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ORIGINAL ARTICLE

The impact of first wave of the SARS-CoV-2 2019 pandemic in Poland on characteristics and outcomes of patients hospitalized due to stable coronary artery disease

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Abstract

Background: *An investigation of baseline characteristics, treatment, and outcomes in patients with stable coronary disease after the first wave of the severe acute respiratory syndrome coronavirus 2 (SARS--CoV-2) pandemic may provide valuable data and is beneficial for public health strategy in upcoming years.*

Methods: *A multi-institutional registry, including 10 cardiology departments, was searched for patients admitted from June 2020 to October 2020. The baseline characteristics (age, gender, symptoms, comorbidities), treatment (non-invasive, invasive, surgical), and hospitalization outcome (mortality, myocardial infarction, stroke, composite endpoint — major adverse cardiac and cerebrovascular events [MACCE]) were evaluated. The comparison was made to parameters presented by patients from the same timeframe in 2019 (June–October). Multivariable analysis was performed.*

Results: *Number of hospitalized stable patients following lockdown was lower (2498 vs. 1903; $p < 0.0001$). They were younger (68.0 vs. 69.0; $p < 0.019$), more likely to present with hypertension (88.5% vs. 77.5%; $p < 0.0001$), diabetes (35.7% vs. 31.5%; $p = 0.003$), hyperlipidemia (67.9% vs. 55.4%; $p < 0.0001$), obesity (35.8% vs. 31.3%; $p = 0.002$), and more pronounced symptoms (Canadian Cardiovascular Society [CCS] III and CCS class IV angina: 30.4% vs. 26.5%; $p = 0.005$). They underwent percutaneous treatment more often (35.0% vs. 25.9%; $p < 0.0001$) and were less likely to be referred for surgery (3.7% vs. 4.9%; $p = 0.0001$). There were no significant differences in hospitalization outcome. New York Heart Association (NYHA) class IV for heart failure was a risk factor for both mortality and MACCE in multivariate analysis.*

Conclusions: *The SARS-CoV-2 2019 pandemic affected the characteristics and hospitalization course of stable angina patients hospitalized following the first wave. The hospitalization outcome was similar in the analyzed time intervals. The higher prevalence of comorbidities raises concern regarding upcoming years.* (Cardiol J 2023; 30, 3: 337–343)

Key words: COVID-19, coronavirus, lockdown, coronary artery disease, pandemic

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Introduction

The severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) pandemic spread across the globe and affected life in many aspects. By October 2021 over 239 million people had suffered from infection, including only confirmed cases [1]. As such, the healthcare system in many counties remains in jeopardy. The effect of increased mortality, not only from the infection itself but also from other diseases, became apparent. According to the Polish National Primary Statistical Department, there were over 67,000 more deaths in 2020 than in 2019 in Poland, which highly exceeds the number of deaths from the infection itself [2].

Circulatory diseases, particularly heart conditions, remain the main cause of mortality and morbidity in developed countries. The investigation of the impact of the lockdown on cardiological care is of the highest priority because rapid intervention in this area is required to prevent a great number of deaths and hospitalizations. In Poland, as well as in other countries, several analyses have already been performed. However, they include mainly acute coronary syndrome (ACS) cases — their incidence and course during the pandemic [3–6]. As such, some additional analyses, considering mainly stable coronary disease, should be performed because those patients stand as a major proportion of cases referred to interventional cardiology departments. Furthermore, the investigation may provide valuable data and is beneficial for public health strategy in upcoming years

The aim of the report is to investigate the patient profile, the number of hospitalizations, and the outcomes in patients with stable coronary disease referred to invasive cardiology department for diagnosis and treatment after the first wave of the SARS-CoV-2 2019 pandemic.

Methods

Multi-institutional registry

The report contains data from the invasive cardiology network in Poland, which includes 10 departments. The data regarding patient hospitalization are processed with the medical management software. Because scheduled hospitalizations were limited during the lockdown, the data from June to October 2019 and June to October 2020 were imported to investigate the potential effect of the first wave of the pandemic on patients with stable coronary artery disease (CAD).

