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Prostate Cancer

Global Incidence and Mortality for Prostate Cancer: Analysis of Temporal Patterns and Trends in 36 Countries

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Abstract

Background: Prostate cancer (PCa) is a leading cause of mortality and morbidity globally, but its specific geographic patterns and temporal trends are under-researched. **Objective:** To test the hypotheses that PCa incidence is higher and PCa mortality is lower in countries with higher socioeconomic development, and that temporal trends for PCa incidence have increased while mortality has decreased over time.

Design, setting, and participants: Data on age-standardized incidence and mortality rates in 2012 were retrieved from the GLOBOCAN database. Temporal patterns were assessed for 36 countries using data obtained from *Cancer incidence in five continents* volumes I–X and the World Health Organization mortality database. Correlations between incidence or mortality rates and socioeconomic indicators (human development index [HDI] and gross domestic product [GDP]) were evaluated.

Outcome measurements and statistical analysis: The average annual percent change in PCa incidence and mortality in the most recent 10 yr according to join-point regression.

Results and limitations: Reported PCa incidence rates varied more than 25-fold worldwide in 2012, with the highest incidence rates observed in Micronesia/Polynesia, the USA, and European countries. Mortality rates paralleled the incidence rates except for Africa, where PCa mortality rates were the highest. Countries with higher HDI ($r = 0.58$) and per capita GDP ($r = 0.62$) reported greater incidence rates. According to the most recent 10-yr temporal data available, most countries experienced increases in incidence, with sharp rises in incidence rates in Asia and Northern and Western Europe. A substantial reduction in mortality rates was reported in most countries, except in some Asian countries and Eastern Europe, where mortality increased. Data in regional registries could be underestimated.

Conclusions: PCa incidence has increased while PCa mortality has decreased in most countries. The reported incidence was higher in countries with higher socioeconomic development.

Patient summary: The incidence of prostate cancer has shown high variations geographically and over time, with smaller variations in mortality.

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1. Introduction

Prostate cancer (PCa) is the second commonest diagnosed malignancy and the fifth leading cause of cancer mortality in men, and represents a substantial public health burden [1]. Established risk factors for PCa include advanced age, black race, a family history of the disease, and certain genetic polymorphisms [2]. There is strong potential to reduce PCa mortality via screening [3,4]. Hence, it is crucial to understand global epidemiological PCa trends.

Previous studies describing international PCa trends were based on data from registries in the early 2000s [5–7], did not take into account the socioeconomic development of each country when comparisons were made [8,9], or depended on model-based clustering [10]. Analysis of PCa patterns and temporal trends could be useful in quantifying geographical variations, identifying high-risk populations, and delineating the extent of the uptake of PSA testing [9]. These epidemiological data could also be used by policy-makers in considering strategies for PCa prevention [11].

A survey based on the UK regional cancer registry revealed a substantial socioeconomic gradient for the use of radiotherapy or surgery among men diagnosed with PCa, and for the application of screening tests for PCa [12]. The study called for further investigation of correlations between socioeconomic development and PCa incidence and mortality patterns. Therefore, we tested the hypothesis that PCa incidence and mortality are associated with levels of socioeconomic development and productivity across

different countries. Another study revealed a substantial increase in PCa incidence but a decrease in PCa mortality in the USA [13]. However, it is unknown whether similar trends exist in other countries, and evaluation of global PCa incidence and mortality is an important research perspective. Thus, we investigated whether global PCa incidence has shown an increasing trend and PCa mortality a decreasing trend in most countries.

2. Materials and methods

2.1. Data sources

Incidence and mortality estimates for PCa (International Classification of Diseases 10th revision [ICD-10] diagnosis code C61) were retrieved from the GLOBOCAN database for 184 countries in 2012 [1]. We used a similar methodology to that in a recent epidemiological study on colorectal cancer [11]. We obtained data for the human development index (HDI) and gross domestic product (GDP) for each country in 2012 from the United Nations Human Development Report [14], which highlights progress in human development over the past 25 yr using different statistical indexes. HDI is a composite index of life expectancy, education period, and income per capita indicators [14]. We extracted 2012 incidence and mortality data from GLOBOCAN for the various continents (Table 1), and plotted age-standardized incidence and mortality against HDI and per capita GDP for the same calendar year (Fig. 1A,B). For temporal trend analysis,

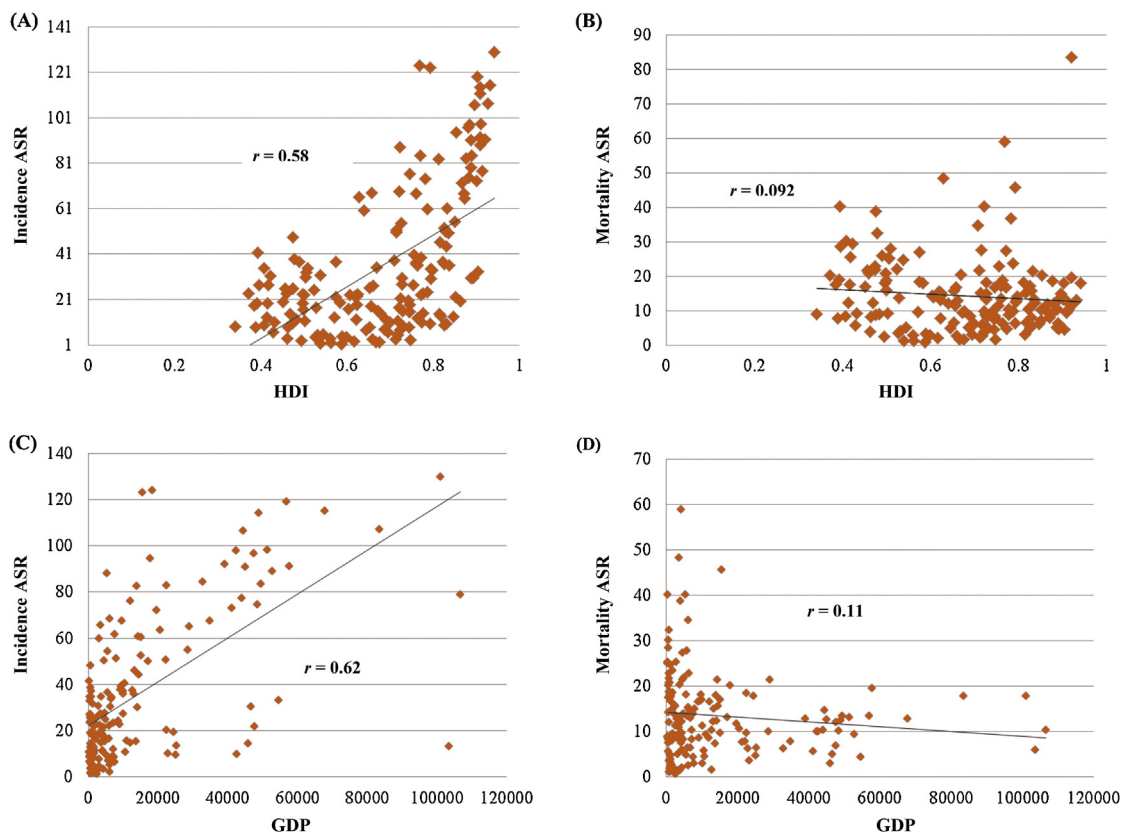


Fig. 1 – Correlation between the human development index (HDI) and the age-standardized rate (ASR) per 100 000 for prostate cancer (A) incidence and (B) mortality. Correlation between per capita gross domestic product (GDP) and the ASR per 100 000 for prostate cancer (C) incidence and (D) mortality.

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