Original Article

A comparative analysis of the burden of lip and oral cavity cancers in the Indian subcontinent

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Abstract

Introduction: Lip and oral cavity cancers are among the top 10 cancer causes and mortality globally. Some countries in the Indian subcontinent bear a disproportionately higher burden of lip and oral cavity cancers. Detailed analysis of lip and oral cavity cancers in the Indian subcontinent using all available data is important for effective policy planning. This paper aims to summarise the total burden of lip and oral cavity cancer and compare it across countries within the Indian subcontinent.

Materials and Methods: Data from the Global Cancer Observatory (GCO) and Global Burden of Disease (GBD) Study were extracted to analyse cancer incidence, prevalence, mortality and cancer risk before reaching 74 years. Furthermore, summary estimates of years of life lost (YLL), years lived with disability (YLDs) and disability-adjusted life years (DALYs) attributable to lip and oral cavity cancers were extracted from the GBD database. The data of individual countries within the Indian subcontinent were used for comparison.

Results: The estimated number of deaths from lip and oral cavity cancers for 2019 was 90732 in the Indian subcontinent. The Indian subcontinent accounted for 45.3% of the deaths attributable to lip and oral cavity cancers. The incidence of lip and oral cavity cancers in the Indian subcontinent ranged from 3.18 per 100,000 population in Maldives to 12.76 per 100,000 population in Pakistan. The incidence rate of lip and oral cavity cancer in India was 7.54 per 100,000 population. However, due to the population size, India accounted for 104837 incident cases of lip and oral cavity cancers annually. The estimated number of prevalent and incident cases of lip and oral cavity cancers from the Indian subcontinent in 2019 was 0.46 million (30% of overall cases globally) and 0.15 million (39% of incident cases globally), respectively. The Indian subcontinent also accounted for 50% of the DALYs attributable to lip and oral cavity cancers worldwide.

Discussion and Conclusion: The Indian subcontinent accounts for disproportionately higher cases and deaths due to lip and oral cavity cancers than other regions. It calls for urgent policy action to prevent the disease spread, early diagnosis and optimal management of lip and oral cavity cancers in the Indian subcontinent.

Keywords: Epidemiology, incidence, Indian subcontinent, lip and oral cavity cancers, mortality, prevalence

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INTRODUCTION

Cancers emerged as the leading cause of death in many high-income countries.[1] The health burden estimates indicate cancer as the first or second leading cause of death before 70 years in at least 112 countries.[2] Globally, 19.3 million new cases of cancer and 9.95 million deaths are reported from cancers of all sites.[3] However, the distribution of cases and fatalities shows substantial global diversity across different regions.[2-4] Furthermore, the relative incidence of cancers of different types and deaths in men and women varies by region.[2,3]

In India, the cumulative risk of cancer before the age of 74 years is 10.4%.[5] Similarly, the cumulative risk of cancer mortality before 74 years in India is 7.4% and 6.7% in men and women, respectively.[3] Globally, the cumulative risk of cancer and cancer mortality shows substantial diversity across different regions.[3,5-7]

Lip and oral cavity cancers are one of the top 10 cancers of the world.[4,8] Nearly 0.4 million cases of lip and oral cavity cancers are reported annually.[3] Similarly, 0.18 million deaths annually are attributable to lip and oral cavity cancers.[3] The age-standardised incidence rates of lip and oral cavity cancers are 6.0 and 2.3 per 100,000 population in men and women, respectively.[5] The age-standardised incidence rate of lip and oral cavity cancers in men varies from 1.0 in Central America to 13.3 in South Central Asia per 100,000 population.[5] Similarly, the age-standardised incidence rate of lip and oral cavity cancers shows substantial heterogeneity across different regions.[8] Asia accounts for 66% of lip and oral cavity cancer incidence (248360 cases), 61% in prevalence (584403 cases) and 74% (131610 deaths) in mortality.[2,3,8]

The Indian subcontinent, a physiographical region in Southern Asia, shares a substantial burden of lip and oral cavity cancers. It comprises Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka. Understanding the demographic and spatial variations in cancer burden is necessary for setting priorities for future clinical care and research.[9] Describing lip and oral cavity cancers in the Indian subcontinent using all available data is important for effective policy planning and efficient resource allocation. Although prior studies have reported on the global burden of oral cancers worldwide,[8,10,11] none of them focused on the Indian subcontinent. In this paper, the variation in lip and oral cancer incidence and mortality in the Indian subcontinent is explored and compared across different countries within the region.

