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# Omorbid Pathology And Age Characteristics Of Patients Requiring Coronary Bypass Surgery In Cardiovascular Disease

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**Abstract**
Purpose. Investigate a group of patients with age-related characteristics and comorbid pathology in patients with cardiovascular disease (CVD) who need coronary bypass surgery.
Material and research methods. Our study included 205 patients (163 (79.5%) men and 42 (20.50%) women) with CVD who need coronary angiography for further identification of multivessel lesions and coronary artery bypass grafting (CABG) in the period of 2018-2021.
Results and discussion. The majority of patients - 99 (48.4%) in the analyzed register were aged from 51 to 60 years. 34.8% patients ranged from 61 to 71 years. Patients aged 71 years and over accounted for 9.3% (n=20). At the same time, the number of patients referred for elective CABG with previous acute coronary events was the highest among young patients. Among young patients, patients with a history of more than two MI prevailed (13.3% and 10.0%, respectively). With increasing age, the history of stroke/transient ischemic attack (TIA) increased from 6.7% to 15.0%, respectively. Smoking with increasing age showed a downward trend (33.3% and 15.0%, respectively). The increase in age was associated with an increase in the proportion of patients with chronic pyelonephritis: from 13.3% in the group of patients ≤ 50 years and up to 40.0% in the group of patients ≥ 71 years.
Conclusion. An increase in patient age is associated with an increase in cardiovascular comorbidity in the absence of a significant increase in non-cardiovascular comorbidities. With the age of patients, the history of acute cerebral circulation insufficiency/TIA increased among older patients.

**Keywords:** Coronary angiography, cardiovascular diseases, hypothyroidism, pyelonephritis, myocardial infarction

## I. INTRODUCTION

Age is a strong risk factor for numerous chronic diseases, therefore, elderly and especially senile patients are characterized by high comorbidity, the prevalence of which reaches 62% among people 65-74 years old and 82% among people ≥85 years old [1,2].

Comorbidity is also of great social importance. Thus, in the United States of America, more than 80% of health care costs are spent on patients with four or more chronic diseases, and health care costs increase exponentially with an increase in the number of diseases [3].
The increase in life expectancy of the population, the improvement of approaches to surgical technique and anesthetic management during myocardial revascularization have significantly expanded the age range of patients requiring elective coronary artery bypass grafting (CABG). So, only in recent years, the average age of patients with open myocardial revascularization has increased from 55.40 years in 2006 to 62.20 years - in 2016. Accordingly, there has been a steady increase in the number of patients who underwent surgery at the age of 70 years and older [4,5].

The current approaches to assessing the risk of hospital complications during CABG are based on the use of various scales, such as: EuroSCORE (1995), STS Score (2006), SYNTAX II (2007), EuroSCORE II (2010) [6] and others . In their calculation, the age of the patient, as well as the presence and severity of comorbid pathology, are of considerable importance. Given the existing "national characteristics" of patients, including the presence of chronic comorbid conditions (oncological diseases, diabetes mellitus (DM), chronic renal failure (CRF), chronic obstructive pulmonary disease (COPD) that were not diagnosed before surgery, it seems important to analyze the existing in patients with coronary artery disease comorbidity in terms of the age factor.

The diverse comorbid background of the patient creates objective difficulties for practitioners, which requires a more multifaceted approach and considering all the features when choosing drug therapy regimens and surgical tactics. In this regard, our study on the impact of comorbid pathology on the course and survival of patients with coronary artery disease who underwent myocardial infarction is certainly relevant.

**The purpose of the study**wasto investigate a group of patients with age-related characteristics and comorbid pathology in patients with

cardiovascular disease (CVD) who need coronary bypass surgery who applied in an outpatient setting.

## II. MATERIAL AND RESEARCH METHODS

Based on the data of patients who applied in an outpatient setting at the Republican Specialized Scientific and Practical Medical Center for Cardiology (RSSPMCC), a selection and analysis of the detection of comorbid pathology with age-related features in patients with CVD who need coronary angiography was carried out for further identification of multivessel lesions and CABG in the period of 2018 -2021.
The study protocol complied with the requirements of the ethics committee of the institution and was developed in accordance with the Helsinki Declaration of the World Association "Ethical principles for conducting scientific medical research involving humans", as amended in 2013.

