PUBLIC AWARENESS ON THE PERFORMANCE OF THE PREVENTIVE ACTIVITY OF CARDIOVASCULAR DISEASES IN BULGARIA

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ABSTRACT
This study aimed to determine the public awareness of the implementation of cardiovascular disease prevention activities in Bulgaria.

Material and methods:
- Sociological method - a sociological survey by the method of an individual anonymous questionnaire
- Statistical methods - method for the statistical study of relationships - Classification trees - Comprehensive CHAID - Graphical method to illustrate the results obtained.
- Analytical method to analyze and evaluate the collected information

Results: This article presents the results of a research related to the classification of the studied signs by the method of “Classification trees” according to two factors - “age” and “monthly income”. Relationships between the signs have been studied, and dependencies between them have been discovered. Conclusions are made based on the analysis about the level of public awareness about the implementation of preventive activities of cardiovascular diseases in Bulgaria.

Conclusion: The prevention of cardiovascular diseases has the main goal of eradicating premature mortality and morbidity from CVDs and prolonging the life expectancy of the nation, which is worth the effort and resources. Moreover, these efforts need to be made in a much broader context, where sectors outside the health system have a serious and even predominant role in shaping public health.

Keywords: cardiovascular diseases, public awareness, prevention, mortality, method “Classification trees”, classification,

INTRODUCTION
According to the European Statistics on Cardiovascular Diseases 2017, each year, cardiovascular diseases (CVDs) cause 3.9 million deaths in Europe and over 1.8 million deaths in the European Union (EU). [1]

Cardiovascular diseases account for 45% of all deaths in Europe and 37% of all deaths in the EU. This type of disease is the leading cause of death for men in most European countries except 12 and is the leading cause of death for women in all but two countries.

Mortality from both coronary heart disease (CHD) and stroke is higher in Central and Eastern Europe. In these parts of Europe, the percentage of disability-adjusted life years (DALYs) is usually higher due to CVDs. [1]

In recent years, CVDs mortality has been declining in most European countries, including Central and Eastern Europe, which increased significantly until the beginning of the 21st century.

In Bulgaria, cardiovascular diseases have been leading in the structure of deaths for decades. They account for 64.4% of all deaths in 2019. The standardized mortality rate from diseases of the circulatory system in Bulgaria (1,115.8‰) is 3 times higher than the EU average (365.5‰). [2]

The measures that are implemented at a country level at this stage do not give a significant result because they are implemented mainly by the health system. Public structures and citizens do not have active behavior in this direction, despite the huge material and human losses due to these diseases. The promotion of health and the prevention of diseases should become a national task because the future of the nation and its prosperity also depends on dealing with them. [3]

Changes in major risk factors and lifestyles have led to at least a 50% reduction in cardiovascular mortality over the last 20 years in various countries around the world. [4]

Modifying risk factors can be avoided, treated or controlled. Intensive prevention at every stage, in every social field and at any time is appropriate and necessary if society wants to control the CVDs epidemic. Successful cardiovascular prophylaxis requires a combined global effort made by health services - personal and population-based interventions. [5]

One of the important factors in reducing the risk is the availability of awareness.

The purpose of the present study is to establish public awareness of the prevention of cardiovascular diseases in Bulgaria.
**Tasks:**
1. Classification of the factors “monthly income” and “age” on the basis of “level of significance of preventive examinations and tests in relation to cardiovascular diseases”.
2. Classification of the factors “monthly income” and “age” on the basis of “character of preventive examinations”.
3. Classification of the factors “monthly income” and “age” on the basis of “familiarity with the type of preventive activities carried out by GPs during the preventive examination of persons with risk factors for the development of cardiovascular diseases.”
4. Classification of the factors “monthly income” and “age” on the sign of “awareness of what part of the Bulgarian citizens undergo prophylactic or regular annual examinations for cardiovascular diseases.”
5. Presentation of conclusions about the level of public awareness about the implementation of preventive activities of cardiovascular diseases in Bulgaria.

