Cukurova Medical Journal
ÇUKUROVA ÜNİVERSİTESİ TIP FAKÜLTESİ DERGİSİ

Cukurova Med J 2017;42(2):233-240
DOI: 10.17826/cutf.322865

ARAŞTIRMA / RESEARCH

Incidence and mortality of uterine cancer and relationship with Human Development Index in the world

Uterus kanser insidansı ve mortalitesi, ve dünyada İnsani Gelişme İndeksi ile ilişkisi

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Cukurova Medical Journal 2017; 42(2):233-240

Abstract

Purpose: The aim of this study was to evaluate the incidence, mortality of uterine cancer, their relationship with Human Development Index (HDI), and its components in world in 2012.

Material and Methods: Data were obtained from incidence and mortality rates presented by GLOBOCAN in 2012. Data on HDI and its components were extracted from the World Bank site. We used the correlation bivariate method for assessment of the correlation between Standardized Mortality Rates (SMRs) and Standardized Incidence Rates with HDI, and its details.

Results: In total, 52762 incidence cases and 265672 deaths of prostate cancer were recorded in 2012 in all countries in the world. ASMR for cervix uteri cancer was 6.8 per hundred thousand people in the entire world and ASMR for cervix uteri cancer was 6.8 per hundred thousand people in the entire world.A negative correlation of -0.578 was seen between SIR of uterine cancer and HDI. Also, a negative correlation of -0.717 was seen between SMR of uterine cancer and HDI.

Conclusion: The results of this study show that the incidence and mortality of uterine cancer is higher in less developed countries and incidence is positively significantly related to HDI. Finally, the expansion of effective, acceptable screening programs can effectively reduce the incidence of Cancer.

Key words: Incidence, mortality, uterine cancer.

Öz

Amaç: Bu çalışmanın amacı uterus kanser insidans ve mortalitesinin, İnsani Gelişme Indeksi (HDI) ve bunun 2012'deki komponentleri ile arasındaki ilişkiyi değerlendirmektir.

Gereç ve Yöntem: Bu çalışmada kullanılan veriler, 2012 yılında GLOBOCAN tarafından sunulan insidans ve ölüm oranlarında elde edilmiştir. HDI ve bileşenleri hakkındaki veriler Dünya Bankası sitesinden alınmıştır. HDI ve komponentleri ile Standart Mortalite Oranları (SMH) ve Standart İnsidans Hızları (SIH) arasındaki korelasyonun değerlendirilmesi için iki değişkenli korelasyon yöntemi kullanıldı. **Bulgular**: Toplamda 2012'de dünyadaki tüm ülkelerde prostat kanseri için 52762 insidans vakası ve 265672 ölüm kaydedildi.

Serviks uteri kanseri için SMH, tüm dünyada yüz bin kişi için 6.8 olarak saptandı. Uterus kanseri SIH ile HDI arasında -0.578'lik negatif korelasyon saptandı. Ayrıca, uterus kanseri (SMH) ile HDI arasında-0.717'lik negatif korelasyon saptandı.

Sonuç: Bu çalışmanın sonuçları, az gelişmiş ülkelerde uterus kanser insidansının ve mortalitesinin daha yüksek olduğunu ve insidansın HDI ile pozitif ilişkili olduğunu göstermektedir. Sonuç olarak, etkili ve kabul edilebilir tarama programlarının yaygınlaştırılmasının kanser insidansını etkili bir şekilde azaltabileceği düşünülmektedir

Anahtar kelimeler: İnsidans, mortalite, uterin kanseri

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Geliş tarihi/Received: 14.06.2016 Kabul tarihi/Accepted: 13.09.2016

INTRODUCTION

After cardiovascular disease, cancer is the second leading cause of death in developed countries[1] and the fourth leading cause of death in developing countries[2];this imposesa huge burden on individuals around the world[3,4]. Femalegenitaltractmalignancies comprising thecorpus uteri, cervix uteri, vulva, ovary, vagina, fallopian tubes, and placenta are the third most common group of cancer among women. Cervical cancer,which is an important public health problem, remainsthe fourth most commontype of cancer among women and the most common gynecologic cancer[5],despite the fact that it is largely preventable[6].There were 528,000 new cases and 266,000 deathsin 2012, wherein a large part of the disease burden was imposed on less developed countries. Hence, cervical cancer has long been the leading cause of mortality among women worldwide[5].

