



Profiling of swallowing function in head and neck cancer patients prior to radiation therapy-Findings from a tertiary hospital in South India

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ABSTRACT

Purpose: Head and neck cancer (HNC) patients often face difficulties with swallowing, which can be due to the cancer itself or the treatment modalities like radiation therapy. The presentation of HNC can vary between developing and developed countries due to socioeconomic factors. The current study aimed to profile the swallowing function of HNC patients before starting radiation therapy in a tertiary hospital in India.

Method: This cross-sectional observational study examined patients with HNC who were scheduled for radiation therapy. The Functional Oral Intake Scale (FOIS) and Karnofsky Performance Status Scale were used to assess the patients' swallowing status and functional abilities, respectively. The study also evaluated the relationship between swallowing function and clinical-demographic factors.

Results: Our assessment of 162 HNC patients found that the cancer site significantly affects swallowing. Although 92% of patients had an oral diet, 64% made dietary modifications. Patients with non-oral intake had either oral or pharyngeal cancer, and over 80% of oral cancer patients and 60% of those with pharyngeal cancer had already made changes to their diet. Patients with laryngeal cancer had a better oral intake, with 58% reporting no swallowing issues.

Conclusion: Patients with HNC scheduled for radiation therapy may experience varying degrees of swallowing difficulty. Early intervention and teaching of safe swallowing strategies are crucial to prepare for the potential worsening of swallowing difficulties resulting from the treatment. Advanced tumor stages and oral/pharyngeal cancers increase the risk of significant swallowing issues.

1. Introduction

Swallowing difficulties are frequently reported by individuals with head and neck cancers (HNC) either as their presenting symptom or because of cancer treatment (Manikantan et al., 2009). Organ preservation protocols such as radiation therapy can have a detrimental effect on swallowing functioning, with the impact manifested immediately or as a long-term consequence of the treatment (Schindler et al., 2015).

Dysphagia not only leads to nutritional deficiencies but also hampers social functioning. Aspiration pneumonia arising from long-standing dysphagia is strongly associated with non-cancer-related mortality in HNC survivors (Szczesniak et al., 2014). Numerous studies have identified pre-existing swallowing issues as predictors of post-treatment swallowing problems (Barnhart et al., 2017; Cates et al., 2022; Petersson et al., 2021).

India bears a substantial burden of HNC, primarily driven by

socioeconomic factors, lifestyle habits, and addictions (Mishra and Meherotra, 2014). Furthermore, most cases are diagnosed at an advanced stage, unlike Western countries (Agarwal et al., 2011; Singh et al., 2018). This study aimed to profile the swallowing function of HNC patients about to begin radiation therapy at a tertiary care hospital in India. Furthermore, the study explored possible links between the patient's swallowing function and factors such as cancer location, tumor stage, age, and habits.

2. Materials and method

HNC patients planned to be treated with radiation therapy were assessed to understand their current swallowing function. Patients scheduled to undergo definitive radiation therapy were evaluated before their first radiation therapy session. The study did not include HNC patients planned for adjuvant radiation therapy and palliative

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treatment. Demographic & clinical details were collected through history taking and clinical examination. Data was recorded in a pre-designed proforma, with data collection occurring between October 2020 and February 2023. The Institutional Ethical Committee of Kasturba Hospital, Manipal (IEC No.362/2020) approved the study. Informed Consent was obtained from the participants.

Swallowing status was assessed using the Functional Oral Intake Scale (FOIS) (Crary et al., 2005). It is a 7-point assessment tool to categorize clinical changes in oral intake of food and liquids. The Karnofsky Performance Scale was also administered to assess patients' ability to do everyday tasks and their medical requirements (Karnofsky et al., 1949). Both FOIS and Karnofsky Performance Scale was administered by a Speech Language Pathologist. In addition, the hospital records were reviewed for details such as the histopathology report, and the treatment recommended by the Tumor board. The tumor size was denoted using T classification from the TNM staging system (Head and Neck Cancer Study Group (HNCSSG) et al., 2019).

2.1. Statistical analysis

Data were analyzed through descriptive statistics (percentage, mean, and standard deviation). The categorical variables were compared using Fischer's exact test. Spearman's correlation test was used to understand the relationship between variables. A p-value of less than 0.05 was considered statistically significant. The data was analyzed statistically using the Jamovi statistical software program (The Jamovi project, Sydney, Australia) (version 1.8).

