

## RESEARCH ARTICLE

# Some Epidemiological Measures of Cancer in Kuwait: National Cancer Registry Data from 2000 -2009

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## Abstract

**Introduction:** Cancer is the second cause of death in Kuwaiti people after cardiovascular diseases. This study is the first in the country to describe epidemiological measures related to cancer in this population. **Methods:** Data obtained from the Kuwait cancer registry included all Kuwaiti patients between years 2000-2009. Analyses were conducted using age-specific rates, the age-standardization-direct method, 95% confidence intervals (95% CI), cumulative risk by the age of 74 years, limited-duration prevalence, mortality and forecasting to year 2029. **Results:** It was noted that the commonest cancer sites were colorectal with an age standardized incidence rate (ASIR) of 16.1/100,000 in males and breast (49.4/100,000) in the female population. The trend of cancer incidence (1974-2009) showed no statistically significant change. First causes of death due to cancer were female breast 8(6.4-9.6)/100,000 and lung (males) 8.1/100,000 (6.6-10.0). The risk of developing cancer by the age of 74 was 13.4% (1/8) and 14.3% (1/7) in males and females respectively, and the risk of dying from cancer in the same age group was 1/17 and 1/23. By the end of 2009, prevalent cases represented 0.52% of the Kuwaiti population. In the year 2029, the total number of cancer cases is expected to reach 1200 cases compared to 889 cases in 2009. **Conclusions and recommendations:** The most common cancers in Kuwait (breast, colorectal and lung) are largely preventable. Prompt and effective interventional prevention programs that vigorously involve diet, anti-smoking and physical activity for both sexes are urgently required.

**Keywords:** Cancer registry - incidence - prevalence - mortality - Kuwait

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## Introduction

Kuwait cancer registry (KCR) is a population based register covering about three million Kuwaiti and non-Kuwaiti residents in Kuwait. It was established and in operation since 1971. It is a full member of the International Association of Cancer Registries (IACR) and is the first of Arab and Gulf countries to have its results accepted and published in "Cancer in Five Continents" since its fifth edition in 1990. Notification of cancer is compulsory by ministerial regulations. The registry collects information on malignant neoplasm according to the recommendations of the International Agency for Research on Cancer (IARC) (Curado et al., 2007), as well as mortality data from the vital and health statistics division, of ministry of health, Kuwait (Health, Kuwait, 2009).

Cancer cases included in this study defined according to the international Classification of disease for oncology third edition (April et al., 2000).

Cancer registration is comprehensive as almost all cases not initially diagnosed or treated at the Kuwait Cancer Control Centre (KCCC) (including those who receive initial treatment abroad) ultimately referred to the center for further treatment or follow-up.

The registry maintains a separate patients' alphabetical and numerical index. Pathology reports as well as death certificates sorted numerically by year. All new registrations checked against these indices to avoid duplication.

### Sources of information

(i) Patients' medical records and pathology reports from the KCCC and other hospitals (both governmental and private),

(ii) Mortality reports obtained from the department of vital and health statistics division of the ministry of health (including those died abroad), and active follow-up of registered cases.

Since January 2000, the registry has adopted ICD-O-3 and ICD-10. All coding (topography, morphology, TNM classification etc.), and computerization of data are done by the registry staff.

This study is conducted to describe some of the epidemiological measures of cancer in Kuwaiti population between years 2000-2009.

## Materials and Methods

The data analysis of this study based on cancer

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registry backup dated 24 January 2011. The denominator (population at risk) for rates obtained from generally approximated mid-year population (Health, Kuwait, 2009).

Data base construction, analysis and drawing done by CanReg4, Microsoft Excel 2007, and Microsoft Word 2007.

Cumulative risk, prevalence, mortality, forecasting, and confidence intervals calculated using Microsoft Excel 2007.

*Age-Specific Rates*

Calculated by dividing the number of new cases occurring in each specified age group (5-years age groups), by the corresponding population at risk in the same age group. It is expressed per 100,000 people.

*Age-Standardization-Direct Method*

Used for comparing the incidence rates for cancer of different countries, or over time. The standard population used is the world standard population (Doll et al., 1966).