Selected parameters

The following data from the database were included in the analysis: the patient's unique hospitalization number, hospitalization department, data of admission and discharge, discharge characteristics, primary diagnosis (initial and after diagnostic process), other diseases, performed procedures, anamnesis, treatment, patient condition, hospitalization course, and complications (death, myocardial infarction, stroke, surgical intervention, cardiac surgery procedure). The composite endpoint comprised major adverse cardiac and cerebrovascular events (MACCE) including death, myocardial infarction, and stroke.

Local Research Ethics Board consent

No Research Ethics Board consent was required for the study. The report is retrospective, the data is a readily available dataset, and no intervention to patients was performed. The National Code on Clinical Trials has reported that ethical approval is not necessary for real retrospective studies (National Code on Clinical Researches, 2011).

Statistical analysis

The continuous data are presented as mean ± standard deviation or median (interquartile range). Categorical data are shown as numbers (percentage). The Shapiro-Wilk test was used to determine normal distribution in continuous data. In cases where normal distribution was confirmed, Student's t-test was used for analysis. In cases where normal distribution was rejected, the Mann-Whitney U test was used for continuous data investigation. The χ^2 test was used for categorical data inquiry. Cox proportional hazards regression model was used for multivariable analysis. Goodness of fit of each multivariate analysis model was verified using the χ^2 test. The data were analyzed using MedCalc v.18.5 software (MedCalc Software, Ostend, Belgium). The p-value of ≤ 0.05 was considered as statistically significant.

Data presentation

The data were divided into categories and presented as number of admissions, information regarding patient condition on admission, demographical data (age and gender), data regarding comorbidities, symptom characteristics, hospitalization course, and hospitalization outcome, including mortality analysis.

Table 1. Baseline patient characteristics.

	2019 (June–October)	2020 (June–October)	P
Hospitalizations due to stable CAD/ /overall CAD hospitalizations	2498/5299 (47.2%)	1903/4523 (42.1%)	**< 0.0001**
Age	69.0 (62.0–75.0)	68.0 (62.0–74.0)	**0.019**
Male gender	1541(61.7%)	1221 (64.2%)	0.093
Arterial hypertension	1885 (75.5%)	1684 (88.5%)	**< 0.0001**
Hyperlipidemia	1384 (55.4%)	1293 (67.9%)	**< 0.0001**
Diabetes	786 (31.5%)	679 (35.7%)	**0.003**
Obesity	783 (31.3%)	682 (35.8%)	**0.002**
Active smoking	422 (16.9%)	359 (18.9%)	0.089
History of stroke	141 (5.6%)	80 (4.2%)	**0.033**
Peripheral artery disease	224 (8.9%)	146 (7.7%)	0.125
CCS III + CCS class IV for angina	662 (26.5%)	578 (30.4%)	**0.005**
CCS IV class for angina	79 (3.2%)	56 (2.9%)	0.675
Symptoms for HF (NYHA II–IV class)	1237 (49.5%)	906 (47.6%)	0.209

Data are presented as number (percentage) and median (interquartile range); CAD — coronary artery disease; CCS — Canadian Cardiovascular Society; HF — heart failure; NYHA — New York Heart Association class for heart failure

Table 2. Treatment during hospitalization.

Treatment during hospitalization	2019 (June–October) N = 2498	2020 (June–October) N = 1903	P
Non-invasive treatment	149 (7.8%)	86 (4.5%)	**0.0346**
Coronary angiography	1549 (62.0%)	1110 (58.3%)	**0.0134**
Percutaneous revascularization	647 (25.9%)	667 (35.0%)	**< 0.0001**
Patients referred for CABG	108 (4.9%)	40 (3.7%)	**0.0001**

Data are presented as number (percentage); CABG — coronary artery bypass grafting

Results

The number of patients hospitalized due to stable CAD was significantly lower in June–October 2020 (following the first lockdown) than in the same period in 2019.

