

Research article

Ranking of cardiovascular risk factors in Romania- regional epidemiological approach

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Abstract: An extensive epidemiological investigation was applied regarding the risk factors, to a cohort of patients with pre-existing heart disease, hospitalized for tertiary prophylaxis in a rehabilitation hospital. The group of 499 patients from all regions of the country respected the proportions of gender and environment of origin for the general population of Romania and was adjusted according to regional proportions.

The ranking of risk factors and protection factors present in the studied population was made, at the level of each of the 8 regions of the country and for the whole country consolidated. The profile of the cardiovascular patient was identified. We used risk factors for population characterization, not for aggregation into tools for assessing total cardiovascular risk (as is the trend in large cohort studies since Framingham)

The data processing was done to be able to develop prevention strategies in the interest of the specific individual, not to standardize population characteristics and translate them to the individual thus decreasing their appropriateness.

Keywords: 1 cardiovascular risk-factors, 2 cardiovascular diseases prevention , 3 cardiovascular rehabilitation.

1. Introduction

A risk factor is considered to be a determinant that increases the likelihood of the disease occurring or favours its negative evolution. If risk factors act systemically and persist over time, they can cumulatively change quantitatively so as to favour the onset of a disease or create a predisposition to the condition. The practical utility of identifying and knowing the risk factors is the possibility of preventing or delaying the development of a disease by identifying and stopping exposure to known disease-specific risk factors or other appropriate measures and the possibility of predicting the incidence of a disease in different populations exposed to the action of risk factors. References in the literature give increasing importance to risk factors and lifestyle in cardiovascular disease as accumulating valid data have demonstrated the link between them and the pathogenesis of heart disease.

Having overcome the knowledge barrier in which genetic factors were considered determining in the onset and progression of the disease, and drug treatment was reemphasised, modern approaches recognise the role of risk factors in both the prevention and curative management of the disease.

The most common classification in the literature groups risk factors into categories that relate to their environment, which I will summarise in the following list.

1. Biological factors

Sex/Gender. Men are at increased risk of cardiovascular disease, while in women the incidence increases after the onset of menopause [1,2]. There are behavioural, social and economic factors dependent on the sex of the individual that influence health concerns, disease perception, decision making, thus impacting on the occurrence and progression of CVD [3,4].

Possible causes for the higher prevalence in males are more frequent smoking and higher plasma lipid levels.

Age is the main risk factor influencing CVD. The major importance of this factor is that it is unchangeable and cannot be intervened upon. The risk of CVD increases with advancing age, the onset of the disease for women is likely after the age of 55 and for men from the age of 45.

Recommendations for intervention are expressed in terms of the overall risk level which increases with age, so that virtually all individuals and all populations aged over 70 have a very high cardiovascular risk (greater than 15%).

Family history - is a risk factor independent of other risk factors and is associated with the existence of cardiovascular disease in first-degree relatives (men under 55 and women under 65) with a risk ranging from 1.5 to 1.7.

Phenotypes - involved in the pathophysiology of cardiovascular disease (dyslipidaemia, hypertension, diabetes, cardiac and vascular hypertrophy, endothelial dysfunction and atherosclerosis) and may have clinical relevance, but also in prevention, as each phenotype has its own genetic and environmental determinants.

Genotypes - the relationship between gene and environment (their interaction) is important for understanding how genetic information can be used in risk assessment, and this finding will be important for future research. However, research has shown that for human populations the genetic code changes very slowly (0.2% in 20,000 years) which means that genes can change in 250 generations and not generation to generation. However, other research suggests that under the influence of environmental factors the genetic structure is relatively easily modifiable.

2. Economic factors

Economic status (income and expenditure/household); Gross earnings; Unemployment rate; Labour force; Length of public roads; Population with access to sewerage; Volume of drinking water distributed.

3. Social factors

Level of education; Average life expectancy; Life expectancy at birth by sex; Family status; Prophylactic stress.

4. Psychological factors

Poor socio-economic status. It is mentioned in many prospective studies that point out that the population of both sexes with low educational level, low income, representing the low status labour force and living in poor areas, is exposed to an increased risk for both general mortality and cardiovascular diseases. [The relative risk (RR) ranges between 1.3 and 2.0] [5,6,7,8].

Social isolation and low social recognition. Reviews and studies confirm that people who are isolated or do not interact with their peers have an increased risk of premature death from cardiovascular disease. Lack of social support also leads to decreased survival with a possible unfavourable prognosis among subjects with CVD symptoms (relative RR risk ranges from 1.5 to 3.0) [6,8,9].

Stress of professional or familial nature. Professional stress, such as high demands, lack of social support, and various constraints at work, is a cardiovascular risk factor for males [odds ratio (OR) 1.5]. For females, studies involving them are insufficient to draw firm conclusions. Litigation, crisis situations, stressful family environment are mentioned in various studies as potentially increasing the risk of cardiovascular disease [hazard ratio (HR) ranging from 2.7 to 4.0], especially among women (RR~2.9-4.0) [7,10].

Depreciation. The results of meta-analyses highlight that clinical depression and clinical psychopathology with depressive cough can predict cardiovascular events (RR in-between 1.6 and 1.9) and worsen their prognosis (Odds Ratio between 1.6 and 2.4). The inclusion of social support is likely to counterbalance the adverse effects of depression, whereas the absence of social support has been shown to potentiate the adverse effects of depression [11].

