

Cancer Occurrence in Fars Province, Southern Iran

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Abstract

Background: Cancer is a significant health problem in the developing countries, and one that is likely to increase in future. Due to unavailability of data concerning cancer during the last 15 years in our area and young age structure of our country, this active hospital-based study was undertaken to determine the occurrence of cancer in Fars Province, southern Iran.

Methods: Data including face-to-face interview with patients and a survey of their medical and demographic records in relation to all invasive cancers were actively collected from 1990 to 2005 from four university hospitals. Among 2993 cases of registered malignant neoplasms presented by site and sex, the crude incidence (CRs), and age-specific incidence and age-standardized incidence rates (ASRs) per 100,000 were determined, using the world standard population.

Results: Over a 5-year period, 1495 and 1620 cancer cases were registered in males and females, respectively, while breast cancer was at the top of 10 cancers in both sexes.

Conclusion: With regard to the top 10 types of cancer, there was a remarkable difference between the results of our study and the estimated cancer incidence for Iran by Globocan 2000. Ethnic, racial and environmental factors may explain these differences but more studies in a longer time span are needed to clarify the causes.

Keywords: Cancer; incidence; Hospital-based; Southern Iran

Introduction

Cancer is a human affliction prevalent worldwide and no race, nationality, or social classes are free from it.¹ Different types of cancer vary in incidence by more than an order of magnitude between different populations, and every type is rare in some parts of the world.² Currently, the top eight cancers in the Asian Pacific Rim region are cancers of the stomach, lung, liver, colon or rectum, esophagus, breast, cervix, and leukemia.³ In developing countries such as Iran, can-

cer is emerging as a public health problem among an array of non-communicable diseases.⁴ It is the third common cause of death in Iran, after cardiovascular diseases and accidents.⁵ Most of the information on malignancies is from United States and Europe and relatively little data are available from Asian and African countries. This is specifically true for Iran. Habibi was a pioneer in this country,¹ and no cancer registry was established since the publication of his cancer data for Tehran.¹ Cancer registries can and should be actively and directly involved in epidemiological research that makes use of the data they collect.⁶ The main objective of a cancer registry would be to collect and classify information of all cancer cases in order to produce statistics on the occurrence of cancer in a defined population.⁶ In this connection, there has been an increasing demand for reliable

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cancer data by health officials and researchers in our area. As such, several studies were undertaken to investigate cancer in our region.^{1,7-44} Due to unavailability of data concerning cancer during the last 15 years in our area and young age structure of our country, this active hospital-based study was undertaken to determine the occurrence of cancer in Fars Province, southern Iran.

Material and Methods

The hospital registry at Shiraz is affiliated to Shiraz University of Medical Sciences and is of special epidemiological significance and their data provide a good insight into the pattern of cancer specifications to these areas. The Fars Hospital-based Cancer Registry was founded in 1971, collecting medical and demographic information from various medical sources throughout the province. The Cancer Registry Center is the major center to refer to for patients suffering from cancer in southern Iran due to its equipped hospitals, and specialists in different fields of cancer.

In our active system, the data were recorded in a data sheet and coded according to ICD-O,⁴⁵ all duplicate cases being eliminated. The records kept in the medical records were carefully scrutinized and the personnel interviewed the patients to get all the information face-to-face. The registered cases included all invasive cancers in ICD-10 categories of C-00 to C-80.

The primary site and morphology data were coded using the ICD-O.⁴⁵ Information on other variables was coded as advised by IARC.⁴⁶

The cancer registry team actively collected and compiled the data for a period of 15 years from 1990 to 2005 from 4 hospitals of Shiraz University of Medical Sciences. In this connection, over 2993 cases of malignant neoplasms were registered. At present, Nemezee, Faghihi, Chamran and Zeynabieh hospitals include 87.8%, 8.3%, 1.7% and 2.2% of patient-referrals, respectively. As Nemezee Hospital is equipped with radio and chemotherapy centers, it covers most of the referrals. The results were presented as the number of cases by site (ICD-10) and sex, with crude incidence (CRs), age-specific incidence and age-standardized incidence rates (ASRs) per 100,000 person a year, performed by direct method using the world standard population. The data were statistically analyzed using SPSS (version 11.5, Chicago, IL, USA), and MS EXCEL (Microsoft, Raymond, WA) softwares. A P value less than 0.05 was considered as significant.

Results

Over a 15-year period (1990-2005), 1495 and 1620 cancer cases were registered in Fars province (Table 1 and 2) in men and woman, respectively. These rates were presented as age-specific incidence rates, crude incidence rates and ASR in 7 age groups for both males and females. The top 10 cancers in males and females according to the calculated ASR are presented in Table 3 while the results are compared to those of Globocan (2000) and of Ardabil Cancer Registry in northwestern Iran.³ Figure 1 and 2 show the

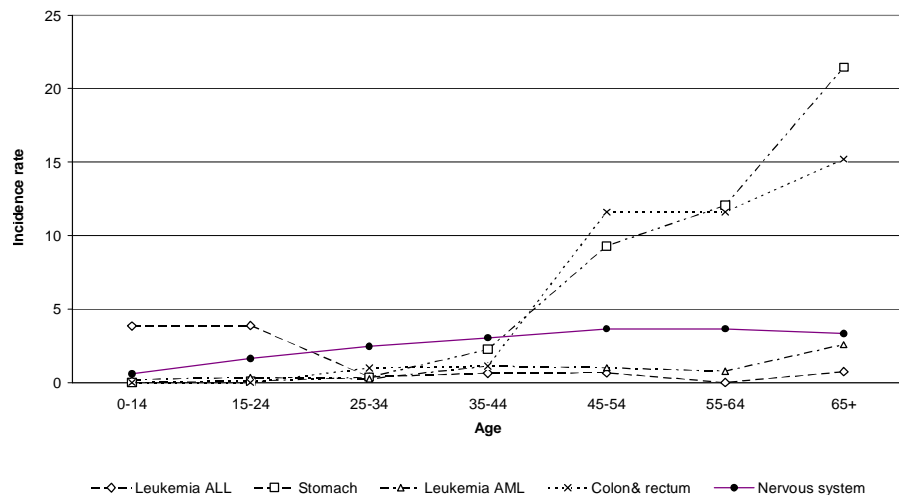


Fig 1: Age-specific incidence of 5 major cancers in males

age-specific incidence of five major cancers in males and females, respectively. Leukemia (ALL) stood at the top of the list of cancer with the highest incidence rate in 15-24 age group and breast cancer in 45-54 age group.

