Evaluation of observed and the expected incidence of common cancers: An experience from Southwestern of Iran, 2010–2014

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Background: Awareness of observed and expected incidence of cancers is so important in managing cancer as the third mortality cause in Iran. In the present study, we evaluated observed and the expected incidence of common cancers in Chaharmahal and Bakhtiari province. **Materials and Methods:** This study is a Secondary data analysis. All data about pathology-based cancer registration (Cancer diagnosis was based on pathological laboratory, ICD-O2) in Chaharmahal and Bakhtiari in Southwestern Iran in 2010–2014 was used. By dividing the number of registered cases of each cancer in every age group into the total observed cancers in that age group, the observed ratio of each cancer in that age group was calculated. Then, using the proposed coefficients Parkin and age-standardized cancer ratio method, the expected ratios in each age group, were calculated. **Results:** In 5 years study, 2918 new cases of cancer were recorded. Out of them, 1735 (59.46%) were male. The annual average total occurrence of all cancers in this province was 68.2/100,000 populations. The observed incidence ratios of common cancers, including stomach, breast, colorectal, thyroid, lymph nodes, ovaries, gall bladder, the bladder and the brain, were 0.11, 0.12, 0.09, 0.06, 0.02, 0.03, 0.01, 0.08, and 0.05, respectively. The expected incidence ratios of above-mentioned cancers are 0.11, 0.13, 0.1, 0.06, 0.02, 0.03, 0.01, 0.08, and 0.05, respectively. Based on observed (O) and expected (E) comparison, breast and colorectal cancer had higher incidence than expected ratio. **Conclusion:** Our results showed that in our area, treatment programs and health plans should focus on cancer registration, especially on common cancers and reevaluate breast and colorectal cancer occurrence. Therefore, the plan for the control and prevention of this cancer must be a high priority for health policymakers.

Key words: Cancer, cancer registry, Iran, neoplasm

INTRODUCTION

In the developed countries, such as Iran, skin, breast, prostate, lung, colorectal, and in developing countries, stomach, liver, and cervix cancers are the most important cancers.[1-3] About 60% of all cancers are occurred in the developing countries.[4] After cardiovascular diseases and accidents, cancer is the third most common cause of death in Iran.[5] It is estimated that each year more than 70,000 new cases of cancer and 30,000 deaths due to cancer are registered in Iran.[6,7] The etiology and effects of cancer control interventions are studied through various methods of epidemiology using cancer registration data.[8,9] More data of cancer are obtained using the registration based on population or hospital, but only cancer registration based on population can bring description without error in the various populations and is a reliable source for cancer prevalence, incidence, and survival[10] and the gold standard for planning cancer control programs.[8] However, only 36% of the countries have population-based cancer registry system.[11] There is not still an accurate and high-quality cancer registry

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system in all regions of Iran, and some differences are sometimes observed in the quality of data.[12] The National Cancer Registry in Iran is not based on population and is conducted by various methods including pathology-based and cohort studies. In some northern provinces, especially Golestan, cancer cases are registered in population-based and cohort study methods, also in several areas of Fars and Tehran, population-based registration is conducted. In other parts of Iran, pathology-based cancer registry is used.[13,14] Incidence ratios of cancers with their expected ratios, which has not ever been compared in Chaharmahal and Bakhtiari province. Due to the lack of population-based cancer registry plan and nonavailability of new and updated statistics in Chaharmahal and Bakhtiari, pathology-based registration data are the best available source. Hence, updating this data takes many years. The latest available data is about 2010–2014. This study was designed and developed to evaluate the cancer registration system in Chaharmahal and Bakhtiari province, in other words, it was conducted to compare the incidence ratios of registered cancers with their expected ratios which have not ever been conducted in this province.

MATERIALS AND METHODS

Study design
This study was done based on existing data and is a Secondary data analysis. Data used in this study were obtained from a Shahrekord University of Medical Sciences (SKUMS) in Iran and was conducted using all data of pathology-based cancer registration center of Chahrmahal and Bakhtiari province. This data were collected by health department of SKUMS with over 95% cover. The target population included all patients with cancer having a definite pathologic sample of cancer in 2010–2014 who were chosen by census. Data based on a definitive pathologic diagnosis of cancer registries were collected from a variety of sources including clinics, laboratories, and centers of histology and cytology throughout the province, hospitals, death certificates and forensic offices. Cancer diagnosis was based on pathological laboratory, encoding book ICD-O2, and International Disease Classification system.

