

The incidence of lung cancer in the Gulf Cooperation Council countries

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BACKGROUND: Lung cancer is the most common cancer in the world, with an estimated number of 1.3 million new cases as of 2002. This is the first report from the countries that comprise the Gulf Cooperation Council (GCC).

PATIENTS AND METHODS: All the primary lung cancer cases registered in the Gulf Center for Cancer Registration during 1998 to 2001 were used to calculate the age-standardized incidence rate (ASR) per 100 000 person-years by the direct standardization method.

RESULTS: Overall, there were 1607 (1261 males, 346 females) primary lung cancer cases registered during this period with the male to female ratio of 3.6:1. The highest ASR was in Bahrain (34.3 for males, 12.1 for females) followed by Qatar (18.5 for males, 5.5 for females) and Kuwait (13.8 for males, 4.0 for females); the lowest rate was in Saudi Arabia (4.8 for males, 1.3 for females). The mean age at diagnosis for males ranged from 68.7 years in Bahrain to 59.2 years in Oman. For females it ranged from 68.2 years in Bahrain to 58.0 years in Oman. Squamous cell carcinoma in males (except in Qatar) and adenocarcinoma in females were the predominant histological type.

CONCLUSIONS: Cancer of the lung is one of the common cancers among males in all the GCC countries and ranks second among Bahraini females. Adenocarcinomas were more common in women than men.

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Lung cancer was the most common cancer in the world in 2002 with an estimated 1.3 million new cases. Almost half of these cases arise from developing countries where resources for treatment and prevention are scarce. Further, with 71% of the world total occurring in men, the disease is more common in men than women. The highest incidence rates in men are seen in Europe (especially eastern Europe) and North America. The rates in Australia/New Zealand, China, Japan and Southeast Asia are moderately high. In women, high incidence rates are observed in North America and northwest Europe (UK, Iceland, Denmark) with moderate incidence rates in Australia/New Zealand and China.¹ Adenocarcinomas are more common in women than in men, in both smokers and non-smokers. In nonsmoking patients with lung cancer, adenocarcinoma is the most frequently observed histological tumor type.²⁻³

This paper describes lung cancer incidence among nationals of the Gulf Cooperation Council (GCC) countries, based on four years data. There are no earlier studies, based on the population data, describing the incidence and patterns of lung cancer in the GCC countries.

Patients and methods

A National Cancer Registry (NCR) exist in each GCC country and they are networked through the Gulf Center for Cancer Registration (GCCR), which has been functioning since 1997 and accumulating incidence data since 1 January 1998. In the GCC countries there is mandatory cancer case reporting, but data is collected by active and passive methods. The data collected includes personal identity details, age, sex, date of diagnosis, histology, and topography. The International Classification of Diseases for Oncology second edition (ICDO-2, WHO, 1990) is used to classify the topography and morphology of the tumor. The lung cancer cases included in this study were defined as code numbers C33 and C34 of ICDO-2. All the primary lung cancer cases registered in the GCCR during 1998 to 2001 were included in this study. The age-standardized incidence rate (ASR) per 100 000 person-years was calculated by direct standardization, using the world standard population. To calculate the ASR, the gender specific population of GCC nationals was estimated with 5-year age spans. Information on prevalence of smoking in GCC countries were obtained from the Family Health Survey conducted in all the GCC countries.⁴⁻⁹ The fraction of lung cancer cases associated with tobacco smoking was calculated by assuming that, if no one smoked, the incidence of lung cancer would be the same as a population of non-smokers in the USA and the method used was that described by Parkin et al.¹⁰

Results

Overall, there were 1607 (1261 males, 346 females) primary lung cancer cases registered during this period among GCC nationals with a male to female ratio of 3.6:1. The male to female ratio ranged from 2.8 in the Emirates and Bahrain to 4.4 in Oman (Table 1). Lung cancer was the most common cancer among males in

