

# Prevalence of head and neck and oral cancer in Rajasthan: An infirmary based retrospective study

Vikram Pal Aggarwal, Dileep Chilagondanahalli Lakshminarayan Rao, Anmol Mathur, Manu Batra, Diljot Kaur Makkar

Department of Public Health Dentistry, Surendera Dental College and Research Institute, Sri Ganganagar, Rajasthan, India

## ABSTRACT

**Background:** The excessive consumption of tobacco in Southeast Asia especially in India has prompted us to undertake this retrospective study. **Aims and Objective:** The aim was to assess the prevalence of head and neck (HN) and oral cancer (OC) in Rajasthan State, India. **Methods:** A retrospective study on the prevalence of various cancers in the HN and oral cavity regions was conducted in the Department of Oncology, S.M.S Hospital, Jaipur, from 1<sup>st</sup> August 2013 to 31<sup>st</sup> July 2014. **Results:** A total of 4587 total body malignancy cases were reported for the out-patient department records, among which HN and OC constituted 1476 cases (32.18%). There were 640 (43.36%) and 836 (56.64%) HN, and OC cases, respectively. **Conclusions:** This study attempts to quantify and analyze the spectrum of HN and OC in the region. A comprehensive effort is needed to identify the cause of such high prevalence, generate awareness, adopting preventive measures and treatment modalities suited to meet this challenge.

**Key words:** Head and neck cancer, oral cancer, prevalence, total body malignancy

## INTRODUCTION

In the present-day scenario, the world is heading toward modern-day epidemics. Number of deaths reported due to cancer are not just limited to developing countries but even reached high prevalence among developed countries.<sup>[1]</sup> Among various cancers, head and neck (HN) cancer in India is emerging as a major public health problem. HN cancer is described as the cancer of the tonsil, pharynx, nasal cavity, salivary gland, hypopharynx and larynx. Oral cancer (OC) refers to the cancer of the lip, tongue, gingivae, floor of the mouth, palate (hard and soft), maxilla and cheek.<sup>[2,3]</sup> The prevalence of HN cancer with respect to total body malignancy (TBM) varies from 9.8% to 40%. Its frequency is high in Asia and other less developed countries, and these

countries account for nearly 0.7% million new HN cancer cases every year. In India, HN cancer accounts for 20–40% of TBM with oral malignancy (9.4%) observed as the most common site by Indian cancer registries.<sup>[4]</sup> OC is the sixth most common cause of death in males and seventh in case of females.<sup>[5]</sup>

Head and neck and OC are strongly associated with certain environmental and lifestyle risk factors, such as tobacco use, alcohol consumption, poor nutrition and ultraviolet light exposure.<sup>[4]</sup> Tobacco is consumed in various forms, although smoking and smokeless tobacco are the most common among them and one of the most common causes of OC. According to the World Health Organization, cancer has been growing at the rate of 11% annually in India due to widespread tobacco consumption.<sup>[1]</sup> Sankaranarayanan *et al.*<sup>[6]</sup> reported a significant increased risk of cancers of the tongue and the floor of the mouth in association with tobacco chewing, bidi smoking, combined bidi and cigarette smoking and alcohol consumption.

Other important risk factors such as viruses' that is, human papillomavirus (HPV) and Epstein–Barr virus are adjuvant carcinogens, which act as distinct promotion factors. There could be a possibility of high infection of HPV among this

### Access this article online

#### Quick Response Code:



#### Website:

www.cci-j-online.org

#### DOI:

10.4103/2278-0513.154537

**Address for correspondence:** Dr. Vikram Pal Aggarwal, Department of Public Health Dentistry, Surendera Dental College and Research Institute, Sri Ganganagar, Rajasthan, India. E-mail: mailto: drvikramaggarwal@yahoo.com

population especially on the stain and abraded oropharynx mucosa as the result of the constant habit of smokeless tobacco mixed with lime against the back ground of poor oral hygiene on an individual who also takes tobacco and alcohol.<sup>[7-9]</sup> Recent evidence suggests that HPV may be linked with some oropharyngeal and OC cases. HPV-16 has been detected in up to 22%, and HPV-18 has been found in up to 14% of OC cases.<sup>[10]</sup>

An alarming increase in the prevalence of the HN and OC in Southeast Asia, especially in India has prompted us to undertake this retrospective study. This study, therefore, attempts to estimate the prevalence of HN and OC in this region which would help the health professionals to understand the burden and to implement strategies for control and prevention of this over spreading disease.

