



A RETROSPECTIVE ANALYSIS OF CLINICAL AND PATHOLOGICAL CHARACTERISTICS OF HEAD AND NECK MALIGNANCIES AT A TERTIARY CARE CENTRE

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Abstract: Background: Head and neck cancers correspond to a considerable clinical burden in tertiary care hospitals particularly in developing countries where late presentation remains common. This retrospective study analyzed the clinico-pathological profile of 187 patients diagnosed with head and neck malignancies at a tertiary care hospital. Demographic characteristics, primary tumor site distribution, TNM classification and stage at presentation were evaluated using descriptive statistical methods. The disease largely affected older individuals with most patients presenting in the sixth and seventh decades of life and displayed a marked male predominance. The larynx was the most frequently involved primary tumor site accounting for 98 cases (52.4%) followed by the nasopharynx and oral cavity. Analysis of TNM classification revealed a high proportion of patients presenting with advanced primary tumors and regional nodal involvement. Consequently, Stage III and Stage IV disease constituted the majority of cases at diagnosis, while early-stage disease was less common. Less frequent primary sites included the hypopharynx, parotid gland, thyroid and other rare subsites. Overall the findings highlight a predominance of laryngeal malignancies and advanced-stage presentation in this cohort, highlighting the need for improved early detection, accurate staging, and systematic documentation to better characterize regional disease patterns and support future research initiatives.

Keywords: Head and neck cancer, Clinico-pathological profile, Laryngeal carcinoma, TNM classification, Stage at presentation, Retrospective study

INTRODUCTION

Head and neck cancers (HNCs) represent a diverse array of malignant neoplasms originating from the upper aerodigestive tract, encompassing the oral cavity, pharynx (nasopharynx, oropharynx, hypopharynx), larynx, nasal cavity and paranasal sinuses, salivary glands and thyroid gland. These

malignancies provide a considerable global public health challenge due to their high occurrence, intricate management and major effects on patient survival and quality of life¹. Recent global cancer statistics indicate that head and neck cancers comprise approximately 900,000 new cases and more than 450,000 fatalities per year worldwide thereby placing them among the

ten most widespread cancers worldwide².

The occurrence of head and neck cancers is significantly elevated in low and middle income countries (LMICs), especially in South and Southeast Asia where there is prevalent exposure to recognized risk factors including tobacco smoking, smokeless tobacco, betel nut chewing and consumption of alcohol^{3,4}. India significantly contributes to the worldwide burden of head and neck cancers which represent about one-third of all cancers in certain regional cancer registries⁵. The significant prevalence highlights the necessity of region-specific epidemiological data to comprehend disease trends, risk variables and clinical manifestations.

Squamous cell carcinoma (SCC) is the predominant histological subtype of head and neck cancer, accounting for roughly 90-95% of cases originating from the mucosal surfaces of the upper aerodigestive tract⁶. Additional histological varieties encompass adenocarcinoma, salivary gland malignancies, lymphomas and thyroid carcinomas each exhibiting unique biological characteristics and therapeutic approaches. The prevalence of SCC indicates a significant correlation between persistent mucosal irritation and carcinogen exposure, especially from tobacco and alcohol⁷.

Head and neck malignancies provide distinct clinical challenges owing to the region's anatomical complexity and its essential activities which encompass respiration, phonation, deglutition, mastication, auditory perception, gestation and facial expression. Neoplasms originating in this area frequently result in considerable functional disability, aesthetic disfigurement and psychological anguish despite successful intervention⁸. The management of head and neck cancer necessitates a multidisciplinary strategy that includes otorhinolaryngologists, head and neck surgeons, radiation oncologists, medical oncologists, radiologists, pathologists, speech and swallowing therapists and supportive care teams.

