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Trends in Head and Neck Cancer in Saudi Arabia from 2016–2020

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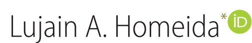

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Abstract

Objectives: Head and neck cancer (HNC) is considered the seventh most common cancer worldwide. To evaluate the incidence and geographical distributions of head and neck cancer among the Saudi population in a specific period.

Methods: A retrospective and a descriptive study investigating HNC in Saudi population from January 2016 through December 2020 was conducted based on data obtained from the Saudi Cancer Registry SCR. Male and female data were included on lip, tongue, mouth salivary glands, oropharynx, nasopharynx hypopharynx, pharynx, nose and sinuses, and larynx. Age-standardized rate (ASR) and age-specific incidence rate (AIR) were calculated with a focus on age, gender and regional differences.

Results: The total number of HNC cases identified by the SCR was 3,232 cases in which males were 2082 (64.4%) and females were 1,150 (35.5%). The mean ASR per 100,000 of HNC was higher in males at 4.94 compared to females at 2.9 over the study period. The mean ASR per 100,000 population ranged from 2.22 in Hail to 5.3 in Jazan, with a national average of 3.68 per 100,000. Positive correlation between HNC incidence and age was noted. Nasopharyngeal cancer showed the highest number of cases for both genders through the same period.

Conclusion: Between 2016 and 2020, HNC incidence in Saudi Arabia remained stable, with consistently higher ASR in males. These findings highlight the importance of targeted, region-specific health initiatives, greater public education, and age-targeted screening to reduce the impact of HNC in Saudi Arabia.

Keywords: Head and neck cancer, cancer incidence, Saudi cancer registry, Age-standardized rate, age-specific incidence rate

Introduction

Head and neck cancer (HNC) is considered the seventh most common cancer worldwide, accounting for more than 660,000 new cases and 325,000 deaths each year.[1,2] It has been predicted that there will be an annual increase of 30% in the overall incidence of HNC by 2030.[2,3] According to the UK National Health Service's (NHS) definition of HNC, HNC includes all types of cancers that arise at any of 30 specific sites within the head and neck area. The specific regions of the head and neck are the mouth and lips, larynx, pharynx, salivary glands, nose and sinuses, and areas at the back of the nose and mouth (nasopharynx).[4]

In Saudi Arabia, the incidence of oral cancer varies by region, and the incidence of oral cancer increases with age.[5] The mean age-standardized rate of oral cancer between 1994 and 2015 was 2.9 per 100,000 people, 1.5 for females and 1.4 for males.[5] The age-standardized rate of nasopharyngeal cancer alone per 100,000 people from 2007 to 2016 showed a national average of 1.06 and ranged from 0.39 in Jazan to 1.92 in Qassim.[6] Moreover, the Gulf Cooperation Council (GCC) member countries, including the United Arab Emirates, Saudi Arabia, Kuwait, Qatar, Bahrain, and Oman, have shown serious increases in new HNC cases and subsequent deaths. Oman and Saudi Arabia ranked the highest in HNC prevalence, with age-specific incidence rate ASIR 8.5 and 8.4 per 100,000 persons, respectively.[7] HNCs are considered the 18th top diagnosed cancer in the GCC and more than the eleventh likeliest cause of death due cancer in these countries.[2] Thus, the HNC burden is anticipated to rise two to three folds in the GCC by 2040.[7]

In general, HNC affects men two to four times more than women, with estimates reaching over 20 per 100,000.[8] HNC is considered multifactorial, and many risk factors can contribute to its increased incidence. The risk of HNC increases with age; it mainly affects people over 50 years of age.[9] However, tobacco use and alcohol consumption are major risk factors for HNC, accounting for 72% of cases, especially when used together.[1] In addition, human papillomavirus (HPV) is another significant risk factor, especially HPV type 16, for oropharyngeal cancer.[10] Additional variables, such as genetic susceptibility and family history of cancer, have been reported in the literature.[1] In addition, local factors, such as inadequate oral hygiene and ill-fitting oral appliances that cause mucosal injuries, also contribute to risk.[11] Many of these factors have been linked to head and neck cancer (HNC) in Saudi Arabia at various rates, making it essential to examine the incidence of different types of HNC to shed light on the relevant risk factors prevalent in the country.

