



Trends in Incidence of Head and Neck Cancers in Dibrugarh District, Assam, India; During the Period 2003–2016

Aditya Sharma¹ · Utpal Dutta¹ · Chandopal Saikia² · Dimpal Pathak³ · Moirangthem Kameshwor Singh⁴

Received: 21 June 2023 / Accepted: 21 May 2024

© The Author(s), under exclusive licence to Indian Association of Surgical Oncology 2024

Abstract

Head and neck cancers are considered to be the most common cancers in developing countries, especially in Southeast Asia. In India, it accounts for one-fourth of male cancers and one-tenth of female cancers. An attempt was made to study head and neck cancer trends in the Dibrugarh district of Assam, North-East India, India. All sites viz., oral cavity and mobile tongue, oropharynx, hypopharynx, larynx, nasopharynx and others were considered separately for both the sexes to carry out the present analysis. Using the data from the Population-Based Cancer Registry, Upper Assam, Dibrugarh, annual crude incidence rate and age-specific rate were calculated for the period from 2003 to 2016. Mann–Kendall and Sen’s Slope non-parametric analysis were applied to examine the trend in the percentages of Head and Neck cancers. The most frequent incidence site for HN cancers was the hypopharynx (33.50%). The disease was common among the males (78.87%) compared to the female (21.13%) population in Dibrugarh district. HN cancers are more prone to the age group 50–70 years (60.93%) compared to the individuals with less than 50 years (26.51%). Combining all the sites of HN cancers in male showed a significant decrease in incidence, whereas in female increasing trend was noted over a period of time. A slight decline in the percentage of head and neck cancer was documented in Dibrugarh when we combined both sexes. The results obtained from the current investigation will laid the scientific framework for proper planning and organization of prevention, diagnosis and treatment of HN cancers in Dibrugarh district, Assam.

Keywords Crude rate · Head and Neck cancers · Mann-Kendell · Sen’s Slope

Introduction

In the developing countries like India, incidence of cancer increases day by day due to population aging and changing life styles [1]. Head and neck (HN) cancers are emerging as a major health problem which has distinct demographic profile, risk factors, food habits and personal history. Head and neck squamous cell carcinomas (HNSCC) develop from the mucosal epithelium in the oral cavity, pharynx and larynx

and are the most common malignancies that arise in the head and neck [2]. In India, approximately 30–40% of all cancers are HN cancers which constitutes one-fourth of the male cancer and one-tenth of the total cancers in females. In India, oral cavity is the predominant site [3], attributed to the local custom of chewing pan, betel leaf with tobacco; however, smoking is the most common form of tobacco consumption in the urban areas [4]; similarly chewing tobacco is also most common in rural areas. In India, Kamrup (Metro) district of Assam emerged in the second position in HN cancer cases for both males and females in the country with 62.4 and 19.2 cases per one lakh male and female population, respectively. Moreover, Dibrugarh district emerged in top five positions with a 0.5% positive annual percentage change (APC) in age-adjusted incidence rates (AAR) over the time period in case of HN cancers among the female population [5]. Similarly the north-eastern region of India reports the highest incidence of HN cancer, among them are 50% of the people who are unaware that the cancer even occurs in the head and neck region [6]. Similarly in Assam, its incidence is

✉ Dimpal Pathak
dimpalpathak20@gmail.com

¹ Department of Pathology, Assam Medical College & Hospital, Dibrugarh, Assam 786002, India

² Department of Zoology, Tingkhong College, Dibrugarh, Assam 786612, India

³ Department of Statistics, Dibrugarh University, Dibrugarh, Assam 786004, India

⁴ Department of Life Sciences, Dibrugarh University-786001, Dibrugarh, India

much higher (54.48%) [6] compared to the other parts of the country. The risk factors like alcohol consumption, high risk human papilloma virus (HPV), chewing bidis, cigarettes, betel nuts, poor oral hygiene and other environmental factors are responsible for the HN cancers in Assam. Despite the high prevalence of HNC in Assam, there are a limited number of comprehensive researches on HN cancers in Assam. This indicates a potential gap in the region's knowledge and understanding of HNC. Therefore, the present analysis has been carried out to scrutinize the trends of HN cancers in the years 2003 to 2016 in Dibrugarh district of Assam; India.

