## Abstract

**Background**: Falls are a public health issue that needs to be addressed around the world, especially in rapidly aging populations such as Japan. This study aimed to examine the temporal, seasonal, and spatial patterns in fall-related mortality in Japan, and to investigate the potential factors associated with fall-related mortality.

**Methods**: The number of unintentional fall-related deaths from 1979 to 2019 were obtained from Japanese vital statistics. We calculated the crude and direct age-standardized mortality rates (DSR) of fall. We also calculated the standardized mortality ratio (SMR) to determine seasonal and prefectural differences. In addition, spatial regression was conducted with prefectural SMRs as the dependent variables to examine the potential factors associated with fall-related mortality.

**Results**: The DSR among those over 65 years old showed a decreasing trend from 1979, but remained unchanged from 1990 to 2019. The DSR was higher for men than for women at all time points for both the overall population and for those over 65 years old. SMRs in summer were significantly lower for both sexes, and the SMR in winter was significantly higher for women. Based on the spatial regression model, the factors significantly associated with fall-related SMRs were the proportion of the aged population (Coefficient: 0.049; 95% CI: 0.013 - 0.086), the number of hospitals (0.118; 0.071 - 0.163), the number of clinics (1.169; 0.386 - 1.951), the number of hospital beds (-0.060; -0.114 - -0.005), and the number of physiotherapists (-0.069; -0.121 - -0.017) for men; and the proportion of aged single households (-0.060; -0.105 - -0.015), the number of hospitals (0.132; 0.088 - 0.176), the number of clinics (1.498; 0.788 - 2.209), the number of hospital beds (-0.051; -0.102 - -0.000), and the number of physicians (-0.308; -0.559 - -0.056) for women.

**Conclusion**: Fall-related mortality among Japanese elderly people over 65 years old has remained unchanged in recent years. In addition, seasonal and spatial patterns were also observed, and it was found that demographic data and healthcare resources in the prefectures affected fall-related mortality rates. Appropriate prevention measures of fall-related deaths should be considered according to the region-specific characteristics and issues.

**Keywords**: Fall-related mortality; National vital statistics; Geographical difference; Spatial regression model.