

# Forecasting Head and Neck Cancer Trends in GCC Countries: Implications for Public Health Policy and Strategy

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**Purpose:** The data available on the incidence and mortality rates of head and neck cancer types (HNCs) in the Gulf Cooperation Council countries (GCC) have relied on global trends and covered only certain cancer sites, types or certain age groups. This study aimed to assess the incidence and mortality rates of head and neck cancer (HNCs) within the Gulf Cooperation Council (GCC) countries, providing insights into their geographic variability in 2020.

**Methods:** Prediction of the magnitude of the disease to 2040 was explored based on demographic projections. Estimates of incidence and mortality and the population projections were extracted from the Global Cancer Observatory (GLOBOCAN) database and the United Nations Department of Economic and Social Affairs respectively for the time frame 2020 to 2040. Additionally, we analyzed the distribution of cases and deaths by age and sex for both time periods.

**Results:** The analysis indicates varying patterns in HNC rates across GCC countries in 2020, with Oman and Saudi Arabia carrying the highest burden. Projections for 2040 reveal a substantial increase in new HNC cases and related deaths, particularly in Qatar, UAE, and Bahrain. Furthermore, incidence rates are predicted to rise significantly for individuals aged 50 and older, while remaining relatively stable for those under 50. With regards to sex, males generally exhibit higher rates, except in Qatar.

**Conclusion:** HNC burden is anticipated to rise significantly in the GCC, with variations per age, sex and geographical location. By 2040, a 2-3-fold increase in HNCs in the GCC is anticipated, emphasizing the need for focused public health strategies to address this rising health challenge.

**Keywords:** head and neck neoplasms, projection, globocan, cancer prevention

## Introduction

The Gulf Cooperation Council (GCC) member countries include Bahrain, Oman, Kuwait, Saudi Arabia, Qatar, and the United Arab Emirates, which together are comprised of 57.4 million people.<sup>1,2</sup> The GCC member countries tend to have similar economic, political, and sociocultural structures that shape their healthcare systems. They also share a history of healthcare practices, including traditional and modern medicine, which have further influenced the development of their healthcare systems. The healthcare outcomes of these countries are often impacted by similar environmental and psychosocial factors.

The GCC member countries are also well known for their economic prosperity, which has ultimately led to an increase in average life expectancy to more than 77 years, resulting in a rapid demographic transition.<sup>3,4</sup> As longevity

increased, chronic diseases, including cancers, became more prevalent, which suggests considerable challenges for future development.<sup>5</sup> Head and neck cancers (HNCs) are the seventh most commonly diagnosed cancer worldwide, accounting for more than 325,000 deaths and 660,000 new cases annually.<sup>6–8</sup> HNCs include cancers in the larynx, pharynx, lips, oral cavity, nose, and salivary glands. HNCs are the 18th most diagnosed cancer and the  $\geq 11$ th most common cause of cancer deaths in the GCC countries.<sup>6</sup>

Despite the advances in treatment, the rate of survival from HNCs remains poor until recently.<sup>9</sup> The regional differences in the incidence of HNCs are largely determined by the underlying regional populations, which are attributed to the differences in underlying risk factors and subtype distributions. The incidence of HNCs is increasing in high-income settings, with possible aetiological changes that have implications for prevention and treatment.<sup>10</sup> Although tobacco and alcohol consumptions were once considered as the established risk factors,<sup>7,11</sup> the risk is clearly socio-economically mediated, and HNCs are reported among non-smoking, non-alcohol users. Furthermore, the human papillomavirus has emerged as the likely cause of oropharyngeal cancer.<sup>11,12</sup> The increasing burden of cancer (including HNCs) is exerting tremendous economic strain, significant psychological distress, and substantial functional impairments on individuals, communities, and healthcare systems.<sup>13–15</sup>

The incidence and mortality rates of HNCs are not well studied in GCC countries. The results of the few studies published have relied on global trends or covered certain cancer sites or types.<sup>16–20</sup> Thus, the primary focus of this study was on describing the incidence and mortality rates of HNCs at the regional level and assessing the geographic variability across GCC countries. Herein, we describe the magnitudes and distributions of the major HNC types in 2020 and end by providing an estimate of the disease in 2040 on the basis of demographic projections for GCC countries, commenting briefly on the potential public health impacts of this trend in relation to the underlying causes and prospects for future cancer control.