Materials and Methods

Study Area and Data Used

The study area of the current study is Dibrugarh district of Assam, India. It has approximately 1.3 million people residing in an area of 3381 km². About 81.62% of the population resides in rural areas, and the remaining 18.38% lives in urban areas along with 51% males and 49% females [7]. The registered HN cancer data of Dibrugarh district for the period of 14 years, i.e., 2003–2016, was collected from Population-Based Cancer Registry, Upper Assam (PBCR-UA); Dibrugarh. The registry was established in 2003 at Assam Medical College and Hospital, Dibrugarh, under the supervision of Indian Council of Medical Research (ICMR), Government of India [1]. Data were analysed to determine the trend of HN cancers whether it is going upward or downward. During the study period, the survey team actively collected and completed the data from hospitals, pathological clinics, CT scan centres and nursing homes, and outpatients of the private and public clinics located in Dibrugarh district along with the health care centres of rural and urban areas. The PBCR-UA collected cancer cases disaggregated by age and sex along with the geographical information of the respective patients. In the study period, the registry also collected information on educational qualification, marital status, mother tongue, religion, and cultural group of the target population.

Methods

In this study, we utilized descriptive statistics to examine the characteristics of the study population. The results were presented in terms of percentage. Additionally, we employed the Mann–Kendall and Sen's Slope test to analyse the overall trend of head and neck (HN) cancer in Dibrugarh district. The Mann–Kendall test is perhaps the most widely used non-parametric test to detect a monotonic upward or downward trend. Unlike parametric regression analysis, the

Mann–Kendall test does not necessitate the assumption of data normality or linearity. In the present investigation a total number of 2731 patients with HN cancer have been analysed with special reference to the different repressors' like age group, place of residence, patient's sex and sub-sites of HN cancers.

Results

In the present study, the overall HN cancers cases were highest among the patients with the age group of 50–70 years with a percentage of 60.93% ($n = 1664$). It was found that the disease is more common in the males (78.87%) in comparison with the females (21.13%) and predominantly higher in the rural areas (63.86%). The most frequent incidence sub-site for HN cancers was found to be hypopharynx (33.50%), followed by oral cavity and mobile tongue (27.69%) and oropharynx (22.92%). Among the morphologies of HN cancers, squamous cell carcinoma (SCC) has the highest incidence with 87.11% ($n = 2379$) (see Table 1).

A visual representation of this data is provided in Fig. 1, which graphically illustrates the age distribution and emphasizes the average ages at the time of diagnosis of HNC of males and females. The average age at the time of diagnosis was 56.99 ± 12.40 years, with males having an average age of 57.88 ± 12.55 years and females having an average age of 53.67 ± 12.58 years. Among the sub-sites of head and neck (HN) cancers, larynx displayed the highest incidence in males, while oral cavity and mobile tongue showed the highest incidence among females (Fig. 2). The overall incidence was observed to be highest within the age group of 50–70 years. However, when considering the sub-sites, patients above the age of 70 had the highest incidence (19.92%) in the larynx sub-site. Conversely, patients below the age of 50 had the highest incidence (50.91%) in the nasopharynx sub-site (Fig. 3). The trend analysis indicated that there was a decrease in incidence when considering all sites of head and neck cancers in males. However, there was an observed increasing trend in females over the studied period (Fig. 4). Furthermore, when combining both sexes in the Dibrugarh district, a slight decline in the percentage of head and neck cancer cases was documented throughout the study (Figs. 5 and 6).

Table 2 presents the analysis of HN cancer cases in the Dibrugarh district from 2003 to 2016, utilizing Mann–Kendall and Sen's slope methods. The tests aimed to assess the statistical significance of changes (increase/decrease) in HN cancer occurrences during the study period. Similar to the results from the Mann–Kendall test, Sen's slope estimator also indicated negative values for male patients, indicating a significant and declining trend from 2003 to 2016 at a 5% level of significance. Conversely, for females, the results