MATERIAL AND METHODS

Global cancer estimation frameworks, such as the Global Burden of Disease (GBD) Study from the Institute for Health Metrics and Evaluation[12] and the Global Cancer Observatory from the International Agency for Research on Cancer,[5] provide reasonable estimates of cancer burden. We extracted data from the Global Cancer Observatory (GCO)[5] and the GBD Study.[12] The data sources available in the GCO are explained in detail on the GCO website. Further, we used the graphical visualisation tool of GCO, which covered cancer data for 185 countries. The data in GCO covered 36 types of cancers, stratified by gender and 18 different age groups. We extracted country-specific data on lip and oral cavity cancers (ICD 10 codes C00-C06) of the selected countries in the Indian subcontinent. The age-standardised incidence or mortality rates (ASR) per 100,000 person-years were estimated based on the 1966 Segi-Doll World standard population[13] for comparison across countries. Furthermore, the cumulative risk of developing or dying from cancer before age 75 was estimated after assuming the absence of competing causes of death.

The GBD 2019 estimated incidence, prevalence, years of life lost (YLLs), years lived with disability (YLDs) and disability-adjusted life years (DALYs). In GBD, the YLLs were computed by multiplying the number of deaths in a specific age group for each cancer by the remaining standard life expectancy at the age of death.[8] Disease-specific and condition-specific disability weights, representing the severity of health loss due to the condition, were used to calculate YLDs.[8] DALYs were calculated by adding YLLs and YLDs. In the GBD estimates, rates are reported per 100,000 population. Further, the age-standardised rates were calculated with the GBD world population standard.[8,9] Like GCO, GBD uses the tenth revision of the International Classification of Diseases (ICD-10) for cancer conditions. The vital registration system, cancer registries and verbal autopsy data are the main data sources in the GBD cancer estimates.[8] The cancer-specific Cause of Death Ensemble models (CODEm) are explained in detail elsewhere.[14]

We have also extracted the gross domestic product (GDP) per capita at the current rates from the International Monitory Fund website (https://www.imf.org/external/datamapper/NGDPDPC@WEO/OEMDC/ADVEC/WEOWORLD) and Human Development Index (HDI) from the United Nations Development data centre (https://hdr.undp.org/data-center). We used GDP and HDI for comparison purposes.

RESULTS

Deaths due to lip and oral cavity cancers

The estimated number of deaths (GBD 2019) from lip and oral cavity cancers was 90732 in the Indian subcontinent [Figure 1]. The Indian subcontinent accounted for 45.3% of the global deaths attributable to lip and oral cavity cancers. The death rate of 7.8 per 100,000 population due to lip and oral cavity cancers in Pakistan was among the highest in the region. The death rate in India and Sri Lanka was 4.7 per 100,000 population. The estimated death rate in Maldives was 1.5 per 100,000 population, while it was 3.3 per 100,000 in Nepal and Bangladesh.

Based on the GCO data of lip and oral cavity cancers from Bangladesh, the estimated number of deaths was 8137 (5352 in males). It was 75290 (57216 in males) in India, while Pakistan accounted for 10617 deaths (7026 in males). The estimated number of deaths in Sri Lanka was 1325 (1026 in males). The age-standardised lip and oral cancer mortality rates in Sri Lanka and Pakistan were 4.2 and 6.2 per 100,000 population, respectively. Similarly, the age-standardised mortality rate in India was 5.1 per 100,000 population.

Incidence and prevalence of lip and oral cavity cancers

Based on GBD data, the incidence of lip and oral cavity cancers in the Indian subcontinent ranged from 3.18 per 100,000 population in Maldives to 12.76 per 100,000 in Pakistan [Table 1]. The incidence rate of lip and oral cavity cancer in India was 7.54 per 100,000 population. However, due to the population size, India accounted for 104837 incident cases of lip and oral cavity cancers annually. Pakistan and Bangladesh accounted for 28579 and 8217 incident cases in 2019, respectively. The estimated number of prevalent and incident cases of lip and oral cavity cancers from the Indian subcontinent in 2019 was 0.46 million (30% of overall cases globally) and 0.15 million (39% of incident cases globally), respectively.