## Data Source and Methods

### Head and Neck Cancer Prediction

Using the GLOBOCAN database (Cancer Tomorrow) of the International Agency for Research on Cancer (IARC), we retrieved predictions of the incidence and mortality rates of HNCs in GCC countries from 2020 to 2040.<sup>21</sup> As part of the GLOBOCAN 2020 report, key results for 6 HNC types in all six GCC countries have been published along with the sources and methods used to compile the estimates ([geo.iarc.fr](http://geo.iarc.fr)).<sup>6,21</sup> GLOBOCAN projections were based on constant age-specific cancer incidence throughout the years, where changes in the number of cases owing solely to population age distributions.<sup>6</sup> Various countries use similar methods for collecting age-specific cancer incidence and mortality rates. The incidence rates of HNCs were sourced from national cancer registries for all six GCC countries, while the mortality rates were assessed by modelling national incidence estimates as incidence-to-mortality ratios using cancer registry data from neighbouring countries.<sup>6</sup>

### Definition of Head and Neck Cancer

Our study adheres to the National Health Service (NHS) UK definition of HNC, NHS (UK) states that cancers can originate in over 30 specific areas within the head and neck region.<sup>22</sup> The specific areas of the Head and Neck considered in the NHS (UK) classification are: the mouth and lips, larynx, pharynx, salivary glands, nose and sinuses, and areas at the back of the nose and mouth (nasopharynx). Those are discretely categorised according to their anatomical locations using the International Classification of Diseases Related Health Problems, 10th Revision (ICD-10).<sup>8</sup> These include the lip, oral cavity (C00–C06), pharynx (including the oropharynx [C09–C10], hypopharynx [C12–C13], and nasopharynx [C11]), larynx (C32), and salivary glands (C07–C08).<sup>21</sup> Paranasal sinuses and nasal cavity cancers were excluded, as they were not included in the GLOBOCAN database.

### Population

Population data corresponding to the year were obtained from the United Nations (UN) website.<sup>23</sup>

## Data Analysis

Future trends in the incidence and mortality rates of HNCs from 2020 to 2040 were estimated for the six GCC countries. Detailed information about the data and the methodological approach used in compiling the IARC cancer estimates can be found in detail elsewhere.<sup>24</sup> Our study presents age-standardised incidence or mortality rates per 100,000 person-years using the 1966 Segi-Doll World standard population.<sup>25</sup> Additionally, we present a forecast for the future burden of HNCs in 2040, utilizing demographic projections and assuming that the rates estimated at the national level in 2020 remain constant. Since cancer incidence and mortality is strongly age-dependent, we further assess the burden of HNCs by characterising age according to a binary proxy of <50 vs ≥50. The age division may have clinical relevance since it might affect cancer diagnosis, treatment choices, and prognosis. Considering that younger patients may respond differently to treatment than older patients, healthcare strategies may need to be adjusted accordingly.

## Ethical Considerations

This study was based on open-access and previously anonymised data. Ethical clearance to conduct this study was obtained from the Research Ethical Committee at Taibah University College of Dentistry (TUCDREC/051233/ATAlsharif).

