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Original Article

# Cancer Unveiling: A Profile of Incidence and Trends in Bam City, Southeast Iran

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## Abstract

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### Keywords

► cancer
► time trends
► Bam
► age-standardized rate

**Background** Cancer is one of the leading causes of mortality and morbidity worldwide. According to the report from the Iranian Ministry of Health, cancer ranks as the third most common cause of death in Iran. Consequently, acquiring information about cancer statistics and their trends is crucial for cancer prevention and control. In this study, we examined the trends and epidemiology of cancer in Bam City, Iran, from 2014 to 2019.

**Material and Methods** This cross-sectional study was conducted using cancer registry data spanning from 2014 to 2019 in Bam, located in Kerman Province. Common cancers were determined based on the reported number of cancer cases and age-standardized rates. Data analysis was performed using SPSS (version 22) and GraphPad Prism (version 9).

**Results** In this study, we examined 1,290 cases of cancer registered in Bam City, Kerman Province, from 2014 to 2019. Of our study population, 42.8% (552 cases) were women. The sex ratio (male to female) for all cancers during the 6-year study period was 1.34. The highest number of cancer cases among men occurred in 2016, while among women, it was in 2017. The age-standardized incidence rate did not display a clear increasing or decreasing trend; instead, we observed fluctuations over the 6-year period for both sexes. Notably, the age-standardized incidence rate trend for males consistently remained higher than that for females.

**Conclusion** Fluctuations of the trend in our study can be attributed to reasons such as referral of cases to other cities with better medical facilities and weakness in the cancer registration system of deprived areas such as Bam. Nevertheless, to reduce the burden

of cancer, each individual should be aware of the most preventable risk factors, such as an unhealthy lifestyle and occupational exposure. To achieve this goal, the government should prioritize improving the accuracy and completeness of cancer registry centers.

## Introduction

Cancer remains a primary cause of global mortality and morbidity. Reports indicate that the frequency of cancer cases experienced a 33% growth from 2005 to 2015.[1] According to the World Health Organization's statements in 2012, cancer incidence is on the rise in developing countries, constituting 70% of the world's total cancer deaths.[2] Furthermore, predictions from 2008 suggest that by 2030, cancer incidence percentages in low- and lower-middle-income countries will increase by 82 and 70%, respectively. In contrast, this increase is expected to be 58 and 40% for upper-middle- and high-income countries.[3]

According to a report from the Iran Ministry of Health, cancer ranks as the third most common cause of death in Iran, following cardiovascular diseases and accidents.[4] Consequently, there has been a growing interest among researchers and national health officials in obtaining accurate cancer incidence data.[5]

The incidence rate of cancer is influenced by factors such as population age, lifestyles, and individual behaviors, resulting in variations across different regions of the country. For example, the age-specific incidence rates per 100,000 population in Yazd, Shahrood, and Khuzestan were reported as 104.7, 95.4, and 66.9, respectively.[6–8]

Cancer garners significant attention within the health care system due to its irrecoverable complications and the high costs associated with diagnosis and treatment.[9] Moreover, it is possible that some uncommon cancers in developed countries are more prevalent in Iran.[10] Therefore, it is imperative to delve into cancer statistics and trends to study the factors that explain these disparities.

To the best of our knowledge, no prior study has explored cancer statistics and trends in Bam, one of the cities in Kerman Province, Iran. Consequently, we conducted an epidemiological investigation into common cancers and their trends in this city from 2014 to 2019. Another driving force behind this study is the profound impact of industrialization on the incidence of cancer in developing countries, influencing the lives and habits of the population.[11] All these factors may contribute to changes in cancer incidence rates in these regions.

## Methods and Materials

### Study Design

This cross-sectional study was conducted based on cancer registry data from 2014 to 2019 in Bam, Kerman Province. The Bam Cancer Registry is integrated with radiotherapy, chemotherapy, pathology sections, and mortality data through online connections. After gathering data from these sources, duplicated information was excluded. The database contains information such as the International Classification of Diseases for Oncology (ICD-O) code, age, and gender.

Furthermore, the Bam Cancer Registry is affiliated with Bam University of Medical Sciences.

### Geography

Bam City is one of the cities in Kerman Province, located 195 km southeast of Kerman in the eastern region of the province.

### Population

According to the 2015 census, which is conducted every 5 years in Iran, Bam had a population of 150,157, consisting of 73,368 females and 76,789 males. The male-to-female ratio was 1.05, with a mean age of 53.88 years. The age distribution of various age categories in Bam City in 2015 is presented in ►Fig. 1. Based on this figure, the population structure exhibits a heterogeneity.