Anxiety. Extensive epidemiological studies have indicated panic attacks as an appreciable risk in the occurrence of cardiovascular events (Hazard Ratio 1.7 and 4.2), noting that generalized phobic anxiety and panic attacks have the capacity to worsen the status of an established cardiovascular disease (odds ratio OD 1.01, respectively 2.0). In contradiction to the above findings, a large, prospective, co-hort study analysed statistically post-hoc shows low all-cause overall mortality in patients with anxiety and cardiovascular disease (HR 0.7). In contrast, high mortality was identified in patients with myocardial infarction whose left ventricular function is reduced post-infarction (HR 1.3), suggesting diametral opposite effects of anxiety status in different subgroups of patients with CVD [12].

Hostility and anger. Hostility is characterized by the excessive re-experiencing of disbelief, anger, rage along with the tendency of subjects to engage in agreeable social relationships. A recent meta-analysis associates both anger and hostility with increased risk of cardiovascular events in both healthy and cardiac subjects (HR 1.2). Failure to express anger may become important, so that suppressing it in patients with CVD constitutes an increased risk of cardiac events (OR 2.9) [13].

Personality type D. In contrast to the isolated, frequently episodically occurring clinical manifestations of anxiety and depression, Type D ('distressed') personality exhibits a long-standing tendency to express a broad spectrum of negative emotions (negative affect) and to inhibit self-expression in relation to other people (social inhibition). This personality type (type D) has been shown to predict an unfavorable disease course in CVD patients (OR 3.7), including postcorrection of depressive symptoms, stress and anger [11].

The effect of psychosocial risk factors is comparable to the effect of obesity or hypertension [14].

5. Clinical factors (comorbidities)

Hypertension is the most important preventable risk factor, with studies showing that mortality is directly proportional to increases in diastolic blood pressure. The prevalence of high blood pressure in the population puts us on the list of countries with the highest number of hypertensive patients, with data published by the European Society of Cardiology claiming that 30% of the Romanian population has a BP value higher than 130/80 mmHg. Other studies, including national ones, also show a higher prevalence of hypertension in the population.

Diabetes mellitus Hyperglycaemia, insulin resistance and hyperinsulinaemia are pathophysiologically related to CVD. The diabetic population has a significantly higher cardiovascular risk than the general population. It is a risk factor that cannot be totally modified, only the progression of the disease can be influenced.

The prevalence in the population is 6.9%, above the regional average as published by the European Society of Cardiology (data for 2020).

Dyslipidaemia is highly prevalent, it is a modifiable factor to which great interest is attributed. The literature points out that reduced LDL-cholesterol is associated with lower cardiovascular mortality, while increased HDL-cholesterol is a protective factor.

Cholesterol The causal relationship between elevated plasma cholesterol levels and atherosclerotic vascular disease is widely recognised. Lowering plasma cholesterol is recommended to reduce cardiovascular risk. Significantly, reducing total plasma cholesterol by 10% will induce a 25% decrease in overt coronary artery disease at 5 years, and a 40 mg/dl (about 1 mmol/l) decrease in LDL-cholesterol will be accompanied by a 20% reduction in coronary events. Data from studies do not allow the identification of a target value for HDL-cholesterol.

Metabolic syndrome The combination of three of these medical risk factors: diabetes, high blood pressure, obesity, increased triglycerides and low HDL-cholesterol defines the metabolic syndrome. Cardiovascular risk is definitely higher, but does not exceed that of the risk factors involved. It is a sensitive indicator for signalling the onset of cardiovascular disease.

Body mass index. In the general population, obesity (chronic adipose disease) increases the risk of cardiovascular disease and is associated with an increased indicator of specific CVD mortality. But in patients with coronary artery disease the evidence takes on aspects. Studies involving patients with coronary artery disease or undergoing cardiac implant procedures (PCI) have evoked the presence of the "obesity paradox", in which BCA constitutes a protective effect against an unfavourable prognosis [15,16].

Other peculiarities related to body weight control are weight fluctuations: weight fluctuations of 5-15% and especially more than 15% in the last 10 years increase the mortality rate from CABG by about 2-fold. For every kg reduction in body weight, LDL-cholesterol is reduced by 0.77 mg % and TC by 0.35 mg % [17,18].

For obesity the European Society of Cardiology data indicate a prevalence of 22.5% in the population aged 15 years and over in 2020. Although the prevalence is low compared to other countries in the same geographical area, it is increasing rapidly compared to 2015, when we were recorded with an 8% prevalence of obesity (defined as BMI greater than 30 kg/mp).

Influenza and viral diseases with respiratory tropism. Seasonal influenza immunization is recommended for patients with diagnosed cardiovascular disease, just as prophylactic vaccination measures are recommended for other respiratory viruses because outbreaks are proven to be at risk for cardiac patients.

The recent pandemic (SARS CoV-2 infection and Covid disease) and its aftermath have re-revealed the magnitude of cardiovascular effects on patients who have experienced the disease [19,20].

Chronic kidney disease. Both diabetes mellitus, dyslipidaemia and hypertension are pathologies ultrarecognised as risk factors in chronic kidney disease and are ubiquitous in association. They act by favouring the progression of endothelial dysfunction pre- as well as the progression of atherosclerosis, thus contributing to the development of renal failure. Vascular damage coexists in chronic kidney disease. The presence of microalbuminuria increases the cardiovascular risk 2 to 4-fold. A low glomerular filtration rate (GFR) is an indicator of cardiovascular disease and all-cause mortality. A study of a large cohort of patients identifies decreased GFR, anemia, and microalbuminuria as independently associated with CVD, and when all were reported together they reduced subjects' survival rates [21,22].

Sleep apnea syndrome. SAS is recognized as frequent obstruction (may be complete or only partial), of the upper airway during the period of time given to sleep. It is estimated to preferentially affect 24% of male adults compared to 9% of female adults. Repetitive "stimulation" of sympathetic nervous system activity, increased blood pressure and pain-induced oxidative stress, together with hypoxic episodes associated with increased levels of inflammatory markers, are considered as initiators for endothelial dysfunction and arterio-sclerosis. SAS is associated with 70% increased relative risk of cardiovascular mortality and morbidity. The risk of developing SAS is correlated in men aged 40-70 years with apnea-hypopnea index. Screening and treatment of sleep apnea syndrome in patients with coronary artery disease and hypertension can reduce cardiac events and sudden cardiac death [23,24,25,26,27,28,29,30,31] .