The presentation stage is a critical prognostic factor in head and neck cancer. Early-stage disease (stage I–II) correlates with positive results when managed with single-modality treatment, including surgery or radiotherapy only. Conversely, locally progressed disease (stage III–IV) typically necessitates multimodal treatment, incorporating surgery alongside radiotherapy or concomitant chemoradiotherapy, and is linked to markedly inferior survival outcomes^{9,10}. Unfortunately, in numerous developing areas a significant percentage of patients arrive at advanced stages owing to insufficient awareness, delayed access to treatment, socioeconomic limitations and inadequate screening initiatives¹¹.

A vital component of head and neck cancer management is post-treatment surveillance. Survivorship concerns, encompassing treatment-related toxicities, functional impairments, disease recurrence and secondary primary cancers, substantially influence long-term outcomes¹². Consistent and systematic follow-up is crucial for the early identification of recurrence, management of problems, and rehabilitation. Nonetheless, follow-up adherence is subpar in numerous institutions owing to patient-related and system-related variables, leading to insufficient outcome data and disrupted continuity of care¹³.

Numerous hospital based and population based studies throughout various parts of India have endeavored to delineate the clinico-pathological profile of head and neck malignancies, emphasizing disparities in age distribution, sex ratio, primary tumor location, and stage at diagnosis^{14–16}. Although these studies offer significant insights, there is an ongoing necessity for the continual documentation of institutional data, especially from tertiary care hospitals that function as referral centers for extensive populations. This data is essential for recognizing local illness patterns, assessing current treatment strategies and developing evidence based policies suited to regional need.

In this context, retrospective investigations of head and neck cancer patients treated at tertiary care facilities are essential for addressing deficiencies in epidemiological knowledge. They provide a chance to evaluate demographic data, anatomical tumor distribution, staging patterns, treatment modalities utilized, and follow-up status in a real-world clinical context¹⁷. Despite their intrinsic limitations such as absent data and the absence of survival analysis, retrospective studies are crucial for hypothesis generation and directing future prospective research. This study aimed to examine the clinico-pathological characteristics of head and neck cancer patients receiving treatment in a tertiary care hospital. This study seeks to provide comprehensive institutional data reflecting the regional burden of head and neck cancer by analyzing demographic characteristics, original tumor locations and TNM staging. This information is crucial for advancing early detection methods, optimizing resource distribution, and improving the overall quality of care for patients with head and neck cancers.

MATERIALS AND METHODS

This research was structured as a retrospective descriptive observational study carried out at a tertiary care hospital which functions as a principal referral center for head and neck cancer patients from adjacent

districts and rural regions. The institution offers extensive oncological services, encompassing diagnostic assessment, surgical oncology, radiation and chemotherapy for patients with head and neck cancers.

The study's retrospective design facilitated the examination of authentic clinical data produced during standard patient care thereby accurately representing disease patterns, treatment methodologies and follow-up conditions within the institutional framework. Hospital-based retrospective studies are especially beneficial in resource-constrained areas, where population-based cancer registry data may be deficient or inaccessible¹¹.

The study population comprised individuals diagnosed with head and neck malignancies who had been admitted for treatment at the tertiary care hospital throughout the study period. The study population comprised one pediatric patient (13 years old) while all remaining patients were adults. In the final analysis, 187 patient records were included following the application of the inclusion and exclusion criteria. Patients were discovered through institutional medical records, radiation registries and departmental databases.

Inclusion Criteria

Patients were incorporated into the trial if they fulfilled the subsequent criteria::

1. Diagnosed with a primary malignancy arising from the head and neck region, including:
 - Oral cavity
 - Nasopharynx
 - Oropharynx
 - Hypopharynx
 - Larynx
 - Nasal cavity and paranasal sinuses
 - Salivary glands
 - Thyroid gland
2. Patients that underwent diagnostic assessment and/or treatment at the study facility
3. Presence of fundamental demographic and clinical data in the medical records

Exclusion Criteria

The following patients were excluded from the study:

1. Patients with malignancies originating from the sites other than the head and neck, including:
 - Cervical esophageal cancers
 - Primary malignancies of the scalp, skin, orbit, or external ear
2. Patients with recurring head and neck malignancies who had received prior definitive treatment elsewhere.
3. Patients with second primary cancers located

outside the head and neck region

4. Records containing significantly inadequate incomplete data for critical study variables.

Data were retrospectively collected from patient case files, outpatient department records, and inpatient admission registers maintained by the hospital. A consistent data extraction format was used to ensure uniformity of data collection and to minimize missing or inconsistent entries.

