Original Research

Periodontal status among head and neck cancer patients from Kolar district, Karnataka – A descriptive cross sectional study

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ABSTRACT:
Aim: The aim of this study was to investigate the manifestation of periodontal disease among Head and Neck Cancer (HNC) patients from Kolar district of Karnataka. **Materials and methods**: A cross-sectional study comprising of patients diagnosed with HNC were examined. Periodontal examination included Plaque Index (PI), Gingival Index (GI), Clinical Attachment Level (CAL) and Decayed Missed Filled Tooth index (DMFT). Age at diagnosis, gender, site, clinical features, type, stage and treatment of tumour were recorded based on their medical records. A descriptive statistics and inference analysis was carried out using SPSS software version22. **Results**: Among the 64 patients examined, there were 26 Males and 38 Females. Median age at diagnosis of tumour was 45yrs. HNC patients presented with early to moderate periodontitis in 65.62% and 31.25% showed signs of advanced periodontitis. Missing teeth was observed in 69% of patients. However in Stage IV cancer patients moderate to advanced CAL was observed in 68.75% of patients. **Conclusion**: Periodontal disease is prevalent in this population of head & neck cancer with a definitive need for better dental health awareness. Generalized chronic periodontitis, low socioeconomic status, missing tooth and women from Kolar district when manifested together have shown to be strong risk factors for HNC. Further implementation of good oral hygiene practices may prove to be protective against HNC but the extent of risk reduction needs to be explored.
Clinical Significance: Periodontitis may well play an important role in HNC that further necessitate better implementation of preventive measures among the present population.
Key Words: Head and Neck Cancer, Kolar, Periodontal disease.

INTRODUCTION

Head and neck cancer (HNC) involves cancer originating from oral cavity, oropharynx, hypopharynx or larynx, is the third most common malignancy known to affect mankind across the globe.[1] Incidence of HNC in India is about 77,000 new cases and 52,000 mortality reported annually accounting for a quarter of all the cases in the world with Karnataka in the 2nd position next to Gujarat in overall tumour incidence.[1] It shows male predilection as 2nd and 5th most common cancer known to affect Indian men and women respectively.[1]

Chronic inflammation has been associated with carcinogenesis since the time Virchow hypothesised that the origin of cancer as chronic inflammation.[2] There are similarities observed between an inflammation and tumorogenesis where inflammatory cells and mediators like cytokines & prostaglandins are observed in tumour tissue, angiogenesis, chronic inflammatory response & tissue repair.[3] Oral lichen planus is one such common inflammatory disease of

autoimmune aetiology where the affected epithelium has a frequency for malignant transformation of 0.4 to 5.3%.[3]

Chronic periodontitis is a multifactorial opportunistic inflammation of the supporting tissues of teeth caused by gram negative anaerobic microorganisms, resulting in progressive destruction of the periodontal ligament and alveolar bone with periodontal pocket formation, gingival recession or both.[4] In periodontitis microbial toxins, proteases and endotoxins are secreted from the microorganism that induces an inflammation in the host tissue through stimulation of monocytes and further produces mediators like prostaglandin E2, thromboxane B2, interleukin I, VI, VIII, XVII, tumour necrosis factors and collagenases.[4] An imbalance in this host immune response are associated with tissue destruction and could even trigger Epithelial-mesenchymal transition (EMT) independently or synergistically[5]. Overall, periodontal disease affects about 20-50% of the population around the globe.[6]

An induction of oral cancer by such chronic inflammation appears possible since the involved inflammatory mediators, cytokines and bacterial toxins have shown potential for malignant transformation in vitro. Some of the recent studies by Shin YS et al[7] and Ganly I et al[8], periodontitis has been associated with oral cancer and periodontal pathogens have been associated as a risk factor of oral squamous cell carcinoma independent of tobacco, alcohol and human papilloma virus.