Cumulative morbidity burden due to lip and oral cavity cancers

The Indian subcontinent accounted for 50% of the total DALYs (2.7 million DALYs) attributable to lip and oral cavity cancers worldwide. The DALYs attributable to lip and oral cavity cancers in India in 2009 stood at 1.9 million, while it was 0.6 million in Pakistan [Figure 2]. Together, the countries in the Indian subcontinent accounted for 2.7 million and 50646 YLLs and YLDs, respectively [Table 1]. Within the Indian subcontinent, Pakistan reported the highest rate of DALYs (265 per 100,000 population) attributable to lip and oral cavity cancers. In India, the DALY rate was 138 per 100,000 population, while in Bangladesh, it was 91 per 100,000.
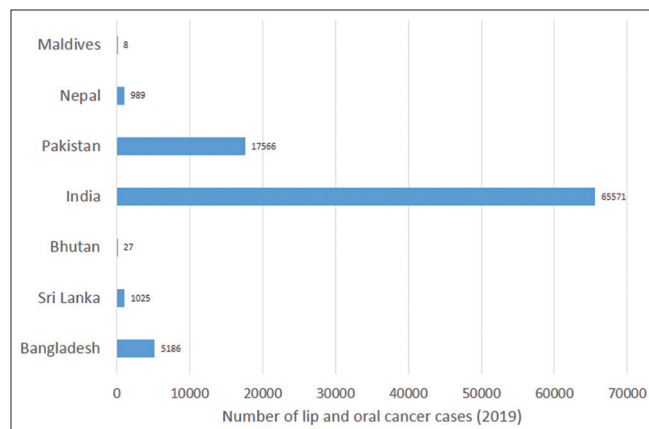

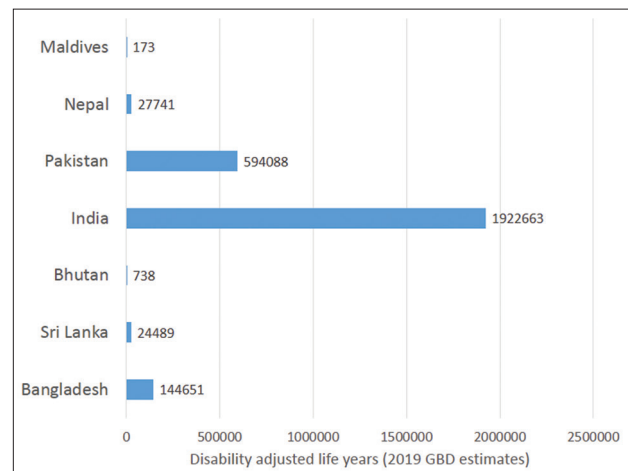**Figure 1:** Deaths due to lip and oral cancer cases in 2019 based on global burden of disease study

Figure 2: Disability-adjusted life years lost due to lip and oral cancer (2019 GBD estimates)

Table 1: Burden due to lip and oral cancer (2019 GBD estimates)

Country	YLL	YLD	Prevalence	Incidence	Incidence rate*	GDP	HDI
Bangladesh	141725	2925	25941	8217	5.16	2620	0.661
Sri Lanka	23676	812	8235	2070	9.47	3393	0.782
Bhutan	722	16	140	43	5.71	3500	0.666
India	1886211	36452	327648	104837	7.54	2610	0.663
Pakistan	584185	9903	92839	28579	12.76	1470	0.544
Nepal	27209	532	4596	1523	5.01	1350	0.602
Maldives	166	6	67	16	3.18	17560	0.747

YLL=years of life lost, YLD=years lived with disability, GDP=gross domestic product per capita (current rate), HDI=Human Development Index.
*Rate per 100,000 population

Trends in burden of lip and oral cavity cancers according to development status

The GDP per capita at current rates within the Indian subcontinent ranged from 1350 US dollars in Nepal to 17560 US dollars in Maldives. There was no trend in the incidence or prevalent rate of lip and oral cavity cancers with GDP per capita. The HDI within the region ranged from 0.544 in Pakistan to 0.782 in Sri Lanka. Like GDP per capita, there was no trend in HDI with the incidence and prevalence rates of lip and oral cavity cancers [Table 1].

