

Decreasing numbers of valve-related infective endocarditis cases. An urgent call to action to improve diagnostic pathways: A retrospective tertiary center perspective (2015–2022)

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INTRODUCTION

Over the last few decades, the number of cases of infective endocarditis (IE) worldwide has been increasing [1] and has doubled over the last 20 years [2]. The widespread use of echocardiography should lead to early diagnosis and implementation of more effective antibiotic therapy. Additionally, improvements in cardiac surgery and intensive care may potentially lower the mortality rate. We carried out an analysis to verify these assumptions in a tertiary center dealing with patients with IE in a stable population of 2.5 million inhabitants. The study aimed to analyze mortality and clinical predictors of death in hospitalized patients with valve-related IE in the years 2015–2022.

METHODS

From all hospital admissions in our Department, we selected patients with acute valve-related IE hospitalized from January 2015 to the end of December 2022 and qualified for both surgical and conservative treatment. Transthoracic and transesophageal echocardiography were basic diagnostic tools for establishing IE diagnosis in all cases. We retrospectively analyzed the total number of cases, number of fatal cases, and in-hospital mortality. We defined preoperative death as death occurring before the surgical procedure (including patients qualified for both conservative and surgical treatment) and perioperative death as death occurring during or after surgical treatment. We analyzed the

impact of multiple variables (including clinical features such as sex, IE localization, etiological factors, and the presence of the artificial valve) on in-hospital mortality to find predictors of deaths (also divided into overall, pre-, and perioperative deaths).

Statistical analysis

Statistical analysis was performed using Statistica 13.1 software (Tibco, Palo Alto, CA, US) and R version 4.2.1. Nominal values were presented as both absolute values and percentages. Variables that did not follow normal distributions (as verified with the Shapiro–Wilk test) were presented as medians with interquartile ranges (IQR). In-hospital mortality was presented as a percentage value. Trends in the number of deaths during the analyzed period were assessed using the Mann-Kendall test (to determine the trend) with Sen's slope evaluation (to determine if the trend is positive or negative). Univariate binomial logistic regression was used to assess the impact of specific factors on mortality, divided into overall, pre-, and perioperative mortality. A *P*-value <0.05 was considered statistically significant.

RESULTS AND DISCUSSION

Overall, 194 patients were hospitalized for acute IE, and the majority of them were men (75.3%; *n* = 146). The results are presented in Supplementary material, *Table S1*. The median age of the studied group was 62 years, and patients between the ages of 58 and

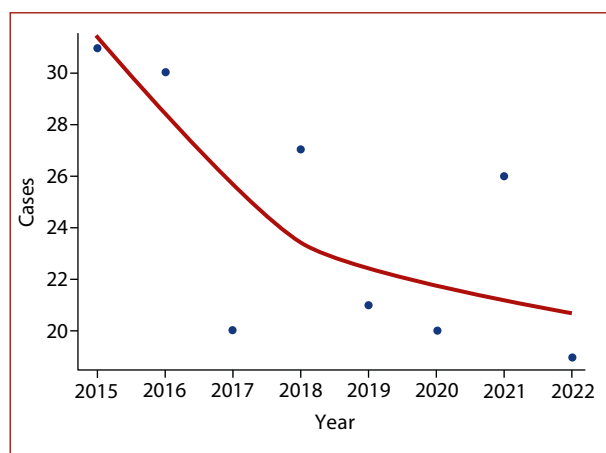


Figure 1. The incidence of infective endocarditis over the analyzed period ($P = 0.046$; Sen's slope: -1.17)

68 were the most numerous group ($n = 66$). In cases with a confirmed etiological factor ($n = 117$), the most common causes of IE were *Staphylococcus spp.* (51.3%), *Enterococcus spp.* (22.2%), and *Streptococcus spp.* (15.4%). Left-sided IE was observed in the vast majority of cases (92.3%). Native valve-related IE (NV-IE, 72%) also prevailed. Surgical treatment was performed in 64.9% of patients. Overall, 27.8% ($n = 54$) of patients died during hospitalization (the preoperative mortality was 14.4%, $n = 28$). The general trend in the overall number of IE cases significantly decreased over the analyzed period ($P = 0.046$; Sen's slope, -1.17 ; 95% confidence interval [CI], -3.0 to -0.001 ; **Figure 1**), but we observed no change in the number of fatal cases or the mortality rate ($P = 0.618$; Sen's slope, -0.33 ; 95% CI, -1.5 to -1.8). In 2021, during the COVID-19 pandemic, mortality peaked at 58% ($n = 15$), which probably interfered with our results. Fatal cases in 2021 were mostly preoperative (60%; $n = 9$; Supplementary material, *Table S1*).