Statistical analysis
First, the observed and expected ratios of each cancer were calculated and determined by using their abundancy. By dividing the number of registered cases of each cancer in every age group (r_i) into the total observed cancers in that age group (t_i), the observed ratio of each cancer in that age group was calculated. Then, by using the proposed coefficients Parkin (w_i), the expected ratios in each age group were calculated.[15] Age-standardized cancer ratio (ASCAR) was used for standardizing the ratios. The

ASCAR is a direct standardization, which requires the selection of a set of standard age-specific proportions to which the series to be compared will be standardized. The choice is quite arbitrary, but a standard which is somewhat similar to the age-distribution of all cancers in the case series being compared will lead to the ASCAR being relatively close to the crude relative frequency. The ASCAR is calculated as:

$$\text{ASCAR} = \sum_{i=1}^{A} (r_i/t_i) W_i$$

Where,

r_i = number of cases of the cancer of interest in the study group in age class i.

t_i = number of cases of cancer of all sites in the study group in age class i.

w_i = standard proportion for age class i.

The ASCAR is interpreted as being the percentage frequency of cancer which would have been observed if the observed age-specific proportions applied to the percentage age-distribution of all cancers in the standard population. It must be stressed that the problems of making comparisons between data sets with different overall incidence rates remain the same and are not corrected by standardization. The statistical problems of comparing ASCAR scores have not been investigated, and there appears to be no formula available for calculating a standard error. Considering the cancer incidence in terms of the year in the province and comparing to the expected ratios of cancer registry in the province, under- or over-registration of cancers was determined. This study did not have any particular moral constraints. The researcher examines the reports of pathological centers observing all the principles of ethics in research without any intervention. Confidentiality and integrity were considered by the investigator in all phases of the research, and all stages of working were conducted with licensees of University of Medical Sciences of Shahrekord and approval of Ethics in Research Committee (SKUMS, 636-73-07-1390).

RESULTS

In the study period, 2918 new cases of cancer in Chaharmahal and Bakhtiari province were registered in 2010–2014. In terms of gender, 1183 (40.54%) were female, and 1735 (59.46%) were male. The annual average incidence of all cancers in this province in male, female, and total population was 38.5, 26.2, and 68.2/100,000 populations, respectively.

In 2014, the observed incidence ratios of common cancers, including stomach, breast, colorectal, thyroid, lymph nodes, ovaries, gall bladder, the bladder, and the brain, were 0.11, 0.12, 0.09, 0.06, 0.02, 0.03, 0.01, 0.08, and 0.05, respectively.

The expected incidence ratios of above-mentioned cancers are 0.11, 0.13, 0.1, 0.06, 0.02, 0.03, 0.01, 0.08, and 0.05, respectively.

Total observed ratios of stomach cancer in 2010 and 2011 were less than the expected ones, but in 2012, 2013, and 2014 there was not seen any differences in the observed and expected total ratios of stomach cancer.

Some differences were observed in total observed and expected ratios of breast cancer during 5 years, so that total observed ratio in 2010 was equal to total expected one, but in 2011, total observed ratio was more than expected one, but in 2012 and 2014, the observed ratios were less than expected ones.

In all years, total observed ratios of colorectal cancer were less than expected ratios, except 2014, total observed ratio was more than expected [Table 1]. Except 2013 when the total observed ratio of thyroid cancer was less than the expected ratio, no difference between two ratios in the other years.

Total observed ratios of lymph nodes and ovarian cancers, except 2011 when there were less than expected ones, were equal to expected ratios in the other years [Table 2].

The results of the study showed that the total observed and expected ratios of gallbladder cancer were equal, except 2011 when total observed ratio was more than the expected one in these years.

Total observed ratios of bladder cancer were more than the expected value in 2010, 2011, and 2013; but in 2012 and 2014, these values were equal. Total observed ratios of brain cancer and CNS except 2010, 2011, and 2014 were equal, and in 2012 and 2013, total observed ratios were less than the expected ones [Table 3].