The following variables were extracted and analyzed:

Demographic variables

- Age at diagnosis (in years)
- Sex (male/female)
- Clinical and pathological variables
- Primary site of tumor, as documented in clinical records
- Tumor–Node–Metastasis (TNM) classification at presentation
- Overall stage grouping (Stage I–IV), derived from TNM classification where not explicitly documented
- Histopathological diagnosis, when available in medical records

Primary tumor sites were reviewed and standardized during data analysis to address variations in terminology and nomenclature (for example, “larynx” and “laryngeal carcinoma”). Tumors were subsequently grouped into major anatomical subsites based on established classifications in head and neck oncology⁷. Rare and heterogeneous primary sites with low individual frequencies were grouped under an “Others” category for descriptive analysis.

TNM subcategories were grouped for clarity (for example, T4a/T4b as T4 and N2a/N2b/N2c as N2), and overall stage grouping was determined in accordance with standard staging guidelines. These steps were undertaken solely for descriptive analysis and did not involve reclassification beyond accepted oncological conventions.

Tumors were classified using the Tumor–Node–Metastasis (TNM) staging approach as documented in the patient records. While the precise version of the staging guideline was not consistently recorded across all documents, the staging adhered substantially to the criteria established by the American Joint Committee on Cancer (AJCC), which are frequently utilized in clinical practice¹⁶.

It is recognized that TNM staging data was absent or insufficient in a portion of patients, a restriction frequently observed in retrospective hospital-based studies conducted in resource-constrained environments¹³.

The research was performed in compliance with the

ethical standards established by institutional and national research committees, as well as the principles delineated in the Declaration of Helsinki. Due to the retroactive nature of this examination of existing medical records, patient consent was not required. Informed consent was acquired from parents or legal guardians for patients under 18 years of age. All data were anonymised before analysis, and patient anonymity was rigorously upheld throughout the study. Institutional administrative authorization was secured to access medical records for research purposes.

Statistical Evaluation

Data were imported into a spreadsheet application and examined utilizing conventional statistical

techniques. Continuous variables such as age were described using the mean and standard deviation as well as the median and range, dependent upon the data distribution. Definite variables were represented as frequencies and percentages. Descriptive statistics were predominantly employed as the study aimed to describe the clinico-pathological profile of head and neck cancer patients rather than to evaluate specific hypotheses. Results were displayed as tables and figures for clarity and interpretative comfort. The distribution of primary sites, age, sex and TNM stages was encapsulated in tables. All analyses were conducted at a 95% confidence level, and results were interpreted within the framework of current literature.

RESULTS

A total of 187 patients who were diagnosed with head and neck cancers were incorporated into the final analysis following the application of the inclusion and exclusion criteria. The demographic features, smoking status, anatomical tumor distribution, TNM classification, presentation stage, treatment options and radiation procedures are encapsulated in Tables 1-6.

The study population mostly consisted of elderly persons with a mean age of roughly 59 years. The largest percentage of patients was in the sixth and seventh decades of life (Table 1). Patients' ages varied from 13 to 86 years.

A significant male predominance was also noted, with males comprising 75.4% of the sample population and a male-to-female ratio of around 3.1:1 (Table 2).

