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Association of Nutritional Status with Disease Stage and Treatment Outcome in Patients with Head and Neck Cancer: A Prospective Observational Study

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ABSTRACT

Aim: To study the association of nutritional status with stage and treatment outcome in patients with head and neck cancer treated with Radiation Therapy.

Materials and Methods: This prospective observational study was conducted at the Department of Radiation Oncology, DVVP Rural Hospital, PIMS, Loni, Maharashtra. 74 newly diagnosed, non-metastatic HNSCC patients were enrolled. Nutritional parameters—including weight, body mass index (BMI), mid-upper arm circumference (MUAC), waist-to-hip ratio (WHR), and prognostic nutritional index (PNI)—were assessed at: baseline, 3rd week of RT, at conclusion, and first follow-up (6–8 weeks post-RT). Treatment response was evaluated using RECIST 1.1 criteria.

Results: The study included 57 males (77.03%) and 17 females (22.97%), with a mean age of 54.68 ± 13.13 years. The most common tumor site was the oral cavity (55.41%), followed by the oropharynx (28.38%) and hypopharynx (16.22%). Most patients (71.62%) were from rural areas, with significant tobacco and alcohol use. Most cases presented with advanced-stage disease, with 71.62% classified as Stage III or IV at diagnosis. Out of 74 patients 21 patients underwent surgery followed by Adjuvant CTRT, 20 patients received NACT (13 underwent surgery followed by CTRT and 7 were unfit for surgery they received Radical CTRT), 33 patients received Radical CTRT.

Nutritional assessment showed a progressive decline in weight, BMI, MUAC, WHR, and PNI during RT, followed by partial recovery post-treatment. Among males, weight decreased from 56.26±13.81 kg (baseline) to 52.48±12.47 kg (RT completion), with a slight improvement at follow-up (53.70±13.06 kg). Similar trends were observed for BMI (20.90±4.13 to 19.51±3.81), MUAC (25.70±2.77 cm to 25.05±2.62 cm), WHR (0.83±0.06 to 0.81±0.06), and PNI (40.52±4.54 to 37.34±4.63). Female patients exhibited a comparable pattern, with weight dropping from 39.33±7.08 kg to 37.84±7.62 kg before improving to 39.67±7.10 kg. Despite these trends, statistical analysis showed no significant variations ($p>0.05$), except for WHR in females ($p=0.000$).

Treatment response analysis revealed that 45.95% of patients achieved a complete response (CR), 9.46% had a partial response (PR), 8.11% had progressive disease (PD), and 4.05% had stable disease (SD). Additionally, 32.43% of cases were classified as "Not Applicable" due to loss to follow-up.

Conclusion: This study highlights the significant impact of nutritional decline on HNSCC treatment outcomes. While a noticeable deterioration in nutritional status was observed during RT, some degree of recovery occurred post-treatment. These findings emphasize the need for early nutritional screening, individualized dietary interventions, and proactive nutritional support to enhance treatment tolerance and recovery. Integrating nutritional management into oncology care through a multidisciplinary approach can improve patient outcomes and quality of life, particularly in resource-limited settings where late-stage presentation remains prevalent.

Keywords: Head and Neck Cancer, Malnutrition, Radiotherapy, Nutritional Assessment, Treatment Outcome.

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I. INTRODUCTION

Head and neck cancers (HNCs) comprise a heterogeneous group of malignancies arising from the mucosal surfaces of the upper aerodigestive tract, including the oral cavity, oropharynx, hypopharynx, nasopharynx, and larynx. Among these, head and neck squamous cell carcinoma (HNSCC) accounts for over 90% of cases and remains a major global public health challenge.[1]

Globally, lip and oral cavity cancer ranks 15th in incidence and 16th in mortality, oropharyngeal cancer is 24th and 23rd, and hypopharyngeal cancer ranks 25th in both. GLOBOCAN 2022 estimates report 389,846 new lip and oral cavity cases, 106,400 oropharyngeal cases, and 86,257 hypopharyngeal cases worldwide.[2,3,4] In India, lip and oral cavity cancer is 2nd in both incidence and mortality, with 143,759 cases, while oropharyngeal and hypopharyngeal cancers account for 23,174 and 30,510 cases.[5]

The epidemiological landscape of HNSCC is further complicated by socio-cultural factors. In India, for instance, the prevalent use of smokeless tobacco products (such as gutkha and pan masala), betel nut chewing, and a high incidence of alcohol consumption synergistically contribute to the risk and poor prognosis of these cancers. Moreover, late-stage presentation is common, driven by limited public awareness, inadequate screening programs, and socio-economic constraints. This late presentation is associated with a higher likelihood of extensive locoregional disease, increased treatment-related morbidity, and diminished overall survival.

