

# Primary gastrointestinal cancers in the Western Region of Saudi Arabia

## *Is the pattern changing?*

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### ABSTRACT

**Objectives:** To determine the age, sex and relative frequencies of various gastrointestinal malignancies in patients registered with the National Cancer Registry from the Western Region of Saudi Arabia from January 1994 till December 1997, and compare this data with previous hospital based studies about the pattern of these malignancies in Saudi Arabia.

**Methods:** A National Cancer Registry was established in Saudi Arabia in 1992, and since 1st January 1994 all cancer cases in Saudi Arabia have been registered with the National Cancer Registry. All National Cancer Registry data on patients with primary gastrointestinal cancers from the Western Region of Saudi Arabia from January 1994 till December 1997 was retrieved and analyzed according to ethnic origin, site, age, sex and relative frequencies of various tumors.

**Results:** Out of a total of 1833 cases with primary gastrointestinal malignancies 1207 (66%) were Saudis, while the rest were Non-Saudis. Colorectal cancer was the most common malignancy found in both population

groups accounting for 28.5% of cases in Saudis and 36% in Non-Saudis. Malignancies of liver, stomach and esophagus followed in decreasing frequencies. The mean age of the Saudi population was 58±16 years (standard deviation) with male to female ratio of 1.67:1. About 80% of the patients were above 40 years of age and the peak of onset for most of the tumors was between 50 and 70 years of age.

**Conclusions:** This study highlights that colorectal cancer is the most common gastrointestinal malignancy seen in the Western Region of Saudi Arabia followed by hepatocellular carcinoma. This is in sharp contrast to the previous hospital based studies from Saudi Arabia and national trends as seen in the cancer incidence report from the National Cancer Registry of Saudi Arabia. The factors for this changing pattern of gastrointestinal malignancy remain to be determined.

**Keywords:** Gastrointestinal malignancies, colorectal carcinoma, hepatocellular carcinoma.

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The gastrointestinal (GI) tract along with its accessory glands is one of the most common systems of the human body affected by various cancers. The pattern of primary GI cancer differs in

different regions of the world depending upon the genetic, cultural, dietary and socioeconomic factors.<sup>1</sup> Therefore, studying the pattern of GI cancer in a certain region of the world will help health planners

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to find the population groups which are at a high risk of developing cancer and recommend preventive measures or advise appropriate screening in high risk populations. The earlier studies on the pattern of various malignancies in Saudi Arabia were based on the hospital medical records of various tertiary care hospitals. This had the drawbacks of having strong referral bias depending upon various factors. Consequently, the data may not have been entirely reliable. A National Cancer Registry (NCR) was established in Saudi Arabia in 1992 under the Ministry of Health (MOH). Since 1st January 1994, all cancer cases in the whole of the Kingdom of Saudi Arabia have been registered by law with the NCR. The aim of the present study is to collect the data of all patients with various GI malignancies registered with the NCR from January 1994 till December 1997 in the Western Region of Saudi Arabia and determine the relative frequency, age, sex and ethnic distribution of these malignancies. We also aim to compare the present data with previous hospital based studies on the pattern of these malignancies in Saudi Arabia.

**Methods.** In Saudi Arabia the NCR was established in 1992 (1412 H) under the jurisdiction of the Ministry of Health and it started reporting cancer cases on 1st January 1994. Its main function is to define the population based incidence of cancer in Saudi Arabia. It has a main office in Riyadh with 5 regional offices in 5 different geographical regions designated as Central, Western, Eastern, Northern and Southern regions. The Western Region includes Jeddah, Makkah, Taif, Yanbu, Al-Medina and Al-Qunfuda health regions. For the purpose of data collection, cancer has been categorized as a notifiable disease by law. Patients diagnosed as having any cancer in any hospital, clinic or laboratory anywhere in Saudi Arabia are notified to the NCR. The data includes patient's demographic data and tumor details. The anatomic and histopathological classification of malignancies is based on international classification of disease for Oncology (ICD-O), World Health Organization (WHO), 1990. Efforts are made to assure against case duplication, verification of the diagnosis and validating the data. All the data is stored and retrieved electronically using computer software EpiInfo version 5.01b and the data is analyzed by software Can Reg Version 2. This software is developed by the International Agency for Research on Cancer, Lyon, France. We retrieved all the data on patients with primary GI cancer from the Western Region of Saudi Arabia from January 1994 till December 1997 using ICD-O coding for categorizing tumor sites. The data was analyzed and relative frequency and rank order of various malignancies were determined in patients from different ethnic backgrounds. In the Saudi population, sex and age distribution of various