Discussion

Epidemiological studies of cancer in many devel-

oping countries are difficult and fraught with considerable errors. Nevertheless, certain important geographic differences, hard to disregard, have emerged from such studies.¹⁷ Studies on cancer epidemiology in developing countries such as Iran are limited by the dearth of tools for disease control and surveillance.⁴ The first report on cancer incidence in Iran was in Caspian Littoral region between 1968 and 1972.⁴⁷

Table 1: Age-specific incidence rates, average annual crude incidence rates and ASR in males in Fars Province.

| Sites | No. | 0-14 | 15-24 | 25-34 | 35-44 | 45-54 | 55-64 | >=65 | Crude | ASR |
|---|------|------|-------|-------|-------|-------|-------|--------|-------|-------|
| Oral Cavity | 20 | 0.00 | 0.00 | 0.12 | 0.32 | 1.66 | 2.33 | 2.22 | 0.34 | 0.58 |
| Oropharynx | 2 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.39 | 0.37 | 0.03 | 0.06 |
| Nasopharynx | 31 | 0.13 | 0.34 | 0.49 | 0.48 | 2.32 | 1.55 | 2.22 | 0.53 | 0.76 |
| Hypopharynx | 4 | 0.00 | 0.00 | 0.00 | 0.00 | 0.33 | 0.00 | 1.11 | 0.07 | 0.11 |
| Larynx | 40 | 0.00 | 0.00 | 0.00 | 0.32 | 2.65 | 4.28 | 7.03 | 0.69 | 1.16 |
| Esophagus | 38 | 0.00 | 0.00 | 0.00 | 0.64 | 1.00 | 4.66 | 7.03 | 0.65 | 1.05 |
| Stomach | 135 | 0.00 | 0.09 | 0.37 | 2.25 | 9.29 | 12.05 | 21.45 | 2.32 | 3.82 |
| Small intestine | 5 | 0.00 | 0.09 | 0.00 | 0.00 | 0.66 | 0.78 | 0.00 | 0.09 | 0.15 |
| Colon & rectum | 112 | 0.00 | 0.00 | 0.98 | 1.12 | 11.6 | 8.16 | 15.2 | 1.92 | 3.26 |
| Liver | 14 | 0.25 | 0.00 | 0.00 | 0.32 | 0.00 | 1.55 | 0.74 | 0.24 | 0.29 |
| Gallbladder, etc | 5 | 0.00 | 0.00 | 0.00 | 0.16 | 0.66 | 0.39 | 0.37 | 0.09 | 0.15 |
| Pancreas | 15 | 0.00 | 0.00 | 0.00 | 0.48 | 1.00 | 1.17 | 2.22 | 0.26 | 0.42 |
| Bronchus & lung | 87 | 0.21 | 1.46 | 0.37 | 0.80 | 4.65 | 7.00 | 9.24 | 1.49 | 2.18 |
| Bone | 29 | 0.25 | 1.20 | 0.25 | 0.16 | 0.33 | 0.39 | 1.48 | 0.50 | 0.51 |
| Connective tissue | 18 | 0.13 | 0.34 | 0.12 | 0.80 | 0.66 | 0.00 | 1.11 | 0.31 | 0.36 |
| Skin melanoma and otherS | 22 | 0.00 | 0.09 | 0.12 | 0.32 | 0.66 | 1.94 | 4.07 | 0.38 | 0.58 |
| Kidney, etc | 21 | 0.25 | 0.09 | 0.00 | 0.16 | 1.33 | 1.55 | 1.85 | 0.36 | 0.51 |
| Bladder | 91 | 0.04 | 0.00 | 0.12 | 0.48 | 6.64 | 7.39 | 17.4 | 1.56 | 2.63 |
| Prostate | 37 | 0.00 | 0.00 | 0.12 | 0.00 | 0.66 | 2.72 | 9.98 | 0.64 | 1.00 |
| Testis | 26 | 0.08 | 0.43 | 0.98 | 0.96 | 1.33 | 0.39 | 0.00 | 0.45 | 0.53 |
| Nervous system | 101 | 0.59 | 1.63 | 2.46 | 3.05 | 3.65 | 3.50 | 3.33 | 1.73 | 2.08 |
| Thyroid | 19 | 0.00 | 0.00 | 0.25 | 0.32 | 1.33 | 1.55 | 2.59 | 0.33 | 0.52 |
| Adrenal gland | 5 | 0.21 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.09 | 0.06 |
| Other endocrine glands and related structures | 21 | 0.04 | 0.17 | 0.49 | 1.28 | 1.33 | 0.78 | 0.00 | 0.36 | 0.47 |
| Breast | 13 | 0.00 | 0.00 | 0.12 | 0.32 | 0.33 | 1.55 | 1.85 | 0.22 | 0.34 |
| Heart ,mediastinum & pleura | 7 | 0.04 | 0.09 | 0.00 | 0.32 | 0.66 | 0.39 | 0.00 | 0.12 | 0.17 |
| Thymus | 2 | 0.00 | 0.00 | 0.12 | 0.00 | 0.33 | 0.00 | 0.00 | 0.03 | 0.05 |
| Hodgkin lymphoma | 57 | 0.42 | 1.20 | 1.60 | 1.44 | 1.66 | 1.94 | 0.37 | 0.98 | 1.09 |
| Non Hodgkin lymphoma | 47 | 0.50 | 0.60 | 0.86 | 0.80 | 1.33 | 2.72 | 1.85 | 0.81 | 0.97 |
| Other lymphoma | 62 | 0.29 | 1.12 | 0.61 | 1.28 | 2.99 | 4.28 | 3.33 | 1.07 | 1.42 |
| Leukemia AML | 114 | 0.21 | 0.34 | 0.25 | 1.12 | 1.00 | 0.78 | 2.59 | 1.96 | 0.64 |
| Leukemia ALL | 148 | 3.85 | 3.87 | 0.37 | 0.64 | 0.66 | 0.00 | 0.74 | 2.54 | 2.10 |
| Leukemia CLL | 22 | 0.00 | 0.00 | 0.37 | 0.80 | 1.66 | 1.94 | 1.48 | 0.38 | 0.59 |
| Leukemia CML | 22 | 0.04 | 0.26 | 0.61 | 1.28 | 0.66 | 0.78 | 0.37 | 0.38 | 0.46 |
| Other leukemia | 28 | 0.13 | 0.26 | 0.12 | 0.96 | 1.66 | 1.94 | 1.85 | 0.48 | 0.68 |
| Eye and adnexa | 9 | 0.13 | 0.00 | 0.12 | 0.16 | 0.66 | 0.00 | 0.74 | 0.15 | 0.20 |
| Retroperitoneum and peritoneum | 2 | 0.00 | 0.00 | 0.00 | 0.16 | 0.00 | 0.39 | 0.00 | 0.03 | 0.05 |
| Other cancers | 64 | 0.00 | 0.09 | 0.37 | 0.80 | 2.65 | 3.11 | 3.33 | 1.10 | 0.94 |
| Total | 1495 | 8.41 | 15.55 | 14.37 | 27.27 | 73.66 | 87.85 | 128.67 | 25.68 | 32.94 |