Cancers of the head and neck area can be classified into different subtypes, which are categorized based on anatomical location using the World Health Organization's (WHO) International Classification of Diseases (ICD-11).[12] Other types of cancer, such as brain, thyroid, eye, esophagus, and skin of the head and neck, are not usually categorized as HNC.[13,14]

Very few studies have looked into the trends in the incidence of HNC in Saudi Arabia, and no known study has investigated HNC incidence from 2016–2020.[5,6,15-17] This study aimed to evaluate the incidence, gender differences, age-specific and geographical distributions of HNCs in the Saudi Arabian population from 2016–2020. This study is expected to provide valuable epidemiological insights on the overall burden of HNC in the population. Also, the outcomes can aid in improving prevention, early detection, and identifying region related risk factors in the country. The most recently released data from the Saudi Cancer Registry (SCR) was used in this research, as the last published report was from 2020.

Materials and Methods

This was a retrospective descriptive study investigating HNC in the Saudi population from January 2016 through December 2020. All data included were retrieved from SCR, which is a

population-based registry established in 1994 by the Ministry of Health in Saudi Arabia that publishes yearly reports on cancer cases. Each report shows multiple tables with row data of all different types of body cancers and cases distribution throughout Saudi regions. No cases have been excluded in this project and all data displayed in the yearly tables about HNC were used in the analysis. No ethical approval was obtained as the data are publically available on the Saudi Cancer Registry SCR website.

In this study, male and female data were included on the lip, tongue, mouth, salivary glands, oropharynx, nasopharynx hypopharynx, pharynx, nose and sinuses, and larynx. Saudi Arabia is geographically partitioned into 13 administrative regions from which all the diagnosed cases were documented and included in the analysis during the duration of the study.

In SCR reports, the age-standardized rate (ASR) and age-specific incidence rate (ASIR) were calculated with a focus on gender-specific and regional differences. The ASR is a summary measure of the rate that would have been observed if the population had a standard age structure. Standardization is necessary when comparing many populations that vary in terms of age; the world standardized population is the most used standard population. The calculated incidence is known as the World Standardized Incidence Rate and is expressed in terms of 100,000 of the population. The ASIR is another parameter used when comparing cancer incidences between different populations with respect to age. ASIR is defined as the number of cancer cases occurring during a specific year in a population category of interest, divided by the at-risk population for that category and multiplied by 100,000. Descriptive analysis of the data was conducted by calculating the mean ASR and AIR stratified by age, sex, region, and year of diagnosis. In the SCR reports, the ASR was calculated by adjusting all Saudi populations from all regions to have the same age structure. All statistical analysis were done using Microsoft excel.

Results

The total number of cancer cases identified by the SCR from 2016–2020 was 74,187, with 31,783 (42.84%) males and 41,148 (55.4%) females. Only 3,232 cases (4.3%) were HNC, of which 2,082 (64.4%) were males and 1,150 (35.5%) were females (Table 1). The number of male cases each year was almost double the number of female cases. The Riyadh region showed the highest number of diagnosed cases from 2016–2020 with 844 cases, followed by the Makkah region with 843 cases and the eastern region with 458. The northern Baha and Najran regions showed the lowest number of cases during the study period, with only 45, 43, and 40 cases, respectively (Table 2). Nasopharyngeal cancer had the highest incidence rate between 2016 and 2020, with 1,036 instances in both males and females. This was followed by tongue cancer with 598 cases and mouth cancer with 558 cases. On the other hand, only 34 cases of pharynx cancer and 22 of the other oropharynx cases were reported during this period (Figure 1).

HNC ASIR Increases with Age

The ASIR increased with advancing age in both genders between 2016–2020. There was a significant rise in ASIR noted after the age of 50 years for both sexes. Higher HNC rates were observed in males compared to females in all age groups, and the gap increased to the 50–54 age group and higher age groups (Figure 2).

HNC ASR during the Study Period

The mean ASR of HNC was higher in males compared to females from 2016–2020. There was no significant change in the ASR means per 100,000 for males and females throughout the study period, with almost flat curves and an ASR mean of 4.94 for males and 2.9 for females (Figure 3).

