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Cancer incidence in Southern Iran, 2015–2018: A population based study on cancer registry profile of Fars province

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Abstract

Background and Aims: Cancer registry profiles provide an insight into the trend of cancer in a specific region. The present study aimed to report the cancer incidence in Fars during 2015–2018, based on the cancer registry of Fars province.

Methods: The present population-based study electronically gathered new cancer patient's data from all pathology, radiology, radiotherapy, chemotherapy departments, and mortality data of Fars province. This electronic connection was first established in 2015, in Fars Cancer Registry database. After data gathering, all duplicated patients are removed from the database. The Fars Cancer Registry database includes data such as gender, age, cancer ICD-O code, and city from March 2015 to 2018. Furthermore, the death certificate only (DCO%) and microscopic verification (MV%) were calculated using SPSS software.

Results: A total of 34,451 patients with cancer were registered in the Fars Cancer Registry database during these 4 years. Among these patients, 51.9% ($n = 17,866$) were male, and 48.1% ($n = 16,585$) were female. Furthermore, the mean age of patients with cancer was about 57.3 ± 19 (60.50 ± 19 in males, 53.86 ± 18 in females). In men, prostate, skin (non-melanoma), bladder, colon and rectum, and stomach are the most common cancers. Also, in women, breast, skin (non-melanoma), thyroid gland, colon and rectum, and uterus were the most common cancers in the studied population.

Conclusion: Overall, breast, prostate, skin (non-melanoma), colon and rectum, and thyroid cancers were the most common cancers among the studied population. Healthcare decision-makers could make evidence-based policies to decrease cancer incidence based on the reported data.

KEYWORDS

cancer, cancer registry, Fars, incidence, Iran, profile

1 | INTRODUCTION

Cancer is undoubtedly a significant public health concern worldwide.[1] In this regard, the overall incidence of cancers is increasing around the globe, and it is approximated that more than 19 million individuals have been diagnosed with cancer in 2020.[2] The increasing incidence of cancer patients is associated with high life expectancy, increased exposure to carcinogen substances, and improved techniques for diagnosing and screening susceptible patients.[3,4] Nevertheless, considering the inevitable burden of cancer on healthcare systems, it is crucial to provide an accurate estimation of cancer prevalence and its associated risk factors to adopt evidence-based strategies to combat cancer.[5]

Although the overall prevalence of cancer is increasing worldwide, this increasing pattern varies considerably between different regions.[6,7] These discrepancies may be due to the impact of ethnicity, demographic, geographic, and lifestyle variation on the prevalence of cancer.[8] For instance, regions with high sun exposure are linked with higher rates of skin cancer.[9] Besides, as the healthcare systems determine the accessibility of individuals to diagnostic and therapeutic facilities, this may, in turn, result in the different prevalence of cancer in developed and developing countries.[8] Regarding the issues mentioned earlier, regional cancer registration profiles remained an ideal option for addressing these concerns.

In a bid to determine the cancer incidence, various studies have been conducted in Iran. In an epidemiological review in 2019,[10] Danaei et al. demonstrated that similar to other developing countries, the incidenc of cancer is increasing in Iran. They observed that skin, breast, gastrointestinal, bladder, and prostate cancers were the most common cancers in Iran.[10] Furthermore, in a study by Roshandel et al.,[11] they predicted that by 2025 in Iran, the thyroid cancer will have the highest increase.[11]

Cancer registry profiles not only provide accurate actual data on the regional prevalence of cancer but also may provide insight into the possible association of regional geographic and demographic characteristics with cancer incidence.[12] Furthermore, precise health-related decision-making could be aided through trend analysis of cancer registry profiles.[13] On this subject, despite various studies in Iran, currently there is no updated cancer profile report in the Fars province. In this regard, the current study reports the cancer registry profile of one of the largest provinces of Iran, Fars province, during 2015–2018.