Our study included 205 patients (163 (79.5%) men and 42 (20.50%) women) with CVD and comorbid pathology who applied for consultation at the polyclinic and CABG was performed on the basis of the RSSPMCC. The mean age of the patients was 54.14±9.87 (from 31 to 79 years) years ($p < 0.05$). For each patient included in our study, an individual registration card was filled out with the patient's primary data and further results after CABG.

The analysis of concomitant pathology was carried out in patients in the aspect of registration of cardiovascular pathology and chronic diseases in history. The fact of the presence of comorbidity was judged by the results of the analysis of examinations carried out in outpatient conditions of the RSSPMCC. For a total assessment of the comorbid background of patients, a modified (taking into account ischemic heart disease (IHD) and chronic heart failure (CHF) Charlson comorbidity index was calculated. This index is a scoring (from 0 to 40) system for assessing the presence of certain concomitant diseases and is used to predict mortality and points corresponding to concomitant diseases, and one point is added for every ten years of life when the patient exceeds the age of forty (i.e. 50 years - 1 point, 60 years - 2 points, etc.) [7].

All patients were divided into 4 age groups: under 50 years old, 51-60 years old, 61-70 years old, over 70 years old. Statistical data analysis was carried out using the SPSS program (version 20.0).

When analyzing the material, mean values (M), standard deviations (SD) were calculated. Comparison of indicators in 4 groups was performed using one-way analysis of variance with the Bonferroni correction (taking into account multiple comparisons) for quantitative indicators and $\chi 2$ - for qualitative indicators. The value of $p < 0.05$ was taken as statistically significant.

## III. RESULTS AND DISCUSSION

The majority of patients - 99 (48.4%) in the analyzed register were aged 51 to 60 years. The age of 71 (34.8%) patients ranged from 61 to 71 years. Patients aged 71 years and over accounted for 9.3% (n=20).

The minimum number of patients was under the age of 50 years (n=15; 7.5%). Naturally, with the increase in the age of patients, the proportion of women increased. Thus, if in the age group under 50 the percentage of women was minimal (4.5%), then in the older age group the proportion of women was 36.1% (Fig. 1).

**Gender composition of examined patients with CABG depending on age**

**Figure 1**

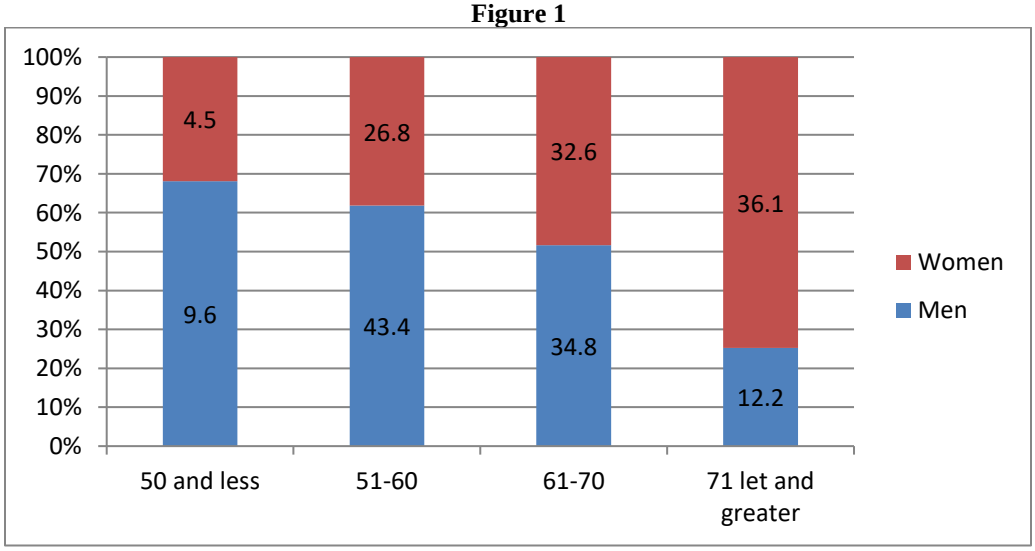

**Figure 1**. The minimum number of patients was under the age of 50 years (n=15; 7.5%). Naturally, with the increase in the age of patients, the proportion of women increased. Thus, if in the age group under 50 the percentage of women was minimal (4.5%), then in the older age group the proportion of women was 36.1%.

