Prostate Int 3 (2015) 135–140

Contents lists available at ScienceDirect

Prostate International

journal homepage: http://p-international.org.

Original Article

The incidence and mortality of prostate cancer and its relationship with development in Asia

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ARTICLE INFO

Article history:
Received 13 July 2015
Received in revised form
12 August 2015
Accepted 8 September 2015
Available online 25 September 2015

Keywords:
Asia
Correlation
Human Development Index
Prostate cancer

ABSTRACT

Purpose: Prostate cancer is a common cancer in men in the world. It is rapidly increasing. This study investigated the incidence and mortality of prostate cancer and the relationship with the Human Development Index (HDI) and its dimensions in Asia in 2012.
Methods: The study was conducted based on data from the world data of cancer and the World Bank (including the HDI and its components). The standardized incidence and mortality rates of prostate cancer were calculated for Asian countries. The correlation between incidence, mortality rates, and the HDI and its components were assessed with the use of the correlation test, using SPSS software.
Results: There was a total of 191,054 incidences and 81,229 death were recorded in Asian countries in 2012. Among the Asian countries, the five countries with the highest standardized incidence rates of prostate cancer were Israel, Turkey, Lebanon, Singapore, and Japan, and the five countries with the highest standardized mortality rates were Turkey, Lebanon, Timor-Leste, Armenia, and the Philippines. The correlation between standardized incidence rate of prostate cancer and the HDI was 0.604 ($P \leq 0.001$), with life expectancy at birth 0.529 ($P = 0.002$), with mean years of schooling 0.427 ($P = 0.001$), and with level of income per each person of the population 0.349 ($P = 0.013$). Also, between the standardized mortality rate and the HDI, it was 0.228 ($P = 0.127$).
Conclusions: A significant and positive correlation was observed between the standardized incidence rate of prostate cancer, and the HDI and its dimensions, such as life expectancy at birth, mean years of schooling, and income level of the population per each person of population. However, there was no significant correlation between the standardized mortality rate, and the HDI and its dimensions.

1. Introduction

Prostate cancer is the sixth most common cancer in the world, the second most common cancer in men, and the most common cancer in men in Europe, North America, and parts of Africa.[1,2] The number of new cases estimated was 513,000 patients in 2000, while the number of new cases estimated was 1.1 million people in 2012. This suggests an increased incidence of prostate cancer in the past decade.[3,4] It is expected that by 2030, 1.7 million new cases and 499,000 deaths will occur in the entire world.[5] The cancer will be known as the most common cancer in men in the future.[4] This cancer includes 15% of all new cancer cases in men. Approximately 70% of all new cases of the cancer occur in developed countries.[3] Fortunately, many people survive for many years after diagnosis. This means that cancer registration systems encompass only the two ends of the spectrum of the disease and are inadequate to determine the true burden of the disease.[6] The incidence rate of prostate cancer differs about 50 times in various populations. The lowest incidence of the disease is seen in Asian countries, and included 14% of all cases in 2008, especially in Tianjin, China (1.9/100,000 person-years). The highest incidence occurred in North America and Scandinavia, especially in African-American people

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http://dx.doi.org/10.1016/j.prnil.2015.09.001

(137/100,000 person-years).[1,7] This might be due to the availability of screening tests used for diagnosis such as prostate specific antigen (PSA), and other factors, including nutrition, genetics, lifestyle, environmental factors, physical activity, smoking, race, and cancer registry systems.[8–10] The incidence of prostate cancer is directly correlated with age. Almost 75% of new cancer cases occur in people older than 85 years. In other words, incidence of this cancer increases with the increase in life expectancy.[1,11] However, the cause of this cancer is unknown.[9] One of the earliest methods of detection of this cancer is PSA,[7] which has been used to screen since the late 1980s. After using the test, a significant increase was observed in the incidence of prostate cancer in 1990; then, the steep of increasing the cancer was less.[12] The level of development is one of the factors that greatly affects the distribution of prostate cancer. In developed countries, prostate cancer is the most common cancer in men, while in less developed countries, the incidence is lower than that of other cancers.[6] This relationship can also be considered in the context of socioeconomics in communities. People with a higher socioeconomic level have a higher incidence of the cancer.[13] Several studies suggest an impact of awareness and level of income on the distribution of mortality from this type of cancer. People with a low awareness and low incomes are more likely to die from prostate cancer. These factors are barriers to treatment of cancer in these individuals.[14–16]

The role of the HDI, and the incidence and mortality of prostate cancer have been considered in a number of studies.[17] Information on the incidence and mortality of prostate cancer can be useful for medical planning and research activities. According to the possible role of the HDI, the aim of this study was to investigate the incidence and mortality of prostate cancer and the relationship with the HDI and its dimensions in Asia in 2012.