*Confidence Interval (95% CI)*

The statistical definition of the 95 % confidence interval is that if the measurement were conducted 100 times, 95 times the true value would be within the calculated confidence interval and 5 times the true value would be either higher or lower than the range of the confidence interval. Statistically significant is considered when no values within the CI overlap, i.e. the difference between rates is greater than that which could be explained by chance. An overlapping CI represents a difference in rates, which is too small to allow differentiation between a real difference and one that is due to chance variation; i.e. no statistically significant difference, not that no difference exists. Confidence intervals that were calculated for trends from year 1974-2009 used the methods described (Boniol and Heanue, 2007). While those calculated for the international comparisons (GLOBOCAN data) of incidence used the following formula: 95%CI approximation=ASIR±1.96×ASR Number of cases

Statistical independence of observations is assumed in the calculations of the confidence intervals for this study.

*Cumulative Risk by the Age of 74 Years*

The cumulative risk is the probability that an individual will develop the cancer under study during a certain age span, in the absence of other competing causes of death (Boniol and Heanue, 2007). This calculation is theoretical and assumes that no death occurs in the assigned period, and that the age-specific incidence rates will be stable for an individual.

$$\text{Cumulative rate between 0–74 year old} = 5 \times i = 115 d_{iy} \times 100$$

When  $i = 5$ -year age group,  $d_i =$  number of cases in  $i^{\text{th}}$  age group, and  $y_i =$  number of person-years in the  $i^{\text{th}}$  age group

Prevalence is concerned with new and old cases alive on a certain date, contrary to incidence, which includes only new cases of a disease diagnosed within a given duration. In a given population, cancer prevalence is

influenced by the incidence, survival, and the age at diagnosed.

Limited-Duration Prevalence (Ten years prevalence of cancer -Kuwaiti): Represents the number of Kuwaiti people alive on 31/12/2009 that had been diagnosed of cancer within the past 10 years (2000-2009).

**Results**

*Incidence, 2000-2009*

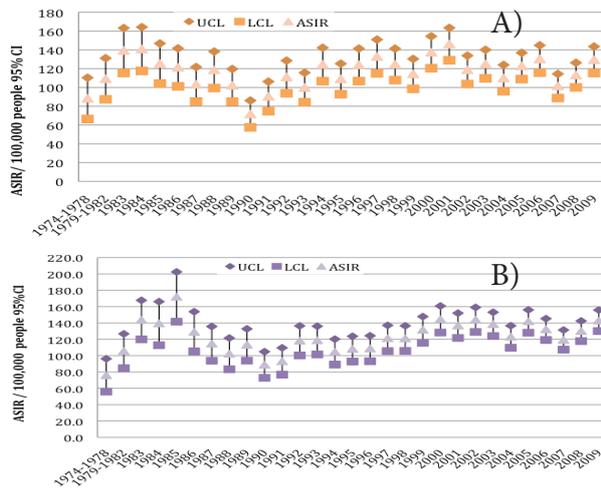
Between years 2000-2009, there were 7,435 new cases of cancer (Kuwaiti), accounting for 35% of the registry data: Male to female ratio was 0.7. Mean age at diagnosis (95%CI) was 42.3 (50.8-51.7) years. About 5.4% of cases were children (age <15 years) and 58.5% of cases aged 50 years or more. Seventy five percent (74.9%) of cases were married, Majority of cases were living in Capital, Hawalli, and Farwaniya (28.0%, 25.1%, 22.1% respectively). The overall age standardized incidence rate (ASIR) was 132.0 cases /100,000. Cancers of breast 1,566 (21.1%), colorectal 747 (10.0%), NHL 551 (7.4%), leukemia 491 (6.6%), and thyroid 427 (5.7%) constitute more than half of the total cancer burden 50.9% (3,782 new cases). Colorectal is the most common cancer in males 358 new cases, followed by NHL 340 cases and Leukemia 281 cases. Breast cancer is the most frequent neoplasm in females, with 1,555 new cases, followed by Colorectal 389 new cases and thyroid with 333-incident cases (Table 1).

