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CARDIOVASCULAR RISK IN MEN AGED 18-27 YEARS – RESIDENTS OF TASHKENT CITY

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Abstract:

Purpose of the study: to determine the prevalence of cardiovascular risk factors in men of military age on the basis of primary health care institutions of the Republic of Uzbekistan and to assess cardiovascular risk.

Material and research methods. The study included 1564 men aged 18-27 years without clinical and anamnestic indications of significant cardiovascular pathology, who underwent primary screening in primary health care facilities. The SCORE system (https://www.cardioc.ru/patsientam/shkala-score.php) was used to assess cardiovascular risk in this study. As an intervention in the present work, we used a program for correcting the CVRF, based on non-drug lifestyle correction. After 3 months, the degree of cardiovascular risk was reviewed. All data obtained in the course of this study were entered into a summary table of the Excell editor and grouped depending on the criterion being evaluated. For parametric values, the arithmetic mean value in the group, its standard deviation, was calculated. Intergroup comparison was carried out using Student's test of significance of differences (paired and unpaired). In the case of non-parametric values and frequency characteristics, the relative proportions of individuals with the studied trait in the group were calculated. The intergroup difference was assessed using the tabular chi-square test and its significance according to the tables depending on the degree of freedom. Differences were considered significant if the significance of differences was more than 95% ($p<0.05$).

Research results. Of the 1564 men who underwent primary cardiovascular screening, 403 were found to have predictors of CV risk, which required their in-depth examination in order to stratify the risk and develop a plan of preventive measures. The use of individually formed recommendations for lifestyle modification and non-drug correction of FSSR led to a decrease in DBP (by 7.61%), heart rate (by 9.56%), BMI and WC (by 13.18% and 12.25%, respectively) , fasting concentrations of glucose and cholesterol (by 32.17% and 31.78%, respectively). The average relative 10-year risk decreased from 2.91±1.63 units to 2.09±1.03 units ($p<0.001$), the absolute 30-year risk decreased by 44.42% (significant difference in the dynamics $p<0.001$).

Conclusion: The use of the developed algorithm for diagnosing and correcting CVRF in men of military age made it possible in the conditions of Tashkent to reduce the number of men with an increased relative risk of fatal cardiovascular events according to the SCORE system from 83.87% to 58.31% ($p<0.001$) and to reduce the number of men with an absolute 30-year total cardiovascular risk of 5% or more from 70.47% to 26.55% ($p<0.001$).

Keywords: Young age, cardiovascular risk, SCORE, non-drug correction of cardiovascular risk

INTRODUCTION

Today, throughout the world, significant attention is paid to preventive medicine, especially in relation to the young population. Not only the social and medical, but also the financial effectiveness of primary prevention of cardiovascular diseases has been proven, with the maximum economic efficiency in the case of early identification of risk factors and their correction in people under 40 years of age (1).

Currently, cardiovascular morbidity and mortality among the adult population is decreasing, thanks to both medical advances and the introduction of

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programs for the prevention and correction of risk factors. Unfortunately, the rate of identification of cardiovascular risk factors in young adults is increasing (2), which increases the predicted incidence of cardiovascular events in the future when the target cohort reaches adulthood. Thus, according to the USA, smoking is registered in 34.2% of people (3), overweight and obesity - in 23.8% and 16.8%, respectively (4), arterial hypertension - in 7.2%, with an increase by 25-32 years old up to 20.9% (5). Moreover, these individual statistics do not take into account combinations of risk factors and their mutual influence. The use of risk prediction algorithms allows us to estimate the risk of developing cardiovascular pathology in young people in the future (6). Most risk prediction scores are designed for use in middle-aged individuals and predict risk over a 5- to 10-year period. This time period is very short for young people. Results from the American National Health and Nutrition Examination Study showed that the vast majority (82%) of young adults had a low 10-year cardiovascular risk, while two-thirds of those assessed had a high long-term risk (7).

Purpose of the study: on the basis of primary health care institutions in the Republic of Uzbekistan, to determine the prevalence of cardiovascular risk factors in men of military age and to assess cardiovascular risk.

Material and research methods.

The study included 1564 men aged 18-27 years without clinical and anamnestic indications of significant cardiovascular pathology who underwent initial screening in primary health care institutions.