Erectile dysfunction. ED defined as the frequent and repeated inability of a male subject to achieve and maintain a satisfactory erection for sexual intercourse, a situation in which 52% of male subjects in the age range 40-70 years are found. The determining causes may be psychological, neurological, hormonal, arterial or cavernous insufficiency, and combinations of these. ED prevalence is high in people with multiple cardiovascular risk factors as well as in those with established CVD. Lifestyle modification and drug treatment of

risk factors are recognised as effective activities resulting in improved sexual function in men with ED [32,33,34,35,36,37,38] .

Psoriasis is considered an independent risk factor for MI. The pathophysiology of psoriasis is characterized by: increased antigen activity, activation of T cells and type 1 T helper cytokines, resulting in the appearance of red scaly plaques with large circumference and diameter, and in some patients pathognomonic arthritis. Psoriasis is frequently associated with systemic inflammatory markers such as elevated serum C-reactive protein (CRP) levels. The risk of psoriasis-associated MI is high in young patients with severe forms, but lessens with age. By controlling the classic risk factors of cardi-vascular disease, the risk of psoriasis patients experiencing MI remains increased due to increased immunological activity. Patients with severe forms of psoriasis have a higher risk of MI than those with mild forms of the disease[39] .

Rheumatoid arthritis. Subjects diagnosed with rheumatoid arthritis are at twice the risk of MI compared to the general population. Cardiovascular risk increases from the early stages of rheumatoid arthritis and is possibly associated with systemic inflammation and prothrombotic status. By adopting a healthy lifestyle, including changes in patients' diet, smoking cessation, a daily exercise program and appropriate medication treatment, modification of classic risk factors is important in reducing cardiovascular risk in patients diagnosed with rheumatoid arthritis. Observational studies support lower rates of cardiovascular events and cardiovascular mortality in patients with rheumatoid arthritis and psoriasis when treated with methotrexate (weekly, doses between 10 mg and 20 mg) [40] .

Lupus erythematosus. SLE is associated with endothelial dysfunction and increased risk of coronary heart disease, which is not explained by classical risk factors for ischemic heart disease. Systemic lupus erythematosus has as its predividing manifestation myocardial dysfunction, expressed in abnormalities of myocardial vascular flow and blood supply in the coronary circulation. Coronary microvascular dysfunction is an early indicator of accelerated coronary atherosclerosis, influencing increased cardiovascular morbidity and mortality in these patients.

Periodontitis is associated with endothelial dysfunction, atherosclerosis and an increased risk of MI and stroke. Both economic factors and lifestyle habits such as low socioeconomic status and smoking play an important role. Periodontitis may be a risk factor contributing to impaired cardiovascular health, and its treatment together with the management of other cardiovascular risk factors is imperative [41,42,43,44].

Vascular disease after radiotherapy. The incidence of stroke and ischaemic heart disease remains high for many years after completion of radiotherapy, signalling characteristic developments of atherosclerosis (including lipid accumulation), thrombosis and inflammatory changes. After radiotherapy it is advisable for oncological cases to opt for risk factors.

Post-transplant vascular disease - Important risk factors (excluding immune factors) are dyslipidaemia, type II diabetes mellitus, hypertension. Sequential vascular damage significantly affects cardiac function.

6. Lifestyle factors

Smoking is a modifiable risk factor with a high prevalence in the population, especially in males. Cardiovascular risk increases the more the onset of smoking is before the age of 15. Including passive smoking increases cardiovascular risk.

The proven mechanisms by which smoking acts are arterial vasoconstriction, increased blood pressure, increased total cholesterol with decreased HDL-cholesterol fraction, platelet activation.

In the European area, as a country we are at the top of the prevalence ranking in the general population (26.7% daily smokers), according to data centralised by the European Society of Cardiology (latest published data are for 2020).

Inadequate diet. High-calorie diets, high in saturated grains, salt and sugar consumption in excess contribute to an increased risk of cardiovascular disease.

Sedentary lifestyles are associated with a doubling of cardiovascular risk compared to active people. Physical activity has beneficial effects by maintaining body weight, reducing blood pressure, improving lipid profile (cholesterol, triglyceride).

Alcohol consumption. Excess alcohol negatively influences cardiovascular risk. However, there are also studies which conclude that moderate consumption (100-300 ml red wine) has a protective cardiovascular effect.

In the data published by the European Society of Cardiology, we have an average consumption of 5.4 l of alcohol for women, but a high alcohol consumption of 18.6 l for men (for men, we are in the ranking next to countries with a tradition of alcohol consumption such as Russia or Belarus, but we are surpassed by countries with a higher reported per capita consumption of alcohol - France, Spain, Portugal - and which have a low prevalence of cardiovascular disease).

In spite of sustained concerns in this area, cardiovascular diseases are again the main cause of death worldwide, and Romania is in first place in Europe in terms of cardiovascular mortality (109 deaths/100,000 inhabitants and 57% of all deaths are caused by cardiovascular disease).

Purpose of the study is to retrospectively assess the exposure of patients with diagnosed cardiovascular disease to cardiovascular risk factors and to rank the cardiovascular risk factors identified in the subjects included in the study group in order to highlight their existence, correlation and specificity, as well as their territorial distribution.

2. Results and Discussion

2.1.1. Medical risk factors

Taking into account cardiovascular risk factors in the medical category, 99% of the patients in the study group have hypertension, 56% are obese and for 45% of them diabetes and vascular disease diagnoses are recorded.