HNC ASR Distribution by Region and Gender

The ASR data for the documented HNC cases of both sexes showed slight diversity across the Saudi provinces. The ASR means per 100,000 people for the period from 2016–2020 ranged from 2.22 in Hail to 5.3 in Jazan, with a national average of 3.68 per 100,000 (Figure 4). The Riyadh region reported the highest male ASR mean at 6.42, followed by Jazan at 6.02. However, the Hail and Madina regions reported the lowest ASR mean for males, at 3.02 and 2.92 per 100,000 cases, respectively (Figure 5). On the other hand, the average ASR for females was almost half the mean ASR of males in all regions except Jazan, where the mean ASR for females was 4.58. This was the highest mean ASR for females documented; the lowest was reported in Hail, at 1.42 per 100,000 population (Figure 5).

Discussion

In this study, the incidence and geographical distributions of HNCs across Saudi Arabia between 2016 and 2020 were investigated using data obtained from the SCR. The ASR data trends curve for HNC remained almost constant without significant change from 2016 to 2020, with a higher incidence in males compared to females (Figure 3). In addition, the HNC ASIR increased with age; the most significant increase occurred after age 50, more so for men than for women. These results stand in contrast to the findings of Alsheri et al., who found that the curve of diagnosed oral cancer cases in Saudi Arabia fluctuated over time from 1994 to 2015. Moreover, in

Table 1. **Number of male and female head and neck cancer cases with percentages in Saudi Arabia for the period from 2016 to 2020**

Year	Number of male cases	%	Number of female cases	%	Total
2016	412	64	231	35	643
2017	377	61.4	237	38.5	614
2018	441	66.8	219	33.2	660
2019	428	62.9	252	37.1	680
2020	424	66.7	211	33.3	635
Total	**2082**	**64.4**	**1150**	**35.6**	**3232**

Table 2. **The total number of diagnosed HNC cases with percentages in all regions during the period 2016-2020 in descending order**

Region	HNC male cases	%	HNC female cases	%	Total
Riyadh	561	66.4	283	33.5	844
Makkah	563	66.7	280	33.2	843
Eastern	313	68.3	145	31.7	458
Asir	158	60.5	103	39.5	261
Jazan	127	53.5	110	46.5	237
Qassim	87	64.9	47	35.1	134
Madina	82	62.5	49	37.4	131
Tabuk	59	62.8	35	37.2	94
Jouf	34	64	19	35	53
Hail	34	67	17	33	51
Baha	25	56	20	44	45
Najran	32	74.5	11	25.5	43
Northern	29	72.5	11	27.5	40

