

CANCER IN AL-QASSIM, SAUDI ARABIA: A RETROSPECTIVE STUDY (1987-1995)

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Regional differences in the pattern of cancer are obvious in Saudi Arabia. From January 1987 to December 1995, 1106 new cases of cancer (642 males, 464 females) were seen at the King Fahd Specialist Hospital in Buraidah, Al-Qassim. Overall, lymphomas, non-Hodgkin's and Hodgkin's disease combined were the most common malignancy seen (15.10%), followed by esophageal carcinoma (7.77%). Thyroid cancer was the most common malignancy among females (12.50%), followed by breast cancer (9.48%). The majority of the patients were in the younger age group (77% were <50 years of age). Among the hematological malignancies, acute lymphoblastic leukemia was the most frequent type (36.23%). Lymphomas were the most common malignancy (66.12%) seen in the pediatric age group (0-14 years), followed by leukemias and brain tumors. The pattern of cancer in Al-Qassim is generally similar to other regions of Saudi Arabia, with few regional variations. Prominent among such variations is the high frequency of non-Hodgkin's lymphomas (NHL), esophageal and thyroid carcinomas. *Ann Saudi Med 1997;17(6):595-600.*

The study of the geographical distribution of malignant tumors has greatly influenced our understanding of the cause of cancer. In Saudi Arabia, which is the largest country in the Middle East, regional variations in the prevalence of different cancers have been documented from data taken from the tertiary care centers.¹ Pending the availability of results from the national cancer registry, information regarding the relative frequency of different tumors can be obtained from sources such as pathology and admissions departments of hospitals in different regions.²

The purpose of this study was to evaluate the pattern of cancer in the Al-Qassim region by analyzing data from the departments of Oncology and Pathology at King Fahd Specialist Hospital (KFSH) in Buraidah. Al-Qassim region has a total population of approximately 578,000.³ It is situated in the central region of Saudi Arabia, and the majority of the population are involved in either agriculture or trading. KFSH, a 570-bed hospital, is the regional referral center for cancer patients, where the majority of cancer patients are seen.

Patients and Methods

All histologically confirmed cases of malignant disease

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seen at KFSH from January 1987 to December 1995 were included in the study. All cases were indexed by medical record number, name, age, sex, nationality, site of tumor and histopathology. The tumor sites and morphology were coded according to the International Classification of Diseases. We studied the frequency by age and sex of different malignant tumors seen among these patients. The observed figures were compared to available data from other regions of Saudi Arabia and the Middle East.

Results

During the nine-year period (1987-1995), 1106 cases of cancer were seen at KFSH. There were 642 males and 464 females, a male to female ratio of 1.38:1. Of these, 966 were Saudis and 140 were non-Saudis. As shown in Table 1, the most common malignancy in the whole group of patients was lymphoma (167/1106 or 15.10%). This included both non-Hodgkin's lymphoma (NHL) and Hodgkin's disease (HD). Carcinoma of the esophagus ranked second (86/1106 or 7.77%), the majority of these (73/86 or 84.88%) being squamous cell, 11 adenocarcinomas and two of the anaplastic type. The median age at presentation was higher in males (61.5 years) than in females (59 years). Similarly, the median age of gastric carcinoma was higher in males (64 years) than in females (58 years). The histological types of thyroid carcinoma consisted of papillary 69 (69/77, or 89.61%), follicular 5 (6.5%), anaplastic type (2), and one lymphoma. The median age at presentation in females was 39 years.

Acute lymphoblastic leukemia was the most frequent hematological malignancy (25/69, or 36.23%) followed by acute myelogenous leukemia (AML) (31.9%), chronic myelogenous leukemia (CML) (8.69%), chronic lymphocytic leukemia (CLL) (8.69%), acute leukemia of unclassified type (8.69%), and multiple myeloma (5.8%).

Basal cell carcinoma (46/67, or 68.65%) was the most common type of skin cancer, followed by squamous cell (22.38%), malignant melanoma (2.98%), lymphoma (2.98%), and Kaposi's sarcoma (2.98%). The median ages at presentation were 59 and 61 years for females and males, respectively. Among bladder tumors, transitional cell carcinoma predominated (25/39 or 64%), followed by squamous cell carcinoma (28%), adenocarcinoma (5%) and anaplastic (2.5%). Adenocarcinoma was the most frequent type of bronchial tumor diagnosed (13/36, or 36%), followed by squamous cell (27.7%), anaplastic (13.8%) and others (22.2%).