## METHODS

A retrospective study on the prevalence of HN and OC was conducted in the Department of Oncology, S.M.S Medical Hospital, Jaipur. All the cancer patients registered between 1<sup>st</sup> August 2013 and 31<sup>st</sup> July 2014 were considered for the study. Jaipur with the sobriquet “Pink city” is the capital of Rajasthan state situated in the Northwest part of India. Being a tertiary hospital, patients from all the districts of Rajasthan state are being referred to this center, thus the hospital receives a fairly representative sample of cases across the state. For the analysis of data in the present study, Rajasthan state was divided into 6 zones, viz., north, south, center, west, east and others [Table 1]. The ethical clearance for the study was obtained from the Ethical Committee of Surendera Dental College and Research Institute before commencing the study and prior permission to conduct the study was taken from the Department of Oncology, S.M.S Medical Hospital, Jaipur.

A total of 4587 TBM cases were obtained from the out-patient department (OPD) registered during the time period (1<sup>st</sup> August 2013–31<sup>st</sup> July 2014) among which HN and OC constituted 1705 cases. Patients diagnosed in OPD and confirmed by histopathological evaluation, that is, 1476 were included in the study. Data was analyzed using IBM SPSS. Statistics Windows, Version 20.0. (Armonk, NY: IBM Corp). The statistical significant difference among groups was determined by the Chi-square test, and the level of significance was set at  $P < 0.05$ .

## RESULTS

A total of 4587 TBM cases were reported at the OPD, among which HN and OC comprised 1476 cases (32.18%). There were 1223 (83.75%) male patients and 253 (16.25%) female patients in the study group. There were 640 (43.36%) and 836 (56.64%) HN, and OC cases, respectively. The most

prevalent age group for OC was <40 years whereas for HN cancer it was 50–59 years, accounting for 26.56% and 32.19% cases, respectively. The prevalence of HN and OC was found to be least in the  $\geq 70$  years cases with 8.75% and 6.34% cases, respectively. There was a statistically significant difference between the prevalence of HN and OC with age, whereas no such difference was reported for gender [Table 2].

Tonsil was the most prevalent cancer site constituting 404 cases (27.37%), followed by the tongue with 284 cases (19.24%). The least common site was gingiva with 15 cases (1.02%). The highest reported cancer patients belonged to 50–59 years of age group while the least reported prevalent age group was  $\geq 70$  years comprising of 405 (27.44%) and 109 (7.38%) cases, respectively [Table 3].

While analyzing the prevalence of HN and OC, in relation to the zone, it was found that HN and OC were most prevalent in the west zone (24.69%) and central zone (31.82%) of Rajasthan state. HN and OC cases were found least in the east zone comprising of 7.03% and 3.83% cases, respectively [Table 4]. There was a statistically significant difference between HN and OC when tested in relation to zone from where case belongs ( $P < 0.05$ ).

Altered taste was the most common symptom observed in both OC (30.14%) and HN cancer (29.69%). The least

**Table 1: Zone-wise distribution of various districts in Rajasthan state**

Zone	Districts
North	Sri Ganganagar, Bikaner, Hanumangarh, Churu, Jhunjhunu, Sikar
South	Tonk, Bundi, Bhilwara, Rajsamand, Chittorgarh, Pali, Udaipur, Dungapur, Banswara
East	Jaisalmer, Barmer, Jalor, Sirohi
West	Alwar, Bharatpur, Dausa, Dholpur, Karauli, Sawaimadhopur, Jhalawar, Kota, Baran
Centre	Jodhpur, Nagaur, Jaipur, Ajmer
Others	From other states (Haryana, Madhya Pradesh, Punjab, Uttar Pradesh)