A critical and often underappreciated aspect of HNSCC management is the impact of nutritional status. Malnutrition is highly prevalent among HNSCC patients due to tumor-induced dysphagia, treatment-induced mucositis, and the systemic metabolic effects of cancer. Several studies have shown that up to 30–50% of patients may be malnourished at diagnosis, with further deterioration observed during radiotherapy (RT) or chemoradiotherapy. Malnutrition not only exacerbates treatment-related toxicities but also compromises the immune response, delays wound healing, and ultimately affects treatment outcomes and quality of life.[6]

The literature highlights that early nutritional screening and timely intervention can mitigate these adverse effects. Nutritional indices such as weight, body mass index (BMI), mid-upper arm circumference (MUAC), waist-to-hip ratio (WHR), and prognostic nutritional index (PNI)[7] have been identified as valuable markers for assessing patient status and predicting treatment tolerance. Despite the recognized importance of nutrition in HNSCC care, there is a scarcity of prospective studies that rigorously document the trajectory of nutritional decline during RT and its direct impact on treatment response.

This study was designed to address these gaps by prospectively evaluating the association between nutritional status, disease stage, and treatment outcomes in HNSCC patients undergoing RT. By integrating comprehensive nutritional assessments with clinical outcome data, the present investigation aims to elucidate the dynamic interplay between nutrition and treatment efficacy.

II. MATERIALS AND METHODS

Ethical consideration

After obtaining clearance from ethical committee all patients fulfilling inclusion and exclusion criteria were enrolled in the study. Informed written consent in a vernacular language was obtained from all the study participants.

Patient selection

All consecutive nonmetastatic oral cavity, oropharyngeal and hypopharyngeal cancer patients treated in the Department of Radiation Oncology from March 2023 to February 2025 were included in the study. The study included patients of all age groups and both sexes with a Karnofsky Performance Scale score of ≥70, histopathologically confirmed HNSCC, who were scheduled for curative radiotherapy, provided informed written consent, and completed treatment. Nutritional parameters—including weight, body mass index (BMI), mid-upper arm circumference (MUAC), waist-to-hip ratio (WHR), and prognostic nutritional index (PNI)—were assessed at: baseline, 3rd week of RT, at conclusion, and first follow-up (6–8 weeks post-RT). Patient with other neoplastic aetiology or secondary primary malignancy, already operated or irradiated, congenital or acquired anomalies of HN region affecting nutrition were excluded from the study. **(Image 1)**

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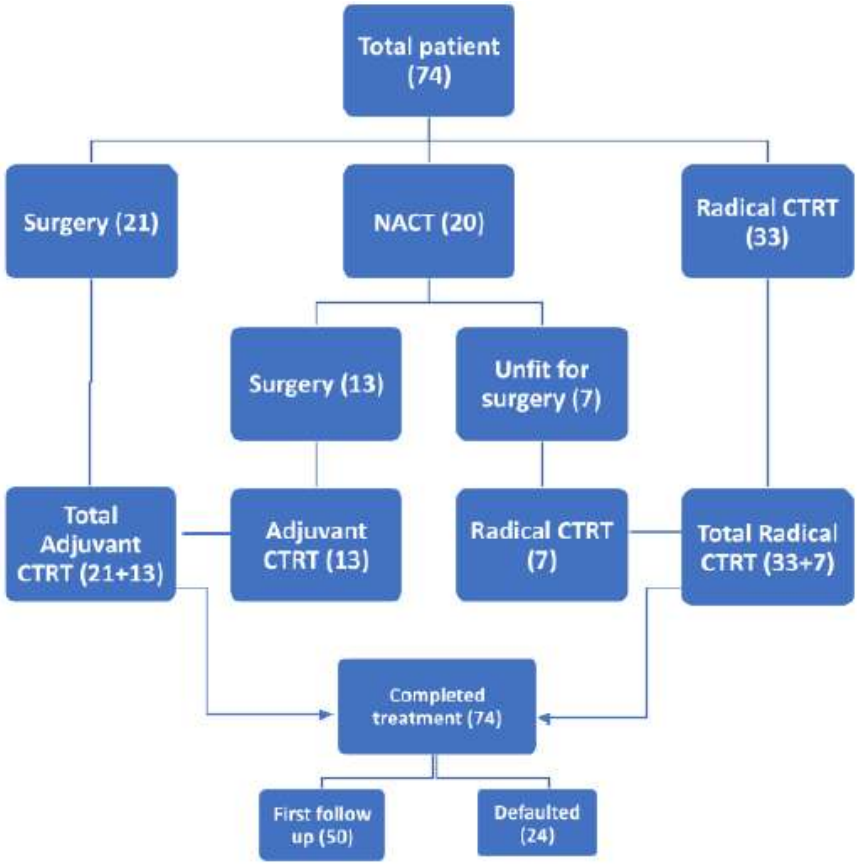

Image 1: Patient selection

Treatment plan:

