

The selected risk factors of peripheral arterial disease of the lower extremities

Magdalena Pieniążek¹_{ABCD}, Łukasz Błaszczuk²_{ABCD}

¹ Jagiellonian University Collegium Medicum, Cracow

² Medical University of Silesia in Katowice, Katowice

Abstract

The number of risks and events of diverse negative consequences and ranges is increasingly high; therefore, novel effective life-saving methods are required. Peripheral arterial disease, which affects 12%-14% of the population, is one of the diseases that should be managed. Its incidence rises with age and non-modifiable factors as well as elements of lifestyle are likely to increase the probability of its development. The aim of the study was to analyse the selected risk factors in patients diagnosed with peripheral arterial disease of the lower extremities attending vascular outpatient clinics in Cracow and its surroundings. The study group included 29 patients aged 44-78 years, the mean age – 64 ± 8.7 years. The most common diseases accompanying peripheral arterial diseases were arterial hypertension (20 patients – 69%) and diabetes mellitus (9 patients – 31%). Moreover, tobacco smoking among patients was assessed; 96% of the study population smoked in the past and only one patient (4%) never smoked. Eleven patients were overweight (BMI = 25-29.99 kg/m²), and four had I degree obesity (BMI = 30-34.99 kg/m²). The study findings demonstrated that the risk factors of civilization diseases, including atherosclerosis/peripheral arterial disease, should be consciously eliminated and proper eating habits followed. Considering a high proportion of smokers, patients with arterial hypertension and abnormal body weight found in the study population, wide-range educational and prophylactic programmes aimed at eliminating the risk factors of atherosclerosis are required.

Key words: risk factors, peripheral artery disease of lower extremities, prophylaxis

1. Introduction

It is anticipated that due to prolonged life span observed predominantly in the developed countries peripheral arterial diseases (PADs) will be a growing issue. Currently, PAD affects 12%-14% of the general population and 20 % of patients aged > 75 years. The symptoms of PAD vary yet the disease can also develop asymptotically [1]. Many factors resulting in increased incidence rates of PAD have been identified, including tobacco smoking, overweight and arterial hypertension.

1.1. Peripheral arterial disease of the lower extremities

Peripheral arterial disease (PAD) is caused by progressive atherosclerosis, which gradually

narrows and ultimately closes the main arteries supplying the extremities and leads to chronic ischaemic hypoxia. PAD is defined as a chronic inflammatory process developing in arteries. Deposits of macrophages, low-density lipoproteins (LDLs), foam cells and extracellular cholesterol aggregates start to appear between the endothelium and the muscular layer of blood vessels forming the fatty streaks, which are the earliest forms of atherosclerotic lesions. With time, fibrous elements of the connective tissue attach to fatty streaks; they overgrow and surround the primary inflammatory focus, leading to its separation from the vessel. This ultimately results in the formation of atherosclerotic plaque, which can accumulate in

the vascular lumen, narrowing it and limiting the blood flow [2].

The symptoms of PAD include intermittent claudication (IC) and critical ischaemia of the lower limbs. PAD can also be asymptomatic. The majority of patients with atherosclerosis obliterans of the peripheral arteries have limitations in physical functioning and walking problems, which worsen their quality of life.

The classic symptom of the disease is intermittent claudication, i.e. muscular discomfort of the lower limb induced by physical effort (walking) and relieved by a 10-minute rest period. Patients experience muscular tiredness, rigidity, hardening, increasing pain and cramps during physical activities, which are gradually relieved by rest. The symptoms are predominantly located in the calf but may also involve buttocks, thighs and feet. IC affects about 1/3 of all PAD patients [3].

The other symptoms of the disease include foot melanoderma (paleness, cyanosis, pallor after lower limb elevation), discolourations, loss of hair, muscle atrophy, weak or absent pulse on the lower limb arteries. In advanced cases, impaired wound healing, ulcerations and necrosis of distal limb parts are observed [4].

1.2. Risk factors

Although the risk factors described below are defined as risk factors of the development of PAD, in many cases they are associated with the disease. Noteworthy, non-modifiable factors and elements of lifestyle can increase the probability of PAD occurrence. The risk factors include:

Race – the race other than Caucasian is the risk factor of the development of PAD. Black race more than doubles the risk of PAD [5].

Gender – The incidence of symptomatic and asymptomatic PAD is slightly higher in men than in women, particularly in younger age groups. In

patients with IC, the male-female ratio ranges from 1:1 to 2:1 [3].

Age – Prevalence and incidence of PAD increase with age [3].

Tobacco smoking – the incidence of IC is 2-5-fold higher in smokers compared to non-smokers [6]. PAD is found about 10 years earlier in smokers than in non-smokers. Habitual smokers are at a fourfold higher risk of IC compared to non-smokers [7].

