Characteristics of hospitalized patients with established coronary artery disease and trends in their management: Comparing 2013 and 2020

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INTRODUCTION

Among patients with cardiovascular (CV) diseases, the most significant subgroup are people with established coronary artery disease (CAD) because this population has a higher risk of recurrence of adverse CV incidents [1–3].

It is known that in southern Poland, in recent years, despite the increasing knowledge about secondary prevention of CV diseases and the introduction of new drugs and rehabilitation programs, the control of risk factors in patients with established CAD has not improved significantly over this span [4, 5].

The primary aim of our study was to assess how the average levels of blood pressure (BP) and body mass index (BMI) changed between 2013 and 2020, as well as the concentrations of given fractions of cholesterol, glucose, and uric acid. We wanted also to compare the frequency of ordering certain laboratory tests and entering measurements in the medical records and analyze how often cardioprotective drugs were prescribed to patients with established CAD in 2020 compared to 2013.

METHODS

This retrospective analysis was performed using data from the electronic database of patients hospitalized in a department of cardiology located in Kraków, Poland. Data of adult patients admitted from the period between January 1 and December 31, 2013 were compared with the data for 2020. Subjects were identified using International Classification of Diseases, 10th Revision (ICD-10) codes for stable CAD [6].

Detailed specifications of the data collection methods and statistical methods used in this study are presented in Supplementary material 1.

RESULTS AND DISCUSSION

The number of admissions to the Department of Cardiology, Electrocardiology, and Hypertension with the main diagnosis of chronic CAD (codes I25.0–9 in ICD-10) between January 1 and December 31 was 154 in 2013 and 113 in 2020. A total of 12 patients in 2013 required multiple admissions due to an exacerbation of CAD, so the final total of 142 patients for that year was included in the analysis. Similarly, a total of 103 patients for 2020 were included in the analysis.

The patients hospitalized in 2020 were older than in 2013. The patients treated in the analyzed two periods had a very similar prevalence of recorded hypertension (HTN), hypercholesterolemia, and diabetes mellitus in their history, and differences in these proportions were not statistically significant. Patients hospitalized in 2020 were significantly more likely to have a history of atrial fibrillation/atrial flutter, non-CV operation, and smoking ≥10 pack-years (differences were statistically significant, also after adjusting for age and sex). The data mentioned above are shown in Supplementary material, *Table S1*.

Many laboratory tests were performed significantly more frequently in patients

Table 1. Anthropometric data, blood pressure, and laboratory tests in patients hospitalized in 2013 vs. 2020

Year of admission	Mean (SD) or median (IQR) [n of analyzed patients]				Normal range[a]
	2013	2020	*P*-value	*P*-value[b]	
Total n of patients	142	103	—	—	—
SBP, mm Hg	132.0 (126.5–144.0) [141]	131.0 (122.0–140.0) [103]	0.25	0.21	<140
DBP, mm Hg	80.0 (72.0–85.0) [141]	78.0 (70.0–82.0) [103]	0.027	0.19	<90
BMI, kg/m^2	29.8 (27.2–31.5) [90]	32.0 (27.2–33.9) [54]	0.019	0.14	18.5–24.9[c]
Height, cm	167.7 (8.9) [85]	168.9 (8.7) [40]	0.496	0.05	—
Weight, kg	83.4 (13.8) [81]	87.6 (22.4) [40]	0.28	0.049	—
Laboratory parameter, unit					
HGB, g/dl	13.9 (13.1–14.8) [141]	13.8 (12.7–14.7) [103]	0.33	0.38	14.0–18.0[d]
WBC, ×10^3/ul	6.8 (5.7–8.0) [141]	7.8 (6.1–9.1) [103]	0.003	0.002	4.0–10.0
PLT, ×10^3/ul	199.0 (172.5–242.0) [141]	236.0 (192.0–275.0) [103]	<0.001	<0.001	125.0–340.0
TC, mmol/l	4.1 (3.5–4.7) [88]	3.7 (3.1–4.3) [94]	0.019	0.24	3.5–5.2
LDL-C, mmol/l	2.1 (1.7–2.8) [87]	1.7 (1.4–2.4) [94]	<0.001	0.026	<3.4
HDL-C, mmol/l	1.1 (0.9–1.5) [88]	1.2 (0.9–1.4) [94]	0.26	0.69	>1.0
TG, mmol/l	1.3 (0.9–1.8) [88]	1.3 (1.0–1.8) [94]	0.47	0.49	<2.3
FGL, mmol/l	5.5 (5.0–6.3) [81]	5.6 (5.2–6.9) [82]	0.37	0.25	3.5–5.6
HbA_{1C}, %	—	6.9 (1.4) [35]	—	—	4.3–5.9
Uric acid, umol/l	351.1 (122.7) [29]	361.2 (107.2) [75]	0.68	0.86	202.0–416.0
Urea, mmol/l	6.5 (5.3–8.0) [141]	7.2 (5.6–9.1) [103]	0.047	0.09	2,8–8.1
Creatinine, umol/l	80.0 (67.0–100.3) [142]	91.8 (77.3–111.0) [103]	0.002	0.21	62.0–106.0
Na^+, mmol/l	140.0 (138.0–142.0) [141]	140.0 (138.0–141.0) [102]	0.41	0.31	136.0–145.0
K^+, mmol/l	4.5 (4.2–4.7) [141]	4.5 (4.2–4.9) [101]	0.36	0.48	3.5–5.1
APTT, s	33.4 (31.3–36.5) [139]	29.9 (27.9–33.0) [102]	<0.001	0.009	26.0–36.0
PT, s	11.9 (11.3–12.5) [141]	11.1 (10.5–11.9) [102]	<0.001	0.07	8.5–12.7
INR	1.1 (1.1–1.2) [141]	1.0 (0.9–1.1) [102]	<0.001	<0.001	0.9–1.2
NT-proBNP, pg/ml	2762.0[e] [3]	563.0 (144.0–2168.0) [87]	0.69	0.86	<125.0

