RESEARCH ARTICLE

Incidence and Mortality of Testicular Cancer and Relationships with Development in Asia

Mostafa Sadeghi[1], Mahshid Ghoncheh[2], Abdollah Mohammadian-Hafshejani[3], Hamidreza Sadeghi Gandomani[4], Hosein Rafiemanesh[4], Hamid Salehiniya[5,6]*

Abstract

Background: Testicular cancer is one of the most common cancers among young men between ages 20-34 in countries with high or very high levels of the Human Development Index (HDI). This study investigated the incidence and mortality of prostate cancer and the relationship with the HDI and its dimensions in Asia in 2012. Materials and Methods: The study was conducted based on data from the world data of cancer and the World Bank (including the HDI and its components). Standardized incidence and mortality rates of testicular cancer were calculated for Asian countries. Correlations between incidence and/ormortality 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 14902 incidences and 5832 death were recorded in Asian countries in 2012. Among the Asian countries, the five countries with the highest standardized incidence rates of testicular cancer were Israel, Georgia, Turkey, Lebanon and Kazakhstan and the five countries with the highest standardized mortality rates were Turkey, Georgia, Jordan, Cambodia and the Syrian Arab Republic. A positive correlation of 0.382 was observed between the standardized incidence rates of testicular cancer and the HDI (p=0.009). Also a negative correlation of 0.298 between the standardized mortality rate of testicular cancer and the Human Development Index was noted although this relation was statistically non-significant (p=0.052). Conclusions: There is a positive correlation between HDI and the standardized incidence rate of testicular cancer and negative correlation with standardized mortality rate.

Keywords: Asia - human development index - testicular cancer - incidence - mortality

Asian Pac J Cancer Prev, **17 (9)**, 4251-4257

Introduction

Testicular cancer is one of the most common cancers in the United States among men between age 15- 44 years, with about 8,400 cases diagnosed in 2010 (ACS, 2010). Recent studies have shown increased incidence of testicular cancer during the past 40 years (ACS, 2010; Bray et al., 2010). The American Cancer Society (ASC) estimates that in 2014, 8820 new cases of testicular cancer will be diagnosed and 380 Of them will die due to the disease (28). According to this association testicular cancer is one of the most preventable cancers. The prognosis is good and 5-year survival rate due to the Stage of diagnosis is 74% to 99% (28). The incidence rate of testicular cancer is reported Annually of 5.6 per 100,000 men of all races between 2007-2011 (Horner et al., 2009). There are no published Data about testicular cancer in the region of Southeast Asia (Tan et al., 2011). The incidence of testicular cancer is known and variable among different ethnic groups (Chia et al., 2010; Gilligan et al., 2010). So that its distribution is highly variable according to race and the lowest rate is reported in African-American race and other non-whites compared to whites. And also exclusive significant attenuation is Shown in Caucasians compared with non-Caucasians (Sui et al., 2015). For unknown reasons, the Incidence of testicular cancer has increased steadily so that it has been doubled in North America and most European countries during the last 20 years (Curreri et al., 2015). The incidence of the Asian countries is much lower than those in European ones (Chia et al., 2010). In general, older than 40 years of age and socioeconomic status are among independent survival Prognostics of testicular cancer (Fossa et al., 2011).

To estimate the economic situation of countries,

*[1]Department of Biostatistics and Epidemiology, Faculty of Health, Tabriz University of Medical Science, Tabriz, [2]Department of Epidemiology & Biostatistics, School of Public Health, Hamadan University of Medical Sciences, Hamadan, [3]Department of Social Medicine, School of Medicine, Rafsanjan University of Medical Sciences, Rafsanjan, [4]Trauma Nursing Research Center, Faculty of Nursing and Midwifery, Kashan University of Medical Sciences, Kashan, [5]Zabol University of Medical Sciences, Zabol, [6]Department of Epidemiology and Biostatistics, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran *For correspondence: alesaleh70@yahoo.com*

United Nations HDI index is used. This index is Effective on the distribution and incidence of cancers, including testicular cancer. HDI is a national Measuring indicator that is based on 4 indexes: life expectancy at birth, the average and expected School years and impure national income. Countries with score of HDI = 0.788 and higher are Classified as developed countries and other countries as developing ones (Klugman, 2010; Pakzad et al., 2015b).