Common tumors among the pediatric age group (0-14 years) included lymphomas (41/62, or 66.12%), HD (34%), NHL (32%), leukemias (19.35%) and tumors of the brain (6.45%).

The age-related distribution of all cancer sites in males and females is shown in Tables 2 and 3, respectively. Tables 4 and 5 show the rank order of the 10 most common malignancies seen in Saudi males and females of the Al-Qassim region, respectively, as compared to data from other regions of the Kingdom.

Discussion

A male preponderance of 1.38:1, and the increased prevalence of cancer in old age, with more than 65% of patients belonging to the over-40-year age group, are an expected phenomenon. HD and NHL together are the most common malignancies seen in the Middle East and in Saudi Arabia.^{7,10,11} NHL is the most common tumor seen among Saudi males in the Al-Qassim region, with an overall relative frequency of 11.35%. This is higher than many other regions of the Kingdom (Tables 4 and 5).⁴⁻⁹ No doubt, data from many of these series included non-Saudi patients as well. In Gizan, lymphoma and leukemia combined ranked second among males and third among females.⁵ However, the breakdown of the exact types of hematological malignancy is not available from that data. NHL also ranked first among males in a study from Riyadh (12.72%), with an overall relative frequency of 9.35%.⁷ Data from Medina also indicate that lymphoma rank first among males and third in females, but again the figures combine HD and NHL.⁶ The peculiarities of the pattern of lymphoma in this region have been reported elsewhere.¹⁰ NHL was more common than HD, which corroborates other studies from Saudi Arabia and the Middle East.¹⁰⁻¹³

TABLE 1. Rank order of ten common malignant tumors among 1106 patients seen at KFSH in Al-Qassim region, both sexes combined (January 1987-December 1995).

Site or type	Number	Percentage
HD/NHL	167	15.10
Esophagus	86	7.77
Thyroid	76	6.87
Stomach	71	6.42
Blood/bone marrow	69	6.23
Skin (SCC, BCC, melanoma)	63	5.69
Liver	64	5.78
Breast	55	4.97
Lip, oral cavity	43	3.88
Colorectal	43	3.88

HD=Hodgkin's disease; NHL=non-Hodgkin's lymphoma; SCC=squamous cell carcinoma; BCC=basal cell carcinoma.

Thyroid cancer was the most common malignancy observed in Saudi females of this region (12.65%), with a male to female ratio of 1:4. The median age at diagnosis of 39 years in females and the peak incidence in the 21-30-year age group is similar to the data from Riyadh.^{12,14} Papillary carcinoma (PC) was more frequent than the follicular type. The marked predominance of PC that we saw has been noted in many other series.^{12,14-16} Iodine deficiency is believed to play a role in causing follicular carcinoma of thyroid in countries where goiter is endemic. Iodine replacement may have decreased the incidence of follicular carcinomas, but at the same time it may be a factor in papillary carcinogenesis.¹⁵ This may explain the high incidence of PC recently reported, especially in females.^{14,15} The high relative frequency of thyroid carcinoma in the Al-Qassim region is in contrast to other parts of the Kingdom.^{5,6,8,9} Other little understood contributing factors responsible for the high relative frequency of thyroid carcinoma in this region need to be explained.

Carcinoma of the esophagus ranked 3rd and 4th among Saudi males and females, respectively. The male to female ratio of 1.28:1 is similar to the data from Riyadh, but lower than that of the USA.^{12,17} The high incidence of esophageal carcinoma in males in the West is probably due to the effect of substances like alcohol and tobacco.¹⁸ Perhaps by virtue of strict adherence to Islamic principles, these factors play little role in the causation of esophageal carcinoma in this population. However, other factors, including food preparation and storage, and differences in soil composition, are accepted etiologic factors which may be of significance in this area.¹⁹ Recently, human papilloma virus infection of the esophageal epithelium has

TABLE 2. Age-related distribution of malignant tumors in males at KFSH in Al-Qassim region (January 1987-December 1995).