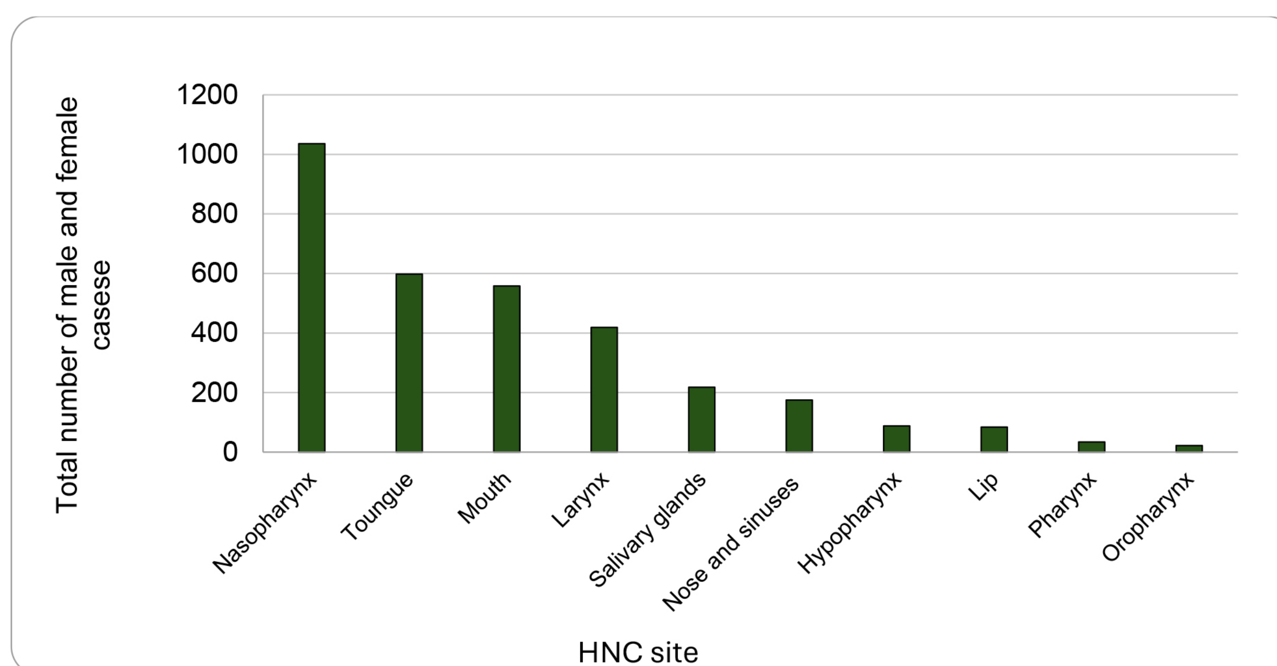

Fig. 1 **Total number of HNC cases of both genders between 2016 and 2020 in Saudi Arabia in relation to the HNC site.**

the eastern region, there was a general increase in the incidence of HNC between 2006 and 2018, with a slight drop from 2016 to 2018.[18] Comparably, HNC incidence rates have increased worldwide, including in the USA and Europe; this rise is linked to HPV infections.[19] In addition, studies in the UK showed an increase in oral and oropharyngeal cancer incidence from 1995–2011 for both genders.[20] Likewise, laryngeal cancers have increased by 23% over the past ten years.[1]

This steadiness of the data in this study can be attributed to many factors, including the significant improvement of the healthcare system in Saudi Arabia and better accessibility to health services as part of Saudi Vision 2030. This huge growth in medical services in Saudi Arabia can play a major role in the early detection and diagnosis of pre-malignancies before cancer develops. In addition, the increased awareness of healthcare among the Saudi population is concurrent with improved educational and socioeconomic status, which also plays an essential role in the early detection of infectious factors related to HNC. Furthermore, Saudi Arabia is an Islamic country, wherein HNC risk factors such as alcohol consumption and other addictive substances are deemed illegal, as the legal framework is founded on Islamic Sharia principles.[21] Conversely, cigarette smoking is legally permitted, but it has not been socially accepted for quite some time. This could be the reason for the lower number of HNC cases among the Saudi population.[22] Infection with HPV has been identified as a crucial factor in the development of head and neck squamous cell carcinoma (HNSCC), with research highlighting its significance independent of other known risk factors, such as smoking or alcohol consumption. Notably, studies have demonstrated that the prevalence of HPV in Saudi patients with HNSCC is significantly lower compared to global

estimates, which generally range from 32% to 36%.[23] This suggests that HPV infection may be less common as a contributing factor to HNSCC in Saudi Arabia compared to other parts of the world.[23]

In this study, nasopharyngeal cancer (NPC) showed the highest number of diagnosed cases during the study period of 2016–2020. This is in line with the fact that nasopharyngeal cancer accounts for 31.4% of HNCs diagnosed in Saudi Arabia annually, and it was the number one HNC diagnosed in the country in 2016.[6,15] This high prevalence of NPC among Saudis can be explained by exposure to different NPC-related risk factors, such as certain human leukocyte antigen class I genotypes, high intake of preserved foods, history of chronic respiratory tract diseases, family history of NPC, exposure to different inhalants, and occupational exposures, which are commonly found in the Saudi population.[24]

Our results also showed that more males than females were diagnosed with HNC in Saudi Arabia from 2016–2020.