The trends of ASIR of cancer together with 95% confidence interval illustrated in (Figure 1 A and B) for Kuwaiti males and females respectively. In year 2009, the age-standardized incidence rate (ASIR±se) stood at 129.5±7.2 cases per 100,000 males and 143.0±6.6 cases per 100,000 females. The highest male ASIR reported in year 2001, 146±9.0 cases per 100,000 males while the highest for female reported in year 2000, 145±8.3 cases per 100,000 females. This year (2009), ASIR proved to be not statistically significant when compared to year 2000 rates (138±8.7 and 144.6±8.3) for male and female

**Table 1. The 10 Most Commonly Diagnosed Cancers, Kuwaiti, 2000-2009**

Site	Males (N=3165)		Females (N=4270)	
	N (%)	ASIR	Site	N (%) ASIR
Colorectal	358(11.3)	16.1	Breast	1555(36.4) 49.4
NHL	340(10.7)	11.3	Colorectal	389 (9.1) 13.4
Leukemia	281 (8.9)	7.4	Thyroid	333 (7.8) 8.2
Trachea, bronchus & lung	277 (8.8)	13.5	NHL	211 (4.9) 6.5
Prostate	271 (8.6)	14.2	Leukemia	210 (4.9) 5.0
Bladder	173 (5.5)	8.0	Corpus uteri	187 (4.4) 7.0
Liver	151 (4.8)	7.4	Ovary	153 (3.6) 5.1
Brain & Nervous system	135 (4.3)	4.3	Cervix	118 (2.8) 3.9
Hodgkin's Disease	135 (4.3)	3.2	Trachea, bronchus & lung	106 (2.5) 4.4
Kidney	121 (3.8)	5.0	Hodgkin's Disease	95 (2.2) 2.1

\* 'ASIR = Age Standardized Incidence Rate / 100,000



**Figure 1. Cancer Age Standardized Incidence Rate (ASIR) World/100,000 among Kuwaiti 1974-2009.** A) Males and B) Females. UCL= Upper confident level, LCL= Lower confident level, ASIR= Age standardized incidence rate, 95%CI= 95% confidence interval

respectively.

#### Risk of developing cancer

The cumulative risk of developing any type of cancer by the age of 74 was 13.4% (1/8) and 14.3% (1/7) for both Kuwaiti male and female respectively. The highest cumulative risks in males are for colorectal, lung and prostatic cancer, (2.0%, 1.8% and 1.7%) respectively, signifying that 1/50, 1/55, and 1/59 Kuwaiti males will develop these cancers by the age of 74. The cumulative risk of breast cancer ranks highest in females, 5.3% indicating that about 1/19 Kuwaiti females will develop this disease before the age of 75, in the absence of competing causes of death. Colorectal 1.6% and corpus uteri 0.9% cancers ranked second and third.

#### Profile of cancer (all cases)

Infiltrating duct carcinoma was the most frequent cancer morphology accounting to about 1242 (16.7%). 2424 (32.6%) of cases presented with regional metastasis and 1152 (15.5%) with distant metastasis. Localized disease seen in 1078 (14.5%) and unknown extent of cancer observed in about 2699 (36.3%). Histology of primary was the basis of diagnosis in 5472 (73.6%) of cancer cases. About 3889 (52.3%) of all cases submitted to surgery, 3814 (51.3%) received chemotherapy, 2193 (29.5%) received radiotherapy, 1301 (17.5 %) of cases were under hormonal treatment and less than (1%) 37 cases received immunological treatment. More than seventy percent 5390 (73%) of cases are still alive.

#### Cancers led to most deaths

A sum of 2,247 deaths were due to cancer among Kuwaiti people, breast cancer (252 deaths), lung cancer (233 deaths), colorectal cancer (203 deaths), blood (197 deaths), liver cancer (170 deaths), and lymphoid tissue cancer (139 deaths) were the most common causes of cancer deaths. Together these six cancer sites represented more than half (52.8%) of all deaths from cancer, with breast accounting to one in every nine deaths due to cancer

(11.2%) and lung cancer accounting for one in every ten deaths due to cancer (10.4%).

