RESEARCH ARTICLE

The Incidence and Mortality of Liver Cancer and its Relationship with Development in Asia

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Abstract

Background: Liver cancer (LC) is the sixth world most common cancer and the second leading cause of cancer death. Due to the importance and necessity of awareness about the incidence and mortality of diseases to perform prevention programs, this study focused on data for LC and its relationship with the human development index (HDI) and its components in Asia in 2012. Materials and Methods: This ecological study was based on GLOBOCAN data for Asian countries. We assessed correlations between standardized incidence rates (SIR) and standardized mortality rates (SMR) of LC with HDI and its components using of SPSS18. Results: A total of 582,420 incident cases and 557,097 deaths were recorded in Asian countries in 2012. The five with the highest SIR were Mongolia, Lao PDR, Vietnam, Republic of Korea and Thailand and those with the highest SMR were Mongolia, Lao PDR, Vietnam, Cambodia and Thailand. A negative relation was observed between HDI and LC for SIR of 0.049 (P=0.748) and for SMR of 0.07 (P=0.645), with life expectancy at birth a positive relation for SIR of 0.061 (P=0.687) and a negative relation for SMR of 0.079 (P=0.603), with the average years of education a negative relation fo SIR of 0.476 (p=0.952) and for SMR of 0.032 (P=0.832), and with the country income level per person a negative relation for SMI of 0.11 (p=0.465) and for SMR of 0.113 (P=0.455). Conclusions: The incidence of LC is more in less developed and developing countries but statistically significant correlations were not found between standardized incidence and mortality rates of LC, and HDI and its dimensions.

Keywords: Human development index - liver cancer - incidence - mortality - Asia - epidemiology

Introduction

Cancer in 2013 was among the main leading causes of illness and death worldwide with an annual incidence of 14.9 million new cases and 8.2 million deaths caused. More than 60 percent occurs in Africa, Asia and Central and South America (Fitzmaurice et al., 2015). It is expected that the number of new cancer cases increases 70 percent in next two decades (Pakzad et al., 2015b).

Liver cancer is among the most common cancers in the world (Wei et al., 2014) so that this cancer is the fifth most common cancer in men (Hall and Wild, 2003) and the ninth most common cancer in women worldwide. This cancer is the second most common cause of cancer death worldwide in 2012 (Pakzad et al., 2015b). Liver cancer mortality is rapidly increasing since 1970. Due to this point that more than 85 percent of liver cancer new cases occur in developing countries which do not have proper

diagnostic and treatment facilities (Ferlay et al., 2010), finally, the case fatality rate will rise so that the 5-year mortality rate of the disease is about 95% in the world (Hall and Wild, 2003). The Age Standardized Incidence Rates (ASIRs) per 100 thousand people for liver cancer is 15 to 7in developing countries than in developed ones in 2013 and the Age Standardized Death Rates (ASDRs) is 16 to 7 for it (Fitzmaurice et al., 2015).

The west region of Pacific Ocean has the highest incidence and mortality of liver cancer in the world. So that the incidence and mortality of liver cancer is about 38 times higher than the East Mediterranean sea which is the region with the lowest incidence and mortality rates. The successful experiences of world countries in a massive reduction in cancer incidence and mortality, even among low-income countries, shows that the Asia and Pacific Region significantly have the potential to reduce the burden of cancer by appropriate policy and planning

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(Ferlay et al., 2010).

The United Nations Development Program (UNDP) has used the Human Development Index (HDI) for the first time in 1990 in order to prevent income concentration and the move towards a more comprehensive measure of human development (Dasgupta and Weale, 1992). The HDI is an index composed of three basic dimensions: human development, including a long and healthy life (Based on life expectancy at birth), access to knowledge (based on a combination of the adult literacy rate and enrollment in primary and high-level education) and the suitable life standard (based on the Gross Domestic Product due to the equality of purchasing power).