Table 2: Age-specific incidence rates, average annual crude incidence rates and ASR in females in Fars Province.

| Sites | No. | 0-14 | 15-24 | 25-34 | 35-44 | 45-54 | 55-64 | >=65 | Crude | ASR |
|---|------|------|-------|-------|-------|--------|-------|-------|-------|-------|
| Oral Cavity | 10 | 0.00 | 0.00 | 0.00 | 0.51 | 0.31 | 1.36 | 1.25 | 0.18 | 0.29 |
| Oropharynx | 3 | 0.00 | 0.00 | 0.00 | 0.00 | 0.31 | 0.00 | 0.84 | 0.05 | 0.09 |
| Nasopharynx | 19 | 0.00 | 0.51 | 0.13 | 0.51 | 1.26 | 2.26 | 0.00 | 0.34 | 0.48 |
| Hypopharynx | 2 | 0.00 | 0.00 | 0.00 | 0.00 | 0.31 | 0.00 | 0.42 | 0.04 | 0.06 |
| Larynx | 3 | 0.00 | 0.00 | 0.00 | 0.00 | 0.31 | 0.45 | 0.42 | 0.05 | 0.10 |
| Esophagus | 27 | 0.00 | 0.00 | 0.00 | 0.51 | 1.57 | 4.98 | 3.35 | 0.48 | 0.87 |
| Stomach | 58 | 0.00 | 0.08 | 1.00 | 1.96 | 3.78 | 3.17 | 7.95 | 1.03 | 1.60 |
| Small intestine | 5 | 0.00 | 0.00 | 0.00 | 0.34 | 0.31 | 0.00 | 0.84 | 0.09 | 0.13 |
| Colon & rectum | 85 | 0.00 | 0.25 | 0.50 | 3.72 | 5.98 | 7.24 | 8.78 | 1.51 | 2.41 |
| Liver | 18 | 0.13 | 0.08 | 0.50 | 0.51 | 1.26 | 0.45 | 0.84 | 0.32 | 0.42 |
| Gallbladder, etc | 3 | 0.00 | 0.00 | 0.00 | 0.17 | 0.31 | 0.45 | 0.00 | 0.05 | 0.09 |
| Pancreas | 12 | 0.00 | 0.00 | 0.00 | 0.17 | 1.26 | 1.81 | 0.84 | 0.21 | 0.38 |
| Bronchus & lung | 34 | 0.35 | 0.51 | 0.25 | 0.34 | 1.26 | 3.62 | 1.67 | 0.60 | 0.82 |
| Bone | 27 | 0.26 | 1.10 | 0.13 | 0.34 | 1.26 | 0.00 | 0.42 | 0.48 | 0.49 |
| Connective tissue | 27 | 0.09 | 0.51 | 1.25 | 0.51 | 0.31 | 0.45 | 1.67 | 0.48 | 0.54 |
| Skin melanoma and otherS | 16 | 0.04 | 0.00 | 0.25 | 0.17 | 1.26 | 0.90 | 2.51 | 0.28 | 0.46 |
| Kidney, etc | 17 | 0.35 | 0.08 | 0.00 | 0.17 | 0.31 | 2.26 | 0.42 | 0.30 | 0.39 |
| Bladder | 14 | 0.04 | 0.00 | 0.00 | 0.00 | 0.63 | 0.90 | 3.76 | 0.25 | 0.42 |
| Cervix | 39 | 0.04 | 0.00 | 0.00 | 2.20 | 4.09 | 3.17 | 20.9 | 0.69 | 1.13 |
| Uterus | 23 | 0.00 | 0.08 | 0.63 | 1.01 | 1.57 | 0.90 | 1.67 | 0.41 | 0.59 |
| Other female genitalia | 23 | 0.00 | 0.25 | 0.13 | 0.17 | 1.57 | 3.17 | 2.51 | 0.41 | 0.68 |
| Nervous system | 69 | 0.48 | 0.93 | 2.38 | 1.52 | 2.83 | 1.81 | 2.51 | 1.23 | 1.46 |
| Thyroid | 31 | 0.00 | 0.08 | 0.88 | 0.85 | 1.89 | 1.81 | 3.35 | 0.55 | 0.83 |
| Adrenal gland | 5 | 0.04 | 0.00 | 0.13 | 0.51 | 0.00 | 0.00 | 0.00 | 0.09 | 0.09 |
| Other endocrine glands and related structures | 9 | 0.00 | 0.08 | 0.25 | 0.00 | 0.94 | 0.9 | 0.42 | 0.16 | 0.25 |
| Breast | 652 | 0.26 | 0.93 | 9.16 | 31.3 | 70.2 | 36.6 | 30.5 | 11.58 | 18.06 |
| Heart , mediastinum & pleura | 7 | 0.04 | 0.00 | 0.25 | 0.00 | 0.31 | 0.45 | 0.84 | 0.12 | 0.18 |
| Thymus | 3 | 0.00 | 0.00 | 0.13 | 0.00 | 0.31 | 0.00 | 0.42 | 0.05 | 0.08 |
| Hodgkin lymphoma | 35 | 0.13 | 1.10 | 1.51 | 0.51 | 0.31 | 0.90 | 0.42 | 0.62 | 0.64 |
| Non Hodgkin lymphoma | 26 | 0.13 | 0.68 | 0.50 | 0.68 | 0.94 | 0.45 | 1.25 | 0.46 | 0.54 |
| Other lymphoma | 26 | 0.35 | 0.42 | 0.13 | 0.51 | 0.94 | 0.90 | 1.67 | 0.46 | 0.55 |
| Leukemia AML | 81 | 0.13 | 0.34 | 0.50 | 0.34 | 0.00 | 0.45 | 1.67 | 1.44 | 1.36 |
| Leukemia ALL | 102 | 2.68 | 2.54 | 0.63 | 0.17 | 0.94 | 0.45 | 0.42 | 1.81 | 1.5 |
| Leukemia CLL | 9 | 0.00 | 0.00 | 0.00 | 0.51 | 1.26 | 0.00 | 0.84 | 0.16 | 0.28 |
| Leukemia CML | 18 | 0.18 | 0.17 | 0.63 | 0.68 | 0.94 | 0.00 | 0.00 | 0.32 | 0.36 |
| Other leukemia | 16 | 0.09 | 0.51 | 0.00 | 0.17 | 1.26 | 1.36 | 0.00 | 0.28 | 0.38 |
| Eye and adnexa | 6 | 0.09 | 0.00 | 0.00 | 0.34 | 0.31 | 0.00 | 0.42 | 0.11 | 0.13 |
| Retroperitoneum and peritoneum | 6 | 0.00 | 0.08 | 0.13 | 0.17 | 0.31 | 0.00 | 0.84 | 0.11 | 0.15 |
| Other cancers | 54 | 0.00 | 0.25 | 0.25 | 1.35 | 2.20 | 3.17 | 3.76 | 0.96 | 1.00 |
| Total | 1620 | 6.23 | 13.27 | 23.34 | 54.61 | 120.80 | 88.21 | 89.94 | 28.76 | 39.28 |