Periodontal disease is preventable and treatable. Oral health awareness programmes could reduce the burden of systemic diseases on human beings.[4,6] Kolar has highest incidence of mouth cancer in Karnataka.[1,9]

In view of the minimal studies on comparison of periodontal parameters with HNC patients in Indian population and none among Kolar population, the aim of this study was to correlate the severity of periodontal disease with different stages of HNC.

MATERIAL AND METHODS
A cross sectional descriptive survey was conducted to investigate the manifestation of periodontal disease among HNC patients. Patients diagnosed with HNC by Head and Neck Oncology Unit at R. L. Jalappa Hospital & Research Centre affiliated to SDUAHER, Tamaka, Kolar, referred to Department of Dentistry for pre-radiation dental check-up were screened. Patients with histopathological report of oral/ oropharyngeal cancer, presence of at least 6 teeth, with no periodontal treatment in the past 6months were included. Whereas completely edentulous

patients, immuno-compromised patients like HIV, immune disorders & chronic inflammatory disease (rheumatoid arthritis, multiple sclerosis, crohn's disease, systemic lupus erythematosus) were excluded.

Institutional ethical clearance and patient consent were obtained prior to start of the study with an estimated sample size of 80 were considered.

Questionnaire was used to collect socio-demographic data, medical history and tumour characteristics were collected by the investigator before subjecting the patient for clinical examination.

Intra-Oral examination: Periodontal examination was performed by a single experienced dental examiner in order to prevent inter-observer variation.

Periodontal parameters included were,

- Clinical attachment loss (CAL):[4] is considered as the gold standard for diagnosis of chronic periodontitis.
- Plaque index (PI) by Silness & Loe and Gingival index (GI) by Loe & Silness:[10] PI scored based on the amount of plaque deposits on selected tooth surfaces to assess the oral hygiene status among the population screened. GI score assessed the degree of gingival inflammation based on visual examination and use of periodontal probe for bleeding on probing (BOP) from gingival sulcus, a characteristic sign of gingivitis.
- DMFT index:[11] This index was used to assess the predilection of PD or tooth decay among HNC patients

CAL was measured using a calibrated millimetre periodontal probe (PCP15; HuFriedy®, Chicago, IL, USA) and values rounded off to the nearest millimetre.

Generalized chronic periodontitis was defined as the presence of at least 30% of the measured sites with CAL ≥ 4 mm.[4] Chronic periodontitis categorised as presence of at least 2 sites CAL as follows,

Advanced periodontitis: CAL$\geq$5mm
Moderate periodontitis: 3-4 mm CAL
Early periodontitis: 1-2 mm CAL

Tumour Site/location [International Classification of Diseases for Oncology (ICD-0-3)][12], stage [American Joint Committee on Cancer staging system - 6th edition (AJCC)][13] and histology of head and neck cancer, interpreted by an experienced Oncosurgeon were recorded.

Statistical analysis:
Data was summarized by use of descriptive statistical analysis. The data is presented as mean, median, frequency and percentages. Multivariate analysis has been done with contingency tables.

RESULTS
Of the 80 patients included for the study 9 patients dropped out and 7 went in for radiotherapy before they were subjected for clinical evaluation hence a total of 64 patients were examined. Among 64 patients examined 26 were male and 38 were female with mean age of 50yrs and 52.5yrs respectively. Females were affected with HNC at a younger age compared to males (Table.1).

Table.1: Socio-demographic data

Variables	Male (No. of cases – 26)		Female (No. of cases – 38)	
Age	40-60yrs (50yrs)		35-70yrs (52.5yrs)	
Educational Status Upto 5 th std > 5 th std	22 04	84.2% 15.8%	32 06	84.6% 15.4%
Socioeconomic Status (B.G. Prasad Classification)	Class IV		Class IV	

The study population (100%) fell under Class IV of socioeconomic status according to modified Prasad BG classification[14] and most of them couldn't complete their schooling.

Questionnaire on habits revealed 100% of female had habit of tobacco chewing while 84.6%, 61.5% of male had tobacco chewing and smoking habit respectively. 30.8% of male population consumed alcohol (Table.2).