Analyzing the features of comorbid cardiovascular pathology, it should be noted that as the age increased, the percentage of patients with arterial hypertension (AH), manifestations of multifocal atherosclerosis (MFA), including hemodynamically significant lesions of the brachiocephalic arteries (BCA) naturally increased; the proportion of patients with a high functional class (FC) of angina pectoris and heart failure (HF), heart rhythm disturbances increased.

At the same time, the number of patients referred for elective CABG with previous acute coronary events was the highest among young patients. So, if among patients under the age of 50 years, 11 (73.3%) had at least one myocardial infarction (MI) in history (60.0% and 50.0%, respectively), then in the age group of 71 years and older patients was significantly less - 60.0% (p = 0.002). Moreover, among young patients, patients with a history of more than two MI prevailed (13.3% and 10.0%, respectively). With increasing age, the history of stroke/TIA increased from 6.7% to 15.0%, respectively. Smoking with increasing age showed a downward trend (33.3% and 15.0%, respectively) (table 1).

The number of previously performed percutaneous coronary interventions (PCI) did not differ among patients of different groups.

**Age characteristics of cardiovascular risk factors in patients with coronary artery disease**

**Table 1**

| Disease | Age groups, n (%) | | | | P |
|---|---|---|---|---|---|
| | ≤ 50 years (n=15) | > 51 ≤ 60 years (n=99) | 61 ≤ 70 years (n=71) | ≥ 71 years (n=20) | |
| AH | 12 (80.0) | 86 (86.8) | 65 (91.5) | 19 (95.5) | 0,01 |
| MI, including: | 11 (73.3) | 79 (79.7) | 46 (64.8) | 12 (60.0) | 0,002 |
| 1 MY | 9 (60.0) | 64 (64.6) | 38 (53.5) | 10 (50.0) | 0,04 |
| 2 and more MI | 2 (13.3) | 15 (15.1) | 8 (11.3) | 2 (10.0) | 0,203 |
| Stroke/TIA | 1 (6.7) | 10 (10.1) | 10 (14.0) | 3 (15.0) | 0,084 |
| Impairment cerebral circulation | 6 (40.0) | 48 (48.4) | 39 (54.9) | 13 (65.0) | 0,065 |
| Smoking | 5 (33.3) | 41 (41.4) | 14 (19.7) | 3(15.0) | 0,01 |
| CHF FCI-II | 11 (73.3) | 70(70.7) | 48 (67.6) | 11 (55.0) | 0,05 |
| CHF FCIII-IV | 4 (26.7) | 29 (29.3) | 23 (32.4) | 9 (45.0) | 0,002 |
| Angina I-II | 7(46.7) | 44(44.4) | 22 (31.0) | 4 (20.0) | 0,05 |
| Angina III-IV | 6 (40.0) | 45 (45.4) | 41 (57.7) | 14 (70.0) | 0,02 |
| Unstable angina | 2 (13.3) | 11 (11.1) | 8 (11.3) | 2 (10.0) | 0,001 |
| Atrial fibrillation | 1 (6.7) | 12 (12.1) | 10 (14.1) | 4 (20.0) | 0,05 |
| PCI in history | 1 (6,7) | 5 (5,0) | 5 (7,0) | 1 (5,0) | 0,401 |
| CABG | 0 | 1 (1,0) | 0 | 0 | 0,034 |

***Notes: AH - arterial hypertension; BCA - brachiocephalic arteries; MI - myocardial infarction; KCABG - coronary artery bypass grafting; ACI - acute cerebrovascular accident; TIA - transient ischemic attack; FC - functional class; AF - atrial fibrillation; PCI - percutaneous coronary intervention.***