Among males, lung cancer was the leading cause of cancer death, with 168 deaths in 2000-2009. Blood (119 deaths), liver cancer (117 deaths), colorectal cancers (110 deaths) and cancer of lymphoid tissue (88 deaths) were the next most common causes of cancer deaths. These five cancers accounted for 51% of all deaths due to cancer among males. Breast cancer was also the most common cancer causing deaths in females in 2000-2009 (250 deaths). Female genital system cancer (149 deaths), colorectal cancer (93 deaths) and blood (78 deaths) were the next most common causes of cancer deaths. Together these four cancer sites accounted for 53.4% of all deaths from cancer in females. The risk of dying from cancer by the age of 74 years was 1 in 17 for males and 1 in 23 for females.

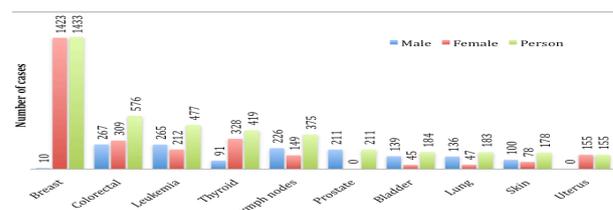
#### Age at death due to cancer

Although death due to cancer can occur in any age, it is mostly observed in the oldest age groups. More precisely, 63% of all cancer deaths in males and 49% all cancer deaths in females occurred in people over the age of 60 years (data of 2000-2009). The median age at death due to cancer was 64 years for males and 57 years for females. The rate of death from cancer increased with increasing age. It is relatively low for people below the age of 35 years (that is, less than 12 deaths per 100,000 people). Starting 35 years and above, the mortality rate increased steadily and significantly between each age groups. The highest mortality rate of 626 deaths per 100,000 people was observed in the oldest age group (85+ years). The odds of dying from cancer were similar for both males and females up to age of 50-54 years. However, after the age of 55 years, the rate of death was higher and increased more steeply in males. Lung, liver and prostate cancer accounted for the highest mortality rate in elderly males 70+ years. On the other hand, breast cancer in females had earlier rise in mortality (increased sharply after the age of 40 years). Breast, colorectal and lung cancer accounted for the highest mortality rate in elderly females 70+ years.

#### Prevalence of cancer in 2000-2009

At the end of 2009, 5,692 cases were alive who had been diagnosed with cancer in the previous 10 years (Table 3). This represented 0.52% of the Kuwaiti population in that year. Males accounted for 38.3% of the 10-year prevalence while females represented 61.7%.

Colorectal cancer was the most prevalent type of cancer among males, with 10-year prevalence of 267 males, followed by leukemia (10-year prevalence of 265



**Figure 2. Ten Years Prevalence of Most Common Cancer Sites, Kuwait by the End of 2009 - All Cases**

**Table 2. The 10 Most Commonly Diagnosed Cancers, Kuwaiti, 2000-2009**

Site/type	Males				Females				
	Frequency	%	ASR	CI (95%)	Site/type	Frequency	%	ASR	CI (95%)
Lung	168	14.2	8.1	6.6-10.0	Breast	250	23.4	8	6.4-9.6
Blood	119	10.1	4.4	2.8-10.0	Female genital‡	149	14	5.5	4.0-7.1
Liver	117	9.9	5.7	4.3-7.2	Colorectal	93	8.7	3.6	2.0-5.1
Colorectal	110	9.3	5.1	3.6-6.6	Blood	78	7.3	2.4	0.8-4.1
Lymphoid†	88	7.5	3.5	2.0-5.1	Lung	65	6.1	2.8	1.3-4.3
Prostate	76	6.4	4	2.5-5.4	Liver	53	5	2.3	0.7-3.8
Brain	75	6.4	2.7	1.1-4.3	Lymphoid	51	4.8	1.8	0.2-3.4
Pancreas	63	5.3	3.1	1.6-4.5	Pancreas	48	4.5	1.9	0.4-3.5
Unknown	60	5.1	2.9	1.4-4.4	Unknown	47	4.4	1.8	0.2-3.4
Primary					Primary				
Stomach	57	4.8	2.7	1.2-4.2	Brain	40	3.7	1.3	0-3.0
All Sites	1179	100	52.9	51.3-54.4	All Sites	1068	100	38.6	37.0-40.2