Studies show that a small percentage of the population have good knowledge about the factors that Cause cancer and diagnostic procedures (Ray and Mandal, 2004). Among the factors associated with an increased Incidence of testicular cancer at early ages, we can mention lack of public awareness about the Importance of the disease. Especially early detection can significantly reduce risks of invasive Treatment and mortality (Wynd, 2002; Ghoncheh et al., 2015a; Pakzad et al., 2015a). Testicular self-examination is a simple method which can help reduce the Consequences of cancer in men who are properly trained and are regularly encouraged to use it (Cook, 2000).

Geographic and ethnic Differences are above determining the causal factors of testicular cancer such as: Genetic Predisposition, exposure to maternal estrogen, occupational hazards, combinations of diet, smoking Habits and place of birth (Myrup et al., 2010; Yousif et al., 2010). Since the awareness of testicular cancer incidence and mortality Can be useful for health programming and research activities and considering the possible role of The Human Development Index, this study examines the incidence and mortality of testicular cancer And its relationship with Human Development Index and its components in Asia in 2012.

Materials and Methods

This study was an ecologic study in Asia for assessment the correlation between age-specific incidence and mortality rate (ASR) with Human Development Index (HDI) and its details that include: 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 Asian country for year 2012 get from global cancer project that available in (http://globocan.iarc.fr/Default.aspx) (Ferlay J et al., 2016) and Human Development Index (HDI) from Human Development Report 2013 (Malik, 2013) that include information about HDI and its details for every country in the word for year 2012.

Method of estimate 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 that 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 modeling, using incidence mortality ratios derived from recorded data in country-specific cancer registries (13 countries)-4-Estimated from national mortality estimates by modeling, 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 modeled 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)-9- The rates are those of neighboring countries or registries in the same area (33 countries) (Ferlay et al., 2015; Ferlay et al., 2016).

Age-specific mortality rate estimate: Depending of 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 modeling, using country-specific survival (2 countries)-5-Estimated from national incidence estimates using modeled survival (83 countries)-6-The rates are those of neighboring countries or registries in the same area (3 countries) (Ferlay et al., 2015; Ferlay J et al., 2016).

Human Development Index (HDI): HDI, 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, and income inequality within and between many countries has been rising (Malik, 2013).

Statistical analysis: In this study, we use of correlation bivariate method for assessment the correlation between age-specific incidence and mortality rate (ASR) with Human Development Index (HDI) and its details that include Life expectancy at birth, Mean years of schooling and Gross national income (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

Overall, in Asian countries 14902 cases of testicular cancer have been registered in 2012 and the 5 Countries with the highest number of cases are as follows respectively: 1.India with 3298 cases, 2. China with 2627 cases, 3.Indonesia with 1676 cases, 4. Turkey with 1320 cases and 5.Japan with 1274 cases and these five countries have allocated a total of 10195 cases (41/68%) of the cases in Asia to themselves. In Asian countries, 5 countries with the highest standardized incidence rate of testicular cancer are As follows respectively: 1. Israel with standardized rate of 4.9 per hundred thousand people, 2. Georgia with rate of 3.3 per hundred thousand people, 3. Turkey with

Table 1. Numbers and Crude and Standardized Testicular Cancer Incidence and Mortality Rates in Asian Countries in 2012 (Sorted by Age-Standardized Rate from the Highest Value to the Lowest)