Table 2 presents data on the frequency of detection of non-cardiovascular pathology in patients before CABG. The increase in age was associated with an increase in the proportion of patients with chronic pyelonephritis: from 13.3% in the group of patients ≤ 50 years and up to 40.0% in the group of patients ≥ 71 years. In addition, in patients of the older age group, thyroid pathology (hyper / hypothyroidism) was detected more often (20.0%) compared to patients aged 50 years and younger, where this pathology was determined by 6.7%. With increasing age, there were more patients with a history of type 2 diabetes (13.3% and 25.0%, respectively) as well as patients with CRF

(33.3% and 45.0%, respectively). At the same time, there were no significant differences in the age groups in the frequency of detection of patients with carbohydrate metabolism disorders, lung damage, obesity, overweight, and diseases of the gastrointestinal tract.
It turned out that the average values of the Charlson index did not differ significantly depending on the patient's belonging to the age group. Thus, in patients under the age of 51 it was 3.40 ± 1.51, in patients aged 51 to 60 it was 4.14 ± 1.58; from 61 to 70 years old - 4.39 ± 1.58; and from 71 years and older - 4.53 ± 1.93. The differences were not statistically significant ($p > 0.05$).

**Age distribution of the frequency of comorbidity in patients with coronary artery disease**

**Table 2**

| Disease | Age groups, n (%) | | | | P |
|---|---|---|---|---|---|
| | ≤ 50 year (n=15) | > 51 ≤ 60 year (n=99) | (n=71) | ≥ 71 year (n=20) | |
| Chronic pyelonephritis | 2 (13,3) | 30 (30,3) | 23 (32,4) | 8(40,0) | 0,005 |
| Chronic cystitis | 1 (6,7) | 22 (22,2) | 19 (26,8) | 6 (30,0) | 0,065 |
| Glucose intolerance | 2 (13,3) | 10 (10,1) | 8 (11,3) | 2 (10,0) | 0,401 |
| Type 2 DM | 2 (13,3) | 21(21,2) | 16 (22,5) | 5 (25,0) | 0,05 |
| Chronic bronchites | 3 (20,0) | 32 (32,3) | 25 (35,2) | 6 (30,0) | 0,01 |
| COPD | 1 (6,7) | 12(12,1) | 22(30,9) | 5 (25,0) | 0,201 |
| BA | - | 2 (2,0) | 2 (2,8) | 1 (5,0) | 0,253 |
| Obesity- I ст | 4 (26,7) | 27 (27,2) | 20 (28,2) | 5 (25,0) | 0,074 |
| Obesity –IIст | 3 (20,0) | 7 (7,1) | 5 (7,0) | 1 (5,0) | 0,085 |
| Obesity–III ст | 2 (13,3) | 3 (3,1) | 1 (1,4) | - | 0,092 |
| Overweight | 5 (33,3) | 38 (38,3) | 28 (39,4) | 6 (30,0) | 0,05 |
| Chronicpancreatitis/cholecystitis | 3 (20,0) | 22 (22,1) | 22 (30,9) | 7 (35,0) | 0,024 |
| Chronicprostatitis/cystitis | 2 (13,3) | 28 (28,3) | 21 (29,6) | 6 (30,0) | 0,064 |
| Osteochondrosis | 3 (20,0) | 30 (30,3) | 25 (35,2) | 8 (40,0) | 0,074 |
| Hyper/hypothyroidism | 1 (6,7) | 12 (12,1) | 11 (15,5) | 4 (20,0) | 0,085 |
| Gastritis/duodenitis/esophagitis/GERD | 8 (53,3) | 62 (62,6) | 41(57,7 ) | 11 (55,0) | 0,04 |
| Peptic ulcer of the stomach and duodenum | 2 (13,3) | 25 (25,2) | 19 (26,8) | 3 (15,0) | 0,06 |
| CKD | 5 (33,3) | 37 (37,7) | 29 (40,8) | 9 (45,0) | 0,062 |

***Notes: BA - bronchial asthma; GERD - gastroesophageal reflux disease; D - duodenum; Chr. - chronic; IGT - impaired glucose***

***tolerance; DM - diabetes mellitus; COPD - chronic obstructive pulmonary disease; CRF - chronic renal failure.***

Discussing the presented data, first of all, attention should be paid to the "rich" cardiovascular history of patients referred for CABG. So, in general, 72.50% of patients had a history of myocardial infarction. Similar results were obtained in studies by D.G. Gromov et al. (2010) [8] and E.P. Pogurelskaya et al. (2009) [9]: the proportion of patients with acute coronary events prior to open revascularization was 71.0% and 72.8%, respectively. In European countries, the percentage of people with MI before CABG is much lower and varies from 5.8% to 19.0% [10]. According to the STS multicenter database, in the USA this figure is 22% [11].