**Table 1** - Distribution of 1833 cases of gastrointestinal cancers according to site and nationality.

Location	Saudis (% of Total)	Non-Saudis (% of Total)	Total
Colorectal	344 (28.5)	225 (36.0)	569
Liver	312 (26.0)	125 (20.0)	437
Stomach	209 (17.0)	112 (18.0)	321
Esophagus	199 (16.5)	81 (13.0)	280
Pancreas	54 (4.5)	30 (4.0)	84
Gall bladder	50 (4.0)	23 (4.0)	73
Anal canal	15 (1.0)	17 (27.0)	32
Appendix	9 (1.0)	4 (1.0)	13
Billiary Tract	11 (1.0)	4 (1.0)	15
Small Bowel	4 (0.5)	5 (1.0)	9
<b>TOTAL</b>	<b>1207 66.0</b>	<b>626 34.0</b>	<b>1833</b>

malignancies was determined. The data was compared with the previously published hospital based studies regarding relative frequency and rank order of different GI cancers.

**Results.** A total of 1833 cases with primary GI tumors were retrieved during the study period from January 1994 till December 1997. Out of these, 1207 cases were Saudi National while the rest were Non-Saudis. Table 1 shows the distribution pattern of primary GI malignancies in different locations in people from different ethnic backgrounds. There is no significant difference in the rank order and relative frequencies of different cancer when Saudi and Non-Saudi patients are analyzed separately or together. Colorectal cancer was the most common malignancy in both Saudi and Non-Saudi accounting for 28.5% and 36% of cases in the respective populations. Liver, stomach and esophagus followed in decreasing frequencies. The mean age of the Saudi population (Table 2) studied was 58±16 years (SD). Table 3 shows the sex distribution of various GI malignancies in Saudis and highlights the number of patients involved in each sex in different tumors with a male to female (M:F) ratio of 1.67:1. The M:F ratio varied from 1.5:1 to 3:1 in colorectal, liver, stomach, pancreas and anal canal malignancies. The ratio was about 1:1 in esophageal biliary tract and small bowel malignancies, whereas the ratio is reversed in gall bladder and appendicular tumors. Table 4 shows further analysis of age distribution of various GI malignancies in the Saudi population. About 80% of the patients belonged to age group of

**Table 2** - Mean ages of 1207 cases of primary GI cancer in Saudis.

Location	Total number of patients	Age (years) Mean $\pm$ SD
Colorectal	344	54 $\pm$ 17
Liver	312	59 $\pm$ 16
Stomach	209	56 $\pm$ 18
Esophagus	199	63 $\pm$ 14
Pancreas	54	62 $\pm$ 14
Gall bladder	50	57 $\pm$ 14
Anal canal	15	52 $\pm$ 14
Billiary Tract	11	60 $\pm$ 10
Appendix	9	49 $\pm$ 15
Small intestine	4	53 $\pm$ 8
<b>TOTAL</b>	<b>1207</b>	<b>58 <math>\pm</math> 16</b>

**Table 4** - Distribution of 1207 cases of primary GI cancer among various age groups in the Saudi population.

Location	0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	>80	Total
Colorectal	1	4	17	50	68	89	66	37	12	344
Liver	2	8	7	18	43	79	84	54	17	312
Stomach	3	3	9	23	27	50	45	34	15	209
Esophagus	0	0	2	17	24	42	61	32	21	199
Pancreas	0	0	1	3	7	16	14	8	5	54
Gall bladder	0	0	2	6	6	19	9	7	1	50
Anal canal	0	0	1	3	2	4	4	1	0	15
Billiary Tract	0	0	0	0	2	4	3	2	0	11
Appendix	0	0	1	1	3	3	0	1	0	9
Small bowel	0	0	0	0	2	2	0	0	0	4
<b>TOTAL</b>	<b>6</b>	<b>15</b>	<b>40</b>	<b>121</b>	<b>184</b>	<b>308</b>	<b>286</b>	<b>176</b>	<b>71</b>	<b>1207</b>

>40 years of age with most of tumors showing a peak of onset between 50 and 70 years of age. Small bowel and appendicular cancers occurred in a relatively younger age group between 40 and 60 years of age.