Table 1 Characteristics of the study population

Patients' characteristics	Percentages	Number of cases
Age		
Less than 50	26.51	724
50–70	60.93	1,664
Above 70	12.56	343
Sex		
Male	78.87	2,154
Female	21.13	577
Place of residence		
Urban	36.14	987
Rural	63.86	1,744
Sub-sites of HNC		
Oral cavity and mobile tongue	27.69	756
Oropharynx	22.92	626
Hypopharynx	33.50	915
Larynx	8.64	236
Nasopharynx	2.01	55
Others	5.24	143
Morphology		
Squamous cell carcinoma (verrucous carcinoma, keratinizing squamous cell carcinoma, non-keratinizing squamous cell carcinoma and other variants of SCC)	87.11	2379
Malignant tumours other than SCC (sinusal undifferentiated carcinoma, lymphoepithelial carcinoma and malignant salivary gland tumours)	12.89	352
Total	100.0	2731

showed a positive trend. Furthermore, the overall trend of HNC exhibited a decrease, as indicated by the negative value of the Mann–Kendall test.

Discussions

The time trend analysis conducted in this study unveiled significant patterns in HN (head and neck) cancer cases throughout the research. Notably, there was a remarkable decrease in HN cancer incidence among males and a simultaneous increase among females. These findings align with the results reported by Mathur et al. [5], strengthening the evidence for gender-specific trends in HN cancer rates. Furthermore, when examining the distribution of cases among patients, the age group of 50–70 years exhibits the highest number of HN cancer cases, accounting for 60.93% of the total, as indicated in Table 1. This age-related pattern is consistent with previous research studies conducted by Manjari et al. [8], Bhattacharjee et al. [6] and Chauhan et al. [9], adding to the body of evidence that highlights this age group’s vulnerability to HN cancer. Notably, a significant male predominance in HN cancer cases was observed in the present study, which concurs with the findings of Chauhan et al. [9], where out of 500

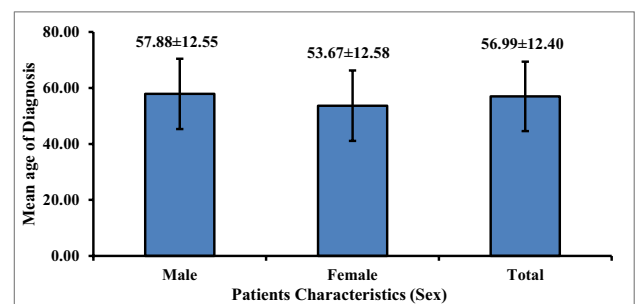


Fig. 1 Mean age of diagnosis of head and neck cancer in Dibrugarh district during the period 2003 to 2016

patients, 447 were male. Moreover, Manjari et al. [8] also reported a substantial male preponderance, with males being affected more than twice as much as females. The higher incidence of HN cancers in males is attributed to prevalent habits like chewing bidis, cigarettes and betel nuts, which are more commonly practised among male populations. This study examined the incidence of HN (head and neck) cancers in rural and urban areas. Our findings were consistent with a previous study conducted by Francis [10], which revealed that HN cancer rates were