**Table 2: HN and OC cases distribution according to age group and gender**

	n (%)		Total (n)	$\chi^2$	P
	OC	HN			
Age groups (years)					
<40	222 (26.56)	93 (14.53)	315	40.52	<0.00001
40-49	179 (21.41)	121 (18.91)	300		
50-59	199 (23.80)	206 (32.19)	405		
60-69	183 (21.89)	164 (25.63)	347		
$\geq 70$	53 (6.34)	56 (8.75)	109		
Total	836 (100)	640 (100)	1476		
Gender					
Male	687 (82.18)	536 (83.75)	1223	0.63	0.43
Female	149 (17.82)	104 (16.25)	253		
Total	836 (100)	640 (100)	1476		

HN: Head and neck, OC: Oral cancer

**Table 3: Distribution of HN and OC cases in relation to anatomical sites according to different age groups of cancer cases**

Anatomical sites of HN and OC cases	Age groups (years)					n (%)
	<40	40-49	50-59	60-69	≥70	
Lip	31	30	56	64	18	199 (13.48)
Tongue	68	66	73	57	20	284 (19.24)
Gingiva	4	2	6	2	1	15 (1.02)
Floor of mouth	12	6	8	8	0	34 (2.30)
Palate	6	9	9	6	3	33 (2.24)
Maxilla	6	8	2	6	1	23 (1.56)
Mandible	5	4	5	7	0	21 (1.42)
Cheek	84	48	34	29	7	202 (13.69)
Nasal cavity	6	6	6	4	3	25 (1.69)
Tonsil	61	87	127	90	39	404 (27.37)
Oropharynx	8	13	22	21	5	69 (4.67)
Hypopharynx	8	5	21	19	4	57 (3.86)
Larynx	16	16	36	34	8	110 (7.45)
Total	316	300	405	346	109	1476 (100)

HN: Head and neck, OC: Oral cancer

**Table 4: HN and OC cases in relation to zones**

Zones	n (%)		Total (n)	χ <sup>2</sup>	P
	OC	HN			
North	118 (14.11)	104 (16.25)	222	52.40	<0.00001
South	92 (11.00)	134 (20.94)	226		
East	32 (3.83)	45 (7.03)	77		
West	213 (25.48)	158 (24.69)	371		
Centre	266 (31.82)	129 (20.16)	395		
Others	115 (13.76)	70 (10.94)	185		
Total	836 (100)	640 (100)	1476		

HN: Head and neck, OC: Oral cancer

common symptom observed in HN and OC cases was dysphagia that is, 10.63% and 11.72% respectively [Table 5].

Table 6 presents the prevalence of various deleterious habits such as smoking, smokeless tobacco, alcohol consumption and their combination with each other among cases with HN and OC. The most common habit was the combination of all three, that is, smoking, smokeless tobacco and alcohol, both in HN (26.09%) and OC (23.68%) cases, followed by smoking. Among the OC cases, 15.43% consumes smokeless tobacco, which is high as compared to HN cancer cases 10.16%. There was a statistically significant difference between HN and OC with smokeless tobacco ( $P < 0.05$ ). Alcohol consumption was greater among HN cancer cases (15.47%) when compared with OC cases (10.65%). Smoking along with smokeless tobacco consumption was higher in OC cases (12.68%) while in HN cancer cases it was found to be only 4.38%. There was a statistically significant difference between HN and OC with alcohol consumption as well as smoking along with smokeless tobacco ( $P < 0.05$ ).

In multivariate analysis HN and OC cases showed highly significant association ( $P < 0.0001$ ) with smoking, smokeless

**Table 5: Distribution of HN and OC cases according to the symptoms reported**

Symptoms	n (%)		Total (n)	χ <sup>2</sup>	P
	OC	HN			
Altered taste	252 (30.14)	190 (29.69)	442	3.50	0.48
Pain	228 (27.27)	173 (27.03)	401		
Dysphagia	98 (11.72)	68 (10.63)	166		
Trismus	110 (13.16)	104 (16.41)	214		
Sore	148 (17.70)	105 (16.25)	253		
Total	836 (100)	640 (100)	1476		

