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Compliance to modification of risk factors for recurrent myocardial infarction in the long term of the disease: a randomized study

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Abstract

Purpose: to study the relationship between awareness and commitment to modifying risk factors for recurrent myocardial infarction in a long period of the disease.

Material & Methods: to study the awareness of risk factors and adherence to secondary prevention of myocardial infarction (MI), a representative sample was created. Of 912 patients treated for myocardial infarction, 333 patients were randomized, taking into account proportional distribution in the population by age (under 65 and over 65 years) and gender. The average age of patients was 62.5±9.8 years: 70,27% of men and 29,73% of women.

Patients' awareness of risk factors, the use of preventive measures and adherence to treatment were assessed on the basis of a questionnaire.

Statistical processing of the obtained material was carried out using the statistical program STATISTICA 12.5 (StatSoft.Inc). Results are presented as mean and standard deviation (M±σ), number of options (n). To compare the qualitative characteristics (frequency tables), the χ^2 test and Fisher's exact test were used.

All participants were informed about the aims of the study and gave written consent to participate in the study.

Results: low awareness (Aw) and commitment (Cm) to the modification of such risk factors for recurrent infarction in a long period of the disease as: reduced fat intake Aw 16,52%, Cm 19,4%; regular consumption of vegetables and fruits Aw 11,41%, Cm 9,7%; smoking cessation Aw 15,92%, Cm 11,04%; decrease in alcohol consumption Aw 16,52%, Cm 10,70%; increased physical activity Aw 14,41%, Cm 12,37%; weight loss with its excess Aw 3,0%, Cm 2,34%; avoidance of stress Aw 28,53%, Cm 18,06%. Although the vast majority of patients received appropriate recommendations from the doctor.

Conclusions: low awareness of the possibility of modifying heart disease risk factors is associated with the failure to implement such non-pharmacological measures in secondary prevention after MI: decrease in fat intake (χ^2=65,12; p=0,000) and regular consumption of vegetables and fruits (F p=0,000), unwillingness to quit smoking (F p=0,000) and decrease in alcohol consumption (F p=0,000), unwillingness to increase physical activity (χ^2=17,61; p=0,000) and reduce weight in case of its excess (F p=0,015), avoiding stress (χ^2=27,42; p=0,000).

Key words: myocardial infarction, risk factors, awareness, compliance, secondary prevention.

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Анотація

Комплаєнс до модифікації факторів ризику повторного інфаркту міокарда у довготривалому періоді захворювання: рандомізоване дослідження.

Мета: вивчити взаємозв'язок обізнаності й прихильності до модифікації факторів ризику повторного інфаркту міокарда в довготривалому періоді захворювання.

Матеріал і методи: для вивчення обізнаності що до факторів ризику та прихильності до вторинної профілактики інфаркту міокарда (ІМ) була створена репрезентативна вибірка. З 912 пацієнтів, які лікувалися з приводу ІМ, було рандомізовано 333 пацієнти з урахуванням пропорційного розподілу у популяції за віком (до 65 та старше 65 років) та статтю. Середній вік пацієнтів – 62,5±9,8 років: 70,27% чоловіків й 29,73%. Обізнаність пацієнтів щодо факторів ризику, застосування профілактичних заходів та прихильність до лікування оцінювались на підставі анкетування. Статистична обробка отриманого матеріалу проводилася з використанням статистичної проґрами STATISTICA 12.5 (StatSoft.Inc). Результати подано, як середнє значення та стандартне відхилення (M±σ), число варіантів (n). Для порівняння якісних характеристик (таблиці частот) застосовували критерій χ^2 і точний критерій Фішера. Усі учасники були поінформовані про мету дослідження та дали письмову згоду на участь у дослідженні.

Результати: виявлено низьку обізнаність (Об) та прихильність (Пр) до модифікації таких факторів ризику повторного інфаркту в довготривалому періоді захворювання як: зменшення вживання жирів Об 16,52%, Пр 19,4%; регулярне вживання овочів і фруктів Об 11,41%, Пр 9,7%; відмова від куріння Об 15,92%, Пр 11,04%; зменшення вживання алкоголю Об 16,52%, Пр 10,70%; підвищення фізичної активності Об 14,41%, Пр 12,37%; зменшення ваги при її надлишку Об 3,0%, Пр 2,34%; уникнення стресів Об 28,53%, Пр 18,06%. Хоча переважна більшість пацієнтів отримували відповідні рекомендації від лікаря.