The study included several stages. The first stage was primary screening, during which each participant filled out a questionnaire, including data on family cardiovascular history, behavioral risk factors, social status, and anthropometric indicators. Also, primary screening included serial (3-fold) measurement of blood pressure and pulse, electrocardiography (ECG) in 12 standard leads, determination of glucose concentration in venous blood. Based on the results of the initial screening, patients with the presence of cardiovascular risk factors (CVRF) were identified and included in the second stage of the study. As a result of the first stage of the study, the frequency of occurrence of various FSSRs in young men 18-27 years old without clinical and anamnestic signs of cardiovascular pathology and their association was established.

During the second stage of the study, men with FSVR underwent an extensive cardiovascular examination, including the concentration of lipids in peripheral venous blood to clarify the assessment of cardiovascular risk. The third stage of the study included men with FSSD identified during the first stage. During the second stage, depending on the individual CVS, men included in the study were offered an individually developed program for correcting FSSR. The effectiveness of the program was assessed during a follow-up examination 3 months after the start of use. The result of this stage was an algorithm for creating an individual risk correction program, adapted for use in primary healthcare settings.

The collection of complaints and anamnesis took place according to a standard generally accepted plan, in an examination room, in the presence of a nurse. Complaints about heartbeat were compared with the results of tonometry and ECG, and if the cardiovascular genesis of the complaints was confirmed, patients were included in the second stage of the study. Otherwise, patients were advised to modify their lifestyle and undergo regular physical therapy to correct their complaints.

Blood pressure and pulse measurements were carried out on both arms, three times: at the beginning of the dose (sitting), with an interval of 5 minutes (sitting) and lying down after 5 minutes of rest. The Riva-Rocci tonometer and Korotkov technique were used. Pulse measurement was carried out manually, in 15 seconds, followed by recalculation in a minute. Subsequently, the arithmetic mean of the three measurements was calculated.

Anthropometric data were determined during the initial examination. Height was measured in cm using a wall-mounted stadiometer, weight in kg was measured using floor-mounted electronic scales. Body mass index (BMI) was calculated using the Quetelet formula: BMI=weight (kg)/height (cm)2. Waist circumference (WC) was determined in cm using a tailor's measuring tape.

Subjective data served as the basis for inclusion in the target cohort of the second stage of the study included 388 men (24.81%), tonometry - 185 people (11.83%), anthropometric data - 313 people (20.01%).

Determination of glucose concentration in peripheral blood was carried out on an empty stomach, after at least a 6-hour fasting period. Blood sampling was carried out in a sitting position using cubital vein venipuncture using a vacutainer. After centrifugation and separation of the serum, the glucose concentration was determined using an automatic biochemical analyzer. According to the results of the study, 72 people (4.60%) were to enter the second stage of the study.

Electrocardiography (ECG) was carried out according to a standard technique using 12 leads and recording on thermal paper, the speed of the tape mechanism was 50 mm/sec. The interpretation included assessment of the regularity, frequency, source, position of the electrical axis of the heart and the vector of the QRS and T waves, the duration of the intervals and waves, their shape and position relative to the isoline. The conclusion indicated the syndromes detected by the ECG. Individuals with the presence of such syndromes as ventricular myocardial hypertrophy, bundle branch

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block, and changes presumably indicating electrical instability of the myocardium and the risk of SCD were identified.

All individuals included in the second stage of the study (in-depth cardiovascular examination) underwent determination of the concentration of total cholesterol (C). On the eve and on the day of the study, it was recommended to avoid excessive physical activity, limit the consumption of extreme foods and drinks (salty, spicy, fatty, fried, alcohol, energy drinks, caffeine, excessive consumption of meat and legumes), maintain sufficient water drinking regime (at least 1 ,5l). The preanalytical stage of the study included blood centrifugation and serum separation. Analysis of the concentration of the listed biochemical markers was carried out automatically using a biochemical analyzer. The results were produced automatically in the digital system "Laboratory Information System" (LIS) using SI concentration units – mmol/l.

