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Research Article

Prescribing Pattern with Treatment Approaches and Mortality Risk Assessment Using the Charlson Comorbidity Index in Head and Neck Cancer

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Abstract

Background: Head and neck cancer (HNC) is a major health challenge in India, which is mainly caused by improper lifestyle and poor social economic status where its treatment choice is mainly dependent on the situation and comorbidity of the patient. **Objective:** To study prescribing pattern along with treatment modalities in HNC and Assessment of 10-year mortality risk using the Charlson Comorbidity Index in a survey-based study population **Methodology:** This study was conducted over a period of 6 months in the Oncology Department of Karnataka Medical College and Research Institute, Hubballi, Karnataka, India. **Results:** A total of 150 cases were evaluated among most of the patients were male and aged between 50 to 69 years. The tobacco chewing is considered a leading cause to get HNC and around 90% of patients are diagnosed at an advanced stage (III–IV) with stage IVA (53.33%) as the most common. From the study it has been observed that about 77% of patients were given with multimodal therapy, among this platinum-based chemotherapy regimen are more common, followed by radiotherapy (71.33%) used as an adjuvant therapy after surgery. A significant association was observed between stage of cancer and treatment modality (χ^2 = 63.783, p = 0.0013) and Charlson Comorbidity Index showed that about 12.7 % patients have lesser than 50 % predicated mortality risk. **Conclusion:** The report finds that stage at diagnosis significantly influences treatment selection, with advanced stages requiring multimodal platinum-based therapy and radiotherapy and with respect to mortality risk , age of the patient significantly influences the mortality risk were as gender has no significance with respect to mortality risk and the predominance of low CCI scores in 87.3% patients indicates a favourable prognostic profile, highlighting the value of combining stage-based treatment with comorbidity assessment for individualized clinical decision-making.

Keywords: Head and neck cancer, prescribing pattern, treatment modalities, platinum-based chemotherapy, Charlson Comorbidity Index.

INTRODUCTION

Head and neck cancer commonly originate from different anatomical sites of head and neck such as mouth, salivary gland, nose etc. Although their development differs widely but they all arise from similar molecular pathways. The term prescribing pattern indicates the method by which healthcare professionals select and administer medications, including their combination and dosing regimen, based on disease characteristics and patient-related factors. In oncology, these prescribing decisions are integrated with different treatment modalities, including surgery, radiotherapy, and chemotherapy. (1) (20)

HNC acts a major global health burden. Each year, approximately 890,000 new cases are diagnosed worldwide, making it the seventh most common type of cancer, with nearly half a million deaths annually. In India, HNC constitutes one of the most frequently diagnosed cancers among men and which contributes significantly to the national cancer burden. It is estimated that by 2040, the number of new cancer cases in India may reach up to 2.1 million, representing an increase of more than 57% compared with two decades

earlier. Approximately one in nine individuals born in India may develop cancer during their lifetime, and nearly three out of ten cancers diagnosed in the country are head and neck cancers, highlighting the substantial impact of this disease on public health. [2][3]

The diagnostic evaluation of suspected head and neck cancer includes detailed clinical history, physical examination, endoscopic assessment, and histopathological confirmation through biopsy. Imaging techniques such as computed tomography (CT), magnetic resonance imaging (MRI), and positron emission tomography (PET-CT) are used to determine tumour extent, nodal involvement, and distant metastasis. Treatment decisions are largely guided by TNM staging, which evaluates the size and extent of the primary tumour (T), involvement of regional lymph nodes (N), and presence of distant metastasis (M).[20]

The management of head and neck cancers is largely stage dependent. Early-stage disease (stage I–II) is generally managed with single-modality therapy, such as surgery or definitive radiotherapy. In contrast, locally advanced disease (stage III–IV) usually requires multimodal treatment, including surgery followed by adjuvant radiotherapy or concurrent chemoradiotherapy, most commonly with cisplatin-based regimens. In selected cases, induction chemotherapy may be administered before definitive therapy, whereas recurrent or metastatic disease is primarily managed with chemotherapy. [20]