All patients satisfying the above inclusion and exclusion criteria were treated with curative intent using Neo-adjuvant chemotherapy (NACT) followed by surgery followed by radiotherapy (RT) or surgery followed by RT or NACT followed by RT or concurrent Chemoradiation therapy (CTRT) based on the stage and general condition of patient. Patient with high tumor burden or high nodal volume were given NACT with chemotherapy regimens such as Paclitaxel (80mg/m2) with a platinum agent such as Cisplatin (40mg/m2) or Carboplatin (AUC 2) given as a weekly regimen, Paclitaxel (80mg/m2) with Cisplatin (40m/m2) and 5-FU (1gm/m2) given as a weekly regimen, Cetuximab (500mg/m2) with Docetaxel (75mg/m2) and Cisplatin (75mg/m2), given a three weekly regimen. After NACT, patients were planned for radiotherapy based on the response to initial chemotherapy and departmental protocols. For radiation therapy, Patients were immobilized with thermoplastic moulds and treatment fields were simulated with CT simulation. Patient planned for radiotherapy were treated using radiotherapy either Intensity-modulated (IMRT). A conventional fractionation schedule was used, delivering 60-70 Gy/30-35 fractions at 2 Gy per fraction per day over 6-7 weeks using six MV photons with or without weekly injection Cisplatin 40mg/m2. In some of patients Hypo-fractionation schedule was used due to underlying cardiac issues. During RT, all patients were assessed weekly for toxicity grading, supportive care need, and RT/prophylactic exercise compliance.

Nutritional Parameters:

Patients weight, body mass index (BMI), waist hip ratio (WHR), mid upper arm circumference (MUAC) and Prognostic nutritional index (PNI) was noted before starting patient on radiotherapy, 3rd week of RT, at conclusion and at 1st follow up.

1. Weight Measurement

- **How to Collect:** Use a calibrated scale consistently and weigh patients at the same time each day (preferably in the morning before meals) to minimize variability.

2. BMI Calculation

- **How to Calculate:** BMI is calculated using the formula: BMI = Weight (kg) / Height (m)^2.

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3. Waist-Hip Ratio (WHR)

- **How to Measure:**
- Waist: Measure at the narrowest point between the ribs and hips, or at the level of the belly button.
- Hip: Measure around the widest part of the hips or buttocks.

4. Mid-Upper Arm Circumference (MUAC)

- **How to Measure:** Measure the circumference of the upper arm, halfway between the shoulder and elbow, ensuring the arm is relaxed.

5. **Protein nutritional index (PNI):** The PNI is an important indicator of the nutritional status of cancer patients, particularly those undergoing treatments like chemotherapy and radiotherapy. It is used to assess the risk of complications, prognosis, and recovery in patients, as protein is critical for immune function, tissue repair, and overall health.

- **How to Measure:** 10 x Sr. Albumin + 0.005 x Lymphocyte Count

- **Statistical analysis:**

1. All the data collected will be compiled and subjected to statistical analysis to derive a conclusion.
2. Patients' characteristics will be assessed by statistical techniques using mean, standard deviation, median, range, proportion/percentage, etc.
3. The median values will be considered for subgroup division.
4. Statistical software Graph pad Instat3 will be used for statistical analysis. The appropriate statistical test will be applied for subgroup analysis as per the type of variable and its distribution (paired or unpaired student's t-test; or Mann Whitney-U or Wilcoxon Signed Rank test). The p-value will be set at 0.05 level of significance.

III. RESULTS

A total of 74 patients of oral cavity, oropharynx and hypopharynx cancer were registered during the study period. The characteristics of study population and disease are described in Table 1 and Table 2

Patient characteristics	Subgroup	n (%)
Age (Years)	Median (range) Oral cavity	50 (30-81)
	Median (range) Oropharynx	58 (33-85)
	Median (range) Hypopharynx	58 (48-77)
Gender	Male	57 (77.02)
	Female	17 (22.98)
Addiction	No addictions	4 (5.4)
	Smoking	13 (17.6)
	Alcohol+ tobacco (smoked/smokeless)	22 (29.7)
	Smoked tobacco + smokeless tobacco	13 (17.6)
Occupation	Tobacco chewers + Mishri	22 (29.7)
	Farmer	34 (44.95)
	Labours	16 (21.62)
	Driver	7 (9.46)
	Homemaker	7 (9.46)
	Shopkeeper	4 (5.41)
	Watchmen	3 (4.05)
	Businessman	2 (2.70)
	News reporter	1 (1.35)

Table 1: Patient characteristics

Disease characteristics	Subgroups	n (%)
Site	Oral cavity	51 (51.41)
	Oropharynx	21 (28.38)
	Hypopharynx	12 (16.22)
Subsite 1. Oral cavity	Tongue	16 (21.62)
	Buccal Mucosa	14 (18.92)
	Gingivobuccal Sulcus (GBS)	6 (8.11)

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2. Oropharynx	Retromolar Trigone (RMT)	2 (2.70)
	Alveolus	3 (4.05)
	Tonsil	7 (9.46)
	Base of Tongue (BOT)	4 (5.41)
	Soft Palate	7 (9.46)
	Vallecula	2 (2.70)
	Anterior Pillar	1 (1.35)
	Pyriform Sinus	7 (9.46)
3. Hypopharynx	Post-Cricoid	4 (5.41)
	Posterior Pharyngeal Wall	1 (1.35)
Laterality	Right	40 (54.05)
	Left	24 (32.43)
	Central	10 (13.51)
HPR grade	I	25 (33.78)
	II	42 (56.76)
	III	7 (9.46)
Stage	I	1 (1.35)
	II	9 (12.16)
	III	19 (25.68)
	IV A	22 (29.73)
	IV B	23 (31.08)

Table 2: Disease characteristics

Treatment:

A total of 74 patients were treated, of whom 20 (27.03%) received neoadjuvant chemotherapy (NACT) and 54 (72.97%) did not. Among those undergoing surgery, 13 (17.57%) had NACT followed by surgery, while 21 (28.38%) had surgery alone; the remaining 40 (54.05%) did not undergo any surgical intervention. Radiotherapy (RT) was administered with either radical or adjuvant intent: 40 (54.05%) patients received radical RT (60–70 Gy), and 34 (45.95%) underwent adjuvant RT (50–66 Gy). Platinum-based chemotherapy was predominantly employed, with cisplatin given to 50 patients (67.57%) and carboplatin to 24 (32.43%). Out of these 50 patients reported for follow-up and post-RT nutritional assessment. The comparative assessment was conducted on a total of 50 patients who reported for 1st follow-up.

