 — Sewer, 46 — Engineer/Train driver, 47 — Metal plater, 48 — Priest, 49 — Ancillary department worker, 50 — Cook, 51 — Assembly line worker, 52 — Unemployed, 53 — Supermarket salesman, 54 — Barman, 55 — Postman, 56 — Waiter.

Fig. 4. Proportions of representatives of individual occupations in males examined.



1 — Office worker, 2 — Seamstress, 3 — Farmer, 4 — Cleaner, 5 — Saleswoman (shop), 6 — Weaver, 7 — Light manual jobs, 8 — Cook, 9 — Knitter, 10 — Storekeeper, 11 — Schoolteacher, 12 — Self-employed (small and medium-size company), 13 — Nursery school teacher, baby sitter, 14 — Nurse, 15 — Manager (low- and medium-level), 16 — Assembly line worker, 17 — Laboratory technician, 18 — Blue collar worker, 19 — Dentist, 20 — Doorwoman, 21 — Printer, 22 — Shoemaker, 23 — Outdoor construction worker, 24 — Electrician, 25 — Pastry cook, 26 — Butcher, 27 — Customer services worker, 28 — Unemployed , 29 — Manager-Director, 30 — Supermarket saleswoman, 31 — Steamer operator, 32 — Barwoman, 33 — Fitter (operator), 34 — Janitor, 35 — Hairdresser, 36 — Presser.

Fig. 5. Proportions of representatives of individual occupations in study group females.

The situation was assessed as rather good by 23.3% of the study subjects (25.6% men and 18.1% women). More women (18.1%) than men (12.7%) graded their financial situation as rather poor. Least numerous (3.4%; 4.9% women and 2.7% men) were those declaring that their financial situation was very good. The situation of 4.8% subjects (6% women and 4.2 men) was very poor (Fig. 6).

In the study group, like in Poland and Łódź, the majority of the responding subjects assessed their financial

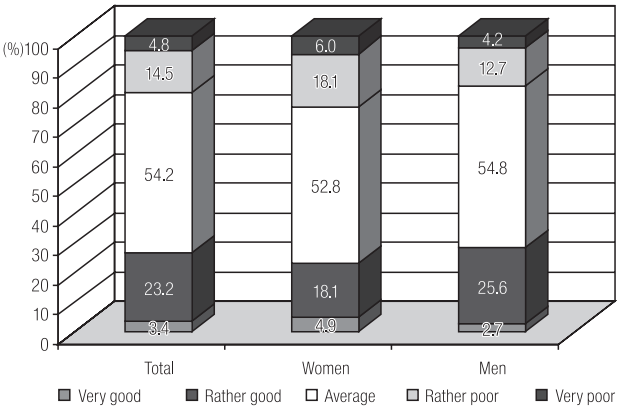


Fig. 6. Assessment of financial situation by study group.

situation as average (54.2% vs. 52.5%, 53.3%); however, almost twice as many (compared to the general Polish and Łódź population) assessed the situation as rather good (23.2% vs. 11.4%, 12.7%), and thrice as many as very good (3.4% vs. 1.1%, 1.0%) [13].

Health status

The majority of the study subjects assessed their pre-infarction health status as good (n = 266 persons, 32.6%) and fairly good (n = 246, 30.1%), while 115 people (14.1%) assessed it as very good. However, 154 people (18.9%) assessed their health status as rather poor, while only 35 subjects (4.3%) as poor. In the study group, the diseases diagnosed in the past included in the first place arterial hypertension (43.2% of people) followed by ischaemic heart disease (21.1% people), diabetes (15.1%), lower limb varices (13.4%). All those diseases were more frequent in women. Table 1 shows the level of the conventional risk factors.

Physical and chemical factors

Workplace noise was reported by over 46% of the subjects, including 33% of the examined patients exposed at their workplaces to noise levels requiring louder speaking. As much as 42% of the subjects were exposed to dust, the greatest number of the dust-exposed subjects were exposed to cotton dust (textile industry) and cereal dust (farmers). Exposure to chemical agents was recorded among 33% of the subjects, and the most frequent types of the chemicals included organic solvents, lead, and pesticides. Almost half (47%) of the occupationally active subjects were blue collar workers. Twenty eight per cent of the people were working in shift work system, including 18% working at night shift (Table 2).

Psychological factors

Over 54% of the subjects assessed work-related stress as moderate or high. This was particularly evident in the male subjects; as much as 58.4% of them reported stress to be present at their workplace (Fig. 7).

Daily life stress was reported by 40% of the men and as much as 62% of the women (Fig. 8).