Bahrain, Qatar and the Emirates; it ranked second, third and fourth in Kuwait, Oman and Saudi Arabia, respectively. In males, the highest ASR was in Bahrain followed by Qatar, Kuwait, Oman, the Emirates and Saudi Arabia. In females, the highest ASR was in Bahrain followed by Qatar, Kuwait, the Emirates, Oman and Saudi Arabia (Table 1). Among males, the mean age at diagnosis was higher in Bahrain (68.7 ± 11.8 years, mean \pm SD) than in the Emirates (63.4 ± 13.1 years), Saudi Arabia (63.4 ± 13.1 years), Kuwait (63.4 ± 12.4 years), Qatar (60.8 ± 15.7 years) and Oman (59.2 ± 13.5 years). Among females the mean age was higher in Bahrain (68.2 ± 12.7 years) than in the Emirates (64.5 ± 12.6 years), Qatar (63.9 ± 10.0 years), Saudi Arabia (63.1 ± 13.8 years), Kuwait (62.9 ± 15.7 years) and Oman (58.0 ± 12.1 years). In general, the incidence of lung cancer increases with age up to 69 years in males and up to 60 years in females (Figures 1a, 1b). The microscopic verification (histological or cytological method) of diagnosis ranged from 62% in the Emirates to 93% in Saudi Arabia. Within the four major histologically distinct types (squamous-cell carcinoma, adenocarcinoma, small-cell carcinoma, and large-cell carcinoma), the predominant types were squamous cell carcinoma in males (except in Qatar) and adenocarcinoma in females (Figures 2a, 2b). The above four types together accounted for 89.7%, 87.5%, 81.7%, 64.9%, 54.7% and 49.0% of total male lung cancers in Qatar, the Emirates, Saudi Arabia, Bahrain, Oman and Kuwait. Among females, these four types together ranged from 53.1% in Kuwait to 85.7% in Qatar. There were only 8 sarcoma cases in our data (one male each in Oman and Kuwait; three in each gender in Saudi Arabia).

Figure 3 shows the smoking prevalence (current smoker of any tobacco product) among males and females aged 15 years or older during the mid 1990s. The highest prevalence, among males, was observed in Kuwait (32.4%) followed by Bahrain (25.8%), Qatar

Table 1. Number, percentage, age-standardised incidence rate (ASR) and ranking of lung cancer in the GCC countries by gender (1998-2001).

Country	Male				Female				Sex Ratio
	No.	%	ASR	Rank	No.	%	ASR	Rank	
Emirates	48	8.8	7.2	1	17	2.9	2.9	10	2.8:1
Bahrain	151	20.0	34.3	1	53	6.8	12.1	2	2.8:1
Saudi Arabia	778	6.5	4.8	4	201	1.8	1.3	18	3.9:1
Oman	159	8.4	9.2	3	36	2.2	2.2	13	4.4:1
Qatar	29	9.9	18.5	1	7	2.3	5.5	11	4.1:1
Kuwait	96	10.8	13.8	2	32	2.8	4.0	9	3.0:1

(23.6%), the Emirates (20.9%), Saudi Arabia (20.3%) and Oman (15.5%). In females, the prevalence in Bahrain (8.8%) was at least 6-fold higher compared with other GCC countries (ranging from 0.5% in Qatar to 1.5% in Oman and Kuwait). The fraction of lung cancer cases associated with tobacco smoking in the GCC countries, among males, ranged from 5% in Saudi Arabia to 84% in Bahrain. In females, the fraction was 0 in three countries (the Emirates, Saudi Arabia and Oman), 2% in Kuwait, 26% in Qatar and 65% in Bahrain (Table 2).

