

Report

Cancer incidence in Oman, 1993–1997

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Introduction

Cancer is as a major public health problem worldwide. Between 1975 and 1990 there was a 37% increase in cancer cases with a growth rate of 2.1% per year [1]. In 1996, more than 10 million people were diagnosed with cancer and at least 6 million people with the disease died from it [2]. These cases were divided almost equally between industrialized and developing countries. The World Health Organization (WHO) estimates these figures will have doubled by the year 2020 with 20 million new cases and 12 million deaths from cancer alone [3]. At present, cancer accounts for one-tenth of all deaths in developing countries [2].

The successful control of most communicable diseases of childhood through the WHO Expanded Programme on Immunization, together with rapid strides in socio-economic development has led to the emergence of noncommunicable diseases as the dominant source of ill health in Oman. Current data indicate cancer as the second leading cause of death among hospitalized patients [4]. In comparison, deaths due to communicable diseases ranked fourth for the same period of time. Cancer incidence rates have not been de-

scribed in a comprehensive manner in Oman. We present here epidemiological data on cancer as recorded in this Arab Muslim country during the 5-year period, 1993–1997.

Methods

Oman is an independent oil-producing country located on the south-eastern tip of the Arabian peninsula. It has an approximate land area of over 200 000 km². Oman is bordered by the Republic of Yemen, Saudi Arabia and the United Arab Emirates. Its coastline stretches over 1700 km along the Gulf of Oman and the Arabian Sea. The population in 1997, based on the 1993 census, was estimated to be 2.24 million (1.64 million Omanis and 0.6 million expatriates). More than 51% of the population is under the age of 15 years and only 2.6% is over the age of 65 years. Health care is free for all Omanis and is provided through a nationwide network of 120 primary health care centres and 47 hospitals. The standards of health services in Oman have been brought up to those of industrialized nations and the services include treatments such as organ transplantation and open heart surgery.

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The Oman National Cancer Registry was established in 1985 as a hospital-based registry. It collected data from tertiary care hospitals only. In 1994, the Registry expanded to become a population-based registry covering the entire country. New cancer notification forms were developed and distributed to all regional, or secondary care, hospitals for notification.

Until recently Oman had only one central laboratory for histopathology and cytological diagnosis of cancer. This was based at the main tertiary care centre, the Royal Hospital in Muscat. The computer system in the pathology department is organized such that on reporting any cancer case an extra copy of the histopathology report is sent to the Cancer Registry. Following receipt of this diagnosis report, staff of the Cancer Registry abstract data from the patient's case notes during regular visits to the Royal Hospital. Cases diagnosed in tertiary hospitals with other subspecialties (otolaryngology, ophthalmology, orthopaedics and neurology) are visited twice monthly to collect patient data.

Monthly discharge and mortality logs for patients diagnosed with cancer are obtained from the Royal Hospital and cross-checked against registered cases. Similar logs are obtained from the oncology outpatient department for patients who are diagnosed and/or treated for cancer abroad and who only come for follow-up.

When cancer cases are diagnosed in a regional hospital, the attending physician in the relevant specialty completes the notification forms and sends them to the Cancer Registry. Similar passive reporting is done by other institutions not under the jurisdiction of the Ministry of Health, such as the Royal Oman Police Hospital, the Armed Forces Hospital and the University Hospital.

All cancer cases are coded using the second revision of the *International classification of diseases for oncology* (ICD-O-2) with topography "C" and morphology "M" codes [5]. Between 1985 and 1997, data were entered in *Dbase IV* program. In 1998, all the data were exported to *CanReg3* software [6] which is still used for data entry. Duplicate entry checking is done by name, age, diagnosis and place of residence. Data obtained from the pathology laboratory for all cancer cases are compared with that received from the clinical units of central and regional hospitals. Missing data are sought from the respective institutions.

The crude incidence rates for 1993 were calculated with *CanReg3* using the midyear population figures from the 1993 census. Thereafter, midyear population figures were calculated by extrapolating from the 1993 base year [4]. These estimations were supplied by the Ministry of Development and based on projections using cohort component techniques using the West UN life table model [7]. Incidence during the entire 1993–1997 period was calculated using the mid-period population, i.e. midyear 1995. Because of the skewed distribution of the Omani population, World Standard Population [8] was used to obtain age-adjusted rates. *Epi-Info* version 6 was used to obtain *P*-values for the trend test.