Cancer develops gradually; thus, regular and periodic screening tests using the Papanicolaou (Pap) technique associated with reducing the risk of invasive cervical cancer reduces the rate of morbidity and mortality[7]. The Pap smear detects any changes in cells of the transformation zone of the cervix and identifies women who need further diagnosis and treatment[8].Given that the initiating event in the development of cervical dysplasia and carcinogenesis is related to certain Human Papillomavirus(HPV)genotypes, the relationship between behavior and cervical cancer has become clear[9]. Studies have shown that different risk factors contribute to the occurrence of cervical cancer. Although persistent infection with oncogenic subtypes of HPV isthe strongestrisk factor, other common risksmay include the age at first sexual intercourse (less than 16 years), multiple sexual partners, having unprotected sex, long-term oral contraceptive use, smoking, immunesuppression, multiparity, and lack of cytology-based screening[10-13]. A portion of these risk factors are associated with lifestyle changes that present in many countries.

The first step in controlling the cancer burden in any population is to know the situation. The incidence and mortality are the key indicators to measure cancer burden and need forcancer services[14]. The impact of cervical cancer is markedly different in various populations, reflecting the HPV prevalence, rate of cervical cancer screening, and treatment[15,16]. According toGlobocan 2012, the highest ASRs ofcervical cancerwere found ineastern Africa, Melanesia, and southern and middle Africa. However, rates are lowest in Australia/New Zealand and western Asia[5].

The human development index (HDI) is developed by the United Nations and was introduced in the first Human Development Report in 1990. This index is astatistical tool of longevity, knowledge, and standard of living. Longevityis measuredbased on the life expectancy at birth, knowledge withpotential years of education, and standard of living with GPD per capita or income.The value of the HDI can vary between 0 and 1. According to HDI, countries in the world are divided into four categories as follows: countries with a very high HDI (≥0.9), a high HDI (≥0.8), a middle HDI (0.8> HDI >0.5), and a low HDI (≤0.5)[17].

The importance of HDI pertaining to the incidence and mortality of cancer has been confirmed in numerous studies[18-20]. Research regarding the patterns of incidence and mortality of cervical cancer among women is keyto health planning and study activities[14]. In this regard, the aim of present study was to evaluate the incidence and mortality of uterine cancer and its relationship with HDI.

MATERIALS AND METHODS

This study was an ecologic study in the World for assessing the correlation between age-specific incidence and mortality rate (ASR) with HDI and its details, including life expectancy at birth, mean years of schooling, and Gross national income (GNI) per capita.

Data about the age-specific incidence and mortality rate (ASR) for every country in 2012 were get from the global cancer project that available in (http://globocan.iarc.fr/Default.aspx)[21] and HDI from Human Development Report 2013[22], that includes information about HDI and its details for every country in the world in 2012. This research followed the tenets of the Declaration of Helsinki.

Method for estimating the age-specific incidence and mortality rates in global cancer project by international agency for research on cancer

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 the 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 priority order:

1- Rates projected to 2012 (38 countries)-
2- Most recent rates applied to 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 a 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)-
9- The rates are those of neighboring countries or registries in the same area (33 countries)[21].

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 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)-
6- The rates are those of neighboring countries or registries in the same area (3 countries)[23].

Human Development Index (HDI)

HDI is a composite measure of indicators along three components, including 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, and income inequality within and between many countries has been rising. According to HDI, countries in the world are divided into four categories as follows: countries with very high HDI (HDI≥=0.80), countries with a high HDI (0.80>HDI>0.710), medium HDI countries (0.710≥HD≥0.535), and countries with a low HDI (HDI<0.535)[22].