DISCUSSION

Average annual incidence of all cancers was 68.2 per 100000 populations in Chahrmahal and Bakhtiari province that was higher in the men than women. In terms of gender pattern, it was consistent with statistics 2012 GLOBOCAN, but in term of quantitative comparison, cancer incidence in Ch and B and the registered cases were less than GLOBOCAN statistics, so that based on this statistics, ASR of cancer incidence per 100,000 populations was 163 and 135.8 per 100,000 populations for the men and women in the developing countries, respectively.[16] According to 2012 GLOBOCAN statistics, the incidence of all cancers in men is more likely than women in Iran.[17] The average observed ratio of breast, colorectal and brain cancers in Chaharmahal and Bakhtiari was less than their expected ratio in 2010–2014, showing the difficulties in pathology-based registration and reporting system in the province consistent with study results in Iran which underestimate the cancer registration.[18,19] Failure to accurately record the deaths and demographic data, problems resulted from economic and political instability and failure to recognize the mistakes of people collecting the cancer data are among the challenge of cancer registration in the developing countries.[20] Cancer registration in Iran is not based on population and is done by different methods including pathology-based registration. Population-based cancer registration collects systemically the data about all cancers in a specified population, while pathologic- and hospital-based cancer registration studies, the data of treated and diagnosed patients and data of many cancers are ignored,[7] providing incomplete data of cancer cases.[10] Incidences of cancer are higher in population-based registration than pathology-based one because in the former, in addition to pathology centers, other sources including clinical, radiotherapy, and especially total population mortality statistics are used, as a result, more cases of cancer recognition are collected and data statistics are increased. Although collecting the data from several sources results in repetition of data about a person and increase the false incidence rate, precision in deleting the duplicates is so critical for presenting the correct rates, and there should be a specified method for it. Presenting a report of duplicates in total cancer registration based on cancer type increases the accuracy of registration report.[18] In this study, the average ratio of observed incidence of bladder cancer in Chaharmahal and Bakhtiari province during the relevant years was more than the expected one which may be related to an increased the incidence of cancer in the province. According to state cancer registries in 2006, the age-specific incidence of bladder cancer in men in this province was 11.35/100,000 individuals which was the third most common cancer in men in this province following skin and stomach cancers.[21] This study showed that average observed incidence of stomach, thyroid, lymph nodes, ovaries, and gallbladder cancers was similar to the average expected cancer ratio of above-mentioned cancers in 2010–2014. The results of this study can also be useful in choosing an appropriate method for planning the cancer registration and its prevention in Chaharmahal and Bakhtiari and suggests

Table 1: Observed and expected ratios of stomach, breast, and colorectal cancer in Chaharmahal and Bakhtiari province

Year	Age groups	Stomach cancer ratio		Breast cancer ratio		Colorectal cancer ratio	
		Observed	Expected	Observed	Expected	Observed	Expected
2010	0–14	0.025	0.125	0	0	0	0
	15–24	0.133	0.665	0	0	0	0
	25–34	0.17	0.85	0	0	0.07	0.35
	35–44	0.11	1.1	0.1	1	0.09	0.9
	45–54	0.09	1.8	0.1	2	0.125	2.5
	55–64	0.11	2.75	0.11	2.75	0.14	3.5
	65–74	0.16	3.2	0.05	1	0.125	2.5
	≤75	0.23	2.3	0.08	0.8	0.07	0.7
	Total	0.12	0.13	0.07	0.07	0.09	0.10
2011	0–14	0.025	0.125	0	0	0	0
	15–24	0.133	0.665	0	0	0	0
	25–34	0.17	0.85	0	0	0.07	0.35
	35–44	0.11	1.1	0.05	0.5	0.05	0.5
	45–54	0.09	1.8	0.06	0.12	0.1	2
	55–64	0.11	2.75	0.07	1.75	0.11	2.75
	65–74	0.16	3.2	0.01	0.2	0.1	2
	≤75	0.23	2.3	0.06	0.6	0.06	0.6
	Total	0.12	0.13	0.04	0.03	0.07	0.08
2012	0–14	0	0	0	0	0	0
	15–24	0.04	0.2	0	0	0.04	0.2
	25–34	0.1	0.5	0	0	0.08	0.4
	35–44	0.08	0.8	0.1	1	0.08	0.8
	45–54	0.07	0.14	0.09	1.8	0.11	2.2
	55–64	0.09	2.25	0.1	2.5	0.13	3.25
	65–74	0.13	2.6	0.04	0.8	0.11	2.2
	≤75	0.21	2.1	0.07	0.7	0.07	0.7
	Total	0.09	0.09	0.06	0.07	0.08	0.10
2013	0–14	0	0	0	0	0	0
	15–24	0	0	0	0	0	0
	25–34	0	0	0	0	0	0
	35–44	0.03	0.3	0.22	2.2	0.05	0.5
	45–54	0.14	2.8	0.15	3	0.09	1.8
	55–64	0.15	3.75	0.18	4.5	0.18	4.5
	65–74	0.14	2.8	0.09	1.8	0.12	2.4
	≤75	0.18	1.8	0.11	1.1	0.1	1
	Total	0.11	0.11	0.12	0.13	0.09	0.10
2014	0–14	0	0	0	0	0	0
	15–24	0	0	0	0	0	0
	25–34	0	0	0.125	0.625	0	0
	35–44	0.03	0.3	0.2	2	0.04	0.4
	45–54	0.13	2.6	0.14	2.8	0.09	1.8
	55–64	0.14	3.5	0.18	4.5	0.18	4.5
	65–74	0.13	2.6	0.09	1.8	0.12	2.4
	≤75	0.17	1.7	0.12	1.2	0.1	1
	Total	0.11	0.11	0.12	0.13	0.09	0.10