Site or type	0-14	15-20	21-30	31-40	41-50	51-60	61-70	71-80	>80	Unk	Total	%	NS
HD/NHL	22	7	12	12	13	17	19	6	4	0	112	17.45	12
Liver	0	0	2	3	6	15	16	8	2	3	55	8.57	4
Esophagus	0	0	0	3	7	13	16	7	4	0	50	7.79	5
Stomach	0	0	0	2	3	13	11	14	4	0	47	7.32	3
Skin (SCC, BCC, melanoma)	0	0	1	2	7	8	17	6	4	1	46	7.16	5
Leukemia/myeloma	5	3	6	9	6	5	3	1	1	0	39	6.07	10
Prostate	0	0	0	0	1	8	10	8	8	0	35	5.45	4
Bladder	0	0	0	2	8	7	6	4	5	0	32	4.98	4
Lip, oral cavity, pharynx	0	0	3	6	6	4	5	2	1	0	27	4.21	3
Unknown primary	0	0	3	3	2	7	6	2	1	0	24	3.74	7
Bronchus, lung	0	0	0	3	3	9	5	2	0	0	22	3.43	4
Thyroid	0	2	1	8	1	1	3	0	1	1	18	2.80	5
Colon	0	0	0	2	5	5	2	1	1	0	16	2.49	4
Brain	3	1	1	3	0	2	2	2	0	0	14	2.18	1
Testis	0	2	6	3	1	0	0	1	0	0	13	2.02	3
Rectosigmoid, rectum	0	0	0	1	1	5	3	1	0	0	11	1.71	3
Soft tissue sarcoma	0	0	3	3	3	0	1	0	0	0	10	1.56	3
Kidney	0	0	1	2	1	4	1	1	0	0	10	1.56	2
Nasal cavity	0	0	0	1	0	4	2	1	0	1	9	1.40	0
Pancreas	0	0	0	0	2	1	3	3	0	0	9	1.40	1
Gall bladder, biliary tract	0	0	0	2	1	3	2	1	0	0	9	1.40	2
Larynx	0	0	0	1	0	3	3	1	0	0	8	1.25	0
Bones, joints	3	0	2	0	0	0	1	0	0	0	6	0.93	1
Other urinary	0	0	0	0	0	2	1	1	0	0	4	0.62	0
Others	0	1	1	1	3	4	4	1	1	0	16	2.49	1
All sites	33	16	42	72	80	140	142	74	37	6	642	100	87

Unk=unknown age; NS=non-Saudi; BCC=basal cell carcinoma; SCC=squamous cell carcinoma; HD=Hodgkin's disease; NHL=non-Hodgkin's lymphoma.

been suggested to be an important etiologic factor.²⁰ Gastric carcinoma closely followed esophageal cancer in rank order in both sexes, being more frequent in males, at a ratio of 1.8:1. Contamination of drinking water has been considered an important etiologic factor for the causation of upper gastrointestinal tract cancers in Al-Qassim region.²¹ However, this has yet to be confirmed.

Breast cancer, the most common cancer among females in the Riyadh and Medina regions, ranked second among the Saudi females in our series.^{4,6,12,22} The majority of patients we saw were below 50 years of age (42/55 or 76.36%). This age distribution is unlike the data from the West, but in conformity with other series from Saudi Arabia and the Middle East.^{7,12,13,22} This might be an indication of the younger constitution of the Saudi

population, where 93.38% are below the age of 50 years.³

Hepatocellular carcinoma (HCC) occurs more frequently in men than in women.²³ The high male to female ratio of 5.6:1 noted in our study has already been reported from other regions of the Kingdom.^{1,5-8} The risk factors for HCC include viral infection, hemochromatosis, alcoholic liver disease and metabolic disorders. HCC has been reported subsequent to exposure to substances like aflatoxin, nitrosamines and thorotrast.²³ However, the most important risk factor for HCC is infection by hepatitis B (HBV) and hepatitis C (HCV) viruses. While the integration of HBV virus DNA in the cellular genome of tumors has been documented in many studies, it is only recently that HCV infection, with its cirrhosis, has been recognized as an important risk factor for HCC.^{24,25} Data

TABLE 3. *KFSH-age related distribution of malignant tumors in females in Al-Qassim region.*