Although the patients presented with the same age and gender, the comorbidity characteristics varied. Significantly higher numbers of patients with arterial hypertension, obesity, diabetes, and hyperlipidemia were noted after the first wave of coronavirus pandemic (Table 1).

Regarding symptom characteristics, a significantly higher number of patients presented with Canadian Cardiovascular Society (CCS) III and CCS class IV of angina after the lockdown than in June––October 2019. However, the number of patients admitted with the most severe angina (CCS IV) was similar (Table 1).

The treatment was very different in June––October 2020 than in June–October 2019. Fewer patients were treated non-invasively, while a greater number of patients qualified for invasive treatment. Notably, a significantly fewer cases were referred for coronary artery bypass grafting procedure (Table 2).

When considering hospitalization outcome, there were no significant differences in mortality, infarction rate, stroke rate, and composite endpoint rate (Table 3).

Cox proportional-hazards regression model revealed no impact of the hospitalization period on mortality (Figs. 1, 2). New York Heart Association (NYHA) class IV for heart failure was the risk factor for mortality (Fig. 1).

Regarding the composite endpoint, NYHA class IV for heart failure was associated with higher risk of MACCE (Figs. 3, 4).

Table 3. Hospitalization outcome.

Hospitalization outcome	2019 (June–October) N = 2498	2020 (June–October) N = 1903	Odds ratio	P
Death	5 (0.2%)	1 (0.05%)	0.2	0.19
Myocardial infarction	2 (0.08%)	2 (0.1%)	1.3	0.78
Stroke	2 (0.08%)	3 (0.2%)	1.9	0.45
MACCE	9 (0.4%)	6 (0.3%)	0.9	0.79

Data are presented as numbers (percentage); MACCE — major adverse cardiac and cerebrovascular events (death, myocardial infarction, stroke)

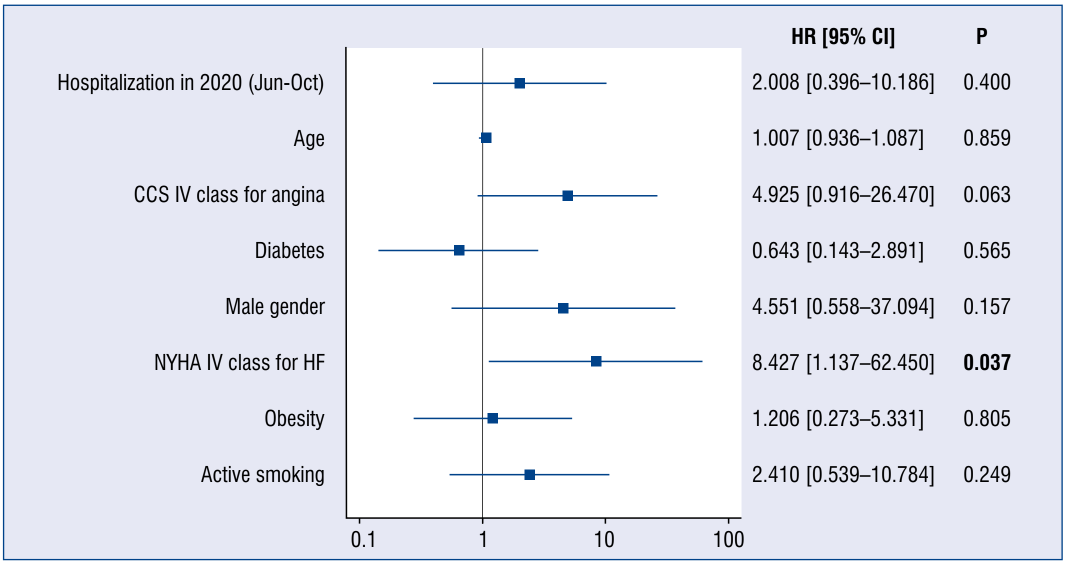

Figure 1. Forest plot of risk ratios for mortality (Cox proportional hazards regression model). Markers represent point estimates of risk ratios. Horizontal bars indicate 95% confidence intervals (CI); CCS — Canadian Cardiovascular Society score for angina; HF — heart failure; HR — hazard ratio; MACCE — major adverse cardiac and cerebrovascular events (death, myocardial infarction, stroke); NYHA — New York Heart Association for heart failure.