The next comorbidities in order of incidence are periodontitis mentioned for 28% of cases, dyslipidemia present in 27% of subjects and anxiety present in 15% of patients.

In the hierarchy of risk factors follows fatal cardiovascular incidences present stroke in 11% and MI present in 10% of the study population.

The hierarchy of medical risk factors, for the studied group indicates:

Presence at the top of the hierarchy in all regions of hypertension. Given that the population evaluated is diagnosed with chronic cardiovascular disease and middle age predisposes to this pathology (vascular resistance increases with advancing age), the increased prevalence (in 6 areas 100%) of this comorbidity is noted. The sensitivity and importance of this observation I believe is re-presented by the fact that arterial hypertension in most cases does not have a noisy symptomatology although the effects are important and disabling over time, but also that there is an adaptation of the body so that the minimization of symptoms is doubled by pathophysiological mechanisms. This observation overlaps with existing data both in the literature and in statistical processing of the general population where the first place as a cause of premature death and disability (assessed using DALYs) is still hypertension (for Romania with a decrease in incidence in the general population of 3.67% for the period 2009-2019). A 10 mmHg drop in blood pressure decreases the risk of death from CVD by 30% according to the Framingham study, making this risk factor a target for prophylactic interventions.

The next risk factor in the medical category is BCA (chronic adipocyte disease = obesity), a risk factor that is absolutely influenced by lifestyle. Although in theory doctors, patients and their entourage are aware of the recommendations, the adoption of a lifestyle that allows for body weight reduction is frequently difficult to implement and respect. The only region in which BCA is ranked second in this hierarchy is Bucharest-Ilfov, where circulatory pathology (vascular diseases) is placed before this pathology, without the prevalence of BCA being low. For this pathology (which is an indicator of the health status of the population) the incidence rate is increasing (+2.67%) in the general population, which indicates the need for early and sustained interventions to optimise the body mass index. Weight loss by 10% decreases the risk of death by fatal events in CVD (MI and stroke) by 20%. Weight loss also prevents the onset and progression of hypertension, diabetes and dyslipidaemia. In the studied group the prevalence is 56%, higher than the prevalence in the general adult population (20-79 years) where it is 31.4% (PREDATOR study).

Diabetes mellitus affects 45% of the subjects in the studied population, while the prevalence in the general population, according to INSP data, PREDATOR study (to assess the prevalence of diabetes in the adult population of Romania) is 11%, and in the SEPHAR III study is 12.2% which allows the interpretation of the results obtained in this population as being dependent on the age of patients, the existence of risk factors for diabetes (hypertension, BCA and dyslipidemia). In territorial profile, the cases of diabetes are not uniformly distributed being in close relation with the accessibility of specialized medical services and the addressability of the population. The prevalence of diabetes in the population of Romania, of epidemic proportions, is a cause for concern as it increased by 17.5% between 2009 and 2019.

Vascular diseases are present in 45% of the studied population, their critical importance being linked to the possibility of occurrence of fatal events (MI and stroke) whose consequences are primarily represented by mortality.

Periodontitis, present in 27.66% of the subjects of this study, is sensibly equal to the prevalence of dyslipidemia (present in 27.05% of the study population), the mention I am allowing myself to make being strictly related to the investigation of this risk factor in the general population. Dyslipidemia is thoroughly researched and mentioned as a risk factor (important also due to its increasing prevalence in the general population), used in the scores and tools for assessing total cardiovascular risk, while periodontitis is neglected (probably due to its diagnosis in the network of dental services for which the patient in our country is not inclined).

For dyslipidemia in our study a prevalence of 27.05% is recorded, being the only known and evaluated classical medical risk factor for CVD for which a lower prevalence is found than in the general population of Romania (the PREDATOR study mentions 38.5% of the general population affected by dyslipidemia).

Another specific result is recorded for anxiety, which is identified as a risk factor for 15% of the patients evaluated, with increased prevalence compared to MI and stroke. The explanation for this pathology being placed before the classic ones is that it is less investigated by clinicians and also the devastating effects of MI and stroke (which translate into mortality).

Stroke is prevalent in the general population characteristic of age groups, i.e. 0.1% under 40 years, 1.8% for the age group 40-55 years, 4.3% for those between 55-70 years and 13.9% for those over 70 years. For this risk factor the prevalence in the study group (adjusted for age of subjects) is superimposable with the results in the general population. I emphasize the importance to be given to this risk factor, as the generated mortality is 21%, and among stroke survivors only 30% have access to rehabilitation therapies.

MI has been encountered in the studied population in 10% of patients, with the same caveats as for stroke (increased mortality) but also a caveat about the lower age at which this incident occurs (which in survivors becomes a negative prognostic factor).

Erectile dysfunction has been assessed using the Men's Health Survey (MHS)2 in Romania, which found a prevalence of 25% in the male population over 35 years of age. According to the results of this survey 82% of men over 35 years old in Romania smoke and/or suffer from at least one of the following diseases: hypertension, hypercholesterolemia, diabetes mellitus, depression, benign prostatic hyperplasia, heart disease, stress. In our sample 30 (1.18%) of the 254 men documented a medical diagnosis of erectile dysfunction. Mention is that there is a marked reluctance of the subjects to address this risk factor (141).

Depression is present in 5% of the general population, in our study it is identified in 9.62% of the subjects evaluated, having a link with attendance in specialist services.

CDK in the general population is around 5%, in our study the prevalence is double-10%, directly related to the age of the subjects.

For sleep apnoea, the literature reports a prevalence of 4% in the general population, with a higher prevalence in the study group (7.21%) due to the presence of obesity, hypertension and diabetes - known risk factors for the occurrence of apnoea.