Висновки: низький рівень обізнаності що до можливості модифікації факторів ризику серцевих захворювань асоціюється з невиконанням таких немедикаментозних заходів у вторинній профілактиці після ІМ: зменшення вживання жирів (χ^2=65,12; p=0,000) й регулярним вживанням овочів та фруктів (F p=0,000), небажанням відмови від куріння (F p=0,000) й зменшенням вживання алкоголю (F p=0,000), небажанням підвищувати фізичну активність (χ^2=17,61; p=0,000) й зменшити вагу при її надлишку (F p=0,015), уникненням стресів (χ^2=27,42; p=0,000).

Ключові слова: інфаркт міокарда, фактори ризику, обізнаність, комплаєнс, вторинна профілактика, стану здоров'я.

Introduction

Ukraine occupies one of the last places in Europe in terms of average life expectancy and mortality from cardiovascular diseases, which in the structure of mortality exceeds 60%. One of the main reasons for the high mortality rate from cardiovascular and cerebrovascular diseases is insufficient primary and secondary prevention of myocardial infarction and stroke.

Secondary prevention of coronary heart disease has become a major public health and economic challenge worldwide. In particular, in the United States, the prevalence of coronary heart disease has risen to 18 million, the rate of recurrent myocardial infarction remains high, and related health care costs will double by 2035 (Aggarwal et al., 2021).

It has been established that patients with acute myocardial infarction and adherence to risk factor modification through lifestyle changes (smoking cessation, weight control or reduction, increased physical activity) and evidence-based drug treatment are more likely to survive and prevent recurrence of cardiovascular events (O'Gara, 2013).

Treatment adherence is a determining factor in the quality and effectiveness of treatment (Yagensky et al., 2019; Mathews et al., 2015). Adherence to treatment and lifestyle modification, the two most important recommendations for risk reduction among patients with cardiovascular disease and associated with quality of life (Kang et al., 2017; Hasandokht et al., 2016).

The presence of several diseases worsens the quality of life, increases the amount of necessary medications, which can adversely affect the patient's adherence to treatment and the modification of risk factors (Sichkaruk et al., 2008).

Over the past decade, practice guidelines and performance indicators for secondary prevention of coronary artery disease have increasingly been based on evidence for lifestyle interventions, including a healthy diet, regular exercise, smoking cessation, weight control, screening for depression, and participation in cardiac rehabilitation (O'Gara et al., 2013; Aggarwal et al., 2021).

Reforms of the healthcare system of Ukraine provide for the implementation and integration of advanced European experience, new technologies for the diagnosis and treatment of cardiovascular diseases, dictate the search for new and modification of existing ways of primary and secondary prevention of cardiovascular diseases. Significant progress has been made in this direction in recent years.

Significant progress has been made in this direction in recent years. A network of reperfusion centers for the treatment of myocardial infarction and ischemic stroke has been created in Ukraine, and the number of interventions for these diseases has significantly increased. In terms of the number of

stentings for myocardial infarction, Ukraine has reached European indicators. Significant progress has been made in the treatment of stroke. Thus, in some clinics in the Volyn region, the percentage of thrombolysis and thrombectomy in ischemic stroke last year exceeded the indicators recommended by the Stroke Action Plan for Europe 2018-2030 program.

However, the results of modern treatment are often offset by poor secondary prevention. As was demonstrated in an international study of the state of secondary prevention, the mortality of patients after myocardial infarction in Lutsk for 3.5 years was 14%, while in Gdansk (Poland) – 8.5%, in Bern (Switzerland) – 4.6%. The analysis showed that the main reason was the unacceptably low level of secondary prevention and the practical absence of modern rehabilitation measures in the Ukrainian city (Kämpfer et al., 2017).

Therefore, the purpose of our study was to study the relationship between awareness and commitment to modify risk factors for recurrent myocardial infarction in the long term of the disease.