Table 2: Questionnaire data:

Habits	Male (No. of cases – 26)	Female (No. of cases – 38)
Tobacco Chewing Yes No	22 (84.6%) 04 (15.4%)	38 (100%) 00
Smoking Yes No	16 (61.5%) 10 (38.5%)	00 38 (100%)
Alcohol Yes No	08 (30.8%) 18 (69.2%)	00 38 (100%)

56.3% of HNC patients examined had carcinoma of buccal mucosa and the least presented site of carcinoma was alveolus (3.1%) (Table.3).

Table 3: Distribution of HNC according to tumour location:

Location	No. of cases (%)
Squamous Cell Carcinoma of tongue	4 (6.3%)
Oropharynx	8 (12.5%)
Buccal Mucosa	36 (56.3%)
Alveolus	2 (3.1%)
Hard Palate	8 (12.5%)
Retro Molar Trigone	6 (9.4%)

Most of the carcinoma sites presented with early to advanced signs of periodontitis while carcinoma of alveolus and retro molar trigone mostly presented with moderate type of periodontitis (Table. 4).

Table 4: Frequency of early to moderate chronic periodontitis and advanced chronic periodontitis with tumour location:

Periodontitis Severity	Alveolar bone n (%)	Tongue n (%)	Buccal mucosa n (%)	Retromolar trigone n (%)	Hard palate n (%)	Oropharynx n (%)
Early (CAL 1-2)	0	0	6 (9.4%)	2 (3.1%)	2 (3.1%)	4 (6.3%)
Moderate (CAL 3-4)	2 (3.1%)	3 (4.7%)	20 (31.3%)	4 (6.3%)	2 (3.1%)	2 (3.1%)
Advanced (CAL >5)	0	1 (1.6%)	10 (15.6%)	0	4 (6.3%)	2 (3.1%)
TOTAL	2	4	36	6	8	8

HNC presented in stage III & IV with moderate to advanced type of periodontitis. 40.6% of stage IV carcinoma presented with moderate periodontitis and 28.1% of stage IV carcinoma with advanced type of periodontitis (Table.5).

Table 5: Frequency of early, moderate and advanced chronic periodontitis with tumour stage:

Periodontitis Severity	Stage 0	Stage I	Stage II	Stage III	Stage IV
Early (CAL 1-2)	0	0	2 (3.1%)	4 (6.3%)	4 (6.3%)
Moderate (CAL 3-4)	0	0	0	6 (9.4%)	26 (40.6%)
Advanced (CAL >5)	0	0	0	4 (6.3%)	18 (28.1%)
TOTAL	0	0	2	14	48

Generalized oral hygiene in these patients was poor with PI score of 2.27 and gingival score of 1.8 that meant mild inflammation in the gingiva which could be attributed to low hemogram in cancer patients. The number of missing teeth (MT) was found to be 69% compared to decayed teeth (DT) which was of 13% (Table.6).

Table 6: Frequency of early to moderate and severe chronic periodontitis and other data:

Parameters	Percentage
Early to moderate Chronic Periodontitis	42 (65.62%)
Advanced Chronic Periodontitis	20 (31.25%)
Decayed Tooth	13%
Missing Tooth	69%
Trismus (II/III)	34.4%
Plaque Index	2.27
Gingival index	1.8
CAL for all sides	7.5

DISCUSSION

Many a research in the recent past has shown that periodontal disease is considered as an independent risk factor for oral squamous cell carcinoma. The chronicity of inflammatory condition in periodontal disease is considered to be the contributing factor for HNC. The present study assessed the severities of periodontal disease amongst patients with HNC.

Severity of periodontitis can be assessed through several clinical methods such as probing depth, CAL, BOP and alveolar bone loss with or without radiographs. Variable threshold values can be used for definition of chronic periodontitis with CAL as the gold standard as followed in the present study.