Table 1: Age distribution of the study population (n = 187)

Age in Years	No. of Patients	Percentage
≤40	15	8
41–50	29	15.5
51–60	48	25.7
61–70	62	33.2
>70	33	17.6

Table 2: Sex distribution of the study population (n=187)

Sex	Number of patients	Percentage
Male	141	75.4
Female	46	24.6

A significant percentage of patients had a documented smoking history whereas a lesser percentage were classified as non-smokers or lacked any recorded smoking history (Table 3). The smoking status was documented descriptively as indicated in the medical records.

Table 3: Smoking status of patients at presentation (n=187)

Smoking status	Number	Percentage
Smoker	102	54.5
Non-smoker	51	27.3
Not documented	34	18.2

The distribution of primary tumor sites among the study population is summarized in Table 4. The larynx was the most commonly involved site accounting for 52.4% of the total cases followed by the nasopharynx and oral cavity. Other sites included the hypopharynx, parotid gland, and thyroid, while a small proportion of cases with rare and heterogeneous primary sites were grouped under "Others."

Table 4: Distribution of primary tumor sites among head and neck cancer patients (n=187)

Primary tumor site	Number of patients	Percentage (%)
Larynx	98	52.4
Nasopharynx	30	16.0
Oral cavity	25	13.4
Hypopharynx	11	5.9
Parotid gland	8	4.3
Thyroid	6	3.2
Others	11	5.9

TNM classification was available for all patients included in the study. The distribution of tumor (T), nodal (N) and metastatic (M) categories at presentation is summarized in Table 5. A substantial proportion of patients presented with higher T categories (T3–T4) and nodal involvement (N1–N3). Distant metastasis at presentation was documented in a minority of patients.

Table 5: TNM classification at presentation (n=187)

TNM component	Category	No. of patients	Percentage (%)
T Category	T1	32	17.1
	T2	65	34.8
	T3	60	32.1
	T4	30	16.0
N Category	N0	63	33.7
	N1	52	27.8
	N2	53	28.3
	N3	19	10.2
M Category	M0	173	92.5
	M1	14	7.5

Stage at presentation was determined for all patients based on TNM classification. The distribution of Stage I to Stage IV disease at diagnosis is summarized in Table 6. Stage III and Stage IV disease constituted the majority of cases, while early-stage disease (Stage I and II) accounted for a smaller proportion of patients.

Table 6: Stage grouping at presentation among head and neck cancer patients (n=187)

Stage	No. of patients	Percentage
Stage I	22	11.8
Stage II	47	25.1
Stage III	56	29.9
Stage IV	62	33.2

DISCUSSION

Head and neck cancers constitute a considerable oncological challenge globally especially in developing nations where delayed diagnosis, restricted healthcare access, and a high incidence of lifestyle related behaviors lead to unfavorable outcomes. This retrospective study examined the clinico-pathological profile of 187 patients with head and neck malignancies treated at a tertiary care hospital, offering significant insights into demographic characteristics, anatomical site distribution, smoking status, stage at presentation and treatment patterns in a real-world clinical context.

Age Distribution and Demographic Characteristics:

The mean age at diagnosis in this study was around 59 years with patients aged between 13 and 86 years.

The majority of patients were concentrated in the sixth and seventh decades of life with the highest proportion in the 61–70 year age group, followed by those aged 51–60 years (Table 1). The age distribution aligns with several studies from India and other low- and middle-income nations, which have indicated a peak incidence of head and neck malignancies throughout the fifth to seventh decades of life^{3,4,5}. The prevalence of disease in older adults presumably indicates the accumulated exposure to diverse environmental and lifestyle factors throughout time. The age-associated deterioration of immune surveillance and the existence of comorbidities may further enhance vulnerability to malignancies in older populations. Comparable age trends have been documented by Dasgupta et al.⁴, Siddiqui et al.⁵, and

Kumar et al.⁶, substantiating the finding that head and neck malignancies primarily impact middle-aged and older individuals. The inclusion of younger patients, such as teenagers, underscores the comprehensive character of tertiary care hospital data and emphasizes the wide age range over which these cancers may manifest.