this hypothesis that whether reducing the registered cases of cancer cases is real in relation to its expected cases and cancers are not well registered in the province or whether the rate of these cancers is less in the society and we search some guideline to know which cases are closer to reality. If the incidence of cancer in the province is low, we will identify the cause of the disease in the region, or if cancer registries in the province do not perform well, planning to implement a detailed program of cancer registration is required. Cancer registration requires the ensuring the data quality.[9] Strengthening the hardware and software resources required for cancer registry program, increasing the number of trained staff for collecting the data play a significant role in attaining and

Table 2: Observed and expected ratios of thyroid, lymph nodes, and ovary cancer in Chaharmahal and Bakhtiari province

Year	Age groups	Thyroid cancer ratio		Lymph nodes cancer ratio		Ovary cancer ratio	
		Observed	Expected	Observed	Expected ratio	Observed	Expected
2010	0-14	0	0	0	0	0	0
	15-24	0.33	1.65	0.07	0.35	0	0
	25-34	0.23	1.15	0.07	0.35	0.07	0.35
	35-44	0	0	0.04	0.4	0.04	0.35
	45-54	0.04	0.8	0.04	0.8	0	0
	55-64	0.1	2.5	0.04	1	0.04	1
	65-74	0	0	0.04	0.8	0	0
	≤75	0.05	0.5	0.03	0.3	0.02	0.2
	Total	0.06	0.06	0.04	0.04	0.02	0.02
2011	0-14	0	0	0	0	0	0
	15-24	0.13	0.65	0.07	0.35	0	0
	25-34	0.1	0.5	0.07	0.35	0.7	3.5
	35-44	0	0	0.04	0.4	0.04	0.4
	45-54	0	0	0.03	0.6	0	0
	55-64	0.04	1	0.04	1	0.03	0.75
	65-74	0	0	0.04	0.8	0	0
	≤75	0.03	0.3	0.02	0.2	0.01	0.1
	Total	0.02	0.02	0.03	0.04	0.02	0.05
2012	0-14	0	0	0	0	0	0
	15-24	0.21	1.05	0.04	0.2	0	0
	25-34	0.18	0.9	0.08	0.4	0.1	0.5
	35-44	0	0	0.05	0.5	0.06	0.6
	45-54	0.03	0.6	0.03	0.6	0	0
	55-64	0.09	2.25	0.05	1.25	0.05	1.25
	65-74	0	0	0.04	0.8	0	0
	≤75	0.05	0.5	0.03	0.3	0.03	0.3
	Total	0.05	0.05	0.04	0.04	0.03	0.03
2013	0-14	0	0	0	0	0	0
	15-24	0.22	1.1	0	0	0	0
	25-34	0.19	0.95	0.03	0.15	0.1	0.5
	35-44	0	0	0.02	0.2	0.06	0.6
	45-54	0.03	1.6	0.01	0.2	0	0
	55-64	0.1	2.5	0.03	0.75	0.06	1.5
	65-74	0	0	0.02	0.4	0	0
	≤75	0.06	0.6	0.01	0.1	0.03	0.3
	Total	0.05	0.07	0.02	0.02	0.03	0.03
2014	0-14	0	0	0	0	0	0
	15-24	0.31	1.55	0	0	0	0
	25-34	0.2	1	0.03	0.15	0.1	0.5
	35-44	0	0	0.01	0.1	0.06	0.6
	45-54	0.03	0.6	0.01	0.2	0	0
	55-64	0.1	2.5	0.04	1	0.6	1.5
	65-74	0	0	0.03	0.6	0.01	0.2
	≤75	0.06	0.6	0.02	0.2	0.03	0.3
	Total	0.06	0.06	0.02	0.02	0.03	0.03

maintaining high standards in cancer registry. Training centers for pathology, clinics, and death registration centers for optimal data recording plays an important role in accurate and complete information.[22-24] Cancer registration program of the province has many defaults and limitations, and it seems that reviewing the existing plan and using different method for cancer registration based on population are necessary for correct estimation of cancer rate in the country.