Overall, HDI is the arithmetic average of the three indicators calculated for each country individually (Sagar and Najam, 1998; Mahdavifar et al., 2016). It seems that the Human Development Index and its components have correlation with the incidence and mortality of liver cancer, so that the results of various studies are the indicators of the relationship between the incidence and mortality of some of the cancers with the development index (Ghoncheh et al., 2015a; Ghoncheh et al., 2015b; Pakzad et al., 2015c; Pakzad et al., 2015a; Razi et al, 2016). Do to this point that the awareness about the incidence and mortality of this cancer is essential in planning, this study is done with the aim to investigate the incidence and mortality of liver cancer and its relationship with Human Development Index in Asian 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 counter 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 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 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 J 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 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) (Ferlay et al., 2015; Ferlay J et al., 2016).

Human Development Index (HDI)

Human Development Index (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 2012, 582420 cases of liver cancer in Asian countries have been registered, of which 422317 cases (51/72%) were in men and 160103 cases (48/27%) were in women. The sex ratio of disease is 2.63. In Asia 5 countries with the highest numbers of liver cancer new cases are as follows, respectively: 1. China with 394,770 cases, 2. Japan with 36,168 cases, 3.India with 27,416 cases, 4. Vietnam with 21,997cases and 5. Thailand with 20,455 cases. These five countries have allocated a total of 500,806 cases (98/85%).

Asia

In Asian countries, 5 countries having the highest standardized incidence rate of liver cancer are as follows, respectively: 1. Mongolia with the standardized incidence rate of 78.1 per hundred thousand people, 2.Lao PDR with the rate of 52.6 per hundred thousand people, 3. Vietnam with the rate of 24.6 per hundred thousand people, 4. Republic of Korea with the rate of 22.8per hundred thousand people and 5.Thailand with the rate of 22.3 per hundred thousand people. Similarly, 5 countries having the lowest standardized incidence rate of liver cancer are as follows: 1. Nepal with the rate of 0.9 per hundred thousand people, 2. Israel with the rate of 2.3 per hundred thousand people, 3. Islamic Republic of Iran with the rate of 2.5 per hundred thousand people, 4. Lebanon with the rate of 2.6 per hundred Thousand people and 5. India with the rate of 2.7 per hundred thousand people.

The number and amount of crude and standardized incidence rate of this cancer is presented in table one due to the sex in Asian countries. Countries are arranged based on standardized rate from high to low in Table one. So in each sex, we can see countries with the highest and lowest standardized rate. (Figure and table 1)

In addition, during 2012 the number of 557097 deaths due to liver cancer occurred in Asia of which 400835 cases (71.95%) were in men and 156262 cases (28.4%) occurred in women.

The sex ratio of disease is 2.56. The highest death number occurred in: china with the number of 383203 cases, Japan with the number of 32518 cases, India with the number of 26763 cases, Vietnam with the number of
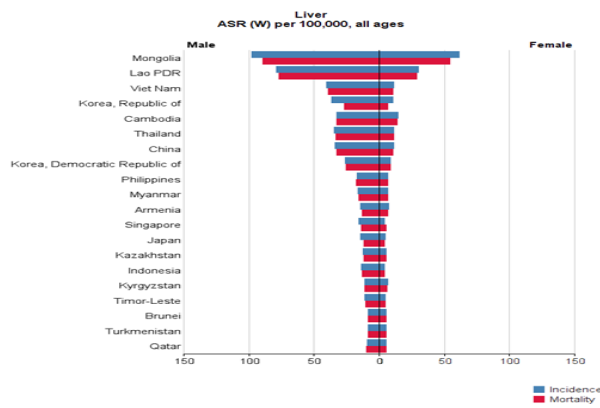
20920 cases and Thailand with the number of 19442 cases. A total of 482846 cases (86.67%) of the deaths occurred in just these five countries.