To assess cardiovascular risk in this study, the SCORE system was used (https://www.cardioc.ru/patsientam/shkala-score.php), developed during the Framingham study and based on such variables as age (the most significant variable, the value systolic blood pressure, total cholesterol concentration, smoking). This system is designed to determine cardiovascular risk in healthy individuals (that is, without diagnosed cardiovascular diseases, arterial hypertension, diabetes mellitus, renal failure). Considering the low cardiovascular risk in the young population, the SCORE system recommends assessing the 10-year risk of fatal cardiovascular events in people under 40 years of age as a relative value - the factor of the increase in the risk of fatal cardiovascular events in a person with the presence of such a combination of CVD.

The absolute 10-year risk of fatal cardiovascular events was assessed using the online calculator https://evidence-neurology.ru/medical-calculators/hemorrhage/score/. For persons under 20 years of age (18 and 19 years), the age in the calculation was indicated as 20. The risk for age "current + 10 years" and "current + 20 years" was also calculated. The sum of all determined absolute risk values was taken as the absolute 30-year risk of fatal cardiovascular events. The absolute risk of all (fatal and non-fatal) events, or total cardiovascular risk, was determined as the product of the risk of fatal events by 3.

The use of the SCORE scale instead of SCORE2, which takes into account the concentration of atherogenic lipoproteins (non-HDL cholesterol) and is recommended in modern guidelines, is due to the fact that the SCORE2 scale is aimed at determining the risk of people over 40 years of age.

As an intervention in this work, a FSSD correction program was used, based on non-drug lifestyle correction. Corrective techniques were combined individually depending on the diagnosed FSSD. Men with diagnosed FSSD included in the studies received recommendations during a conversation with a general practitioner. The conversation included an explanation of the concept of cardiovascular risk, absolute and relative, the characteristics and characteristics of individual FSSRs, the concept of modifiable and non-modifiable FSSRs, the possibility of reducing the degree of cardiovascular risk in the conditions of correction of FSSRs. The essence of each FSSR and their pathogenetic relationships were explained. After which an individual correction program for FSSR was developed. All study participants were given information about the possibility of follow-up consultations in the event of questions or adverse events.

After 3 months, a follow-up examination was carried out, which included measuring weight and calculating BMI, measuring WC, blood pressure, heart rate, glucose and lipid concentrations.

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Note: on the plotting area the numbers indicate the absolute number of persons with a given FSSR, in the data table - the relative proportion of persons with a given FSSR in the group. Chi square values for the frequency difference in the frequency of occurrence initially and after 3 months of elevated SBP – 82.15***, DBP – 140.68***, HR – 118.13***, BMI – 354.56***, OT - 274.32***, glycemia 65.13***. *** - reliability of frequency difference with the original data – $p<0.001$.

As a result, by the end of the 3rd month of observation, the number of men with FSSD who are recommended to be identified at the stage of primary screening decreased from 403 (selection criterion for the target examination group) to 155, which amounted to 38.46% of the original (chi square = 258.23 , $p<0.001$). At the same time, the frequency of occurrence of FSSR combinations also decreased (Fig. 2). Thus, by the end of the 3rd month of observation, of all individuals with FSSD, the combination of factors was observed in only 38.71%, versus 99.50% initially (chi square = 286.87, $p < 0.001$).

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A study of the dynamics of the absolute values of FSHR (Table 1) showed that the level of DBP and HR in the group significantly decreased by 7.61% and 9.56%, respectively ($p<0.001$ significance of the difference with the initial data for both values, Fig. 3) , while the value of SBP did not change significantly, although the number of people with elevated SBP decreased significantly (see above). This fact is probably due to the active sympathetic regulation characteristic of men of this age.

BMI and WC values against the background of lifestyle modification, which included dietary correction and increased physical activity, significantly decreased by 13.18% and 12.25%, respectively ($p<0.001$ for both comparisons).

The concentration of biochemical markers of cardiovascular risk also underwent changes, indicating a positive effect of the corrective program on cardiovascular risk. Thus, the concentration of glucose in venous blood on an empty stomach decreased significantly by 32.61% ($p<0.001$), the concentration of total cholesterol and atherogenic fractions also decreased (by 31.78% and 39.09%, respectively, $p<0.001$ for both comparisons with initial data), while the concentration of anti-atherogenic HDL did not change, which indicates a positive pathogenetic effect of lifestyle modification on the metabolic profile of the studied population (young healthy men with the presence of FSSR).