3. Results

A total of 162 patients with HNC who were about to commence radiation therapy were assessed. All patients were scheduled to undergo radiation therapy for a period of 6 to 7 weeks. Additionally, 134 patients were also planned to receive concurrent chemotherapy weekly.

3.1. Demographic and clinical details

The majority of patients in this study (61.1 %, n = 99) had pharyngeal cancer (nasopharyngeal, oropharyngeal, or hypopharyngeal), 20.9 % (n = 34) had laryngeal cancer, and 16.6 % (n = 27) had cancer of the lip or oral cavity. Among the patients with pharyngeal cancers, most of the patients had oropharyngeal cancer (31.5 %; n = 51), followed by hypopharyngeal (24.7 %; n = 40). The nasopharyngeal subsite was limited to 8 patients. One patient had cancer of the External Auditory canal (EAC), and another had an unknown primary. There was a preponderance of male patients compared to females with a ratio of 6:1. The average age of male patients was 60.2(±10.7) years, while that of female patients was 51.7(±13.2) years. The clinical and treatment-related details of the patients are detailed in Table 1. It is noteworthy that one patient with pharyngeal cancer was found to have oligometastatic disease and was taken up for treatment with curative intent.

3.2. Presenting symptoms and habit history

The presenting symptoms of patients that led to the diagnosis of HNC were recorded and are displayed in Table 2. Most of the patients had more than one symptom, and the duration of the presence of symptoms was variable. Fifty-eight patients reported symptoms experienced for one month, 61 for about three months, and 27 patients experienced symptoms for six months. Prolonged symptoms of 1 year were reported by 17 patients, and above one year by three patients. Complaint of change/hoarseness of voice, reported by 43 patients (26.5 %), was the most frequent presenting symptom. Swelling of the neck was the next most common symptom (n = 32,19.7 %), followed by dysphagia (n = 31, 19.13 %). The percentage of presenting symptoms grouped broadly as oral, pharyngeal, and laryngeal cancers are depicted in Table 2.

Table 1

Demographic and Clinical details of HNC patients (n = 162) scheduled to receive definitive RT in a tertiary hospital in South India from October 2020 to February 2023.

SNO	DETAILS	COUNT	%
1	GENDER		
	Male	139	85.8
	Female	23	14.2
2	AGE GROUPS		
	<30 years	1	0.61
	31–40 years	12	7.40
	41–50 years	22	13.58
	51–60 years	50	30.86
	61–70 years	52	32.0
	71–80 years	22	13.5
	81–90 years	3	1.85
3	PRIMARY SITE		
	Lip and oral cavity	27	16.7
	Nasopharynx	8	4.9
	Oropharynx	51	31.5
	Hypopharynx	40	24.7
	Larynx	34	21.0
	EAC	1	0.6
	Unknown primary	1	0.6
4	TNM CLASSIFICATION		
	T		
	T0	1	0.6
	T1	13	8.0
	T2	40	24.6
	T3	59	36.4
	T4	49	30.2
	N		
	N0	57	35.1
	N1	35	21.6
	N2	49	30.2
	N3	21	12.9
	M		
M0	161	99.3	
	M1	1	0.6
5	OLD HISTORY OF CANCER		
	No	152	93.8
	Yes	10	6
6	HISTOPATHOLOGICAL FINDINGS		
	Squamous Cell Carcinoma	159	98.1
	Nasopharyngeal Carcinoma-Non-Keratinizing type	2	1.2
	Polymorphous Adenocarcinoma	1	0.6
7	RADIATION TREATMENT		
	Definitive CT-RT	134	82.7
	Definitive RT	28	17.3
8	RADIATION DOSE		
	70 GY 35#	149	91.9
	66 GY 30#	11	6.8
	65.25 GY 29#	1	0.6
	63 GY 28#	1	0.6
9	RT TECHNIQUE		
	VMAT	156	96.3
	3DCRT	6	3.8
10	ADDITIONAL CHEMOTHERAPY		
	NACT	4	2.39
	Adjuvant CT	1	0.59

Abbreviations-RT: Radiation Therapy,CT: Chemotherapy, VMAT: Volumetric Modulated Arc Therapy, 3DCRT:Three Dimensional Conformal Radiation Therapy, NACT: Neoadjuvant Chemotherapy.