[a]Values' normal ranges according to norms in University Hospital in Krakow laboratories. [b]Adjusted for age and sex. [c]According to the World Health Organization. Regional Office for Europe: https://www.euro.who.int/en/health-topics/disease-prevention/nutrition/a-healthy-lifestyle/body-mass-index-bmi. [d]12–17 g/dl in women. [e]The interquartile range was not calculated because there were only 3 values of this parameter

Abbreviations: APTT, activated partial thromboplastin time; BMI, body mass index; DBP, diastolic blood pressure; FGL, fasting glucose; HbA_{1C}, glycated hemoglobin; HDL-C, high-density lipoprotein cholesterol; HGB, hemoglobin; INR, international normalized ratio; IQR, interquartile range; K^+, potassium; LDL-C, low-density lipoprotein cholesterol; N, number; Na^+, natrium; NT-proBNP, N-terminal pro-B natriuretic peptide; PLT, platelets count; PT, prothrombin time; SBP, systolic blood pressure; SD, standard deviation; TC, total cholesterol; TG, triglycerides; WBC, white blood cells count

in 2020 than in 2013, also after adjusting for sex and age. These tests include measuring the levels of total cholesterol, low-density lipoprotein cholesterol (LDL-C), high-density lipoprotein cholesterol, triglycerides, fasting glucose, and glycated hemoglobin. These tests were measured 22.6%–34.0% more frequently in 2020 than in 2013. There were even bigger differences when looking at the frequency of the measurements of levels of uric acid (52.4%) and N-terminal pro-B-type natriuretic peptide (82.4%), while comparing 2020 vs. 2013 (Supplementary material, *Table S2*).

Regarding procedures reported in the medical records in 2020 compared to 2013, transthoracic echocardiography was entered more than twice as often, and carotid ultrasound was entered about three times as often. The largest difference was how often the fractional flow reserve procedure was performed. All differences were statistically significant, also after adjusting for age and sex. These data are shown in Supplementary material, *Table S2*.

Considering patient characteristics and their laboratory test results that are associated with patients' CV risk, only the difference in the level of LDL-C between 2020 and 2013 was statistically significant after adjusting for age and sex (median [interquartile range, IQR], 1.7 [1.4–2.4] mmol/l vs. 2.1 [1.7–2.8] mmol/l) (Table 1).

Analyzing medications prescribed at hospital discharge, it can be concluded that in 2020, patients were significantly more frequently prescribed ticagrelor, ezetimibe, allopurinol, non-vitamin K antagonist oral anticoagulants (NOAC), and rivaroxaban in vascular dose, than in 2013. These data are shown in Supplementary material, *Table S3*.