Table 1

Dynamics of average FSSR values in men included in the second and third stages of the study, against the background of the use of recommended corrective measures (n=403)

показатель	исходно	3 месяца
САД, мм.рт.ст	124,88±18,46	126,91±8,84
ДАД, мм.рт.ст	83,59±11,50	75,84±8,71***
ЧСС, уд в мин	82,20±13,15	72,59±9,61***
ИМТ, кг/м^2	27,26±4,29	23,10±0,97***
ОТ, см	102,05±9,41	88,77±8,76***
гликемия тощаковая, ммоль/л	5,53±0,76	3,66±0,45***
Хс, ммоль/л	4,85±0,78	3,22±0,74***

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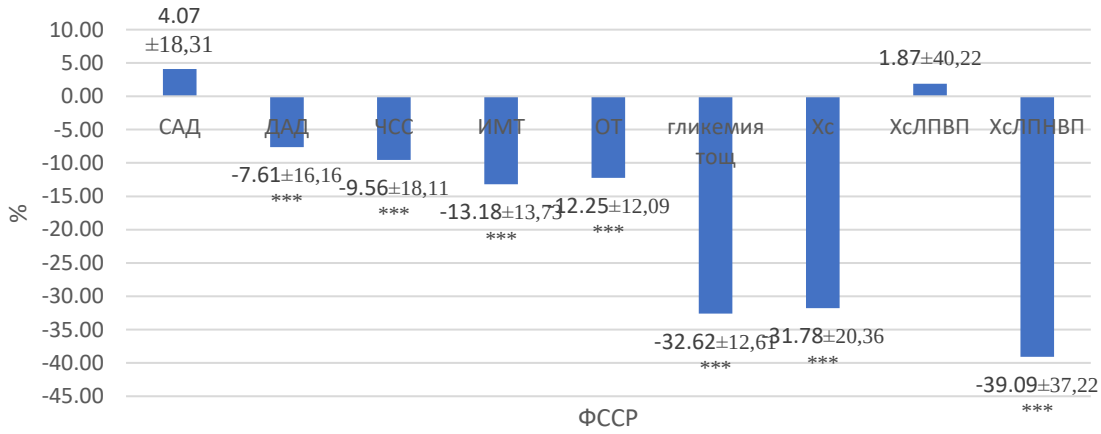
ХсЛПВП, ммоль/л	1,36±0,21	1,35±0,44
ХсЛПНВП, ммоль/л	3,31±0,80	1,87±0,87***

Note: * - reliability of differences with the original data. Three signs – p<0.001.

Рисунок 3. Относительная динамика значений основных ФССР у мужчин 18-27 лет, с обнаруженными в ходе первичного скрининга ФССР, на фоне применения рекомендованных корректирующих мероприятий



Note: * - reliability of differences with the original data. Three signs – p<0.001.

The number of smoking men in the study cohort decreased by 17.75% (from 231 to 190 people - from 57.32% to 47.15%, respectively, chi square = 8.36, p < 0.01).

Thus, the use of an individual program of non-drug correction of CVS in a cohort of young men of military age with the presence of FSSD contributed to a significant reduction in the prevalence and severity of FSSD.

In this study, cardiovascular risk was determined. According to the recommendations of the European Society of Cardiology (19), the assessment of the 10-year risk in healthy individuals under 40 years of age due to the low risk of total cardiovascular events is carried out by calculating the relative risk. The SCORE scale takes into account gender, SBP, total cholesterol concentration and smoking. Calculation of the relative risk according to this scale for individuals included in the second and third stages of this study showed significant positive dynamics (Fig. 4). Despite the fact that both initially and against the background of correction of FSVR, the median RR in the study group of men was 2, initially only 16.13% had cardiovascular risk that did not differ from the risk in the population of healthy individuals without FSVR (RR = 1), and in 11 ,41% relative risk exceeded 5, then after three months already in 41.69% of men the risk did not differ from the healthy population without FSSR (RR = 1), and persons with RR more than 5 were not registered (difference in the frequency distribution according to the degree of RR from the initial data chi square=183.96%, p<0.001).