## Results

### Current Incidence and Mortality

The estimated age standardized incidence/mortality rate (ASIR/ASMR) per 100,000 persons and cumulative risk (age 0–85) of HNCs combined are presented in Table 1. The highest burden of HNCs is observed in Oman and Saudi Arabia (ASIR 8.5 and 8.4 per 100,000 persons respectively) followed closely by UAE and Kuwait (ASIR 7.8 and 7.2 per 100,000 persons respectively) and Qatar and Bahrain (ASIR 6.7 per 100,000 persons each). The cumulative risk of developing HNCs is the highest in UAE (2.16%) and Saudi Arabia (1.99%) and the lowest in Kuwait (1.4%) and Qatar (1.32%). On sex level, the ASIR and the cumulative risk of HNCs in males are higher than in females in all GCC countries. The highest ASIR per 100,000 persons of HNCs among males are seen in Oman, Bahrain and Saudi Arabia (5.9, 5.2 and 5.1 respectively) and among females in UAE (3.7) and Saudi Arabia (3.3). The highest cumulative risk to getting HNCs among males is predicted to be in UAE (1.42%) and in Saudi Arabia among females (0.77%). With regards to mortality, the highest ASMR per 100,000 persons is observed in Oman (4.9), UAE (4.4) and Saudi Arabia (4.2). Similar to the incidence rates, the ASMR per 100,000 persons and the cumulative risk of dying from HNCs are higher in males all GCC countries except in Qatar where ASMR per 100,000 persons of females is equal to males and the cumulative risk is slightly higher among females.

### Projections of Future Incidence and Mortality

The incidence of HNCs in GCC countries was 1925 in the year 2020 and is projected to rise to 4444 by the year 2040. Meanwhile, the number of fatalities is expected to increase from 923 in 2020 to 2345 by 2040. Figure 1 illustrates the projection pattern of new HNC cases and related deaths from 2020 (baseline) to 2040 across all GCC countries. Over this time period, Qatar, UAE and Bahrain are projected to the largest increases of newly diagnosed HNC cases, with anticipated increases of +219%, +213%, and 192% respectively. In the remaining three GCC countries, the expected increases vary from +130% to +113%. The mortality projections exhibit a similar pattern, aligning with trends observed in the incidence rates.

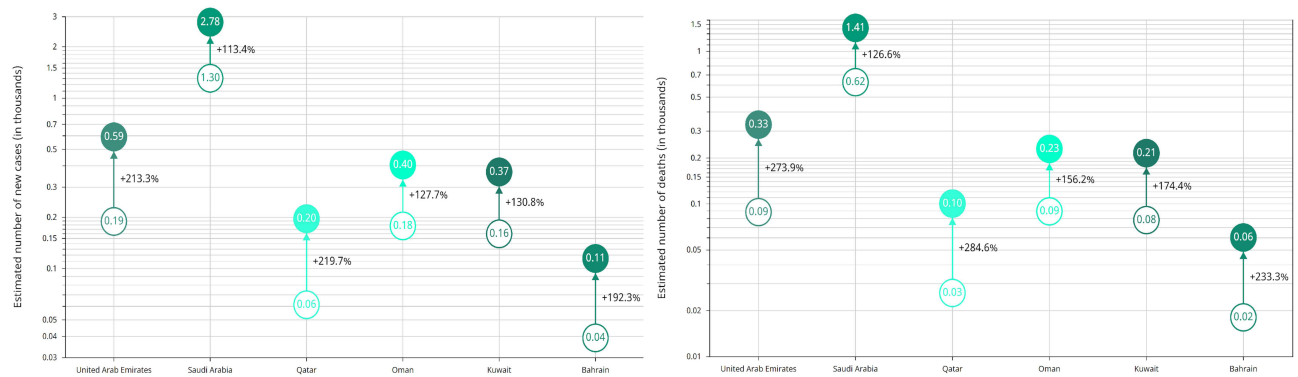
### Changing Profile of HNCs

The incidence of HNCs in the GCC countries for individuals below the age of 50 was 756 cases in 2020 and is projected to be 757 cases in 2040. On the other hand, the number of HNC cases for individuals aged 50 years or older is expected to rise significantly from 1169 cases in 2020 to 3688 cases in 2040. As for HNC-related deaths, in 2020, there were 285 deaths among individuals below 50 years of age, and this number is estimated to increase to 291 by 2040. For the population aged 50 years or above, the number of HNC-related deaths is anticipated to increase from 638 in 2020 to 2053