2 | MATERIALS AND METHODS

2.1 | Study design

The current study was conducted in Fars Cancer Registry, Shiraz, Iran, in Sothern, Iran. In this regard, Shiraz medical centers are known as referral centers for numerous Fars province, Iran cities. In 2015, Fars Cancer Registry established an electronic automatic online connection with all the pathology, radiology, radiotherapy and chemotherapy departments, and mortality data. In addition, the Fars Cancer Registry is affiliated with Shiraz University of Medical Sciences. Through these connections, data of cancer patients are obtained, and duplicated ones are removed from the database. The Fars Cancer Registry database includes data such as gender, age, cancer ICD-O code, and city from March 2015 to 2018. It should be noted that all data are being reported to the Iran National Cancer Registry.

In addition, the geographic characteristics of Fars province are fully described in a previously published report.[14] In summary, Shiraz is a mountainous city with arid weather about 5000 feet above sea level. The average population of Fars province during the mentioned years was about 4,850,000 people (male = 2,460,000, female = 2,390,000) with the mean age of 30 years old. All data were analyzed using SPSS software version 20 and reported as mean ± standard deviation. Also, the age-standardized rate (ASR) per 100,000 was reported based on the world standard method proposed by Segi.[15] Furthermore, microscopic verification (MV) and death certificate only (DCO) were also calculated for the most common cancers.

3 | RESULTS

A total of 34,451 patients with cancer were registered in the Fars Cancer Registry database during these 4 years. Among these patients, 51.9% (n = 17,866) were male, and 48.1% (n = 16,585) were female. Furthermore, the mean age of patients with cancer was about 57.3 ± 19 (60.50 ± 19 in males, 53.86 ± 18 in females), as depicted in Table 1.

The mean age of cancer diagnosis in various types of cancer is indicated in Table 2. In this regard, patients with malignant neoplasms of ill-defined, secondary, and unspecified sites had the lowest age, and those with malignant neoplasms of digestive organs had the highest age at the time of diagnosis.

In addition, breast, prostate, skin (non-melanoma), colon and rectum, and bladder cancers have the highest incidence (Table 3 and Figure 1). Furthermore, the ASR, MV%, and DCO% is provided in Table 3.

In men, prostate, skin (non-melanoma), bladder, colon and rectum, and stomach are the most common cancers (Table 4 and Figure 2).

TABLE 1 Frequency, percent, and mean age at the time of cancer diagnosis in studied population.

	Frequency	Percent	Mean age
Male	17,866	51.9	60.50 ± 19.55
Female	16,585	48.1	53.86 ± 18.66
Total	34,451	100.0	57.31 ± 19.41

TABLE 2 Mean age of studied patients at the time of diagnosis based on the type of cancer.

Cancer	Mean age ± SD
Malignant neoplasms of lip, oral cavity, and pharynx	60.13 ± 17.25
Malignant neoplasms of digestive organs	64.08 ± 15.65
Malignant neoplasms of respiratory and intrathoracic organs	60.47 ± 19.09
Malignant neoplasms of bone and articular cartilage	38.89 ± 20.79
Melanoma and other malignant neoplasms of skin	61.71 ± 17.39
Malignant neoplasms of mesothelial and soft tissue	53.21 ± 20.80
Malignant neoplasm of breast	52.27 ± 13.67
Malignant neoplasms of female genital organs	50.76 ± 14.95
Malignant neoplasms of male genital organs	59.79 ± 17.97
Malignant neoplasms of urinary tract	63.64 ± 15.78
Malignant neoplasms of eye, brain, and other parts of central nervous system	47.94 ± 26.76
Malignant neoplasms of ill-defined, secondary, and unspecified sites	46.12 ± 20.15
Malignant neoplasms, stated or presumed to be primary, of lymphoid, haematopoietic and related tissue	54.31 ± 18.49
Malignant neoplasms of independent (primary) multiple sites	58.33 ± 27.19

TABLE 3 The ASR (per 100,000), DCO%, and MV% of top 10 cancers with highest incidence in the studied population.