Nutritional assessment Pre- RT, 3rd week of RT, conclusion and 1st follow up:

1. **<u>Male patients</u>: (Table 3)**

- At baseline, the mean weight was 56.26±13.81 kg, which declined to 54.09±12.97 kg at week 3 and to 52.48±12.47 kg at RT conclusion, with a slight recovery at follow-up (53.70±13.06 kg).
- A similar pattern was seen in BMI, which declined from 20.90±4.13 at baseline to 19.51±3.81 by RT conclusion, with a partial improvement (19.86±3.94) at follow-up.
- MUAC followed a comparable trend, reducing from 25.70±2.77 cm at baseline to 25.26±2.57 cm at the third week and further to 25.05±2.62 cm at RT completion, with a slight increase (25.21±2.62 cm) at follow-up.
- WHR showed a minor but consistent decline from 0.83±0.06 at baseline to 0.81±0.06 at RT completion and remained stable at follow-up.
- The PNI, a key indicator of nutritional and immune status, declined from 40.52±4.54 at baseline to 37.37±4.57 at the third week and 37.34±4.63 at RT completion but showed some improvement (39.69±5.07) at follow-up.

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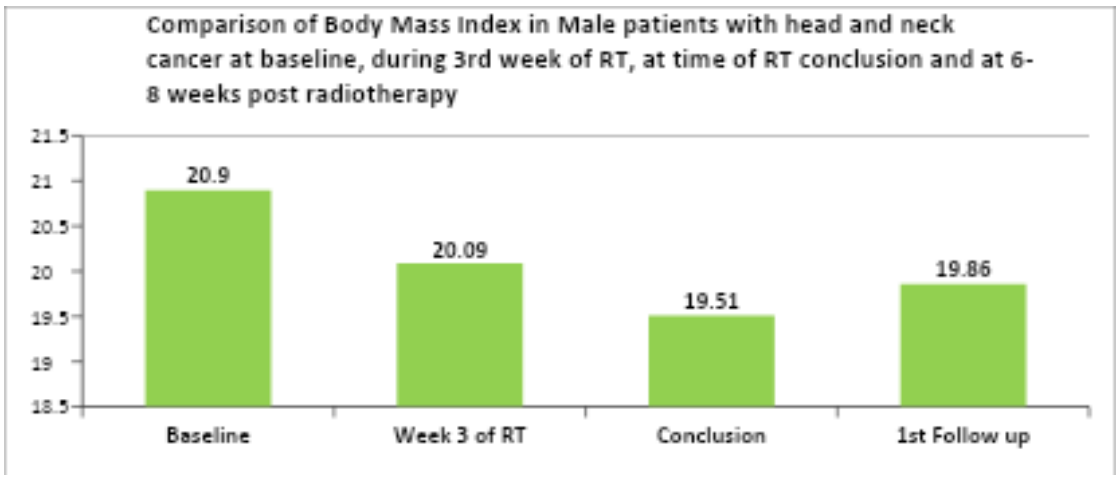
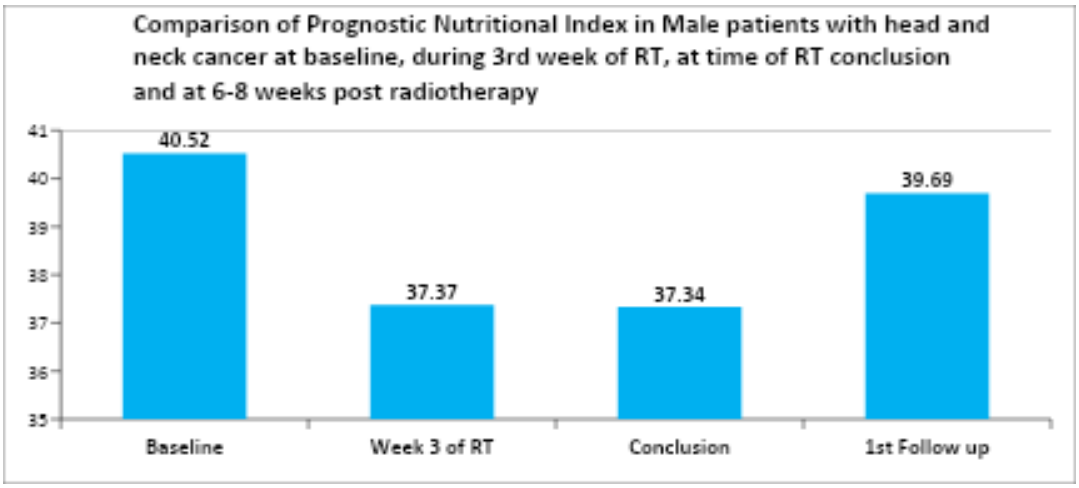