Postinfarction cardiosclerosis in the present study was more often detected in patients in the age groups up to 60 years than in patients of older age groups. Explanations for this fact are possible from the standpoint of the fact that in young people, the onset of IHD is most often acute coronary syndrome (ACS), and not manifestations of angina pectoris, as in the elderly. However, it is important to note that young patients are more likely than older patients to have a history of recurrent coronary events. At the same time, it is surprising that only a few patients with past episodes of ACS, including those of young age, had previously undergone any surgical interventions on the coronary and peripheral arteries (PCI - 6.7%). This fact, on the one hand, indicates the untimely performance of diagnostic angiography and revascularization procedures. On the other hand, it may also indicate a more aggressive course of coronary artery disease in young patients requiring CABG.

It cannot be ruled out that such differences are also due to certain specifics of the selection of patients for CABG. Thus, it is known that in elderly patients in the general population, as well as with the CHD clinic, a more frequent comorbid pathology is recorded, which, in combination with myocardial infarction, the development of HF, increases the risk of death and complications and, thus, limits the indications for surgical treatment. According to the results of the study, an increase in age is associated with a history of hypertension, manifestations of MFA, including hemodynamically significant BCA lesions. The number of patients with severe FC of angina pectoris and CHF, atrial fibrillation (AF) is steadily growing, which is consistent with the results of other studies [12-14]. Naturally, with an increase in the age of patients, the proportion of women increases, which is consistent with a study conducted earlier at the Research Institute for Complex Problems of Cardiovascular Diseases [15].

At the same time, there were no statistically significant differences in the frequency of registration of such important comorbid components as carbohydrate metabolism disorders, chronic diseases of the lungs and gastrointestinal tract, chronic renal failure. The increase in age was associated only with an increase in the number of patients with chronic pyelonephritis and thyroid pathology compared with patients aged 50 years and younger, which may be one of the factors that increase the proportion of patients with AF with increasing age. Thus, the presented data indicate that patients of older age groups referred for CABG, despite a higher FC of angina pectoris and CHF, a higher frequency of AH, MFA, and cardiac arrhythmias, are less likely to have a history of MI before revascularization interventions, as well as a comparable with "young" comorbidity. Indeed, the sample of patients referred for CABG differs significantly both from population data [16] and from the general cohort of patients with coronary artery disease [17]. The absence of a significant increase in the Charlson index, which to a certain extent reflects the severity of the patient's condition (both in the presence of cardiovascular and comorbidities) with increasing age, allows us to assert a "preferential" selection of patients for surgery, characterized by the choice of patients for CABG with less burdened with cardiovascular and concomitant pathology. Of course, the comparison of the analyzed patient populations with a cohort of patients referred for PCI will provide a more complete picture of the "portrait of patients" undergoing various options for myocardial revascularization.

## IV. CONCLUSION

An increase in patient age is associated with an increase in cardiovascular comorbidity in the absence of a significant increase in non-cardiovascular comorbidities. With the age of patients, the history of Stroke/TIA increased among older patients. The increase in age was associated only with an increase in the number of patients with thyroid pathology compared with patients aged 50 years and younger, which is one of the factors that increase the proportion of patients with AF with increasing age. The highest percentage of patients with cardiosclerosis was found among young patients.

**Conflict of interest.**No potential conflict of interest relevant to this article was reported.

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## REFERENCES

1. Barnett K, Mercer SW, Norbury M, et al. Epidemiology of multimorbidity and implications for health care, research, and medical education: a cross-sectional study. Lancet. 2012;380(9836):37-43. doi:10.1016/S0140-6736(12)60240-2.
2. Guiding principles for the care of older adults with multimorbidity: an approach for clinicians: American geriatrics society expert panel on the care of older adults with multimorbidity. J Am Geriatr Soc. 2012; 60(10):E1-E25. doi:10.1111/j.1532-5415.2012.04188.x.