Fig. 2 Sex-wise distribution of HN cancers

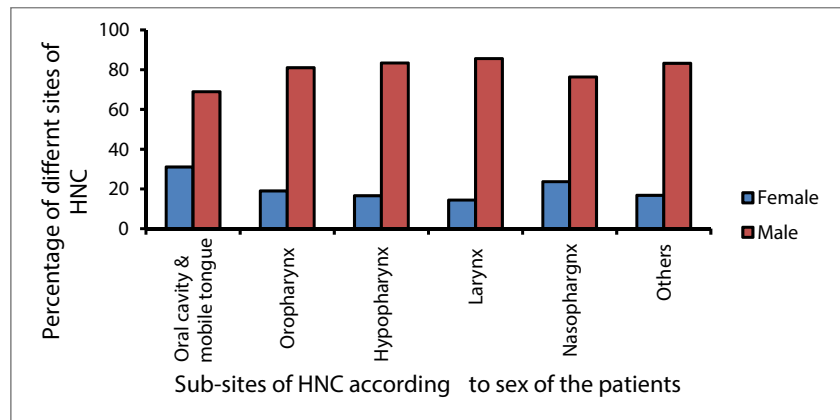


Fig. 3 Age-group wise distribution of HN cancers

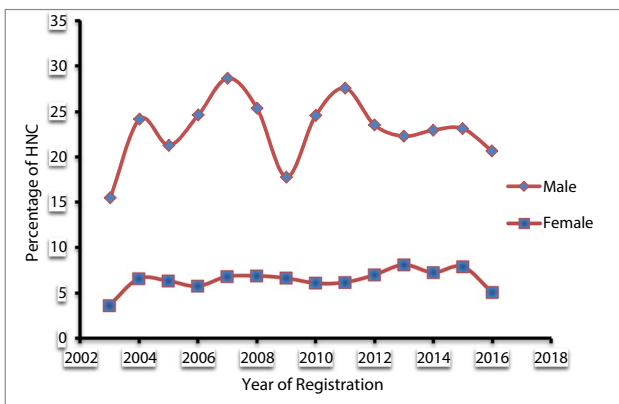
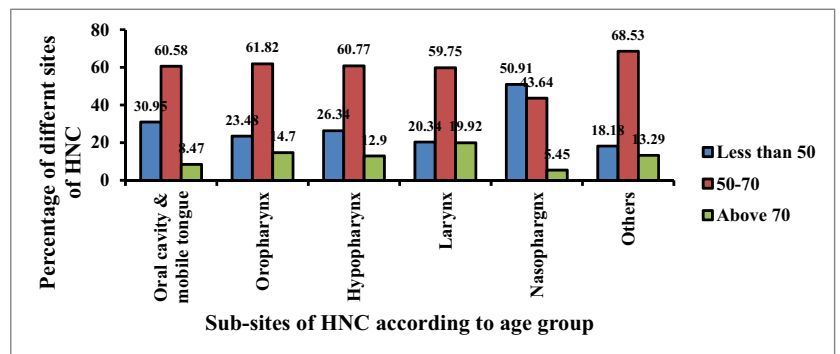


Fig. 4 The percentage distribution of registered HNC cases by sex of the patients during the period 2003–2016

higher in rural regions compared to urban regions. Our research also showed notably elevated rates of HN cancers in rural areas, supporting these findings.

Furthermore, we investigated the specific sub-sites of HN cancers that were most frequently affected. The results indicated that the hypopharynx (33.50%) and the oral cavity and mobile tongue (27.69%) were the most common sub-sites. These findings align with a study by Bhattacharjee et al. [6]

though their study strictly was limited on the hospital-based data. Also, somehow similar findings were recorded in a retrospective hospital-based study carried out by Nagarajan et al. [11], where oral cavity was found to be the dominant sub-site. Among the female patients, we found that oral cavities and mobile tongue were the most common sub-sites for HN cancers, accounting for 31.08% of cases. This finding closely resembled the results reported by Shunyu and Syiemlieh [12], adding further evidence to this observation. However, some discrepancy might be attributed to differences in the study population or regional variations.

In terms of the morphology of HN cancers we found that squamous cell carcinoma (SCC) was the most common histological type. In our study, SCC was observed in 87.11% of patients, which closely resembled the results reported by Nagarajan et al. [11], where SCC accounted for 87% of cases. These findings align with previous research by Manjari et al. [8] and Bhattacharjee et al. [6], identifying SCC as the most prevalent histological type in HN cancers. Furthermore, in the current investigation, we found that there was a decrease in incidence when considering all sites of HN cancers in males which is quite similar with the findings of Elango et al. [3] and Kulkarni [13] in which the decreasing trends of HN cancers in males was also observed. The decreasing trends may be due to the decrease prevalence of

Fig. 5 Overall incidence pattern of HNC in Dibrugarh district from 2003 to 2016 with reference to sex of the patients