**Table 1** Incidence and Mortality Rates (Age- Standardized Rate, Cumulative Risk) for GCC Areas and Sex for Head and Neck Cancers Combined in 2020

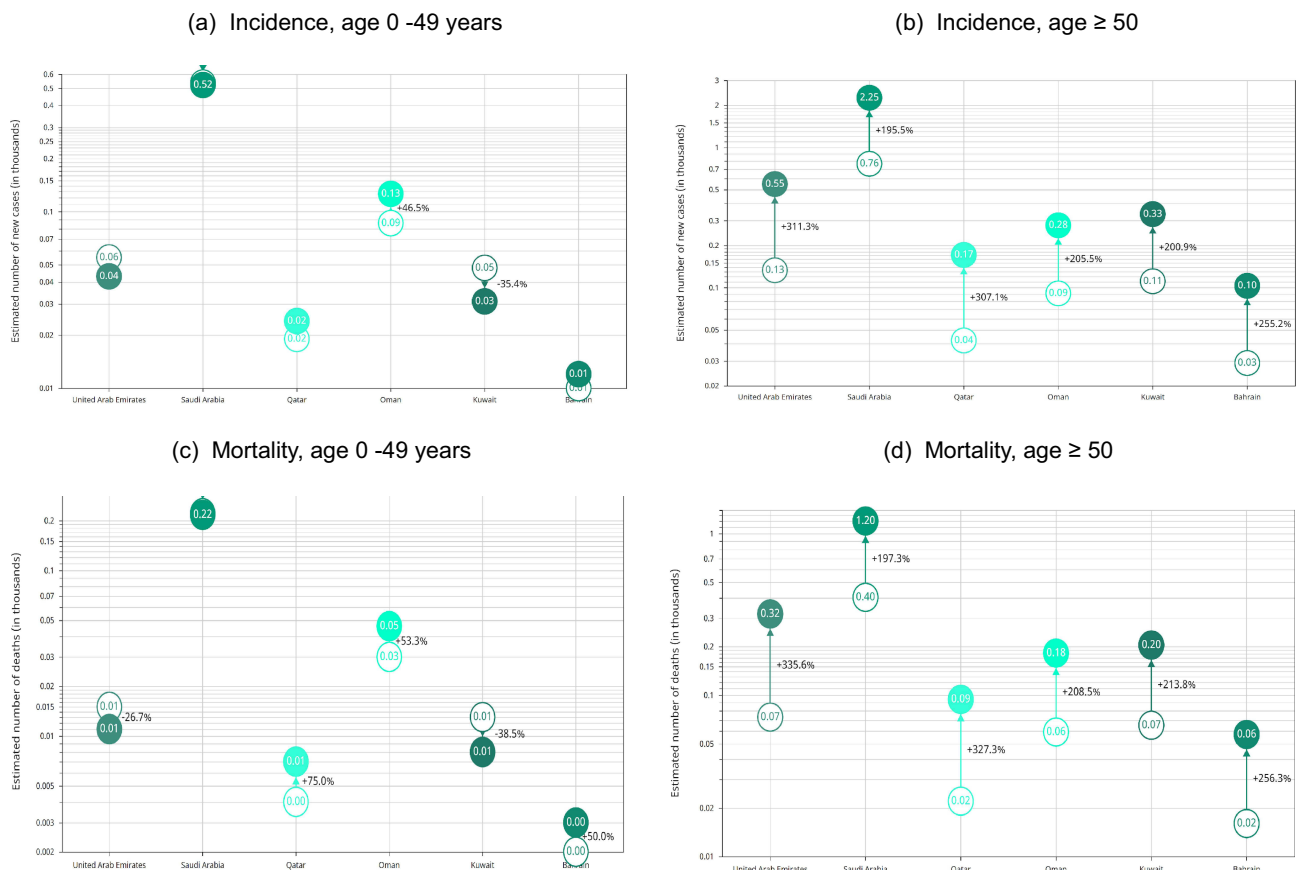
Countries	Incidence						Mortality					
	Males		Females		Total		Males		Females		Total	
	ASR	CR, Age 0–85 (%)	ASR	CR, Age 0–85 (%)	ASR	CR, Age 0–85 (%)	ASR	CR, Age 0–85 (%)	ASR	CR, Age 0–85 (%)	ASR	CR, Age 0–85 (%)
Saudi Arabia	5.1	1.22	3.3	0.77	8.4	1.99	2.6	0.67	1.6	0.39	4.2	1.06
UAE	4.1	1.41	3.7	0.75	7.8	2.16	2.3	0.82	2.1	0.34	4.4	1.16
Kuwait	4.8	0.92	2.4	0.48	7.2	1.4	2.6	0.47	1.4	0.3	4	0.77
Oman	5.9	0.86	2.6	0.4	8.5	1.26	3.4	0.54	1.5	0.29	4.9	0.83
Bahrain	5.2	1.36	1.5	0.24	6.7	1.6	2.7	0.85	0.9	0.12	3.6	0.97
Qatar	4.1	0.68	2.6	0.64	6.7	1.32	2	0.33	2	0.54	4	0.87
Total	4.9	1.08	2.7	0.55	7.6	1.62	2.6	0.61	1.6	0.33	4.2	0.94

