Health System Factors Associated with Mortality to Incidence Ratio in Malignant Bone Neoplasms: A Global Burden of Disease Analysis

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INTRODUCTION:

Bone and cartilage sarcomas have shown rising age-standardized mortality rates globally since the 1990s. This study investigates the associations between national health system characteristics and mortality to incidence (MIR) ratio of bone and cartilage sarcomas based on age group, sex, WHO Region designation, and WHO income status.

METHODS: We conducted a population-based analysis using age-standardized Global Burden of Disease (GBD) incidence and mortality data. Health system characteristics were sourced from the WHO and the World Bank and included the Universal Health Coverage (UHC Index), Gender Inequality Index (GII), GDP per capita (per 1,000 USD), Human Development Index (HDI), health spending (% GDP), densities of nurses/midwifery personnel, physicians, and surgeons (per 1,000 people), and pathology and palliative services (binary score). We used multivariable stepwise regression to assess associations between health system characteristics and MIR for bone and cartilage malignancies.

RESULTS:

Out of 199 countries and territories globally, the highest mortality to incidence ratio (MIR) was found in Africa at 84%, while the lowest MIR was found in Europe at 56%. By income-levels, the highest MIR was in lower-middle income nations at 86%, while the lowest was in high-income nations at 50%.

Among the 119 countries with complete health system data, several variables were significantly associated with MIR on the multivariable stepwise regression analysis. Globally, UHC index (ΔMIR=β=-0.002, 95% CI -0.004 to -0.0007), GDP per capita (β=-0.002, -0.003 to -0.001), and surgeon density (β=-0.06, -0.11 to -0.008) were negatively correlated with MIR, while increased GII was associated with higher MIR (β=0.20, 0.06 to 0.33). In high-income countries, increased UHC Index (β=-0.01, -0.02 to -0.01) and HDI index (β=-0.44, -0.85 to -0.04) was correlated with a lower MIR. For middle-income countries, physician density (β=-0.02, -0.04 to -0.002) and HDI (β=-0.21, -0.37 to -0.05) were negatively associated with MIR, while GII was positively correlated with MIR (β=0.26, -0.08, 0.45). Across low-income countries, UHC was not correlated with MIR, but rather GDP per capita (β=-0.09, -0.13, -0.06) and surgical workforce (β=-5.04, -8.60, -1.48) were both associated with a decreased MIR.

DISCUSSION AND CONCLUSION:

Improved health system indicators, including those that measure universal health coverage, income, and surgeon density, are associated with lower mortality for bone and cartilage sarcomas globally. Increased universal health coverage is associated with lower MIR only in high-income countries, suggesting that efforts to reduce mortality in low- and middle-income countries by expanding coverage may be limited by treatment capacity constraints. Targeted investments in health infrastructure, gender equity, and diagnostics are critical for improving bone and cartilage sarcoma outcomes.