Testis - Estimated incidence, all ages				Testis - Estimated mortality, all ages			
POPULATION	Numbers	Crude Rate	ASR (W)	POPULATION	Numbers	Crude Rate	ASR (W)
Israel	185	4.9	4.9	Turkey	492	1.3	1.3
Georgia	82	4.0	3.3	Georgia	28	1.4	1.0
Turkey	1320	3.6	3.2	Jordan	23	0.7	0.8
Lebanon	57	2.7	2.4	Cambodia	41	0.6	0.8
Kazakhstan	196	2.5	2.4	Syrian Arab Republic	67	0.6	0.8
Japan	1274	2.1	2.2	Iraq	79	0.5	0.8
Armenia	29	2.0	1.9	Kazakhstan	58	0.7	0.8
Iran, Islamic Republic of	721	1.9	1.7	Indonesia	851	0.7	0.8
Jordan	55	1.7	1.7	Afghanistan	95	0.5	0.7
State of Palestine	40	1.8	1.6	State of Palestine	19	0.9	0.7
Indonesia	1676	1.4	1.4	Iran, Islamic Republic of	269	0.7	0.7
Syrian Arab Republic	134	1.3	1.4	Lebanon	17	0.8	0.7
Bahrain	9	1.1	1.3	Armenia	11	0.8	0.7
Singapore	37	1.4	1.3	Pakistan	551	0.6	0.7
Turkmenistan	30	1.2	1.2	Turkmenistan	12	0.5	0.6
Iraq	142	0.8	1.1	Tajikistan	14	0.4	0.6
Cambodia	67	0.9	1.0	Kyrgyzstan	10	0.4	0.5
Pakistan	870	1.0	0.9	Uzbekistan	52	0.4	0.5
Malaysia	135	0.9	0.9	Nepal	44	0.3	0.4
Korea, Republic of	222	0.9	0.9	Bangladesh	234	0.3	0.4
Afghanistan	132	0.8	0.9	Myanmar	80	0.3	0.3
Tajikistan	26	0.7	0.8	Timor-Leste	2	0.3	0.3
Kyrgyzstan	20	0.7	0.7	Mongolia	4	0.3	0.3
Uzbekistan	104	0.7	0.7	Lao PDR	8	0.3	0.3
Mongolia	8	0.6	0.6	Philippines	94	0.2	0.3
Saudi Arabia	99	0.6	0.6	India	1452	0.2	0.3
Kuwait	12	0.7	0.6	Malaysia	34	0.2	0.2
Thailand	208	0.6	0.6	Saudi Arabia	27	0.2	0.2
India	3298	0.5	0.5	Thailand	64	0.2	0.2
Qatar	12	0.8	0.5	Oman	3	0.2	0.2
Bangladesh	366	0.5	0.5	Sri Lanka	22	0.2	0.2
Korea, Democratic Republic of	64	0.5	0.5	Azerbaijan	8	0.2	0.1
Timor-Leste	3	0.5	0.5	Viet Nam	59	0.1	0.1
Nepal	65	0.4	0.5	Korea, Democratic Republic of	17	0.1	0.1
Myanmar	121	0.5	0.5	Japan	86	0.1	0.1
Philippines	204	0.4	0.5	Israel	5	0.1	0.1
Sri Lanka	53	0.5	0.4	China	863	0.1	0.1
Oman	8	0.5	0.4	Yemen	14	0.1	0.1
Azerbaijan	20	0.4	0.4	Singapore	3	0.1	0.1
Lao PDR	11	0.3	0.4	Korea, Republic of	17	0.1	0.1
United Arab Emirates	30	0.5	0.4	Kuwait	1	0.1	0.0
China	2627	0.4	0.3	United Arab Emirates	2	0.0	0.0
Viet Nam	109	0.2	0.2	Bhutan	0	0.0	0.0
Yemen	21	0.2	0.1	Maldives	0	0.0	0.0
Bhutan	0	0.0	0.0	Brunei	0	0.0	0.0
Brunei	0	0.0	0.0	Qatar	0	0.0	0.0
Maldives	0	0.0	0.0	Bahrain	0	0.0	0.0