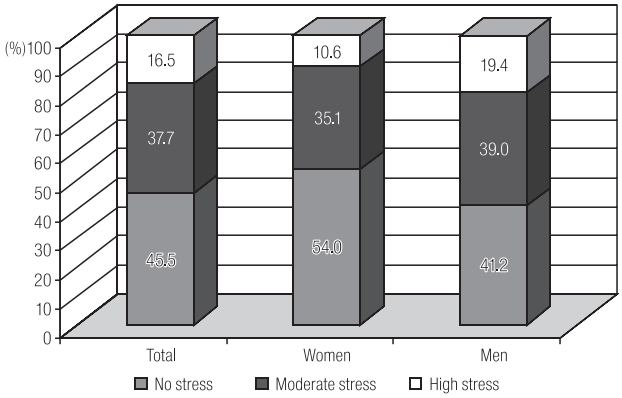


Fig. 7. Assessment of stress at workplace in total group, in women and men.

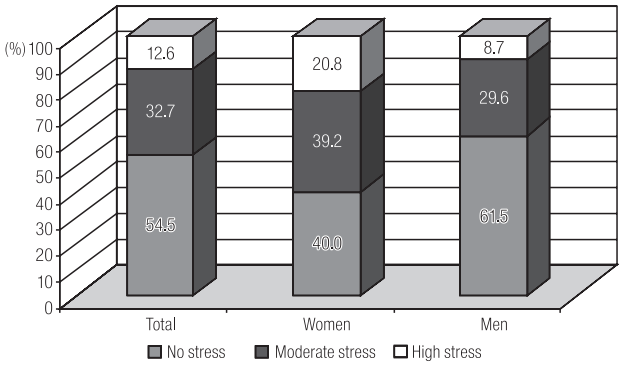


Fig. 8. Assessment of life stress in total group, in women and men.

The myocardial infarction was declared to be associated with exceptional circumstances at home or at work by 40.4% people (43% women and 39.2% men). A majority of the study group (62.1%, including 76.5% women and 54.4% men) associated this event with stress.

DISCUSSION

The examined population is characterized by a high level of the conventional CVD risk factors [table 1]. The role of those factors (elevated cholesterol level, diabetes, arterial hypertension, obesity, physical inactivity, diet, family history) in the development of CVD has been extensively described in the relevant literature [14]. In the examined population, overweight and obesity was most frequent conventional risk factor (71% of the subjects had overweight or obesity). This is higher than in the general Polish population, where the corresponding value is 52% (58% men and 49% women). In the USA, the problem is yet more severe than in Poland, because as much as 65.7% of the adult population has BMI higher than normal value (over 25); abdominal obesity has been found there in 38.3% men and 59.9% women [15]. Elevated cholesterol levels were recorded in 50% of examined people. In the Polish population, disturbed lipid metabolism also constitutes a major health problem affecting over 50% of adult Polish citizens.

In the examined population the percentage of smokers was higher than among general population of Poland (respectively 48.7% vs. 40%). Authors of numerous epidemiological studies conclude that tobacco smoking is associated with ca. 1.5 to 2.5 increase in the risk of developing CVD [16–19]. In Europe, 18% of deaths from CVD are attributable to tobacco smoking. The smoking results in: lower HDL cholesterol concentration, higher LDL cholesterol and triglyceride concentration, increased aggregation of blood platelets and elevated fibrinogen concentration. Tobacco smoking has a pressing effect on the vessels, resulting in the development of arterial hypertension. Results of meta-analyses performed by several independent research centres have revealed a connection between passive smoking and CVD [20–25].

Low level of physical activity was the next problem in the population examined in our study; 46% of the participants (42% men and 54% women) did not practise any kind of physical activity during leisure time.

Recently, low level of physical activity has been considered to be a factor contributing to shorter life — the annual number of premature deaths caused by sedentary lifestyle in USA has been estimated to be as high as 250 000 per year. Physical inactivity is associated with higher risk of developing obesity, diabetes, arterial hypertension, elevated serum LDL cholesterol, eventually leading to the development of CVD. The impact of physical activity on the CVD risk was confirmed by large scale epidemiological studies. One of the largest was a questionnaire study conducted in Japan (Tokyo and Kyoto) including 31 023 male and 42 242 female participants at the age of 40 to 79 years. The cohort was followed for 10 years. It has been found that among the persons who practised physical activity longer

