

## **Cancer in the Arabian Gulf Kingdom of Bahrain (1952-2004)**

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**Objective:** To study the incidence pattern of cancer in Bahrain and compare the data with those of the world and Gulf Cooperation Council countries (GCC).

**Design:** Retrospective Study.

**Setting:** Pathology Department, Salmaniya Medical Complex, Bahrain.

**Method:** Confirmed malignancies diagnosed in Bahraini patients between 1952 and 2004 in the histopathology and hematology departments of all government and private hospitals and clinics of Bahrain.

**Result:** The overall age standardized rate (ASR) of cancer in Bahrain is 70.15/100,000. At 78.12 and 62.50, the male and female ASRs in Bahrain are less by 22.3% and 36.9% than the 100.5 and 99.1 GCC incidences and by 62.7% and 61.3 than the 209.6 and 161.7/100,000 world data respectively.

Bahrain male ASR is lower than the 157.0, 132.6 and 99.1/100,000 of Qatar, Kuwait and Oman; it is higher than the 70.1 and 66.1 of the United Arab Emirates, and Saudi Arabia, whereas the female rate is similar to the 62.9 of Saudi Arabia but lower than the 165.2, 236.7, and 81.9 of Qatar, Kuwait, Oman and United Arab Emirates respectively.

The age and gender distribution pattern of cancer patients in Bahrain and the frequency orders of the 10 most common cancers are also different from those of the GCC countries. The annual incidence rate in Bahrain increased from 12.05 during 1952-1964 to 73.6/100,00 during 1995-2004 with cross-over pattern during 1995-2004 whereby the annual male incidence rates, which were consistently higher than those of female prior to 1995, became consistently lower.

**Conclusion:** Cancer pattern in Bahrain is different from that of Gulf Cooperation countries thus disputing a proposed hypothesis that people living along the shores of this region have common environmental, epidemiologic and population characteristics, and would therefore have a common expression of disease pattern including cancer. The unique characteristics specific to each country would determine the pattern of cancer.

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Cancer is a worldwide health problem including Bahrain, a developing country which geographically located at the centre of the Arabian Gulf with a population of 650,604 (2004) of whom 62% are indigenous Arabs; together with the neighbouring five Arab states, namely Kuwait, Oman, Qatar, Saudi Arabia (SA) and United Arab Emirates (UAE) form the Arabian Gulf Cooperation Council (GCC)<sup>1-6</sup>. Ideally, analysis of cancer studies should be based on cancer registry data and results compared to countries with similar population characteristics. Regrettably, the reports from Bahrain Cancer Registry (BCR) and the GCC study from the Gulf Centre for Cancer Registration (GCCR) fell short of providing reliable data because of inconsistency of criteria used for cancer registration, population census studied, source of cancer diagnosis and the inclusion of non-histologically confirmed clinically diagnosed patients<sup>2-6</sup>. In such circumstances, data obtained from pathology laboratories could provide a useful source of information on the frequency and incidence of cancer.

We present a preliminary study on the incidence of cancer in Bahrain based on the analysis of all histologically and hematologically confirmed cases diagnosed in Bahraini patients between 1952 and 2004.

We compared our results with relevant world data, as well as with those from Gulf Cooperation countries, which are supposed to share many common ethnic, racial, family, genetic, socioeconomic, environmental, dietetic, cultural, linguistic and historical characteristics<sup>2-7</sup>.

## **METHOD**

Bahraini patients diagnosed with malignancy between 1952-2004, according to their archives in the histopathology and bone marrow hematology of government, private hospitals and clinics in Bahrain were reviewed. These records were analysed for year of diagnosis, age and gender, anatomic sites, behaviour and histological type of the tumour using standard WHO criteria<sup>8-10</sup>. The age-standardized incidence rates (ASR), annual incidence rates and age-specific rates of Bahraini males, females and of both gender were calculated as per the formulas of Cancer in Five Continents<sup>10</sup>.

The annual incidence rates of cancer were calculated for the periods 1952-1964, 1965-1974, 1975-1984, 1985-1994 and 1995-2004. The overall male and female ASRs, as well as those of the 10 most common cancers in the GCC countries were compiled by listing the relevant rates outlined in the GCCR report but replacing the Bahrain data with the findings of the present study<sup>2</sup>.

## **RESULT**

During the 53 years (1952-2004) period of the present study, we found 7146 Bahraini patients diagnosed with malignant neoplasia, 3850 (54%) males and 3296 (46%) females, M:F ratio of 1.2:1. Childhood cancer formed 6.5% of all cancers in Bahrain.

