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CANCER INCIDENCE PATTERN IN IRAN PROVINCES AND ASSOCIATION WITH HUMAN DEVELOPMENT INDEX

R. ALIZADEH-NAVAEI, A. HEDAYATIZADEH-OMRAN, G. JANBABAEI

Gastrointestinal Cancer Research Center, Mazandaran University of Medical Sciences, Sari, Iran

Abstract – *Objective:* *Cancer is one of the main causes of death in Iran. Socioeconomic factors, such as human development index (HDI), affect cancer incidence. The aim of this study was to determine the cancer incidence pattern in Iran provinces and its association with HDI.*

Materials and Methods: *This cross-sectional study was performed on the latest national cancer registry report. The HDI index values include: education, life expectancy, and GDP indexes. The extracted data, including age-standardized incidence rate (ASR) for cancers in men and women of each province, as well as the HDI value of the province, were analyzed by SPSS. HDI was classified in four categories, low (score < 0.55), medium (0.55-0.7), high (0.7-0.8), and very high (0.8-1.0).*

Results: *The lowest HDI pertained to Sistan (0.582). The highest ASR of cancer related to women were in Yazd (173 per 100,000), while in Markazi for men (180 per 100,000). A significant correlation was observed between ASR of cancer incidence in female gender and HDI (r=0.418; p=0.021), while no correlation was found between ASR of cancer incidence in men and HDI (r=0.322; p=0.083). The mean ASR for cancer incidence among women in areas with high HDI (125.2 ± 37.2) was significantly higher compared to that of regions with medium HDI (96.2 ± 28.9) (p=0.024).*

Conclusions: *The findings of the present study suggest that the age-standardized cancer incidence for the female gender was higher in neighborhoods with higher human development index, whereas no significant relationship was observed between age-standardized cancer incidence for the male gender and human development index.*

KEYWORDS: *Cancer, Age-standardized rate, Human development index.*

INTRODUCTION

Nowadays non-communicable diseases (NCDs) are known as "onfige of the major challenges for health system in the 21st century"[1]. In 2015, cancer caused over 8.7 million deaths globally in the world and it is the third cause of death and major health issues in Iran[2,3]. Avoidable inequalities in social determinants of health, such as socioeconomic factors, geographic location, and sex, also play a role in cancer incidence[4,5]. Various studies have shown the relations between development indexes as socioeconomic factors with cancer incidence and mortality[6,7]. Human development index (HDI) is a composite measure of indicators on three dimensions: life expectancy, educational index, and control over the resources demanded for a decent living[8]. HDI as a key socioeconomic determinant of health is composite of these three components[10]. Although the overall incidence of cancer in developing countries is as much as half of the world's developed countries in both sexes, generally overall cancer death rate in these countries is similar and cancer survival tends to be poorer in developing countries[8]. Whereas the significance of the developmental consequences of NCDs is not yet sufficiently understood and given the high geographical variations in the field

Corresponding Author: Akbar Hedayatizadeh-Omran, MD, Ph.D; e-mail: akbar_hedayati@yahoo.com

of cancer[1,10] this study aims to investigate the relationship between cancer incidence in different provinces of Iran and the HDI of each respective province.

MATERIALS AND METHODS

This is a cross-sectional study in the latest national cancer registry report. HDA values were obtained from Neisi study[11]. The extracted data, including age-standardized incidence rate (ASR) for cancers in men and women, also included HDI value and its subtype: education, life expectancy, and GDP indexes for each province. HDI was classified in four categories, namely low (score < 0.55), medium (0.55-0.7), high (0.7-0.8), and very high (0.8-1.0). The maps were created with Microsoft Office Excel. Data were analyzed with SPSS 19 (SPSS Inc. Chicago, IL, USA). Pearson's correlation coefficient and *t*-test were used for analysis and *p*-values < 0.05 were considered as significant level.