Discussion

In comparing the ASR for lung cancer in the GCC countries with other countries listed in Cancer Incidence in Five Continents,¹¹ the incidence in Bahraini males was greater than the African and most of the Asian populations. The incidence in Bahraini females was greater than in females in African, Asian (except China) and most of the European countries. The most important risk factor for lung cancer is tobacco smoking and the supportive evidence for this association has been reviewed many times by different scientific groups and institutions.¹²⁻¹³ By 1985, it was estimated that lung cancer was the most common malignant disease, and about 85% to 90% of lung cancer cases were attributed to tobacco smoking.^{10,14} At the beginning of the 1990s some 86% of lung cancer cases in men and 49% in women were attributed to tobacco smoking.¹⁵ In women, the proportion of tobacco-related lung cancer is much more variable throughout the world, reflecting differences in the development of the tobacco smoking epidemic. The proportion of cancers in women that can be attributed to tobacco varies from about 80% in the UK to virtually nothing in Spain and Portugal.¹⁵ Since the risk associated with tobacco smoking in the GCC countries is not known, the fraction of lung cancer cases associated with tobacco smoking was calculated by assuming that, if no one smoked, the incidence of lung cancer would be the same as a population of non-smokers in the USA. For both genders, the estimates from Bahrain precisely reflect the world pattern and estimates from other GCC countries closely approximate the world pattern.

The prevalence of smoking in the GCC countries, obtained from surveys conducted in the mid-1990s (Emirates, Bahrain and Oman in 1995; Saudi Arabia and Kuwait in 1996; Qatar in 1998), are published elsewhere.⁴⁻⁹ Because this information was collected from the household head, it is likely to underestimate smoking prevalence, particularly among young adults and women, because of either a lack of knowledge or reluctance to answering questions truthfully. Despite these drawbacks, the results of these surveys were used in this study be-

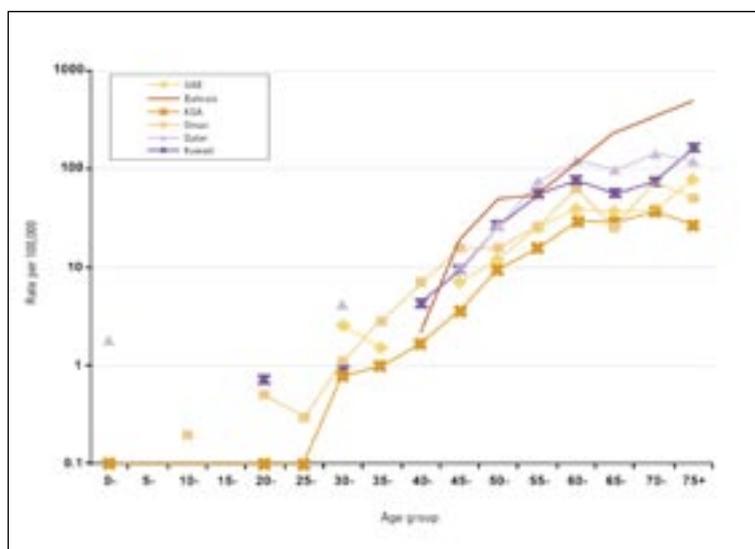


Figure 1a. Age specific incidence rate of lung cancer among male GCC nationals in the GCC countries, 1998-2001.

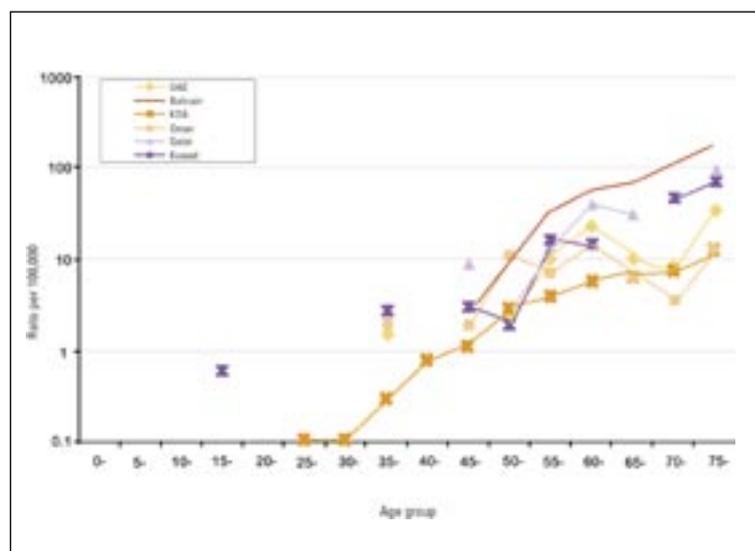


Figure 1b. Age specific incidence rate of lung cancer among female GCC nationals in the GCC countries, 1998-2001.