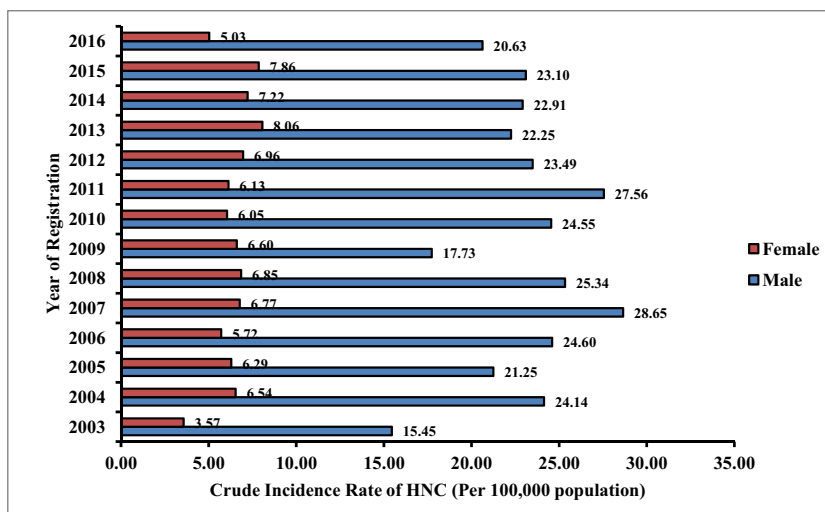


Fig. 6 Overall incidence pattern of HNC in Dibrugarh district from 2003 to 2016 with reference to age of the patients

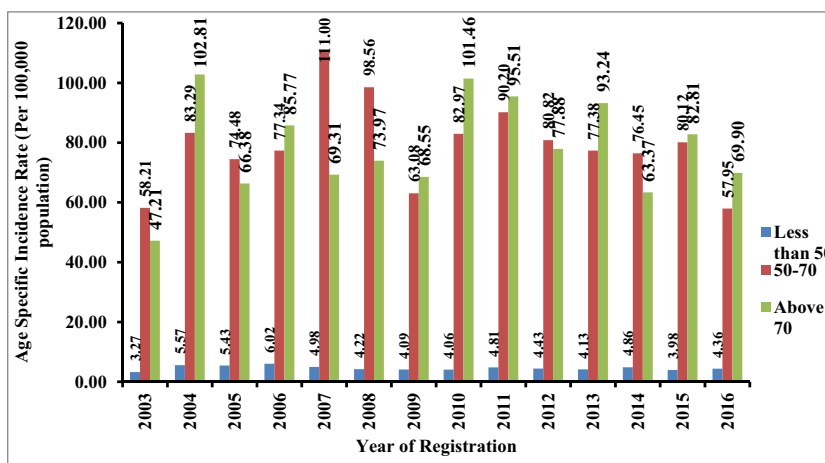


Table 2 Mann–Kendall and Sen’s Slope result of HNC during 2003 to 2016

Patients’ characteristics	Mann–Kendall tau	P-value	Sen’s slope
Sex			
Male	−0.483	0.02	−0.794
Female	0.319	0.025	0.304
Total	−0.165	0.04	−0.225

tobacco use [3], along with the impact of early diagnosis, heightened awareness among individuals and enhancement of access to healthcare services in the study area. In this regard, cancer registry (PBCR)’s role in creating awareness among the peoples under its jurisdiction by conducting awareness and healthcare camps can also be considered.

However, several factors could account for the observed differences in the reported HN cancers incidence in our study. Nevertheless, it is essential to acknowledge that our

study also has limitations. For instance, we relied on registry data in the ICMR (Indian Council of Medical Research) database, which may not capture all cases accurately. Some patients seeking treatment outside the Dibrugarh district might have been excluded from our data, as they preferred to receive better treatment for HN cancers in centres outside Assam. Population-based cancer registries often face challenges in collecting reliable data on the clinical extent of the disease and treatment options. This is because the data are sourced from various facilities with differing investigative capabilities and documentation procedures [14]. Such variations in data collection can influence the accuracy and completeness of the information available.

Moreover, various studies have shown that the high prevalence of tobacco use is a leading cause of HN cancers in India. To address this issue, it is crucial to raise awareness about the dangers of tobacco use, especially among the youth in the region. Further research is needed to explore other potential factors, such as HPV, that may contribute to HNC among non-tobacco users. Promoting good oral

hygiene, treating benign oral lesions promptly, adopting a healthy diet and encouraging positive lifestyle habits are essential for preventing HN cancers in the region.

Conclusion

These comprehensive findings contribute to our understanding of the gender and age-related trends in HN cancer. The present study reveals a significant decrease in HN cancer cases in Dibrugarh district, Assam, according to the registry data, although there are certain limitations. The data indicates a decrease in overall cases, particularly among males, with a simultaneous increase among females. However, there is still much work to be done in further reducing the burden of HN neck cancer in the females of the region.