DISCUSSION

The high incidence rate of lip and oral cavity cancers in the Indian subcontinent is alarming and calls for urgent policy action. While this region accounts for only 23% of the world's population, it carries the burden of 39% of incident cases, 30% of prevalent cases and 45% of deaths due to lip and oral cavity cancers. This disproportionately higher burden in this region should be the focus of future policy actions to prevent and manage lip and oral cavity cancers. Efforts should focus on narrowing the oral cancer equity gap between high-income countries and countries in the Indian subcontinent. The substantial burden of lip and oral cavity cancers in the Indian subcontinent reinforces the need for innovative and resource-sensitive models of cancer control efforts at the global level.

The Indian subcontinent accounts for 30% of the prevalent lip and oral cavity cancer cases. However, in terms of incidence, this region accounts for 39% of cases. It reflects the high mortality rate of lip and oral cavity cancers in the Indian subcontinent, possibly due to delayed diagnosis and sub-optimal management. Available literature shows that lip and oral cavity cancers are often diagnosed at a late stage, and the high mortality is due to the advanced stage of cancer at the time of diagnosis.[15,16] Investments in infrastructure for disseminating proven cancer prevention measures and expanding cancer care as part of universal health care in countries in the Indian subcontinent are critical for global cancer control. Oral health care, in general, incurs substantial out-of-pocket expenditure.[17] Furthermore, even with universal coverage, most health systems do not currently include oral health components in the available basket of provision of essential health care.[18] Expanding universal health coverage to oral health care will support early diagnosis and access to timely treatment of lip and oral cavity cancers. Therefore, integrating oral health care as part of universal health care is essential for mitigating the suffering from oral cancer in the Indian subcontinent.

The DALY represents cumulative burden due to mortality and morbidity. It is calculated by adding YLL and YLD. Within the DALYs, the contribution of YLL was substantial for lip and oral cavity cancers in the Indian subcontinent compared to YLD. It explains that after a lip and oral cavity cancer diagnosis, many do not survive with the disability. The high mortality burden during the productive life years contributes to the substantial YLLs due to lip and oral cavity cancer. This region's high mortality burden from lip and oral cavity cancers supports these findings.[7]

The substantial diversity of lip and oral cavity cancers and their relative distribution across different regions continue to offer clues to the underlying causes. The high prevalence of tobacco use in smoking and nonsmoking forms may be one of the leading underlying causes of the high incidence of lip and oral cavity cancers in the Indian subcontinent.[8] Effective and resource-sensitive preventative and curative interventions are available for oral cancer globally. Interventions targeting tobacco and alcohol use are the prominent preventive strategies.[19,20] Furthermore, actions to limit the impact of human papillomavirus infections are also effective strategies in preventing and controlling lip and oral cavity cancers.[20,21] Early diagnosis, even during precancerous lesions, also helps in effective management and reducing the substantial years lost in the productive life years. Population-based screening for oral cancer is estimated to be cost-saving or cost-effective in the Indian settings.[20,22] Tailored integration of these strategies into health planning nationally and regionally is essential to reduce the future burden and suffering from cancer in the Indian subcontinent.

Strengths and limitations

We relied on established global models for the estimation of the cancer burden. Although the data were available globally, the disproportionate burden of lip and oral cavity cancers in the Indian subcontinent was not highlighted in any previous publications. The validity of the data estimates varies from country to country, depending on the data sources used for estimation. The quality of data sources is often a concern in low- and middle-income countries. The lack of data or poor quality often leads to a substantial underestimation of the actual disease burden. The data availability across space and time limits the estimation accuracy of disease burden.

CONCLUSION

Disproportionately higher cases and deaths due to lip and oral cavity cancers in the Indian subcontinent calls for

urgent policy action to prevent the disease spread, early diagnosis and optimal management.

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Conflicts of interest
There are no conflicts of interest.

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