Our results showed that all AML leukemia, stomach, colon and rectum, bronchus and lung, nervous system, and Hodgkin lymphoma were among the top 10 cancers among males and females. In females, cancer of breast and in males, leukemia was at the top of the common cancers (Tables 1 and 2). The remained common cancers were those of cervix and thyroid in females and cancer of bladder, non-Hodgkin lymphoma and other lymphomas among males.

Sadjadi *et al.* noticed that cancer of stomach was the first common cancer in males (ASR= 49.13) and females (ASR= 25.42) in Iran while in our area the figures related to this type of cancer were 3.82 and 1.60, respectively. The ASR for colorectal cancer in their study was 7.86 and 5.89, respectively, being the 4th common cancer in both sexes while the figures were 3.26 and 2.41 in our area, respectively, being the 4th and third common cancer.⁴

Table 3: Top 10 cancers in Fars Cancer Registry compared with Ardabil Cancer Registry and Globocan 2000.

| Male | | | | | | | | |
|----------------------|-------|------|-------------------------|-------|-------|----------------------|-------|------|
| Fars Cancer Registry | | | Ardabil Cancer Registry | | | Globocan 2000 | | |
| Site | Crude | ASR | Site | Crude | ASR | Site | Crude | ASR |
| Leukemia ALL | 2.54 | 2.10 | Stomach | 31.4 | 49.13 | Lung | 29.6 | 34.9 |
| Stomach | 2.32 | 3.82 | Esophagus | 9.66 | 15.42 | Stomach | 18.3 | 21.5 |
| Leukemia AML | 1.96 | 0.64 | Lung | 5.08 | 7.95 | Prostate | 17.8 | 21.2 |
| Colon & rectum | 1.92 | 3.26 | Colorectal | 5.04 | 7.86 | Colorectal | 16.4 | 19.1 |
| Nervous system | 1.73 | 2.08 | Bladder | 4.79 | 7.59 | Liver | 13.1 | 15.0 |
| Bladder | 1.56 | 2.63 | Nervous system | 3.14 | 4.44 | Esophagus | 9.1 | 10.8 |
| Bronchus & lung | 1.49 | 2.18 | Oral cavity | 2.50 | 3.75 | Bladder | 8.5 | 10.0 |
| Other lymphoma | 1.07 | 1.42 | Prostate | 2.25 | 3.45 | Oral | 5.6 | 6.4 |
| Hodgkin lymphoma | 0.98 | 1.09 | Non Hodgkin lymphoma | 1.57 | 2.60 | Non Hodgkin lymphoma | 5.5 | 6.1 |
| Non Hodgkin lymphoma | 0.81 | 0.97 | Bone | 1.44 | 1.69 | Larynx | 4.7 | 5.5 |

| Female | | | | | | | | |
|----------------------|-------|-------|-------------------------|-------|-------|----------------------|-------|------|
| Fars Cancer Registry | | | Ardabil Cancer Registry | | | Globocan 2000 | | |
| Site | Crude | ASR | Site | Crude | ASR | Site | Crude | ASR |
| Breast | 11.58 | 18.06 | Stomach | 14.23 | 25.42 | Breast | 34.9 | 35.7 |
| Leukemia ALL | 1.81 | 1.5 | Esophagus | 7.96 | 14.36 | Cervix | 15.7 | 16.1 |
| Colon & rectum | 1.51 | 2.41 | Breast | 4.71 | 7.60 | Colorectal | 14.8 | 14.4 |
| Leukemia AML | 1.44 | 1.36 | Colorectal | 3.33 | 5.89 | Lung and bronchus | 11.2 | 11.1 |
| Nervous system | 1.23 | 1.46 | Lung | 1.99 | 3.59 | Stomach | 10.6 | 10.4 |
| Stomach | 1.03 | 1.60 | Nervous system | 2.25 | 3.13 | Ovary etc. | 6.4 | 6.5 |
| Cervix | 0.69 | 1.13 | Liver | 1.30 | 2.28 | Corpus uteri | 6.3 | 6.4 |
| Hodgkin lymphoma | 0.62 | 0.64 | Bladder | 0.99 | 1.78 | Liver | 5.5 | 5.5 |
| Bronchus & lung | 0.60 | 0.82 | Oral cavity | 0.99 | 1.71 | Esophagus | 4.4 | 4.5 |
| Thyroid | 0.55 | 0.83 | Lymph leukemia | 0.91 | 1.43 | Non Hodgkin lymphoma | 4.0 | 4.0 |