CONCLUSION

The study showed some cancers are well registered or have high incidence than the expected rate compared to other

Table 3: Observed and expected ratios of gallbladder, bladder, brain, and central nervous system cancer in Chaharmahal and Bakhtiari province

Year	Age groups	Gallbladder cancer ratio		Bladder cancer ratio		Brain and CNS cancer ratio	
		Observed	Expected	Observed	Expected	Observed	Expected
2010	0–14	0	0	0	0	0	0
	15–24	0	0	0	0	0	0
	25–34	0	0	0.07	0.35	0	0
	35–44	0	0	0.11	1.1	0	0
	45–54	0	0	0.09	0.18	0	0
	55–64	0	0	0.11	2.75	0.1	2.5
	65–74	0.04	0.8	0.06	1.2	0	0
	≤75	0.02	0.2	0.13	1.3	0.04	0.4
	Total	0.01	0.01	0.09	0.07	0.03	0.03
2011	0–14	0	0	0	0	0	0
	15–24	0	0	0	0	0	0
	25–34	0	0	0.07	0.35	0	0
	35–44	0	0	0.11	1.1	0	0
	45–54	0	0	0.09	1.8	0	0
	55–64	0	0	0.1	2.5	0.1	2.5
	65–74	0	0	0.06	1.2	0	0
	≤75	0.007	0.07	0.12	1.2	0.05	0.5
	Total	0.002	0.001	0.09	0.08	0.03	0.03
2012	0–14	0	0	0	0	0	0
	15–24	0	0	0	0	0	0
	25–34	0	0	0.13	0.56	0	0
	35–44	0	0	0.12	1.2	0	0
	45–54	0.01	0.2	0.1	2	0	0
	55–64	0.01	0.25	0.13	3.25	0.09	2.25
	65–74	0.01	0.2	0.08	1.6	0	0
	≤75	0.01	0.1	0.13	1.3	0.05	0.5
	Total	0.01	0.01	0.1	0.1	0.02	0.03
2013	0–14	0	0	0	0	0.13	0.65
	15–24	0	0	0	0	0	0
	25–34	0	0	0.05	0.25	0.1	0.5
	35–44	0	0	0.09	0.9	0	0
	45–54	0	0	0.08	0.16	0.05	1
	55–64	0.01	0.25	0.1	2.5	0.14	3.5
	65–74	0.01	0.2	0.06	1.2	0	0
	≤75	0.01	0.1	0.11	1.1	0	0
	Total	0.01	0.01	0.08	0.06	0.04	0.06
2014	0–14	0	0	0	0	0.12	0.6
	15–24	0	0	0	0	0	0
	25–34	0	0	0.05	0.25	0.125	0.625
	35–44	0	0	0.09	0.9	0	0
	45–54	0	0	0.08	1.6	0.05	1
	55–64	0.03	0.75	0.1	2.5	0.13	3.25
	65–74	0.02	0.4	0.07	1.4	0	0
	≤75	0.01	0.1	0.12	1.2	0	0
	Total	0.01	0.01	0.08	0.08	0.05	0.05

CNS = Central nervous system

types including breast, bladder, and gallbladder cancers. In some cancers, less registered cases than the expected ones were observed, showing that these cancers are not well registered in the province or their real incidence is less than their expected ones. In any case, necessity of attention at proper registering the incidence of all cancers and planning for determining the reasons of the cancers with more than expected incidence is felt. Less incidence of some observed ratios than the expected ones of cancers may be duo to the difficulties in cancer registration. Then, it is recommended to conduct the proper planning for registering the cancers in the province. Managers of health system should consider

the pattern and risk factors of cancers for planning and controlling these patients. Thus, heath policy-makers should pay special attention at cancers as heath priority to increase public awareness and increase people's knowledge about cancer and consider the cancer prevention seriously in their agenda through continuous negotiation with social media. Of course, implementation of cancer-preventing measures requires the proper cancer registration which has not been yet realized in Ch&B.

Conflicts of interest
There are no conflicts of interest.

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