**MATERIALS AND METHODS**

The following were used for the study:
- Sociological method - A sociological survey was conducted using the method of the individual anonymous survey for the period June - October 2021. The respondents are 546 people, including university lecturers from medical universities, health managers and medical specialists, patients and other citizens from the districts of Sofia, Sofia-city, Plovdiv, Stara Zagora, and Vratsa. The survey was conducted through an online survey through the Google forms platform.
- Statistical methods - statistical survey method - Classification trees - Exhaustive CHAID.

The method of classification trees is used to study relationships by examining both quantitative and qualitative traits and a combination of them [6]. At each stage, the method looks for connections between all the factors individually and the result. If the factor is qualitative, the method looks for connections both separately between the individual categories of the factor and between sets of its categories so as to find the strongest possible connection. If the factor is quantitative, the interval of change of the factor is divided into subintervals, and the strength of the connections for the individual intervals is measured; then, the adjacent intervals are combined, and the strongest connection is sought again. As a result, the “classification trees” method:

- Detects all factors (quantitative and qualitative) that affect the result and rejects those that do not;
- Arranges the factors that influence the result in order of importance and structures them in the form of a tree from the most important to the least important;
- It forms “positive” and “negative” target groups, in which the considered feature has the highest and the lowest value, respectively.

The results are processed using the statistical program SPSS v.25.0 and are presented in graphical form.

- Analytical method for analysis and evaluation of the collected information

**RESULTS**

This article presents the results of research related to the classification of the studied signs by the method of “classification trees” according to two factors - “age” and “monthly income”. Relationships between signs have been studied, and dependencies between them have been discovered. Conclusions are made based on the analysis about the level of public awareness about the implementation of preventive activities of cardiovascular diseases in Bulgaria.

**Classification of factors by the studied signs**

To classify the observed signs and detect significant factors, we use the method of Exhaustive CHAID (Chi-squared Automatic Interaction Detection).

1. Classification of the factors “monthly income” and “age” on the basis of “level of significance of preventive examinations and tests in relation to cardiovascular diseases”.

**Fig. 1.** Classification tree on the sign of “level of significance of prophylactic examinations and tests in relation to cardiovascular diseases” according to the factors “monthly income” and “age”
The analysis of the obtained results (Fig. 1) shows that according to the sign “level of significance of prophylactic examinations and tests in relation to cardiovascular diseases,” a classification tree is formed on 2 levels, including 8 nodes, 2 of which are final. At the first level (the strongest factor) is the “monthly income”, and the “age” factor is at the second level.

The “positive” target group, which indicated a “very large” answer to the importance of preventive examinations and tests regarding CVDs - 88.5% is the group with a monthly income over BGN 2,000, and the “negative” target group is the group of respondents with a monthly income of BGN 300 - 500 - 18.6%.

The ranking of the nodes according to the increase in the monthly income shows a tendency to increasing the importance of the prophylactic examinations and tests in relation to the CVDs of the respondents.

For node 4, the value of the income level is displayed as <missing>. This means that the node contains cases in the income category of BGN 1,000-2,000 plus all cases with missing values for income level.

The “positive” target group, which indicated a “big” answer to the importance of preventive examinations and tests regarding CVDs - 68.8% is the group with a monthly income of BGN 800-1,000, and the “negative” target group is the group of respondents with a monthly income of over 2,000 BGN - 10.3%.

Given the answer that the significance of prophylactic examinations and tests for CVDs is “insignificant”, the “positive” target group is the group with a monthly income of BGN 800-1,000 - 4.6%, and “negative” - 0.0% are the target groups of the respondents’ age 50-69 years and with a monthly income of BGN 1,000 to 2,000, as well as the respondents with monthly incomes of BGN 300-500 and BGN 500-800.

2. Classification of the factors “monthly income” and “age” on the basis of “character of preventive examinations”.

**Fig. 2.** Classification tree by “prophylactic examinations” sign according to the “age” factor.
The study of the total number of cases studied with the Exhaustive CHAID method on the basis of “character of preventive examination” showed a relationship with the “age” factor, Figure 2.

The analysis of the obtained results (Figure 2) shows that according to the sign “character of preventive examination,” a classification tree of 1 level is formed from the population, which includes a total of 4 nodes.

