Survival in nonagenarians with acute myocardial infarction in 2014–2020: A nationwide analysis

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INTRODUCTION

Myocardial infarction (MI) has been considered a major cause of death in developed countries. The prevalence of MI and mortality in MI patients is strongly influenced by age [1–4]. The evidence on changes in survival and management in nonagenarians with acute coronary artery disease in recent years is limited. Therefore, the present study aimed to evaluate changes in in-hospital and post-hospital survival of patients aged at least 90 years and diagnosed with acute MI.

METHODS

We included all patients aged at least 90 years hospitalized for acute MI (the ICD-10 codes I21–I22) in Poland from 2014 to 2020 and reported to the National Health Fund (NHF) database and followed up for up to one year. The analysis was conducted using Polish personal identification numbers (PESEL). Medical histories of patients were obtained from the NHF database, and survival was determined according to the national database of deaths (Statistics Poland). Hospitalization was defined as an admission to a healthcare facility longer than 24 hours, excluding patients who died within 24 hours. The hospitalization for MI was defined as a continuous stay in the hospital, including any transfers between wards or hospitals for whatever reason and also as subsequent admission for myocardial infarction within 24 hours after hospital discharge. Hospital readmissions were determined using the NHF database. The primary endpoint was defined as death from any cause, whereas the secondary endpoint was defined as all-cause death, MI, or stroke.

Ethics committee approval was not needed as we analyzed the national database. Informed consent was not required.

Statistical analysis

Continuous variables were presented as means (standard deviations [SD]) or medians (interquartile ranges [IQRs]), while categorical values were presented as percentages with 95% confidence intervals (CI) when appropriate. The Shapiro-Wilk test was used to assess the normality. In order to compare variables without normal distribution, we used the Mann-Whitney U test or Kruskal-Wallis test, as appropriate. The Pearson χ^2 test was applied to all categorical variables. A *P*-value of less than 0.05 was considered statistically significant. Kaplan-Meier methods were used to construct unadjusted survival curves. Log-rank tests were performed to evaluate differences between groups. Statistical analysis was conducted using STATISTICA 13 software (TIBCO Software, Palo Alto, CA, US).

RESULTS AND DISCUSSION

The study included a total of 2019 (71.6% females), 2007 (69.7% females), 2197 (67.9% females), 2313 (70.6% females), 2321 (67.5% females), 2282 (67.7% females), and 1831 (67.0% females) patients aged at least 90 years old and diagnosed with acute MI in Poland in 2014, 2015, 2016, 2017, 2018, 2019, and 2020, respectively. The median age (interquartile range [IQR]) was 92.0 (90.9– 93.8) years, 92.0 (90.9–93.6) years, 92.1 (90.9––93.7) years, 92.1 (91.0– 93.7) years, 92.1 (90.9–93.9) years, 92.2 (91.0–94.1) years, and 92.1 (90.9–94.1) years, respectively, in the aforementioned years.

Most patients were hospitalized in only one hospital (87.6% [95% CI, 87.1%–88.1%]), while 10.5% (10.0%–11.1%), 1.8% (1.6%–2.0%), 0.07% (0.03%–0.12%), and 0.01% (0.00%–0.04%) of patients were hospitalized in two, three, four, and five hospitals, respectively. The proportion of patients hospitalized who were transferred at least once between hospitals decreased during the observation period (14.8% [13.3%–16.4%] in 2014, 12.5% [11.1%–14.0%] in 2015, 14.2% [12.8%–15.7%] in 2016, 12.1% [10.8%–13.6%] in 2017, 11.8% [10.5%–13.2%] in 2018, 11.5% [10.2%––12.9%] in 2019, and 10.1% [8.8%–11.6%] in 2020, $P<0.05$). The median duration of hospitalization was 7.0 (4.0–11.0) days, while the mean duration of hospitalization was 8.5 (4.0–11.0) days.

Overall, invasive management (at least coronary angiography) was applied in 47.0% (46.2%–47.8%) of patients (42.0% [39.8%–44.2%] in 2014, 44.3% [42.1%–46.5%] in 2015, 47.2% [45.1%–49.3%] in 2016, 46.5% [44.4%–48.6%] in 2017, 49.0% [46.9%–51.0%] in 2018, 49.9% [47.8%––52.0%] in 2019, and 51.5% [49.2%–53.8%] in 2020, $P<0.001$). In total, in 2014, 2015, 2016, 2017, 2018, 2019, and 2020, 35.4% (33.3%–37.5%), 37.5% (35.4%–39.7%), 39.3% (37.2%–41.4%), 41.0% (39.0%–43.0%), 40.8% (38.8%–42.9%), 42.4% (40.4%–44.4%), and 42.9% (40.6%––45.2%), respectively, ($P<0.001$) underwent percutaneous coronary intervention (PCI), while 0.1% (0.0%–0.4%), 0.2% (0.1%–0.5%), 0.3% (0.1%–0.7%), 0.0% (0.0%–0.2%), 0.3% (0.1%–0.6%), 0.1% (0.0%–0.3%), and 0.1% (0.0%–0.4%) ($P=0.33$), respectively, underwent coronary artery bypass grafting. In-hospital mortality was 27.8% (25.9%–30.0%), 28.5% (26.5%–34%), 28.0% (26.2%–30.0%), 27.6% (25.8%––29.5%), 27.7% (25.9%–29.5%), 26.1% (24.3%–27.9%), and 29.5% (27.4%–31.6%) in 2014, 2015, 2016, 2017, 2018, 2019, and 2020, respectively, ($P<0.001$). In-hospital mortality was significantly higher in 2020 compared to 2019 ($P=0.02$).