	ASR					
Cancer	2015	2016	2017	2018	MV%	DCO %
Breast	36.6791	39.6465	46.6568	55.2862	0.910	0.030
Prostate	24.3029	23.3799	25.8345	28.3862	0.826	0.091
Skin non-melanoma	17.3963	12.5167	16.1564	39.0813	0.962	0.005
Colon and rectum	11.8615	9.1566	13.5302	15.8267	0.763	0.090
Bladder	10.0337	9.8073	11.3999	11.6408	0.840	0.029
Thyroid gland	7.9008	9.0886	11.4348	14.4462	0.935	0.003
Stomach	8.86732	8.0476	10.9327	11.2758	0.724	0.130
Uterus	7.0884	5.0934	9.3135	11.8807	0.865	0.055
Trachea and lung	7.4167	6.7763	9.4394	9.3484	0.575	0.200
Brain and nervous system	5.6948	5.6833	8.6003	7.1481	0.505	0.313

Abbreviations: ASR, age-standardized rate; DCO, death certificate only; MV, microscopic verification.

Also, in women, breast, skin (non-melanoma), thyroid gland, colon and rectum, and uterus were the most common cancers in the studied population (Table 5 and Figure 3).

In addition, the incidence of the top 10 cancers in the present report is compared with the previously published report of the Fars cancer registry database and global data of GLOBOCAN. In this regard, Tables 6 and 7 present the ASR per 100,000 of the top 10 cancers in the male and female gender, respectively.

4 | DISCUSSION

The present study was conducted on about 34,450 patients with cancer who were registered in the Fars cancer registry database during 2015–2018. The Fars cancer registry database started in 1980 and evolved through time.[14] It should be noted that since the Fars cancer registry database is one of the largest cancer centers in Iran, its data not only provide insights into the cancer situation in the South of Iran but also could be taken into

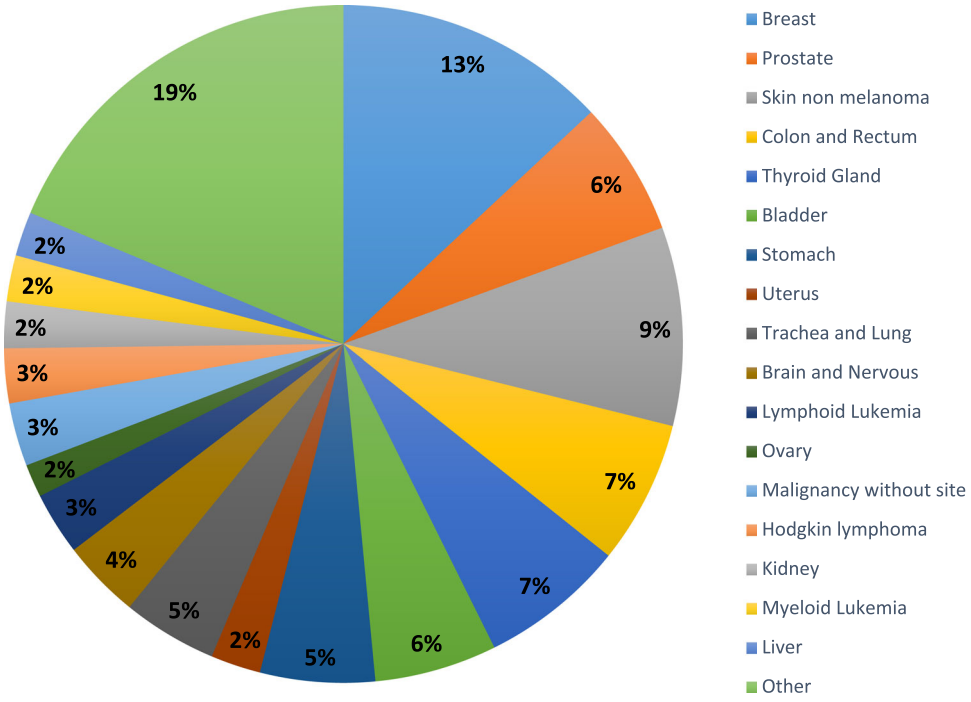

FIGURE 1 The overall incidence of diagnosed cancer in studied population.

TABLE 4 The ASR (per 100,000) of top 10 cancers in men with highest incidence in the studied population.

