Quality and clinical outcomes of primary percutaneous coronary intervention after ST-segment elevation myocardial infarction: a population density analysis of a Japanese nationwide registry

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Background: Despite progress in acute myocardial infarction (MI) treatment, data on geographical disparities in its care remain limited.

Purpose: We aimed to assess the discrepancy by population density (PD) on the quality and clinical outcomes of patients with primary percutaneous coronary intervention (PCI) after ST-segment elevation MI (STEMI).

Methods: The J-PCI registry is a prospective procedural registry conducted by the Japanese Association of Cardiovascular Intervention and Therapeutics (CVIT) to assure the quality of delivered care. Between January 2014 and December 2018, 209,521 patients underwent PCI for STEMI in 1,126 institutes. Population of administrative municipal-level districts was determined through the complete population census. The patients were divided into tertiles according to the PD of the PCI institution location (low: <951.7/km^2, n=69,797; middle: 951.7–4,729.7/km^2, n=69,750; high: ≥4,729.7/km^2, n=69,974).

Results: Patients treated in high PD administrative districts were younger (low: 69.1±12.9, middle: 68.7±12.9, high: 68.0±13.1) and likely to be male (low: 75.6%, middle: 76.0%, high: 76.6%). No significant correlation was observed between PD and door-to-balloon time (DTB: regression coefficients: 0.036 per 1000 people/km^2, 95% CI: −0.232 to 0.304, P=0.79). Patients treated in low PD areas had higher crude in-hospital mortality rates than those treated in high PD areas (low: 2.89%, middle: 2.60%, high: 2.38%; P<0.001). Moreover, PD and in-hospital mortality had a significantly inverse association, before and after adjusting for baseline characteristics (crude odds ratio [OR]: 0.983 per 1,000/km^2, 95% confidence interval [CI]: 0.973–0.992, P<0001; adjusted OR: 0.980 per 1,000/km^2, 95% CI: 0.964–0.996, P=0.01, respectively). Higher PD districts had more operators per institute (low: 6, interquartile range [IQR] 3–10; middle: 7, IQR 3–13; high: 8, IQR 5–13, P<0.001), suggesting an inverse association with in-hospital mortality (OR: 0.992, 95% CI: 0.986–0.999, P=0.03).

Conclusions: Marked geographical inequality was observed in immediate case fatality; patients treated in population-dense areas had a lower in-hospital mortality than those treated in less dense areas. Variation in the number of operators per institute, rather than traditional quality indicators (e.g. DTB) may explain the difference in in-hospital mortality.