HN: Head and neck, OC: Oral cancer

**Table 6: Prevalence of deleterious habits among study population**

Habits	n (%)		Total (n)	χ <sup>2</sup>	P
	OC (836)	HN (640)			
Smoking	181 (21.65)	147 (22.97)	328	0.36	0.55
Smokeless	129 (15.43)	65 (10.16)	194	8.83	0.003
Alcohol	89 (10.65)	99 (15.47)	188	7.59	0.006
Smoking+alcohol	55 (6.58)	52 (8.13)	107	1.29	0.26
Smoking+smokeless	106 (12.68)	28 (4.38)	134	30.29	<0.0001
Alcohol+smokeless	35 (4.19)	21 (3.28)	56	0.81	0.37
Smoking+alcohol+smokeless	198 (23.68)	167 (26.09)	365	1.1	0.29
No habits	43 (5.14)	61 (9.53)	104	10.66	0.001
Total	836 (100)	640 (100)	1476		

HN: Head and neck, OC: Oral cancer

tobacco, alcohol consumption and the combination of all three, that is, smoking, smokeless tobacco and alcohol [Table 7].

## DISCUSSION

The overall prevalence of HN and OC cases reported in the present study is 32.18%, which is toward the higher end according to the range of 10%–40% being reported by other studies.<sup>[11-15]</sup> A higher prevalence of the disease in India (54.48%) was reported by Bhattacharjee *et al.* in the northeastern states. It has been indicated that several factors predispose to HN and OC. The use of tobacco, lime, betel and smoking are very common oral habit prevalent in this region, which might be one of the major causes.<sup>[5]</sup>

Oropharynx has been reported as the most prevalent HN cancer type by various studies,<sup>[5,16]</sup> but on the contrary, the results of the present study showed no such trend and it accounted for only 4.67% of the cases, which is similar to the findings of the study conducted by Shinde and Hashmi<sup>[17]</sup> in which oropharynx constituted only 3.66% of the TBM. According to various studies,<sup>[7-10]</sup> the reason for such a high trend could be that fewer patients had reported with HPV since research had proven a correlation between HPV and oropharyngeal cancer. In the present study tonsil (27.37%) was the most common site for HN cancer, which was similar to the findings reported by Shiboski *et al.*<sup>[18]</sup> (30.01%) but in disagreement with the results of the study conducted by

**Table 7: Association of smoking and alcohol consumption with HN and OC cases separately**

Characteristic	OC		HN	
	OR <sup>a</sup> (95% CI)	P	OR <sup>a</sup> (95% CI)	P
Smoking				
Yes	7.6 (3.22-16.70)	<0.0001**	7.7 (3.33-17.17)	<0.0001**
No	1		1	
Smokeless tobacco				
Yes	6.2 (2.84-13.81)	<0.0001**	2.4 (1.71-5.73)	0.002*
No	1		1	
Alcohol consumption				
Yes	3.1 (1.51-6.27)	0.001*	6.8 (3.08-15.57)	<0.0001**
No	1		1	
Smoking+smokeless+alcohol				
Yes	8.9 (3.64-22.02)	<0.0001**	8.1 (3.49-21.93)	<0.0001**
No	1		1	

<sup>a</sup>Adjusted ORs for age and each characteristic. \*Significant, \*\*Highly statistically significant. OR: Odds ratio, CI: Confidence interval, HN: Head and neck, OC: Oral cancer

Sharma *et al.*,<sup>[19]</sup> where tonsil constituted only 4.2% of the HN cancer cases.

Hypopharynx accounted for 3.86% of the cases in the present study, which was similar to the results of the study carried out by Shunyu and Syiemlieh *et al.* (2.31%).<sup>[4]</sup> However, in other studies,<sup>[20-23]</sup> it accounted for 11.7%–28.3% of the cases. Laryngeal cancer comprised 7.45% of the total cases which was somewhat similar to the results in the study conducted by Shiboski *et al.* (5%)<sup>[18]</sup> while in relation to other research<sup>[21,22,24]</sup> it ranged from 11% to 26% of the total cases.

Earlier studies<sup>[11,21,22,25]</sup> had shown that OC accounted for 24%–28% of the cases whereas in the present study OC accounted for 56.64% of the cases, which was somewhat similar to the findings of the study carried out by Shinde and Hashmi<sup>[17]</sup> which reported 41.28% of the cases. The tongue was the most affected oral site as seen in other studies.<sup>[5,14,17]</sup> However, in the studies conducted by Shunyu and Syiemlieh *et al.*<sup>[4]</sup> and Bhurgri *et al.*<sup>[26]</sup> the pattern was not the same. In agreement with the present study, cheek was the second most common oral site of OC in various studies<sup>[4,17]</sup> and in dissimilarity with the findings of the study conducted by Bhurgri *et al.*,<sup>[26]</sup> this difference could be due to the high consumption of smokeless tobacco.