Statistical analysis

In this study, we used correlation bivariate method for assessment of the correlation between age-specific incidence and mortality rate (ASR) with HDI and its details, which 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.).

RESULTS

The number of Cervix uteri cancer

There were 52762 cases of cervix uteri cancer in 2012 worldwide. In very high HDI countries, there were 65314 cases, in high HDI countries 94262, in medium HDI countries 257729 cases, in low HDI countries 110061. The five countries with the most cases of the Cervix uteri cancer included: India with 122844 cases, China with 61619, Indonesia with 20928, Brazil and Russian Federation with 18503

and 15342 cases, respectively.

Age-standardized incidence of Cervix uteri cancer

ASIR for cervix uteri cancer was 14 per hundred thousand people in the world. ASIR in very high HDI countries was 8.5 per hundred thousand people, in high HDI countries was 15.5 per hundred thousand people, in medium HDI countries was 13.8 per hundred thousand people, and in countries with a low HDI was equal to 25.7 per hundred thousand people. Five countries that had the highest ASIR include Malawi with 75.9 per hundred thousand people, Mozambique with 65 per hundred thousand people, Comoros with 61.3 per hundred thousand people, Zambia with 58 per hundred thousand people, and Zimbabwe with 56.4 per hundred thousand people.

Cervix uteri cancer mortality

In 2012, 265672 deaths due to Cervix uteri cancer occurred worldwide. In very high HDI countries 27261 cases, in high HDI countries 39075 cases, in countries with low HDI 67237, in medium HDI countries 131980 cases of deaths occurred. Five countries with the highest number of deaths included: India with 67477 cases, China with 29526 cases, Indonesia with 9498 cases, Brazil and Nigeria with 8414 and 8240 cases, respectively.

Age-standardized mortality rates for cervix uteri cancer

ASMR for cervix uteri cancer was 6.8 per hundred thousand people in the entire world. ASMR in very high HDI countries was 2.7 per hundred thousand people, in high HDI countries was 6.1 per hundred thousand people, medium HDI countries was 7.1 per hundred thousand people, and in countries with low HDI was 16.6 per cent thousand people. Five countries that had the highest ASMR include Malawi with 49.8 per hundred thousand people, Mozambique with 49.2 per hundred thousand people, Comoros with 40.3 per hundred thousand people, Burundi and Zambia with 36.2 to 39.3 per hundred thousand people, respectively. Standardized incidence and mortality rates is higher in developing countries more than developed countries.

HDI situation in the world

HDI values range from 0.944 to 0.337 in the studied countries. Of the countries surveyed, 49 countries ranked as very high HDI countries, 52 countries were in the category of countries with a high HDI, 41 countries with medium HDI countries and 32 countries in the category of countries with low HDI, respectively.

Five countries with the highest HDI included Norway with 0.944, Australia with 0.933, Switzerland with 0.917, Netherlands and the USA with 0.914 and 0.915, respectively. Five countries with the lowest HDI, respectively, included Sierra Leone with 0.374, Chad with 0.372 and Central African Republic with 0.341 and Democratic Republic of the Congo with 0.338 and Niger with 0.337[22].

The relationship between the age-standardized incidence of cervix uteri cancer and the human development index

There was a statistically significant negative correlation equal to -0.578 between the standardized incidence rate of cervix uteri cancer and the human development index ($p<0.001$) (Figure 1). As well, there was a negative correlation between components of the human development index and standardized incidence rate of cervix uteri cancer, so that the standardized incidence rate had a negative correlation of -0.625 with life expectancy at birth ($p<0.001$), a negative correlation of -0.419 with mean years of education ($p <0.001$) and a negative correlation of -0.487 with the income level per person of the population ($p<0.001$), respectively (Table 1).