\*The rates standardized to the Kuwaiti population as at 30 June 2005 and expressed per 100,000 population. †Lymphoid cancers included B-cell, T-cell, NK- cell neoplasm and Hodgkin lymphoma. ‡ Female genital cancers (ICD-10 codes of C51–C56),

**Table 3. Ten Years Prevalence of All Cancers Combined, Kuwaiti at the End of 2009**

	Males	Females	Person
Kuwaiti Population	539,973	562,512	1,102,485
Number of cases	2,178	3,514	5,692
Percentage of prevalent cases	38.26%	61.74%	100.00%
Percentage of Kuwaiti population	0.40%	0.62%	0.52%

males), and lymphomas (10-year prevalence of 226 males) Figure 2. Prostate cancer accounted for 9.7% of the total 10-year prevalence in male.

Breast cancer was the most prevalent type of cancer in females (10-year prevalence of 1,423 females), followed by thyroid cancer (10-year prevalence of 328 females) and colorectal cancer (10-year prevalence of 309 females) Figure 2. Breast cancer accounted for 40.5% of the total 10-year prevalence in females.

Excluding both sexes genital systems and breast, 10-year prevalence was higher in females than in males. This trend was most observed in thyroid cancer. As the 10-year prevalence was over three times higher in females than in males (10-year prevalence of 91 males and 328 females). In contrast, the 10-year prevalence of bladder cancer was over three times higher in males than in females (10-year prevalence of 139 males and 45 females) and for Lung cancer, it was almost three times higher in males than in females (10-year prevalence of 136 males and 47 females).

## Discussion

The State of Kuwait, like other gulf countries, has overtook the economical transition phase from tradition lifestyle to urban, modern and western lifestyle. Together with improved health care services and control of communicable diseases, the epidemiological transition from communicable to chronic non- communicable disease (NCDs) was obvious. It is estimated that, overall, 47% of the Middle East region’s burden of disease is due to NCDs, and by 2020 this is anticipated to rise to 60%) (Khatib, 2004). Key triggers include tobacco use, unhealthy diets and lack of exercise.

Worldwide, in 2008 Globocan estimated 12.7 million

new cancer cases and 7.6 million cancer deaths (Jemal et al., 2011).

In Kuwait cancer is the second cause of death accounting for almost one-fifth of all burdens (19.2 per 100,000 people) and preceded only by deaths due to cardiovascular diseases (51.6/100,000 people) (Health, Kuwait, 2009).

Our results pointed that, on average, one in eight Kuwaiti males and one in seven Kuwaiti females will develop cancer before the age of 75. This is close to what reported (Jemal et al., 2011) for developing countries one in six and one in seven for males and females respectively. Our finding is lower than that of the developed countries one in three and one in five for males and females respectively.

Between 1980 and 2009, the number of new cancer cases more than doubled for both males and females. Between year 1980-1989, 2,772 new cases of cancer diagnosed in Kuwaiti compared with 7,435 cases between years 2000-2009. Furthermore, the number of new cancer cases (889) diagnosed in 2009 was 10.7% higher than the number diagnosed in the previous year (803 cases) (Elbasmy et al., 2011). This increase in cases was primarily due to an increase in the number of breast cancer cases (an additional 223 cases), GIT cases (an additional 158 cases), lymphoid and haemopoietic tissue (an additional 161 cases). When the age structure and size of the population taken into account, the trend data indicate that the incidence rate for all cancers combined increased by only 2.8% from 128.4 cases per 100,000 people in 1980-1989 to 132 cases per 100,000 people in 2000-2009. This suggests that the increase in the absolute number of cancer cases over the years can partially explained by the ageing and increasing size of the population. In year 2029: the number of cases of cancer is expected to increase to reach about 500 and 700 cases for both male and female respectively, the male and female ASR is expected to be around 140 cases/100,000 population.

The proportion of children (age <15 years) in Kuwait cancer patients is higher than that reported in Norway (0.6%) (Inger et al., 2011) and lower to that of the GCC countries (8.1%) Gulf Center for Cancer Control and

prevention, 2011.

The overall male to female ratio of cancer cases in Kuwait is almost similar to that of other gulf countries, UAE and Bahrain and Qatar 0.9. KSA 1.0 and Oman 1.1 Gulf Center for Cancer Control and prevention, 2011. The ratio is lower than that of the world 1.1. Developed and developing countries (1.2 and 0.1 respectively) (Jemal et al., 2011).