Table 1 and 2 show the ASRs of the 10 most common male and female cancers in Bahrain as compared to corresponding rates in other GCC countries, the average GCC rates and world incidence. The overall incidence of cancer in Bahrain is 70.15 and those of males and females were 78.12 and 62.50/100,000 respectively.

**Table 1: The Age Standardized Rates of the 10 Most Common Male Cancers in Bahrain Compared with Corresponding Rates in GCC Countries, the Overall Average in the GCC and the World Incidence**

ICD-O	Site	Bahrain	Kuwait <sup>2</sup>	Oman <sup>2</sup>	Qatar <sup>2</sup>	SA <sup>2</sup>	UAE <sup>2</sup>	GCC	World <sup>10</sup>
33-34	Lung	9.67	17.0	9.1	18.8	5.0	7.2	11.13	35.5
65-68	Urinary Tract	8.80	7.5	4.9	16.4	4.0	5.4	7.83	10.1
61	Prostate	7.58	12.3	9.6	9.4	4.0	6.4	8.21	25.3
16	Stomach	6.70	3.8	12.8	6.4	2.8	7.2	6.62	22.0
81-88,96	Lymphoma	6.46	14.3	10.5	16.3	7.6	6.6	10.29	7.3
18-20	Colorectal	5.50	15.1	4.5	11.6	5.0	6.6	8.05	20.1
91-95,other	Leukemia	4.77	5.8	8.3	9.0	4.2	2.7	5.80	5.9
32	Larynx	3.00	3.0	1.1	4.3	1.3	1.3	2.33	5.1
15	Oesophagus	2.56	2.4	2.6	4.2	1.6	2.4	2.63	11.5
43-44	Skin	2.01	1.9	4.6	5.3	3	3.6	3.40	2.8
ASR		78.12	132.6	99.1	157.0	66.1	70.1	100.5	209.5

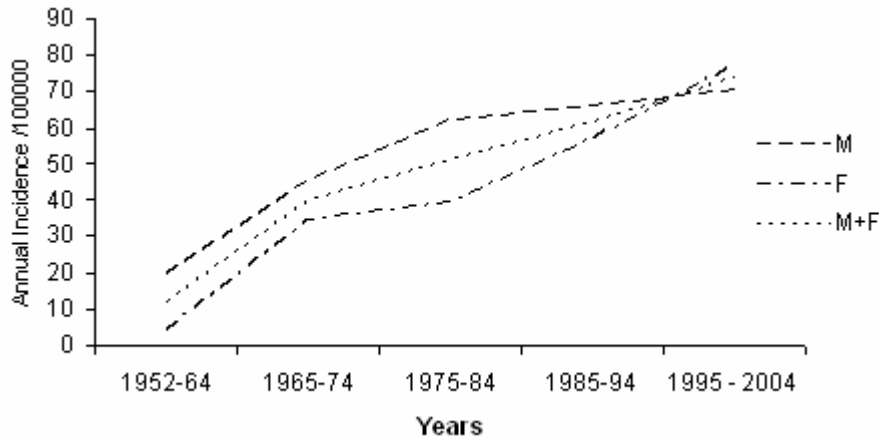
GCC-Gulf Cooperation Council, SA-Saudi Arabia, UAE-United Arab Emirates

**Table 2: The Age Standardized Rates (ASRs) of the 10 Most Common Female Cancers in Bahrain Compared with the Corresponding Rates in Other GCC Countries, the Average GCC and the World Incidence**

ICD-O	Site	Bahrain	Kuwait <sup>2</sup>	Oman <sup>2</sup>	Qatar <sup>2</sup>	SA <sup>2</sup>	UAE <sup>2</sup>	GCC	World <sup>10</sup>
50	Breast	16.11	44.3	14.4	35.5	12.9	19.2	23.74	37.4
53	Cervix	5.24	4.8	5.7	6.8	2.2	5.4	5.02	16.2
18-20	Colorectal	3.89	12.7	3.8	14.1	4.7	5.3	7.42	14.6
81-88,95	Lymphoma	3.54	8.8	5.6	10.3	5.3	5.4	6.49	4.7
73	Thyroid	3.49	7.7	5.9	13.5	5.0	6.0	6.90	3.3
16	Stomach	3.19	2.7	6.2	4.9	1.7	3.9	3.77	10.3
54-55	Uterus	2.92	4.7	2.2	12.1	2.3	3.1	4.60	6.5
56	Ovary	2.90	5.9	5.5	6.7	2.3	4.4	4.62	6.6
91-95,other	leukemias	2.72	4.0	3.8	5.4	6.6	3.1	4.27	4.1
33-34	Lung	2.57	4.8	2.0	4.2	1.3	3.7	3.10	12.1
ASR		62.5	136.7	85.4	165.2	62.9	81.9	99.1	161.7