Rheumatoid arthritis, with a prevalence of 1% in the general population, is reported as a risk factor in 2% of the study population.

Psoriasis was found in 1.2% of the patients studied, a lower percentage than in the general population, where 5% of people are affected by this pathology.

Radiotherapy, systemic lupus erythematosus and transplantation are risk factors identified in the study in a very small number of patients, so I cannot consider the influences significant at the research level (but at the individual level the influence of these risk factors is certainly important).

Within the regions studied, in 6 of the regions all patients in the study have hypertension, the lowest prevalence of hypertension is identified in the Oltenia region (SV), without variations between regions having statistical significance (chi-square test).

Analyzing the incidences of subjects with obesity (lately named BCA - chronic adipocyte disease primarily to remove stigma), the regions show variations between Oltenia (SV) where the prevalence detected is 67.35% - the highest and Muntenia (S) with the lowest prevalence -52.11%.

In the case of diabetes mellitus, the incidences vary from 58.62% in the Bucharest-Ilfov region and 53.33% in the Banat (West) region - regions considered highly developed with double the incidence compared to the Crişana region with the lowest prevalence of 30.77%.

Vascular diseases are more frequent in the population of the developed regions of the country - Bucharest-IF region 58,62% and Banat (V) with 53,33% and have the lowest prevalence in Crişana (NV) - 30,77%.

Periodontosis present in 30% of the subjects included in this research varies with statistical significance depending on the region, from a maximum value of 46.67% recorded in Banat (V) to a minimum of 15.38% in Crişana (NV).

Dyslipidemias register the highest incidents in Moldova (NE) - 38.2% and Oltenia (SV) - 36.73% and the lowest in Bucharest-Ilfov - 8.62%.

Anxiety occurs most frequently in Dobrogea (SE) 21.88% and least frequently in Banat (V) 6.67% and Crişana (NV) 9.23%, with an average of 15% of the CVD population affected by this pathology.

Stroke most impacts subjects in Oltenia (SV) -16.33% and least in Transylvania (C) with 8.62%.

Myocardial infarction is found in the study group with high prevalence values in Moldova (NE) 13.48% followed by Muntenia (S) with 12.68% and at the opposite end of the hierarchy is Banat with 4.62% percentage of the study population affected.

Depression is most common in Muntenia (S) with 15.49% of the study population, Crişana (NV) with 13.85% of the subjects and Transylvania (C) 10.34% and least common in Banat with a prevalence of 4.44%.

Chronic kidney disease is common in the population of Dobrogea (SE) - 17.19% and least common in Moldova (NE) -5.62%.

Apnea is recorded in high proportion in Muntenia (S) -15,49% and with the lowest prevalence in Dobrogea (SE) -3,13%.

Erectile dysfunction affects in the highest proportion men in Banat (V) -11.11% and Crişana (NV)-10.77% and is not registered in the population of Bucharest-Ilfov.

Rheumatoid arthritis affects 2% of the subjects, with 6.67% the highest prevalence in Banat (V) followed by 3.45% in Transylvania (C) and Bucharest-Ilfov, while in Dobrogea (SE) and Muntenia (S) no cases are registered in the lot.

Radiotherapy is mentioned as a risk factor for 7 patients in the studied group, 3 of them from Transylvania (C).

Psoriasis have 6 patients, 2 of them from Muntenia and 1 each from Dobrogea (SE), Banat (V), Crişana (NV) and Transylvania (C).

SLE is found in 3 patients with CVD, one each from Oltenia (SV), Crişana (NV) and Bucharest-Ilfov, while 1 patient with transplant (renal) is registered from Muntenia(S).

On average, each subject investigated in the study has an average number of 3.73 medical RF, ranging from no medical RF (1 patient) to a maximum of 8 medical RF present in 7 patients. There is regional variation, in the case of Oltenia there are 5.59 medical RF per

subject, and in the case of Crişana the lowest average value of 3.41 RF per patient is recorded. For 88 patients (17.63%) of the group, the coexistence of all 4 major RFs (hypertension, BCA, diabetes mellitus and vascular diseases) is noted.

2.1.2. Risk factors - hereditary and collateral history

Although it is a non-influential factor, the existence of a hereditary or collateral history has a definite negative prognosis in cardiovascular disease, which is why it is given great importance. The weight of the maternal lineage in terms of both cardiovascular suffering and deaths in the family due to it is noted. In the regional distribution of the risk factors listed, Bucharest-Ilfov and Banat stand out with a high prevalence of maternal hereditary history.

2.1.3. Social risk factors

Education

The most frequent levels of education are high school (35%) followed by vocational school (31%) according to the training period of the subjects. Lack of education is considered a risk factor, while higher education (university studies) is a protective factor. Within the regions, high school education predominates, followed by vocational school, except for the Bucharest-Ilfov region, where most of the people in the study group have graduated from university, and the Oltenia region, where the majority of the people in the study group have no education.

Occupation

Several categories were used for occupation, but due to age and acquired disabilities due to illness the subjects were classified in only 2 (employed or employed with a clear variation in favour of the latter category).

Social status

For social status categories, married people benefit from protection (lack of alienation, existence of purpose, sense of belonging), while single people (single, divorced or widowed) have an additional risk factor. The existence of children is a protective factor, while the absence of children is considered a risk factor. In the regional analysis, married people are predominant in all regions, with the highest proportions of divorced people in Oltenia and widowed people in Bucharest-Ilfov. According to the presence of children in the subjects' families, the areas with the highest proportion of people with children are Transylvania and Muntenia, while Dobrogea is the region with the highest proportion of people without children.