Site	0-14	15-20	21-30	31-40	41-50	51-60	61-70	71-80	>80	Unk	Total	%	NS
Thyroid	0	6	14	8	9	10	4	3	0	4	58	12.5	6
Breast	0	0	6	24	12	6	3	4	1	0	55	11.85	16
HD/NHL	19	6	6	4	1	9	5	4	1	0	55	11.85	4
Esophagus	0	0	1	0	7	11	12	4	1	0	36	7.76	1
Leukemia/myeloma	7	5	1	6	3	2	2	1	1	2	30	6.47	2
Stomach	0	0	0	0	6	8	8	1	1	0	24	5.17	0
Unknown primary	0	1	2	1	4	4	4	5	0	1	22	4.74	3
Skin (SCC, BCC, melanoma)	0	0	1	1	2	3	5	2	2	1	17	3.66	0
Colorectal	0	0	1	3	3	5	3	2	0	0	17	3.66	1
Ovary	0	1	3	4	3	4	2	0	0	0	17	3.66	2
Lip, oral cavity, pharynx	0	0	4	3	4	2	0	1	1	1	16	3.45	2
Bronchus, lung	0	0	1	1	4	2	4	2	0	0	14	3.02	0
Gall bladder, biliary tract	0	0	0	1	3	3	1	3	1	0	12	2.59	0
Cervix	0	0	1	3	5	1	1	1	0	0	12	2.59	4
Brain	1	3	1	2	3	1	0	0	0	0	11	2.37	2
Liver	0	0	0	0	1	2	3	3	0	0	9	1.94	0
Soft tissue sarcoma	1	1	2	3	1	1	0	0	0	0	9	1.94	0
Kidney	1	1	1	2	1	1	1	1	0	0	9	1.94	0
Uterus	0	0	0	0	4	2	0	0	1	0	7	1.51	1
Bladder	0	1	0	0	0	1	3	0	1	1	7	1.51	0
Other genital	0	0	1	1	1	1	0	0	0	0	4	0.86	2
Other urinary	0	0	2	1	0	0	1	0	0	0	4	0.86	2
Pancreas	0	0	0	1	1	1	0	0	0	0	3	0.65	0
Others	0	2	0	1	1	5	5	1	1	0	16	3.45	5
All sites	29	27	48	70	79	84	67	38	12	10	464	100	53

Unk=unknown age; NS=non-Saudi; BCC=basal cell carcinoma; SCC=squamous cell carcinoma; HD=Hodgking's disease; NHL=non-Hodgkin's lymphoma.

on the prevalence of HBV and HCV in the Al-Qassim region is not yet available.

Skin cancer, reported to be the highest in rank order in the southern regions of the Kingdom, ranked 5th for males and 7th for females, with a male to female ratio of 2.4:1 in our series.^{5,8,9} Both the relative frequency and the male to female ratio are similar to the data from the Medina region.⁶ The rarity of melanoma in the Kingdom has been reported in other studies as well.^{4,5,22} The two malignant melanomas we saw were of the acral type. The importance of exposure to sunlight as an etiologic factor for melanoma is well established.²⁶ Although the Kingdom has abundant sunshine, the low incidence of malignant melanoma may be due to multiple reasons, including racial factors, strict observance of *hejab* (a mode of dressing whereby all parts of the body are covered) by females, as well as the cultural

habits of the population related to the method of dressing.

It is interesting to note that tumors of the lip, oral cavity and pharynx were less frequent than in the Gizan region.⁵ Smoking is considered a social taboo in this region. This may account for the low frequency of these tumors, as well as those of the lung. The latter are more frequently seen in the eastern and northern regions.²² The male to female ratio of 1.28:1 of carcinoma of the lung among Saudi patients in Al-Qassim is one of the lowest. This is contrary to the male preponderance reported from other regions of the Kingdom and the Middle East, where one of the highest male to female ratios has been noted.^{4,5,7,13}

Colorectal carcinoma had a male to female ratio of 1.58:1. The overall low frequency of colorectal carcinoma, as compared to Western countries, may be due to the

TABLE 4. *Relative frequency of ten common malignancies seen among 555 Saudi males in Al-Qassim region compared to other regions.*