Sex Distribution: The survey revealed a significant male predominance with 75.4% men and 24.6% females yielding a male-to-female ratio of around 3.1:1 (Table 2). This discovery is consistent with existing Indian and international research which routinely reports male to female ratios between 2:1 and 4:1^{4,7,8}.

Numerous studies relate the elevated incidence of head and neck malignancies in males to gender specific disparities in lifestyle choices, occupational exposure and healthcare seeking behaviors. Tobacco smoking, smokeless tobacco usage and alcohol intake are conventionally more common among males in numerous areas of India. Sociocultural influences and postponed presentation in men may potentially contribute to this discrepancy. While a rising trend among females has been observed in certain areas, male predominance continues to be a persistent epidemiological characteristic in hospital based studies.

Smoking Status

A significant percentage of patients in this study had a documented smoking history, whereas a lesser percentage were classified as non-smokers or lacked any recorded smoking history (Table 3). This retrospective descriptive analysis reported smoking status just as a documented clinical feature without seeking to establish any connection or causative relationship with disease occurrence, tumor location or stage at presentation.

The inadequate documenting of smoking history in certain patients highlights a prevalent drawback of record-based studies and emphasizes the necessity for enhanced and uniform recording of habit history in routine clinical practice. However, the incorporation of smoking status offers valuable contextual insights into the clinical profiles of patients receiving treatment at a tertiary care facility.

Primary Tumor Site Distribution: The present study demonstrates a clear predominance of laryngeal malignancies which constituted more than half of all head and neck cancer cases in this cohort. This finding is consistent with several hospital based studies from India that have reported a high burden of laryngeal cancers, particularly in tertiary care settings^{10,11}. The predominance of laryngeal involvement may reflect regional and institutional referral patterns as well as variations in exposure to established risk factors.

Malignancies of the nasopharynx and oral cavity represented the next most common primary sites. Oral cavity tumors included lesions of the tongue, buccal mucosa and lip related subsites which were grouped together for descriptive analysis. The relative frequency of these sites is comparable to observations from other institutional studies even though considerable geographic variation has been reported in the literature^{4,5,6}.

Less frequent primary sites included the hypopharynx, parotid gland and thyroid each accounting for a small proportion of cases. Rare and heterogeneous sites such as plasmacytoma of the maxilla or mandible, submandibular gland tumors and maxillary bone lesions were grouped under the "Others" category due to their low individual frequencies.

Overall, the observed site distribution underscores the importance of institution specific epidemiological data in understanding regional disease patterns and complements population based cancer registry reports by providing detailed clinical insight from a tertiary care hospital setting.

TNM Classification: Accurate TNM classification is fundamental to disease stratification and staging in head and neck cancers. In the present study, complete TNM information was available for all patients enabling a reliable assessment of disease extent at presentation. Analysis of TNM components demonstrated that a considerable proportion of patients presented with locally advanced primary tumors (T3–T4) and regional nodal involvement (N1–N3). The predominance of higher T and N categories reflects delayed presentation which remains a persistent challenge in developing countries. Similar distributions of advanced T and N categories at diagnosis have been reported in several institutional studies from India and other low and middle income settings^{4,6,10}. Although distant metastasis at presentation was less frequent, its presence in a subset of patients further contributed to advanced disease classification. For descriptive analysis, T and N subcategories were grouped to provide a clear and interpretable overview of disease extent. The availability of complete TNM data in the present study strengthens the reliability of staging and allows meaningful comparison with existing institutional and regional reports.

