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Authors: Jacek Legutko, Łukasz Niewiara, Stanisław Bartuś, Sławomir Dobrzycki, Mariusz Gąsior, Marek Gierlotka, Janusz Kochman, Maciej Lesiak, Jerzy Matysek, Andrzej Ochała, Tomasz Pawłowski, Robert Gil, Adam Witkowski

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The decline of coronary angiography and percutaneous coronary intervention procedures in patients with acute myocardial infarction in Poland during the COVID-19 pandemic

Jacek Legutko¹, Łukasz Niewiara¹, Stanisław Bartuś², Sławomir Dobrzycki³, Mariusz Gąsior⁴, Marek Gierlotka⁴, Janusz Kochman⁶, Maciej Lesiak⁷, Jerzy Matysek⁸, Andrzej Ochała⁹, Tomasz Pawłowski¹⁰, Robert Gil¹⁰, Adam Witkowski¹¹

¹ Jagiellonian University Medical College, Faculty of Medicine, Institute of Cardiology, Department of Interventional Cardiology, John Paul II Hospital, Kraków, Poland
² Jagiellonian University Medical College, Faculty of Medicine, Institute of Cardiology, 2nd Department of Cardiology, New University Hospital, Kraków, Poland
³ Department of Invasive Cardiology, University Hospital in Bialystok, Medical University of Bialystok, Poland
⁴ 3rd Department of Cardiology, Silesian Center for Heart Diseases, Faculty of Medicine in Zabrze, Medical University of Silesia, Zabrze, Poland
⁵ Department of Cardiology, University Hospital, Institute of Medical Sciences, University of Opole, Opole, Poland
⁶ 1st Department of Cardiology, Medical University of Warsaw, Warsaw, Poland
⁷ 1st Department of Cardiology, Poznań University of Medical Sciences, Poznań, Poland
⁸ Clinical Department of Invasive Cardiology, Electrotherapy and Angiology, St. Raphael Hospital, Scanmed S.A., Kraków, Poland
⁹ 3rd Department of Cardiology, Silesian Medical University, Katowice, Poland
¹⁰ Department of Invasive Cardiology, Centre of Postgraduate Medical Education, Warszawa, Poland
¹¹ Department of Interventional Cardiology and Angiology, National Institute of Cardiology, Warszawa, Poland
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Correspondence to:

Jacek Legutko, MD, PhD
Department of Interventional Cardiology
Institute of Cardiology
Jagiellonian University Medical College
John Paul II Hospital
ul. Prądnicka 80
31-202 Kraków, Poland
phone: +48 12 614 35 01
email: jacek.legutko@uj.edu.pl

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**Introduction**

Primary percutaneous coronary intervention (PCI) is the preferred reperfusion strategy for patients presenting with ST-segment elevation myocardial infarction (STEMI). An early invasive strategy and revascularization are also recommended for patients with non-ST-segment elevation myocardial infarction (NSTEMI) [1]. In Poland, there are 158 interventional cardiology centers operating in 24/7 mode (approximately 1 center per 240,000 of population), and the number of coronary angiographies (CA) and PCI procedures in STEMI and NSTEMI per 1 million of the population is one of the highest in Europe [2]. Consequently, in the year 2018 the proportion of STEMI patients arriving in the first 12 hours receiving primary PCI exceeded 95% [3].

The COVID-19 pandemic significantly influenced healthcare systems around the world. To preserve resources and hospital beds to care for COVID-19 and other life-threatening conditions like STEMI and NSTEMI, the healthcare providers in many countries including Poland recommended deferral of elective hospitalizations and invasive procedures. However, in those countries, with fast spread of SARS-Cov-2 infection and large number of COVID-19 patients requiring hospital admission and treatment, a significant drop in the number of cardiac catheterization laboratory STEMI activations was recently reported [4-6]. It remains unclear, what is the impact of COVID-19 pandemic on invasive assessment and treatment of patients with acute myocardial infarction (AMI) in such countries like Poland, with a well-developed network of cathlabs and relatively slower spread of COVID-19 epidemic.