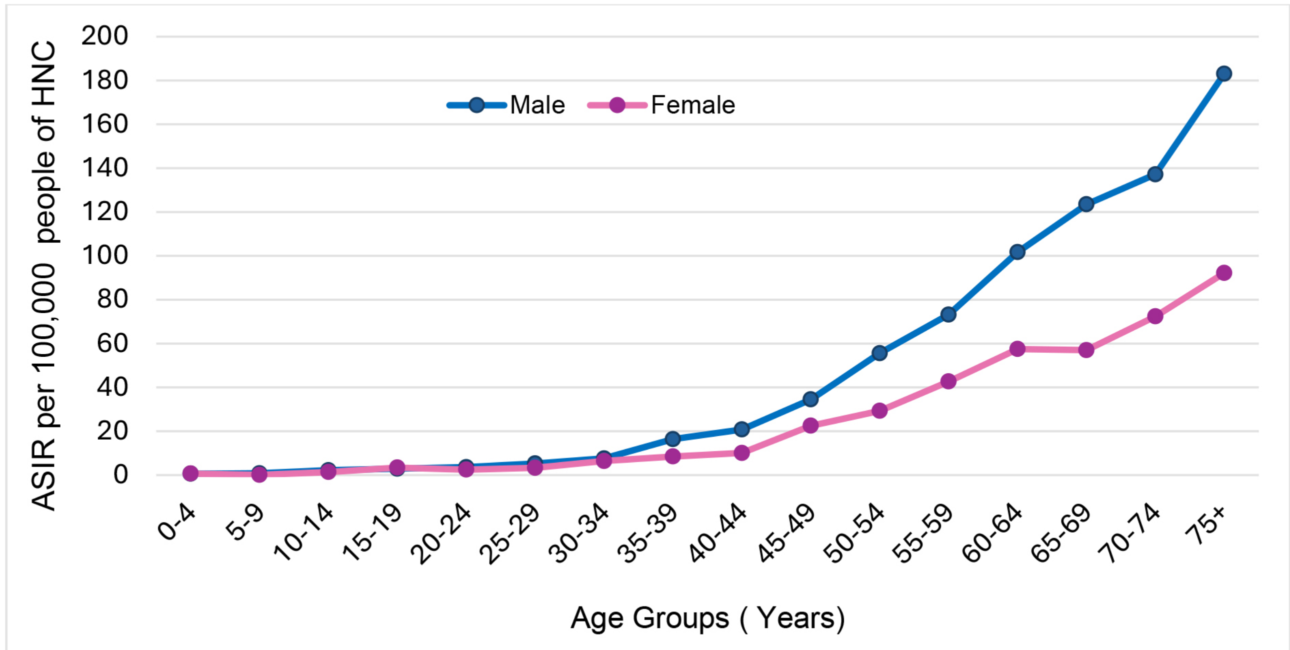

Fig. 2 **The ASIR data from 2016 to 2020 revealed a positive correlation between HNC cancer incidence and age, with majority of cancer cases occurring in older age groups. Higher HNC rates were observed in males compared to females in all groups but the gap increased in the 50–54 age group and older ages.**