We also analyzed predictors of in-hospital mortality and found that an unidentified etiological factor in IE significantly increased the risk of death in cases of both preoperative and perioperative deaths (odds ratio [OR], 4.66; 95% CI, 1.07–20.23; $P = 0.04$). Moreover, we found *Staphylococcus spp.* as a perioperative predictor of in-hospital death (OR, 0.16; 95% CI, 0.04–0.071; $P = 0.02$), along with the number of infected valves (OR, 2.27; 95% CI, 1.19–6.23; $P = 0.02$) and age as a preoperative predictor of death (OR, 1.04; 95% CI, 1.00–1.07; $P = 0.03$).

Our results show a declining number of IE cases over the analyzed period, while the overall global incidence of IE is increasing [1]. The population we studied is similar to those reported from different European countries in the EURO-ENDO Registry [1] and the LEIOT [3]. The ICE Prospective Cohort Study, which contains data on over 5000 patients with confirmed and suspected IE, also showed similar demographics results (men 69.4%; age 63.7 years; NV-IE 68.3%; *Staphylococcus spp.* as the most frequent etiological factor) [4]. Furthermore, the above-mentioned study

highlights a decreasing mortality rate over the last decades despite an increasing complexity of IE cases.

The most worrying result of our analysis, in contrast to global observations, is the decreasing trend in the number of confirmed IE cases. A delay in establishing an IE diagnosis leads to a higher mortality rate, which in our study was, indeed, higher than the one reported in the EURO-ENDO Registry (17.1%) and ICE (19.3%). Healthcare authorities should conduct careful analysis of the management of patients suspected of having IE and the availability of diagnostic tools (such as echocardiography) in hospitals across the region.

The retrospective character of our study is its main limitation. Due to incomplete data, we were unable to analyze the impact of "time from diagnosis to cardiac surgery" on in-hospital mortality. Additionally, the exclusion of device-related IE patients may have impacted our results. However, it is worth noting that the staff of our Department and available equipment as well the number of local inhabitants remained relatively unaltered throughout the study period. Furthermore, the study period started just before the publication of the 2015 IE guidelines (September 2015). Although the diagnostic principles remained constant, we decided to initiate our analysis at the beginning of 2015.

The COVID-19 pandemic also had a significant impact on our study, as we had to pay special attention to patients with elevated body temperature or fever. This may have contributed to the higher number of confirmed IE cases in 2021. Furthermore, the time to diagnose IE was prolonged due to pandemic-related restrictions, which likely led to more complex cases and worse clinical conditions. There are inconsistent worldwide data on reported IE cases during the COVID-19 pandemic. For example, Cabral et al. reported an increased number of IE patients during the first semester of 2020 [5], while a Danish study found no difference in IE incidence before and during lockdown. A study by XinPei et al. [6] from Beijing reported a lower number of IE patients admitted to their cardiac surgery department. The above-mentioned study from China also highlighted a higher surgical risk (EuroSCORE II) in admitted patients during the COVID-19 pandemic although this was not associated with higher postoperative mortality. Similar observations were reported from Spain, where fewer IE incidences and fewer cardiac surgeries performed did not impact in-hospital mortality in IE patients [7].

In conclusion, our study shows a decreasing trend in the number of confirmed IE cases in our region, which is at variance with the global trend of increasing IE incidence. Further analysis is necessary to understand the reasons behind this observation and to improve IE diagnostic pathways in the Lodz region. The impact of the COVID-19 pandemic on IE incidence and diagnosis should also be considered in future studies. These findings highlight

the need for continuous monitoring and improvement of IE diagnosis and management to reduce mortality and improve patient outcomes.

Supplementary material

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

Article information

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