Cancer	2015	2016	2017	2018
Prostate	24.3029 (541)	23.3799 (508)	25.8346 (569)	28.3862 (590)
Skin non-melanoma	20.5103 (486)	15.3871 (365)	19.7090 (458)	30.4226 (653)
Bladder	16.9001 (390)	16.1335 (370)	19.0908 (439)	9.5207 (448)
Colon and rectum	13.5427 (317)	10.0652 (236)	14.4561 (325)	8.7483 (404)
Stomach	11.6934 (287)	11.2249 (265)	14.8726 (361)	7.5226 (356)
Trachea and lung	10.4709 (243)	9.3895 (226)	13.4853 (317)	6.5668 (304)
Lymphoid lukemia	6.8422 (151)	8.0734 (183)	8.6584 (182)	3.1604 (139)
Brain and nervous	6.6203 (160)	6.4355 (156)	9.3010 (224)	4.1449 (202)
Malignancy without site	6.3145 (156)	4.1859 (102)	7.3714 (174)	2.4581 (139)
Hodgkin lymphoma	5.2929 (132)	5.7657 (149)	5.0919 (136)	2.4771 (120)

Abbreviation: ASR, age-standardized rate.

account for the decision-making of Iran and other developing countries.

Of all studied patients, 51.9% were men, and 48.1% were female. This finding is similar to a previously published report, in which men consisted 54.4% of patients with cancer. Nevertheless, various cancer registry profiles of the current literature observed female domination in cancer incidence.[17,18] In this regard, they indicated that since several high prevalent cancers, such as breast cancer, occur primarily in women, this results in the overall domination of women with cancer.[3]

In addition, to the authors' knowledge, the current study is the first cancer registry profile of Iran, which presents the mean age at the time of diagnosis for each cancer separately. As mentioned earlier in the manuscript, malignant neoplasms of ill-defined, secondary, and unspecified sites have the lowest age, and malignant neoplasms of digestive organs have the highest age at the time of diagnosis. These results could aid in adjusting cancer screening guidelines to determine screening age. In addition, in the current study, the mean age of cancer diagnosis is relatively higher than that of the previously published report.[14]

Interestingly, the most common cancers of the current study differ from that of a previously published report. In the current study, prostate, skin (non-melanoma), bladder, colon and rectum,

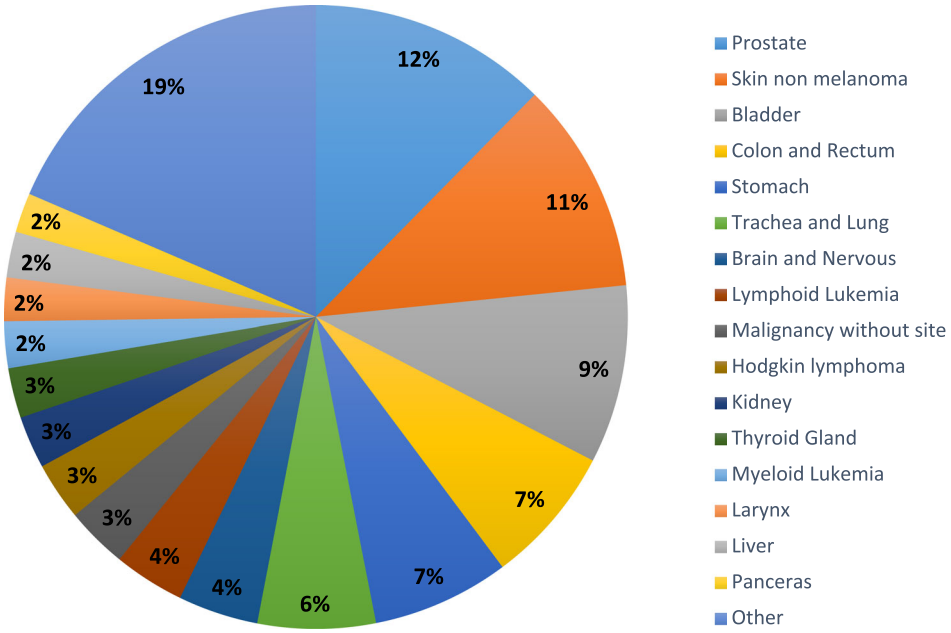

FIGURE 2 The overall incidence of diagnosed cancer in male population.