Material and methods of research

Participants

A representative sample was created to study awareness of risk factors and adherence to secondary prevention of myocardial infarction (MI). Of 912 patients treated for myocardial infarction, 333 patients were randomized, taking into account the proportional distribution in the population by age (under 65 and over 65 years) and gender.

Patients' awareness of risk factors and adherence to the modification of risk factors for recurrent myocardial infarction were assessed on the basis of our questionnaire (Yagensky et al., 2023).

The purpose of the questionnaire is to assess the health status of patients who have had a heart attack or stroke, as well as to identify the risk of possible complications and, on this basis, to assess awareness and commitment to modifying risk factors for recurrent myocardial infarction and stroke. The analysis of the obtained results makes it possible to realistically assess the situation in which patients who have undergone these diseases are located and develop measures to modify risk factors, focus on the weak links in their compliance with the modification of risk factors for recurrent myocardial infarction and stroke.

The questionnaire consists of an explanatory note, written informed consent of the patient, questions in the block of statistical data and questions in the main block.

The explanatory note noted the purpose of the survey and the importance of the data obtained for the further development of a strategy for the treatment and rehabilitation of the patient. The block of statistical data indicates the age, gender, level of education, marital status, professional employment and economic status of the patient.

In the main block, the patient notes all non-drug measures that he adheres to, and also answers questions to assess awareness and adherence to drug treatment, modification of risk factors - smoking, alcohol, poor diet and overweight, stress, physical inactivity, possible causes of violations of the therapeutic regimen, relationships with the doctor and relatives and possible barriers to effective interaction.

The structure and content of the questions were formed in such a way that the answers reflected the behavior of patients regarding medication, awareness, lifestyle modification, self-control, and motivation for interaction.

The respondent is explained in advance the rules for filling out and the features of the questions. All questions are read by the interviewer. When filling out the questionnaire, the patient was asked to answer questions independently in the presence of the interviewer. For some questions, the interviewer reads out the answer options. In some questions, the answer options were not read out, but a spontaneous answer was expected, and the patient could also indicate his answer option. For each question, detailed instructions for the interviewer have been developed.

If the patient himself could not answer the question, this could make him close. They described the reason. The duration of the survey was not limited in time (Yagensky et al., 2023).

333 respondents took part in the survey – the average age was 62,5±9,8 years. There were 234 men (70,27%) and 99 women (29,73%). Women in the total sample were older (65,8±8,7 years) than men (61,0±9,9 years) (z=3,97, p=0,0001).

The period after myocardial infarction averaged 2,5±1,6 years (from 0,5 to 7,0 years). For women, the average period for an index event was 2,7±1,5 years, for men, 2,4±1,6 years (z=1,60, p=0,112).

All participants were informed of the objectives of the study and gave written consent to participate in the study.

Methods

Patients' awareness of risk factors, the use of preventive measures and adherence to treatment were assessed by a questionnaire. The questionnaire included 60 questions, in particular, regarding the implementation of the doctor's recommendations, which were used to determine the subjective component of adherence.

Procedure

Since the period after a heart attack or stroke ranged from 0.5 to 7 years, the survey was conducted at home. The questionnaire determined the socioeconomic status, the patient noted all the observed non-drug measures, and also answered

questions to assess adherence to treatment and possible causes of violations of the treatment regimen, additional risk factors – smoking, alcohol, poor nutrition, overweight, physical inactivity.

The studies were carried out in compliance with the main provisions of the "Rules for the ethical principles of conducting scientific medical research involving humans", approved by the Declaration of Helsinki (1964-2013).

Statistical analysis

Statistical processing of the obtained material was carried out using the statistical program STATISTICA 12.5 (StatSoft.Inc). Results are presented as mean and standard deviation (M±χ^2), number of options (n). To compare qualitative characteristics (frequency tables), criterion 2 and Fisher's exact test were used. The results were considered statistically significant at $p<0,05$.

Results of the study

Analyzing the answers to the question: "Do you use any methods of preventing cardiovascular diseases, that is, are you doing something to reduce the risk of occurrence or worsening of these diseases?" we found that 303 patients out of 333 (90,99%) answered "Yes" to this question (90,6% for men and 91,92% for women).