In Asian countries, 5 countries having the highest standardized mortality rate of liver cancer are as follows, respectively: 1. Mongolia with the standardized rate of 70.3 per Hundred thousand people, 2.Lao PDR with the rate of 50.9 per hundred thousand people, 3. Vietnam with the rate of 23.7 per hundred thousand people, 4. Cambodia with the rate of 21.5 Per hundred thousand people and 5. Thailand with the rate of 21.5 per hundred thousand people. Similarly, 5 countries having the lowest standardized mortality rate of liver cancer are as follows: 1. Nepal with the rate of 0.9 per hundred thousand people, 2.Islamic Republic of Iran with the rate of 2.3 per hundred thousand people, 3. Lebanon with the rate of 2.4 per hundred thousand people, 4.Israel with the rate of 2.5 per hundred thousand people and 5. India with the rate of 2.6 per hundred thousand people (Figure 1).

In Table 2, values related to the Human Development Index and its components for each of the Asian countries are shown and arranged based on the HDI (human development index).The Asian countries in terms of Human Development Index are classified as follows so that three countries are classified in very top category, four countries in top category, thirty-five countries in medium category, three countries in low category and one country in unknown category.

Standardized incidence rate and the human development index

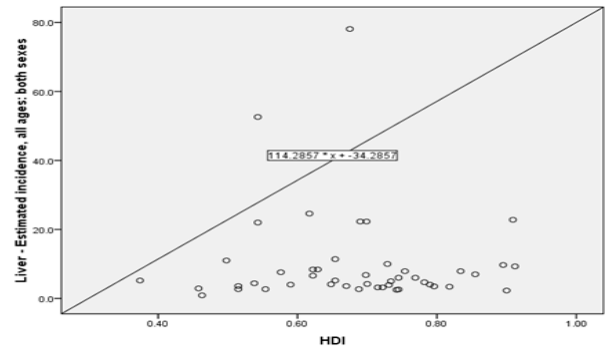It has been seen a negative correlation of 0.049

Figure 2. Correlation between the Human Development Index and Standardized Incidence Rate of Liver Cancer in Asia in 2012
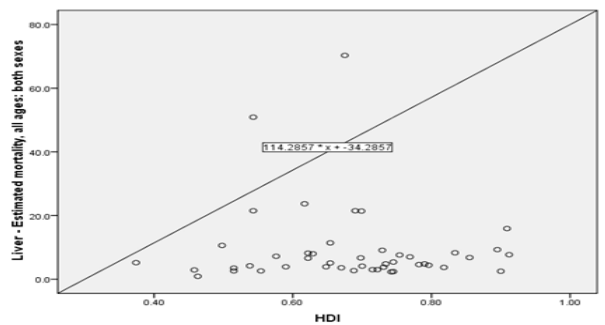

Figure 3. Correlation between the Human Development Index and Standardized Mortality Rate of Liver Cancer in Asia in 2012

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

Table 1. Number and Amount of Crude and Standardized incidence rate of liver Cancer in Asian Countries in 2012(Sorted by Age-Standardized Rate from the Highest to the Lowest Values