GCC-Gulf Cooperation Council, SA-Saudi Arabia, UAE-United Arab Emirates

Figure 1 shows the annual incidence/100,000 of cancer in Bahrain amongst males, females and in both. The overall incidence showed gradual and consistent increase from 12.05 between 1952 and 1964 to 73.6/100,000 during 1995-2004. Male incidence increased from 19.7 during 1952-1964 to 61.8 during 1975-1984, and thereafter the increase was slow over the next 20 years reaching 70.2/100,000 during 1995-2004. Similarly, the female incidence showed consistent rise from 4.18 during 1952-1964 to 34.5 during 1965-1974 and to 77/100,000 during 1995-2004. There is a cross over pattern during the 1995-2004, where the annual male incidence rates, which were consistently higher than those of females were, prior to 1995, became consistently lower. As such, the annual male marginally rose from 66.1 during 1985-2004 to 70.2/100,000 during 1995-2004, whereas the female incidence sharply increased from 39.7 during 1975-1984 to 77/100,000 during 1995-2004.



**Figure 1: Annual Incidence of Cancer in Bahrain (1952-2004)**

## DISCUSSION

Reservation has been raised about the statistical inflation of the 1998-2002 BCR and GCCR reports due to inconsistencies in the criteria applied for cancer registration<sup>2-6</sup>. In the present study, we dealt with all these shortages and established further control measures namely:

(a) The study is based on the review of all histopathology and haematology archives of all government and private medical institutions in Bahrain ensuring that cancer verification was made by an expert pathologist's opinion and even those cases which may have escaped BCR notification for any reasons were identified and included. As such clinically diagnosed cases were not included.

(b) Only Bahraini cancer patients were included.

(c) A unified system of cancer registration and coding, including the inclusion of immunoproliferative and lymphoreticular diseases were followed.

(d) The study covered 53 years (1952-2004) period rather than the 5 years (1998-2002) data of BCR and the GCCR reports. There are no other cancer reports from any other GCC country which matches this lengthy coverage. As such the established ASRs annual incidence rates and age-specific rates of Bahraini males and females can be treated with confidence. Accordingly, we replaced Bahraini data in the GCCR report with the results of the present study and averaged the total ASRs to obtain the overall cancer incidence in the GCC countries<sup>2</sup>.

Whether cancer incidence rates in Bahrain are low or high is subject to comparison with regional and international data. However, since there are worldwide geographic variations in the cancer incidence rates, it is not ideal to compare the rates of Bahrain with those of other countries of the world in which, not only the cancer registration and screening programmes are different but also the population characteristics, environmental factors, and risk factors are variable. For example, the male and female cancer incidence rates in Bahrain of 78.12 and 62.5 are less by 62.7% and 61.3% than the 209.6 and 161.7/100,000 world incidence rates respectively<sup>10,11</sup>. Therefore, the best comparative data, which can provide a reasonable source of information, would be those from the five GCC countries, which share many common characteristics<sup>7</sup>.

However, review of cancer data of these countries showed three main groups of differences related to the incidence rates, the frequency order of the 10 most common male and female cancers and the age distribution of patients in the GCC countries<sup>2-6</sup>.

Firstly, the male cancer incidence in Bahrain of 78.12 is lower than the 157.0, 132.6 and 99.1/100,000 of Qatar, Kuwait and Oman but higher than the 70.1 and 66.1/100,000 established in the United Arab Emirates (UAE) and Saudi Arabia (SA) respectively. Likewise, the 62.5 female incidence in Bahrain is only similar to the 62.9 of Saudi Arabia but lower than the 165.2, 236.7, and 81.9/100,000 reported from Qatar, Kuwait, Oman and UAE respectively. As such the M: F ratios amongst the GCC countries are different<sup>2,6</sup>.

Secondly, the ASRs of only very few malignancies from GCC country (including Bahrain) appeared amongst the 10 most common male or female cancer listings of other country. For example, colorectal cancer and lymphomas appeared amongst the 10 most common malignancies in male and female listings in all GCC countries. In addition, leukemias, lung, prostate and urinary tract cancers appeared amongst similar male listing while amongst females, breast, thyroid and gynaecological malignancies appeared likewise.