Graph no 1: comparison of BMI of male patients



Graph no 2: comparison of PNI of male patients

	Weight in kg Mean ± SD	**BMI Mean ± SD**	**MUCA Mean ± SD**	**WHR Mean ± SD**	**PNI Mean ± SD**
Baseline	56.26±13.81	20.90±4.13	25.70±2.77	0.83±0.06	40.52±4.54
Week 3 of RT	54.09±12.97	20.09±3.85	25.26±2.57	0.82±0.059	37.37±4.57
Conclusion	52.48±12.47	19.51±3.81	25.05±2.62	0.81±0.06	37.34±4.63
1st Follow up Student's Paired 't' test value and significance	53.70±13.06 t=0.9994, p=0.8712 not significant	19.86±3.94 t=0.4562, p=0.3126 not significant	25.21±2.62 t=0.024, p=0.9887 not significant	0.81±0.06 t=0.235, p=0.4248 not significant	39.69±5.07 t=0.5423, p=0.4569 not significant

Table 3: Comparison of nutritional status in Male patients with head and neck cancer at baseline, during 3rd week of RT, at time of RT conclusion and at 6-8 weeks post radiotherapy

2. <u>Female patients</u>: (Table 4)

- At baseline, the mean weight was 39.33±7.08 kg, which decreased slightly to 38.44±7.19 kg by the third week of RT and further to 37.84±7.62 kg at RT conclusion, before recovering to 39.67±7.10 kg at follow-up.
- BMI followed a similar pattern, reducing from 18.85±2.84 at baseline to 17.9±2.96 at RT completion, with a subsequent improvement to 18.59±3.30 at follow-up.

(Graph 3)

- MUAC showed a slight decline from 23.80±2.30 cm at baseline to 23.37±2.32 cm at RT completion, with a minor increase to 23.85±2.18 cm at follow-up.

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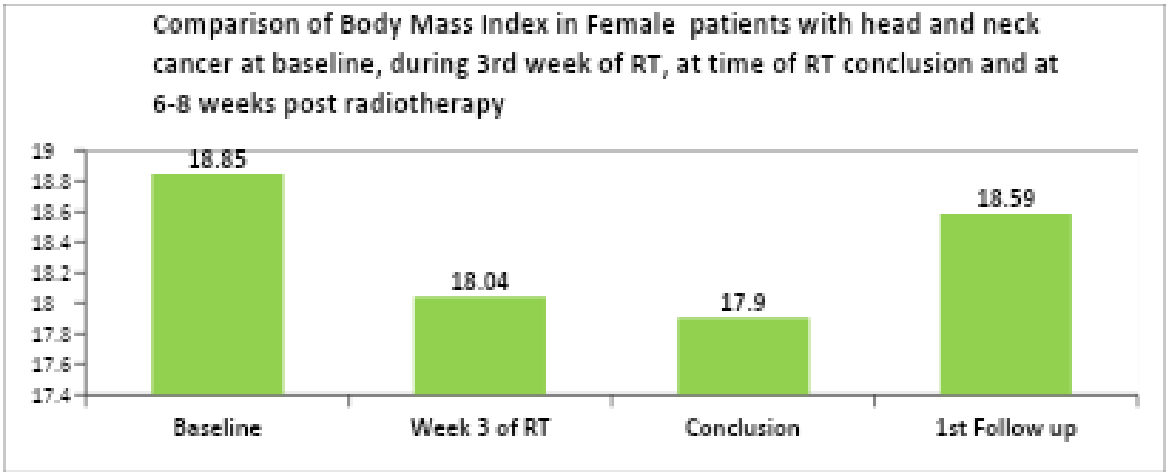
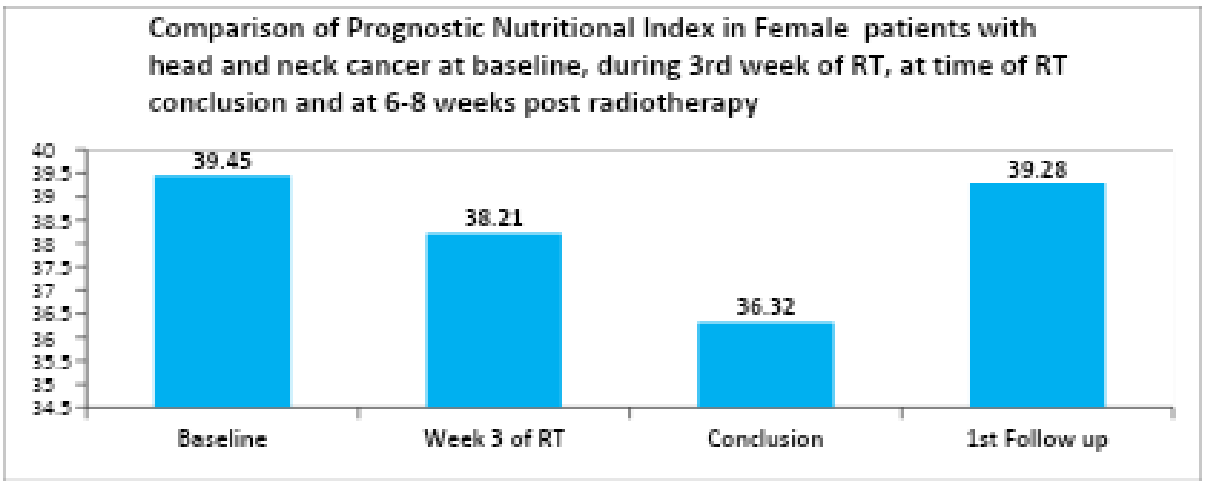
- WHR remained stable at 0.76±0.05 at baseline and throughout treatment, showing no significant variation.
- The PNI, which reflects nutritional and immune status, declined from 39.45±5.42 at baseline to 36.32±5.24 at RT completion but improved to 39.28±3.51 at follow-up. **(Graph 4)**