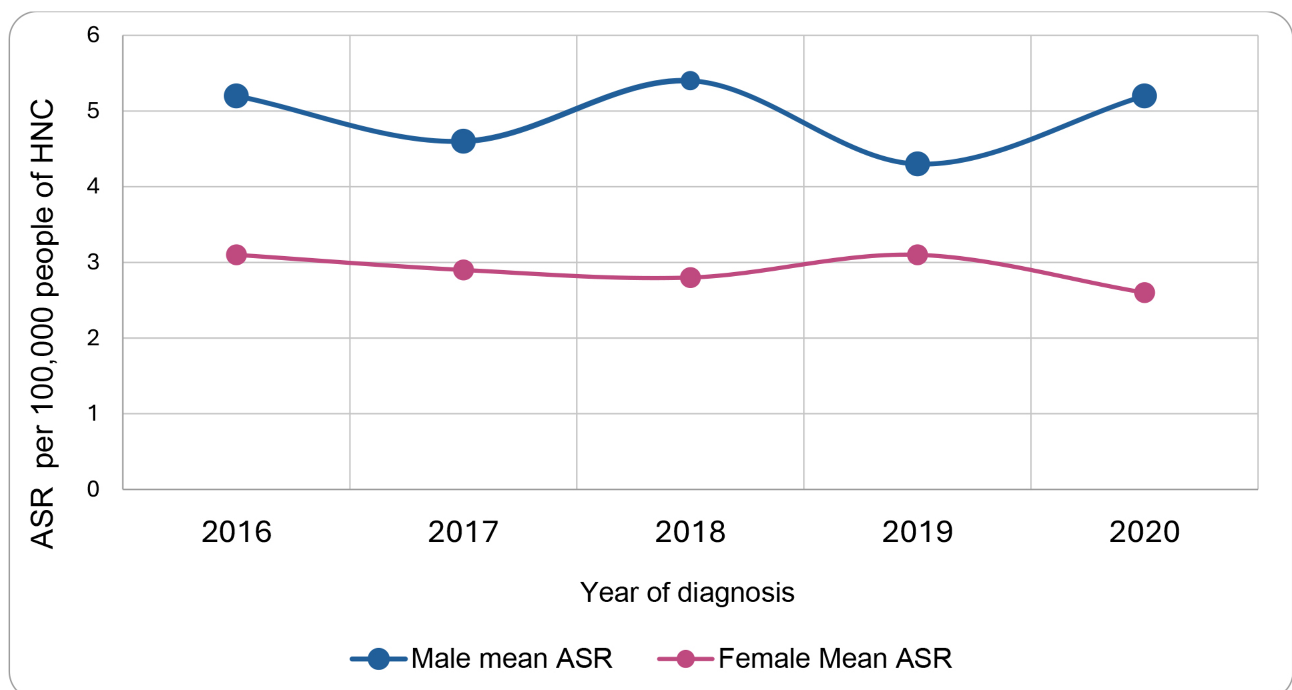

Fig. 3 **The HNC incidence was higher in males compared to females. No significant change in the ASR means in males or females diagnosed with HNC from 2016 to 2020.**

This finding is consistent with the global findings, in which HNC affects more males than females[2] and with the data from all GCC countries that gave the same results.[7] In addition, similar local findings were reported, indicating that men were diagnosed with NPC more than women from 2007–2016.[6] Moreover, a study from the Al-Baha region found that HNC was significantly greater in males than females between 2009 and 2019.[16] In contrast to these results, a study by Alsheri on Saudi people found that more women than men were diagnosed with oral cancer; the mean ASR was 1.4 for males and 1.6 for females.[5]

Like other types of cancers, the incidence of HNC in this study increased with age, in which more than 85% of the cases were diagnosed after age 50. This concurs with the incidence of oral cancer in Saudi Arabia between 1994 and 2015, where 75% of the cases were identified after the age of 50 years[5] and