Discussion

The effect of the pandemic on healthcare has been touched on in many reports. It is clear that many patients did not receive proper healthcare throughout the pandemic, mainly because of healthcare system paralysis, but also due to fear of contact with potentially infected patients in both public and private hospitals. In fact, the fear of coronavirus disease 2019 (COVID-19) is a reason for patients not attending medical care when experiencing any kind of symptoms, representing multiple diseases [7–11]. It must be underlined that patients with pre-existing cardiovascular disease are especially prone to coronavirus infection and may undergo adverse outcomes due to the infection [12–15].

Not surprisingly, people admitted to hospital following the lockdown had more comorbidities, often untreated or treated inadequately. This is a worldwide phenomenon [16–21]. Furthermore, the pandemic and the lockdown heavily affected people's daily routine. It is important to mention that physical activity has an effect in both the prevention and treatment of CAD [22, 23]. Avoidance of physical exercise, an unhealthy diet, and mental and social problems largely impacted populational health. As a result, a higher number of patients with non-communicable diseases may be expected. Consequently, the long-term outcome in most of those cases is uncertain.

Because patients presented with very different baseline characteristics, the treatment was also different in both time intervals. It seems that despite a decrease in the number of patients hospitalized for stable CAD, the number of percutaneous interventions was even higher in the period following the first wave of the pandemic. This leads to the opposite conclusion to the one reported by other

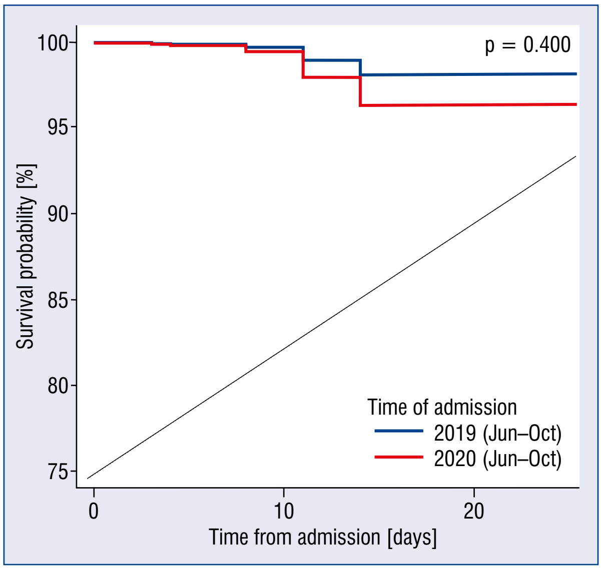

Figure 2. Cox proportional hazards cumulative survival curves with respect to different hospitalization timeframes adjusted for age, Canadian Cardiovascular Society Class IV class for angina, diabetes, male gender, New York Heart Association IV class for heart failure, obesity, and active smoking.