Table 1. Conventional risk factors in examined group

Conventional risk factors	Total group	Male	Female	General population in Poland male/female
Smoking habit (%)	48.7	53.0	39.6	no data available
Cigarettes/day (n)	21.4±9.7	23.1±10.1	16.6±6.4	no data available
Alcohol consumption (no drinking at all) (%)	25.7	13.8	59.3	no data available
BMI				
Mean ±SD	27.7±4.7	27.9±3.0	27.7±4.5	no data available
Range	18.0–51.7	18.0–52.0	18.0–41.0	
Overweight (> BMI) (%)	43.0	46.6	35.0	35.0/29.0
Obesity (> BMI) (%)	27.5	26.6	29.5	19.0/19.0
Cholesterol HDL (mg/dl)				
Mean ±SD	51.5±16.4	49.5±15.4	51.7±17.7	no data available
Range	21.0–202.0	21.0–202.0	28.0–174.0	
Cholesterol LDL (mg/dl)				
Mean ±SD	130.7±42.0	126.6±39.0	139.0±46.4	no data available
Range	27.0–400.0	27.0–273.0	48.0–400.0	
Triglicerides (mg/dl)				
Mean ±SD	161.6±10.3	154.4±11.0 23	145.9±11.0	no data available
Range	23.0–263.0	280.0	34.0–263.0	
Cholesterol > 200 mg/dl (%)	50.0	58.0	25.0	no data available
Hypertension (%)	43.7	60.0	43.2	25.0
Lack of leisure time physical activity (%)	45.0	75.5	80.5	no data available

BMI — Body Mass Index = body mass/height^2 (kg/m^2).

than 5 h/week, the number of deaths from CVD was smaller (20% in women and 50% in men) compared to the least active group (after adjusting for other risk factors) [26].

A similar questionnaire study was performed in Germany in a group of 3939 people, 1941 women and 1998 men at the age of 23 years. After adjusting for all other risk factors (age, tobacco smoking, obesity, diabetes, cholesterol concentration), the risk of CVD in the women and men with lowest physical activity was significantly higher (OR = 2.19 and 1.72, respectively) compared to the more active women and men [27].

Recently, the role of diabetes in the development of CVD has been increasingly recognised. Diabetes affects 6% of adult Polish citizens; coronary heart disease has been recorded in 25% of the patients with new-detected diabetes type 2 [11]. In the examined population, the percentage of people with diabetes was much higher, 16.8%. Diabetic persons more frequently experience asymptomatic myocardial ischaemia, silent myocardial infarction, infarction complications and sudden cardiac death [28].

Arterial hypertension, like diabetes, is both a disease and a risk factor for other cardiovascular diseases, including myocardial infarction. It is estimated that arterial hypertension affects 8.6 million (ca. 25%) adult Polish citizens. In the study population, the proportion was higher, 43.7%.

In addition to conventional CVD risk factors, the study population was affected by numerous work-related factors considered in the literature to be occupational risk factors for myocardial infarction. The dominant work-related factors in the population examined in our study included noise, dust, chemical agents and stress.

Noise is one of major risk factors for the development of CVD. In our study, exposure to noise was reported by over 46% of the participants. Davies et al. studied a cohort

of 27 464 blue collar workers of 14 Canadian lumber industry plants, who were employed for minimum one year during 1950–1995. The authors concluded that the risk of myocardial infarction in the highest-noise-exposed group was by about 50% higher compared to the lowest-noise-exposed group (OR = 1.5; 95% Cl: 1.1–2.2) and increased with longer exposed tenure [29].

In the NaRoMI (Noise and Risk of Myocardial Infarction) study, the authors assessed whether staying in very noisy environment could affect the incidence of myocardial infarction. They found elevated risk of myocardial infarction in the inhabitants of noisy residential areas (objective noise assessment) both in the group of women (OR = 3.36; 95% CI: 1.40–8.06; p = 0.007) and in men (OR = 1.46; 95% CI: 1.02–2.09; p = 0.040). Workplace noise (also assessed objectively) caused increased risk of the infarction only in the group of men (OR = 1.31; 95% CI: 1.01–1.70; p = 0.045). The results show that prolonged exposure to intense noise may affect the frequency of myocardial infarction [30].

As much as 42% of the subjects were exposed to dust, predominantly to cotton and cereal dust. The literature review published by Sjoegren et al. in 1997 includes findings that indicate an increased risk of ischaemic heart disease (IHD) among workers exposed to dust containing a specific agent, e.g. quartz, asbestos, PAHs, arsenic, beryllium, lead, organic dust, wood dust, paper dust and welding fumes [31]. Also, a number of studies have linked the increased risk of IHD with working under high-level exposure to non-specified dust [32–34]. Epidemiological studies provide also evidence that airborne particulate matter may contribute to increased morbidity and mortality rates from pulmonary and cardiovascular diseases [35–37].

In the study population, 33% of the participants were exposed to chemical agents — those were usually organic solvents, lead, and pesticides. Experiments show that various chemical agents may produce different types of toxic effects, such as heart rhythm disturbances, cardiomyopathies, arterial hypertension, ischaemic heart disease, vasoconstriction. Because of a considerable variety of factors affecting the studied population and small number of participants exposed to individual factors, it is difficult to relate our results to those obtained by other authors.