The “positive” target group, which answered that preventive examinations are “mandatory” - 58.8%, is the group aged 20 to 49 years, and the “negative” target group is the group aged ≥ 70 years - 18.9 percent.

There is a tendency that with increasing age, the opinion about the obligatory nature of prophylactic examinations decreases.

An upward trend is observed in the opinion of the respondents that the preventive examinations are “voluntary”.

The “positive” target group, which indicated such an answer - 47.2% covers the respondents aged ≥ 70 years, and the “negative” target group, 25.9%, covers the respondents from the age group 20 to 49 years.

There is a tendency that with increasing age, the opinion about the obligatory nature of prophylactic examinations decreases.

An upward trend is observed in the opinion of the respondents that the preventive examinations are “voluntary”.

The “positive” target group, which indicated such an answer - 47.2% covers the respondents aged ≥ 70 years, and the “negative” target group, 25.9%, covers the respondents from the age group 20 to 49 years.

The tendency we observe in the opinion of the respondents that the preventive examinations are “of a desirable nature” is upward, although to a lesser extent.

Here, the “positive” target group (18.9%) covers the respondents aged ≥ 70 years, and the “negative” target group (13.4%) covers the respondents from the age group between 20 and 49 years.

The “positive” target group, which “has no opinion” about the nature of preventive examinations - 15.1% is the group aged ≥ 70 years, and the “negative” target group is the age group from 50 to 69 years - 1.5 percent.

3. Classification of the factors “monthly income” and “age” on the basis of “familiarity with the type of preventive activities carried out by GPs during the preventive examination of persons with risk factors for the development of cardiovascular diseases”

Fig. 3. Classification tree on the sign of “familiarity with the type of preventive activities carried out by GPs during the preventive examination of persons with risk factors for the development of cardiovascular diseases” according to the factors “monthly income” and “age”
The Exhaustive CHAID method was used to study the influence of the factors “monthly income” and “age” on the attribute “familiarity with the type of preventive activities performed by GPs during the preventive examination of persons with risk factors for cardiovascular diseases” of the studied aggregate and a classification tree on two levels was obtained, which includes 6 nodes, two of which are final. At the first level (the strongest factor) is the “monthly income”, and at the second level is the “age” factor.

The “positive” target group that answered “yes” to the question is that of the age group, comprising respondents between 40 and 59 years - 40.2% who have a monthly income over BGN 1,000. The “negative” target group is the respondents with a monthly income of BGN 300-500 - 16.3 percent.

To those who answered “partially”, the “positive” target group covers the respondents with a monthly income between BGN 500 and 1,000 - 56.3%, and the “negative” target group covers respondents aged over 40 years, receiving a monthly income over BGN 1,000. This group, in turn, appears as the “positive” target group, which answered “no” to the question “Are you familiar with the type of preventive activities carried out by GPs during the preventive examination of persons with risk factors for the development of cardiovascular diseases?" (33.9 percent). The “negative” target group (7.8%) here covers the respondents aged between 40 and 59, who receive a monthly income over BGN 1,000.

The “positive” target group of the respondents, “I have no opinion”, consists of respondents with a monthly income of BGN 300-500 (9.3%).

“Negative” target groups (0.0%) are all others.

4. Classification of the factors “monthly income” and “age” on the sign of “awareness of what part of the Bulgarian citizens undergo prophylactic or regular annual examinations for cardiovascular diseases”

The study of the set of cases studied with the Exhaustive CHAID method on the sign of “awareness of what part of Bulgarian citizens undergo prophylactic or regular annual examinations for cardiovascular diseases” showed a relationship with the factor “age”, Figure 4.

The analysis of the obtained results (Figure 4) shows that according to the sign “familiarity with what part of the Bulgarian citizens undergo prophylactic or regular annual examinations for cardiovascular diseases”, a classification tree of 1 level is formed from the set, which includes a total of 6 nodes.