### Data Collection and Statistical Analysis

The final data were prepared and described after coding using the ICD-O. Age-standardized rates (ASRs) and crude rates were computed in this study for the most frequent cancers. Standardized incidence rates were calculated using the world standard population. Data analysis was conducted using SPSS (version 22) and GraphPad Prism (version 9). The determination of common cancers was based on the reported number of cancer cases and ASRs.

## Results

In this study, 1,290 cases of cancer were registered in Bam City, Kerman Province, between 2014 and 2019. Within our population, 42.8% (552 cases) were women. The sex ratio (male to female) for all cancers during the 6-year study period was 1.34. The highest number of cancer cases among men occurred in 2016, while among women, it was in 2017.

The ASR did not exhibit a clear trend of increase or decrease; instead, we observed fluctuations over the 6-year period for both sexes. Notably, the ASR trend for males consistently remained higher than that for females (►Fig. 2). The largest and smallest values of ASR for men were 356.083 in 2014 and 217.87 in 2015, respectively. The minimum value of the ASR for women was 128.586 in 2015, while the maximum ASR, 232.505, was observed in 2017. The most common cancers, considering their frequency during 2014 to 2019 in Bam City, were breast, skin, bladder, myeloma, lung, thyroid gland, and laryngeal cancers.

The crude average annual incidence and ASRs of the 10 most common cancers in males and females differed. Based
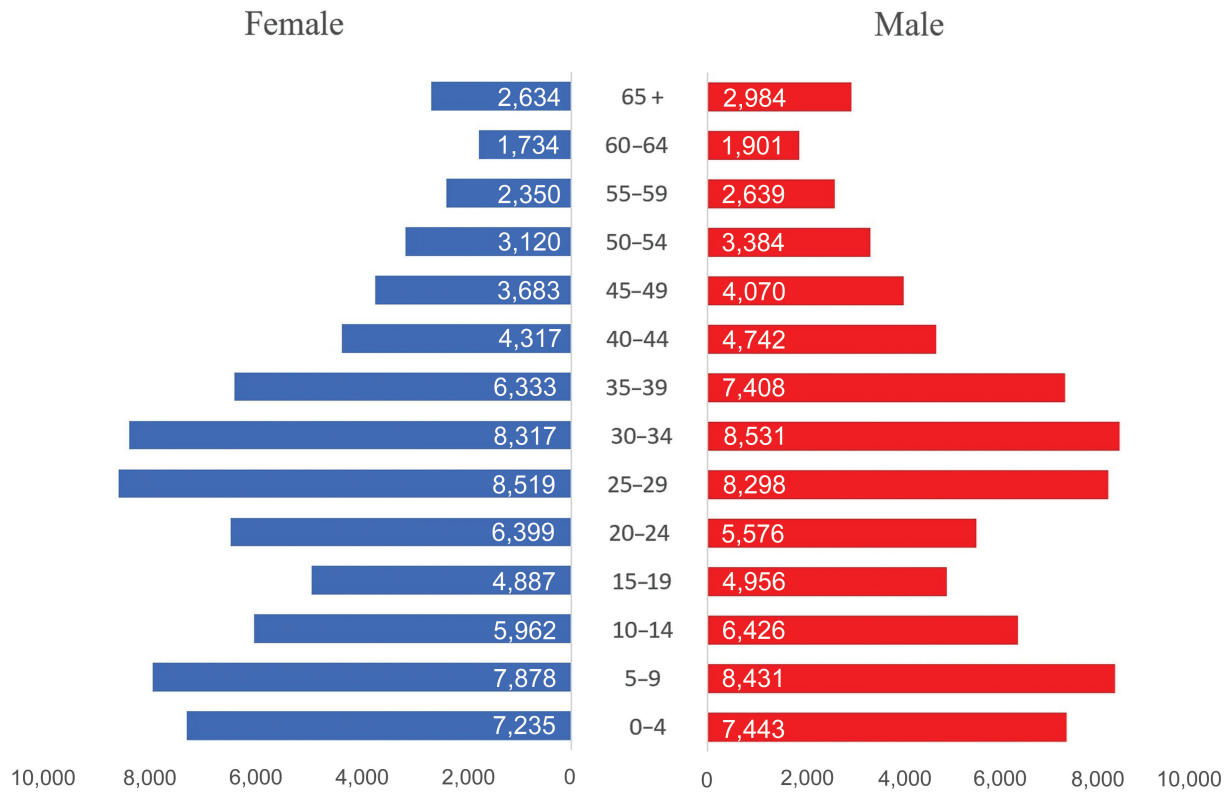
Female