2. Materials and methods

This study was an ecologic study in Asia for assessment of the correlation between the age-specific incidence and mortality rate (ASR) and the HDI and its details that include: life expectancy at birth, mean years of schooling, and gross national income (GNI) per capita. Data about the ASR for every Asian country for the year 2012 is obtained from the global cancer project available at http://globocan.iarc.fr/Default.aspx and data about the HDI is obtained from the Human Development Report 2013[18] that includes information about the HDI and its details for every country in the world for the year 2012.

2.1. Method of estimate of the ASRs in the global cancer project by the international agency for research on cancer

2.1.1. Age-specific incidence rate estimate

The methods of estimation are country-specific and the quality of the estimation depends upon the quality and on the amount of information available for each country. In theory, there are as many methods as countries, and because of the variety and the complexity of these methods, an overall quality score for the incidence and mortality estimates combined is almost impossible to establish. However an alphanumeric scoring system which independently describes the availability of incidence and mortality data has been established at the country level. The combined score is presented together with the estimates for each country, with an aim of providing a broad indication of the robustness of the estimation.

The methods to estimate the sex- and age-specific incidence rates of cancer for a specific country fall into one of the following broad categories, in the following order of priority: (1) rates projected to 2012 (38 countries); (2) most recent rates applied to the 2012 population (20 countries); (3) estimated from national mortality by modelling, using incidence mortality ratios derived from recorded data in country-specific cancer registries (13 countries); (4) estimated from national mortality estimates by modelling, using incidence mortality ratios derived from recorded data in local cancer registries in neighboring countries (9 European countries); (5) estimated from national mortality estimates using modelled survival (32 countries); (6) estimated as the weighted average of the local rates (16 countries); (7) one cancer registry covering part of a country is used as representative of the country profile (11 countries); (8) age/sex-specific rates for “all cancers” were partitioned using data on relative frequency of different cancers (by age and sex) (12 countries); and (9) the rates are those of neighboring countries or registries in the same area (33 countries).[19–21]

2.1.2. Age-specific mortality rate estimate

Depending on the degree of detail and accuracy of the national mortality data, six methods have been utilized in the following order of priority: (1) rates projected to 2012 (69 countries); (2) most recent rates applied to the 2012 population (26 countries); (3) estimated as the weighted average of regional rates (1 country); (4) estimated from national incidence estimates by modelling, using country-specific survival (2 countries); (5) estimated from national incidence estimates using modelled survival (83 countries); and (6) the rates are those of neighboring countries or registries in the same area (3 countries).[19–21]

2.2. HDI

The HDI is a composite measure of indicators along three dimensions: life expectancy, educational attainment, and command over the resources needed for a decent living. All groups and regions have seen notable improvement in all HDI components, with faster progress in low and medium HDI countries. On this basis, the world is becoming less unequal. Nevertheless, national averages hide large variations in human experience. Wide disparities remain within countries of both the North and the South; income inequality within and between many countries has been rising.[17]

2.3. Statistical analysis

In this study, we used to the correlation bivariate method for assessment of the correlation between the ASR and the HDI and its details that include: life expectancy at birth, mean years of schooling, and GNI per capita. Statistical significance was assumed if $P < 0.05$. All reported P values are two-sided. Statistical analyses were performed using SPSS (version 15.0, SPSS Inc., Chicago, IL, USA).

3. Results

A total of 191,054 prostate cancer cases were recorded in Asian countries in 2012. The five countries with the highest number of patients were Japan (55,970 cases), China (46,745 cases), India (19,095 cases), Indonesia (13,663 cases), and Turkey (12,650 cases), respectively. The five countries include a total of 148,123 cases, 77.52 percentage of all cases in Asia.

Among Asian countries, the five countries with the highest standardized incidence rates of prostate cancer were: Israel with 84.3/100,000, Turkey with 40.6/100,000, Lebanon with 37.2/100,000, Singapore with 33.1/100,000, and Japan with 30.4/100,000. The five countries with the lowest standardized incidence rates of the cancer were Bhutan with 1.2/100,000, Nepal with 1.5/100,000, Bangladesh with 1.7/100,000, Uzbekistan with 2/100,000, and Turkmenistan with 2.1/100,000 (Table 1 and Fig. 1).