Diabetes mellitus – the incidence of IC is two times higher in diabetic patients than in non-diabetic individuals. According to the American Diabetes Association recommendations, diabetic patients should be screened for PAD every 5 years. [8].

Arterial hypertension – Arterial hypertension is associated with various cardiovascular diseases, including PAD. However, the relative risk of the development of PAD is lower in patients with arterial hypertension than in diabetic individuals and smokers [3].

Dyslipidaemia – The fasting concentration of cholesterol > 7 mmol/l (270 mg/dl) is associated with twofold higher incidence rates of intermittent claudication [9].

Markers of inflammation – Study findings demonstrate that the concentration of C-reactive protein (CRP) is elevated in primarily asymptomatic patients who developed PAD during the next 5 years, compared to the age-matched control group remaining asymptomatic [10].

Chronic kidney failure – There is a correlation between kidney failure and PAD. In the Heart and Estrogen/Progestin Replacement Study (HERS), kidney failure was connected with future cases of PAD in post-menopausal women [11].

Each of the factors mentioned above constitutes a potential risk for the development of the disease; therefore, it is extremely important to limit their effects to a minimum, which can be achieved by changing lifestyle (diet, physical activity, elimination of stress) and pharmacological

treatment (normalisation of arterial pressure, reduction in cholesterol levels).

The analysts of the American Academy of Science emphasise that lifestyle has the largest influence (> 50%) on the objective feeling of health or disease. Figure 1 presents the risk factors divided into modifiable and non-modifiable ones (Fig.1).

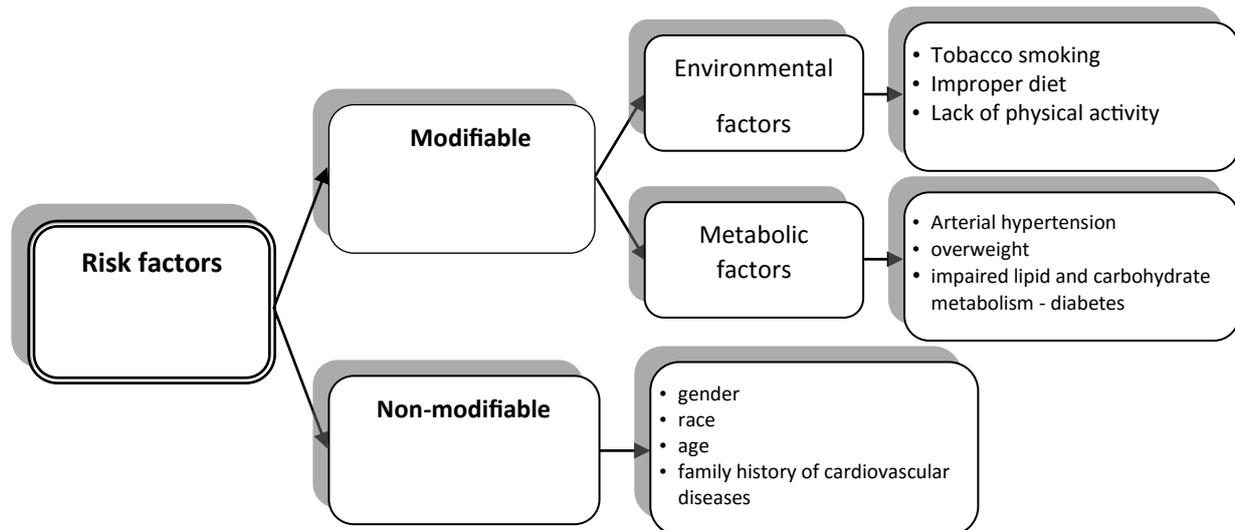


Fig 1. Risk factors of PAD [12]

People should be aware that they can affect the environment, i.e. reduce the effects of many risk factors inducing civilisation diseases, including atherosclerosis (Fig.2). Another essential element of prophylaxis is to establish proper dietary habits, proper proportions and amounts of nutrients as well as forms of their consumption [13].