Living conditions

94% of the respondents consider that they have adequate housing conditions (regardless of the quantification of the other variables). We consider this aspect to be of greater importance than external assessments of the subject. Only 7.62% of the people surveyed live alone which is a risk factor. On average, a subject lives with 2 other people.

Access to the water network is ensured for 92% of the subjects of the study, access to the heating network for 42% and access to the sewage system for 59%. In all regions, the population living in urban areas is 100% satisfied with the housing conditions, while in the rural areas there are variations, with the highest percentage of dissatisfaction with the housing conditions in the Muntenia region, while in the Bucharest-Ilfov region and all the rural population is satisfied with the housing conditions.

2.1.4. Lifestyle

Smoking

In the research group 56.31% of the subjects are smokers, while 17.43% are former smokers. Compared to the prevalence in the general population (44% of the adult population) the proportion is significantly higher. At the same time there is a high percentage of subjects who are passive smokers (they belong approximately equally to the non-smokers category - 109 persons and smokers - 117 persons). The period during which smokers have consumed toxic substances is impressive - the average duration is 45.65 years. Also for former smokers the data obtained in the present research support that they smoked on average 35.87 years before quitting, and the period without tobacco use in this category is 10.08 years, significantly shorter than the period of exposure. The average age for the onset

of this habit is low at 21 years, which makes me emphasize the need for prevention primarily in young communities. In terms of territorial distribution, the highest percentage of active smokers is found in Banat and Transylvania, while smoking prevalence (active and former smokers) is highest in Muntenia and Transylvania, with Muntenia also recording the highest percentage of quitting smoking (highest percentage of former smokers). Active smokers have the longest exposure period (average time since smoking) in Banat (46.79 years) and the shortest in Oltenia (41 years). As regards the populations who quit smoking, the longest period since quitting smoking is found in the Muntenia region with 14.23 years average period, and the shortest is found in Bucharest-Ilfov with an average period of 8 years.

Exercise

Only 11% of the subjects of this research consider that they are sedentary and that for medical reasons (difficulties in moving, pain) they do not have enough physical activity. For 51% of them physical activity is carried out for a period between 30 min daily and 60 min daily. Sedentariness and low physical activity (more than 30 min/day but less than 60 min) are considered risk factors, while physical activity of more than 60 min/day is considered a protective factor as it is part of cardiovascular disease prevention. In all regions physical activity falls predominantly in the range of over 30 min, under 60 min daily. The highest proportion of sedentary people is identified among subjects in Muntenia, while the highest proportion of active people (who perform physical activity over 60 min daily) is in Bucharest-Ilfov.

Sleep duration

The quality and duration of rest time was assessed in the study, with inadequate sleep duration (less than 7 hours daily average) experienced by 37% of the subjects) and sleep disorders (present in 18%) of patients being included in the category of risk factors, while adequate sleep duration (more than 7 hours daily, without disorders) is considered a protective factor.

The region where the duration of sleep is inadequate (less than 7 hours/day) is Moldova, while the percentage of patients suffering from sleep disorders is highest in Muntenia.

Stress

A special category in the present survey is stress, with only 4.21% of patients with cardiovascular disease not recognizing a source of stress. The low percentage of positive responses regarding stress at work can be explained by the high percentage of pensioners (in accordance with age). More than 95% of the subjects recognise several categories of stress, the most important cause being economic worries (recognised by 98.2% of the patients), followed by social worries (97.8%) and family causes of stress (95.71%). Stress is recognized as a multiple source by the entire population of the Bucharest-Ilfov region, with minimal regional variations, with values exceeding 90%.

Nutrition

The predominant type of diet is mixed, found in 86% of the study population, followed by 7% of ovo-lacto-vegetarian diet. As the type of diet in itself is not a risk factor (the risk consists mainly in the quantity and quality of the food), this indicator will be considered as an enabling factor, not a risk or protective factor. On the other hand, the habit of restricting proteins of animal origin in the diet (fasting) is cited in the literature as a protective factor, so we will consider people who fast (weekly, occasional or black fasting) as protected categories, and people who do not fast (15% of the study group) as risk factors. The predominant type of diet is the mixed one, animal protein restriction is the most common in Muntenia (ovo-lacto-vegetarian diet), Bucharest-Ilfov (vegetarian) and Moldova (vegan). The habit of restricting the ingestion of animal protein (fasting), with beneficial effects, is practised in weekly stages, periodically and fasting when no solid food is eaten. Most people who observe this pattern (rooted in religious-oath customs) are in Transylvania, for the cohorts studied.

Meat consumption

The vast majority (431 people out of 499 studied) consume meat and a pro-cent of 13.63% of the study population does not consume this type of food.

Consumption assessed by the predominant amount in the diet by type of meat is divided into pork, red meat (beef, game), white meat (chicken) and fish.

As the first 2 categories are high in fat they will be included in the category of risk factors, while the last 2 categories, low in fat and easy to digest, will be included in the category of protective factors (it is worth noting that for only 1% fish is the preferred choice in the diet). Consumption of semi-prepared foods is a risk factor due to the presence of excess amounts of salt, fat and stabilisers, exposure being 5 times higher in the study group (semi-prepared food consumers vs. non-consumers).

Fruit and vegetable consumption

In Romania, the percentage of people not consuming fruit and vegetables is the highest in Europe according to data provided by Eurostat. In the group of patients investigated, the percentages of those who consume fruit and vegetables are clearly higher than the reports presented and we consider the consumption of raw fruit and vegetables daily as a protective factor and their consumption weekly as a risk factor (since the food ration will most likely be supplemented by carbohydrates). A small proportion of the cohort consumes raw fruit daily, 10% in Oltenia and Transylvania, while insufficient portions of raw vegetables consumed daily we have mainly in Bucharest-Ilfov.