Male

| | | |
|---|---|---|
| 2,634 | 65 + | 2,984 |
| 1,734 | 60–64 | 1,901 |
| 2,350 | 55–59 | 2,639 |
| 3,120 | 50–54 | 3,384 |
| 3,683 | 45–49 | 4,070 |
| 4,317 | 40–44 | 4,742 |
| 6,333 | 35–39 | 7,408 |
| 8,317 | 30–34 | 8,531 |
| 8,519 | 25–29 | 8,298 |
| 6,399 | 20–24 | 5,576 |
| 4,887 | 15–19 | 4,956 |
| 5,962 | 10–14 | 6,426 |
| 7,878 | 5–9 | 8,431 |
| 7,235 | 0–4 | 7,443 |

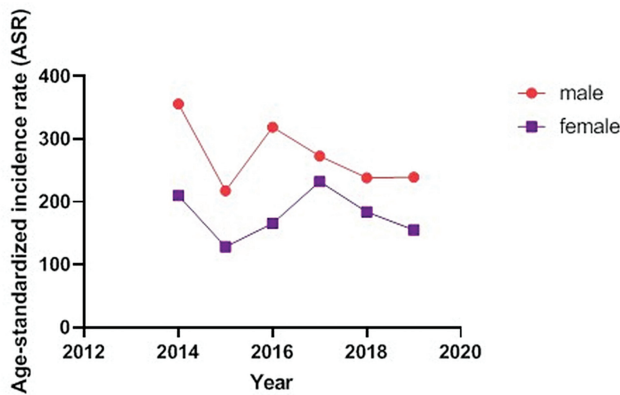**Fig. 1** Population pyramid of Bam City, 2015.



**Fig. 2** Trend of age-standardized rate (ASR) changes in Bam, Kerman, 2014–2019.

on the percentages, the most common cancer for men was bladder cancer and that for women was breast cancer (►Table 1). Cancer diagnoses were based on histopathologic and microscopic verification, clinical or radiographic evidence, and death certificates, accounting for 85.99, 8.28, and 5.73%, respectively.

## Discussion

In this study, we investigated cancer incidence and its trends in a city in Iran between 2014 and 2019. A study projecting cancer in Iran indicates that the ASRs for all cancer sites will nearly double by 2035.[12]

The results of our study revealed that the sex ratio was 1.34 for all cancers over the 6-year period. This finding is consistent with other studies.[7,13,14] This difference may be attributed to factors such as self-care practices, which tend to be more common among women than men[15] or, potentially, genetic predispositions in women.[16] Additionally, it appears that in Iran, there is a higher exposure to cancer risk factors among men than among women.[9]

In our study, breast cancer emerged as the most frequent cancer. Several studies in Iran have consistently identified breast cancer as the most common carcinoma in women.[7,8,17] Some suggested risk factors for breast cancer include family history, reproductive factors, lifestyle factors, birth weight, growth rate in childhood, early-age menarche, and genetics.[18–21]

Skin cancer was the second most prevalent cancer in both men and women, which aligns with the findings of other studies in Shahrood and the province of Eastern Azerbaijan.[6] However, in some regions of Iran, such as Yazd, Markazi, and Khuzestan Provinces, skin cancer ranked as the most prevalent cancer in both sexes.[7,8] A plausible risk factor that may explain the prevalence of this cancer is sunlight exposure.[17] The third most prevalent cancer in our study was bladder cancer. An increasing incidence of bladder cancer in the Fars Province of Iran during 2003 to 2007 was reported.[22] Its incidence may be attributed to factors such as improper nutrition, physical inactivity, smoking, addiction, and prolonged chemical exposure.[23]

Myeloma was the next most prevalent cancer in our study. According to a previous study, an overall increase in myeloma

**Table 1** Crude average annual incidence rates and age-standardized rates per 100,000 person-years (ASRs), by 10 most prevalent cancer, in men and women in Bam, Kerman Province, Iran, 2014–2019