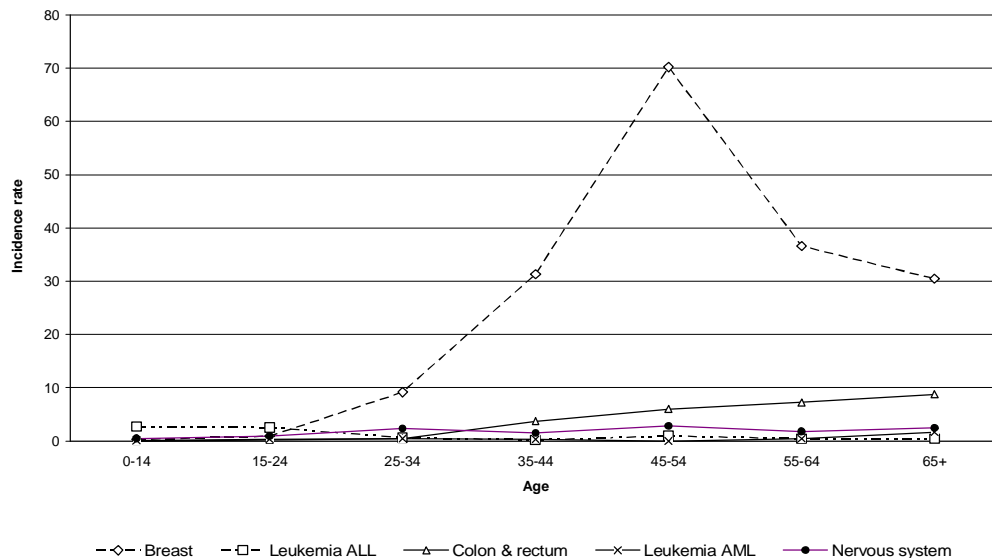


Fig 2: Age-specific incidence of 5 major cancers in females.

Colorectal cancers occurred in a 2:1 and 1:1 male/female ratio, respectively but were not among

the 10 common cancers.¹⁷ Habibi (1965) in a survey of the most common cancers showed that colorectal

cancers were among the 9th and 10th common cancers in Iran.¹ In Asia, cancers of the stomach and the liver have traditionally been the predominant cancer incidence, and colorectal cancer was not commonly observed. During the past few decades, there has been a remarkable increase of colorectal cancer in Asian countries.⁴⁸ Colorectal neoplasm in asymptomatic Asians was reported to be 18.5% and for advanced neoplasms 4.5%.⁴⁸ Colorectal cancer was estimated to comprise 10.7% of the new cancer cases and was the second leading cause of cancer death in the United States in 2004.⁴⁹ In Aomori Prefecture in Japan, the age-adjusted incidences for colorectal cancer were 12.6 and 8.7 per 100,000 people for men and women, respectively in 1974, and increased to 42.5 and 25.6 per 100,000 in 1991.⁵⁰ In Hong Kong, China, the incidence of colorectal cancer in men increased from 40.0 per 100,000 in 1992 to 60.0 per 100,000 in 2002.⁵¹ In South Korea, a 35% increase was reported in relation to colorectal cancer in both sexes.⁵² A recent study compared an Asian population in Taiwan (14.7%) with a Western population in Seattle (20.7%).⁵³ Male sex and advanced age were reported as two well-known risk factors of colorectal neoplasm,⁵⁴ even genetic and environmental factors may also be contributing to the discrepant results.⁵⁵ Efforts were made to decrease mortality associated with colorectal cancer. Fecal occult blood screening for this important malignancy showed to reduce the mortality.⁵⁶ Colonoscopic polypectomy revealed to reduce the incidence of colorectal cancer, too.⁵⁷ Asia is the most densely populated continent in the world that, with the exception of Taiwan, Japan and Korea, does not have a full coverage national health insurance. With the existing health care system, it would be very difficult to perform colorectal cancer screening for the whole population of older age. Therefore, it is important to identify the high-risk populations before any population-based screening for colorectal cancer. The incidence of esophageal cancer is increasing per year.⁵⁸ In Sajadi et al.'s study, esophageal cancer was the second common cancer in both sexes while in our area this cancer was not among the 10 common cancers.⁴ Haghghi et al. (1971) in their study in our area showed that cancer of esophagus was among the 10 most common cancers next to stomach with a higher frequency before age 45, while gastric cancer was the third common cancer with a male/ female ratio of 3:7.¹⁷ In 1970 in Iran, Habibi showed that cancer of the esophagus occupied the fifth place.¹¹ In his next study in 1985 in Iran, it was reported that esophageal

cancer occupied the third and fourth place in males and females, respectively while cancer of stomach occupied the seventh place among the 10 common cancers in males and rectal cancer was the 10th common cancer among the females in Iran.³⁵ The results showed that the incidence of cancer has changed in our area while it was a region with a high number of esophageal cancer,^{16,43} being different from northern and northwestern parts of Iran.^{4,33,42,48,59-64} Interrelated risk factors were reported to be chronic gastroesophageal reflux disease, poor diet, *H. pylori* and obesity.⁵⁸ The ingestion of hot food and beverages has been regarded as the risk factors for esophageal cancer.^{29,58,65} Cigarette and water-pipe smoking can be causative factors for this cancer, too.²⁹ Increase in the knowledge of people in relation to esophageal cancer, changes in food habit and low intake of alcohol after Islamic revolution in Iran due to prohibition might be factors influencing these changes in our area. The presence of a qualified cancer registry center in Fars with equipped hospitals having several specialists and subspecialists and a good system of cancer recording may help to record other cancers, which were ignored or underestimated in previous studies in this region. More studies need to be carried out on the esophageal cancer in our area. The differences may also be related to techniques used to diagnose cancers more accurately and in the size of population studied. Other explanations could be changes in life style, shifting from the rural toward the urban areas, which has taken place over the past 25 years after Islamic revolution. High vitamin C and riboflavin deficiencies were found in the population of the highest incidence area⁴⁸ while these signs of poor nutrition were absent in our area.