Analyzing the information, before the doctor recommended the use of certain measures of secondary prevention, it was found that 85,95% of patients received recommendations to adhere to a diet (eat less sweet, fatty foods); 82,61% of patients received recommendations from their doctor to consume less salty foods; 73,24% received advice from a doctor to consume less alcohol; 69,23% received recommendations from their doctor to smoke less or stop smoking; 65,88% received advice from a doctor to exercise; 93,65% received advice from a physician to avoid stress (Table 1).

In order to determine the patients' awareness of the possibility of modifying risk factors for heart disease, the following answers to the question "How can the risk of a recurrent heart attack or stroke be reduced?" were analyzed: regular medication; decrease in blood pressure in hypertension; reduction in fat intake; regular consumption of vegetables and fruits; to give up smoking; decrease in alcohol consumption; increased physical activity; weight loss with its excess; avoidance of stress. And in order to clarify the adherence to the modification of risk factors for re-infarction, we analyzed the responses of patients regarding which of the listed methods of secondary prevention of heart disease they use.

Tables 2 and 3 show the percentage distribution of survey results in the total sample. The text analyzes the percentage distribution of men and women

Table 1. The results of the respondents' answers about the doctor's recommendations regarding the use of certain measures of secondary prevention

Doctor's recommendations	Received recommendations		Did not receive recommendations		p
	n	%	n	%	
Follow a diet (eat less sugary, fatty foods)	257	85,95	42	14,05	p=0,000
Engage in physical exercise	197	65,88	102	34,12	p=0,000
Eat less salty foods	276	82,61	57	17,39	p=0,000
Less smoking / stop smoking	207	69,23	92	30,77	p=0,000
Consume less alcohol	219	73,24	80	26,76	p=0,000
Avoid stress	280	93,65	19	6,35	p=0,000

Table 2. Awareness of patients about the possibility of modifying risk factors for recurrent myocardial infarction, n (% of the total sample)

Awareness of risk factors		Unaware, n (%)	Aware, n (%)	χ^2; p
Reducing fat intake	Women	79 (23,72)	20 (6,01)	χ^2=1,38; p=0,238
	Men	199 (59,76)	35 (10,51)	
Regular consumption of vegetables and fruits	Women	89 (26,73)	10 (3,0)	χ^2=0,24; p=0,624
	Men	206 (61,86)	28 (8,41)	
Smoking cessation	Women	93 (27,93)	6 (1,8)	χ^2=10,23; p=0,001
	Men	187 (56,16)	47 (14,11)	
Reducing alcohol consumption	Women	93 (27,93)	6 (1,8)	χ^2=11,17; p=0,000
	Men	185 (55,56)	49 (14,71)	
Increasing physical activity	Women	90 (27,03)	9 (2,7)	χ^2=3,24; p=0,072
	Men	195 (58,56)	39 (11,71)	
Weight loss when overweight	Women	93 (27,93)	6 (1,8)	Fp=0,042
	Men	230 (69,07)	4 (1,2)	
Stress avoidance	Women	67 (20,12)	32 (9,61)	χ^2=0,99; p=0,318
	Men	171 (51,35)	63 (18,92)	

among those who are aware and those who are committed to modifying risk factors for heart disease.

Only 16,52% (55 people) of patients are aware that reducing fat intake reduces the risk of a second heart attack. Among those who knew there were men – 14,96% (35 people), women – 20,2% (20 people) (χ^2=1,38; p=0,238) (Table 2). It was found that only 19,4% (58 people) noted that they reduce their fat intake in order to prevent heart disease. Among adherents there were men – 19,71% (41 people), women – 18,68% (17 people) (χ^2=0,04; p=0,835) (Table 3).

Only 11,41% (38 people) are aware that regular consumption of fruits and vegetables reduces the risk of a second heart attack. Among those aware there were men – 11,97% (28 people), women – 10,1% (10 people) (χ^2=0,24; p=0,624) (Table 2). And only 9,7% (29 people) noted that they regularly eat vegetables and fruits to prevent heart disease. Among the adherents were men – 9,13% (19 people), women – 10,99% (10 people) (χ^2=0,25; p=0,618) (Table 3).