Liver- Estimated incidence, all ages: both sexes			Liver- Estimated incidence, all ages: male			Liver- Estimated incidence, all ages: female		
POPULATION	Numbers	Crude Rate	ASR (W)	POPULATION	Numbers	Crude Rate	ASR (W)	POPULATION	Numbers	Crude Rate	ASR (W)
Mongolia	1518	53.4	78.1	Mongolia	888	63.3	97.8	Mongolia	630	43.7	61.1
Lao PDR	2116	33.2	52.6	Lao PDR	1486	46.7	78.7	Lao PDR	630	19.7	29.7
Viet Nam	21997	24.5	24.6	Viet Nam	16815	37.9	40.2	Cambodia	820	11.1	14.2
South Korea	16900	34.8	22.8	South Korea	12559	51.9	36.7	Thailand	5716	16.1	11.3
Thailand	20455	29.3	22.3	Thailand	14739	42.9	34.8	Viet Nam	5182	11.4	10.9
China	394770	29	22.3	China	293318	41.5	33.7	China	101452	15.5	10.9
Cambodia	2264	15.6	22	Cambodia	1444	20.4	32.7	South Korea	4341	17.8	10.5
North Korea	4969	20.2	16.2	North Korea	3391	28.1	25.8	Norht Korea	1578	12.6	8.7
Philippines	7734	8	11.4	Philippines	5441	11.2	17.1	Armenia	204	12.3	6.9
Myanmar	4912	10.1	11	Myanmar	3421	14.2	16.1	Philippines	2293	4.8	6.5
Armenia	464	14.9	10	Singapore	588	22.2	15.8	Myanmar	1491	6	6.4
Singapore	763	14.5	9.7	Japan	23651	38.4	14.6	Kyrgyzstan	138	5	6.3
Japan	36168	28.6	9.3	Armenia	260	18	14.4	Brunei	6	2.9	5.4
Kyrgyzstan	324	5.9	8.4	Indonesia	13365	11	13.4	Kazakhstan	547	6.4	5.3
Indonesia	18121	7.4	8.4	Kazakhstan	790	10	12.2	Turkmenistan	110	4.2	5.2
Kazakhstan	1337	8.2	7.9	Timor-Leste	29	4.8	11.1	Tajikistan	117	3.2	5.1
Qatar	49	2.5	7.9	Kyrgyzstan	186	6.9	11	Qatar	5	1.1	5
Timor-Leste	44	3.7	7.6	Qatar	44	3	8.9	Japan	12517	19.3	4.7
Brunei	20	4.8	7	Turkmenistan	153	6	8.8	Timor-Leste	15	2.6	4.6
Turkmenistan	263	5.1	6.8	Malaysia	1111	7.5	8.7	Uzbekistan	481	3.4	4.2
Tajikistan	273	3.9	6.6	Brunei	14	6.7	8.7	Singapore	175	6.7	4.1
Malaysia	1527	5.2	6	Tajikistan	156	4.5	8.5	Indonesia	4756	3.9	4
Georgia	439	10.2	6	Georgia	250	12.3	8.5	Azerbaijan	212	4.5	3.9
Afghanistan	760	2.3	5.2	Afghanistan	477	2.8	6.6	Georgia	189	8.3	3.9
Uzbekistan	1078	3.8	5.2	Azerbaijan	254	5.4	6.4	Afghanistan	283	1.8	3.8
Azerbaijan	466	4.9	5	Saudi Arabia	516	3.3	6.4	Iraq	360	2.1	3.7
Saudi Arabia	722	2.5	4.7	Uzbekistan	597	4.3	6.3	Bahrain	9	1.8	3.4
Bhutan	25	3.3	4.4	Bhutan	18	4.5	6.1	Syria	244	2.3	3.3
Jordan	159	2.5	4.2	Jordan	100	3	5.4	Malaysia	416	2.9	3.3
Syria	565	2.7	4.1	Kuwait	43	2.5	5.3	Jordan	59	1.9	3
Kuwait	52	1.8	4	Maldives	6	3.7	5.3	UAE	17	0.7	3
Iraq	678	2	4	State of Palestine	50	2.3	5.1	Saudi Arabia	206	1.6	2.8
Oman	59	2	3.9	Syria	321	3	4.9	Oman	17	1.4	2.8
State of Palestine	73	1.7	3.6	Pakistan	2824	3.1	4.7	Pakistan	1500	1.7	2.5
Pakistan	4324	2.4	3.6	Turkey	1537	4.1	4.7	Bhutan	7	2	2.4
Bahrain	26	1.9	3.5	Oman	42	2.4	4.6	State of Palestine	23	1.1	2.2
UAE	68	0.8	3.4	Sri Lanka	527	5	4.4	Iran	678	1.8	2.1
Sri Lanka	806	3.8	3.2	Iraq	318	1.9	4.4	Bangladesh	1185	1.6	2.1
Turkey	2227	3	3.2	Yemen	222	1.7	4.1	Sri Lanka	279	2.6	2.1
Yemen	349	1.4	2.9	Bahrain	17	2	3.6	Yemen	127	1	2
Maldives	6	1.9	2.7	UAE	51	0.9	3.5	Lebanon	47	2.1	1.9
Bangladesh	3022	2	2.7	India	17236	2.7	3.5	India	10180	1.7	1.9
India	27416	2.2	2.7	Israel	158	4.2	3.4	Kuwait	9	0.8	1.9
Lebanon	116	2.7	2.6	Bangladesh	1837	2.4	3.3	Turkey	690	1.8	1.8
Iran	1567	2.1	2.5	Lebanon	69	3.3	3.3	Israel	85	2.2	1.3
Israel	243	3.2	2.3	Iran	889	2.3	2.8	Nepal	77	0.5	0.7
Nepal	186	0.6	0.9	Nepal	109	0.7	1.2	Maldives	0	0	0