Acknowledgements The authors express their gratitude to the PBCR-UA, Assam Medical College and Hospital for providing the data essential for the current research work. Additionally the authors extend their appreciative acknowledgement to the authorities of Assam Medical College & Hospital, Dibrugarh; Assam.

Author Contribution Dr. Adity Sarmah: research idea and supervision. Dr. Utpal Dutta: research idea, supervision and data analysis. Chandopal Saikia: research idea, literature search, data collection and manuscript preparation. Dimpal Pathak: research idea, statistical analysis, manuscript preparation and correspondence to editor for publication. Dr. Moirangthem Kameshwar Singh: research idea, supervision and data analysis.

Data Availability Available with the authors.

Declarations

Ethics Approval All the procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee.

Consent for Publication Taken from all the authors.

Conflict of Interest The authors declare no competing interests.

Data Transparency Yes.

References

1. Saikia C, Pathak D, Saikia P, Dutta U (2021) Trend analysis of gallbladder cancer for Dibrugarh District, Assam, during the

period of 2003–2016. *Indian J Surg Oncol* 13(2):1–6. <https://doi.org/10.1007/s13193-021-01455-w>

2. Johnson DE, Burtness B, Leemans CR, Lui VW, Bauman JE, Grandis JR (2020) Head and neck squamous cell carcinoma. *Nat Rev Dis Primers* 6(1):92
3. Elango JK, Gangadharan P, Sumithra S, Kuriakose MA (2006) Trends of head and neck cancers in urban and rural India. *Asian Pac J Cancer Prev* 7(1):108
4. Thomas SJ, Penfold CM, Waylen A, Ness AR (2018) The changing aetiology of head and neck squamous cell cancer: a tale of three cancers? *Clin Otolaryngol* 43(4):999–1003
5. Mathur P, Sathishkumar K, Chaturvedi M, Das P, Sudarshan KL, Santhappan S, Nallasamy V, John A, Narasimhan S, Roselind FS, Icmr-Ncdir-Ncrp Investigator Group (2020) Cancer statistics 2020, report from national cancer registry programme, India. *JCO Glob Oncol* 6:1063–1075
6. Bhattacharjee A, Bahar I, Saikia A (2015) Nutritional assessment of patients with head and neck cancer in North-East India and dietary intervention. *Indian J Palliat Care* 21(3):289
7. Census of India (2011) Report on post enumeration survey. Registrar General & Census Commissioner, India 2/A, Mansingh Road, New Delhi-110011. Accessed on 20th June, 2023
8. Manjari M, Popli R, Paul S, Gupta VP, Kaholon SK (1996) Prevalence of oral cavity, pharynx, larynx and nasal cavity malignancies in Amritsar, Punjab. *Indian J Otolaryngol Head Neck Surg* 48:191–195
9. Chauhan R, Trivedi V, Rani R, Singh U (2022) A study of head and neck cancer patients with reference to tobacco use, gender, and subsite distribution. *South Asian J Cancer* 11(01):046–051
10. Francis D (2018) Trends in incidence of head and neck cancers in India. *Eur J Cancer* 92:1–23. <https://doi.org/10.1016/j.ejca.2018.01.056>
11. Nagarajan M, Banu R, Shrividhya A, Chellapandian TP, Rajkumar A, Mohanraj R (2022) Outcomes and management of head and neck cancer at a South Indian Cancer Centre: a retrospective study. *Ind J Med Paediatr Oncol* 5:43
12. Shunyu NB, Syiemlieh J (2013) Prevalence of head and neck cancer in the state of Meghalaya: Hospital-based study *Int J. Head Neck Surg* 4:1–5
13. Kulkarni MR (2013) Head and neck cancer burden in India. *Int J Head Neck Surg* 4(1):29–35
14. Yeole BB, Sankaranarayanan R, Sunny L, Swaminathan R, Parkin DM (2000) Survival from head and neck cancer in Mumbai (Bombay) India. *Cancer* 89(2):437–444

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Springer Nature or its licensor (e.g. a society or other partner) holds exclusive rights to this article under a publishing agreement with the author(s) or other rightsholder(s); author self-archiving of the accepted manuscript version of this article is solely governed by the terms of such publishing agreement and applicable law.