Several patients had a history of habits such as smoking, chewing tobacco/betel nut, and alcohol consumption. Moreover, a combination of either two or more of these habits, often regarded as synergistically detrimental, were reported in some patients (Refer Table.3). About half of the patients were smokers (51.9 %, n = 84), a quarter reported consumption of alcohol (27.8 %, n = 45) and tobacco chewing (26.5 %, n = 43). 16.7 % (n = 27) reported betel quid chewing. The association between the habits and HNC sites is presented in Table 3. However, there was no significant association between individual habits or the combination of habits.

Table 2

Presenting symptoms of HNC patients with different sub-sites (n = 162) scheduled to receive definitive RT in a tertiary hospital in South India from October 2020 to February 2023.

Presenting symptoms	Oral Cancer	Pharyngeal Cancer	Larynx Cancer	Other	Total n (%)
Change/hoarseness in voice	–	18	25	–	43 (26.5)
Neck Swelling	5	26	–	1	32 (19.7)
Dysphagia	5	23	3	–	31 (19.13)
Ulcer	10	5	–	–	15 (9.25)
Pain	4	8	2	–	14 (8.64)
Throat pain	–	13	2	–	15 (9.25)
Growth	9	6	–	–	15 (9.25)
Odynophagia	–	10	3	–	13 (8.02)
Foreign body Sensation	–	6	–	–	6 (3.70)
Dysphagia to Solids	–	5	1	–	6 (3.70)
Ear Pain	–	4	–	1	5 (3.08)
Burning sensation in the throat	–	3	1	–	4 (2.46)
Difficulty Breathing	–	3	1	–	4 (2.46)
Reduced mouth opening	2	1	–	–	3 (1.85)
Cough	–	2	1	–	3 (1.85)
Headache	–	2	–	–	2 (1.23)
Nasal block	1	1	–	–	2(1.23)

'n' is the total number of patients who presented with a particular symptom.

3.3. Swallowing function and Performance Scale evaluation

The functional oral intake scale (FOIS) was administered to understand the current oral intake status. Eleven patients (6.8 %) had FOIS Level-1, “Nothing by mouth,” and one patient each had FOIS Level-2, “Tube dependent with minimal/inconsistent oral intake,” and Level-3, “Tube supplements with consistent oral intake,” respectively. 16 % (n = 26) had Level-4 “Total oral intake of a single consistency,” 20.4 % (n = 33) patients had Level-5 “Total oral intake of multiple consistencies requiring special preparation,” and 23.5 % (n = 38) patients had FOIS Level-6 “Total oral intake with no special preparation but must avoid specific food or liquid item.”. FOIS Level-7, “Total oral intake with no restrictions,” was

Table 3

Association between Habits and Swallowing function of HNC patients (n = 162) with different sub-sites scheduled to receive definitive RT in a tertiary hospital in South India from October 2020 to February 2023.

SNo	Variables	HNC Subsites						Total		P Value*
		Oral Cancers		Pharyngeal cancers		Laryngeal cancers		n	%	
		n	%	n	%	n	%			
1	Habits									
	Smoking	11	40.7	52	52.5	20	58.8	84	51.9	0.566
	Tobacco Chewing	9	33.3	29	29.3	5	14.7	43	26.9	0.242
	Betel nut Chewing	5	18.5	20	20.2	2	5.9	27	16.9	0.24
	Alcoholism	6	22.2	31	31.3	7	20.6	44	27.5	0.40
	Smoking + Chewing (Tobacco/Betel nut)	8	29.6	43	43.4	14	41.2	65	40.6	0.62
	Smoking + Alcohol	10	37	44	44.4	11	32.4	65	40.6	0.24
	Alcohol + Chewing (Tobacco + Betel nut)	7	25.9	33	33.3	12	35.3	52	32.5	0.64
Total	27	100	99	100	34	100	160	100		
2	FOIS Levels									
	Level 1–3	3	11.1	10	10.1	0	0	13	8.1	<0.001*
	Levels 4–6	22	81.5	60	60.6	14	41.2	96	60	
	Level-7	2	7.4	29	29.3	20	58.8	51	31.9	
	Total	27	100	99	100	34	100	160	100	

*Significant values marked in bold.

