
Gholamreza Roshandel MD1,2, Alireza Sadjadi MD1,3, Mohsen Aarabi PhD2, Abbasali Keshkhatar PhD1, Seyed Mehdi Sedaghat MD5, Seyed Mehdi Nouraie PhD1, Reza Malekzadeh MD1

Abstract

Background: Golestan Province, at the western end of the Asian esophageal cancer (EC) belt in northeastern Iran, was reported to have one of the highest worldwide rates of EC in the 1970s. We have previously shown a declining incidence of EC in Golestan during the last decades. This study reports additional new results from the Golestan Population-based Cancer Registry (GPCR).

Methods: The GPCR collected data from newly diagnosed (incident) cancer cases from all 68 public and private diagnostic and therapeutic centers in Golestan Province. CanReg-4 software was used for data entry and analysis based on the guidelines of the International Agency for Research on Cancer (IARC). Age-standardized incidence rates (ASR) of cancers were calculated using the 2000 world standard population.

Results: From 2004 through 2008, 9007 new cancer cases were reported to the GPCR. The mean (SD) age was 55.5 (18.6) years, and 54% were diagnosed in men. The ASRs of all cancers were 175.3 and 141.1 per 100,000 person-years for males and females, respectively. Cancers of the stomach (ASR:30.7), esophagus (24.3), and lung (15.4) were the most common cancers in males. In females, breast cancer (ASR:26.9) was followed by malignancies of the esophagus (19.1) and stomach (12.4). The diagnosis of cancer was based on histopathological reports in 71% and on death certificate only in 9% of cases.

Conclusions: The EC incidence rate continues to decline in Golestan, while the incidence rates of stomach, colorectal, and breast cancers continue to increase.

Keywords: Cancer registry, esophageal cancer, Golestan, Iran


Introduction

In Iran it is mandatory to report all confirmed or suspicious cancer diagnoses to the Iranian Ministry of Health (IMOH).1 Iranian health authorities have maintained a pathology-based cancer registry since 1986.2 The first report of this registry, which includes at maximum 80% of the new cancer cases, was published recently.1 The Digestive Diseases Research Center (DDRC) of Tehran University of Medical Sciences (TUMS) has established population-based cancer registries in two northern provinces of Iran, Ardabil, and Golestan, in collaboration with the International Agency for Research on Cancer (IARC), the Center for Disease Control at IMOH and local medical universities.3 Golestan Province is located at the southeastern corner of the Caspian Sea (northeast Iran), at the western end of the Asian esophageal cancer (EC) belt.2 It is located in the steppe grasslands of the Turkmen plain and neighboring hills4 and includes Turkmen (35%) and Fars (65%) ethnic groups. Historically, the incidence of EC was found to be very high in this region.7 Mahboubi et al. in 1973 reported exceptionally high age-adjusted incidence rates (up to 165.5/100,000 in men and 195.3/100,000 in women) for EC in this region.8

The Golestan Population-based Cancer Registry (GPCR) began in 2001. The first report from this registry was a retrospective cancer surveillance for 1996 to 2000, published in 2006. This study showed a declining incidence of EC and an increasing incidence of gastric, colorectal, and breast cancers in this region compared to the data published from this area in the 1970s.8 GPCR is now run by the Golestan Research Center of Gastroenterology and Hepatology (GRCGH) of Golestan University of Medical Sciences (GOUMS), under the supervision of DDRC/TUMS. Since January 2006, all data in the GPCR was collected prospectively, and the GPCR has been a member of the International Association of Cancer Registries (IACR) since 2007. In this report, we present cancer incidence data collected by the GPCR over the 5-year period from 2004 through 2008.

Materials and Methods

GPCR collected information on newly diagnosed (incident) cancer cases from all public and private diagnostic and therapeutic centers in Golestan Province, including hospitals, pathology/lab-
nosis. The Persian version of CanReg4 software was used for data name, topography of tumor, place of residence, and year of diag-

Figure 1. Population pyramid of Golestan Province, 2006. (Source: Health Department of Golestan University of Medi-
cal Sciences)

Figure 2. Previous* (1970s) and current divisions of Golestan Province, Iran (*Reference 6).