	Weight in kg	**BMI**	**MUCA**	**WHR**	**PNI**
	Mean ± SD	**Mean ± SD**	**Mean ± SD**	**Mean ± SD**	**Mean ± SD**
Baseline	39.33±7.08	18.85±2.84	23.80±2.30	0.76±0.05	39.45±5.42
Week 3 of RT	38.44±7.19	18.04±2.82	23.78±.2.34	0.76±0.06	38.21±4.61
Conclusion	37.84±7.62	17.9±2.96	23.37±2.32	0.76±0.06	36.32±5.24
1st Follow up	39.67±7.10	18.59±3.30	23.85±2.18	0.76±0.06	39.28±3.51
Student's Paired 't' test value and significance	t=0.1023, p=0.1146 not significant	t=0.3326, p=0.2165 not significant	t=0.0644, p=0.1654 not significant	t=0.000, p=0.000 not significant	t=0.3633, p=0.2157 not significant

Table 4: Comparison of nutritional status in Female patients with head and neck cancer at baseline, during 3rd week of RT, at time of RT conclusion and at 6-8 weeks post radiotherapy



Graph no 3: comparison of BMI of female patients



Graph no 4: comparison of PNI of female patients

Feeding support Pre and post RT:

During RT, 50 patients required Ryle's tube feeding, while 24 managed without it. At the 6–8 week follow-up, feeding support was needed by 30 patients, 20 did not require it, and 24 were "Not Known" due to loss to follow-up.

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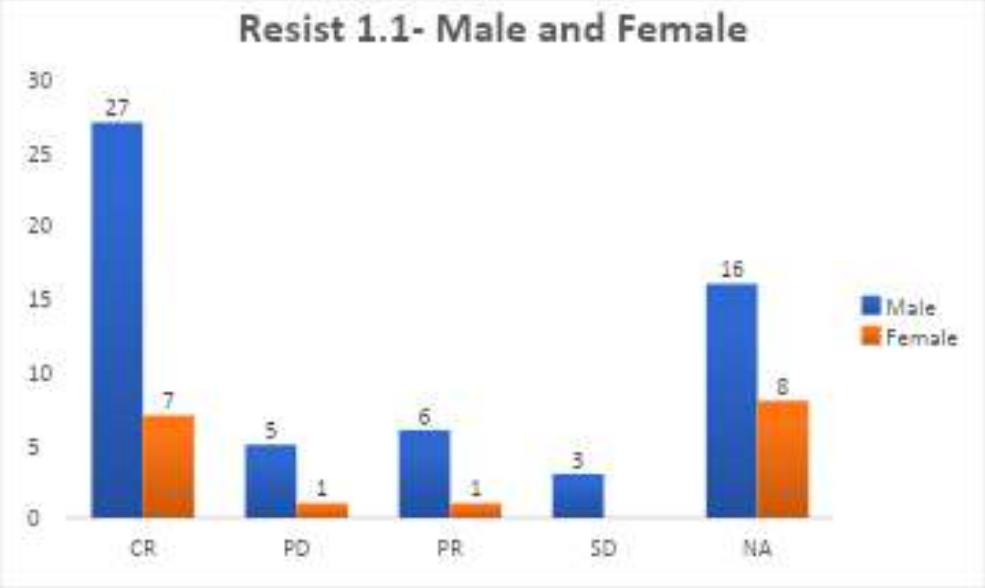
Treatment Response and Follow-Up:

Response evaluation by RECIST 1.1 in 74 patients revealed complete response (CR) in 34 cases (45.95%: 27 males, 7 females), partial response (PR) in 7 cases (9.46%: 6 males, 1 female), progressive disease (PD) in 6 cases (8.11%: 5 males, 1 female), and stable disease (SD) in 3 cases (4.05%, all males). Additionally, 24 cases (32.43%; 16 males, 8 females) were classified as "Not Applicable" due to incomplete follow-up data. **(Graph 5)**

At the first follow-up (6–8 weeks post-RT), patient status was recorded as follows: 31 patients (41.89%) were Alive with No Evidence of Disease (NED), 10 (13.51%) were Alive with Disease (AWD), 9 (12.16%) had died, and 24 (32.43%) were "Not Known" due to loss to follow-up



Graph no 5: Response evaluation at 1st follow up

IV. DISCUSSION

HNSCC remains a formidable public health challenge in India, characterized by high incidence, advanced-stage presentation, and significant morbidity. Our study of 74 patients, predominantly male (77.03%) with a mean age of 54.68 ± 13.13 years, underscores the aggressive nature of the disease. The predominance of oral cavity and oropharyngeal cancers, particularly among males, aligns with previous reports by **Michaelraj et al. (2023)[8]** and **Bagal et al. (2021)[9],** which noted similar demographic and tumor distribution patterns. These findings emphasize that while HNSCC is largely preventable and potentially curable, delays in diagnosis and treatment are common, contributing to poor survival outcomes.