RESULTS

The lowest HDI pertained to Sistan (0.582) and the highest age-standardized incidence rate of cancer pertained to women in Yazd (173) and men in Markazi (180). The pattern of cancer incidence and HDI in Iran provinces was shown in Figure 1. A significant correlation was observed between ASR of cancer incidence in female gender and HDI (r=0.418; *p*=0.021) (Figure 2), while no correlation was found between ASR of cancer incidence in men and HDI (r=0.322; *p*=0.083) (Figure 2). Eleven provinces had high and 19 provinces had medium HDI. The mean ASR for cancer incidence among women in regions with high HDI (125.2 ± 37.2) was significantly higher compared to that of regions with medium HDI (96.2 ± 28.9) (*p*=0.024) (Figure 3). The mean ASR for cancer incidence among men in regions with high HDI (129.5 ± 33.4) wasn't significantly difference (*p*=0.14) compare to that of regions with medium HDI (109.6 ± 35.2) (Figure 3). There was a significant correlation between education index and life expectancy index with ASR in male (r=0.419, *p*=0.021 and r=0.426, *p*=0.19, respectively) and female (r=0.545, *p*=0.002 and r=0.613, *p*=0.000, respectively), but there wasn't a significant correlation between GDP with ASR in male (r=0.151, *p*=0.426) and female (r=0.196, *p*=0.3)

DISCUSSION

The findings of the present study indicate that the age-standardized cancer incidence for the female gender was higher in regions with higher human development index, whereas no significant relationship was observed between age-standardized cancer incidence for the male gender and human development index. One of the reasons for higher incidence rates of cancer in areas with high HDI could be the common stage of risk factors in that area, which is consistent with the research conducted by Ferrari et al[8]. It is estimated that cancer led to 13.2 million deaths with 20.3 million new cases in 2030 compared with an estimated 7.6 million deaths and 12.7 million cases in 2008 and over the past decades, the global patterns of cancer incidence and mortality have been changed. The highest incidence and mortality rates of many cancers were found in most developed countries compared to less developed countries[9]. In a global study has been looked to whether all cancer mortalities to incidence ratio were related to the country's income level by gross domestic product (GDP) and HDI[9]. Various studies have shown a relationship between risk factors for

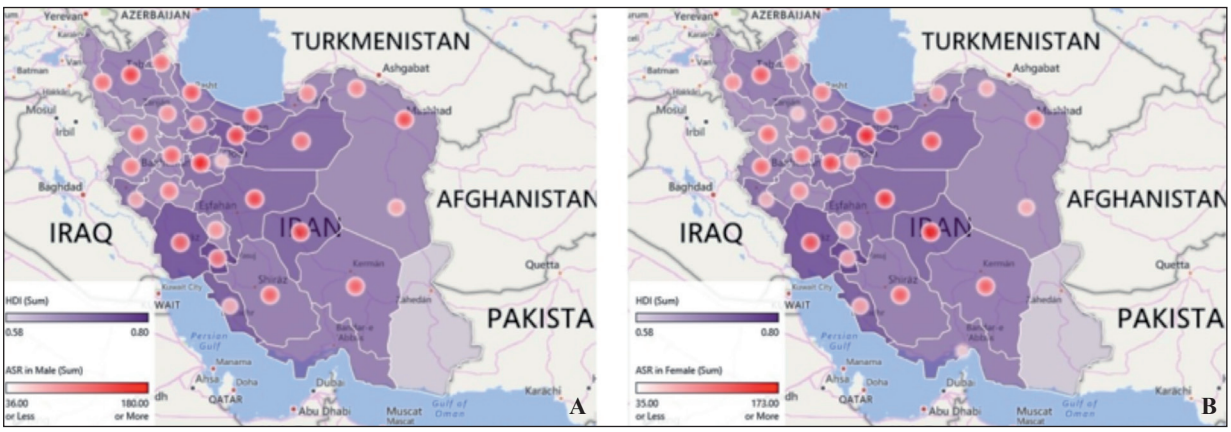

Fig. 1. Male (**A**) and female (**B**) of cancer incidence pattern and Human Development Index (HDI) in Iran provinces.