Abbreviations: Abbreviation-FOIS: Functional Oral Intake Scale.

seen in 32.1 % of the HNC patients (n = 52).

Out of the total patients, a large majority (91.7 %, n = 149) could consume food orally without any feeding tube dependence, as indicated by FOIS levels > 3. However, out of these patients, only a small percentage (34.8 %, n = 52) were found to have a completely normal oral intake. The FOIS Levels across the different HNC subsites are represented in Fig. 1. A statistically significant association existed between the FOIS Levels and the HNC sites (<0.001, by Fischer’s exact test). The patients with laryngeal cancers had a better oral intake status as indicated by the FOIS level-7 (Refer Table 3). Most oral and pharyngeal cancer patients had FOIS levels of 4–6, suggesting the usage of food consistency modifications and thereby implicating dysphagia. Among the group of patients on non-oral intake (FOIS < 3), oral cancer patients were more dominant in this category.

Out of the 162 patients assessed, the average Karnofsky score was 77.2. The highest score was 100, while the lowest score was 50. Most patients (n = 57, 35.2 %) scored 80, indicating “normal activity with effort, some signs, and symptoms of disease.” Meanwhile, 29.6 % (n = 48) patients had a score of 70 (able to care for self but unable to do normal activities), 20.4 % (n = 33) had a score of 90 (able to perform normal activity with only minor symptoms), and only six patients had a performance score of 100. Four patients had a score of 50. This score designates the patients as “requires considerable assistance.”

3.4. Correlation between clinical and demographic parameters

Correlation analysis between clinical and demographic parameters (Refer to Table 4) indicated a statistically significant negative association between T stage and FOIS levels (p=<0.001). Patients with advanced tumors (T3/T4) had a higher tendency to modify their food consistencies, which is reflected in lower FOIS levels. However, there was no statistical association between “N stage” and “FOIS scores,” as well as “age group” and “FOIS scores.”

Higher FOIS levels were associated with higher Karnofsky scores, indicating better overall functioning (p < 0.001). A negative correlation existed between Karnofsky scores and age (p = 0.004), suggesting that older patients presented with lower (poorer) Karnofsky performance scores.

4. Discussion

The study evaluated the baseline swallowing function and clinical-demographic profile of patients with HNC. Although there are other studies on this topic, the current study is distinguished by its precise