Among the variations, we cite the following:

- (a) Leukemias appeared amongst the 10 most common tumours in the female listing of all GCC countries except for Qatar, which appeared in 12<sup>th</sup> position.
- (b) Lung cancer is rare amongst GCC females and is ranked 7<sup>th</sup> and 9<sup>th</sup> most common cancer in the female listing of Kuwait and UAE respectively but outside similar female listings in other GCC countries.
- (c) Gastric cancer appeared amongst the 10 most common male malignancies in all GCC countries except for Kuwait ranking 11<sup>th</sup> in the male list. It also appeared amongst 10 most common in all female cancers except for Kuwait, Qatar and Saudi Arabia, which ranked 13<sup>th</sup>, 13<sup>th</sup> and 11<sup>th</sup> respectively.
- (d) Hepatic cancer ranked amongst the 10 most common male cancers in all Gulf studies except for Bahrain, which appeared in the 13<sup>th</sup> position. It also appeared outside corresponding female listing in UAE.
- (e) Laryngeal cancer is common only in Bahrain ranking 8<sup>th</sup> most common male cancers with M:F ratio of 6.3:1. It is outside the 10 most common males and female listings in all other GCC countries.
- (f) Oesophageal cancer is common only in Bahrain and UAE, males ranking 9<sup>th</sup> and 10<sup>th</sup> amongst the male list respectively but outside similar listing in all other GCC countries. Similarly, it is only common amongst Qatar females ranking 7<sup>th</sup> in the female list but outside similar list in all other GCC countries.
- (g) Pancreatic cancer ranked 10<sup>th</sup> amongst male malignancies in Kuwait but outside male and female listings in all other GCC countries.

(h) Brain malignancies are common in Kuwait and Qatar males but outside the 10 most common male and female listing in all other GCC countries. Likewise, kidney cancers are only common in Kuwait males but outside male and female listings in all other GCC countries.

(i) Skin cancer (other than basal cell carcinomas and malignant melanoma) appeared amongst the 10 most common cancer in Bahrain males only but outside the males and female lists in all GCC countries.

(j) Urinary tract cancer appeared amongst the 10 most common malignancies in all GCC male cancer data but outside female listings except of Bahrain.

Thirdly, there are variations in the age distribution pattern of cancer patients between the GCC countries<sup>2,3</sup>. For example, childhood cancer formed 6.5% of all cancers in Bahrain as compared to the 7.4%, 7.5%, 8.9% and 9.4% reported in Qatar, Kuwait, Oman and Saudi Arabia respectively<sup>2</sup>.

Therefore, it would seem from the aforementioned review that variations exist in the incidence rates, the frequency order of the 10 most common cancers and the age distribution of GCC cancer patients. Therefore, the proposed hypothesis on shared common characteristic between the population of the GCC countries is not valid and that each country would have its own unique and specific characteristics<sup>2-7</sup>. This would mean that not only the ethnic, racial, familial, genetic, socioeconomic, environmental, dietetic, cultural, linguistic and historical characteristics are variable, but also the aetiological factors of cancer in each country are also different. However, this needs to be verified with further research.

Nonetheless, irrespective of the above variations, we note that the annual incidence of cancer in Bahrain is increasing. For example, the overall annual incidence showed progressive and gradual increase of six fold from 12.05 between 1952 and 1964 to 73.6/100,000 during 1995-2004. Similarly, the corresponding increase in male and female rates were 72% and 104% respectively. There is a cross over pattern during 1995-2004 where the annual male incidence rates, which were consistently higher than those of female prior to 1995, became consistently lower. We attribute this cross over as due to the influence of new breast, gynaecological and thyroid malignancies diagnosed among Bahraini females as well as the effective screening programmes for the early detection of these cancers.

## **CONCLUSION**

**The study reveals that variations exist in the incidence rates, the frequency order of the 10 most common cancers and the age distribution of GCC cancer patients,**

**There is a need to standardize the criteria of cancer registration in the GCC cancer registries. Furthermore, the inclusion of cancer data from southern parts of Iran and Iraq, which roughly corresponds to more than half of the geographic zone of the Arabian Gulf, must be incorporated in any future GCCR study.**

**Consequently, local variables need to be investigated in view of addressing common aetiological factors and to establish effective screening programmes and protocols of management.**

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