between the standardized incidence rate of liver cancer and the Human Development Index that this correlation is not statistically significant (p=0.748). Also it was seen an insignificant correlation between the human development index components with standardized rate. So that it was seen a positive correlation of 0.061 between the standardized incidence rate and life expectancy at birth (p=0.687), negative correlation of 0.009 with mean years of schooling (p=0.952) and negative correlation of 0.11 with income level of the population per person (p=0.465).

In men also, It has been seen a negative correlation of 0.047 between the standardized incidence rate of liver

Table 2. The Human Development Index in Asian Countries in 2012

HDI situation	POPULATION	Human Development Index(HDI)	Life expectancy at birth	Mean Year of schooling	Gross national income (GNI) per capita
Very high	Japan	0.912	83.6	11.6	32545
	Korea, Republic of	0.909	80.7	11.6	28231
	Israel	0.9	81.9	11.9	26224
High	Singapore	0.895	81.2	10.1	52613
	Brunei	0.855	78.1	8.6	45690
	Qatar	0.834	78.5	7.3	87478
	United Arab Emirates	0.818	76.7	8.9	42716
Medium	Bahrain	0.796	75.2	9.4	19154
	Kuwait	0.79	74.7	6.1	52793
	Saudi Arabia	0.782	74.1	7.8	22616
	Malaysia	0.769	74.5	9.5	13676
	Kazakhstan	0.754	67.4	10.4	10451
	Georgia	0.745	73.9	12.1	5005
	Lebanon	0.745	72.8	7.9	12364
	Iran, Islamic Republic of	0.742	73.2	7.8	10695
	Azerbaijan	0.734	70.9	11.2	8153
	Oman	0.731	73.2	5.5	24092
	Armenia	0.729	74.4	10.8	5540
	Turkey	0.722	74.2	6.5	13710
	Sri Lanka	0.715	75.1	9.3	5170
	Jordan	0.7	73.5	8.6	5272
	China	0.699	73.7	7.5	7945
	Turkmenistan	0.698	65.2	9.9	7782
	Thailand	0.69	74.3	6.6	7722
	Maldives	0.688	77.1	5.8	7478
	Mongolia	0.675	68.8	8.3	4245
	State of Palestine	0.67	73	8	3359
	Philippines	0.654	69	8.9	3752
	Uzbekistan	0.654	68.6	10	3201
	Syrian Arab Republic	0.648	76	5.7	4674
	Indonesia	0.629	69.8	5.8	4154
	Kyrgyzstan	0.622	68	9.3	2009
	Tajikistan	0.622	67.8	9.8	2119
	Viet Nam	0.617	75.4	5.5	2970
	Iraq	0.59	69.6	5.6	3557
	Timor-Leste	0.576	62.9	4.4	5446
	India	0.554	65.8	4.4	3285
	Cambodia	0.543	63.6	5.8	2095
	Lao PDR	0.543	67.8	4.6	2435
	Bhutan	0.538	67.6	2.3	5246
	Bangladesh	0.515	69.2	4.8	1785
	Pakistan	0.515	65.7	4.9	2566
Low	Myanmar	0.498	65.7	3.9	1 817
	Nepal	0.463	69.1	3.2	1137
	Yemen	0.458	65.9	5.3	928
	Afghanistan	0.374	49.1	3.1	1000
Unknown	North Korea	-	-	-	-