Fig. 4. Classification tree on the sign of “familiarity with which part of the Bulgarian citizens undergo prophylactic or regular annual examinations for cardiovascular diseases?” according to the “age”factor

The “positive” target group that answered “yes” to the above question is that of the age group, comprising respondents aged 40-49 - 21.1%. The “negative” target group is the respondents from the age group 60-69 years - 2.5 percent.

To the people who answered “partially”, again, the “positive” target group is the respondents from the age group 40-49 years (47.2%), and the “negative” target group consists of respondents aged ≥ 70 years.

Among the respondents who answered “no” to the question “Are you aware of how many Bulgarian citizens undergo prophylactic or regular annual examinations for cardiovascular diseases?" the “positive” target group - 66.0 percent covers the respondents aged ≥ 70 years. The “negative” target group - 31.7% covers the respondents from 40 to 49 years.
The “positive” target group of respondents “I have no opinion” on this issue consists of respondents aged 60 years (15.1%).

“Negative” target groups (0.0%) are the respondents from the age groups 20-39 years, 40-49 years and 50-59 years.

We observe an upward (albeit weak) trend in the answers of the respondents with increasing age who “do not have an opinion” on the above question.

DISCUSSION

In the Republic of Bulgaria, the prevention of cardiovascular diseases is performed as follows. If abnormalities are found on examination, specifically focused on heart disease by the GP, then the consulting cardiologist should make a program that includes correction and periodic monitoring of the risk factors. If there is a family history, preventive examinations usually begin in adolescence or young adulthood. In men over 45 and women over 55, preventive examinations are highly recommended and include blood pressure measurement, electrocardiogram, laboratory tests of blood sugar, cholesterol metabolism, renal function and uric acid. [7]

According to M. Okoliyski, an expert at the WHO, “Preventive examinations are mandatory, but only 38% of the population conducts them, and the control mechanisms do not work well. Prevention is underfunded, only 2% of the health budget is for chronic non-communicable diseases.” Insufficient public awareness of rights and commitments is one of the main weaknesses of the sector. There are no clinical paths for the prevention of hypertension, acute coronary syndrome and diabetes. [8]

In the Annual Report on Citizens’ Health and the Implementation of the National Health Strategy for 2019 of the Ministry of Health, it is noted that in primary outpatient care, “The share of those covered by preventive examinations of patients over 18 increases to 51% compared to 50% in 2018. From 01.01.2019, the secondary prophylactic examination of persons included in a group with risk factors for the development of a disease agreed with the NFA from 01.04.2018 will be canceled.” For specialized outpatient medical care (incl. for complex dispensary/outpatient monitoring) (SOMC) is indicated: reduction of prophylactic examinations of health insured patients over 18 years of age from risk groups - by 138 examinations or by 41.6% less than in 2018. [9]

In order to improve the health and quality of life of the population, in implementation of the UN Program for Sustainable Development until 2030, Bulgaria has adopted a National Program for Prevention of Chronic Non-Communicable Diseases 2021-2025. Among the long-term goals set in it is a 10% reduction in premature mortality (before the age of 65) from cardiovascular diseases and the incidence of heart failure; with 5% of mortality from ischemic heart disease, cerebrovascular disease and heart failure and by 5% of the incidence of arterial hypertension in the age group 25-64. [10]

CONCLUSION

The prevention of cardiovascular diseases has the main goal of eradicating premature mortality and morbidity from CVDs and prolonging the life expectancy of the nation, which is worth the effort and resources.

The ranking of the nodes according to the increase in the monthly income shows a tendency to increasing the importance of the prophylactic examinations and tests in relation to the CVDs of the respondents.

There is a tendency that with increasing age, the opinion about the obligatory nature of prophylactic examinations decreases.

An upward trend is observed in the opinion of the respondents that the preventive examinations are “voluntary”.

By analyzing the results of the study using the method “Classification Trees”, factors influencing the results of the level of public awareness of the prevention of cardiovascular diseases in Bulgaria are classified, and patterns between the studied features are established.

This article is part of an in-depth survey of public opinion to reveal the main problems associated with the timely provision of medical care to patients at risk of developing cardiovascular diseases, as well as those ending in death.

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