15,92% (53 people) are aware that smoking cessation reduces the risk of recurrent heart attack. Among those aware there were men – 20,09% (47 people), women – 6,06% (6 people) (χ^2=10,23; p=0,001) (Table 2). And 11,04% (33 people) noted that they had given up smoking in order to prevent heart disease. Among the adherents were men – 14,9% (31 people), women – 2,2% (2 people) (χ^2=10,41; p=0,001) (Table 3).

16,52% (55 people) are aware that reducing alcohol consumption reduces the risk of a second heart attack. Among those aware there were men – 20,94% (49 people), women – 6,06% (6 people) (χ^2=11,17; p=0,000) (Table 2). And 10,70% (32 people) said they had reduced their alcohol intake to prevent heart disease. Among the adherents were men – 13,46% (28 people), women – 4,4% (4 people) (χ^2=4,54; p=0,033) (Table 3).

Only 14,41% (48 people) are aware that increased physical activity reduces the risk of a second heart attack. Among those aware there were men – 16,67% (39 people), women – 9,09% (9 people) (χ^2=3,24; p=0,072) (Table 2). And 12,37% (37 people) noted that they increase physical activity in order to prevent a recurrent heart attack. Among the adherents were men – 12,02% (25 people), women – 13,19% (12 people) (χ^2=0,08; p=0,777) (Table 3).

Only 3,0% (10 people) are aware that weight loss with its excess reduces the risk of a second heart attack. Among those aware, there were men – 1,71% (4 people), women – 6,06% (6 people) (F p=0,042) (Table 2). And only 2,34% (7 people) noted that they were trying to lose weight in order to prevent a recurrent heart attack. Among the adherents were men – 1,44% (3 people), women – 4,4% (4 people) (F p =0,129) (Table 3).

28,53% (95 people) are aware that avoiding stress reduces the risk of a second heart attack. Among the knowledgeable were men – 26,92% (63 people), women – 32,32% (32 people) (χ^2=0,99; p=0,318) (Table 2). And 18,06% (54 people) noted that they are trying to avoid stress in order to prevent a recurrent heart attack. Among the adherents were men – 16,35% (34 people), women – 21,98% (20 people) (χ^2=1,36; p=0,244) (Table 3).

Examining the association between awareness and commitment to modify risk factors for re-infarction, we found that low awareness of the possibility of modifying heart disease risk factors is associated with failure to implement such non-drug interventions in secondary prevention after MI: decrease in fat intake (χ^2=65,12; p=0,000) and regular consumption of vegetables and fruits (F p=0.000), unwillingness to quit smoking (F p=0,000) and decrease in alcohol consumption (F p=0,000), unwillingness to increase physical activity (χ^2=17,61;

Table 3. Adherence of patients to modification of risk factors for recurrent myocardial infarction, n (% of the total sample)

Adherence to risk factor modification		Not committed, n (%)	Committed, n (%)	χ^2; p
Reducing fat intake	Women	74 (24,75)	17 (5,69)	χ^2=0,04; p=0,835
	Men	167 (55,85)	41 (13,71)	
Regular consumption of vegetables and fruits	Women	81 (27,09)	10 (3,34)	χ^2=0,25; p=0,618
	Men	189 (63,21)	19 (6,35)	
Smoking cessation	Women	89 (29,77)	2 (0,67)	χ^2=10,41; p=0,001
	Men	177 (59,2)	31 (10,37)	
Reducing alcohol consumption	Women	87 (29,1)	4 (1,34)	χ^2=4,54; p=0,033
	Men	180 (60,2)	28 (9,36)	
Increasing physical activity	Women	79 (26,42)	12 (4,01)	χ^2=0,08; p=0,777
	Men	183 (61,2)	25 (8,36)	
Weight loss when overweight	Women	87 (29,1)	4 (1,34)	Fp=0,129
	Men	205 (68,56)	3 (1,0)	
Stress avoidance	Women	71 (23,75)	20 (6,69)	χ^2=1,36; p=0,244
	Men	174 (58,19)	34 (11,37)	

Table 4. Association of awareness and commitment to modification of risk factors for recurrent myocardial infarction, n (%) of the total sample