**Discussion.** Saudi Arabia is a vast country occupying four fifths of the Arabian Peninsula with on area of 1,500,000 square miles. The NCR in

Saudi Arabia was started in January 1994 under the auspices of the Ministry of Health to obtain reliable statistical information regarding cancer incidence in this country. Cancer incidence in general and GI cancer in particular varies widely in different parts of the world in different age groups.<sup>1</sup> Distribution of cancer can also vary over time depending on various factors such as behavior and environmental changes, availability of medical facilities, changes in age distribution of population, public education and availability of screening programs.<sup>2</sup> All the previously published studies from Saudi Arabia were based on the hospital based tumor registries, which has many limitations including a very strong referral bias. Even so, these studies have helped us to make some conclusions about the relative frequency of different cancers in this country. This study is based on the figures from the newly established NCR on cases reported from January 1994 till December 1997 in the Western Region of Saudi Arabia. This is the first study which has attempted to show the distribution of various primary GI malignancies in the Western Region of Saudi Arabia from the data collected by the NCR. According to our study a total of 1833 cases were reported to have different GI tumors. Out of these 1207 (66%) were Saudis while the rest (34%) were non-Saudis. The non-Saudis represent a heterogeneous group of people coming mostly from Southeast Asia, Africa and other Middle Eastern countries. Their patients were not analyzed any further. Among the Saudi patients 63% were males and the rest were females accounting for a M:F ratio of 1.67:1. Colorectal cancer GI was found to be

**Table 3** - Sex distribution of 1207 cases of primary GI cancers.

Location	Total number of patients	Male	Female	Male:Female Ratio
Colorectal	344	212	138	1.60:1
Liver	312	223	89	2.50:1
Stomach	209	132	77	1.71:1
Esophagus	199	105	94	1.12:1
Pancreas	54	41	13	3.15:1
Gall bladder	50	20	30	0.67:1
Anal canal	15	11	4	2.75:1
Billiary Tract	11	6	5	1.20:1
Appendix	9	3	6	0.50:1
Small intestine	4	2	2	1.0:1
<b>TOTAL</b>	<b>1207</b>	<b>755</b>	<b>452</b>	<b>1.67:1</b>

the most common tumor in this study accounting for 28.5% of cases with a mean age of 54 years and a M:F ratio of 1:60:1. This finding is in sharp contrast to the data previously published from Saudi Arabia. According to studies by Bedikian,<sup>3</sup> Koreich,<sup>4</sup> and Ajarim<sup>5</sup> it was ranked as the 3rd most common GI malignancy in Saudi Arabia. It was reported as the 2nd and 4th most common malignancy in 2 studies from Rabadi<sup>6</sup> and Al-Mofarreh.<sup>7</sup> In a recent cancer incidence report in Saudi Arabia from 1994 to 1996 from the NCR, colorectal cancer has been found to be the 5th most common malignancy among 10 common tumors and the 2nd highest GI malignancy in Saudi Arabia accounting for 5.5% of total cases reported.<sup>8</sup> There can be many explanations for this interesting observation. Colorectal cancers arise through a complex interaction between genetic and environmental factors and generally evolve over a long period of time from an adenoma carcinoma sequence. Genetic factors predominate only in defined hereditary syndromes. Sporadic colonic cancers develop under the influence of environmental factors, which are mainly dietary in origin. There is increasing urbanization and visible changes in the life style and dietary habits of the Saudi population with increasing consumption of fast food and other cholesterol rich foods, especially from the Western Region. These changing dietary habits might explain the changing pattern of this malignancy. The other possible explanation may be the expansion of GI services and availability of colonoscopic facilities in many hospitals in this area in recent years resulting in higher diagnostic yield of this malignancy. Hepatocellular carcinoma is the 2nd most common tumor seen in our study presenting in 26% of the Saudi population. These results are also quite different from most of the previously published hospital based studies in which this tumor ranked as the most common GI tumor. In the cancer incidence report from the NCR of Saudi Arabia, liver cancer was found to be the 2nd most common tumor (7.5%) following female breast cancer (9%). In the same report, liver tumor was reported as the most common tumor in males (10%) and 7th most common malignancy in females among 10 most common cancers.<sup>8</sup> In many hospital based published studies from various regions in Saudi Arabia, it has been ranked as the most common GI malignancy,<sup>4,5,7,9</sup> with a crude relative frequency varying from 9% to 18% in different studies. However, these results are markedly different from the 5.5% reported in the Mahboli study<sup>10</sup> or 3% reported by Rabadi in the Eastern province.<sup>6</sup> This has been thought to be due to a high endemicity of Hepatitis B Virus (HBV) infection in different regions of Saudi Arabia, especially the South Western Region.<sup>11,12</sup> There is also a strong etiological relationship of Hepatitis C Virus (HCV) with hepatocellular carcinoma.<sup>13</sup> Hepatitis C virus has medium endemicity in Saudi Arabia and it might also account for the relatively