Cancer of the head and neck is primarily treated surgically to remove the primary tumour/ lymph nodes and chemo therapy may interfere with DNA replication, inhibit cell division, or induce programmed cell death in malignant cells. Radiotherapy uses high-energy radiation beams to destroy cancer cells, either as a definitive treatment or in combination with other modalities. [5][6] When diagnosed at an early stage, surgical resection remains one of the most effective curative approaches, although advances in treatment strategies have expanded therapeutic options for more advanced disease. [7]

Selection of appropriate therapy requires careful evaluation of the tumour as well as patient-related factors such as age, comorbidities risk stratification using CCI which helps in identification and estimation of comorbidity burden and mortality risk and overall performance status, as treatment must be individualized for optimal outcome. Personalized treatment planning helps improve therapeutic effectiveness while minimizing treatment-related adverse effects. [8][23

MATERIALS AND METHODS

This study was conducted over a duration of six months in the Oncology Department of Karnataka Medical College and Research Institute, Hubballi. Ethical approval was obtained from Institutional Ethics Committee, and written informed consent was taken from all participants prior to collect data .

The sample size was calculated using the formula n=Z2×p(1−p) / d2where Z = 1.96 at a 95% confidence level, p = 0.30 (expected prevalence of head and neck cancer)22, and d = 0.075 (margin of error). The calculated sample size was approximately 144 patients. Considering Practical availability of patient during the study period, a total of 150 patients were included in the study.were we included the Patients aged 18 above age , of either sex diagnosed with HNC, including both newly diagnosed and previously diagnosed cases, were included to evaluate prescribing patterns across different stages of disease management. Patients with comorbid conditions were included to assess the influence of associated diseases on treatment decisions and survival outcomes. Participants receiving treatment in outpatient (OPD), day-care, or inpatient (IPD) departments were included to get various treatment modalities such as surgery, radiotherapy, and chemotherapy. Patients admitted to the ICU were excluded because they usually require critical care management that different from routine oncology treatment protocol. Patients not willing to provide consent were excluded to keep ethical standards and voluntary participation, while patients with incomplete clinical or treatment records were excluded to ensure accuracy and reliability of the collected data.

Data were collected using pre-designed data collection form patient case sheets and prescriptions which included demographic details, subjective complaints, site of cancer, stage of disease, treatment planning, comorbidities, histopathological findings, and supportive medications. Mortality risk was analysed using Charlson Comorbidity Index, and treatment modalities were categorized into surgery, radiotherapy, and chemotherapy.

The collected data were entered into Google Sheets and summarized as frequency and percentage. Statistical analysis was performed using the Chi-square test to determine association between variables included in the data collection form.

RESULTS:

Among 150 patients with HNC about 120 were male and 30 were female, which shows male predominance. Most of the patients were between 50-69 years age group, indicating the HNC is very common in middle-aged and older individuals.

Socioeconomic status of the patient was analysed using Modified Kuppuswamy scale which shows most patients belonged to the upper-lower socioeconomic class, followed by lower middle class and lower class, with no patients from the upper class.

Regarding comorbidities, 105 patients had no major illnesses, while 45 patients had conditions such as hypertension (HTN), Diabetes (DM), renal disease, Cerebrovascular accident (CVA), HIV, hypothyroidism, jaundice etc.

Table 1. Baseline Demographic, Clinical and Disease Characteristics

Variable	Category	Number	Percentage %
Gender	Male	120	80.00
	Female	30	20.00
Age group (years)	18-35	9	6.00
	36-49	45	30.00
	50-69	78	52.00
	≥70	18	12.00
Socioeconomic status	Upper middle (II)	6	4.00
	Lower middle (III)	37	24.67
	Upper lower (IV)	84	56.00
	Lower (V)	23	15.33
Comorbidity status	No significant comorbidity	105	70.00
	Having comorbidity	45	30.00
Social risk factors	Tobacco chewing	129	86.00
	Betel nut use	91	60.67
	Alcohol use	57	38.00
	Smoking	50	33.33
Clinical stage	Stage I	3	2.00
	Stage II	13	8.67
	Stage III	45	30.00
	Stage IVA	80	53.33
	Stage IVB	6	4.00
	Stage IVC	3	2.00