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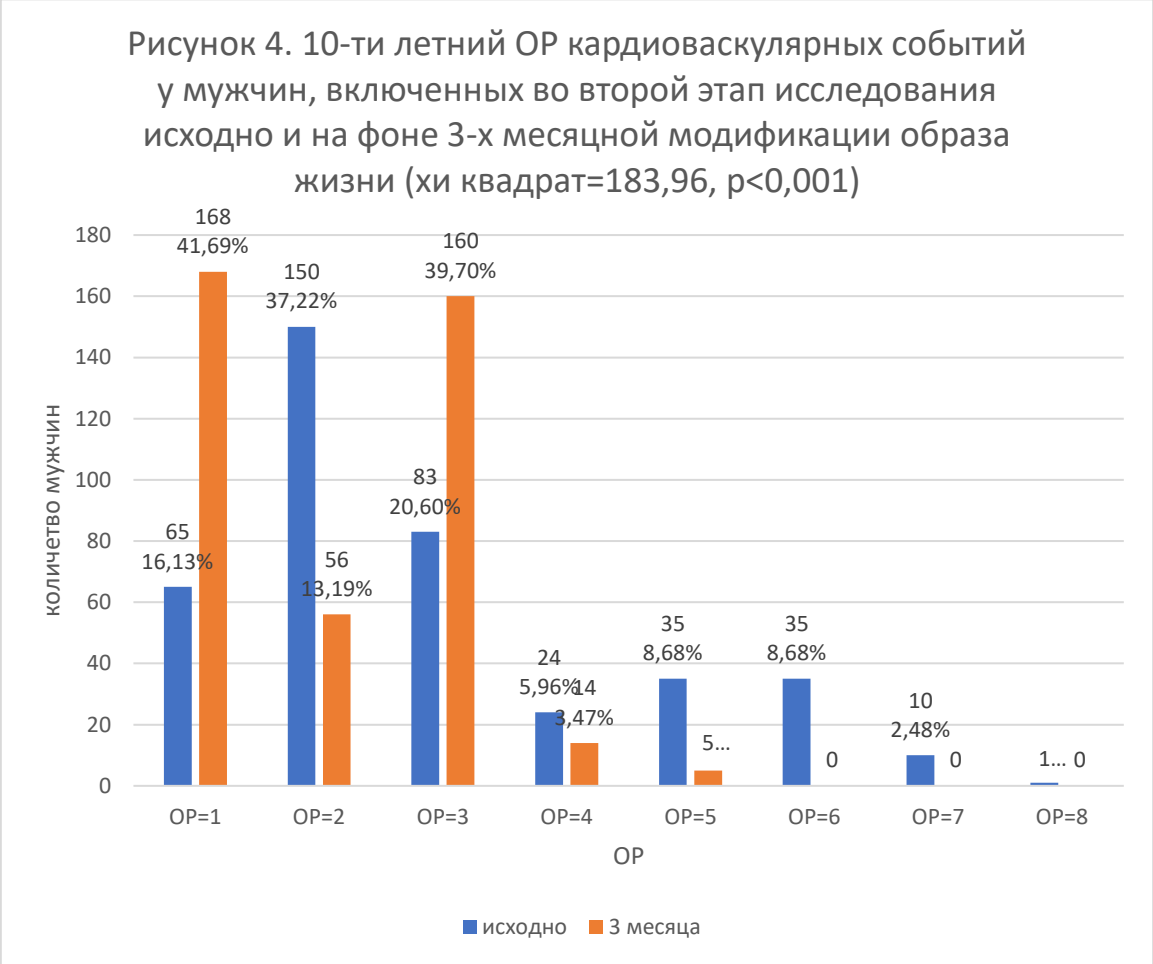

In addition, the present study determined the 30-year absolute risk of fatal cardiovascular events and total (fatal and non-fatal events), calculated during initial screening and against the background of a 3-month corrective program. The study found that at the time of inclusion in the study, the average 30-year risk of fatal cardiovascular events was 2.42±1.19%, the total risk was 7.25±3.57%. During observation, against the background of non-drug corrective measures, the risk level decreased by 44.42±8.87% and will be, respectively, 1.35±0.70% and 4.04±2.09%. The distribution of men included in the study by risk level demonstrated a significant shift in the frequency distribution due to lifestyle correction towards low risk ($p<0.001$ for both frequency comparisons, Fig. 5).