Indicators		Not committed, n (%)	Committed, n (%)	χ^2; p
Reducing fat intake	Unaware	220 (73,58)	27 (9,03)	χ^2=65,12; p=0,000
	Aware	21 (7,02)	31 (10,37)	
Regular consumption of vegetables and fruits	Unaware	250 (83,61)	13 (4,35)	Fp=0,000
	Aware	20 (6,69)	16 (5,35)	
Smoking cessation	Unaware	243 (81,27)	13 (4,35)	Fp=0,000
	Aware	23 (7,69)	20 (6,69)	
Reducing alcohol consumption	Unaware	235 (78,6)	15 (5,02)	Fp=0,000
	Aware	32 (10,7)	17 (5,69)	
Increasing physical activity	Unaware	234 (78,26)	23 (7,69)	χ^2=17,61; p=0,000
	Aware	28 (9,36)	14 (4,68)	
Weight loss when overweight	Unaware	285 (95,32)	5 (1,67)	Fp=0,015
	Aware	7 (2,34)	2 (0,67)	
Stress avoidance	Unaware	188 (62,88)	22 (7,36)	χ^2=27,42; p=0,000
	Aware	57 (19,06)	32 (10,7)	

p=0,000) and reduce weight in case of its excess (F p=0,015), avoiding stress (χ^2=27,42; p=0,000) (Table 4).

It should be noted that in the general sample there is a category of patients who are unaware of how to reduce the risk of a recurrent heart attack, but they are still favorable to the prevention of cardiovascular diseases: reduction in fat intake (9,03%), regular consumption of vegetables and fruits (4,35%), smoking cessation (4,35%) and reduced alcohol use (5,02%), increased physical activity (7,69%), weight loss (1,67%), stress avoidance (7,36 %) (Table 4). It is obvious that their decision is connected with some other targets, for example, to consume less fat to lower cholesterol, increase physical activity to reduce their weight, etc., that is, the patient associates this not with the prevention of a recurrent heart attack, but with the prevention of concomitant diseases. Therefore, for example, there may be an even smaller number of those who are aware (55 people) in relation to adherents (58 people) to reduce fat intake (Tables 2, 3).

Discussion

Therefore, we found low awareness of the possibility of modifying such risk factors for recurrent heart attack in a long period of the disease as a decrease in fat intake – 16,52%, regular consumption of vegetables and fruits – 11,41%, smoking cessation – 15,92%, reduced consumption of alcohol – 16,52%, increased physical activity – 14,41%, weight loss with its excess – 3,0%, avoidance of stress – 28,53%. Although the vast majority of patients received appropriate recommendations from the doctor.

Along with this, we revealed a low adherence to the modification of these risk factors for recurrent infarction in a long period of the disease: only 19,4% noted that they reduce fat intake; 9,7% noted that they regularly eat vegetables and fruits, 11,04% – quit smoking; 10,70% – reduced alcohol consumption; 12,37% – increase physical activity; 2,34% are trying to lose weight; 18,06% try to avoid stress.

At the same time, we did not reveal gender differences in awareness and commitment to reducing fat intake, regular consumption of vegetables and fruits, increasing physical activity, avoiding stress to reduce the risk of a second heart attack.

However, gender differences were found regarding awareness and commitment to quitting smoking and reducing alcohol consumption to reduce the risk of recurrent heart attack: significantly more men are aware that smoking cessation and reducing alcohol use reduce the risk of recurrent heart attack, and significantly more men are committed to smoking cessation and reducing alcohol consumption to reduce the risk of a second heart attack. Obviously, this fact is determined by the fact that such risk factors associated with lifestyle are more typical for men. We found that there were more men than women among smokers (93,91%, p=0,000) and among those who consumed alcohol (81,73%, p=0,000).

Gender differences in patients' awareness have also been established that weight loss with excess weight reduces the risk of recurrent heart attack: significantly more women are aware that weight loss with excess weight reduces the risk of recurrent heart attack. Although no gender differences in adherence to weight loss have been found.