The relationship between the age-standardized mortality of cervix uteri cancer and the human development index

The standardized mortality of the cervix uteri cancer had a statistically significant negative correlation with the human development index equal to -0.717 ($p<0.001$) (Figure 2). In addition, there was a significant negative correlation between components of the human development index and the standardized mortality of cervix uteri cancer, so that the relationship between the standardized mortality had a negative correlation of -0.739 with life expectancy at birth ($p<0.001$), a negative correlation equal to -0.578 with the mean years of schooling ($p<0.001$), and a negative correlation of equal to -0.517 with the income level per person of the population ($p<0.001$), which were statistically significant relationships (Table 1).

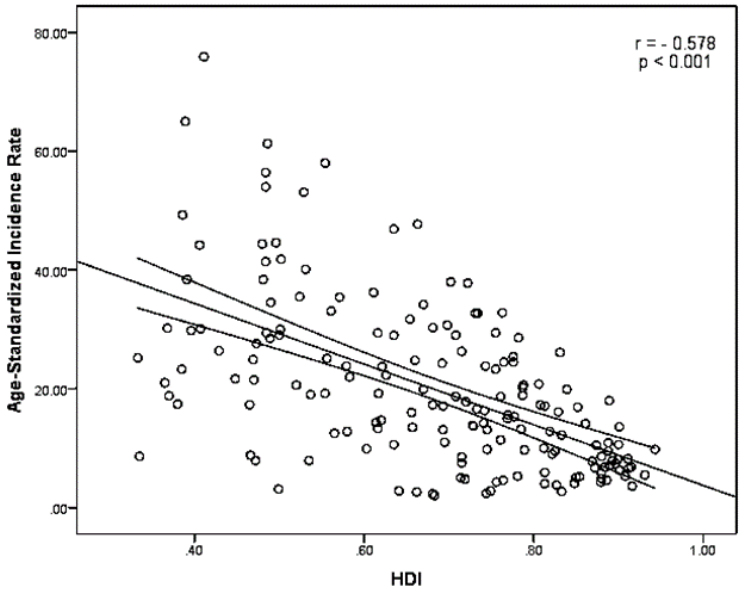

Figure 1. The association between standardized incidence of cervix uteri cancer and human development index.

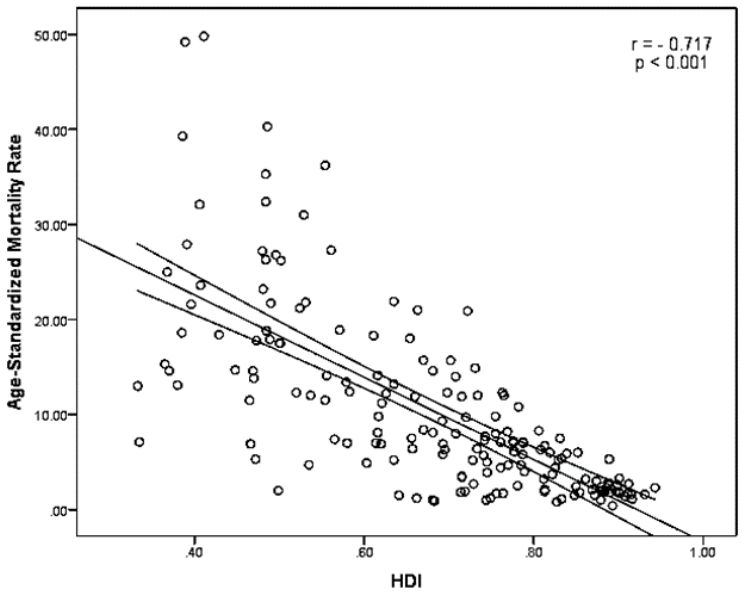

Figure 2. The association between standardized mortality of cervix uteri cancer and human development index

Table 1- The correlation between ASIR, ASMR with HDI and their subscores

Variables	HDI	LEY	Literacy	GNP
#ASIR	r = - 0.578 p < 0.001	r = -0.625 p < 0.001	r = - 0.419 p < 0.001	r = - 0.487 p < 0.001
*ASMR		r = - 0.739 p < 0.001	r = - 0.578 p < 0.001	r = - 0.517 p < 0.001