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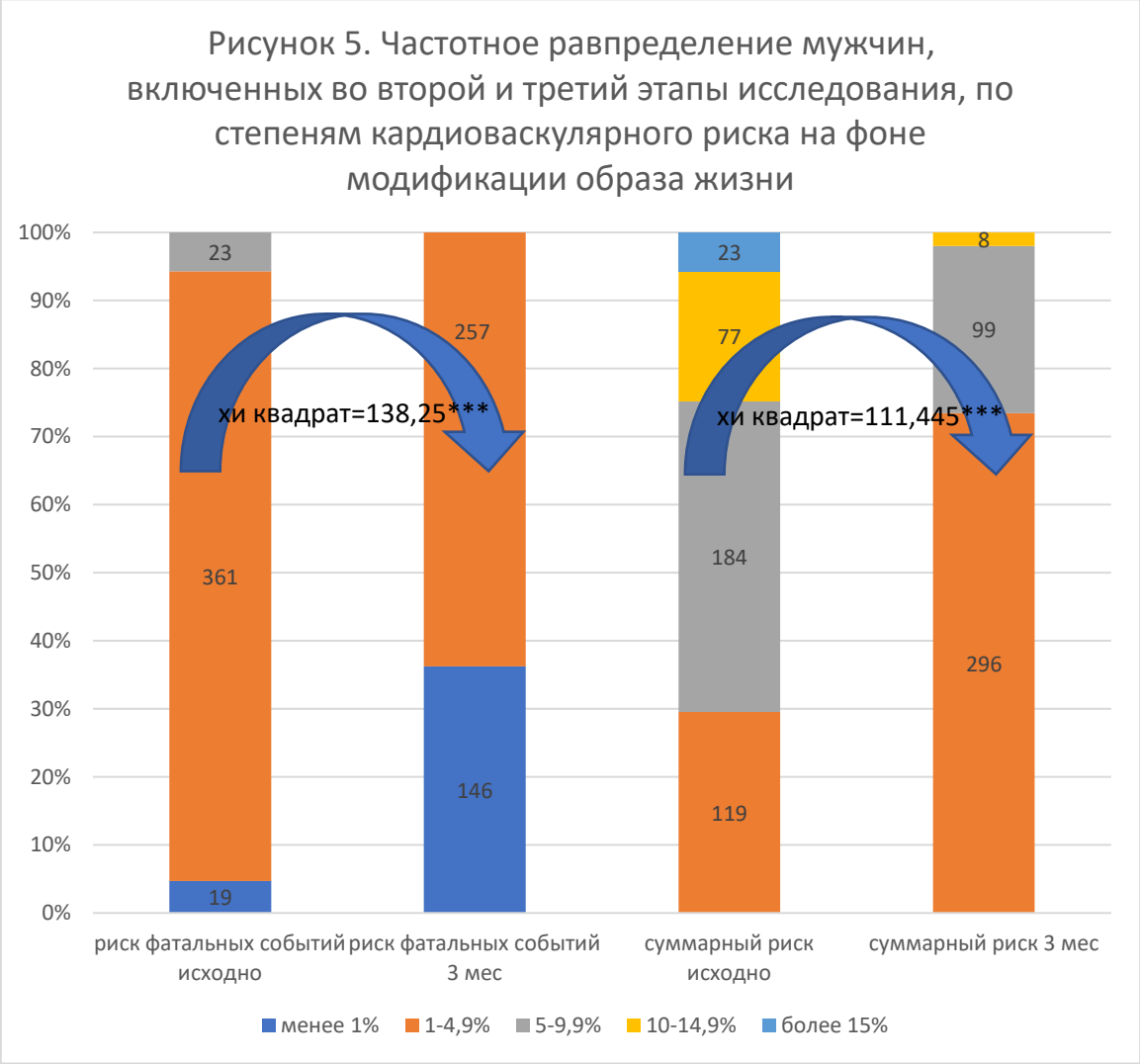

Note: * - reliability of the chi square test. Three signs – p<0.001.

Thus, the present study on a model of residents of the city of Tashkent showed the effectiveness of the proposed algorithm in terms of reducing cardiovascular risk in young men.