Therefore, our low level of awareness of the possibility of modifying heart disease risk factors is associated with the failure to implement such non-pharmacological measures in secondary prevention after MI: decrease in fat intake (χ^2=65,12;

p=0,000) and regular consumption of vegetables and fruits (F p=0,000), unwillingness to quit smoking (F p=0,000) and decrease in alcohol consumption (F p=0,000), unwillingness to increase physical activity (χ^2=17,61; p=0,000) and reduce weight in case of its excess (F p=0.015), avoiding stress (χ^2=27,42; p=0,000).

Similar data have been obtained by other authors. In particular, it was found that in patients with obesity adherence to drug treatment is higher than in patients with normal weight. Reluctance to medical treatment was associated with failure to implement non-pharmacological measures of secondary prevention after myocardial infarction - the reluctance to lose weight with obesity and quit smoking (Yagensky et al., 2019).

Low adherence to treatment and a healthy lifestyle was revealed in patients with recurrent myocardial infarction, as well as low awareness of patients about diseases, which turned out to be a significant factor in worsening their long-term prognosis. Recurrent myocardial infarction was associated with increased willingness to adhere to treatment (62%), but was not accompanied by improved patient awareness of the causes of the disease (36,6%), health status (30,9%), and secondary prevention. (63,3%). A large number of subjective factors affecting the adherence of patients to long-term therapy prescribed by a doctor requires the introduction of additional informing patients about the importance of further therapy, special training programs and group psychotherapy (Sedykh et al., 2018).

A study of adherence to modification of risk factors associated with lifestyle (smoking cessation, increased physical activity, reduction of excess weight) at the beginning of outpatient treatment revealed a low level of it. Specifically, out of 502 patients, 54,5% were smokers, 27,5% had a low level of physical activity, 51,8% of patients were overweight, and 26,0% were obese (Cohen et al., 2014).

Issues of increasing adherence to modification of risk factors for recurrent myocardial infarction are studied by individual authors. In particular, it has been found that the use of special education at the end of inpatient treatment increases the level of awareness of risk factors for cardiovascular diseases and adherence to a rational diet one month after discharge (Tuna et al., 2021).

Participation of patients after MI in a 12-month prevention program, accompanied by training sessions (awareness building) and telemetric monitoring of rehabilitation outcomes and coordinated by a non-physician prevention assistant, improved adherence to risk factor modification. In particular, the incidence of smokers decreased to 3,2% in the prevention program group compared to 16,4% in the usual observation group (p=0,017). Body mass index did not improve significantly in the prevention program group; however, there was a significant deterioration in the usual observation group (p<0,05). Physical activity increased by 157% from baseline in the preventive program group (p<0,01 compared to baseline and compared with usual observation) (Wienbergen et al., 2019).

Somewhat opposite results were obtained by other authors. In particular, it was found that the participation of patients after myocardial infarction in a 12-month individual educational program, which was conducted in a unique non-hospital environment ("House of Education"), and which aimed to reduce risk factors for cardiovascular diseases, did not lead to an increase in adherence to modification. lifestyle-related risk factors (smoking cessation, increased physical activity, reduction of excess weight) after acute coronary syndrome compared with standard treatment. Patients attended such classes after 1, 2, 3, 6, 9 and 12 months. If the patient could not visit the "House of Education", the consultation was provided by telephone. After 1 month, from 80,5% to 81,2% of patients attended such classes, and after 12 months, only 37,3% of patients continued consultations regarding smoking cessation, and 56,9% - consultations of a nutritionist on rational nutrition and weight loss. Patients who participated in the 12-month individualized educational program did not differ from patients who received standard treatment in adherence to modification of lifestyle-related risk factors (smoking cessation, increased physical activity, reduction of excess weight) one year after myocardial infarction (Cohen et al., 2014).

The association of low awareness with low attachment that we have established regarding the modification of risk factors for heart disease is confirmed in some aspects by other authors. In particular, low knowledge is associated with low adherence to modification of factors such as low-fat and/or weight loss diets (p<0,01) and reduced alcohol consumption. (p<0,01). At the same time, there was no significant relationship between awareness and other factors: low-salt diet (p=0,175), regular exercise (p=0,872), reduction of stress in everyday life (p=0,072), smoking cessation (p =0,063), which differs from our data (Lee et al., 2018).