This study aimed to assess the influence of COVID-19 pandemic on the number of CAs and PCI procedures in patients with STEMI and NSTEMI in selected high-volume interventional centers in Poland.
Methods

We retrospectively collected the number of CA and PCI procedures performed between January 1, 2020, and April 14, 2020, in 11 high-volume interventional cardiology centers in Poland, including: John Paul II Hospital in Krakow, New University Hospital in Krakow, St. Raphael Hospital in Krakow, Silesian Medical Center in Katowice, Silesian Centre for Heart Diseases in Zabrze, University Hospital in Opole, University Hospital in Poznan, National Institute of Cardiology in Warsaw, University Clinical Center in Warsaw, Central Clinical Hospital of the Ministry of Interior in Warsaw and University Hospital in Bialystok. The data in particular centers was collected following local reporting procedures. Acute myocardial infarction (AMI) was defined according to the Fourth Universal Definition of Myocardial Infarction [7]. The total number of AMI was calculated as a sum of STEMI and NSTEMI. There was no need for approval of an ethics committee for the present study.

Statistical analysis. We evaluated a two-weeks mean number of CA and PCI in AMI, STEMI and NSTEMI performed in four different time periods selected according to the development of COVID-19 Pandemic in Poland: period 0 - from January 1, 2020 to February 29, 2020 (pre-pandemic); period 1 - from March 1, 2020 to March 14, 2020 (beginning of pandemic), period 2 - from March 15, 2020 to March 31, 2020 (gradual introduction of pandemic restrictions) and period 3 - from April 1, 2020 to April 14, 2020 (pandemic lockdown) (Figure 1A). Finally, we assessed the percent change in the number of CA and PCI in AMI, STEMI and NSTEMI in period 1-3 in comparison to period 0 as a reference.

Results and discussion

Between January 1, 2020, and April 14, 2020, there were 1898 of CA and 1608 of PCI procedures performed in AMI patients in all centers. In comparison to period 0 as a pre-pandemic reference, we have found a slight decrease of CA and PCI procedures in AMI performed in period 1 (-13.8% and -10.6%, respectively) and significant decrease in period 2
(-29,2% and -28,0%, respectively) and period 3 (-34,8% and -28,3%, respectively) (Figure 1B). Percent drop in the number of CA and PCI procedures was more pronounced in NSTEMI, in comparison to STEMI population (period 3 vs. period 0; CA: -44,3% vs. -17,6%; PCI: -36,1% vs. -16,2%, respectively) (Figure 1C-D).

New COVID-19 pandemic has a huge impact on current medical practice, which is particularly seen in contemporary diagnostics and treatment of acute coronary syndromes. Recent reports show over 39% decrease of admissions for ACS after the beginning of COVID-19 outbreak in Austria [6]. Similar, 40% decline was observed in the number of PCIs in STEMI observed in Spain [5]. Comparable 38% decline in the number of STEMI cath-lab activations was reported after the appearance of COVID-19 in 9 high-volume centers in the United States [4]. Even greater decline in the number of STEMI procedures, over 5-fold decline, was reported in Hong Kong [8]. Our study showed consistent results, with similar, about 30% decline in both CAs and PCIs in the setting of AMI after the beginning of COVID-19 pandemic in Poland. Similarly to Austria, a decrease in numbers of procedures appeared just after the first identified case of disease reported in Period 1, and was even more evident after epidemic lockdown, which fully affected medical operations (Period 2 and 3). A smaller decrease in the number of STEMI procedures can be attributed to severe symptomatic course, forcing patients to look for help. On the contrary, when symptoms are milder, like in major part of NSTEMI cases, patients may postpone medical contact, driven by fear of COVID-19 contact in emergency rooms and other medical facilities. Nevertheless, detailed research in this matter would be needed.

**Limitations.** We included in our study 11 high-volume centers in Poland; however, collected data are not covering all the polish population. Even though the influence of COVID-19 on the total number of procedures was clearly visible, the dynamics of a pandemic might have differed from region to region and this possible effect was not included in our analysis.
Conclusions. The COVID-19 pandemic in Poland is associated with a large decline in both CAs and percutaneous coronary interventions performance in the setting of AMI. The greater decline is observed in the number of NSTEMI procedures compared to STEMI.
References:


Figure 1. Changes in total numbers of coronary procedures with relative decrease during COVID-19 epidemics.

Panel A – Number of confirmed SARS-Cov-2 infections in Poland with major time-points when countermeasures were introduced.

Panel B – Total number of coronary angiographies (CA) and percutaneous coronary interventions (PCI) performed in setting of acute myocardial infarction (blue), percentage change in number of procedures as compared to period 0 (red).
Panel C – Total number of coronary angiographies (CA) and percutaneous coronary interventions (PCI) performed in setting of STEMI (blue), percentage change in number of procedures as compared to period 0 (red).

Panel D – Total number of coronary angiographies (CA) and percutaneous coronary interventions (PCI) performed in setting of NSTEMI (blue), percentage change in number of procedures as compared to period 0 (red).