high incidence of hepatoma reported from various studies. There is an ongoing compulsory mass immunization program in Saudi Arabia for children and high risk groups. This will hopefully ensure a reduction in the incidence of this malignancy.

Gastric carcinoma is the 3rd most common malignancy in our study representing 17% of total cases. In a cancer incidence report by the NCR of Saudi Arabia it has been found to be the 9th most common tumor in Saudi Arabia with a frequency of 4%. In the same report this malignancy ranked 6th in males and 10th in females.<sup>8</sup> In most of the other studies from the Kingdom, it has been reported to be the 2nd most common GI tumor.<sup>5,7,9</sup> In a few other studies it has been ranked as the most common GI tumor.<sup>6</sup> This tumor has been recently shown to have a clear association with *Helicobacter Pylori* (H. Pylori).<sup>14,15</sup> The fact that H. Pylori has a high prevalence in Saudi Arabia explains the high prevalence of this malignancy in the Western Region of Saudi Arabia.<sup>16</sup>

Esophageal carcinoma is the 4th most common tumor in our study with a frequency of 16.5%, which is a little less than gastric cancer. In most of the studies from Saudi Arabia, it has been reported to be a relatively uncommon tumor except in a couple of studies from the King Faisal Specialist Hospital & Research Center and the Armed Forces Hospital in Riyadh especially among patients coming from the central province of Saudi Arabia.<sup>4,17</sup> The factors for this high prevalence in these regions of Saudi Arabia have not been elucidated. Pancreas, gall bladder, anal canal, appendix and small bowel malignancies are relatively infrequent and form 12% of all cases of GI malignancies. The other reports also show similar trends. The mean age at diagnosis for all GI cancers was 58 years and M:F ratio was 1.67:1. It is true for most of the malignancies except esophageal and pancreatic cancer, which tends to occur at an older age. Appendicular, anal cancers and small bowel tumors, on the other hand tend, to occur in a relatively younger age group in our study. The age distribution in this study is comparable to most of the other studies published from Saudi Arabia including the cancer incidence report from the NCR of Saudi Arabia.<sup>8</sup> Only 4% of all malignancies occurred below the age of 50 and 6% occurred after the age of 80. About 65% of all cancers occurred between the age of 40 and 70. Sex distribution shows a high M:F ratio as seen in most of the other studies from the Kingdom. The only exception is appendix and gall bladder malignancies where the ratio is reversed.

Lastly we want to highlight that it is the first study which depicts the pattern of GI malignancy from the Western Region of Saudi Arabia. As the data is derived from the NCR of Saudi Arabia, it does not suffer from the inherent limitations of previous hospital based statistics on this subject. The most striking observation in this study is that colorectal