Among the major risk factors were tobacco chewing as most common followed by Betel nut, alcohol consumption and smoking but overall tobacco-related substance abuse were clearly dominant and with respect to distribution of clinical stage about half of the patients were diagnosed at stage IVA followed by Stage III, II, IVB, IVC, I and with respect to treatment choice multimodal therapy shows clear dominance which was 77% which is more common than single-modality treatment. The most common approach was surgery + chemotherapy+ radiotherapy (28.67%), followed by surgery +radiotherapy (24.67%) and chemoradiation (16%) Surgery alone (11%), chemotherapy alone (9%), surgery +chemotherapy (8%), and radiotherapy alone was rare just 2%. So clearly, combination therapy dominated

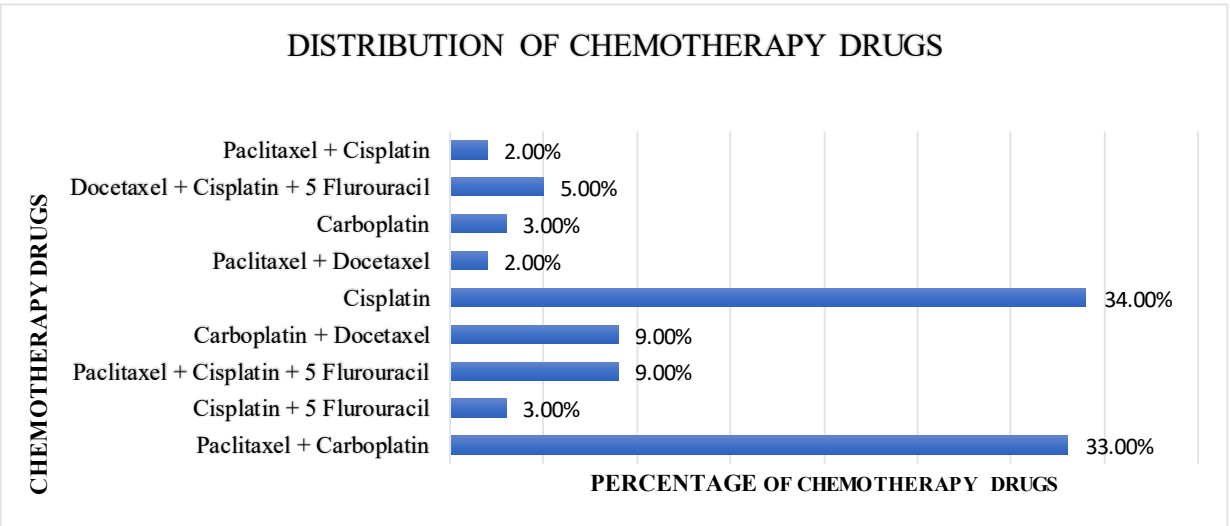

Figure 1. Distribution of chemotherapy drugs

Chemotherapy was given to 94 (62.67%) patients in which paclitaxel + carboplatin was more common whereas Cisplatin alone was more common in monotherapy and Overall platinum drugs act as the centre of systemic therapy. Before every chemotherapy, pre chemotherapy medications were given; it was about 376 medications prescribed which mainly included drugs like dexamethasone, pantoprazole, ondansetron and pheniramine given in IV forms which help in preventing chemotherapy induced ADR and to improve patient tolerability with respect to post chemotherapy medications were about 668 medications were prescribed which mainly includes drugs like dexamethasone, ranitidine, ondansetron ,pheniramine, anxit, paracetamol, syp duphalac and protein powder through oral route which help in preventing chemotherapy induced ADR. About 109 (72.66%) patients under gone surgery where about 545 medications prescribed which mainly includes amoxicillin, clavulanic acid, pantoprazole, ondansetron, combination of painkillers, trypsin, vitamin and nutritional supplements etc... were given as supportive agents. Radiotherapy was given to 107 patients (71.33%) were all of them received external beam radiation which includes VMAT/3D-CRT/2D techniques. Total doses ranges from 30 to 70 Gy, with a mean of 54 Gy. Average fraction dose was about 2.25 Gy and treatment of duration varied from 10 to 35 days.