Table 2. Human Development Index in Asian Countries in 2012

HDI	Population	Human Development Index (HDI)	Life expectancy at birth	Mean year of schooling	Gross national income (GNI) per capita
Very high human development	Japan	0.912	83.6	11.6	32,545
	Republic of Korea	0.909	80.7	11.6	28,231
	Israel	0.9	81.9	11.9	26,224
	Singapore	0.895	81.2	10.1	52,613
	Brunei	0.855	78.1	8.6	45,690
	Qatar	0.834	78.5	7.3	87,478
	United Arab Emirates	0.818	76.7	8.9	42,716
High human development	Bahrain	0.796	75.2	9.4	19,154
	Kuwait	0.79	74.7	6.1	52,793
	Saudi Arabia	0.782	74.1	7.8	22,616
	Malaysia	0.769	74.5	9.5	13,676
	Kazakhstan	0.754	67.4	10.4	10,451
	Georgia	0.745	73.9	12.1	5,005
	Lebanon	0.745	72.8	7.9	12,364
	Islamic Republic of Iran	0.742	73.2	7.8	10,695
	Azerbaijan	0.734	70.9	11.2	8,153
	Oman	0.731	73.2	5.5	24,092
	Armenia	0.729	74.4	10.8	5,540
	Turkey	0.722	74.2	6.5	13,710
	Sri Lanka	0.715	75.1	9.3	5,170
Medium human development	Jordan	0.7	73.5	8.6	5,272
	China	0.699	73.7	7.5	7,945
	Turkmenistan	0.698	65.2	9.9	7,782
	Thailand	0.69	74.3	6.6	7,722
	Maldives	0.688	77.1	5.8	7,478
	Mongolia	0.675	68.8	8.3	4,245
	State of Palestine	0.67	73	8	3,359
	Philippines	0.654	69	8.9	3,752
	Uzbekistan	0.654	68.6	10	3,201
	Syrian Arab Republic	0.648	76	5.7	4,674
	Indonesia	0.629	69.8	5.8	4,154
	Kyrgyzstan	0.622	68	9.3	2,009
	Tajikistan	0.622	67.8	9.8	2,119
	Viet Nam	0.617	75.4	5.5	2,970
	Iraq	0.59	69.6	5.6	3,557
	Timor-Leste	0.576	62.9	4.4	5,446
	India	0.554	65.8	4.4	3,285
	Cambodia	0.543	63.6	5.8	2,095
	Lao PDR	0.543	67.8	4.6	2,435
	Bhutan	0.538	67.6	2.3	5,246
Low human development	Bangladesh	0.515	69.2	4.8	1,785
	Pakistan	0.515	65.7	4.9	2,566
	Myanmar	0.498	65.7	3.9	1,817
	Nepal	0.463	69.1	3.2	1,137
	Yemen	0.458	65.9	5.3	928
	Afghanistan	0.374	49.1	3.1	1,000
Other countries or territories	Republic of Korea	–	–	–	–

rate of 3.2 per hundred Thousand people, 4. Lebanon with rate of 2.4 per hundred thousand people and 5. Kazakhstan with Rate of 2.4 per hundred thousand people. Similarly, 5 countries with the lowest standardized Testicular cancer rate include: Maldives, Brunei, Bhutan and Yemen with rate of 0.1 per hundred Thousand people and Viet Nam with rate of 0.2 per hundred thousand people. (Table and Figure 1).

On the other hand, the number of 5832 deaths occurred due to testicular cancer in Asia in 2012 and Among these, the largest number of deaths was in India with 1452 cases, China with 863 cases, Indonesia with 851 cases, Pakistan with 551 and Turkey with 492 cases that a total of 4209 cases (72.17 %) of deaths occurred in just these five countries.