Referring to the characteristics of the patients with CAD analyzed in our study, they can be, to some extent, compared to the results of the EUROASPIRE IV [7] and EUROASPIRE V studies [8]. EUROASPIRE IV and V were cross-sectional studies that evaluated the control of CV risk factors in patients with CAD at least 6 months after their initial hospitalization, and data was collected in 2012–2013 and 2017–2018, respectively. Our retrospective study was methodologically different from the prospective EUROASPIRE IV and V studies, but some aspects of these different investigations can still be compared.

The EUROASPIRE IV study (2012–2013) showed that patients with CAD had major problems in achieving secondary prevention goals, e.g. 37.6% were obese (body mass index [BMI], ≥30 kg/m^2), 42.7% had blood pressure ≥140/90 mm Hg (≥140/80 mm Hg if diabetic), 80.5% had LDL-C ≥1.8 mmol/l, 16.0% and were smokers. Additionally, 26.8% of them reported having diabetes [7]. Our patients from 2013 were similar to those from the EUROASPIRE IV

study. They were, in many cases, obese (median [IQR] BMI, 29.8 [27.2–31.5] kg/m^2), 35.2% had diabetes, and a high percentage of them had a problem with smoking (37.3% had at least 10 pack-years of smoking cigarettes in the past).

The much higher prevalence of HTN in our 2013 patient population (97.2%), compared to the EUROASPIRE IV study data (78.6%) [7], may be because HTN was over-diagnosed in our study. After all, patients who received drugs to reduce their CV risk were probably considered to have HTN. What may have contributed to this is that our patients were on average older than those in the EUROASPIRE IV study.

Similarly, the prevalence of hypercholesterolemia was higher in our 2013 patients (98.6%) than in the EUROASPIRE IV study (74.2%) [7]. Patients who were treated using hypolipidemic therapy to reduce CV risk, and not necessarily because of too high levels of LDL-C, may have been over-diagnosed with hypercholesterolemia, considering their medical documentation.

The EUROASPIRE V study (2017–2018) showed that problems with obesity, optimal control of BP, and smoking in CAD patients have not decreased in EU countries since 2012–2013 [8]. These trends were also observed in patients from our study comparing 2020 to 2013.

Patients from our 2020 study were more likely to be prescribed at-discharge medications from a few groups: allopurinol, ezetimibe, NOACs, rivaroxaban in vascular dose, and ticagrelor. These changes may be due to: (1) the increasingly emphasized role of uric acid as one of the factors of CV-disease control and, therefore, the more frequent inclusion of this allopurinol in the treatment; (2) an overall trend towards lowering LDL-C targets as the years progressed, following the European Society of Cardiology (ESC) guidelines — using ezetimibe combined with statins is often necessary to lower the level of LDL-C; (3) the results of studies showing that rivaroxaban in vascular dose may be beneficial to patients with arteriosclerosis and the introduction of such a dose of this NOAC drug into the treatment [3].

Results from our study can be, in part, compared to results from a large prospective study including 11 021 patients with established CAD hospitalized between 2006 and 2016 in one center in the southwestern part of Poland (Zabrze). It may be noted that some characteristics of the patients from our study were very similar to the mentioned study (e. g. age, BMI, history of atrial fibrillation, or diabetes mellitus). The percentages of cardioprotective drugs prescribed to patients, e.g. antiplatelets, beta-blockers, or angiotensin-converting enzyme inhibitors [9], were also similar.

Study limitations

The imitations of our study include the relatively small number of hospitalizations that were analyzed. Diseases including patients' past medical history were determined by medical records or by interviewing patients on admission. This causes possible limitations related to patient misinformation or the lack of previous documentation.

Further limitations arise from measurements taken during hospitalizations in 2013 and 2020. BP measurements were not always in accordance with the recommendations of the European Society of Cardiology (ESC)/European Society of Hypertension (ESH) guidelines and patients' anthropometric parameters were not always defined identically. These results, however, reflect findings from everyday clinical practice.

CONCLUSIONS

Patients with CAD treated in 2020 were older, had a significantly lower level of LDL-C, and were more often prescribed at discharge ticagrelor, ezetimibe, allopurinol, NOAC, and rivaroxaban in vascular dose, than patients in 2013. Better control of LDL-C levels, BP, and a reduction of patients' weight (BMI) is needed.

Supplementary material

Supplementary material is available at https://journals.viamedica.pl/kardiologia_polska.

Article information

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