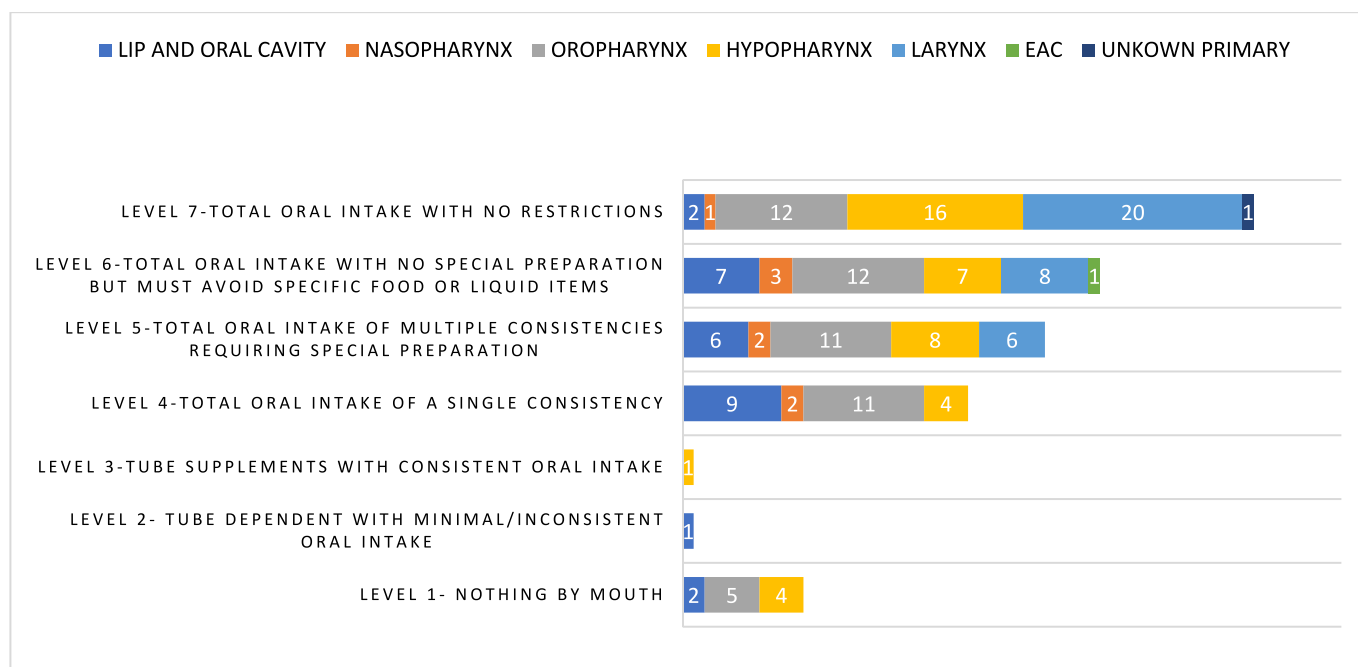


Fig. 1. FOIS Levels of HNC patients (n = 162) with different subsites scheduled to receive definitive RT in a tertiary hospital in South India from October 2020 to February 2023.

Table 4

Correlation between Clinical measures and demographics of HNC patients (n = 162) scheduled to receive definitive RT in a tertiary hospital in South India from October 2020 to February 2023.

SNo	Clinical Measures	Spearman's rho	P value
1	T stage vs FOIS Levels	-0.317**	<0.001*
2	N stage vs FOIS Levels	-0.021	0.394
3	FOIS vs Age	0.136	0.956
4	FOIS Levels vs Karnofsky scores	0.446	<0.001*
5	Karnofsky score vs age	-0.213**	0.004*

*Significant values, marked in bold.

**Negative correlation

Abbreviation-FOIS: Functional Oral Intake Scale.

inclusion criteria. The study focused exclusively on patients who were scheduled to receive non-surgical treatments, such as radiation therapy with or without chemotherapy, and only those who were treated with curative intent were included. This makes it even more crucial to consider their swallowing abilities for their long-term survival and well-being. This group of patients is frequently overlooked, particularly in developing countries with limited resources. However, mounting evidence of swallowing dysfunction in HNC patients treated with organ preservation protocols suggests that preservation of the organ does not always preserve its function (Mittal et al., 2003).

4.1. Clinical assessment of swallowing skills and functional impairment

The FOIS assessment implies that though most patients had functional swallowing skills, as indicated by the absence of the enteral feeding requirement, several patients with oral and pharyngeal cancers already used some form of consistency modification to have food orally. This is reflected in the FOIS levels 4 to 6, representing mechanically modified food or using single consistency such as liquids only. Radiation therapy is known to affect swallowing detrimentally. Patients with baseline swallowing difficulties will face further worsening of swallowing abilities. Furthermore, concurrent chemotherapy is known to aggravate the worsening of dysphagia. Concurrent chemotherapy has

been identified as a predictor of extended feeding tube dependency at six months following radiation therapy (Barnhart et al., 2017).

Radiation-induced dysphagia manifests acutely as inflammation of soft tissues. Post-treatment soft tissue fibrosis, lymphedema, and scar tissue formation can cause swallowing dysfunction. In addition, reduced food intake can cause atrophic changes in swallowing muscles, thereby further impeding swallowing function (Hutcheson et al., 2013). A growing body of evidence suggests that Prophylactic swallowing exercises during radiation therapy can improve swallowing function (Greco et al., 2018; Perry et al., 2014).

The patients in the study had varying Karnofsky scores, with the lowest being 50. Higher scores could be because only patients planned for curative radiation therapy were included. However, functional scores may be lower for patients with advanced diseases receiving palliative treatment.

4.2. HNC site and swallowing function

The tumor site is reported to affect the pre-treatment swallowing status. The FOIS levels indicated oral and pharyngeal cancers cause more swallowing difficulty than laryngeal cancers. This finding agrees with existing literature. Pre-treatment videofluoroscopy swallowing studies have found that patients with pharyngeal tumors and oral cancers have more oral residue and longer pharyngeal transit times than patients with laryngeal cancer (Pauloski et al., 2000). However, patients with advanced stages of laryngeal and hypopharyngeal cancers are more likely to have aspiration than patients with advanced stages of other oral and oropharyngeal sites and early stages of tumor (Starmer et al., 2017). This is because the site of the tumor, structurally and physiologically, puts the patient at a greater risk of bolus entry into the laryngeal vestibule.