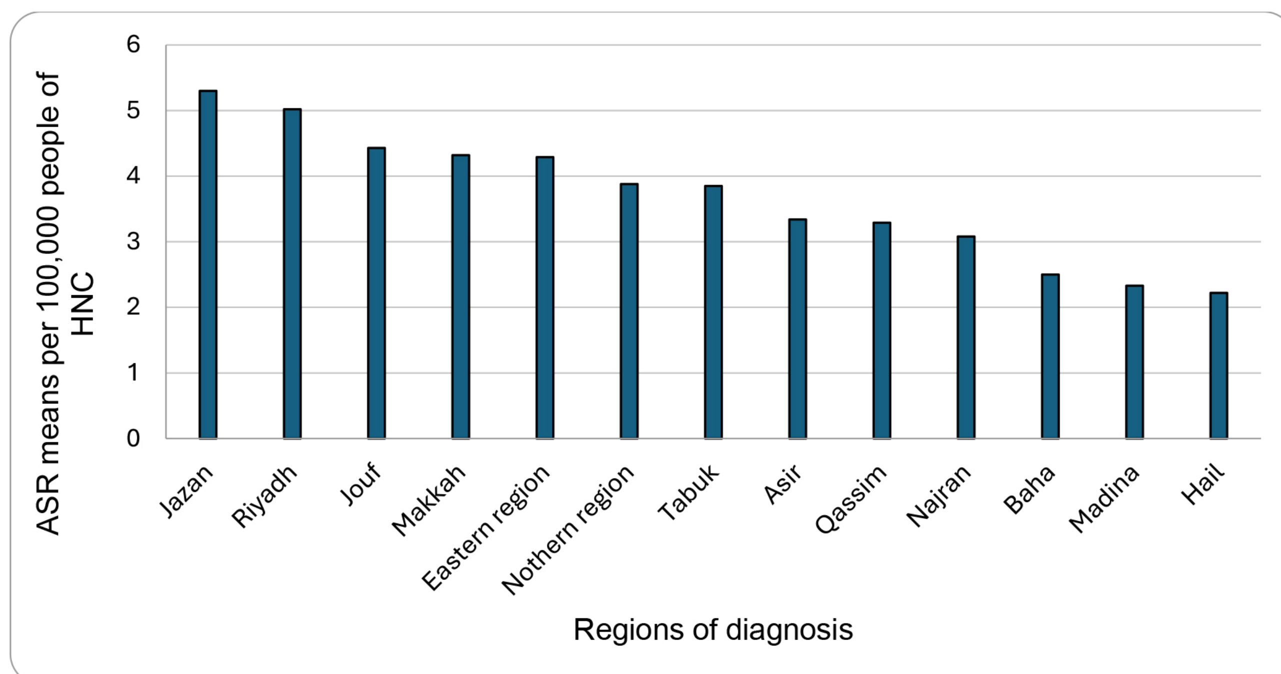

Fig. 4 **The means ASR data for head and neck cancer cases of both males and females showed slight variation across Saudi provinces. The ASR means per 100,000 people for the period from 2016–2020 ranged from 5.3 in Jazan to 2.22 in Hail for both genders.**

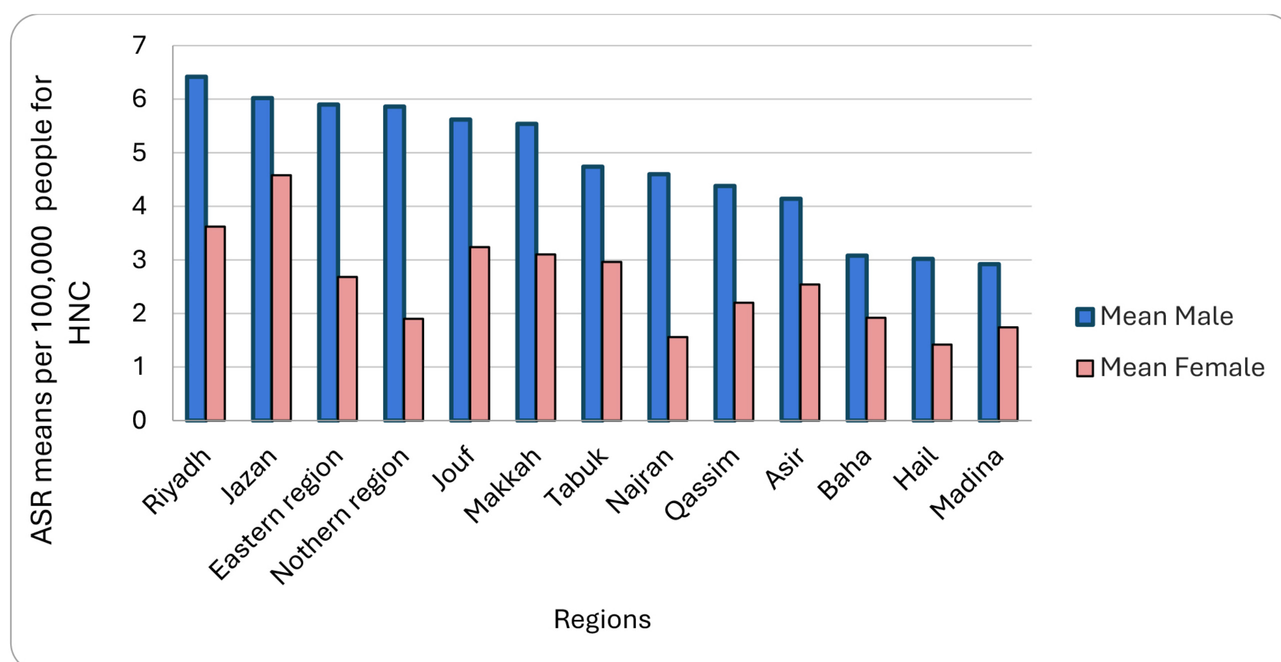

Fig. 5 **The ASR mean per 100,000 people for the period from 2016–2020 showed some variation between regions, with the highest male ASR mean at 6.42 reported in Riyadh, while for females, the highest was in Jazan with 4.58. The lowest ASR means were 2.92 for males in Madina and 1.42 for females in Hail.**

85% of NPC cases were diagnosed after the age of 40 years from 2007–2016.[6] In a similar manner, the average age at diagnosis of oral cancer in the United States is 62 years[9] and of NPC is 52.7 years.[25] The cumulative exposure to environmental risk factors as the individual ages can lead to increased susceptibility to oncogenic genetic maturations.