Bread consumption

The risk factor in this food category is represented by the ex-cedent quantity and consumption of white bread (found in 82.16% of subjects). Elimination of bread from the regular diet, consumption of black bread or bread with seeds are considered protective factors. For bread consumption, most subjects consume white bread in Bucharest-Ilfov and Banat, while black bread is consumed most in Moldova and Crişana.

Consumption of non-alcoholic beverages

Carbonated drinks are a risk factor due to their high sugar content. Regardless of the frequency of consumption we quantify the risk factor, in the case of the 38% of subjects who do not consume carbonated drinks we quantify the protective factor. Moderate coffee consumption may have beneficial effects on blood pressure values, but excess constitutes a risk factor through cardiotoxic effects. More than half of the patients in the study consume coffee daily, which is a predisposing factor for hypertension and rhythm and conduction disorders. Drinking tea is a protective factor, it is recognized as a blood pressure regulator by its diuretic effect, digestive aid which helps maintain an optimal body weight, useful in excretion. The percentage of the study population not consuming tea (17%) will be quantified as a risk factor. Carbonated drinks are consumed by a large part of the population with CVD in Bucharest, Ilfov and Muntenia, while the highest proportion of people who do not consume carbonated drinks is found in Banat and Crişana.

Consumption of alcoholic beverages

The type and frequency of alcoholic beverages consumed has different impacts on cardiovascular health. Existing data provide arguments for and against the consumption of beer (which would favour diuresis but would increase body weight by ingested calories and by favouring hepatic steatosis) and wine (a defined small amount up to 300 ml consumed daily would show beneficial effects in some studies, while in others alcohol intake is a risk factor). For spirits there is a congruent opinion of studies classifying this habit as bringing additional risks in cardiovascular disease. In this research the only protected category will be those who do not consume alcoholic beverages (34.47%). According to the type of alcoholic beverages consumed by the patients in the study group, in Transylvania they drink the most beer, in Moldova they are the most wine drinkers, and in Bucharest-Ilfov they are the most consumers of refined alcohol (spirits). Regarding the frequency of consumption for all types of alcoholic beverages, the habit of daily consumption is most frequent in Muntenia, weekly consumption of alcoholic beverages is most frequent in Transylvania and occasional consumption in Moldova. Most people who consume alcoholic beverages are found in the study in the region of Moldova, and most people who do not consume alcoholic beverages in Banat.

Salt restriction

Excess salt intake negatively influences blood pressure control, with cardiac patients recommended to restrict salt intake. For the 97% who re-restrict salt intake as a preventive (tertiary) measure I will consider protective factor, and the exposure of the 3% without restriction will be considered risk behaviour. In the region of Moldova we find in the research the most patients who do not have a sodium (salt) restriction regime, in contrast in Dobro-gea and Muntenia all the population of the study controls the amount of salt.

Sugar restriction

Carbohydrate intake has a negative influence on diabetes control, weight maintenance and metabolic syndrome. In the research population, more than half of the people do not consume sugar (protective factor). Without sugar restriction in the diet we find the highest proportion of people in Bucharest-Ilfov, while in Oltenia are the most people who do not consume sugar.

2.1.5. Access to health services

Although it is a characteristic of the research subjects that they have a concern for their own health, which is also based on the addressability to health services but also on accessibility, in the studied group there is the greatest difficulty in accessing ambulatory services (1 out of 3 subjects does not have access to this type of services). A percentage of 6.21% of the subjects say that they do not have access to any type of health service, while 57% say that they have access to all types of care. Access to health services is likely to be higher for the cohort studied (given that it is a characteristic of this group that it attaches importance to care), the most difficult access to the family doctor is recorded in Crişana and the most difficult access to the specialist outpatient clinic and hospital is recorded in Muntenia.

3. Limits of the study

The present research was carried out in a group of chronic patients, with the particularity of the impact of risk factors over a long period of time. If in studies on cardiovascular risk factors, subjects are part of the general population (not selected by chronic cardiovascular disease criteria as in the present cohort) and risk factors are investigated in order to use the data to develop tools for calculating total cardiovascular risk, in my study, regardless of the existing cardiovascular risk, risk factors with a preventive bias were retrospectively identified. Exposure and effect were investigated concurrently. The patient was not investigated as an individual but as part of the population. Therefore protective measures can remain at the population level.

4. Materials and Methods

Research group The study is a descriptive, observational, epidemiological study conducted on a group of 499 chronic patients with cardiovascular disease admitted for tertiary prevention procedures between January and April 2022.

The selection of patients was made respecting the territorial distribution of the general population (starting from counties and grouped in regions) and the proportions of belonging to the environment of origin (urban/rural) and gender (male/female).

The epidemiological anamnesis data were obtained by direct examination by the author of the present article and the clinical data, and laboratory parameters as well as the medical history of the identified comorbidities were taken from the General Clinical Observation Sheets (GCOS) of the patients of the Dr. Benedek Geza Covasna Cardiovascular Recovery Hospital.

Data from the epidemiological survey were uploaded into a centralized Excel worksheet for mathematical processing. The information was recorded numerically or later transformed into numerical values No = 0 and Yes = 1 for interpretation.

