

Effects of the coronavirus disease 2019 pandemic on the number of hospitalizations for myocardial infarction: regional differences. Population analysis of 7 million people

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Introduction The coronavirus 2019 (COVID-19) pandemic has affected the health-care system across the world. In Poland, the first case of COVID-19 was announced on March 4, 2020, and lockdown was introduced on March 12, 2020. Data from different countries across the continents reveal a significant decrease in the number of patients hospitalized for acute myocardial infarction (AMI).¹⁻⁵ The observed reduction in the hospitalization number reaches 40% to 50% and is independent of the epidemic intensity.⁵ Analysis of invasive procedures performed in selected interventional cardiology centers in Poland revealed a decrease in the number of patients treated for both ST-segment elevation myocardial infarction (STEMI) and non-ST-segment elevation myocardial infarction (NSTEMI) in the first weeks of the epidemic (before April 14, 2020).⁶ So far, there have been no population data or data from selected regions of Poland that would confirm this trend.

Methods The analysis was based on data of the Polish National Health Fund (Narodowy Fundusz Zdrowia [NFZ]) and State Emergency

Medical Services (Państwowe Ratownictwo Medyczne [PRM]) as well as on administrative and epidemiological data.

Data from the NFZ were collected using the SILCARD (Silesian Cardiovascular Database) methodology, which was published elsewhere.⁷ In brief, the database is based on the payer's data according to ICD-9 (procedures) and ICD-10 (diagnosis) classification and includes all patients hospitalized at the departments of cardiology, cardiac surgery, and vascular surgery as well as patients with diagnosed cardiovascular diseases hospitalized at the departments of internal diseases and intensive care units across Silesia Province. The present analysis includes all patients hospitalized for acute myocardial infarction (I21 and I22) between March 9 and April 16, 2019 and 2020 (eleventh to seventeenth calendar week of the year). Data from the Opole and Podlasie Provinces were developed using the same methodology.

Data from the PRM were analyzed with regard to the records of dispatch orders and records of medical rescue operations between March 3 and April 26, 2019 and 2020.

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FIGURE 1 Data from the National Health Fund (NFZ), State Emergency Medical Services (PRM), and Central Statistical Office regarding the coronavirus 2019 pandemic and number of patients with symptoms and diagnosis of myocardial infarction: **A** – the number of severe acute respiratory syndrome coronavirus (SARS-CoV-2) infections per 1 million inhabitants up to April 26, 2020; **B** – percentage decrease in the total number of hospitalized patients with acute myocardial infarction (AMI) between 2019 and 2020 in relation to the number of SARS-CoV-2 infections per population density; **C** – the numbers and percentage reduction of ambulance calls due to chest pain between 2019 and 2020; **D** – the numbers and percentage reduction of patients with AMI diagnosed by the PRM between 2019 and 2020; **E** – the percentages of patients with AMI treated in the cardiology wards out of all AMI cases and percentage reduction between 2019 and 2020; **F** – the numbers and percentage reduction of all hospitalized patients with AMI between 2019 and 2020. Percentages in red indicate relative decrease in 2020 compared with 2019. Podlasie stands for the Podlasie Province, Opole for the Opole Province, and Silesia for the Silesia Province.

The analysis included the cause of a call recorded by the medical dispatcher in the record of dispatch order, and final diagnosis made by the head of the medical emergency team on the basis of the ICD-10 classification. Data were prepared on the basis of the Command Support System of the State Emergency Medical Services (System Wspomagania Dowodzenia Państwowego Ratownictwa Medycznego

[SWD PRM]) with the participation of the Ministry of Health.

The administrative data were obtained from the report of the Central Statistical Office (Główny Urząd Statystyczny [GUS]). The Silesia Province has an area of 1233 km² and is inhabited by 4533.6 thousand people with a population density of 368 people/km². The area of the Opole Province is 9412 km², it is inhabited

by 986.5 thousand people, and population density is 105 people/km². The Podlasie Province has an area of 20187 km² and is inhabited by 1181.5 thousand people with a population density of 59 people/km².⁸

The epidemiological data were collected from the reports of the Ministry of Health and they include all infected patients in the study provinces before April 26, 2020.