**Notes:** ASR per 100,000 people. Source: GLOBOCAN 2020.  
**Abbreviations:** ASR, Age-standardized risk; CR, Cumulative risk; UAE, United Arab of Emirates.



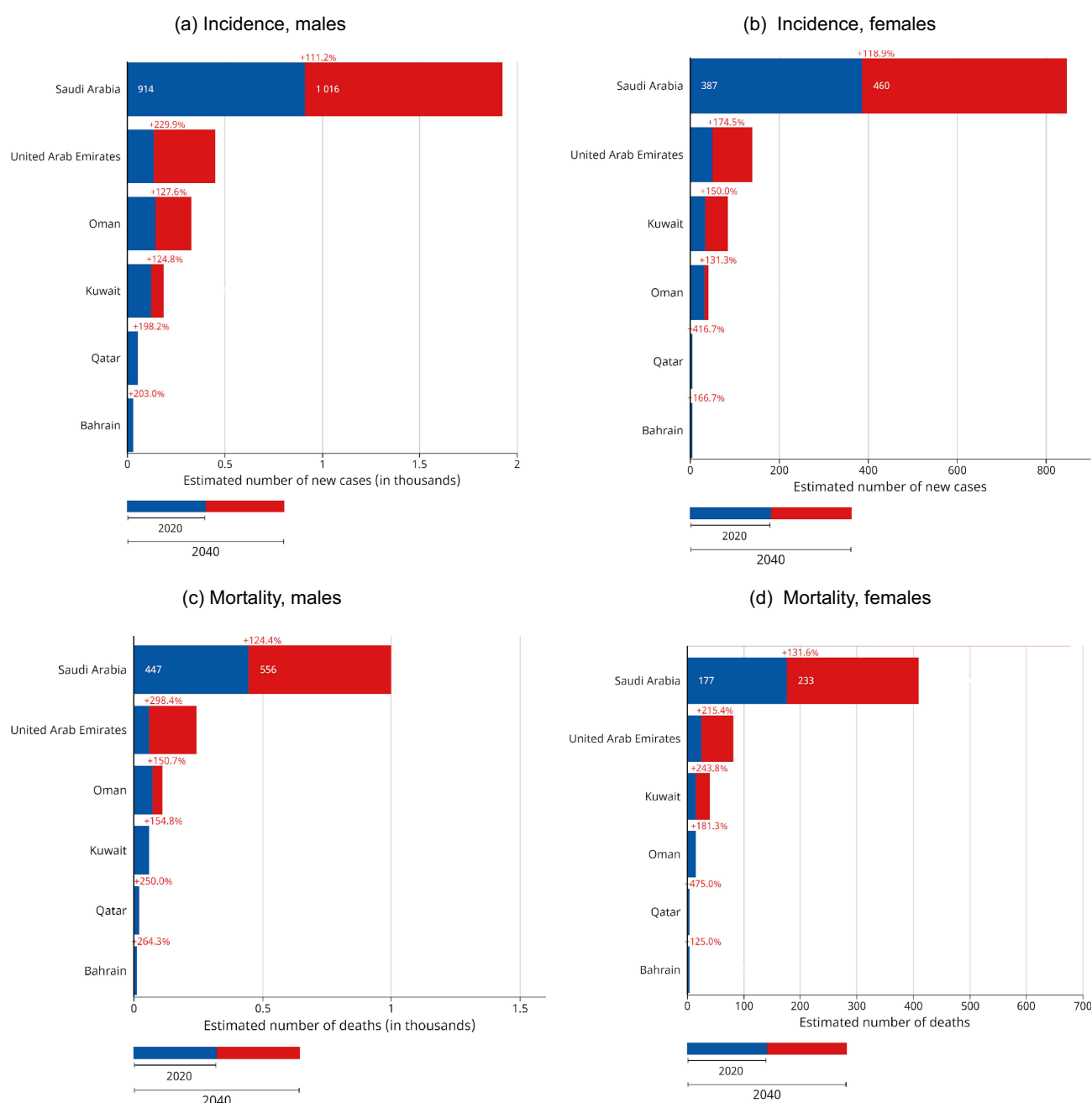
**Figure 1** Estimated number of new cases and death cases of head and neck cancers and the percentage of change from 2020 to 2040 by country.