| | Crude rate (95% CI) | ASRs (95% CI) |
|---|---|---|
| **Site** | **Men** | |
| Bladder | 20.81 (15.3-26.3) | 31.91 (23.6-40.3) |
| Skin | 16.99 (14.3-19.7) | 26.95 (18.9-35.0) |
| Lung and Bronchus | 16.59 (8.20-24.9) | 28.28 (15.9-40.6) |
| Myeloma | 15.03 (10.5-19.5) | 20.02 (14.5-25.5) |
| Larynx | 13.23 (8.30-18.1) | 20.11 (12.5-27.7) |
| Prostate | 11.73 (7.70-15.7) | 23.68 (9.75-37.6) |
| Stomach | 11.69 (5.59-17.8) | 14.33 (1.69-26.9) |
| Colon | 7.420 (5.29-9.54) | 10.16 (7.23-13.1) |
| Thyroid | 5.270 (1.72-8.82) | 8.049 (−0.1-16.14) |
| Breast | 0.482 (−0.3-1.27) | 1.069 (−0.8-2.986) |
| | **Women** | |
| Breast | 31.77 (22.2-41.3) | 35.81 (24.4-47.2) |
| Skin | 13.83 (5.89-21.8) | 23.68 (16.7-30.6) |
| Thyroid | 11.71 (5.82-17.6) | 11.47 (7.08-15.8) |
| Colon | 11.71 (5.82-17.6) | 7.320 (3.20-11.4) |
| Myeloma | 9.030 (6.68-11.4) | 11.55 (8.69-14.4) |
| Lung and Bronchus | 6.860 (2.54-11.2) | 10.06 (3.12-17.0) |
| Stomach | 3.880 (1.42-6.33) | 5.190 (0.72-9.68) |
| Bladder | 3.670 (0.32-7.02) | 5.810 (0.60-11.0) |
| Larynx | 1.990 (−0.2-4.22) | 3.120 (−0.5-6.78) |
| Prostate | — | — |
| | **Total** | |
| Breast | 31.77 (22.3-41.3) | 35.81 (24.4-47.2) |
| Stomach | 15.99 (11.4-20.6) | 9.720 (2.74-16.7) |
| Bladder | 12.31 (9.03-15.6) | 18.64 (13.9-23.3) |
| Myeloma | 12.06 (10.4-13.8) | 15.65 (13.3-18.0) |
| Lung and Bronchus | 11.75 (6.27-17.2) | 19.01 (11.2-26.8) |
| Thyroid | 8.460 (4.02-12.9) | 9.000 (4.31-13.7) |
| Skin | 7.810 (4.77-10.9) | 25.26 (22.8-27.7) |
| Larynx | 7.650 (4.39-10.9) | 11.45 (6.56-16.3) |
| Colon | 6.180 (4.53-7.82) | 8.290 (5.90-10.7) |
| Prostate | 5.910 (3.91-7.91) | 11.52 (4.75-18.3) |

Abbreviation: CI, confidence interval.

incidence was observed, particularly among individuals aged ≥50 years, men, and people from high-income countries.[24] Several explanations have been suggested for these findings. For instance, the higher prevalence in men compared with women may be attributed to men's greater exposure to environmental risk factors and occupational factors.[25] Additionally, the higher prevalence of myeloma in high-income countries may be linked to the limited diagnostic capacity in underdeveloped countries.[26] Demographic factors such as sex, race, age, obesity, geography, and radiation are considered among the most important risk factors.[24] The high prevalence of myeloma in Bam City may be attributed to elevated pollution levels resulting from the machinery building industry and factories in and around the city.

Lung cancer ranks as the fifth most prevalent cancer in our study. Important risk factors for this cancer include smoking, air pollution, lifestyle choices, and an unhealthy diet.[27–29] A study conducted in Kerman Province, Iran, reported significantly high rates of cigarette abuse among teenagers. The prevalence of lung cancer in our city may be attributed to the lack of effective prevention policies for smoking in Iran, coupled with air pollution generated by industries.[30]

Despite the increasing trend in ASR,[7,8,17,31] our study did not show a clear trend of increase or decrease. Similar fluctuations in cancer trends have been reported in other studies.[32,33] Awareness about risk factors, such as changing lifestyles and behaviors, may explain these fluctuations in some years.[33] Additionally, during the years under our study, there was no scheduled cancer registry system, which may have led to some cancer cases being missed, potentially biasing our results. Second, the weak health care system in Bam City may have prompted people to seek treatment in other cities and provinces, which could have affected the precision of the registry system and the available information.

## Conclusion

As the incidence and mortality of cancer are increasing worldwide, it is necessary to improve our cancer survival system. Considering the rising statistics of cancer incidence in Iran, people should be made aware of the most common and preventable risk factors, such as an unhealthy lifestyle and occupational exposure. For this purpose, the government should prioritize enhancing the accuracy and completeness of the cancer registry centers.

### Availability of Data and Materials
The data that support the findings of this study are available from the corresponding author upon reasonable request.

### Consent for Publication
Informed written consent was obtained from each of the patients before enrollment.

### Authors' Contributions
Study concept and design were developed by S.N. and M.J. Analysis and interpretation of data was done by S.N. Drafting of the manuscript was done by M.J., S.N., S.KH., and N.R.GH. Critical revision of the manuscript for important intellectual content was done by S.N., M.J., N.R.GH, and S.KH. Statistical analysis was done by S.N. and MJ. Acquisition of the data was by S.KH. and M.H. All the authors have read and approved the final manuscript.

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