Women were tobacco chewers but men had varied level of tobacco and alcohol consumptions. The culture of chewable tobacco is common in indoor women.[1] Tobacco and alcohol are independent risk factors for HNC. [2,3] Buccal mucosa (56.3%) the commonest head and neck cancer in present study with female (59.4%) and male (40.6%) ratio of 1.5:1. Women as strong risk factors for mouth cancer in Kolar[1,7] as seen in present study. Sixty two patients (94%) had advanced cancer (III &IV stage). Advanced cancer was reported in more than 80%. Varied analytical studies revealed that cancer patients were reported late due to cancer myths and low socioeconomic status[1].

Periodontal disease is characterized by chronic inflammation of the periodontium.[3-8] Early to moderate chronic periodontitis (65.62%), advanced chronic periodontitis (31.25%), trismus(34.4%) and missing teeth (69%) were observed among the study population with HNC. 100% and 85% of the participated population were below poverty line and illiterates respectively, as most category of cancer patients in the hospital utilize benefits provided by the government for underprivileged. Chronic periodontitis, low socioeconomic status and teeth loss are strong risk factors for HNC association.[3] Overall oral hygiene score was poor as assessed with PI and GI with trismus as contributing factor.

Studies have demonstrated that periodontitis may promote cancer initiation and progression by following mechanism a. stimulation of inflammatory reaction, b. increase in inflammatory markers & molecules that enhance inflammatory reaction, & c. presence of cell stimulating signals which promote cell proliferation & differentiation.[14,17,18]

In the present study, HNC patients included were of invasive tumours of head & neck, oral cavity, oropharynx, hypopharynx & larynx with moderate to advanced type of periodontitis. 40.6% of stage IV carcinoma presented with moderate periodontitis and 28.1% of stage IV carcinoma with advanced type of periodontitis. Most of the carcinoma sites presented with early to moderate signs of periodontitis. Chronic

periodontal inflammation does not have a critical role in the progression of HNC but present in all sites.[9] Advanced HNC usually have periodontitis which is similar to study by Javed F[17] et al 2016.

Analogous to a study by Moergel M[18] et al 2013 present study also revealed more number of MT recorded in HNC patients while the number of DT recorded were not significant. MT can reflect poor oral hygiene and mechanical trauma. The mechanism by which poor oral hygiene is associated with HNCs falls into categories of trauma and inflammation are a result of coexisting disease &/or negligence of oral hygiene.[18]

Bacteria (Porphyromonas gingivalis), virus (Human papilloma virus), [oral microbiome], host response (activation of immunologic and inflammatory reactions), hereditary, environmental, geography (Kolar), and behavioural factors (tobacco/alcohol consumption) have been leading etiological factors for periodontal diseases and carcinogenesis[1,2,8,9] Chemical mediators like proinflammatory proteins or bacterial toxins in response to periodontal disease may influence the cancer initiation and location remote from its site of action.[8,20,21]

Gum diseases develop secondary to chronic disease or result of neglected oral health maintenance that can be correlated with the present study and could independently be associated with increased risk of HNC.[18]

Increasing oral hygiene literacy among public has been associated with lower risk of HNC that can prove to be protective against HNC although the risk reduction is modest. Local drug delivery and adjunctive agents, scaling/root planning, photodynamic therapy and mechanical debridement are useful treatment modalities for periodontitis.[21]

LIMITATIONS
No earlier diagnosis of periodontitis at two different time point was possible. More advanced stages of cancer, small sample size, cross sectional study and presence of confounding factors are limitations of the study. Random control trial, with larger sample size of cases, and controls matched to age, sex, and smoking from a community health cohort, and biochemical factors assay are scope for future studies.

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CONCLUSION
The association of periodontal disease and HNC was found to coexist in this population. Generalized chronic periodontitis, low socioeconomic status, women, and missing teeth when manifested together may be considered as strong risk factors for HNC. Primary prevention strategies for periodontitis and early diagnosis of HNC are pivotal in trailing its expression. Periodontal therapies and adjuvant antimicrobial therapies may have protective impact on HNC incidence.

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