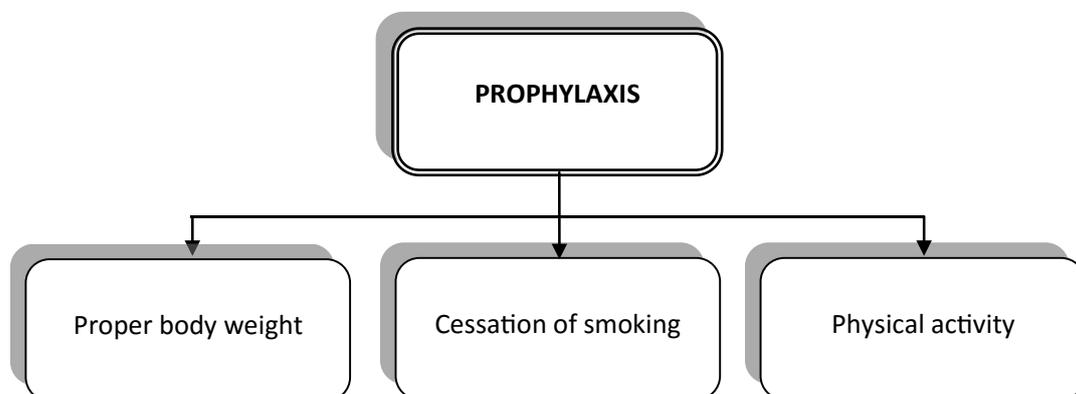


Fig 2. Prophylactic management

It should be stressed that both primary and secondary prophylaxis recommended to diagnosed patients is equally important.

2. Material and method

The study encompassed 29 patients (5 women and 24 men) treated in the vascular outpatient clinics in Cracow and its vicinity who were diagnosed with PAD of the lower extremities (stage II according to the Fontaine scale). Their age ranged from 44 to 78 years (mean age 64 ± 8.7 years). In the study group, 11 individuals had normal weight (BMI = 18.5-24.99 kg/m²), 14 were overweight (BMI = 25-29.99 kg/m²), and 4 had stage I obesity (BMI = 30-34.99 kg/m²).

The study was performed using a questionnaire and direct history taking. Patients were asked to fill the data concerning tobacco smoking and co-existing diseases.

3. Results

Analysis of questionnaire answers was to identify the most common diseases and those considered risk factors. The findings are presented in the figures below.

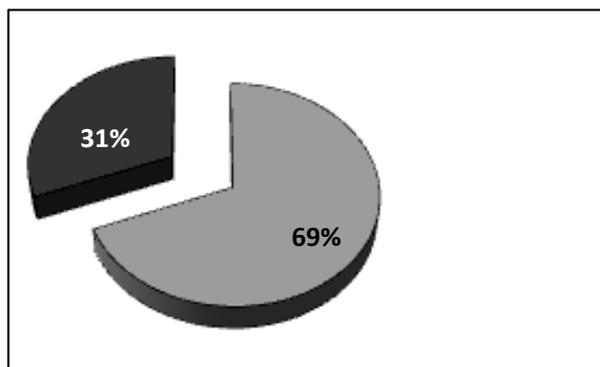


Fig 3. Percentage distribution of arterial hypertension in the study group
patients with hypertension 31%, patients without hypertension 69%

The most common co-existing disease reported was arterial hypertension – 20 individuals (69%)

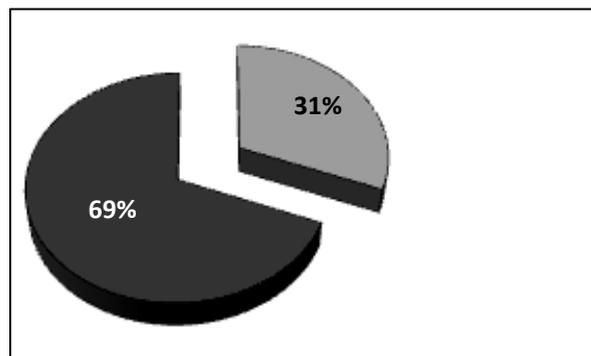


Fig 4. Percentage distribution of diabetes mellitus in the study group
individuals with diabetes mellitus 31%, individuals without diabetes mellitus 69%

Nine patients had diabetes mellitus (31%). Moreover, the analysis involved smoking habits.

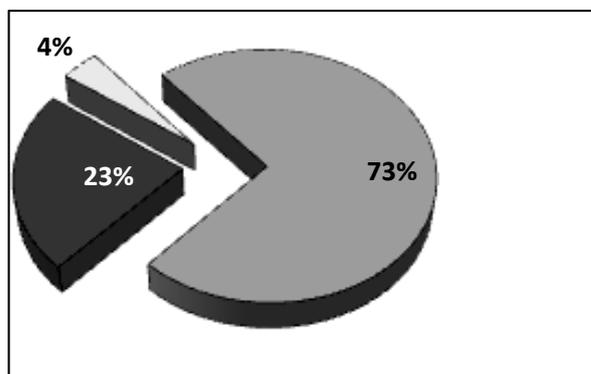


Fig 5. Percentage distribution of smoking habits in the study group
smokers 73%, former smokers 23%, non-smokers 4%

Former smokers constituted 96% of the study population. Only one individual has never smoked (4%). The table below presents the data regarding the duration of smoking and the number of cigarettes smoked. (Table 1).