3. Pazdernik M. ,Gramegna M. , Bohm A. , ... Westermann D. , Schrage B. Regional differences in presentation characteristics, use of treatments and outcome of patients with cardiogenic shock: Results from multicenter, international registry. Biomedical Papersthis link is disabled, 2021, 165(3), pp. 291–297.
4. Complex problems of cardiovascular diseases 2017; 2 (adj.): 53. Analysis of the activities of the clinic of the Research Institute of the KPSSZ. Complex problems of cardiovascular diseases 2017; 2 (adj.): 88-90.
5. Bohbot Y. , Habib G. , Laroche C. , ... Alyavi B. , Uzokov J. Characteristics, management, and outcomes of patients with left-sided infective endocarditis complicated by heart failure: a substudy of the ESC-EORP EURO-ENDO (European infective endocarditis) registry. European Journal of Heart Failurethis link is disabled, 2022, 24(7), pp. 1253–1265.
6. Roques F., Michel P., Goldstone A.R., Nashef S.A. The logistic EuroSCORE. Eur Heart J 2003; 24 (9): 882- 883.
7. Bekbaulieva, G.N. , Abduraimova, G.A. , Razzakova, N.S. , Uzokov, J. Influence of technologies of effective perinatal care on operating indicators of obstetric complexes // Journal of Critical Reviews, 2020, 7(9), pp. 1182–1184.
8. Gromov D.G. Surgical and endovascular myocardial revascularization in patients with coronary artery disease with multivessel coronary disease: a comparative analysis of immediate and medium-term results: Abstract of the thesis. dis. doc. honey. Sciences. M., 2010.
9. Uzokov J., Statins and dementia: effect of statins beyond the treatment of dyslipidaemia, European Journal of Preventive Cardiology, Volume 29, Issue 5, March 2022, Pages 802–803, https://doi.org/10.1093/eurjpc/zwab226
10. Nashef S.A., Roques F., Michel P. et. al. Coronary surgery in Europe: comparison of the national subsets of the European System for cardiac operative risk evaluation database. Eur J CardiothoracSurg 2000; 17 (4): 396-399.
11. LaPar D.J., Filardo G., Crosby I.K. et al. The challenge of achieving 1% operative mortality for coronary artery bypass grafting: a multi-institution Society of Thoracic Surgeons Database analysis. J ThoracCardiovasc
12. Surg 2014; 148 (6): 2686-2696.
13. Borisov I.A., Rudakov A.S., Bletkin A.N. Operative treatment of coronary heart disease in senile patients. Clinical Medicine 2013; 91(2):52-57.
14. Gagaev A.V., Gagaeva I.V., Vasyagin E.V. Surgical treatment of coronary pathology of the elderly and senile age. Bulletin of the NCSSH them. A. N. Bakuleva RAMS Cardiovascular diseases 2011; 12(6, app.): 54.
15. Uzokov J. Influence of abnormal lipid components in statin-naive young adults: Is there any gap? // European Journal of Preventive Cardiology, Volume 27, Issue 8, 1 May 2020, Pages 868–869. https://doi.org/10.1177/2047487319894693
16. Van Oostrom S.H., Gijsen R., Stirbu I. et al. Time trends in prevalence of chronic diseases and multimorbidity not only due to aging: data from General Practices and Health Surveys. PLoS One 2016; 11 (8): e0160264. doi: 10.1371/journal.pone.0160264.
17. Matić I, Froelicher ES, Uzokov J, Ljubas A. A Survey on Cardiovascular Nursing Occupational Standard: Meeting the Needs of Employers. Policy Polit Nurs Pract. 2021 Feb;22(1):73-79.
18. Adelborg K., Horvath-Puho E., Schmidt M. et al. Thirty-year mortality after coronary artery bypass graft surgery: A Danish Nationwide Population-Based Cohort Study. Circ Cardiovasc Qual Outcomes 2017; 10: e002708. doi:10.1161/CIRCOUTCOMES.116.002708.