In Asian countries, 5 countries with the highest standardized mortality rate of testicular cancer are As follows respectively: Turkey with the standardized rate of 1.3 per hundred thousand people, Georgia with the rate of 1 per hundred thousand people, Jordan, Cambodia and Syrian Arab Republic with the rate of 0.8 per hundred thousand people. Similarly, 5 countries which have the lowest standardized mortality rate of testicular cancer include: Bahrain, Qatar, Brunei, Bhutan Maldives, United Arab Emirates and Kuwait that all of them had zero rate of incidence (table and Figure 1).

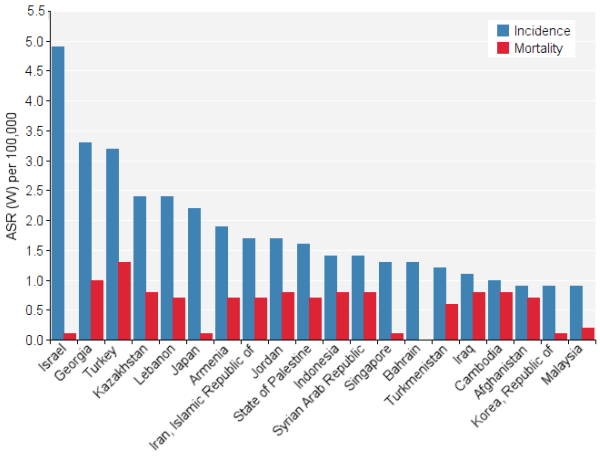

Figure 1. Standardized Incidence and Mortality Rates for Testicular Cancer in Asia in 2012

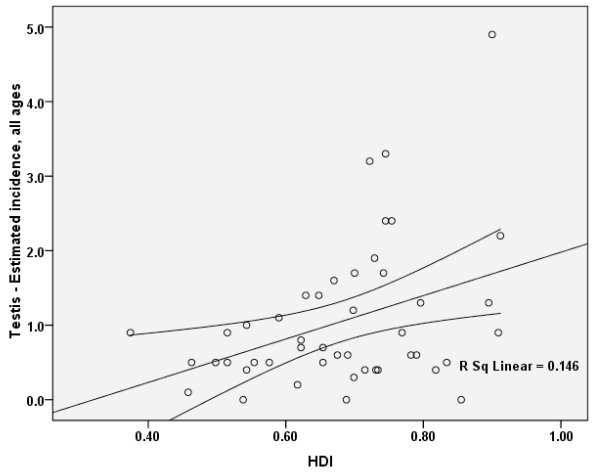

Figure 2. Correlation between HDI and Standardized Incidence Rate of Testicular Cancer in Asia in 2012

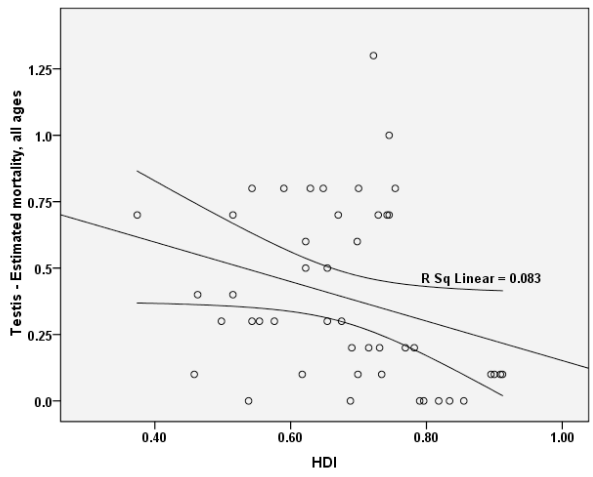

Figure 3. Correlation between HDI and Standardized Mortality Rate of Testicular Cancer in Asia in 2012

In table 2 values of the Human Development Index and its components for each of the Asian countries that are classified due to HDI, are shown. So the Asian countries are classified due to The HDI so that three countries are classified in very high categories, four countries in high category, Thirty-five countries in middle category, three countries in low category, and one country in Unknown category.