Low awareness and commitment to modify lifestyle risk factors requires finding ways to change this situation.

There is evidence of a reduction in fatal and/or non-fatal cardiovascular events, an improvement in the quality of life in patients whose cardiac rehabilitation was supplemented by special training programs. It is noted that cardiac rehabilitation for people with coronary heart disease should be comprehensive and include educational interventions along with physical exercises and psychological therapy and further development of these approaches (Anderson et al., 2017).

Cardiac rehabilitation at home is no less effective than that in the clinic in terms of positive dynamics of clinical indicators and health-related quality of

life indicators. However, further research requires studying the economic effect of such programs (Anderson et al., 2017; Uddin et al., 2020).

Patients after acute coronary syndrome who underwent traditional clinical cardiac rehabilitation and patients who used a smartphone-assisted remote rehabilitation program had similar rates of smoking cessation, BP reduction, depression, anxiety, and quality of life. (Yudi et al., 2020). This confirms the relevance of developing a strategy for personalized primary and secondary prevention, as well as an economic justification for the effectiveness of individualized rehabilitation programs for cardiovascular diseases.

Thus, further research is required to increase awareness and commitment to modifying lifestyle risk factors in accordance with the capabilities and needs of the national healthcare system. Prospects for further research lie in the need to develop information content - as a system of knowledge formation regarding the possibility of modifying risk factors for the purpose of secondary prevention of myocardial infarction, as well as a system for interaction and monitoring of the patient's implementation of the therapeutic plan regarding the modification of the risk factors of recurrent myocardial infarction studied by us. Obviously, the development of strategies for the formation of compliance in the modification of risk factors associated with lifestyle in the long period after myocardial infarction should be developed with the involvement of healthcare professionals with higher non-medical education.

Conclusion

1. Low awareness was revealed about the possibility of modifying such risk factors for recurrent heart attack in a long period of the disease as a decrease in fat intake – 16,52%, regular consumption of vegetables and fruits – 11,41%, smoking cessation – 15,92%, reduction in alcohol consumption – 16,52%, increased physical activity – 14,41%, weight loss with its excess – 3,0%, avoidance of stress – 28,53%. Although the vast majority of patients received appropriate recommendations from the doctor.

2. Low adherence to modification of the indicated risk factors for recurrent infarction in the long-term period of the disease was revealed: only 19,4% noted that they reduce fat intake; 9,7% noted that they regularly consume vegetables and fruits, 11,04% – gave up smoking; 10,70% – reduced alcohol consumption; 12,37% – increase physical activity; 2,34% are trying to lose weight; 18,06% try to avoid stress.

3. There were no gender differences in awareness and commitment to reducing fat intake, regular consumption of vegetables and fruits, increasing physical activity, avoiding stress to reduce the risk of a second heart attack.

4. Significantly more men are aware that quitting smoking and reducing alcohol use reduces the risk of a second heart attack, and significantly more men are committed to quitting smoking and reducing alcohol consumption to reduce the risk of a second heart attack.

5. Significantly more women are aware that weight loss when overweight reduces the risk of recurrent heart attack, but gender differences in adherence to weight loss when overweight have not been identified.

6. Low awareness of the possibility of modifying heart disease risk factors is associated with the failure to implement such non-pharmacological measures in secondary prevention after MI: decrease in fat intake (χ^2=65,12; p=0,000) and regular consumption of vegetables and fruits (F p=0,000), unwillingness to quit smoking (F p=0,000) and decrease in alcohol consumption (F p=0,000), unwillingness to increase physical activity (χ^2=17,61; p=0,000) and reduce weight in case of its excess (F p=0,015), avoiding stress (χ^2=27,42; p=0,000).

Author's contribution

Conceptualization, A.S.; methodology, A.S.; software, O.A.; validation, A.S.; formal analysis, A.S.; investigation, O.Y. and N.U. and O.U.; resources, O.A.; data curation, A.S.; writing – original draft, A.S.; writing – review and editing, O.Y. and N.U. and O.U.; visualization, O.U.; supervision, A.S.; project administration, A.S. All authors have read and agreed with the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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