cancer and the Human Development Index that this correlation is not statistically significant (p=0.755). Also it was seen a negative correlation between the Human Development index components with standardized rate. So that it was seen a negative correlation of 0.041 between the standardized incidence rate and life expectancy at birth (p=0.786) in men, negative correlation of 0.016 with mean years of schooling (p=0.916) and negative correlation of 0.119 with income level of the population per person (p=0.429).

In women also, it has been seen a negative correlation of 0.061 between the standardized incidence rate of liver cancer and the Human Development Index but this correlation is not statistically significant (p=0.687). Also

it was seen a correlation between the human development index components with standardized rate. So that it was seen a positive correlation of 0.109 between the standardized incidence rate and life expectancy at birth (p=0.470), positive correlation of 0.012 with mean years of schooling (p=0.935) and also a negative correlation of 0.120 with the income level of the population per person (p=0.426).

Standardized mortality rate and the human development index

Also it has been seen a negative correlation of 0.07 between the standardized mortality rate of liver cancer and the Human Development Index but this correlation

is not statistically significant (p=0.645). Also it was seen a correlation between the HDI components with standardized rate. So that it was seen a negative correlation of 0.079 between the standardized mortality rate and life expectancy at birth (p=0.603), negative correlation of 0.032 with mean years of schooling (p=0.832) and negative correlation of 0.113 with income level of the population per person (p=0.455).

In men also, It has been seen a negative correlation of 0.076 between the standardized mortality rate of liver cancer and the HDI that this correlation is not statistically significant (p=0.615). Also it was seen a correlation between the Human development index components with standardized rate. So that it was seen a negative correlation of 0.067between the standardized mortality rate and life expectancy at birth (p=0.660), negative correlation of 0.041 with mean years of schooling (p=0.789) and negative correlation of 0.134with income level of the population per person (p=0.374).

In women also, it has been seen a negative correlation of 0.069between the standardized incidence rate of liver cancer and the HDI that this correlation is not statistically significant (p=0.649). Also it was seen a correlation between the HDI components with standardized rate. So that it was seen a negative correlation of 0.116 between the standardized mortality rate and life expectancy at birth (p=0.441), negative correlation of 0.007with mean years of schooling (p=0.965) and negative correlation of 0.104with income level of the population per person (p=0.490).

Discussion

In recent years, the greatest burden of cancer is seen in developing countries. So that now about 57% of cancer cases and 65 percent of deaths due to that occur in these countries worldwide (Bray and Moller, 2006). So cancer is becoming a serious health threat in developing regions especially in many Asian countries and as one of the main leading causes of death in some Asian countries such as Japan and South Korea. It is predicted that if management strategies ,in these areas will continue to be stable, the number of new cancer cases in Asia will rise to 7.1 million by 2020 (Mackay J, (2006).).

Based on the findings of this study, the incidence of liver cancer in Asia is not in relation with The Human Development Index which checks a countries' mean success in three Human dimensions: Long life, access to knowledge and a desirable life standard. Among Asian countries, Mongolia, Lao PDR, Vietnam, the Republic of Korea and Thailand had the highest standardized incidence of cancer. The Human Development Index in 4 countries is in medium level but in Republic of Korea, its level is too high. In contrast, in countries such as Nepal, Israel, Islamic Republic of Iran, Lebanon and India with very high, medium and low human development index low incidence was seen. The results of another study showed that although hepatocellular carcinoma (HCC) due to chronic hepatitis B infection is more common in Asia and Africa that have lower HDI level, HCC rates due to vaccination programs in some areas have declined in recent years (Chang et al., 1997) .