Standardized incidence rate and the Human Development Index

It is observed positive correlation of 0.382 between the standardized incidence rates of testicular Cancer and the Human Development Index and this relation is statistically significant (p=0.009). It is also observed positive correlation between the components of the Human Development Index and standardized incidence rate. So that the positive correlation between standardized incidence rate of testicular cancer with life expectancy at birth is 0.274 (p=0.065), with average years of Education is 0.476 (p<0.001) and with income level per person is 0.025 (p=0.868). (Figure 2).

Standardized mortality rate and the Human Development Index

On the other hand, it is observed negative correlation of 0.298 between the standardized mortality Rate of testicular cancer and the Human Development Index and this relation is statistically Insignificant (p=0.052). It is also observed negative correlation between the components of the Human Development Index and standardized mortality rate. So that the negative correlation between Standardized mortality rate of testicular cancer with life expectancy at birth is 0.356 (p=0.015), with Average years of education negative correlation is 0.018 (p<0.904) and with income level per person Negative correlation is 0.461 (p<0.001) (Figure 3).

Discussion

Testicular cancer is one of the most common cancers among young men between age 20-34 in Countries with very high and high level of the Human Development Index (Znaor et al., 2014). And now forms About 1% of all tumors in men. The ratio between the standardized incidence and mortality can be Used as a substitute for the ability of a country in diagnosis and treatment of a disease (Rosen et al., 2011). The Increasing trend of testicular cancer incidence in countries with high Human Development Index is Intensified and the corresponding mortality rates also was stable in all levels and had decreasing Process (Znaor et al., 2014). Life expectancy is one of the indicators of human development which is widely used in Demography and epidemiology. Life expectancy in patients diagnosed with breast, colon and Testicular cancer which is classified based on diagnosis age and time, is considered as an indicator to Assess the risk of mortality and health care needs of cancer survivors (Capocaccia et al., 2015).

The Disability-Adjusted Life Year (DALY) based on age that is among the life expectancy factors, regardless of the global Area is remarkable in types of cancers. Years of Life Lost (YLL) is higher in countries with low Human Development Index compared with countries which have high HDI and it is the sign of Inherent inequality In prognosis after diagnosis (Soerjomataram et al., 2012).

Linear regression analysis results, showed a strong inverse Relationship between the Human Development Index and mortality-to-incidence ratio (MIR). This relation is potentially affected by factors such as: genetic differences between countries, diet, Exposure to environmental factors (smoking) and health care system (Patel et al., 2012). In this study, it is observed a positive correlation of 0.476 ($p<0.001$) between the standardized Incidence rate and average years of schooling. One of the indicators of Human Development Index Is access to knowledge. Recent studies showed that knowledge and practice about testicular self-Examination (TSE) is low especially among young people, including university students and others (Shallwani et al., 2010). In Iran we had 5% of self-awareness about TSE and 10% were performing it (Ramim et al., 2014). In Turkey 88-93% did not have any cognizance (Özbaş et al., 2010) and 1% did the TSE routine once in month (Kuzgunbay et al., 2013). The results of This study has accordance with the results of Shanmugalingam et al study which is the increasing of Standardized age incidence per year in developed countries (Shanmugalingam et al., 2013). It's observed negative correlation between the Human Development Index and also its components With standardized mortality rate in this study. In Asian countries, people who has the lowest Standardized mortality rate of testicular cancer, they all had high and medium Human Development Index.

The global attenuation of testicular cancer has been proposed as a successor to the quality of Health care system. It is shown that the 5-year survival rate of patients is related to enhancement with Advanced treatments and economic situation of countries (Sankaranarayanan et al., 1996). Sophie et al study showed that among Seminoma patients those who have lower socio-economic status have significantly higher mortality (2, 3%). But in patients with moderate socio-economic level (1, 5%) and high (1, 45%) no significant Difference was observed (Fosså et al., 2011). Znaor et al study showed that deaths of testicular cancer in high-Income countries is stable and decreasing but this decline in middle-income regions such as Central American and Asian countries was not significant (Znaor et al., 2014). Awareness of warning signs and emergency medical attention, helps to make medical decisions, Increasing the survival rate and enhancement of life experiences (Ghoncheh et al., 2015a; Ghoncheh et al., 2015b; Pakzad et al., 2015b; Mahdavifar et al., 2016).