The results of the current study show that most of the patients currently on non-oral intake were oral or pharyngeal cancer patients. Individuals suffering from oral cavity tumors often encounter increased pain challenges in managing and controlling food within the mouth. These issues usually do not result in laryngeal penetration or aspiration, although adjustments in food consistencies may be necessary (Starmer et al., 2017). In addition, the percentage of effect of the neoplasm on the

oral tongue and base of the tongue has been reported to have a direct impact on swallowing function. In contrast, the percentage of affected oral tongue and anterior floor of mouth has been reported to influence speech understandability (Colangelo et al., 2000).

4.3. Common sub-site of Cancer, Gender, Habits, and advanced tumor presentation

Though in India, cancer of the lip and oral cavity are the most common subsites of cancer in men and the fourth most common cancer in women (Sung et al., 2021), in the present study, only 16.7 % of the patients had cancer of this subsite while the majority had oropharyngeal cancer. This could be because of the inclusion criteria that excluded surgical patients, and most oral cavity cancers are treated with primary surgery due to the accessibility for resection (Arboleda et al., 2023; Chaturvedi et al., 2020).

Most patients had locally advanced disease at diagnosis, with T4 tumors accounting for 30.4 % and T3 tumors accounting for 36.4 %. Conversely, a smaller proportion of patients were diagnosed in the early stages of the disease, with T2 tumors accounting for 24.6 % and T1 tumors accounting for 8.2 %. These results are consistent with prior research conducted in other regions of India (Krishnamurthy and Ramshankar, 2013; Singh et al., 2016). In developing countries, cancer usually presents in advanced stages due to multiple factors such as lack of awareness, lower socioeconomic status, and low resources.

A male-to-female ratio of 6:1 was noted in this study. While it is widely acknowledged that HNC is more prevalent among males worldwide, recent studies from India have shown rising ratios, indicating a notable increase in the occurrence of HNC among Indian men (Lakhera et al., 2023). This study endorses it.

In the Indian sub-continent, smokeless tobacco, such as Paan and Ghutka, are the most common forms of tobacco consumption, unlike in Western countries where smoking is more prevalent (Singh et al., 2016). On the contrary, most of our patients were smokers. This pattern can be linked to the HNC subsite of most of our patients. Oropharyngeal cancer was the most common type of cancer in our patient group, followed by hypopharyngeal, laryngeal, and oral cavity cancers. According to a systematic review of tobacco use studies from India, smoking is associated with a 5-fold higher risk of oropharyngeal and laryngeal cancer (Prasad and Dhar, 2019). There is a 3-fold higher risk of hypopharyngeal cancer and a 2-fold higher risk of oral cancer.

4.4. Presenting symptoms

The presenting symptoms associated with HNC are known to be varied depending on the HNC subsite. Such trends were also seen in our study. Unhealing ulcers or growths are often reported in cancers of the oral cavity (Pauloski et al., 2000; Douglas et al., 2018). Laryngeal cancers are usually first presenting with voice change; in addition, throat pain and breathing difficulties are also reported (Pauloski et al., 2000; Douglas et al., 2018; Hoare et al., 1993). Dysphagia is often a presenting symptom in patients with oral and pharyngeal cancers (Pauloski et al., 2000; Walther and Deroover, 1991). Based on research conducted by Douglas et al. (2018), the symptom burden is linked to patient survival rates. The study found that patients with only one symptom had a median survival rate of 5.3 years, while those who presented with three symptoms had a median survival rate of 1.1 years (Douglas et al., 2018).

4.5. Tumor size and swallowing

Smaller Tumor sizes were associated with better FOIS scores, as depicted by the statistically significant negative correlation between them. Similar findings, suggestive of worsening swallowing scores with an increase in tumor size, have been reported. (Pauloski et al., 2000). Pre-treatment videofluoroscopy swallow studies in HNC patients with varying T stages compared with normal are suggestive of longer

pharyngeal transit time, oral residue, and pharyngeal residue increased with advanced tumor stage (Pauloski et al., 2000). T stage has been reported to be a predictor of post-treatment dysphagia at six months (Barnhart et al., 2017). The efficiency of swallowing is greatly affected by the tumor volume and the percentage of affected oral tongue and base of the tongue (Colangelo et al., 2000). T3-T4 HNC tumors are reported to have a significant correlation with heightened dysphagia severity in a pre-treatment swallowing status evaluation using modified barium swallow assessments (Nguyen et al., 2008).