Table 2. Stages of Cancer and treatment modality

Stage of cancer	Chemotherapy alone	Chemotherapy + Radiotherapy	Radiotherapy alone	Surgery alone	Surgery + Chemotherapy	Surgery + Chemotherapy + Radiotherapy	Surgery + Radiotherapy	Total
Stage I	0	0	0	2	0	0	1	3
Stage II	0	4	0	1	1	0	7	13
Stage III	2	10	0	8	1	8	16	45
Stage IVA	8	10	3	4	9	33	13	80
Stage IVB	3	0	0	1	1	1	0	6
Stage IVC	1	0	0	1	0	1	0	3
Total	**14**	**24**	**3**	**17**	**12**	**43**	**37**	**150**

The significant association between cancer stage and treatment modality was observed (χ^2 = 63.783, p = 0.0013). Cramér'sV value of 0.29, which indicates a moderate association, showing that treatment decisions were influenced by the stage of the cancer at diagnosis.

When the data was analysed significant association was observed in oral cavity cancer (p = 0.0115), pharyngeal (p = 0.0161), and nasal cancers (p = 0.0455),but for laryngeal and salivary gland cancers, the association was not statistically significant.

Table 3. Distribution of Survival Scores Based on Charlson Comorbidity Index (CCI) (n = 150)

Survival Score	Frequency (n)	Percentage (%)
0	3	2.00%
1	10	6.70%
2	43	28.70%
3	41	27.30%
4	34	22.70%
5	11	7.30%
6	4	2.70%
7	4	2.70%
Total	**150**	**100%**

The probability of mortality risk was estimated using Charlson Comorbidity Index showed that about 12.7 % patients have lesser than 50 % predicated mortality risk were The mean age in mortality risk assessment is 54 years old between the age group of 28 to 86. The average survival score was 3.0. About 37.3% are at low risk, 50.0% at moderate risk, and 12.7% at high risk patients. Age showed significant positive correlation with survival score ($r = 0.44$, $p < 0.001$). ANOVA showed significant differences across age groups ($p < 0.001$). Gender was not significantly associated with risk ($p = 0.57$).

DISCUSSION

This prospective hospital-based study was made to analyse prescribing patterns, treatment approaches, and CCI-based survival prediction in patients with HNC , highlight the need of real-world evidence on stage-specific treatment patterns in tertiary care hospital. As treatment decisions in HNC are largely influenced by disease stage and comorbidity burden, such evaluation is essential to determine the suitability of multimodal therapy and its impact on prognosis. By correlating prescribing trends with treatment selection and predicted survival outcomes, the study highlights its clinical relevance in supporting individualized and evidence-based oncology care.

This study included 150 patients of (HNC) among which a clear male predominance was observed which was mainly due to higher exposure of males to risk habits, Similar with studies by Ashish Mathew et al.[9]. The majority of patients were within the 50–69-year age group, suggesting that HNC occurs more frequently among middle-aged and elderly individuals due to prolonged exposure to carcinogenic factors, Similar with studies by Mohammad Hasan Larizadeh et al.[10].

Socioeconomic status showed predominance was observed in upper-lower socioeconomic class, which was due to increased risk factors, poor awareness and limited health access, Similar with studies by A. K. Agarwal et al.[11]. Comorbidities status showed 44 had conditions such as Diabetes Mellitus, Hypertension, and Cerebrovascular Accident., Similar with studies by Singh B et al. [19]

Tobacco chewing was identified as the most common risk factor, Similar with studies by AbrarWahab et al.[12] A large proportion of patients were diagnosed at stage IVA, indicating late presentation of the disease, Similar with studies by FláviaNascimento de Carvalho et al.[13] and Due to the predominance of advanced-stage disease, multimodal therapy was more commonly adopted than single-modality treatment. The most frequent approach was surgery combined with chemotherapy and radiotherapy, followed by surgery with radiotherapy and chemoradiation, Similar with studies by Garrett Anderson et al.[14]

Systemic therapy plays an important role in the management of head and neck cancer, where platinum-based regimens remain the backbone of chemotherapy. Combination regimens containing paclitaxel and carboplatin are frequently utilized due to their synergistic antitumor activity and improved tolerability, while cisplatin is commonly used as a single-agent therapy in selected patients., Similar with studies by Ashish Mathew et al.[9] and VidishaTuljapurkar et al.[15], which highlighting the continued importance of platinum compounds in systemic treatment strategies for HNC.