Inequality in health care is considered as a major cause of difference in the effectiveness of cancer care. An inverse relationship Between MRI and HDI is reflected which is influenced by factors such as: socio-economic status, Lifestyle (including diet and tobacco use) and genetic differences between individuals and races (Hu et al., 2013). Currently, only 5 percent of global resources for cancer are spent in developing countries while about 80% of The Disability-Adjusted Life Year with cancer is in these countries. The global inequalities Specified in cancer mortality for malignancies such as breast cancer and testicular cancer, represents The less than desirable quality level of health care system and the lack of access to health care (Patel et al., 2012).

Conclusion:

The results of this study showed that it is a positive correlation between the standardized incidences Rate of testicular cancer with the Human Development Index and its components, and also negative Correlation between the Human Development Index and its components with the standardized Mortality rate of testicular cancer which shows better tendency and access to health care systems in Developed countries with high Human Development Index.

References

ACS A (2010). Cancer facts and figures 2010. American Cancer Society. Atlanta.

Bray F, Klint A, Gislum M, et al (2010). Trends in survival of patients diagnosed with male genital cancers in the Nordic countries 1964-2003 followed up until the end of 2006. *Acta Oncologica*, **49**, 644-54.

Capocaccia R, Gatta G, Dal Maso L (2015). Life expectancy of colon, breast and testicular cancer patients. An analysis of US-SEER population-based data. *Ann Oncology*, **131**.

Chia VM, Quraishi SM, Devesa SS, et al (2010). International trends in the incidence of testicular cancer, 1973-2002. Cancer Epidemiology Biomarkers & Prevention, 19, 1151-9.

Cook R (2000). Teaching and promoting testicular self-examination. *Nursing Standard*, **14**, 48.

Curreri SA, Fung C, Beard CJ. Secondary malignant neoplasms in testicular cancer survivors. Urologic Oncology: Seminars and Original Investigations, 2015. Elsevier, 392-8.

Ferlay J, Soerjomataram I, Ervik M, et al (2016). GLOBOCAN 2012 v1.0, Cancer Incidence and Mortality Worldwide: IARC CancerBase No. 11 [Internet]. Lyon, France: International Agency for Research on Cancer; 2013. Available from: http://globocan.iarc.fr, accessed on 2/2/2016.

Ferlay J, Soerjomataram I, Dikshit R, et al (2015). Cancer incidence and mortality worldwide: sources, methods and major patterns in GLOBOCAN 2012. *Int J Cancer*, **136**, E359-E86.

Fosså SD, Cvancarova M, Chen L, et al (2011). Adverse prognostic factors for testicular cancer–specific survival: a population-based study of 27,948 patients. *J Clin Oncol*, **29**, 963-70.

Ghoncheh M, Mirzaei M, Salehiniya H (2015a). Incidence and Mortality of Breast Cancer and their Relationship with the Human Development Index (HDI) in the World in 2012. *Asian Pac J Cancer Prev*, **16**, 8439-43.

Ghoncheh M, Mohammadian-Hafshejani A, Salehiniya H (2015b). Incidence and Mortality of Breast Cancer and their Relationship to Development in Asia. *Asian Pac J Cancer Prev*, **16**, 6081-7.

Gilligan TD, Seidenfeld J, Basch EM, et al (2010). American Society of Clinical Oncology Clinical Practice Guideline on uses of serum tumor markers in adult males with germ cell tumors. *J Clin Oncol*, **28**, 3388-404.

Hu QD, Zhang Q, Chen W, et al (2013). Human development index is associated with mortality-to-incidence ratios of gastrointestinal cancers. *World J Gastroenterol*, **19**, 5261.