by 2040. There was a substantial change point identified in the incidence and mortality of HNCs cases from 2020 to 2040 within the older population (aged  $\geq 50$ ) across all GCC countries (Figure 2). By 2040, the projected incidence/mortality of HNC among this age group peaked approximately by 4-folds in UAE (+311%/+335%) and Qatar (+307%/+327%) followed by the remaining countries. Saudi Arabia had the lowest projected incidence and mortality with 2-folds increase (+195%/+197%). Among individuals younger than 50 years old, Oman exhibits the most significant variation in incidence projection with a remarkable increase of 46%. As for mortality projection in the same age group, Qatar stands out with a notable rise of 75%.



**Figure 2** Estimated number of new cases and death cases of head and neck cancers and the percentage of change from 2020 to 2040 by country and age groups. (a) Estimated number of HNC new cases for those aged between 0 to 49 years, (b) Estimated number of HNC new cases for those aged 50 years and older, (c) Estimated number of HNC death cases for those aged between 0 to 49 years, and (d) Estimated number of HNC death cases for those aged 50 years and older.

When considering sex, the total incidence of HNCs among males in the GCC countries was 865 cases in 2020, and this number is projected to rise significantly to 2731 cases by 2040. For females, the incidence is expected to increase from 304 cases in 2020 to 958 cases in 2040. In terms of HNC-related deaths, in 2020, there were 473 deaths among males, and this number is anticipated to increase to 1518 by 2040. For females, the number of HNC-related deaths is expected to increase from 304 in 2020 to 958 in 2040. [Figure 3](#) illustrates the projected burden of HNCs on sex-specific level from 2020 to 2040. Surprisingly, the predicated incidence and mortality of HNCs combined is higher among females compared to males across the GCC region except in UAE and Bahrain where the projected trend is higher among males. By 2040, Qatar demonstrated the highest projected incidence/mortality of HNCs among females with estimated



**Figure 3** Estimated number of new cases and death cases of head and neck cancers and the percentage of change from 2020 to 2040 by country and sex. (a) Estimated number of new HNC cases among males, (b) Estimated number of new HNC cases among females, (c) Estimated number of HNC death cases among males, and (d) Estimated number of HNC death cases among females.