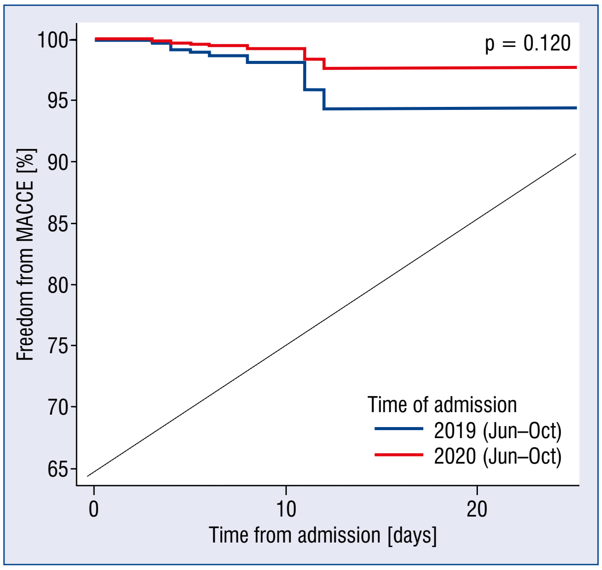

Figure 4. Cox proportional hazards freedom from major adverse cardiac and cerebrovascular events (MACCE) (death, myocardial infarction, stroke) curves with respect to different hospitalization timeframes adjusted for age, Canadian Cardiovascular Society Class IV class for angina, diabetes, male gender, New York Heart Association (NYHA) IV class for heart failure, obesity, and active smoking.

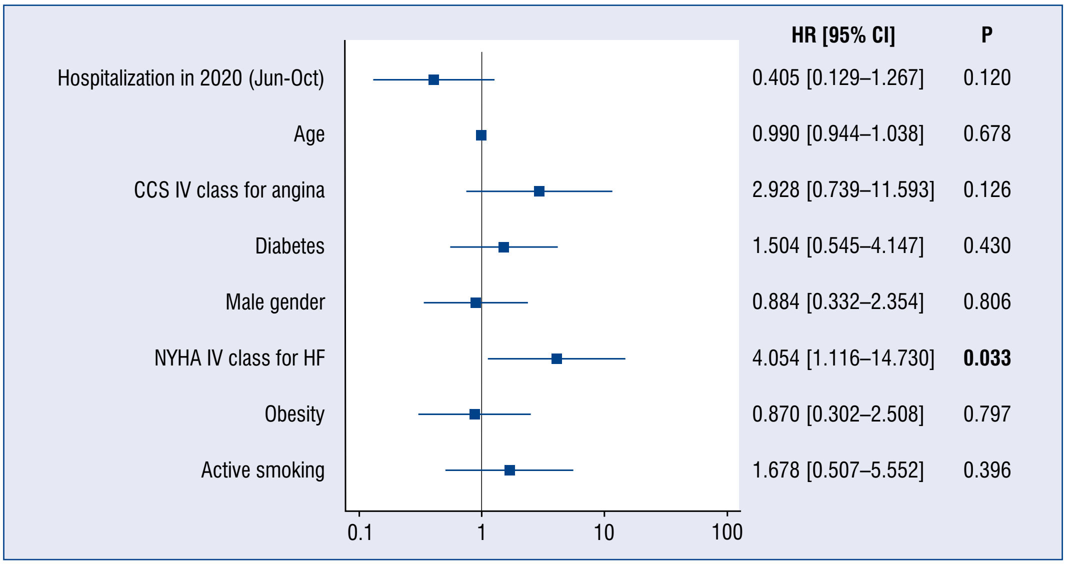

Figure 3. Forest plot of risk ratios for major adverse cardiac and cerebrovascular events (death, myocardial infarction, stroke) (Cox proportional hazards regression model). Markers represent point estimates of risk ratios. Horizontal bars indicate 95% confidence intervals (CI); CCS — Canadian Cardiovascular Society score for angina; HF — heart failure; HR — hazard ratio; NYHA — New York Heart Association for heart failure.

authors [24–26]. However, there are significant differences regarding study methodology. First, our investigation refers to patients admitted following the first wave, which describes the impact of clinical care limitation. In this situation, following lockdown withdrawal, a great number of hospitalizations should be expected due to the greater number of patients with severe symptoms and long lines of patients awaiting diagnostic and therapeutic processes. This effect is probably strongly limited by fear of hospitalization and potential infection, particularly in the elderly. Importantly, the analyzed timeframe refers to a time during which vaccination was not available.