Tobacco and alcohol use play pivotal roles in the etiology of HNSCC. In our study, the high prevalence of combined tobacco use—especially the use of smokeless tobacco with mishri, and the combination of smoking tobacco, alcohol, and smokeless tobacco—mirrors the addiction patterns observed by **Jain et al. (2015)[10]** and **Chauhan et al. (2022).[11]** These lifestyle factors not only contribute to the initial development of HNSCC but also exacerbate the progression and severity of the disease. The higher incidence of advanced stages (with Stage IV predominating among males and Stage III among females) further underscores the impact of these risk factors, as late-stage presentation is often associated with more aggressive tumor biology and poorer prognosis.

Histopathologically, our data revealed that moderately differentiated squamous cell carcinoma (MDSCC) was the most prevalent subtype (56.76%), followed by well-differentiated (33.78%) and poorly differentiated (9.46%) variants. These findings are consistent with the study by **Gaikwad et al. (2024),[12]** which also reported a predominance of moderately differentiated tumors. The differentiation status has significant prognostic implications, as well-differentiated tumors generally exhibit a more favorable response to treatment, whereas poorly differentiated tumors are associated with aggressive behavior and a higher risk of metastasis.

A pivotal aspect of our study was the evaluation of nutritional status at multiple time points—baseline, during radiotherapy (RT) at the

third week, at RT conclusion, and at 6–8 weeks post-RT. We assessed weight, BMI, mid-upper arm circumference (MUAC), waist-to-hip ratio (WHR), and the prognostic nutritional index (PNI). In male patients, mean weight decreased from 56.26 ± 13.81 kg at baseline to 52.48 ± 12.47 kg at the conclusion of RT, with a modest recovery to 53.70 ± 13.06 kg at follow-up. Similarly, the PNI declined from 40.52 ± 4.54 to 37.34 ± 4.63 before partially recovering to 39.69 ± 5.07. Female patients exhibited comparable trends, with reductions in weight, BMI, and PNI during treatment followed by recovery during follow-up.

Although the statistical analysis using paired t-tests revealed that these nutritional changes did not reach significance ($p > 0.05$), the observed trends remain clinically important. Even modest declines in nutritional parameters can compromise immune function and treatment tolerance, leading to higher rates of treatment toxicity and potentially poorer survival outcomes. Our findings are in line with previous studies by **Citak et al. (2018)**[13] and **Powrozek et al. (2019),**[14] which documented significant nutritional deterioration during RT as a result of treatment-induced mucositis, dysphagia, and systemic inflammation.

The lack of statistical significance in our p-values may reflect the sample size or variability in individual patient responses; however, the consistent downward trends underscore the need for early nutritional intervention. Proactive nutritional screening—using tools such as the Patient-Generated Subjective Global Assessment (PG-SGA) or Nutritional Risk Index (NRI)—and timely interventions, including dietary counseling, oral nutritional supplements, and enteral feeding support, could help mitigate the impact of RT on nutritional status.

Gender-specific differences in nutritional decline have also been observed. Research by **Zohri R et al**[15] indicates that during chemoradiotherapy, males exhibited a larger increase in calorie deficit and greater reductions in BMI, fat-free mass index (FFMI), and phase angle (PA) compared to females. Malnutrition risk increased significantly in males but not in females. Albumin and total protein levels declined in both genders, with a more pronounced drop in albumin for females. Survival analysis revealed that, for males, factors such as baseline calorie deficit, BMI, PA, and FFMI were linked to survival, while for females, only albumin levels at therapy end were significantly associated with survival

Treatment strategies in our study were reflective of current multimodal approaches. Approximately 27.03% of patients received neoadjuvant chemotherapy (NACT), with surgery (either alone or following NACT) performed in 45.95% of cases. The remaining patients were managed with definitive chemoradiotherapy, with 54.05% receiving radical RT (60–70 Gy) and 45.95% receiving adjuvant RT (50–66 Gy). Platinum-based chemotherapy, primarily with cisplatin (used in 67.57% of cases) and carboplatin (32.43%), was employed in accordance with established protocols. Our treatment response—assessed by RECIST 1.1 criteria, which showed a complete response in 45.95% of patients—is consistent with reports by **Kale et al.**[16] However, the substantial loss to follow-up (32.43%) underscores the challenges in maintaining long-term patient monitoring, particularly in resource-limited settings.