The administration of appropriate supportive medications during chemotherapy is essential to reduce treatment-related adverse effects and improve patient tolerance. Corticosteroids, proton pump inhibitors, antihistamines, and antiemetic agents such as dexamethasone, pantoprazole, ondansetron, and pheniramine are widely used as prophylactic medications to prevent hypersensitivity reactions, gastritis, and chemotherapy-induced nausea and vomiting., Similar with studies by Novita Sari et al.[16].

Surgical management of HNC is also associated with the use of multiple perioperative medications, including antibiotics, proton pump inhibitors, antiemetics, analgesics, and nutritional supplements to prevent postoperative complications and promote recovery. , Similar with studies by Seth M. Cohen et al.[17]

Radiotherapy remains a key modality in the multidisciplinary management of HNC, with modern external beam techniques such as VMAT and 3D-CRT commonly employed to deliver precise radiation doses while minimizing damage to surrounding tissues., Similar with studies by Eva Yu-Hsuan Chuang et al.[18].

A significant association between cancer stage and treatment modality was observed ($\chi^2 = 63.783$, $p = 0.0013$), with a Cramér's V value of 0.29 indicating a moderate association. This finding suggests that treatment decisions were considerably influenced by the stage of cancer at diagnosis, reflecting a stage-directed therapeutic approach in clinical practice. This observation is consistent with studies by A. K. Agarwal et al. who reported that advanced-stage head and neck cancers are more likely to receive multimodality treatment compared to early-stage disease.[21]

Evaluation using the Charlson Comorbidity Index showed that about 12.7 % patients are having 50 % predicated mortality risk despite of 89% at advanced stage, 29.33% comorbidity burden and more than 60 % are above the age of 50 which clearly shows that CCI is relatively low resulting in higher predicated mortality risk which is similar to studies with Singh B et al.[19]

Assessment of mortality risk showed that risk increase with increase in age. A moderate positive correlation indicate a consistent relationship between increasing age and higher survival risk scores. Analysis of variance (ANOVA) further confirmed statistically significant differences in risk distribution across different age groups World Health Organization [24] Steyerberg EW [25] Niccoli T et al. [26]

Gender was not significantly associated with mortality risk distribution, indicating that sex does not independently influence survival scoring in this population. Regression analysis further identified age as

the only significant predictor of survival score Oksuzyan A et al. [27]

These findings are consistent with existing clinical evidence, which indicate age as a major determinant of health outcomes and mortality risk, while gender plays a comparatively limited role in risk prediction models Charlson ME et aol. [23]

CONCLUSION

This study shows that stage at diagnosis had a direct influence on treatment selection. A limited number of Early-stage cases were managed with monotherapy but once the disease progressed multimodal therapy will be the only treatment option and Platinum-based chemotherapy acts as a backbone of chemotherapy Regimens such as paclitaxel–carboplatin and various cisplatin-based combinations are more prescribed, reflecting standard oncologic practice. Radiotherapy was used both as a definitive treatment in early stages and as an adjuvant therapy after surgery in advanced stages, thereby following NCCN guidelines and about 86% of patients had a low CCI, indicating that most patients had fewer coexisting illnesses and therefore a better predicted prognosis which further helps in evaluation of patient prognosis and can guide individualized treatment planning in clinical practice.

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ETHICS STATEMENT:

The study protocol was reviewed and approved by the Institutional Ethics Committee (IEC) of SET'S College of Pharmacy. Ethical approval was granted under reference number SET/CPD/IEC/101A on 04/03/2025.

CONFLICT OF INTEREST:

The authors declare that there is no conflict of interest among them regarding the publication of this study.

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