All-cause one-year mortality following discharge in 2014, 2015, 2016, 2017, 2018, 2019, and 2020 was 41.7% (95% CI, 39.2%–44.3%), 38.1% (35.6%–40.7%), 36.9% (34.5%–39.3%), 38.0% (35.7%–44%), 34.7% (32.4%–37.1%), 35.3% (33.0%–37.6%), and 48.5% (45.7%–51.3%), respectively, ($P<0.001$), whereas, the proportions for endpoint involving all-cause death or MI or stroke were 47.0% (44.8%–49.2%), 43.0% (38.2%–42.5%), 41.1% (39.0%––43.2%), 42.8% (40.8%–44.9%), 39.4% (37.4%–41.4%), 39.8% (38.8%–41.8%), and 50.0% (48.8%–52.3%), respectively, ($P<0.001$) (Figure 1).

The characteristics of our study group (the median age slightly over 90 years, the majority women) did not differ during the follow-up period and are comparable to other studies focused on nonagenarians [5]. We observed the tendency, comparable to other studies, toward a higher number of the oldest (≥90 years) admitted to hospital for MI up to the year 2020, when this number was significantly lower [6]. The proportion of hospitalized patients who were transferred at least once between hospitals decreased during the follow-up period, which could be connected with more specialized medical care.

Percutaneous coronary intervention remains the most effective treatment for acute MI patients, and our data demonstrated that also in the oldest subjects, the proportion of patients managed invasively has increased significantly in recent years in Poland. However, the proportion is still significantly lower when compared with younger adults in Poland [3]. A national analysis in the United States concluded that PCI is related to better survival of acute MI patients over 90 years of age [7]. Similar conclusions could be drawn based on analyses from other countries [8–10]. Indeed, our data provides evidence that despite benefits, primary PCI may remain underutilized in the elderly in Poland.

We showed no favorable trend in in-hospital mortality up to 2019, which agrees with data from other countries [7]. The one-year all-cause mortality rate following discharge in nonagenarians was gradually decreasing in Poland up to 2019 with a sharp increase in patients hospitalized in 2020, which could be attributed to the COVID-19 pandemic [11]. However, in other studies, it was suggested the upward trend in MI mortality was most pronounced for the youngest adults when compared to the oldest age groups [12].

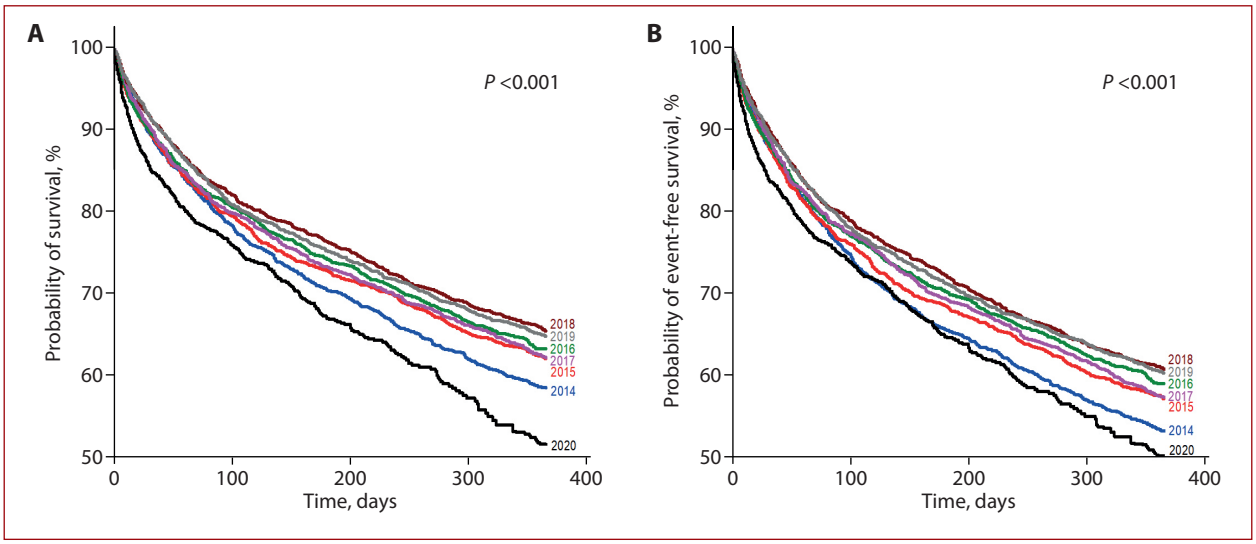

Figure 1. Kaplan-Meier curves displaying the estimated one-year event-free survival probability according to the year of hospitalization. **A.** All-cause death. **B.** All-cause death, myocardial infarction, or stroke

In conclusion, we did not find a significant trend in in-hospital mortality from 2014 to 2019 in nonagenarians, but we showed increased in-hospital mortality in 2020. On the other hand, we found a decreasing trend in one-year post-discharge mortality from 2014 to 2019 and a significant increase in 2020 in Poland.

Supplementary material

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

Article information

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