Table 2. Total (average per year, based on 1998-2001 cases) and percentage of lung cancer cases attributable to tobacco smoking in GCC countries.

Country	Males		Females	
	Total cases	% Tobacco attributable	Total cases	% Tobacco attributable
Emirates	12	28	4	0
Bahrain	38	84	13	65
Saudi Arabia	195	5	50	0
Oman	40	40	9	0
Qatar	7	69	2	26
Kuwait	24	61	8	2

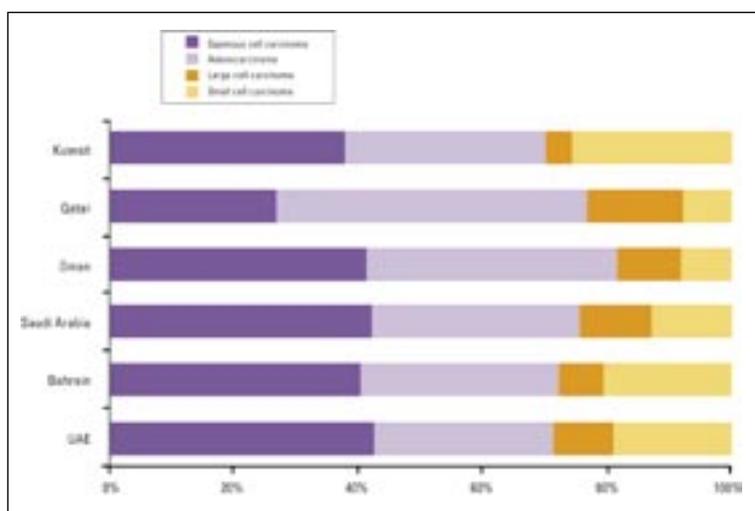


Figure 2a. Histological distribution among male lung cancer cases in the GCC countries: 1998-2001.

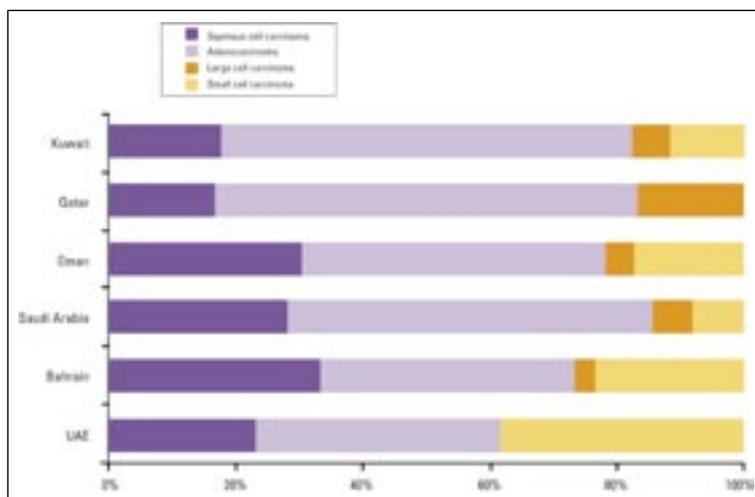


Figure 2b. Histological distribution among female lung cancer cases in the GCC countries: 1998-2001.

cause of the uniformity in the study design, sampling procedure, data collection and analysis. Though the incidence of cancer in our study cannot be directly attributed to the smoking prevalence from these surveys, the higher prevalence and longer history of smoking among Bahrainis (both men and women) than other GCC nationalities was reflected in the higher incidence of lung cancer and the higher proportion of lung cancer attributable to tobacco smoking compared with other GCC countries.