+417% new cases and +475% deaths followed by the remaining countries which represented between 2-3-folds increase. While among males, the projected incidence/mortality trend by 2040 are estimated to be approximately 2-folds higher in UAE, Bahrain and Qatar with percentage change of +230%/298%, +203%/264% and +198%/+250% respectively. The predicted change among males in Oman, Kuwait and Saudi Arabia are more than double by 2040.

## Discussion

This study examined the regional incidence, mortality rate, and geographic variability of HNCs in the GCC. Oman and Saudi Arabia had the highest ASIR of HNCs, while Bahrain and Qatar had the lowest rates. The differences in the incidence rates may be partly explained by the differences in exposure to numerous risk factors, such as tobacco use<sup>26–28</sup> and alcohol consumption,<sup>29–31</sup> increased incidence of the human papillomavirus (HPV),<sup>32,33</sup> and diet and familial risk.<sup>34,35</sup> Other risk factors that have a positive correlation with oral and oropharyngeal cancers, such as poor oral hygiene, genetics predispositions, and bacterial infection, are also present in the GCC.<sup>36</sup> In two reviews involving studies from GCC countries and the Middle Eastern region, the analysis indicates a strong association between tobacco (eg cigarette, shisha and narghile) and smokeless tobacco (specifically Shamma) and oral cancer.<sup>36–38</sup>

Oman, Saudi Arabia, and Bahrain have higher cumulative incidence and mortality risk in males, while Qatar has higher mortality risk in females. This result, which aligns with that of other studies,<sup>39,40</sup> is because the habits associated with HNCs – tobacco use and alcohol consumption – are strongly associated with males.<sup>41</sup> Increasing trends in smoking in GCC countries have been reported in several publications,<sup>42–44</sup> and globally, regions with high tobacco use and alcohol consumption tend to have higher HNC rates,<sup>34</sup> primarily affecting men.<sup>45,46</sup>

Sex disparity in HNC incidence and mortality was observed, with males generally having higher rates. In UAE, Qatar, and Bahrain, this trend is reversed, emphasizing the complex nature of these cancers. This raises the question of why Qatari females are affected by a notable rise in new HNC cases or mortality rates compared to females from other GCC countries. These findings could be related to its unique population structure with wide range of ethnic backgrounds, which have been associated with different health behaviours.<sup>47</sup> Moreover, increasing HPV infections in women have been observed<sup>32,33</sup> in Saudi Arabia and the UAE, which likely contribute to HNCs. Parallel findings are expected in other GCC countries as well. The reported data indicates a notable increase in the overall prevalence of oropharyngeal cancers in certain Gulf region countries, including Saudi Arabia and Arab Emirates, where a rise from 40% to 51% has been observed. This increase may be attributed, in part, to the rising incidence of HPV infections in these regions.<sup>36</sup> Increased HPV infection in the GCC can be attributed to a variety of factors, including changes in sexual behavior,<sup>48</sup> inadequate vaccination strategies, effective detection methods, and a lack of public awareness of HPV transmission.<sup>49,50</sup> In Qatar, HNCs represent 4% of all malignant cancers, with approximately 60% of them being in advanced stages.<sup>51,52</sup> These findings emphasise the necessity of tailored healthcare approaches and awareness campaigns to address the unique challenges posed by HNCs.