Ghavami and Saidi¹⁰ reported that environmental or purely external factors may account for differences between the incidence of colorectal, gastric and esophageal cancers in our region and in the West. Haghghi et al.²⁷ reported that rectal carcinomas were more frequent than those of colon and the age over 45; predominating in males. Barekat et al.¹⁴ in their study in our area showed that cancers of stomach and esophagus were the fourth and sixth common cancers in males while esophageal cancer occupied the fifth place among females. The male to female sex ratio for stomach cancer was 3:1 but colon and rectum cancers were considered rare. They demonstrated that variations may be related to environmental or racial factors and the lifestyle can also have an important role for these differences. Although prostate cancer is

one of the most common cancers in western countries,⁶⁶ and had the ninth rank in Sadjadi et al.'s study,⁴ it was not among the most common ones in our locality. This may be partly due to the fact that in the rural areas, people older than 65 years do not receive a full diagnostic work up when they are sick, and a significant number of deaths in older people are being attributed to old age in rural health centers.⁴

In our study, uterine cervical cancer was the 7th common cancer while in Sadjadi *et al*'s. survey⁴ it did not occupy any place in 10 common cancers in Ardebil. Habibi reported it as the second common cancer in Iran in 1965¹ and the first one in 1985³⁵ and Haghghi *et al.* found it as having the second rank in Southern Iran.¹⁶ In Barekat et al.'s study, it occupied the second place of common cancers in the south of Iran.¹⁴ Changes in age of marriage, number of pregnancies, personal hygiene in relation to reproductive organs may be responsible for these differences. Access to better equipped facilities and techniques used for diagnosis can affect the rate of this cancer. Educating people through mass media and health centers widely established in the country after revolution and increase in the number of literate people and physicians are other important factors, which can explain these differences. Regular periodic pap smear screening tests by both rural and urban health centers, family-based traditions of Shii's Moslems, low rate of extramarital sex, low sexual-transmitted diseases, and uncommon practice of cigarette smoking among females may explain the low occurrence of this cancer.⁶⁷ In our study, breast cancer was the most common cancer in females while Habibi showed it to occupy the fourth place in 1970,¹² ranked as the third¹ in 1965 and the fifth in 1985.³⁵ Sadjadi et al. (2003)⁴ reported it as the third common cancer among females in Ardebil, while Haghghi et al. (1971) found

it as the most common neoplasm in females in southern Iran.¹⁷ The differences could be explained by variation in the number of children born, period of breast feeding, changes in standards of living, access to better techniques and well equipped diagnostic centers and also the promotion of the educational level of women.

In our study, carcinoma of the thyroid gland was just the 10th common cancer among females while Hashemian and Keyhani in 1977 reported an incidence of 23.4% for this cancer, being equally common in both sexes.²⁸ Irradiation and hormonal causes may be the important factors to explain the difference.

Regarding the 10 common cancers in Southern Iran, there is a significant difference between our results and those of Globocan 2000 (Table 3).^{28,69} The differences may be due to application of a database using a large amount of data by Globocan 2000 derived from different populations based on population or hospital-based cancer registries. As the duration of our study was not long enough, more long term studies are needed to clarify the factors affecting the differences in the occurrence of cancer in our area and to map out a real cancer incidence, too.

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References

- 1 Habib A. Cancer in Iran. A survey of the most common cases. *J Natl Cancer Inst* 1965;**34**:533-69. [14313816]
- 2 Coll R, Petro R. The causes of cancer. Oxford University press, Oxford: 1981.
- 3 Yang BH, Parkin DM, Cai L, Zhang ZF. Cancer burden and trends in the Asian Pacific Rim Region. *Asian Pac J Cancer Prev* 2004;**5**(2):96-117. [15244511]
- 4 Sadjadi A, Malekzadeh R, Derakhshan MH, Sepehr A, Nouraie M, Sotoudeh M, Yazdanbod A, Shokoohi B, Mashayekhi A, Arshi S, Majidpour A, Babaei M, Mosavi A, Mohagheghi MA, Alimohammadian M. Cancer occurrence in Ardabil: results of a population-based cancer registry from Iran. *Int J Cancer* 2003;**107**(1):113-8. [12925965] [10.1002/ijc.11359]
- 5 Naghavi M. Death report from 10 provinces in Iran. 1st ed. Tehran: Ministry of Health, 2000.
- 6 Armstrong BK. The role of the cancer registry in cancer control. *Cancer Causes Control* 1992;**3**:369-79. [1384732] [10.1007/BF00052754]
- 7 Boulvin R, Chahinfar M. Thyroid cancer in Iran. *Rev Med Moyen Orient* 1965;**22**(2):280-8. [5212758]
- 8 Maleki A, Hashemian H, Afchari R. Esophageal cancer in Iran. *J Radial Electro Med Nucl* 1965;**46**(3):135-41. [5830105]
- 9 Armine K. Frequency, histologic images and atypical forms of malignant lymphogranulomatosis in Iran. *Rev Med Moyen Orient* 1967;