Site (#)	Al-Qassim*	Riyadh ⁴	Gizan ⁵	Madina ^{6**}	Riyadh ^{7**}	Abha ^{8**}	Al Baha ^{9**}
NHL (64)	11.53	8.5	NA	NA	12.72	9.6	10.4
Liver (51)	9.17	14.48	18.72	9.4	5.5	11	6.5
Esophagus (45)	8.09	2.98	1.83	6.6	5.72	3	2.7
Stomach (44)	7.91	7.35	3.28	7.5	4.54	8	11.3
Skin (41)	7.38	2.75	12.51	8.8	3.97	14.6	15.2
Hodgkin's disease (36)	6.47	3.9	NA	NA	4.96	NA	NA
Prostate (31)	5.57	6.2	4.2	3.2	1.87	2.3	4.2
Bladder (28)	5.03	4.82	8.58	5.1	3.52	9.4	7.5
Lip, oral cavity (24)	4.31	NA	13.24	1.8	5.45	NA	4.5
Colorectal (20)	3.59	3.9 [†]	2.46	6.7	3.26	4.7	4.8

#=The number of Saudi patients with malignancy at that site in the present series; *present series; **includes non-Saudis of that region; [†]rectum only.

TABLE 5. *Relative frequency of ten common malignancies seen among 411 Saudi females in Al-Qassim region compared to other regions.*

Site (#)	Al-Qassim*	Riyadh ⁴	Gizan ⁵	Madina ^{6**}	Riyadh ^{7**}	Abha ^{8**}	Al Baha ^{9**}
Thyroid (52)	12.65	10.44	2.24	4.6	5.72	6.3	5.7
Breast (39)	9.48	13.29	9.09	20.1	16.76	9.2	9.8
NHL (30)	7.29	8.22	NA	NA	7.96	8.4	6.1
Esophagus (35)	8.51	4.74	2.83	6.3	4.64	3.7	1.2
Stomach (24)	5.84	5.37	2.36	4.2	2.62	4.8	11.4
Hodgkin's disease (21)	5.11	2.53	NA	NA	2.36	NA	NA
Skin (17)	4.14	NA	11.6	4.4	2.87	12.5	14.2
Colorectal (20)	3.89	NA	2.95	5.9	2.74	4.8	5.3
Ovary (15)	3.64	3.799	2.95	3	4.33	NA	4.9
Lip, oral, cavity (14)	3.41	NA	19.95	1.9	5.91	4	3.2

#=The number of Saudi patients with malignancy at that site in the present series; *present series; **includes non-Saudis of that region.

dietary habits of the local population, as has been reported from other regions.^{12,22}

Prostatic carcinoma had a relative frequency of 5.57%, which is similar to the data from Riyadh and Al Baha.^{4,9} The overall median age at presentation of prostatic carcinoma (69.5 years) is similar to other studies.^{12,27} Prostatic carcinoma constituted 97% of all male genital cancers seen in men older than 60 years. Interestingly, not a single case of penile carcinoma was recorded by us. Carcinoma of the bladder was less common than in the southern regions of the Kingdom.^{5,8,9} Compared to Gizan, where squamous cell carcinoma occurs with equal frequency as transitional cell carcinoma, the latter predominated in our series.⁵ Unlike Gizan, Al-Qassim is not an endemic area for schistosomiasis.

Carcinoma of the ovary was more frequent than cervical cancer among Saudi females, having relative frequencies of 3.4% and 1.94% respectively. The lower relative frequency of cervical carcinoma has been reported from some regions of the Kingdom,^{4,5,9} whereas studies

from other regions have reported a higher relative frequency of cervical cancer.⁶⁻⁸ Unfortunately, some of the larger studies have not provided us with detailed data regarding female genital tract cancer.^{12,22}

Adherence to Islamic moral codes and circumcision of males may be the main reasons for the low incidence of cervical neoplasia in this country. However, remarriages, multiparity and early age of marriage are all risk factors, including laxity in observing Islamic moral codes. All these factors may be responsible for the regional variations in the relative frequency of cervical cancer. A recent study from Jeddah region has reported the high prevalence of this disease, based on cytological studies.²⁸

Among childhood tumors, lymphomas were more common than leukemias (62.12% vs. 19.35 %). This is in contrast to the data from the USA, where leukemias predominate, comprising approximately 31% of all malignant tumors of childhood, followed by the central nervous system neoplasia (17.6%).²⁹

The pattern of cancer in the Al-Qassim region is

different from the published data from other regions of the Kingdom. The predominance of lymphomas, thyroid, breast and esophageal cancers is obvious. On the other hand, lung and colorectal carcinomas are less frequent. It will be interesting to compare this data with the results of the national cancer registry.

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