TABLE 5 The ASR (per 100,000) of top 10 cancers in women with highest incidence in the studied population.

Cancer	2015	2016	2017	2018
Breast	35.9085 (906)	38.6319 (972)	46.2093 (1158)	54.0488 (1360)
Skin non-melanoma	14.3620 (344)	9.7128 (237)	12.7103 (299)	25.2871 (414)
Thyroid gland	12.9548 (359)	14.3969 (409)	18.3079 (504)	11.7147 (650)
Colon and rectum	10.2564 (244)	8.2560 (190)	12.7051 (300)	7.0465 (339)
Uterus	7.0884 (172)	5.0935 (128)	9.3136 (225)	11.8807 (294)
Ovary	6.2356 (152)	3.8853 (91)	5.2824 (134)	6.8472 (166)
Stomach	6.0326 (145)	4.9628 (123)	7.0441 (169)	3.7533 (175)
Brain and nervous	4.7958 (113)	4.9192 (112)	7.9129 (180)	3.0033 (144)
Malignancy without site	4.8774 (115)	4.9758 (118)	5.5869 (132)	1.9835 (102)
Trachea and lung	4.4144 (102)	4.1813 (98)	5.4697 (132)	2.7817 (133)

Abbreviation: ASR, age-standardized rate.

stomach, trachea and lung, lymphoid leukemia, and brain and nervous system were the most common malignancies in men, respectively. However, in the previously published report, stomach, bladder, lung, leukemia, melanoma, prostate, colorectal, nervous system, non-Hodgkin, and liver malignancy were among the top 10 cancers. Furthermore, in this study, breast, skin (non-melanoma), thyroid, colon and rectum, uterus, ovary, stomach, and brain and nervous system were the most common malignancies in women. In comparison, the previous Fars cancer registry database study indicated that breast, stomach, leukemia, lung, uterus, colorectal, melanoma, thyroid, nervous system, and ovary were the most common malignancies. Also, as indicated in Table 3, the ASR of all common cancers increased during the studied years. On this subject, in the next part of the manuscript, the top 10 most common cancers of Fars province are discussed.

4.1 | Breast cancer

Similar to numerous other countries, breast cancer had the highest incidence.[19] In addition, breast cancer consists of about 12% of all cancers. Furthermore, the ASR of breast cancer increased from 13 to 43.69 compared to the previous study. In this regard, the elevated ASR may contribute to the increased risk factors associated with breast cancer, such as nulliparity,