The relationship between passive exposure to smoke and lung cancer was first shown by Hirayama at the beginning of the 1980s,¹⁶ and soon after by two other groups.¹⁷⁻¹⁸ It is now estimated that environmental exposure to tobacco smoke increases risk by 15% to 25%,¹⁹⁻²¹ even after adjustment for other possible confounding factors.²²⁻²³ Environmental exposure can be the result of exhaled smoke from smokers and sidestream smoke from burning tobacco products (cigarettes, cigars, and pipes). Sidestream smoke has a higher concentration of carcinogenic compounds than mainstream smoke.²⁴ As such there is no information, to the knowledge of the authors, on the level of environmental exposure in the GCC countries. Other factors known to increase the risk of lung cancer are occupational exposure to asbestos, some metals (e.g., nickel, arsenic, cadmium), radon (particularly amongst miners) and ionizing radiation.¹⁵ Though the contribution of environmental factors other than tobacco smoke to total population rates of cancer is small¹⁵, the effect of these factors remains unstudied in GCC countries.

Carcinoma of the lung can be divided into four histologically distinct types: squamous-cell carcinoma, adenocarcinoma, small-cell carcinoma, and large-cell carcinoma.²⁵ The four types differ not only in terms of their clinical features, responses to treatment, and prognosis, but their distribution varies among smokers and non-smokers also.²⁶ Smoking increases the risk of all histological types of lung cancer, although the relative risk is greater for squamous-cell and small-cell carcinomas than for adenocarcinomas.²⁷⁻²⁹ Adenocarcinoma has always been more common in women than in men, in both smokers and non-smokers. In non-smoking patients with lung cancer, adenocarcinoma is the most frequently observed histological tumor type.²⁻³ However, the proportion of lung cancers that are adenocarcinomas is lower in Europe than in Asia or North America.³⁰ Our study also shows that adenocarcinomas in women are more common than in men and the proportion is higher than in European women.

There is no doubt that smoking cessation is the best way to reduce risk of lung cancer and many observa-

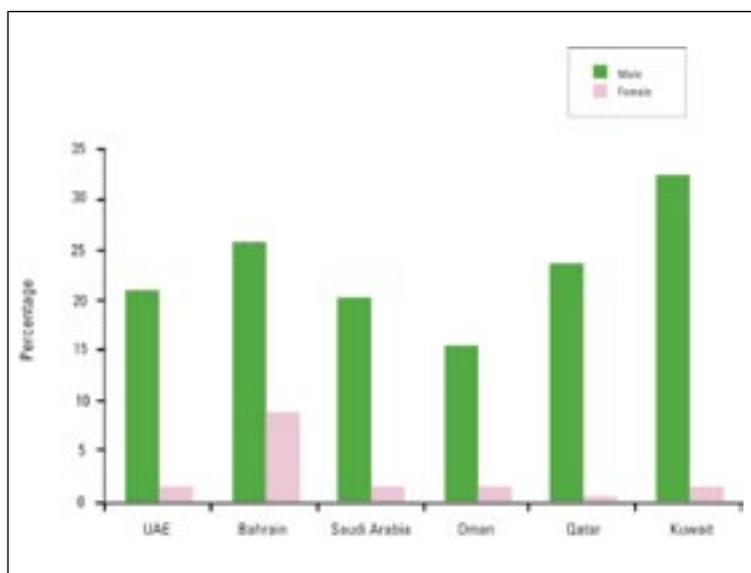


Figure 3. Prevalence of smoking by gender among GCC nationals in GCC countries.

tional studies (both cohort and case-control) have confirmed this fact. For men, the evidence shows that several populations have now passed the peak of the tobacco-related epidemic and incidence rates are now declining (for example, in the United States, Australia, Singapore and the countries of Northern and Western Europe).¹⁵ As 85% to 90% of lung cancers are attributable to tobacco use, the incidence of lung cancer in the GCC countries will rise in coming decades due to an increase in cigarette smoking unless extensive control

measures on tobacco are implemented. From a public health point of view, more benefit in terms of an immediate impact on number of deaths from lung cancer can be gained by persuading adult smokers to give up rather than focusing on smoking prevention in adolescents.³¹⁻³³ Antismoking programs should therefore be a public health priority in these countries and further work should be done to identify environmental causes in addition to finding the risk associated with tobacco smoking.

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