Unlike other parts of the world, colorectal cancer was the most frequent cancer diagnosed in Kuwaiti males and females if female related malignancies excluded, while lung cancer was the highest worldwide, and in developing countries, on the other hand prostate cancer was the commonest in developed countries. The rates of thyroid cancer are high in Kuwait as well as GCC countries Gulf Center for Cancer Control and prevention, 2011 in comparison to other parts of the world IARC, 2011.

With control of breast cancer and colorectal cancer, hematopoietic malignancies in males and thyroid cancer in females will take the upper hand. This can be attributed to the young population structure as about half 49.4% of Kuwaiti people are under the age of 20 years (Health, Kuwait, 2009).

On the other hand, lung cancer was number one cancer killer in Kuwaiti males. The finding was consistent to that published in 2010 (Ferlay et al., 2010), which estimated that in 2008 1.38 million deaths (18.2%) of total cancer deaths-related to lung cancer, mostly occurring in developing countries (55%).

Female breast cancer was the most common causes of death in Kuwaiti females. It was also recognized as the first cause of death due to cancer in females in both developed and developing countries, (189,000 and 269,000 deaths/100,000 12. The range of mortality from breast cancer in the world ranged between 6-19 deaths/100,000 population. Those rates are of no statistical significance when compared to ours (6.4-9.6 deaths/100,000 population) (Table 2).

For new cases of all cancer sites (except C44.) around the world in 2008, the estimated age-standardized incidence rate was 181.6 new cases per 100,000 people. The age-standardized incidence rate for Kuwait was 117.2 new cases per 100,000 people. The highest age-standardized incidence rates estimated for Denmark, Ireland and Australia are 326.1, 317.0 and 314.0 new cases per 100,000 people respectively. The lowest estimated for Namibia, Syrian Arab Republic, and Gaza Strip & West Bank are 78.3, 72.2 and 54.9 respectively (IARC, 2011).

Kuwait incidence rate is lower than the estimated age-standardized incidence rate for the World, and Middle East and North Africa (MENA) (181.6 and 119.0 new cases per 100,000 people respectively). Compared to other Gulf countries, Bahrain had the highest estimated age-standardized incidence rate (129.6 new cases per 100,000 people) while Saudi Arabia had the lowest age-standardized incidence rate (87.6 new cases per 100,000 people) (IARC, 2011).

In 2005 Parkin et al. reported that breast cancer is the most prevalent cancer worldwide constituting (17.9%), the same was found in this study as breast cancer ranked

the first prevalent site of cancer in Kuwaitis however with higher rate 1433 (25.2%). Colorectal cancer ranked the second worldwide (11.5%) as well as in Kuwait 576 (10.1%). While, prostate cancer (9.6%) stood to be the third most prevalent cancer worldwide, it ranked the sixth among Kuwaitis 211 (3.7%).

In conclusion and recommendation, cancer is one of the health problems in Kuwait, the most common cancer sites are breast and colorectal. The first cancer killers in Kuwait are breast and lung cancer those three cancer sites are largely preventable (Parkin et al., 2011). Many of modifiable risk factors for non-communicable diseases in Kuwaitis were revealed by the large-scale survey study conducted by WHO and the GCC in conjunction with the Ministry of Health in Kuwait. It concluded that there is a high prevalence of obesity (BMI  $\geq$ 30) among Kuwaiti Males (36%) and females (48%). Sixty-five percent of Kuwaiti populations are not physically active. The prevalence of inadequate intake of fruits and vegetables (less than 5 servings/day) is (81%); prevalence of smoking is (42%) and (4%) for males and females respectively (Al-Nesf et al., 2008). Cancer is known to be a disease of old age, however the relation of cancer to age is the results of cumulative effects of risk factor on people. If exposure to mentioned risk factors will continue on the same level among Kuwaiti, it is expected that deaths due to cancer will surpass that of cardiovascular diseases. The need for prompt and effective interventional prevention programs that vigorously involve diet, anti-smoking and physical activity between both sexes are urgently needed.

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