An examination of the geographical distribution in this study shows that the mean ASR per 100,000 people for men and women with HNC was the lowest in Hail and the highest in Jazan. Similarly, the mean ASR per 100,000 people in oral cancer for the period from 1994 to 2015 was the lowest in Hail at 1.5 and the highest in Jazan at 19.6.[5] In addition, this study found that the most prominent HNC subtype in Jazan from 2016 to 2020 was mouth cancer, with a total of 90 cases, followed by tongue cancer, with 83 cases and an almost equal number of cases for both genders. This aligns with similar results that have been reported for Jazan where it ranked the highest in oral cancer in Saudi Arabia, and the ASR was 6.2 for males and 9.82 for females.[26] Many studies have looked into the factors related to the increased incidence of oral cancer in the Jazan region.[17,27-32] It has been concluded that there was a significant prevalence of tobacco use, which is the main risk factor, including *shammah* and *khat*, among residents of the Jazan region of different ages.[17,28] *Shammah* is a powdered form of smokeless tobacco mixed with various ingredients, such as lime, pepper, and ash, which are placed in the buccal fold.[27] As discussed earlier, smokeless tobacco is a major factor contributing to oral cancer. Therefore, this high prevalence of HNC cases in Jazan Province is expected over time. Comparably, oral and lip cancers are highly frequent in variable areas such as in South Central Asia (e.g., India, Sri Lanka, and Pakistan), Southeast Asia and Asia-Pacific[33] and Melanesia due to the widespread use of betel nut chewing.[34] In India, oral cancer is considered a leading cause of cancer death, especially in males.[2]

The Riyadh region ranked second in terms of mean HNC ASR, which could be due to the fact that Riyadh city has the largest population in Saudi Arabia, with a significantly greater number of hospitals and healthcare centers compared to other cities. In addition, the established healthcare system in Saudi Arabia, with facilitated access to services, has an impact on the early detection and documentation of cancer cases. The main limitation of this study is its retrospective nature. However, all analyzed records were governmental registered data, which is considered a notable advantage. More detailed reporting of the cities in each region with specific cancer subtypes could be helpful in determining the risk factors and causes of HNC.

Strengths and Limitations of the Study

The data provided by SCR were arranged in tables that included all types of cancer, and no specific analysis of HNC incidence rates was presented. Another limitation is that the statistical analysis was conducted on secondary data, which only allowed for descriptive analysis and did not support any further investigation. In this study, the valuable and concentrated information on HNC in Saudi Arabia within the study period was presented in a more focused manner. The last published report on SCR was on data from 2020. This represented a limitation of the study, as we could not include statistics on the subsequent years. We recommend that the authorities try to publish more updated reports, which will help in research.

Conclusion

In general, between 2016 and 2020, HNC incidence in Saudi Arabia remained stable, with consistently higher ASR in males. This persistent gender gap suggests that interventions aimed at reducing male-specific risk factors, such as tobacco use, could be vital. A significant age-related increase in cancer incidence was observed, espcially after age of 50, emphasizing the need for age-specific prevention. A clear geographic variation was observed in HNC distribution. These regional disparities may be indicative of differences in risk factors such as environmental exposures, access to healthcare, and population density, all of which warrant further investigation. Public health strategies should consider tailoring cancer prevention and awareness campaigns to high-risk regions, particularly in areas where HNC rates are notably higher, like Jazan and Riyadh. Overall, these findings highlight the importance of targeted, region-specific health initiatives, greater public education, and age-targeted screening to reduce the impact of HNC in Saudi Arabia.

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Conflict of Interest

None.

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