Various studies<sup>[5,21,22]</sup> have shown that the most common age group for occurrence of cases was the sixth decade comprising 30–40% of the overall cases, whereas in the present study the fifth decade was the commonest age group, which comprised of 405 cases (27.44%) which was similar to the findings of the study conducted in Pakistan by Bhurgri *et al.*<sup>[26]</sup> In the current study, the most prevalent age group for OC was <40 years whereas for HN cancer it was 50–59 years. When the gender distribution was calculated it was found that, male to female ratio was 4.83:1 which was somewhat in the range of the findings of the study conducted by Bhattacharjee *et al.*<sup>[5]</sup> (3:1), while in other studies this ratio was 1.5:1–2.1:1.<sup>[20-22,24]</sup>

Santos *et al.*<sup>[27]</sup> in their study stated that pain was the most prevalent general symptom affecting 71.5% of the patients while in the present study altered taste was the most prevalent general symptom affecting 29.95% of the patients, followed by pain (27.17%).

The limitations of the present study was that the information was collected retrospectively, thus being subject to inherent inaccuracies, including the inability to control bias and cofounders, although the sample size generated in the present study could have not been generated by any other study design. The authors believe that few more sociodemographic factors could have been added, but due to the retrospective design there was a limited access.

## CONCLUSIONS

The rising prevalence of HN and OC cases in the Rajasthan state is alarming. While HN and OC cases are difficult to manage, they are, however, very much preventable, and the emphasis, therefore, ought to be on preventing the onset and early diagnosis. It is pertinent to note that when the symptoms become noticeable to patients, they are already an indication of an abnormality, foreshadowing advanced disease, suggesting rapid evolution of early disease stage to more advanced stages. Over and above, lack of awareness about cancer has made the scenario even worse. This study quantifies and analyses the spectrum of the prevalence of HN and OC in the region. A comprehensive effort is needed to identify the cause of increasing prevalence, generate awareness, adopting preventive measures and treatment modalities suited to meet this challenge.

## REFERENCES

- Mishra A, Khandelwal A, Kanungo M, Pradhan P, Gupta P. Prevalence of oral cancer in Chhattisgarh – An epidemiological study. *Chhattisgarh J Health Sci* 2013;1:1-4.
- MacCarthy D, Flint SR, Healy C, Stassen LF. Oral and neck examination for early detection of oral cancer – A practical guide.