Stress was one of the dominant factors reported by the participants of our study (40.4% people). A majority of them (62.1% patients, including 76.5% women and 54.4% men) associated myocardial infarction with stress.

Theorell et al. in their study on patients with the first myocardial infarction, who were followed for a two-year period in the Stockholm region, found that the work-related stress induced increased risk of myocardial infarction (after controlling for age, smoking, social status, arterial hypertension and lipid concentration) [38]. In a 6.5-year prospective study in 416 workers with a high level of work-related stress, the risk of myocardial infarction (fatal and non-fatal cases), adjusted for age, BP, cholesterol level and BMI, was estimated at 4.53 (95% CI: 1.15–17.80) [39]. Moreover, Bosma et al. demonstrated that the imbalance between personal efforts (competitiveness, work-related overcommitment, and hostility) and rewards (poor promotion prospects and a blocked career) was associated with a 2.15-fold higher risk of new coronary heart disease [40].

The INTERHEART (Rosengren et al. [41]) project was the largest study performed heretofore to analyse the association between occupational stress and myocardial infarction. This was a case-control study, and the follow-up period was 1999–2003. The participants were 24 767 people of 52 countries (262 centres from Asia, Europe, Middle East, Africa, Australia, North and South America), including 11 119 patients with first myocardial infarction and 13 648 controls matched for age (±5 years) and gender, hospitalized for diseases non-related with CVD. Polish centres also participated in the study (ca. 2 000 subjects).

Psychosocial stress was assessed using four questions about stress experienced at workplace, at home, stress associated with participant's financial situation and about major life events that had occurred during the period of one year preceding the infarction. It has been found that the risk of myocardial infarction was significantly associated with the level of stress after adjustment for the conventional risk factors. The general level of stress has proved to be an independent myocardial infarction risk factor with a predictive value of 2.51 (95% Cl: 2.15–2.93), which

Table 2. Physical and chemical factors at the workplace reported by subjects examined

Occupational risk factors	Exposed people (%)
Occupational noise	45.5
Fine particulate dust	42.0
Chemicals	33.0
Hot microclimate	13.8
Electromagnetic fields	13.8
Vibration	12.1
Cold microclimate	1.7

is only slightly lower than that for diabetes (OR = 3.08; 95% Cl: 2.77–3.42) and tobacco smoking (OR = 2.95; 95% Cl: 2.72–3.20) and equal to that for arterial hypertension (OR = 2.48; 95% Cl: 2.30–2.68). It has been demonstrated that stress is equally effective in women and men.

Few studies are accessible on the relationship between occupation and risk of myocardial infarction. In a Swedish study by Hammar et al. [34], the highest risk of myocardial infarction was found in the group of men in industrial sector: metal process workers (OR = 2.8), frame and circular sawyers, paper and paperboard workers (OR = 1.8), chemical process workers (OR = 1.6), plastic production workers (OR = 1.5) and transportation sector: ship deck officers (OR = 1.8), road traffic supervisors (OR = 1.7), air traffic controllers (OR = 1.7), bus and tram conductors (OR = 1.6) [42].

In our male population, the major occupational groups were farmers, low- and medium-level managers, and self-employed. The female group consisted mostly of office workers, seamstresses and farmers, while in the Swedish study the highest risk was found for bench carpenters (OR = 2.0), protective service workers (OR = 2.0), tele assemblers (OR = 1.8), toolmakers, machine assemblers (OR = 1.8), kitchen assistants (OR = 1.5), building caretakers (OR = 1.5), practical nurses (OR = 1.4).

It is difficult to compare our results with the study of Hammar et al., which refers to the general population, while our study is limited to one region in Central Poland. Many of the high-risk occupations indicated in the Swedish study (e.g. ships deck officers, air traffic controllers) are not found in our group.

CONCLUSIONS

The analysis of the collected data shows that the demographic situation, financial status and residential conditions of the study group were similar to those of the general Polish and the Łódź municipal populations. However, it is worth noting that disturbed lipid metabolism and obesity were considerably more frequent in the examined group than in the general Polish population. The frequency of arterial hypertension and diabetes was also higher. The high rates of occupational factors, especially stress, noise, exposure to dust and chemical agents reported by the subjects might elevate the risk of first myocardial infarction.

Among occupational factors, stress was perceived by most of examined subjects as possible reason of cardiac infarction. Therefore, it would be advisable to make stress coping methods widely popular in the working population.

Our study is a first epidemiological study in Poland in which the occupational factors are included in the profile of CVD risk factors. Our results indicated what kind of occupational factors prevailed in the group of patients with first myocardial infarction. It could be an important information for preparing programme of prevention strategies for workers exposed to these factors. Further research is also necessary to explain the elevated incidence of myocardial infarction in the different occupational groups.

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