cancer has been observed to be the most common malignancy among GI cancers. This is in sharp contrast to the observations made in previous hospital based studies in which colorectal cancer was found to be an uncommon disease in Saudi Arabia. This data also differs from the national cancer incidence trends as shown in the cancer incidence report from the NCR of Saudi Arabia.<sup>8</sup> Whether this represents changing patterns of GI malignancy in this area or a true picture emerging only with the reliable data collected by the NCR remains to be seen. The factors for the high prevalence of this malignancy are not exactly clear. Clearly there is also a need to start some screening programs in the form of fecal occult blood testing or flexible sigmoidoscopy in the high-risk population to detect the disease at an earlier stage.<sup>18</sup> Hepatocellular carcinoma still remains a big problem in this region with HBV and HCV as common predisposing factors. The effect of compulsory childhood vaccination against HBV infection in reducing the incidence of this malignancy will take a few years to appear. The pattern of other malignancies does not differ significantly from the other hospital based studies previously published from Saudi Arabia. The pattern of GI malignancies observed in our study is interesting and should provide a stimulus for further research to determine the factors for this changing pattern of primary GI malignancies.

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## References

1. Doll R. The geographical distribution of cancer. *Br J Cancer* 1989; 23: 1-8.
2. Wynder EL, Gori GB. Contribution of the environment to cancer incidence and epidemiologic exercise. *J Natl Cancer Inst* 1997; 58: 825-834.
3. Bedikian AY. Survey of alimentary malignancies at King Faisal Specialist Hospital and Research Center. *Annals of Saudi Medicine* 1987; 7: 277-281.
4. Koreich OM, Al-Kuhaymir R. Cancer in Saudi Arabia, Riyadh Al-Kharj Hospital Program Experience. *Saudi Medical Journal* 1984; 5: 217-223.
5. Ajarim DS. Pattern of primary gastrointestinal cancer: King Khalid University Hospital Experience. *Annals of Saudi Medicine* 1996; 16: 386-391.
6. Rabdi S. Cancer at Dahran health Center in Saudi Arabia. *Annals of Saudi Medicine* 1987; 7: 288-293.
7. Al-Mofarreh MA, Afzal M, Al-Kraida AA, Al-Qassabi QO, Fakuncle YM, Abdul-Quasem et al. Pattern of primary gastrointestinal tract malignancy among Saudi Nationals a retrospective study. *Annals of Saudi Medicine* 1991; 11: 15-18.
8. National Cancer Registry. Cancer Incidence report. Saudi Arabia 1994-1996. Riyadh (KSA): Ministry of Health; 1997.
9. Tandon P, Pathak V, Zaheer A, Chatterjee A, Walford N. Cancer in Jizan province of Saudi Arabia. *Annals of Saudi Medicine* 1995; 15: 14-20.
10. Mahboubi E. Epidemiology of cancer in Saudi Arabia. *Annals of Saudi Medicine* 1987; 7: 265-276.
11. Al-Faleh Z. Hepatitis B infection in Saudi Arabia. *Annals of Saudi Medicine* 1988; 8: 474-480.
12. Shobokshi OA. The epidemiology of hepatitis B virus and primary hepatocellular carcinoma in Western Region Saudi Arabia. *Annals of Saudi Medicine* 1988; 8: 81-85.
13. Saeed AA, Ahmed A, Al-Karawi M, Mohamed AE, Al-Saud AA, Shariq SA. The association between hepatitis C virus antibody and hepatocellular carcinoma in relation to hepatitis B virus infection. *Annals of Saudi Medicine* 1992; 12: 283-285.
14. Asaka M, Takeda H, Sugiyama T, Katom M. What role does helicobacter pylori play in gastric cancer? *Gastroenterology* 1997; 113 (6 supp): 556-560.
15. Fuchs CS, Mayer RJ. Gastric carcinoma. *N Eng J Med* 1995; 333: 32-51.
16. Al-Moagel MA, Evans DG, Abdulghani M, Adam E, Evan DJ, Malaty HM et al. Prevalence of Helicobacter Pylori infection in Saudi Arabia and comparison of those with and without upper gastrointestinal symptoms. *Am J Gastroenterol* 1991; 85: 944-948.
17. El-Akkad SM, Amer MH, Lin GS, Sabbah RS, Godwin JT. Pattern of cancer in Saudi Arabia referred to King Faisal Specialist Hospital. *Cancer* 1986; 58: 1172-1178.
18. Winawer SJ, Fletcher RH, Miller L, Godlee F, Stolar MH, Murlow CD et al. Colorectal cancer screening: Clinical guidelines and rationale. *Gastroenterology* 1997; 112: 594-642.