The changes of treatment in time intervals need to be discussed in light of recently published results of the 'Ischemia' trial, which did not find evidence that an initial invasive strategy in stable CAD, as compared with an initial conservative strategy, reduced the risk of ischemic cardiovascular events or death from any cause over a median of 3.2 years [27]. However, it must be noted that both the 'Ischemia' trial and the guidelines for myocardial revascularization [28] underline the importance of adequate medical treatment to prevent symptoms and improve survival. Importantly, the trial was conducted during normal healthcare accessibility, prior to the pandemic. During the pandemic, each case needed to be assessed individually, taking into consideration limited accessibility to both basic healthcare (general practice) and cardiovascular care. Furthermore, the patients admitted following lockdown had more pronounced symptoms than patients admitted in the corresponding timeframe in 2019 (Table 1). The perspective of future waves of the pandemic and upcoming lockdowns also played a role in the decision-making process.

It should be emphasized that some authors already point out the consequences of postponing elective percutaneous revascularization procedures in stable patients [26].

The decrease in the number of patients referred for surgical treatment may also be associated with limited healthcare accessibility. Firstly, avoidance of multiple hospitalizations was strongly required during the pandemic, which might have affected the heart-team decisions in borderline cases to operate in favor of percutaneous treatment. Secondly, the decisions might have been affected by the perspective of an upcoming second wave of the pandemic, taking into consideration the next lockdown. This could interrupt both diagnostic and therapeutic processes and pose an even greater threat for patients. In this scenario, multiple hospitalizations, including staged intervention, complicated diagnostic processes, coronary artery bypass grafting, and longer rehabilitation following surgery, are not advantageous. Furthermore, the potential of coronavirus infection increases the perioperative risk significantly. Global reports present similar reductions in elective surgical procedures [29].

Regarding the hospitalization outcome, there were no significant changes in the analyzed timeframes. This may seem surprising, but it must be remembered that the report contains stable CAD cases. As such, the true impact of the pandemic, including the adverse outcome of the development and lack of control of non-communicable diseases, may yet become visible in a long-term observation. Furthermore, it may be speculated that the most severe cases with initially stable coronary disease underwent an ACS, which excluded them from this study. There are reports that the incidence of ACS cases is much higher (which includes our institutional experience). Those cases develop mostly on the basis of pre-existing stable CAD, which was treated in earlier stages prior to the pandemic. From this perspective, the similar number of deaths in the analyzed timeframes may be related to shifting the most complicated and most severe cases directly to the ACS cohort in 2020.

Similar conclusions can be drawn from the multivariable analysis. There was no direct impact of the hospitalization period on the risk of mortality or MACCE in the stable patient cohort. Importantly, NYHA class IV for heart failure was a risk factor for mortality and MACCE.

Limitations of the study

This report is a retrospective dataset analysis, and most of the limitations are associated with this methodology. What is more, the investigation represents only part of the picture, because due to the delay in diagnosis and treatment, some patients might have suffered from ACS during the first wave of the pandemic or just following the first wave, which excluded them from the report and might have affected the comparison regarding the most severe cases. Furthermore, the true long-term outcome in those patients is yet unknown because they presented with higher incidence of non-communicable diseases, which may have an impact on the incidence of ACS cases in the future as well as on mortality and morbidity.

Conclusions

In conclusion, the SARS-CoV-2 2019 pandemic affected the characteristics and hospitalization course of stable angina patients hospitalized following the first wave. The hospitalization outcome was not significantly affected in this group of cases. However, the high incidence of non-communicable diseases in hospitalized patients is disturbing because an increase in acute cerebrovascular events is to be expected in forthcoming years. Consequently, a great effort should be made to provide cardiovascular care and both primary and secondary prophylaxis to avoid a dramatic rise in the incidence of acute cardiovascular events.