This study, in addition to depicting the magnitude and distribution of major HNC types in the GCC in 2020, offers two predictions: that, by 2040, HNCs cases could increase by approximately 2.3-fold compared to the levels in 2020, and that fatalities could rise by around 2.5-fold by 2040. These predictions indicate a concerning trend of increasing HNCs and related deaths in the coming years, with Qatar, UAE, and Bahrain expected to bear the brunt of them. Globally, the incidence and mortality rates of HNCs are on the rise, with a projected 30% rise in incidence by 2030.<sup>53</sup> HNCs account for a significant portion of all cancers, contributing to 4.9% of incidence and 4.7% of cancer-related deaths, with the highest rates found in Southeast Asia, Western Pacific, and Pacific Asia regions.<sup>7</sup>

A key distinction in the GCC countries is the substantial shift in the HNC profiles, with an increase in cases and deaths among individuals aged 50 and above, straining the GCC's healthcare system. However, the reverse trend is expected in Qatar, a demographic change that underscores the importance of age-specific interventions and healthcare strategies. In line with the demographic projections for GCC countries, the average population age rose from 30.2 in 2017 to 31.4 in 2021.<sup>54</sup> This demographic shift towards an older population is expected to have implications for HNC incidence and mortality and can burden the healthcare system, particularly in terms of cancer diagnosis and treatment.

In GCC countries where HNC prognosis is poor, this study proposes a few key strategies including raising public awareness, as knowledge about HNCs is notably low.<sup>55,56</sup> General educational campaigns as social media can help



disseminate information, and dental offices can serve as educational hubs. Collaboration between medical and dental professionals is essential,<sup>57</sup> early HNC screening in physicians' offices, which demands excellent training and robust referral systems. Dentists can also be trained in tobacco cessation and pharmacists in HPV vaccination.<sup>58–60</sup> HPV vaccination awareness should be heightened by following successful models, such as the UAE's free schoolgirl vaccination programme.<sup>32</sup> Qatar's recent approval of the HPV vaccine and cancer screening programs are positive steps.<sup>61</sup> Early diagnosis is vital, especially for high-risk groups, such as smokeless tobacco users.<sup>28</sup> IARC's Perspectives on oral cancer prevention could guide the policy makers to take necessary action on cancer prevention particularly on tobacco control at country levels.<sup>62</sup> Also crucial is overcoming barriers to participate, raising awareness, and promoting screening campaigns.<sup>63,64</sup>

## Implications

GLOBOCAN offers insight into cancer profiles based on country, site, age, and sex. These specifications can help ministries of health, policymakers, and healthcare organisations to formulate the necessary strategies and plans for the care and prevention for the projected increase in HNCs. The potential public health impact of this trend in relation to the underlying causes and prospects are necessary for future cancer control. Understanding the trend and variation in the incidence and mortality of HNCs can help experts from the public health, medical, allied health, nursing, community, and policy makers and cancer prevention advocacy groups to employ evidence-based decision-making in their countries.

## Limitations

Since GLOBOCAN uses cancer registries to generate estimates, caution should be made when interpreting them, as some registries may be deficient in terms of quality or comprehensive population coverage. The scope of our study was inherently dependent on the data available in this database, which did not include specific information on paranasal sinuses, nasal cavity cancers and some detailed information on HNC types and subsites. GLOBOCAN also does not account for preventive measures or alterations in risk factors – another plausible factor for imprecision. Additionally, the GLOBOCAN data did not consider the impact of COVID-19 on cancer diagnosis.

## Conclusion

Our study provides a comprehensive projection of the incidence and mortality rates of head and neck cancers in the Gulf Cooperation Council (GCC) countries from 2020 to 2040. The analyses reveal a significant projected increase in the burden of these cancers across the GCC region, with notable variations in incidence and mortality rates by country and age group. Our findings highlight the urgent need for comprehensive health policy strategies, particularly focusing on cancer prevention, early detection, and management. Furthermore, these findings have implications for resource allocation and healthcare planning. Policymakers and healthcare providers must consider these projections in their long-term planning to effectively address the growing cancer burden. The recently published Handbook on Oral Cancer Prevention provides scientific evidence on recommended interventions for control of oral cancer, which is a major cancer within the Head and Neck Region.<sup>65</sup> Additionally, the data underscores the critical need for targeted research into region-specific risk factors such as age and gender and preventative strategies for the GCC population, to better inform future healthcare interventions.

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## Disclosure

The authors report no conflicts of interest in this work.

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