Results

Although the Cancer Registry collects data on all cancer cases occurring in Oman, the following analysis pertains to the Omani population only. Between January 1993 and December 1997, 4091 cases of cancer (2282 males and 1809 females) were reported to the Cancer Registry. The average crude annual incidence rate was 57.8 per

Table 1 Cancer frequency and incidence per 100 000 population, Oman, 1993–1997

Year	Males			Females			Total cases
	Cases	CR	ASR	Cases	CR	ASR	
1993	432	57.3	107.3	364	50.0	94.0	796
1994	406	52.9	94.5	352	47.3	85.5	760
1995	475	50.2	109.8	358	47.0	81.5	833
1996	457	56.2	109.6	350	44.7	84.6	807
1997	510	61.1	121.8	385	47.8	93.6	895
Total	2282	57.8	108.4	1809	47.6	87.0	4091

CR = crude incidence rate

ASR = age-adjusted incidence rate to the World Standard Population [8]

Table 2 Frequency of the 10 most common cancers among Omani males

Rank	Type of cancer	No. (n = 2282)	%
1	Stomach	254	11.1
2	Non-Hodgkin lymphoma	220	9.6
3	Prostate	174	7.6
4	Leukaemia	153	6.7
5	Lung and bronchus	147	6.4
6	Primary liver	111	4.9
7	Bladder	102	4.5
8	Brain and nervous system	77	3.4
9	Hodgkin disease	68	3.0
10	Colon	63	2.8

100 000 population for males and 47.6 per 100 000 population for females (Table 1). The corresponding age-adjusted rates were 108.4 and 87 per 100 000 population for males and females respectively. The male to female ratio during the study period ranged from 118–132:100.

During the 5-year study period the highest crude and age-adjusted incidence rates for males were in 1997 (61.1 and 121.8 per 100 000 respectively), whereas the highest incidence rates among females were in 1993 (50 and 94 per 100 000 respectively). There was no significant relationship between the proportion of cases among males or females and the time period 1993 to 1997 (P -value for trend = 0.13).

Stomach cancer was the leading cancer among males in Oman (11.1%), followed by non-Hodgkin lymphoma (9.6%), prostate cancer (7.6%), leukaemia (6.7%), lung and bronchus cancer (6.4%), primary liver cancer (4.9%), bladder cancer (4.5%), brain and nervous system cancers (3.4%), Hodgkin disease (3%) and carcinoma of the colon (2.8%) (Table 2).

Among females, breast cancer was the most common malignancy (13.7%) (Table 3). This was followed by cervical cancer (8.8%), non-Hodgkin lymphoma (7.6%), stomach cancer (6.9%), thyroid cancer (6.4%), leukaemia (5.4%), ovarian cancer (3.8%), bronchus and lung cancer (2.9%), primary liver cancer (2.5%) and connective tissue cancers (2.2%).

Table 3 Frequency of the 10 most common cancers among Omani females

Rank	Type of cancer	No. (n = 1809)	%
1	Breast	248	13.7
2	Cervical and uterine	159	8.8
3	Non-Hodgkin lymphoma	138	7.6
4	Stomach	125	6.9
5	Thyroid	116	6.4
6	Leukaemia	98	5.4
7	Ovarian	68	3.8
8	Bronchus and lung	52	2.9
9	Primary liver	46	2.5
10	Connective tissue	40	2.2

Discussion

Cancer is usually considered to be a disease of the industrialized world, whereas infectious diseases are the main disease burden of the developing world. The increases in life expectancy in most developing countries, even in the least developed ones [2], together with drastic changes in lifestyle are expected to lead to an epidemic of cancer in developing countries by the first quarter of the next century. With the current trends it is estimated that 70% of the new cases of cancer will be diagnosed in people living in developing countries by the year 2020 [9].

The morbidity and mortality transition from communicable diseases of childhood to noncommunicable disease is apparent in Oman. Since the 1970s, the country has witnessed rapid socioeconomic developments. With the successful control of most communicable diseases of childhood, cardiovascular diseases, cancer, and injuries

and poisoning have become the leading causes of hospital mortality and morbidity over the past decade.

We found that on average there are 818 new cases of cancer in Oman each year and a crude annual incidence rate of 57.8 per 100 000 males and 47.6 per 100 000 females. The age-adjusted incidence rate for males in Oman (108.4 per 100 000) is similar to the rate reported among Kuwaitis (106.7 per 100 000) [10]. The age-adjusted incidence rate among Omani females (87 per 100 000), however, is substantially lower than rates among Kuwaiti females (127.3 per 100 000). Both are substantially lower than in the United States of America (162.7 and 110.4 among males and females respectively) and in the United Kingdom (173.7 and 121.3 respectively) [11].

These differences can be attributed to several factors. Changes in lifestyle have become apparent only in the past 2-3 decades. This may be too short an interval to manifest increases in cancer incidence. Risk factors, such as smoking and alcohol consumption, are still relatively less prevalent for cultural and religious reasons [12]. Several surveys have documented a relatively low smoking prevalence, ranging from 15.5% to 23.5% among males and 1.2% to 2.0% among females [13]. Fat intake is also low compared to Western societies and the diet of traditional Omani societies consists of a high intake of fruits, vegetables and fish rather than meat [14]. The recent demographic trends in Oman, characterized by relatively low infant and under-5 mortality (25 and 31 per 1000 live births in 1997 respectively), high total fertility rate (7.2% in 1997) and life expectancy at birth comparable to that in the industrialized world (71 years for both sexes in 1997), indicate that a sizeable ageing population can be expected [2]. In addition, cultural disturbances associated with mod-

ernization [15], rich diet [16], physical inactivity and increasing trends of smoking may all lead to an increased burden of cancer in Oman early next century.