Klugman J (2010). Human Development Report 2010–20th Anniversary Edition. The Real Wealth of Nations: Pathways to Human Development.

Kuzgunbay B, Yaycioglu O, Soyupak B, et al (2013). Public awareness of testicular cancer and self-examination in Turkey: A multicenter study of Turkish Urooncology Society. Urologic Oncology: Seminars and Original Investigations. Elsevier, 386-91.

Mahdavifar N, Ghoncheh M, Pakzad R, et al (2016). Epidemiology, Incidence and Mortality of Bladder Cancer and their Relationship with the Development Index in the World. *Asian Pac J Cancer Prev*, **17**, 381-6.

Malik K (2013). Human development report 2013. The rise of the south: Human progress in a diverse world. The Rise of the South: Human Progress in a Diverse World (March 15, 2013). UNDP-HDRO Human Development Reports.

Myrup C, Wohlfahrt J, Oudin A, et al (2010). Risk of testicular cancer according to birthplace and birth cohort in Denmark. *Int J Cancer*, **126**, 217-23.

Özbaş A, Cavdar I, Findik Ü, et al (2010). Inadequate knowledge levels of Turkish male university students about testicular self-examination. *Asian Pac J Cancer Prev*, **12**, 919-22.

Pakzad R, Mohammadian-Hafshejani A, Ghoncheh M, et al (2015a). The incidence and mortality of lung cancer and their relationship to development in Asia. *Transl Lung Cancer Res*, **4**, 763-74.

Pakzad R, Mohammadian-Hafshejani A, Ghoncheh M, et al (2015b). The incidence and mortality of prostate cancer and its relationship with development in Asia. *Prostate Int*, **3**, 135-40.

Patel AR, Prasad SM, Shih Y-CT, et al (2012). The association of the human development index with global kidney cancer incidence and mortality. *J Urol*, **187**, 1978-83.

Ramim T, Mousavi SQ, Rosatmnia L, et al (2014). Student knowledge of Testicular cancer and self-examination in a medical sciences University in Iran. *Basic Clin Cancer Res*, **6**, 7-11.

Ray K, Mandal S (2004). Knowledge of cancer in West Bengal-a pilot survey. *Asian Pac J Cancer Prev*, **5**, 205-12.

Rosen A, Jayram G, Drazer M, et al (2011). Global trends in testicular cancer incidence and mortality. *European Urol*, 60, 374-9.

Sankaranarayanan R, Swaminathan R, Black R (1996). Global variations in cancer survival. *Cancer*, **78**, 2461-4.

Shallwani K, Ramji R, Ali TS, et al (2010). Self examination for breast and testicular cancers: a community-based intervention study. *Asian Pac J Cancer Prev*, **11**.

Shanmugalingam T, Soultati A, Chowdhury S, et al (2013). Global incidence and outcome of testicular cancer. *Clinical epidemiol*, **5**, 417.

Soerjomataram I, Lortet-Tieulent J, Parkin DM, et al (2012). Global burden of cancer in 2008: a systematic analysis of disability-adjusted life-years in 12 world regions. *Lancet*, **380**, 1840-50.

Sui W, Morrow DC, Bermejo CE, et al (2015). Trends in testicular cancer survival: a large population-based analysis. *Urol*, **85**, 1394-8.

Tan G, Azrif M, Shamsul A, et al (2011). Clinicopathological Features and Survival of Testicular Tumours in a Southeast Asian University Hospital: A Ten-year. Asian Pacific Journal of Cancer Prevention, 12, 2727-30.

Wynd CA (2002). Testicular self-examination in young adult men. *J Nurs Scholarship*, **34**, 251-5.

Yousif L, Blettner M, Hammer GP, et al (2010). Testicular cancer risk associated with occupational radiation exposure: a systematic literature review. *J Radiological Protect*, **30**, 389.

Znaor A, Lortet-Tieulent J, Jemal A, et al (2014). International variations and trends in testicular cancer incidence and mortality. *Eur Urol*, **65**, 1095-106.