Conflict of interest: None declared

References

1. WHO COVID-19 situation report. https://www.who.int/.
2. Statistics related to COVID-19 infection, Primary Statistical Department. https://stat.gov.pl/.
3. Hawranek M, Grygier M, Bujak K, et al. Characteristics of patients from the Polish Registry of Acute Coronary Syndromes during the COVID-19 pandemic: the first report. Kardiol Pol. 2021; 79(2): 192–195, doi: 10.33963/KP.15756, indexed in Pubmed: 33463992.
4. Mafham M, Spata E, Goldacre R, et al. COVID-19 pandemic and admission rates for and management of acute coronary syndromes in England. Lancet. 2020; 396(10248): 381–389, doi: 10.1016/s0140-6736(20)31356-8.
5. Metzler B, Siostrzonek P, Binder RK, et al. Decline of acute coronary syndrome admissions in Austria since the outbreak of COVID-19: the pandemic response causes cardiac collateral damage. Eur Heart J. 2020; 41(19): 1852–1853, doi: 10.1093/eurheartj/ehaa314, indexed in Pubmed: 32297932.
6. De Filippo O, D'Ascenzo F, Angelini F, et al. Reduced Rate of Hospital Admissions for ACS during Covid-19 Outbreak in Northern Italy. N Engl J Med. 2020; 383(1): 88–89, doi: 10.1056/NEJMc2009166, indexed in Pubmed: 32343497.
7. Lazzerini M, Barbi E, Apicella A, et al. Delayed access or provision of care in Italy resulting from fear of COVID-19. Lancet Child Adolesc Health. 2020; 4(5): e10–e11, doi: 10.1016/s2352-4642(20)30108-5.
8. Marín-Jiménez I, Zabana Y, Rodríguez-Lago I, et al. COVID-19 and inflammatory bowel disease: questions arising from patient care and follow-up during the initial phase of the pandemic (February-April 2020). Gastroenterol Hepatol. 2020; 43(7): 408–413, doi: 10.1016/j.gastrohep.2020.05.003, indexed in Pubmed: 32419715.
9. Hammad TA, Parikh M, Tashtish N, et al. Impact of COVID-19 pandemic on ST-elevation myocardial infarction in a non-COVID-19 epicenter. Catheter Cardiovasc Interv. 2021; 97(2): 208–214, doi: 10.1002/ccd.28997, indexed in Pubmed: 32478961.
10. Pessoa-Amorim G, Camm CF, Gajendragadkar P, et al. Admission of patients with STEMI since the outbreak of the COVID-19 pandemic: a survey by the European Society of Cardiology. Eur Heart J Qual Care Clin Outcomes. 2020; 6(3): 210–216, doi: 10.1093/ehjqcco/qcaa046, indexed in Pubmed: 32467968.
11. Agrawal S, Makuch S, Dróżdż M, et al. The impact of the COVID-19 emergency on life activities and delivery of healthcare services in the elderly population. J Clin Med. 2021; 10(18), doi: 10.3390/jcm10184089, indexed in Pubmed: 34575200.
12. Guan WJ, Ni ZY, Hu Yu, et al. Clinical characteristics of coronavirus disease 2019 in China. N Engl J Med. 2020; 382(18): 1708–1720, doi: 10.1056/NEJMoa2002032, indexed in Pubmed: 32109013.
13. Zheng YY, Ma YT, Zhang JY, et al. COVID-19 and the cardiovascular system. Nat Rev Cardiol. 2020; 17(5): 259–260, doi: 10.1038/s41569-020-0360-5, indexed in Pubmed: 32139904.
14. Ganatra S, Hammond SP, Nohria A. The novel coronavirus disease (COVID-19) threat for patients with cardiovascular disease and cancer. JACC CardioOncol. 2020; 2(2): 350–355, doi: 10.1016/j.jaccao.2020.03.001, indexed in Pubmed: 32292919.
15. Zhou F, Yu T, Du R, et al. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. Lancet. 2020; 395(10229): 1054–1062, doi: 10.1016/s0140-6736(20)30566-3.