Stage at Presentation: Stage at diagnosis is a key determinant of prognosis and overall disease burden in head and neck cancers. In the present study, Stage III and Stage IV disease accounted for the majority of cases indicating that a substantial proportion of patients presented with advanced-stage disease. In contrast, Stage I and Stage II disease was observed in

a smaller subset of patients. This pattern of advanced stage presentation is consistent with findings from several hospital based studies in developing countries where delays in diagnosis and referral are common^{4,5,6}. Factors such as limited awareness of early symptoms, socioeconomic constraints, and delayed access to specialized oncology services have been widely implicated in late stage diagnosis. The observed stage distribution showed good concordance with the TNM profile, particularly the high frequency of T3-T4 tumors and nodal involvement, supporting the internal consistency of the staging data. The ability to derive stage accurately for all patients based on complete TNM information represents a methodological strength of the present study and enhances the robustness of its clinico-pathological analysis.

Comparison with Existing Literature: The findings of this study align with existing literature from India and other developing nations regarding age distribution, male preponderance and advanced stage at presentation^{4-6,10}. Numerous studies indicate that the highest incidence of head and neck malignancies occurs in the middle aged and older populations exhibiting a distinct male predominance which mirrors prevalent demographic trends across various geographies and healthcare environments. The prevalence of laryngeal carcinoma in the current cohort underscores significant regional and institutional disparities in disease trends. Oral cavity and oropharyngeal cancers are frequently identified as the predominant subsites in various population based and hospital based studies. However, laryngeal malignancies have also been observed to prevail in specific institutional series especially in populations with a high incidence of tobacco use and associated behaviors^{10,11}. These variances highlight the necessity of producing localized epidemiology data to augment national cancer registry statistics.

Retrospective institutional investigations like the current one offer significant insights into actual clinical presentations and treatment methodologies that are frequently inadequately documented in population based registries. Despite the absence of survival analysis and long term outcome data, these studies are essential for finding patterns in disease presentation, resource consumption and deficiencies in treatment delivery. The results of this study are thus comparable to analogous institutional audits and augment the expanding literature on head and neck cancer characteristics at tertiary care facilities within resource-constrained settings.

Limitations: The present study has certain limitations that should be acknowledged. Its retrospective design is inherently subject to selection bias and relies on the accuracy and completeness of existing medical

records, which may vary across patients. Although TNM classification was available for all cases, variations in documentation practices and reliance on record based data may have limited the depth of certain clinico-pathological correlations. Information regarding specific risk factors, histopathological grading and molecular characteristics was not uniformly available for all patients and was therefore not included in the analysis. In addition, consistent follow-up and outcome data were not consistently documented, preventing assessment of survival outcomes or treatment related morbidity. As a single center hospital based study, the findings may not be fully generalizable to the broader population. However, despite these limitations the study provides valuable institution specific insight into the demographic and clinico-pathological profile of head and neck cancer patients and contributes meaningful data for understanding regional disease patterns in a tertiary care setting.

CONCLUSION

Head and neck cancers continue to constitute a significant oncological burden particularly in tertiary care hospitals within developing countries. In this retrospective analysis of 187 patients, the disease predominantly affected older individuals and demonstrated a marked male predominance, consistent with patterns reported in existing institutional and regional studies. The larynx emerged as the most common primary tumor site accounting for over half of all cases followed by malignancies of the nasopharynx and oral cavity. This site distribution highlights important regional and institutional variations in disease patterns and underscores the value of hospital based epidemiological data in complementing population level cancer registry reports. Less frequent primary sites including parotid gland and thyroid malignancies as well as rare and heterogeneous subsites contributed to the overall disease spectrum encountered in routine clinical practice. Analysis of TNM classification and stage at presentation revealed that a substantial proportion of patients presented with advanced disease (Stage III and IV). This finding reflects persistent challenges related to delayed diagnosis and referral which may be influenced by limited awareness of early symptoms, socioeconomic barriers and restricted access to specialized healthcare services. The availability of complete TNM and staging information for all patients strengthened the reliability of the descriptive analysis and allowed for accurate assessment of disease extent at presentation. Overall, this study provides valuable institutional insight into the clinico-pathological profile of head and neck cancer patients and emphasizes the need for improved early detection strategies, systematic staging and robust medical record documentation to better characterize regional

disease patterns and support future prospective research.

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