DISCUSSION.

Assessing long-term prognosis of the risk of subclinical and symptomatic cardiovascular disease is more sensitive than short-term prognosis (8,9,10). Long-term prognosis predicts a high lifetime risk of cardiovascular disease in 60% of men and 56% of women (11). However, these calculations are made for individuals who were 45 years old at the time of inclusion in the study. For young people, the influence of individual risk factors has been established, but it is clear that a combined assessment of a combination of risk factors has greater prognostic value (12). Scores for calculating cardiovascular risk based on a combination of factors have not yet been developed for young adults. The only available prognosis system is the Framingham 30-year cardiovascular risk score. This score was developed in the Framingham Legacy Cohort model and predicts long-term risk in young adults. Study participants were included in the database in the 70s, since then there has been a significant change in the structure of risk factors - the average body mass index (BMI) has increased (13), the incidence of type 2 diabetes mellitus (T2DM) has increased (14), the frequency of smoking decreased (15). A more accurate predictive system should be developed using modern young people and assessing 30-year cardiovascular risk. Such a system was developed by Pencina et al (10) and includes the risk of "major cardiovascular events—fatal and nonfatal myocardial infarction (MI) and fatal or nonfatal acute cerebrovascular accident," and "total cardiovascular

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risk—all forms of ischemic heart disease, acute cerebrovascular accident, and transient ischemic attacks, intermittent claudication and chronic heart failure. This scale includes, in addition to age, the level of systolic blood pressure, the concentration of total cholesterol and smoking, the level of atherogenic lipoproteins, body mass index, socioeconomic status, and the presence of diabetes mellitus.

Guidelines published by the American College of Cardiology and the American Heart Association recommend that individuals 20-39 years of age with a low long-term cardiovascular risk and those 40-59 years of age with a low 10-year cardiovascular risk (less than 7.5%) should make lifestyle changes to reduce behavioral risk factors (smoking, alcohol, physical inactivity) (16). Behavioral risk factors are the most important components of risk and can be neutralized without negative consequences, effectively reducing cardiovascular risk (17). However, the effect of lifestyle modification on long-term cardiovascular prognosis has not been fully studied and recommendations are based on extrapolation of 10-year risk prediction (18). In the course of this study, a large cohort of healthy men 18-27 years old was examined, in whom a combination of factors indicating the presence of cardiovascular risk was recorded in 25.77% of cases, including: cardiovascular disease and family history were recorded in 24.81% and 5.37% of individuals, arterial hypertension in 11.82%, fasting hyperglycemia - in 4.60%, abdominal obesity in 20.01%, pathological ECG patterns, the significance of which is confirmed by clinical and anamnestic data - in 13.36% , smoking – in 56.65%. 67.74% of people with cardiovascular risk factors have a combination of 2 and 3 factors.

Identification of individual combinations of FSSR allows us to individualize recommendations for their correction and develop an individually selected program of non-drug correction methods, including dietary prescriptions, recommendations for physical activity and a healthy lifestyle. Calculation of the individual absolute and relative risk of fatal and total cardiovascular events and clarification of the concepts of cardiovascular risk increases the adherence of young men with FSVR to the implementation of the recommended risk correction program: adherence to recommendations on nutrition and physical activity amounted to 81.89%, to refusal smoking - 17.75% (41 people out of 231). The use of individually tailored recommendations for lifestyle modification and non-drug correction of FSHR led to a decrease in DBP (by 7.61%), heart rate (by 9.56%), BMI and WC (by 13.18% and 12.25%, respectively) , fasting concentrations of glucose and cholesterol (by 32.17% and 31.78%, respectively). The average relative 10-year risk decreased from 2.91±1.63 units to 2.09±1.03 units ($p<0.001$), the absolute 30-year risk - by 44.42% (significant difference in dynamics $p<0.001$)

CONCLUSION: The use of the developed algorithm for diagnosing and correcting FSSR in men of military age allowed, in the conditions of Tashkent, to reduce the number of men with an increased relative risk of fatal cardiovascular events according to the SCORE system from 83.87% to 58.3 1% ($p<0.001$) and reduce the number of men with an absolute 30-year total cardiovascular risk of 5% or more from 70.47% to 26.55% ($p<0.001$).

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