Data analysis was done

- Through tables and graphs using Microsoft Excel
- Statistical mathematical processing using SPSS (Statistical Package for the Social Sciences)

- Discrete variables were presented as percentages, comparisons were made with chi-square test
- Continuous variables were presented with mean or median according to distribution, comparisons were made with t-student or Kruskal-Wallis

In the group formed during the research, we looked for the following categories for cardiovascular risk factors:

1. Medical risk factors
 - 1.1. Hypertension (hypertension)
 - 1.2. diabetes mellitus (DZ)
 - 1.3. obesity (chronic adipose disease)
 - 1.4. vascular disease
 - 1.5. stroke
 - 1.6. myocardial infarction (MI)
 - 1.7. dyslipidaemia
 - 1.8. chronic kidney disease (CKD)
 - 1.9. sleep apnea
 - 1.10. erectile dysfunction
 - 1.11. psoriasis
 - 1.12. rheumatoid aortitis
 - 1.13. systemic lupus erythematosus (SLE)
 - 1.14. periodontosis
 - 1.15. depression
 - 1.16. anxiety
 - 1.17. radiotherapy
 - 1.18. transplantation
2. Hereditary history (genetic factors)
3. Social risk factors
 - 3.1. Educational level (education)
 - 3.2. Occupation
 - 3.3. Family status
 - 3.4. Existence of children
 - 3.5. Housing (environment)
 - 3.6. Number of people living with
 - 3.7. Access to drinking water
 - 3.8. Access to heating
 - 3.9. Access to sewage system
 - 3.10. Assessment of living conditions
4. Lifestyle factors
 - 4.1. Smoking
 - 4.2. Drinking alcoholic beverages
 - 4.3. Physical activity
 - 4.4. Sleep
 - 4.5. Stress
 - 4.6. Nutrition
 - 4.6.1 Type of feeding
 - 4.6.2. Meat consumption
 - 4.6.3. Fruit and vegetable consumption
 - 4.6.4. Consumption of bread
 - 4.6.5. Consumption of non-alcoholic beverages
 - 4.6.6. Sugar consumption restrictions
 - 4.6.7. Salt consumption restrictions.
5. Access to health services..

For the current research we considered the division of the territory into the 8 current administrative regions that correspond to the historical regions of Romania, regions that

have different characteristics and lifestyle habits and could provide data on cardiovascular risk factors.

5. Conclusions

The top 20 cardiovascular risk factors were ranked for each region according to their prevalence in the studied cardiovascular disease population. Risk factors are not the same in all regions. For those risk factors present in all territories, there are regional variations.

The medical risk factors included in this classification are limited in number - they are the 4 major risk factors plus possibly up to 2 more medical risk factors. The share is represented by lifestyle risk factors, modifiable risk factors. It is important to point out that in a group of patients with long-standing proven cardiovascular disease, lifestyle habits have not undergone appropriate modifications for prevention. The weights in the study population of all RF included in the hierarchy affect more than 1 in 3 subjects.

For the whole country, almost in the whole population the presence of stress (familial, economic and social) and increased blood pressure values are detected. The next places in the hierarchy are occupied by harmful eating habits - consumption of semi-prepared foods, white bread, pork, consumption of alcohol and carbonated drinks, insufficient consumption of raw vegetables, lack of sugar consumption restrictions, smoking - both active and passive smoking are present in the hierarchy, insufficient physical activity, insufficient sleep duration (less than 7 hours of sleep in 24 hours), female sex (which is a predisposing factor according to the age of the group and postmenopausal hormonal status), maternal AHC among genetic factors, housing conditions- wood heating, education level- high school education.

The ranges of variation for risk factors in the studied cohort are small for female prevalence and large for housing conditions - wood heating and insufficient consumption of raw vegetables (Table 1).

Table 1 Ranges of variation for risk factors

Rank	Risk factor	Median	Lower quartile	Upper quartile	Variation%
1	HTA	99	93,88	100	6,52
2	stress	98,2	91,38	100	9,43
3	cold meats and fast foods	82,77	77,59	85,39	10,05
4	white bread	82,66	77,53	87,53	12,90
5	pork meat	70,33	65,52	73,44	12,09
6	alcohol consumption	65,23	55,1	71,11	29,06
7	active smoker	56,31	50,77	64,44	26,93
8	low physical activity	56,8	53,45	64,44	20,56
9	obesity	56,11	52,11	67,35	29,25
10	insufficient raw vegetables	53,64	27,58	69,23	151,02
11	female gender	50,9	50,94	52,96	3,97
12	consumption of carbonated drinks	46,92	39,66	53,45	34,77
13	passive smoker	45,29	35,21	57,11	62,20
14	insufficient sleep duration	44,92	39,66	50,56	27,48
15	maternal AHC	45,47	30,77	53,33	73,32
16	vascular disease	45,09	30,77	58,62	90,51
17	DZ	45,09	35,21	57,14	62,28
18	wood heating	39,55	10,34	56,34	444,87
19	no sugar restriction	39,68	34,69	46,55	34,19
20	education - high school	34,85	25,84	44,83	73,49

Hierarchizing each category of risk factors and protective factors, the characterization of the CVD patient in the study cohort emerges as in:

- Female aged 67.26 years (mean age in the study group), urban resident.
- Mother suffered from cardiovascular disease
- High school education
- Retired
- Married with children
- Lives with family, with 2 other persons
- Has on average 4 medical RF (comorbidities) in order of likelihood these are hypertension (99%), obesity (56%), diabetes (45%) and vascular disease (45%), followed by periodontitis, dyslipidemia and anxiety
- Has access to drinking water, communal heating (mains), sewage system and considers the conditions in which they live to be adequate
- Is a smoker, has been smoking for 46 years (on average)
- Does physical activity more than 30 min/day, less than 60 min/day
- Has an adequate sleep duration (7 hours)
- Has sources of stress in the family, is burdened by economic and social worries
- As for diet, it is mixed, fasts regularly, consumes mainly pork meat, consumes semi-prepared food, raw fruit daily, prepared fruit weekly, raw vegetables weekly, prepared vegetables daily, white bread, does not consume carbonated drinks, coffee daily, tea daily, no sugar, restricted salt intake, consumes wine weekly and occasionally liquor
- Has access to medical services - family doctor, outpatient clinic, hospital

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