#: Age-Standardized Incidence Rate, *: Age-Standardized Mortality Rate

DISCUSSION

Cancer is a global health problem[24]. In the present article, the incidence and mortality of cervical cancer worldwide is summarized. Cervical cancer is the most common gynecological cancer in women. It currently accounts for 528,000 new cases worldwide and remains the leading cause of cancer deaths[5]. This is an important public health problem affecting all societies. Its incidence follows a substantially different pattern in different geographical areas, and this needs to be explained. Since the introduction and widespread use of prevention programs, particularly the Papanicolaou (Pap) smear, vaccination against the Human Papillomavirus (HPV), and early treatment, the incidence and mortality of cervical cancer has steadily and significantly declined in developed countries[25].

HPV is one of the most common viral infections of the reproductive tract and causes many cancers in men and women, including cervical cancer [26,27]. Permanent infection with oncogenic types of HPV is necessary but insufficient to cause cervical cancer. HPV prevalence is highest in those <25 years of age. Two types of vaccine for HPV are available.Both encompass high-risk species that cause most cervical cancer, and must therefore be administered before the first sexual encounter and exposure to HPV infection. The availability and use of these vaccines differs vastly between more and less developed countries and impacts the cervical cancer occurrence[28].

Although the screening of cervical cancer was introduced many years ago, the use and acceptance of this test varies widely. Therefore, the incidence of cervical cancer is lowest in countries in which screening programs for women are available[25]. In some parts of the world, the screening program is insufficiently available. Furthermore, some women do not wish to undergo these tests. According to Jia et al (2013), demographic characteristics and knowledge about cervical cancer affects the decision about screening. In this study, the most common barrier to screening of cervical cancer is anxiety related to a possible positive result on the screening test[29]. The realization of vulnerability to cervical cancer is an important predictor in screening. According to Bayu et al, the fear of testing and feeling healthy were common causes for not having the screening test[30]. Almost 445000 new cases occurred in less developed regions[5]. However, before the introduction of the screening policy, the rate of cervical cancer was more similar among developing and developed countries[31]. Married women were diagnosed earlier, which was associated with better outcome[32].

Most cases of cervical cancer occur in less developed regions.The highest incidence is in India, China, Indonesia, Brazil, and Nigeria. The reasons for the difference in incidence rates in different geographic regions are complex and include genetics, exposure to risk factors, lifestyle, socio-economic and behavioral factors, and availability of screening and treatment options[12,33-35]. Higher rates of cervical cancer occur in lower HDI regions, reflecting the socioeconomic disparity. The use of secondary prevention for cervical cancer is related to HDI. Hence, in developed countries with high HDI, the application of public health promotion programs is more common[35].

The results indicate that not only incidence but also mortality of cervical cancer varies worldwide. Nearly 7.5% of all female cancer deaths are a result of cervical cancer. The mortality rate varies in different regions, by approximately 18 fold worldwide[5]. Most of the differences in the mortality are attributable to cancer prevention and early detection[36,37]. However, the survival rate can contribute to the mortality rate. Based on the development status of each country, the survival rate of cervical cancer varies between different regions around the world. Higher survival rate may be due to earlier stage at diagnosis, better treatment outcome, and improved treatment management[38]. The incidence and mortality rate are a manifestation of inequality in health, because approximately 85% of the global burden occurs in

less developed countries[5]. The HIV/AIDS epidemic also plays an important role in the high incidence of cervical cancer.Previous studies reveal higher rates of HPV in HIV-positive individuals[39,40].

Our study was an ecological study and special limitations of this study include ecological misleading and lack of relation of group results with individuals.

The results of this study show that the incidence and mortality of cervical cancer is higher in less developed countries and incidence is positively significantly related to HDI. Finally, the expansion of effective, acceptable screening programs can effectively reduce the incidence of CC.

Acknowledgements

Hereby we appreciate of the cooperation of all employees involved in data collection in the GLOBOCAN project and World Bank.

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