Results

During the 5-year period from 2004 through 2008, 9007 new cancer cases were reported to GPCR from 68 healthcare centers across the province, the provincial death registry, and medical centers and cancer registries in neighboring provinces. More than half, 4862 (54%), of the cases were male (male to female ratio = 1.2; \( P = 0.001 \)). Of all 9007 cases, 69% were confirmed by histop-

truncated (34–65 years) ASR (TASR) of EC.\(^1\) \( P \)-values of less than 0.05 were considered statistically significant.

The protocol was approved by the Ethics Committee of GOUMS and the DDRC Institutional Review Board. Confidentiality mea-
sures were used to ensure the preservation of anonymity of the cancer cases, the best quality of registry data, and the best possible usage of the data.\(^3,\)\(^14\)

10% of data collection forms were checked and compared with the original documents in the source centers to verify the ac-
curacy and completeness of the abstraction process. The results of this checking process were acceptable in the majority of centers.

The other methods of diagnosis were DCO in 9%, clinical in 10%, and para-clinical (e.g., imaging studies or surgical reports) in 10% of cases. The overall ASRs for all cancers were 175.3 (95% CI: 166.5–184.5) and 141.1 (95% CI: 133.2–149.5) per 100,000 person-years in males and females, respectively. Male patients were generally older than female patients, with median (inter-quartile range) ages of 62 (48-73) and 53 (41-66) years, respectively (\( P = 0.001 \)).

Microscopic verification (MV) was done in 71% of all cancer cases. The MV% of the five most common cancers in males and females are shown in Table 1. Table 2 shows several indices of data quality for GPCR data collected between 2004 and 2008. The MV% increased from 60% in 2004 to 75% in 2008, with a con-
comitant decline in the DCO% from 23% in 2004 to 5% in 2008. The proportion of cases with an unknown primary site decreased from 6% in 2004 to 2% in 2008. There were no cases with an unknown method of diagnosis or an unknown age or sex in the GPCR between 2004 and 2008.

Table 3 shows the case numbers, crude rates and ASRs of the ten most common cancers in each sex. Stomach and esophageal malignancies were the most common cancers in males, while
breast and esophageal cancers were the most common tumors in females.

Table 4 shows the ASRs and TASRs (34–65 years) of EC in the different regions of Golestan Province (Figure 2) reported in 1968–1971 and in the current Cancer Registry data. The incidence rate of EC was higher in Gonbad and Kalaleh districts, located in the eastern area of the province, than in the other districts at both time points, both in males and in females. Between 1968–1971 and 2006 on, all data has been collected prospectively. Indices of data quality are now within acceptable ranges according to IARC standards,11/g3/g90/g75/g76/g70/g75/g3/g86/g88/g74/g74/g72/g86/g87/g86/g3/g87/g75/g68/g87/g3/g87/g75/g72/g3/g42/g51/g38/g53/g3/g76/g86/g3/g81/g82/g90/g3/g68/g3/g84/g88/g68/g79/g76/g191/g72/g71/g3/g83/g82/g83/g88/g79/g68-

Discussion

The Golestan Population-based Cancer Registry showed improvement in several quality measures during 2004–2008 (Table 3). The proportions of cases with microscopic verification increased from 60% to 75% and the cases diagnosed only by death certificate decreased from 23% to 5% during this time, and from 2006 on, all data has been collected prospectively. Indices of data quality are now within acceptable ranges according to IARC standards,11 which suggests that the GPCR is now a qualified population-based cancer registry by these standards.

The incidence of cancers was higher in males than in females, which is in agreement with the results of most other cancer registries.3,11,15 The mean age for cancer cases in our study (55.5 years) was similar to other reports from Iran.15,16

<table>
<thead>
<tr>
<th>Sex</th>
<th>Location</th>
<th>MV%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>Stomach</td>
<td>68</td>
</tr>
<tr>
<td></td>
<td>Esophagus</td>
<td>73</td>
</tr>
<tr>
<td></td>
<td>Trachea, bronchus, lung</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td>Hematopoietics</td>
<td>98</td>
</tr>
<tr>
<td></td>
<td>Colorectal</td>
<td>74</td>
</tr>
<tr>
<td>Female</td>
<td>Breast</td>
<td>75</td>
</tr>
<tr>
<td></td>
<td>Esophagus</td>
<td>73</td>
</tr>
<tr>
<td></td>
<td>Stomach</td>
<td>64</td>
</tr>
<tr>
<td></td>
<td>Hematopoietic</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Colorectal</td>
<td>73</td>
</tr>
</tbody>
</table>

Table 1. Proportion of cases with microscopic verification (MV%) for the five most common cancers in males and females of Golestan Province, Iran (2004–2008).