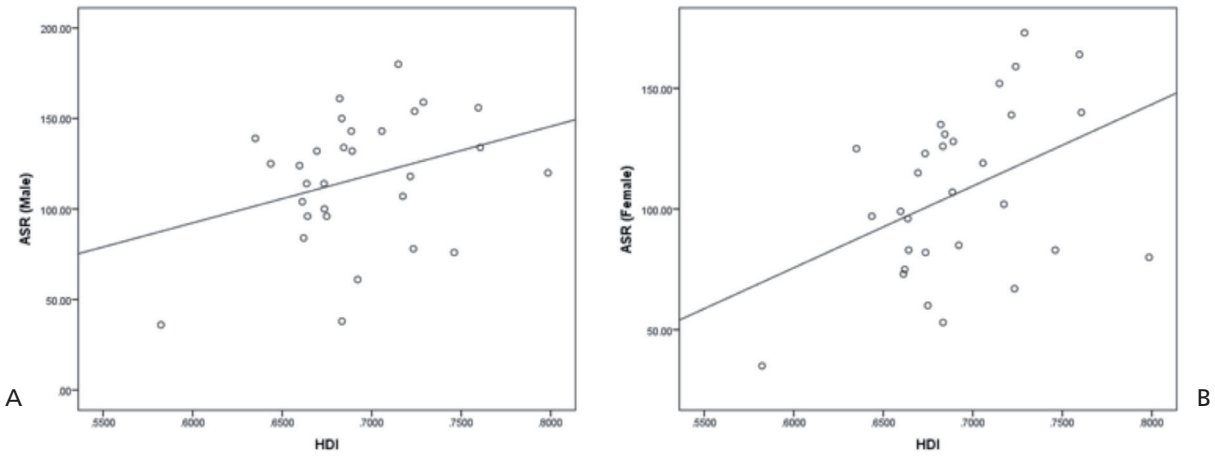

Fig. 2. Correlation between ASR of cancer incidence in male (**A**) and female (**B**) with HDI.

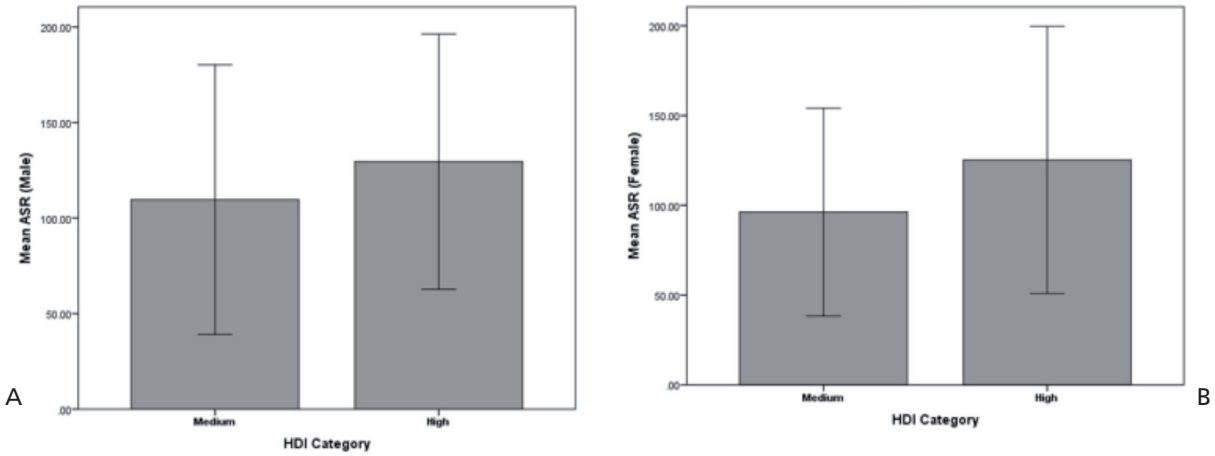

Fig. 3. The mean ASR for cancer incidence among male (**A**) and female (**B**) in regions with high and medium HDI.

types of cancers and other chronic diseases with HDI and development of countries. Ferrari et al[8] showed that high HDI in the population are accompanied with increased obesity prevalence in men, increased alcohol, cigarette, fruits and vegetable capitation, increased red meat consumption and also with high stomach cancer incidence. However, Fidler et al[12] showed that there was consistent evidence of differing cancer profiles across HDI levels, particularly to the extent that declines in infection-related cancers are being displaced with cancers associated with Westernization and increasing socioeconomic development. Reducing disparities in cancer outcomes are a major priority of governments. We assess for the first time the link between human HDI and the incidence cancer in Iran provinces. This study highlights positive and negative associations between human development and incidence of cancers. These results show cancer control specialists and governments should be aware of the cancer profiles and risk factors and reliability of data on cancer-related health disparities observed at each HDI levels of provinces.

CONCLUSIONS

Clarifying the contributions proportion of this HDI inequality in different type of cancers within a given area is likely an appropriate goal. Further studies and reliable data on cancer-related health disparities among socioeconomic and demographic groups are required.

Conflict of interest:
None

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