Various factors can cause an increment of swallowing difficulty with increased tumor sizes.

Larger tumors invading structures and muscles in the aerodigestive tract make food passage difficult. Weakened muscles can disrupt the hyolaryngeal excursion process and contribute to difficulty swallowing. Pain resulting from advanced disease can further disrupt swallowing. Pain has been reported to directly affect the self-report of dysphagia in HNC patients, though it did not affect speaking and swallowing efficacy (Colangelo et al., 2000). Pain is considered to have a more significant influence on swallowing than speaking due to the greater involvement of muscle activity and pressure generation. Even in the absence of any swallowing inefficacy, pain can still be perceived as a swallowing problem due to its bothersome nature (Colangelo et al., 2000).

4.6. N Stage and swallowing

It is noteworthy that patients with HNC who present advanced neck nodes (N3) may also experience dysphagia. However, the impact of node stages on dysphagia is often overlooked. Although the current study did not establish any correlation between neck nodes and FOIS levels, there are reports indicating that larger nodes can hinder the passage of food through the aerodigestive tract, thereby exacerbating swallowing difficulties (Nguyen et al., 2008).

4.7. Strengths and limitations of the study

By using stringent inclusion and exclusion criteria, this study has focused on the patients planned for organ preservation protocols with curative intent, thereby reducing the heterogeneity resulting from including all HNC patients. One study limitation is the lack of an instrumental swallowing assessment, which could have provided a more detailed understanding of swallow physiology.

4.8. Recommendations

The study's findings reveal the importance of addressing swallowing difficulties in head and neck cancer patients scheduled to undergo radiation therapy. Considering the anticipated decline of swallowing during treatment, the need for early-initiated swallowing rehabilitation in this patient group is advocated. All HNC patients will benefit from a swallowing evaluation by a speech and swallowing therapist. A routine assessment before starting radiation therapy and at the first follow-up visit may be a viable option in developing countries. In addition, evaluation can be repeated on a discretionary basis during the treatment and recovery phases as per each patient's need.

It is recommended that a baseline evaluation of speech and swallowing skills be conducted in all patients diagnosed with head and neck cancer (Clarke et al., 2016). The acquisition of pretreatment data is crucial to determine if any post-treatment differences observed are exclusively attributable to the treatment effects (Frown and Perry, 2006). This process is instrumental in developing effective treatment protocols that ensure the preservation of swallowing function and the quality of life of the patient. This is especially important in today's age of artificial intelligence and predictive analytics, it's crucial to consider the potential benefits of using AI models to forecast the lasting effects of various treatment methods. These models can help healthcare providers and patients make informed decisions about how different approaches

may impact swallowing function over time.

5. Conclusion

Patients with HNC commonly experience swallowing difficulties before radiation therapy. Those who have severe difficulties before treatment are more likely to have worse swallowing outcomes after treatment. To provide the necessary support, it is imperative to involve speech and swallow therapists in the cancer care team. Patients ready for radiation treatment should be educated about the anticipated decline in swallowing ability. In addition, oral intake difficulties must be promptly identified and managed with strategies to maintain functional swallowing and adequate nutrition during treatment. Early identification of patients who may require swallowing support and proactive intervention might enhance the quality of life of patients and reduce the financial burden associated with reactive intervention.

Ethical approval

The Institutional Ethical Committee of Kasturba Hospital, Manipal (IEC No.362/2020) approved the current study.

CRedit authorship contribution statement

Janet Jaison Varghese: Writing – original draft, Formal analysis, Data curation, Conceptualization. **Venkatarama U. Aithal:** Writing – review & editing, Supervision, Conceptualization. **Krishna Sharan:** Writing – review & editing, Supervision. **Arun G. Maiya:** Conceptualization, Supervision, Writing – review & editing. **Bellur Rajashekhar:** Supervision, Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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