- 24(2):**97-109. [5248422]
- 10** Ghavami A, Saidi F. Patterns of colonic disorders in Iran. *Dis Colon Rectum* 1969;**12(6)**:462-6. [5354896] [10.1007/BF02617735]
- 11** Habibi A. Cancer in Iran. Statistical review on 28000 cases. *Pathol Microbiol (Basel)* 1970;**35(1)**:181-3. [5472019]
- 12** Habibi A, Survey on the most common cancers in Iran. *Bull Cancer* 1970;**57(1)**:133-50. [4317940]
- 13** Nasr K, Haghghi P, Bakhshandeh K, Haghshenas M. Primary lymphoma of the upper small intestine. *Gut* 1970;**11(8)**:673-8. [4919259] [10.1136/gut.11.8.673]
- 14** Barekat AA, Saidi F, Dutz W. Cancer survey in Southern Iran with special reference to gastrointestinal neoplasms. *Int J Cancer* 1971;**7(2)**:353-63. [5087354] [10.1002/ijc.2910070221]
- 15** Habibi A. Cancer in Iran. Malignant tumors of the female genitalia. *Int Surg* 1971;**56(1)**:13-7. [4327460]
- 16** Haghghi P, Nasr K. Gastrointestinal cancer in Iran. *Chronic J Dis* 1971;**24(10)**:625-33. [4334175] [10.1016/0021-9681(71)90065-8]
- 17** Haghghi P, Nabizadeh I, Asyadi S, Mahallatee EA. Cancer in Southern Iran. *Cancer* 1971;**27(4)**:965-77. [5574084] [[10.1002/1097-0142(197104)27:4<965::AID-CNCR2820270432>3.0.CO;2-F]]
- 18** Mahboubi E. Epidemiologic study of esophageal carcinoma in Iran. *Int Surg* 1971;**56(2)**:68-71. [5560006]
- 19** Mahallatee EA. Leukemia in Southern Iran. *Indian J Med Sci* 1972;**26(5)**:313-4. [4516011]
- 20** Fars Census. Management and Planning Organization. Shiraz, 2003.
- 21** Haghghi P, Mohallatee EA, Nasr K, Dezhbaksh F, Salmasi S, Daneshbod K. Childhood cancer in Southern Iran. *Cancer* 1974;**34(5)**:1824-8. [4426042] [10.1002/1097-0142(197411)34:5<1824::AID-CNCR2820340538>3.0.CO;2-P]
- 22** Haghghi P, Nasr K. Primary upper small intestinal lymphoma (so-called Mediterranean lymphoma). *Pathol Annu* 1973;**8**:231-55. [4583015]
- 23** Habibi A, Manouchehri A, Diba MH, Sajadi M, Ghavam M. Prostatic tumors in Iran. *Int Surg* 1975;**60(8)**:405-7. [1158617]
- 24** Sabeti H, Mohabatayin A. Analysis of 510 surgical lymph node biopsies. *Acta Med Iran* 1975;**18(1-2)**:5-19. [782173]
- 25** Vazin GH. Acute leukemia in Iran. *Blood* 1976;**47(6)**:1057-8. [1064435]
- 26** Behmard S, Taherzadeh D, Gondos B. Cytologic screening for cervical cancer in Southern Iran. *Acta Cytol* 1977;**21(3)**:433-4. [268125]
- 27** Haghghi P, Nasr K, Mohallatee EA, Ghassemi H, Sadri S, Nabizadeh I, Sheikholeslami MH, Mostafavi N. Colorectal polyps and carcinoma in Southern Iran. *Cancer* 1977;**39(1)**:274-8. [832242] [10.1002/1097-0142(197701)39:1<274::AID-CNCR2820390142>3.0.CO;2-1]
- 28** Hashemian H, Keyhani A. Carcinoma of the thyroid gland in Iran. *Br J Surg* 1977;**64(7)**:457-9. [922301] [10.1002/bjs.1800640702]
- 29** Sadeghi A, Behmard S, Shafiepoor H, Zeighamani E. Cancer of the esophagus in Southern Iran. *Cancer* 1977;**40(2)**:841-5. [890664] [10.1002/1097-0142(197708)40:2<841::AID-CNCR2820400237>3.0.CO;2-K]
- 30** Dabestani A, Toosi A, Haghshenas M, Beigi FI. Acute leukemia in adults. *Pahlavi Med J* 1978;**(3)**:277-88. [280896]
- 31** Sadeghi A, Behmard S. Cancer of the bladder in Southern Iran. *Cancer* 1978;**42(1)**:353-6. [667805] [10.1002/1097-0142(197807)42:1<353::AID-CNCR2820420153>3.0.CO;2-W]
- 32** Haghghi P, Mostafavi N, Dezhbaksh F, Ariazad M, Ghassemi H, Cook A, Salmassi S, Nabizadeh I, Asvadi S. Childhood lymphoma in Southern Iran. *Cancer* 1979;**44(1)**:254-7. [378362] [10.1002/1097-0142(197907)44:1<254::AID-CNCR2820440142>3.0.CO;2-N]
- 33** Epidemiologic study of esophageal carcinoma in Iran. *Int Surg* 1971;**56(2)**:68-71. [5560006]
- 34** Fahmy MS, Sadeghi A, Behmard S. Epidemiologic study of oral cancer in Fars Province, Iran. *Community Dent Oral Epidemiol* 1983;**11(1)**:50-8. [6572124] [10.1111/j.1600-0528.1983.tb01354.x]
- 35** Habibi A. Epidemiological aspects of cancer in Iran. *Int Surg* 1985;**70(2)**:105-8. [4055271]
- 36** Shariat TS, Mazabraud A. Statistics on 596 cases of bone tumors detected at the Tehran cancer Institute. *Bull Cancer* 1985;**72(5)**:468-70. [4074916]
- 37** Ghadirian P, Thoues JP, Simard A. Geography of cancer of the esophagus. *Soc Sci Med* 1988;**27(9)**:971-85. [3067369] [10.1016/0277-9536(88)90288-2]
- 38** Ardehali MR. Relative incidence of spinal canal tumors. *Clin Neurol Neurosurg* 1990;**92(3)**:237-43. [2171831] [10.1016/0303-8467(90)90026-2]
- 39** Dutz W. Autopsy pathology and disease patterns in Shiraz, Iran, 1960-1974. *IARC Sci Publ* 1991;**112**:269-81.
- 40** Alebouyeh M, Vossough P. Hodgkin disease in Iranina children. *Eur J Pediatr* 1993;**153(1)**:21-3. [444201] [10.1007/BF02072511]
- 41** Harirchi I, Ebrahimi M, Zamani N, Jarvandi S, Montazeri A. Breast cancer in Iran: a review of 903 case records. *Public Health* 2000;**114(2)**:143-5. [10800155] [10.1016/S0033-3506(00)00324-3]
- 42** Ghavamzadeh A, Moussavi A, Jahani M, Rastegarpanah M, Irani M. Esophageal cancer in Iran. *Semin Oncol* 2001;**28(2)**:153-7. [11301377] [10.1016/S0093-7754(01)90086-7]
- 43** Sadighi S, Raafat J. Sarcoma in Iran. *Asian Pac J Cancer Prev* 2003;**4(2)**:95-8. [12875619]
- 44** Rao DN, Sanghvi LD, Desai PB. Epidemiology of esophageal cancer. *Semin Surg Oncol* 1989;**5(5)**:351-4. [2814146] [10.1002/ssu.2980050512]
- 45** Fritz PA, Percy C, Jack A, Shanmugaratnuers K, et al. International classification of diseases for oncology. 3rd ed. Geneva: WHO, 2000.
- 46** Jensen OM, Parkin DM, MacLennan R, Mair CS, Skeet RG. Cancer registration: Principles and methods, 1st ed. Lyon: IARC, 1991.
- 47** Mahboudi E, Kmet J, Cook PJ, Day NE, Ghadirian P, Salmasizadeh S. Oesophageal cancer studies in the Caspian Littoral of Iran: the Caspian Cancer Registry. *Br J Cancer* 1973;**28(3)**:197-214. [4743904]
- 48** Sung JJ, Lau JY, Goh KL, Leung WK. Asia Pacific Working Group on Colorectal Cancer. Increasing incidence of colorectal cancer in Asia: implications for screening. *Lancet Oncol* 2005;**6**:871-6. [16257795] [0.1016/S1470-2045(05)70422-8]
- 49** Tamura K, Ishiguro S, Munakata A, Yoshida Y, Nakaji S, Sugawara K. Annual changes in colorectal carcinoma incidence in Japan. Analysis of survey data on incidence in Aomori Prefecture. *Cancer* 1996;**78**:1187-94. [8826939] [10.1002(SICI)1097-0142(19960915)78:6<1187::AID-CNCR4>3.0.CO;2-7]
- 50** Hong Kong Cancer Registry, Hospital Authority of Hong Kong Special Administrative Region [accessed 2005 Nov]. Available from: URL: <http://www3.ha.org.hk/cancer/>.
- 51** Bae JM, Jung KW, Wong YJ. Estimation of cancer deaths in Korea for the upcoming years. *J Korean Med Sci* 2002;**17**:611-5. [12378010]
- 52** Soon MS, Kozarek RA, Ayub K, et al. Screening colonoscopy in Chinese and Western patients: a comparative study. *Am J Gastroenterol* 2005;**100**:2749-55. [16393230] [10.1111/j.1572-0241.2005.00355.x]
- 53** Betés M, Muñoz-Navas MA, Duque JM, Angós R, Macías E, Súbtil JC, Herraiz M, De La Riva S, Delgado-Rodríguez M, Martínez-González MA. Use of colonoscopy as a primary screening test for colorectal