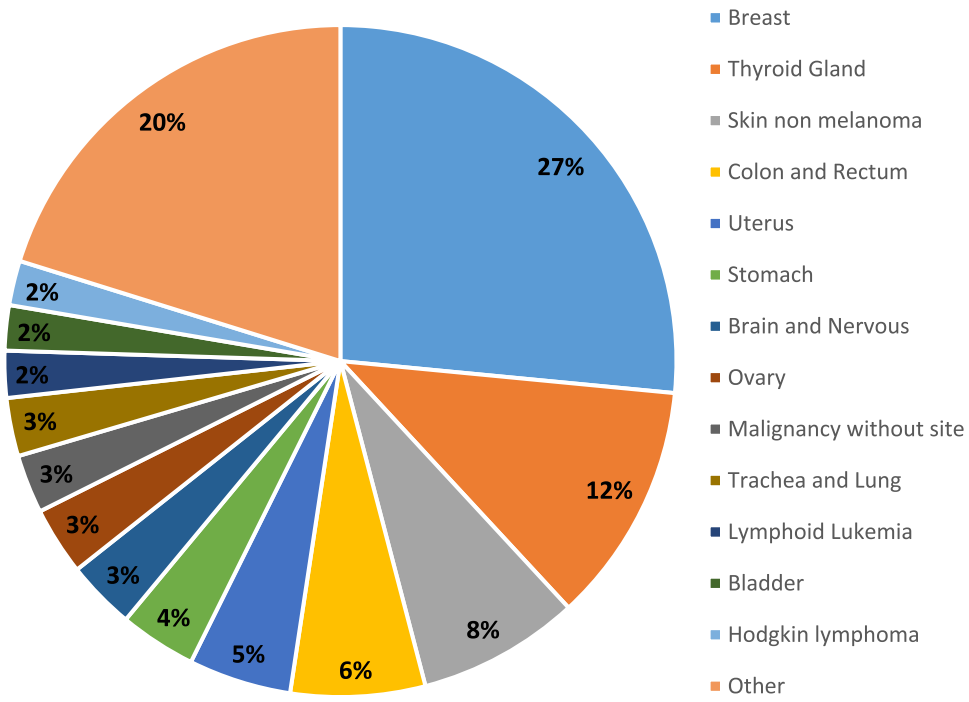

FIGURE 3 The overall incidence of diagnosed cancer in female population.

contraceptive use, and decreased breastfeeding among women of reproductive ages.[20] Besides, the national-wide screening policies may be associated with the increased incidence of patients with breast cancer.

4.2 | Prostate cancer

Prostate malignancy is the most common cancer of men in the study population. Also, it accounts for 11.20% of malignancies among the studied population. In this regard, although the ASR of prostate cancer is elevated compared to the previously published report, it is still meaningfully lower than that of the GLOBOCAN. Undoubtedly, this discrepancy highlights the impacts of national-wide screening programs and PSA-testing conducted in the country. Similarly, Hassanipour et al. indicated that the incidence of prostate cancer is lower in Iran than various other parts of the world.[21]

4.3 | Skin (non-melanoma) cancer

The non-melanoma skin cancer is the third most common cancer among the studied population. In addition, the ASR associated with non-melanoma skin cancer is higher than that of the GLOBOCAN. In this regard, non-melanoma cancers are associated with sun exposure.[22] Therefore, this high incidence of non-melanoma cancer may attribute to the low administration of sun-protection products among the studied population.

TABLE 6 Comparison of ASR in top 10 most common cancers of studied men.

Male			
Cancer	Present study	Previous study[14]	GLOBOCAN[16]
Prostate	25.4759	9.20	29.30
Skin (non-melanoma)	21.5073	NR	13.9
Bladder	15.4113	6.80	9.6
Colon and rectum	11.7031	3.40	13.1
Stomach	11.3284	9.20	15.7
Lung and trachea	9.9781	6.30	31.5
Lymphoid lukemia	6.6836	5.50	6.1
Brain and nervous system	6.6254	3.00	3.90
Malignant neoplasm, without specification of site	5.0825	2.70	4.60
Hodgkin lymphoma	4.6569	5.5	1.1

Abbreviation: ASR, age-standardized rate.

4.4 | Colorectal cancer

Colorectal cancers comprise 4.7% of all cancers in the studied population, and it is among the top 10 common cancers in both genders. In this regard, although the ASR associated with colorectal cancers is elevated in both genders compared to the previous report,

TABLE 7 Comparison of ASR in top 10 most common cancers of studied women.

Female			
Cancer	Present study	Previous study[14]	GLO-BOCAN[16]
Breast	43.6996	13.00	46.30
Skin (non-melanoma)	15.5181	NR	7.0
Thyroid gland	14.3436	2.2	10.2
Colon and rectum	9.5660	2.60	10.1
Uterus	8.3440	2.70	8.4
Ovary	5.5626	2.00	6.6
Stomach	5.4482	4.40	7.0
Brain and nervous system	5.1578	2.20	3.10
Malignant neoplasm, without specification of site	4.3559	NR	4.6
Trachea and lung	4.2118	2.9	14.6

Abbreviation: ASR, age-standardized rate.

it is much lower than the estimation of GLOBOCAN. Furthermore, this may be due to the applied screening programs and elective colonoscopy procedures, which can identify and resect the pre-malignant lesions.[23]

4.5 | Thyroid malignancy

The thyroid gland malignancy was the sixth most prevalent cancer in the studied population. Also, it was the third most common cancer in female patients. In this regard, not only the ASR of thyroid malignancy (14.34 per 100,000) is considerably higher than the previous report (2.2 per 100,000), but also it is higher than the estimation of the GLOBOCAN. The exact etiology of thyroid malignancy is not fully identified.[24] However, radiation and various regional pollutants are associated with thyroid cancer.[25] Also, previous studies established that the high incidence of thyroid malignancy might be due to over-diagnosis and advanced diagnosis techniques.[26] On this subject, further studies are encouraged to shed light on the etiology of thyroid cancer.