16. Holland D, Heald AH, Stedman M, et al. Assessment of the effect of the COVID-19 pandemic on UK HbA1c testing: implications for diabetes management and diagnosis. J Clin Pathol. 2021 [Epub ahead of print], doi: 10.1136/jclinpath-2021-207776, indexed in Pubmed: 34645702.
17. Pettus J, Skolnik N. Importance of diabetes management during the COVID-19 pandemic. Postgrad Med. 2021; 133(8): 912––919, doi: 10.1080/00325481.2021.1978704, indexed in Pubmed: 34602003.
18. Banerjee M, Chakraborty S, Pal R. Diabetes self-management amid COVID-19 pandemic. Diabetes Metab Syndr. 2020; 14(4): 351–354, doi: 10.1016/j.dsx.2020.04.013, indexed in Pubmed: 32311652.
19. Clemmensen C, Petersen MB, Sørensen TIA. Will the COVID-19 pandemic worsen the obesity epidemic? Nat Rev Endocrinol. 2020; 16(9): 469–470, doi: 10.1038/s41574-020-0387-z, indexed in Pubmed: 32641837.
20. Lim MA, Huang I, Yonas E, et al. A wave of non-communicable diseases following the COVID-19 pandemic. Diabetes Metab Syndr. 2020; 14(5): 979–980, doi: 10.1016/j.dsx.2020.06.050, indexed in Pubmed: 32610263.
21. Gopalan HS, Misra A. COVID-19 pandemic and challenges for socio-economic issues, healthcare and National Health Programs in India. Diabetes Metab Syndr. 2020; 14(5): 757–759, doi: 10.1016/j.dsx.2020.05.041, indexed in Pubmed: 32504992.
22. Piepoli M, Hoes A, Agewall S, et al. 2016 European Guidelines on cardiovascular disease prevention in clinical practice. Eur J Prev Cardiol. 2016; 23(11): NP1–NP96, doi: 10.1177/2047487316653709.
23. Winzer EB, Woitek F, Linke A. Physical activity in the prevention and treatment of coronary artery disease. J Am Heart Assoc. 2018; 7(4): e007725, doi: 10.1161/JAHA.117.007725, indexed in Pubmed: 29437600.
24. Kwok CS, Gale CP, Curzen N, et al. Impact of the COVID-19 pandemic on percutaneous coronary intervention in England: insights from the British Cardiovascular Intervention Society PCI Database Cohort. Circ Cardiovasc Interv. 2020; 13(11): e009654, doi: 10.1161/CIRCINTERVENTIONS.120.009654, indexed in Pubmed: 33138626.
25. Ishii H, Amano T, Yamaji K, et al. Implementation of Percutaneous Coronary Intervention During the COVID-19 Pandemic in Japan: Nationwide Survey Report of the Japanese Association of Cardiovascular Intervention and Therapeutics for Cardiovascular Disease. Circ J. 2020; 84(12): 2185–2189, doi: 10.1253/circj.CJ-20-0708, indexed in Pubmed: 32963133.
26. Moreno R, Díez JL, Diarte JA, et al. Consequences of canceling elective invasive cardiac procedures during COVID-19 outbreak. Catheter Cardiovasc Interv. 2021; 97(5): 927–937, doi: 10.1002/ccd.29433, indexed in Pubmed: 33336506.
27. Maron D, Hochman J, Reynolds H, et al. Initial invasive or conservative strategy for stable coronary disease. N Engl J Med. 2020; 382(15): 1395–1407, doi: 10.1056/nejmoa1915922.
28. Neumann FJ, Sousa-Uva M, Ahlsson A, et al. 2018 ESC/EACTS Guidelines on myocardial revascularization. EuroIntervention. 2019; 14(14): 1435–1534, doi: 10.4244/EIJY19M01_01, indexed in Pubmed: 30667361.
29. Gaudino M, Chikwe J, Hameed I, et al. Response of Cardiac Surgery Units to COVID-19: An Internationally-Based Quantitative Survey. Circulation. 2020; 142(3): 300–302, doi: 10.1161/CIRCULATIONAHA.120.047865, indexed in Pubmed: 32392425.