<table>
<thead>
<tr>
<th>Sex</th>
<th>Location</th>
<th>MV%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>Stomach</td>
<td>68</td>
</tr>
<tr>
<td></td>
<td>Esophagus</td>
<td>73</td>
</tr>
<tr>
<td></td>
<td>Trachea, bronchus, lung</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td>Hematopoietics</td>
<td>98</td>
</tr>
<tr>
<td></td>
<td>Colorectal</td>
<td>74</td>
</tr>
<tr>
<td>Female</td>
<td>Breast</td>
<td>75</td>
</tr>
<tr>
<td></td>
<td>Esophagus</td>
<td>73</td>
</tr>
<tr>
<td></td>
<td>Stomach</td>
<td>64</td>
</tr>
<tr>
<td></td>
<td>Hematopoietic</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Colorectal</td>
<td>73</td>
</tr>
</tbody>
</table>


Table 3. Case numbers, crude incidence rates and age-standardized incidence rates (ASR) per 100,000 persons-years of the top ten cancers in Golestan Province, Iran (2004–2008).

Cancer Incidence in Golestan Province

Discussion

The Golestan Population-based Cancer Registry showed improvement in several quality measures during 2004–2008 (Table 3). The proportions of cases with microscopic verification increased from 60% to 75% and the cases diagnosed only by death certificate decreased from 23% to 5% during this time, and from 2006 on, all data has been collected prospectively. Indices of data quality are now within acceptable ranges according to IARC standards,11 which suggests that the GPCR is now a qualified population-based cancer registry by these standards.

The incidence of cancers was higher in males than in females, which is in agreement with the results of most other cancer registries.3,11,15 The mean age for cancer cases in our study (55.5 years) was similar to other reports from Iran.15,16

According to this study, the ASRs of cancer in Golestan Province were 175.3 for males and 141.1 for females, which were similar to the findings of another population-based cancer registry in Iran.17 A recent pathology-based National Cancer Registry from
IMOH, on the other hand, has underestimated the incidence of cancer in Golestan (reporting ASRs of cancers for Golestan as low as 61 in males and 54 in females) and other parts of the country. This is most likely due to the different methodologies of the two registries: the only data source for the IMOH registry is pathology reports, and all data is collected passively, which are well-known shortcomings of this type of registry. Therefore, it is highly recommended that national cancer incidence and mortality rates be estimated based on population-based cancer registries with active case ascertainment, as they were estimated in the past.

Stomach and esophageal cancers were the most common cancers in Golestan males during this time period. These results are similar to reports from some other Asian countries. The most frequent female cancers in Golestan Province were breast and cervical cancers in both cases. In Golestan males, during this time period, the results are similar to that of the previous report.6 For example, the incidence rate of EC was considerably higher in Gonbad and Kalaleh (regions 6a and 6b in the previous report) in both the current and previous studies. Thus, despite its overall declining trend, EC remains a major health problem in this part of Golestan Province, which needs further investigation to determine unknown risk factors. In addition, implementation of an EC control program may be beneficial in this area.

In conclusion, GPCR is now a qualified population-based Cancer Registry based on IARC standards, and a major asset for planning cancer prevention strategies in this province. It may also be considered a good model for establishing population-based Cancer Registries in other provinces of Iran and in other Middle Eastern countries. Similar to our previous report, we have found that the EC incidence rate continues to decline in Golestan, while the rates of stomach, colorectal, and breast cancers continue to increase.

**Acknowledgments**

The authors are deeply grateful to Dr. Sanford M. Dawsey from NCI for reviewing the manuscript and his valuable comments. We would also like to thank Mrs. Honeyehsadat Mirkarimi, Mr. Abbas Moghaddami, Mrs. Seyedizin Hasheminasab, Mr. Reza Mohammadi, GPCR staff, pathologists, physicians, and other health professionals in Golestan Province in addition to the staff at the cancer office of IMOH for their valuable assistance. This work was supported by GRCGH/GOUMS and DDRC/TUMS.
References