It seems that the rise of HCC in Western countries that have a higher HDI, has been due to hepatitis C infection and alcohol consumption (Liver, 2012). Distribution of cancers based on HDI is different in the world. So that countries with high very high and high HDI have four types of cancers including lung cancer, breast, colorectal and prostate cancer have allocated almost half of the total cancer incidence load to themselves. In countries with medium and low HDI, in addition to lung, colorectal and breast cancer, cancers of the stomach, liver and cervical cancer have allocated a significant amount of cancer to themselves. In countries with low HDI, though the absolute burden of cancer is low, but a variety of cancers such as cancer of the cervix, liver, Kaposi's sarcoma and non-Hodgkin that the etiology of all of them is related to infectious agents, have the highest incidence and mortality rates in these areas (Bray et al., 2012; Franceschi and Wild, 2013).

The results of this study showed that the standardized mortality rate of liver cancer in Asia varies from 0.9 per hundred thousand people in Nepal to 70.3 per hundred thousand people in Mongolia. The most standardized mortality rates occurred in Mongolia, Lao PDR, Vietnam, Cambodia and Thailand with the average level of Human Development Index. And it is noteworthy that, countries with high incidence does not experience higher mortality necessarily.

The standardized mortality rate showed insignificant negative correlation with HDI and its markers like life expectancy at birth, mean education and level of life. Similarly, 5 countries having the lowest standardized mortality rate of liver cancer are: Nepal, Iran, Lebanon, Israel and India that are in low, medium and very high level in terms of HDI. While the results of another study showed that the ratio of mortality to incidence of digestive system cancer including liver has an inverse relation with HDI in national and regional levels (Hu et al., 2013).

In this study a positive correlation was seen between the standardized incidence rate and life expectancy at birth as one of the HDI dimensions. But this relation was not statistically significant. Also a negative insignificant correlation was seen between standardized mortality rates with life expectancy at birth. Studies results have shown that age in many malignant cancers has been mentioned as a prognostic item but it may have controversial role in the prognosis of HCC. Young patients with liver cancer have a poorer prognosis, because they show poor pathological grade and advanced stage of the tumor. However, some studies have argued while young patients with liver cancer have poor clinical manifestations, their long-term survival are better than older patients. These different results may be due to performing study in a single center and limitation of sample size (Ni et al., 1991; Tobe et al., 1994; Yamanaka et al., 1994; Lee and Ko, 1998; Zhang and Sun, 2015).

Another indicator of the Human Development Index is access to knowledge that in this study has an insignificant negative correlation with the standardized incidence rate of liver cancer. While other research in this area showed that one of the important primary prevention actions for HCC, is improving public health in countries which requires new training strategies and increasing awareness

and knowledge of individuals which is expected to lead to improvements in early detection and prevention of new cases of HBV and HCC (He et al., 2013).

Therefore, the implementation of targeted cultural and educational programs with an emphasis on prevention and screening for HBV was considered as an important tool for the prevention of liver cancer (Chao et al., 2009).

Another dimension of the HDI is suitable income level which is determined by Gross domestic Product. In our study, income level had an insignificant negative correlation with standardized incidence and mortality rate. While other studies have shown that different Patterns exist in different countries with various geographical, cultural, social and economic status (Sepanlou et al., 2015). So that each year more cases of liver cancer is recognized in less developed countries, compared with more developed ones.

In conclusion, the incidence of LC is more in less developed and developing countries. Statistically significant correlation was not found between standardized incidence and mortality rates of LC, and HDI and its dimensions.

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