History taking involved questions regarding the date of smoking cessation (2 weeks-20 years). The number of cigarettes smoked was 1-30 a day and the duration of active smoking was 15-57 years.

Table 1. Tobacco smoking in the study group

Smoking					
Number of individuals			Mean duration of smoking	Mean number of cigarettes	Mean number of packet/year
Smokers	Former smokers	Non-smokers			
29			31 years	20 cigarettes	31
7	21	1			

Discussion

The basis for discussion of the essential problem of our study can be the interesting data presented by Edward B. Jude. The author analysed angiograms of patients from the period of 1992-1996. The study group was divided into individuals with diabetes mellitus and otherwise. Atherosclerosis in diabetic patients was markedly more advanced in deep femoral veins and all segments of arteries below the knee. It should be stressed that in this group the incidence of amputations was higher; moreover, the risk of losing the lower limb was fivefold higher as compared to individuals without diabetes. The mortality rates were also higher in diabetic patients and they died younger compared to controls [14]. Similar conclusions were presented by Huysman and Mathieu. According to them, the risk of peripheral artery disease is increased in diabetic patients, who develop the disease earlier; moreover, in many cases, the disease is more severe and disseminated [15].

Since the percentage of smokers (former and present) among patients with intermittent claudication is high and arterial hypertension accompanying is common, prophylaxis is of importance. Many authors emphasise negative effects of tobacco smoking on the cardiovascular system. Some interesting findings were reported by A.W. Gardner, who studied patients with intermittent claudication divided into smokers and non-smokers. In smokers, claudication-associated pain was substantially more pronounced, occurred

earlier and subsided over longer periods, compared to non-smokers. Moreover, the peripheral blood flow was lower. The results regarding oxygen consumption, ventilation and blood oxygenation in the lower limbs were also worse [16].

Cessation of smoking reduces the risk of amputation yet does not lead to complete recovery [17]. It is mainly recommended not to deteriorate the ongoing disease; nevertheless, patients often ignore the orders [18]. It is worth discussing the results presented by G.R. Dagenais, who studied 4570 male patients initially without cardiovascular diseases. They were observed for 12 years for the incidence of disease, risk factors and correlations between intermittent claudication and coronary disease. In the study group, smoking was a predominating factor and was associated with a four-fold increase in the incidence of intermittent claudication, compared to non-smokers. In men who stopped smoking one year before the study, the incidence of disease was comparable to that in non-smokers. Cessation of smoking beneficially affected their health. Smoking is a modifiable risk factor; therefore, primary prevention should be a priority [19].

As mentioned earlier, arterial hypertension is a relevant risk factor of peripheral artery disease. This issue was studied by Denis L. Clement. According to his findings, over 50% of patients with PAD have arterial hypertension, which is also associated with increased risks of myocardial infarction and cerebral stroke. The author stresses the necessity of

further studies regarding the treatment of arterial hypertension in PAD patients [20]. According to A.V. Chobanian, even 30% of patients with arterial hypertension are not aware of their disease, thus prophylaxis is essential [21].

M.McDermot has presented the findings concerning a correlation between weight and physical capacities; 389 patients with PAD were observed for 48 months; the data were collected at the beginning of the observation period and repeated very 12 months. Patients with baseline BMI > 30 kg/m² were characterised by a higher annual drop in walking abilities during the 6-minute walk test, compared to individuals with baseline BMI of 20-25 kg/m². Amongst individuals who gained 2 – 4.5 kg a year compared to their initial weight and regularly exercised (minimum 3 times a week), physical capacities observed during the 6-minute walk test were substantially better, as compared to individuals who did not exercise and whose weight remained unchanged. The above findings suggest that regular physical activity of PAD patients can compensate for negative effects of slight weight gains [22].

Conclusions

Literature data and empirical study findings indicate that the risk factors of peripheral artery disease of the lower extremities are a growing problem in modern society.

The analysis of risk factors constituting a potential source of the disease in question demonstrates that conservative therapy should be accompanied by changes in lifestyle habits, which mainly regard physical activity, diets and limitation of stress.

The awareness of dangers is essential for the treatment of peripheral artery diseases; therefore, patients should consider the recommendations for primary and secondary prevention with due attention.

Prevention of peripheral artery disease of the lower extremities requires the combined use of therapeutic and prophylactic measures of the most important risk factors, such as arterial hypertension, tobacco smoking and overweight.

Increased efficacy of treatment of this disease requires widespread educational programmes, which are an extremely effective and relatively less expensive measure of preventing the growing risk factors.

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Correspondence address:

Magdalena Pieniążek

pieniazek.m@interia.pl