Overall, our study illustrates the complex interplay between tumor biology, high-risk behaviors, and nutritional status in HNSCC patients. The advanced stage at presentation, coupled with significant yet subclinical nutritional decline during RT, emphasizes the necessity of integrating comprehensive nutritional support into standard oncologic care. Future research should focus on developing standardized, multidisciplinary nutritional protocols and further exploring the impact of nutritional interventions on treatment outcomes. Ultimately, these efforts will be crucial in improving treatment tolerance, functional recovery, and overall survival in this high-risk patient population.

V. CONCLUSION

HNSCC remains a major public health challenge in India, marked by late-stage diagnosis and significant treatment-related toxicities. Our study of 74 patients demonstrated a progressive decline in nutritional parameters—such as weight, BMI, MUAC, and PNI—during radiotherapy, with partial recovery observed post-treatment. Although these changes were not statistically significant (except for WHR in females, $p = 0.000$), even modest nutritional deterioration can adversely affect treatment tolerance and outcomes. Treatment response by RECIST 1.1 revealed a complete response in 45.95% of patients, underscoring the need for individualized care. Given these findings, an integrated approach that includes early nutritional screening, personalized dietary interventions, and multidisciplinary supportive care is essential to improve treatment tolerance, reduce complications, and enhance overall patient outcomes in HNSCC.

REFERENCES:

[1]. Lydiatt WM, Patel SG, O'Sullivan B, Brandwein MS, Ridge JA, Migliacci JC, Loomis AM, Shah JP. Head and neck cancers—major changes in the American Joint Committee on Cancer eighth edition cancer staging manual. CA Cancer J Clin. 2017;67(2):122-137. doi:10.3322/caac.21389

[2]. International Agency for Research on Cancer (IARC). Lip, oral cavity cancer fact sheet. GLOBOCAN 2022. Available from: https://gco.iarc.who.int/media/globocan/factsheets/cancers/1-lip-oral-cavity-fact-sheet.pdf

[3]. International Agency for Research on Cancer (IARC). Oropharynx cancer fact sheet. GLOBOCAN 2022. Available from: https://gco.iarc.fr/today/data/factsheets/cancers/3-Oropharynx-fact-sheet.pdf

[4]. International Agency for Research on Cancer (IARC). Hypopharynx cancer fact sheet. GLOBOCAN 2022. Available from: https://gco.iarc.fr/today/data/factsheets/cancers/5-Hypopharynx-fact-sheet.pdf

[5]. International Agency for Research on Cancer (IARC). India fact sheet. GLOBOCAN 2022. Available from: https://gco.iarc.who.int/media/globocan/factsheets/populations/356-india-fact-sheet.pdf

[6]. Nutritional Deficiencies in Radiotherapy-Treated Head and Neck Cancer Patients Tomasz Powrózek *, Joanna Dziwota and Teresa Małecka-Massalska

[7]. Moon H, Roh JL, Lee SW, et al. Prognostic value of nutritional and hematologic markers in head and neck squamous cell carcinoma treated by chemoradiotherapy. Radiother Oncol. 2016;118:330-334. doi:10.1016/j.radonc.2015.10.029.

[8]. Michaelraj MJ, Kuttiappan K, Ramasamy S, Rodrigues FAE, Govindaraj S. Demographic profile and risk factors of head-and-neck squamous cell carcinoma in west Tamil Nadu: A cross-sectional observational study.

[9]. Bagal S, Budukh A, Thakur JS, Dora T, Qayyumi B, Khanna D, Fernandes D, Chakravarti P, Singh R, Patil S, Dikshit R, Chaturvedi P. Head and neck cancer burden in India: an analysis from published data of 37 population-based cancer registries.

[10]. Jain V, Dharkar D, Nandini H, Jain SM, Verma S, Shinde PH. Various addiction patterns and duration in head and neck carcinoma: An institutional experience from Central India

[11]. Chauhan R, Trivedi V, Rani R, Singh U. A study of head and neck cancer patients with reference to tobacco use, gender, and subsite distribution.

[12]. Gaikwad R, Jain V, Mandloi V, Thomas T, Dongargaonkar P, Gupta A, Bonam J, Sharma H. Association between pharyngeal movements and swallowing function in patients of oropharynx and hypopharynx squamous cell carcinoma treated with curative non-surgical therapy: A prospective study.

[13]. Citak E, Tulek Z, Uzel O. Nutritional status in patients with head and neck cancer undergoing radiotherapy: A longitudinal study.

[14]. Powrózek T, Dziwota J, Małecka-Massalska T. Nutritional deficiencies in radiotherapy-treated head and neck cancer patients.

[15]. Zohri R, Hahn L, Seyedi N, Petersen C, Ziemann C, Abel J, Kutz LM, Krüll A, Flüh C, Ehresmann C, Zemskova O, Liubich L, Rades D, Löser A. Nutritional gender-specific differences in head and neck cancer patients treated with (chemo)radiotherapy: Results from a prospective trial.

[16]. Kale P, Datta S, Kalbande P, Aher P, Singh A, Datta NR. Is it time to move from the unidimensional RECIST 1.1 response assessment criteria to a volumetric evaluation in the present era of image-based oncology? An evaluation in locally advanced head and neck cancers undergoing treatment.