- J Ir Dent Assoc 2011;57:195-9.
3. Fritz A, Percy C, Jack A, Shanmugaratnam K, Sobin LH, Parkin MD. International Classification of Diseases for Oncology (ICD-O). 3<sup>rd</sup> ed. Geneva: World Health Organization; 2000.
  4. Shunyu NB, Syiemlieh J. Prevalence of head and neck cancer in the state of Meghalaya: Hospital-based study. *Int J Head Neck Surg* 2013;4:1-5.
  5. Bhattacharjee A, Chakraborty A, Purkaystha P. Prevalence of head and neck cancers in the north east – An institutional study. *Indian J Otolaryngol Head Neck Surg* 2006;58:15-9.
  6. Sankaranarayanan R, Duffy SW, Padmakumary G, Day NE, Padmanabhan TK. Tobacco chewing, alcohol and nasal snuff in cancer of the gingiva in Kerala, India. *Br J Cancer* 1989;60:638-43.
  7. Sato T. High-risk factors in the development of head and neck cancers. *Gan To Kagaku Ryoho* 1987;14:2626-31.
  8. Döbrossy L. Epidemiology of head and neck cancer: Magnitude of the problem. *Cancer Metastasis Rev* 2005;24:9-17.
  9. D'Souza G, Kreimer AR, Viscidi R, Pawlita M, Fakhry C, Koch WM, et al. Case-control study of human papillomavirus and oropharyngeal cancer. *N Engl J Med* 2007;356:1944-56.
  10. Heck JE, Berthiller J, Vaccarella S, Winn DM, Smith EM, Shan'gina O, et al. Sexual behaviours and the risk of head and neck cancers: A pooled analysis in the International Head and Neck Cancer Epidemiology (INHANCE) consortium. *Int J Epidemiol* 2010;39:166-81.
  11. Gangadharan P. Epidemiologic observations on cancer in Indian people. *Indian J Cancer* 1979;16:5-17.
  12. Winn DM. Smokeless tobacco and aerodigestive tract cancers: Recent research directions. *Adv Exp Med Biol* 1992;320:39-46.
  13. Murata M, Takayama K, Choi BC, Pak AW. A nested case-control study on alcohol drinking, tobacco smoking, and cancer. *Cancer Detect Prev* 1996;20:557-65.
  14. Singh NP, Sachan MS, Budhiraja N, Kapur BM, Mehdirattaks, Ray BC. Anaesthetic problems in excisional surgery for malignant lesions of oral cavity and maxillary antrum. *Indian J Cancer* 1965;2:135-42.
  15. Shaw HJ. Glottic cancer of the larynx 1947-1956. *J Laryngol Otol* 1965;79:1-14.
  16. Bhatia PL, Jha BK. Pattern of head and neck cancer in Manipur. *Indian J Cancer* 1982;19:241-8.
  17. Shinde JK, Hashmi SI. Retrospective study of malignant lesions of head and neck in rural area of Ahmednagar district. *IOSR J Dent Med Sci* 2013;4:12-9.
  18. Shiboski CH, Schmidt BL, Jordan RC. Tongue and tonsil carcinoma: Increasing trends in the U.S. population ages 20-44 years. *Cancer* 2005;103:1843-9.
  19. Sharma JD, Katak AC, Vijay CR. Population-based incidence and patterns of cancer in Kamrup Urban Cancer Registry, India. *Nat Med J India* 2013;26:133-41.
  20. Chaturvedi VN, Raizada RM, Jain SK, Tyagi NK. Cancer of ear, nose, pharynx, larynx and esophagus in a rural hospital. *J Vivekananda Inst Med Sci* 1987;10:63-7.
  21. Manjari M, Popli R, Paul S, Gupta VP, Kaholon SK. Prevalence of oral cavity, pharynx, larynx, nasal cavity malignancies in Amritsar, Punjab. *Indian J Otolaryngol Head Neck Surg* 1996;48:189-96.
  22. Thakur S, Chaturvedi VN, Singh AK, Puttewar MP, Raizada RM. Pattern of ear, nose, pharynx, larynx and oesophagus (enplo) cancers in a rural based hospital. *Indian J Otolaryngol Head Neck Surg* 2001;53:93-9.
  23. Chakravarty S, Kar TK, Ghosh LM. Neoplasm of ear, nose, throat. *Indian J Otolaryngol Head Neck Surg* 1992;1:113-8.
  24. Jussawalla DJ, Sathe PV, Yeole BB, Natekar MV. Cancer incidence in Aurangabad City 1978-1980. *Indian J Cancer* 1984;21:55-62.
  25. Kulkarni PV, Jaiswal SS, Rathod SB, Khaliq A, Kulkarni RR. Profile of malignancies at Medical College, Ambajogai (15 years retrospective study). *Indian J Cancer* 1996;33:31-6.
  26. Bhurgri Y, Bhurgri A, Hassan SH, Zaidi SH, Rahim A, Sankaranarayanan R, et al. Cancer incidence in Karachi, Pakistan: First results from Karachi cancer registry. *Int J Cancer* 2000;85:325-9.
  27. Santos FB, Vasconcelos-Raposo JJ, Figueiredo Mdo C. Correlation between symptoms and course duration of upper aerodigestive tract cancer at early and advanced stages. *Braz J Otorhinolaryngol* 2013;79:673-80.

**Cite this article as:** Aggarwal VP, Rao DC, Mathur A, Batra M, Makkar DK. Prevalence of head and neck and oral cancer in Rajasthan: An infirmity based retrospective study. *Clin Cancer Investig J* 2015;4:339-43.

**Source of Support:** Nil, **Conflict of Interest:** None declared.