- cancer in average risk people. *Am J Gastroenterol* 2003;**98**:2648-54. [14687811]
- 54 Rex DK, Rawl SM, Rabeneck L, Rex EK, Hamilton F. Colorectal cancer in African Americans. *Rev Gastroenterol Disord* 2004;**4**:60-5. [15184825]
- 55 Hardcastle JD, Chamberlain JO, Robinson MH, Moss SM, Amar SS, Balfour TW, James PD, Mangham CM. Randomized controlled trial of fecal-occult-blood screening for colorectal cancer. *Lancet* 1996;**348**:1472-7. [8942775] [10.1016/S0140-6736(96)03386-7]
- 56 Citarda F, Tomaselli G, Capocaccia R, et al. Efficacy in standard clinical practice of colonoscopic polypectomy in reducing colorectal cancer incidence. *Gut* 2001;**48**:812-5. [11358901] [10.1136/gut.48.6.812]
- 57 Enzinger PC, Mayer RJ. Esophageal cancer. *N Engl J Med* 2003;**349**:2241-52. [14657432] [10.1056/NEJMra035010]
- 58 Editorial: Oesophageal cancer on the Caspian littora. *Lancet* 1973;**15**:1365-7. [4128058]
- 59 Oesophageal cancer on the Caspian Littoral. *Lancet* 1978;**1(8065)**:641-2. [76173]
- 60 Cook-Mozaffari PJ, Azordegan F, Day NE, Ressicaud A, Sabai C, Aramesh B. Oesophageal cancer studies in the Caspian Littoral of Iran: results of a case-control study. *Br J Cancer* 1979;**39(3)**:293-309. [465299]
- 61 Ghadirian P, Stein GF, Gorodetsky C, Roberfroid MB, Mahon GA, Bartsch H, Day NE. Oesophageal cancer studies in the Caspian littoral of Iran: some residual results, including opium use as a risk factor. *Int J Cancer* 1985;**35(5)**:593-7. [3997280] [10.1002/ijc.2910350505]
- 62 Ghadirian P. Familial history of esophageal cancer. *Cancer* 1985;**56(8)**:2112-6. [4027937] [10.1002/1097-0142(19851015)56:8<2112::AID-CNCR2820560838>3.0.CO;2-3]
- 63 Crespi M, Munos N, Grassi A, Aramesh B, Amiri G, Mojtabai A, Casale V. Oesophageal lesions in Northern Iran: a premalignant condition? *Lancet* 1979;**2(8136)**:217-21. [89331] [10.1016/S0140-6736(79)90236-8]
- 64 Kmet J, Mahboubi E. Esophageal cancer in the Caspian littoral of Iran: initial studies. *Science* 1972;**175(2)**:846-53. [5008604] [10.1126/science.175.4024.846]
- 65 Armesh B, Ghadirian P. Survey on probable factors causing cancer of esophagus in the Caspian Littoral of Iran. Proc 3rd INT Symp Oncology, Tehran, 1978, p 87.
- 66 Ferlay J, Bray B, Pisani P, Parkin DM. Globocan 2000. Cancer incidence, mortality and prevalence worldwide. Lyon: IARC, 2001.
- 67 Draini PK, Holes KK, Hughes JP, Koutsky LA. Determinants of cervical cancer rates in developing countries. *Int J Cancer* 2002;**100**:199-205. [12115570] [10.1002/ijc.10453]
- 68 Parkin DM. Cancer occurrence in developing countries. Lyon: IARC, 1986, 231-8.