Stomach cancer is the second most frequent cancer in the world [2]. The highest incidence of stomach cancer occurs in Japan (age standardized rate 77.9 per 100 000 for men) [1]. In Oman, stomach cancer is the most common cancer with 379 new cases (9.3% of total) during the 5-year study period and is the dominant cancer among Omani males (11.1% of the total male cases). An earlier report also found stomach cancer to be the most common cancer among Omani males, constituting 15.5% of all malignancies among men [12]. In contrast, stomach cancer ranks as the 10th most common cancer among males in Middle Eastern countries, such as Egypt and the Gaza Strip [17].

Green et al. estimated crude and age-adjusted incidence rates of gastric carcinoma in Oman to be 4.2 and 8.6 per 100 000 population respectively based on hospital data [18]. Our pooled data found the corresponding rates to be similar (crude and age-adjusted rates 4.9 and 10.6 per 100 000 population respectively). Furthermore the incidence among males was twice that of females (13.8 versus 7.1 per 100 000 respectively). The rates among Omani males are similar to those reported in Setif, Algeria (14.4) but are higher than rates reported among Kuwaitis and Jews born in Israel (4.1 and 8.9 respectively) [10]. The age-adjusted incidence rate of stomach cancer among females is also higher in Oman (7.1) than in women born in Israel (6.0), Kuwait (4.1) and Setif, Algeria (3.5) [10].

Etiological factors for this relatively high incidence of stomach cancer in Oman are unclear. Chopra et al. found a lower incidence of gastric carcinoma among Arab immigrants to Zanzibar and attributed this

to their adoption of the dietary habits of Zanzibar [19]. No specific dietary or environmental factors have yet been studied in relation to the higher incidence of stomach cancer in Oman. The International Agency for Research on Cancer (IARC) has acknowledged *Helicobacter pylori* as a major causal factor in the etiology of stomach cancer worldwide [20]. It is estimated that 47% of gastric cancers occurring in developing countries and 35% in industrialized countries are attributable to this bacterium [1]. At present, there are no data regarding the prevalence of *H. pylori* infection in the Omani population. In view of the relatively high incidence of stomach cancer, it may be worthwhile to investigate its prevalence in Oman.

Non-Hodgkin lymphomas (NHL) are the second most frequent malignancy among males and third most common among females in Oman. During the 5-year study period, 358 cases of NHL were reported to the Cancer Registry. This constituted 8.7% of all malignancies and 77.5% of all lymphomas. The age-adjusted incidence rate of NHL was 8.7 for 100 000 males and 5.7 per 100 000 females. This incidence is higher than reported in other Arab countries for males (5.5 in Kuwaitis and 6.3 in Algerians in Setif) and lower than the incidence among Jews born in Israel (13.5) [10]. NHL is a common malignancy in the Middle East. The pattern of NHL in Oman is similar to other Middle Eastern countries with a predominance of lymphomas with aggressive histology [21].

Breast cancer is the most common cancer in women with 900 000 new cases occurring annually worldwide [2]. Our data indicate that it is also the dominant cancer among Omani women with approximately 50 new cases occurring per year. The age-adjusted annual incidence rate is 13 per 100 000 women. Breast cancer is also the

most common cancer among Egyptian, Palestinian and Kuwaiti women, and Jewish women born in Israel [10,17]. The incidence rates in the latter two populations are much higher than that of Oman (32.8 per 100 000 in Kuwait and 90.5 per 100 000 in Jewish women). In contrast, breast cancer ranks third among women in Setif, Algeria; with lower incidence rates (9.5 per 100 000 women) than in Oman. Factors such as early age at first childbirth, multiparity, prolonged period of lactation and infrequent use of oral contraceptive pill may have contributed to the observed lower incidence of breast cancer in the Omani female population.

Some limitations of our analysis are worth noting. Since the total number of cases occurring in Oman is relatively small (fewer than 1000 cases per annum), the ranking of various malignancies among each gender must be interpreted with caution as they may vary considerably from one year to another. It is also possible that the reported data of our study are incomplete, especially that which comes from border areas of the neighbouring country of United Arab Emirates (UAE). Patients from these areas are much closer to treatment facilities in the UAE than to institutions in the capital Muscat. Another limitation is that the reporting includes only cases that present for medical care. Although free

health care is provided to all in Oman, the mountainous and desert terrain in several parts of the country may prevent some patients with cancer from approaching the health care providers. Despite these limitations, our estimates do provide a good indication of current patterns of cancer in Oman. Such estimates may serve as a baseline for investigating future trends of cancer incidence and for planning cancer control activities in the next millennium.

Conclusion

This is the first comprehensive report on cancer incidence in Oman since the Cancer Registry was expanded to cover the entire country. The study is based on data from over 4000 cases seen during a 5-year period. At present, the actual burden of cancer in Oman remains small with less than 1000 cases per year. However, as the country undergoes demographic and socioeconomic changes, the actual burden of cancer may increase in the next century. The pattern of cancer among males in Oman is different from those of other countries of the region, with stomach cancer being the dominant malignancy throughout the study period. In contrast, the pattern among females is consistent with the regional and global picture, with breast cancer being the most common cancer.

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