Results and discussion In the analyzed provinces, before April 26, 2020, 2599 infections were reported with the highest number in the Silesia Province, 1867 infections, and with 363 and 369 infections in the Opole and Podlasie Provinces, respectively. In the study period, the mean number of infections per million was 388 people. Details of particular regions are presented in [FIGURE 1A](#). The association between the number of infections, population density, and reduction in the number of hospitalizations for AMI is shown in [FIGURE 1B](#).

In all provinces, there was a decline in the number of PRM calls due to chest pain by a mean of 11.7% ([FIGURE 1C](#)). The number of AMI diagnoses made by the head of the PRM dropped by 22.3% ([FIGURE 1D](#)). In the destination department, a similar percentage of patients with AMI were treated in 2019 and 2020. ([FIGURE 1E](#)). However, the total number of hospitalizations for AMI dropped on average by 43.6% ([FIGURE 1E](#)).

Despite the fact that the epidemic in Poland started relatively late and its intensity was lower, the observed decrease in the number of hospitalizations is comparable with other regions of the world.¹⁻⁵ This phenomenon may have various causes, related to both the healthcare system itself and to the patient. In Poland, the system of treating AMI was not modified in the analyzed period. All cardiac catheterization laboratories prepared protective equipment and places to treat patients with AMI during the pandemic.⁶ Moreover, there are no differences in the final department where patients were treated between 2019 and 2020. Therefore, patient-related factors could have played an important role. Firstly, patients could have avoided contact with medical services out of fear of infection. When the epidemic was spreading in the first 6 weeks in Poland, there were reports of high risk of infections transmitted by the medical personnel in other countries, which could have affected the decisions made by Polish patients. The highest reduction in the number of AMI was observed in the south of Poland, which was considered the most exposed from the very first weeks of the pandemic. Secondly, one cannot exclude that some patients treated the infarction-related complaints as symptoms of COVID-19. It was emphasized from the very beginning that dyspnea and chest

discomfort were the dominant symptoms of viral infection, which obviously could be misleading for many patients with AMI. Thirdly, one cannot exclude that the introduced strict lockdown measures had an effect on the reduction of the AMI incidence (less job-related stress, fewer parties and stimulants, less extreme physical exercise).

Of note is a difference in the reduction of the number of PRM calls due to AMI, diagnoses of infarction made by the PRM and the final number of hospitalized patients with this diagnosis. The final decline in the number of hospitalizations seems to have also other underlying causes. Before the epidemic outbreak, some patients with symptoms of myocardial infarction arrived directly at hospitals or were referred from outpatient treatment.⁹ Perhaps suspended activity of the clinics providing only tele-counselling caused a reduction in the number of patients they referred to hospitals. Moreover, since logistic difficulties in hospitals were primarily related to the activity of emergency departments, this could have a negative impact on the number of patients using this way of hospital admission.

With regard to the analyzed material, the lowest epidemic intensity was observed in the Podlasie Province. The first case of COVID-19 was reported in that region as late as March 16, 2020. This could have translated into fewer public communications and lower fear of contact with medical services in this population. On the other hand, in northern Italy, where the epidemic started the earliest and had a dramatic course, the observed reduction in the number of AMI was similar to that reported in central and southern regions of Italy, where the epidemic intensity was much lower.⁵

This is a retrospective analysis and it involves all the limitations related thereto. Moreover, we do not have information on the number of patients with myocardial infarction and COVID-19 and we were not able to verify whether this was correlated with the observed differences between the provinces.

The COVID-19 pandemic caused a significant reduction in the number of treated patients with myocardial infarction in Poland. The extent of the reduction may be related to the epidemic intensity.

ARTICLE INFORMATION

CONFLICT OF INTEREST None declared.

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