4.6 | Bladder cancer

Bladder malignancy is the third most common cancer in men in the studied population. Also, it accounts for 5.23 of malignancies. In addition, the ASR of bladder cancer is increased compared to the previously reported study. Also, it is higher than the global estimation reported by GLOBOCAN. Although smoking and several chemical occupational exposures are thought to be associated with the risk of bladder malignancies,[27] further regional studies are suggested to determine the exact etiology of the elevated incidence of bladder cancer, especially among men.

4.7 | Stomach cancer

The ASR of stomach cancer in both genders is increased slightly than that of the previous study on the same population. Furthermore, it is still lower than that of GLOBOCAN. This may either reflect lower levels of Pylori infections among the Fars population or healthier diet habits of the studied population.[28]

4.8 | Cervical and uterus malignancy

The ASR of cervical malignancy is elevated notably in comparison with the previous report of Fars province. In this regard, since the infection with Human papillomavirus (HPV) plays a significant role in cervical cancers, increased cervical malignancies may attribute to the increased prevalence of HPV.[29] Furthermore, screening programs and vaccination may decrease the incidence of cervical malignancies.[30]

4.9 | Lung and trachea malignancy

The ASR of lung cancers is increased in both genders compared to the previous report. Also, it is much lower than the estimation of GLOBOCAN. One possible explanation for this discrepancy may be due to the increased awareness and public health education about smoking impacts on lung cancer.[31]

4.10 | Malignancy of brain and nervous system

The malignancies associated with the brain and nervous system are ranked among the top 10 common cancers in both genders. Nonetheless, its associated ASR is increased than the previous assessments and much higher than the estimations of GLOBOCAN.

4.11 | Other common cancers among studied population

Ovarian and uterus cancers were among the most common malignancies in the female population. In this regard, the ASR of ovarian cancer is slightly increased compared with the previous study. Nevertheless, lower than that reported by GLOBOCAN. In addition, the ASR of uterus malignancy increased than in previous studies, and similar to ovarian cancer, it is still lower than GLOBOCAN estimations.

5 | LIMITATIONS, STRENGTHS, AND CONCLUSION

There are a few limitations considering the present study. First of all, the present study is conducted retrospectively. In addition, the recorded database lacked various important parameters such as marital status, educational level, and death rates. However, the authors did their best to collect and analyze the available data to obtain an accurate cancer incidence. The present study demonstrated a considerably higher incidence of non-melanoma skin cancer, thyroid, bladder, and nervous system cancer than the estimation of the GLOBOCAN. In this regard, not only clinicians could benefit from these, but also, healthcare decision-makers could make evidence-based policies to decrease cancer incidence based on the provided data.

AUTHOR CONTRIBUTIONS

Abbas Rezaianzadeh: Investigation; methodology; project administration; supervision. **Masoumeh Ghoddusi Johari**: Conceptualization; data curation; formal analysis; project administration. **Hamid Reza Niazkar**: Data curation; formal analysis; methodology; writing—original draft. **Zahra Khosravizadegan**: Data curation; investigation. **Ahmad Monabati**: Formal analysis. **Babak Shiraziyeganeh**: Methodology.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

TRANSPARENCY STATEMENT

The lead author Hamid Reza Niazkar affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

DATA AVAILABILITY STATEMENT

Due to the ethical, and legal concerns, the supporting data could not be publicity available. However, the data that support the findings of this study are available from the corresponding author (H. R. N) and Fars Cancer Registry upon reasonable request.

ETHICS STATEMENT

Approval was granted by the Ethics Committee of Shiraz University of Medical Sciences.

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