Distinct Dysphagia Profiles in Patients With Oral Cancer After Surgery

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OBJECTIVES: To determine distinct profiles based on symptom severity in patients undergoing surgery for oral cancer and examine whether these profiles differ by participant characteristics.

SAMPLE & SETTING: 300 patients who underwent surgery for oral cancer at two outpatient clinics between June and December 2021.

METHODS & VARIABLES: Symptoms were assessed using the MD Anderson Symptom Inventory–Head and Neck Cancer Module. Sociodemographic and clinical characteristics were collected. Latent profile analysis was performed.

RESULTS: Five distinct dysphagia profiles were identified, which qualitatively differed regarding co-occurrence patterns of dysphagia, mucus-related symptoms, speech disturbances, and psychoneurologic symptoms. Significant differences were reported in interference to function, number of co-occurring symptoms, time since diagnosis and treatment completion, use of symptom management medications, oral cancer stage and site, and treatment completed.

IMPLICATIONS FOR NURSING: Identifying distinct dysphagia profiles can improve patient outcomes and help in planning specific nursing interventions to influence nutritional and functional status in oral cancer survivors. Dysphagia and dry mouth can persist beyond one year post-treatment, so follow-up dysphagia assessments are needed.

Extensive evidence exists that patients with head and neck cancer (HNC), including oral cancer, experience multiple local, systemic, and psychological symptoms across the cancer trajectory (Murphy et al., 2019; Muthu et al., 2018; Speksnijder et al., 2021; Townes et al., 2020). Some of these symptoms can continue even after surgical resection of a tumor (Crowder et al., 2018) and occur together as symptom clusters (SCs). SCs have been found to have synergistic effects on patient outcomes (Oh et al., 2019), signifying the need for advanced SC research in cancer. SC research conducted using a person-centered approach, in which patients are clustered based on their experiences with concurrent symptoms, has significant clinical value (Barsevick, 2016; Miaskowski, 2016; Ryan et al., 2019). This approach enables the identification of subgroups or profiles of individuals who share similar patterns of symptom experiences. Examination of these distinct profiles can inform clinical decisions on targeted assessment and intervention strategies, which can subsequently lead to better treatment effectiveness and improved patient outcomes (Ryan et al., 2019).

Latent profile analysis (LPA), a model-based approach to clustering based on continuous indicators (e.g., patients' ratings of symptom severity), generates groups of latent profiles through estimates of conditional means and variances, such that each group of individuals has a distinct pattern of responding to symptom items (Lanza & Rhoades, 2013; Lazarsfeld & Henry, 1968). This allows researchers to examine qualitative differences among individuals and how symptoms combine to form profiles, providing insight into the different groups' symptom experiences (Spurk et al., 2020; Williams & Kibowski, 2016). In symptom science, LPA allows for investigating how various symptoms

co-occur in individuals at different severity levels and provides a more nuanced understanding of individual differences in SC experiences.

Oral cancer is defined as a cancer of the lips, dorsal surface of the tongue, gums, cheek mucosa, hard and soft palate, uvula, floor of the mouth, or unspecified parts of the mouth (Conway et al., 2018; Sarode et al., 2020). Research on SCs in oral cancer is scarce, as evidenced by a review that synthesized evidence on SCs in individuals with HNC (Mathew, Tirkey, et al., 2021). This review concluded that the majority of the literature on SCs in oral cancer is subsumed under the vast domain of HNC, with most studies conducted among heterogeneous HNC populations (Mathew, Tirkey, et al., 2021). In addition, only nine studies identified patient subgroups, and these were also conducted in heterogeneous HNC populations. None of the reviewed studies examined oral cancer populations exclusively or explored distinct symptom profiles using LPA, revealing a gap in the relevant literature. Lastly, only five studies examined factors predicting or associated with subgroup membership, and these were again among heterogeneous HNC populations (Mathew, Tirkey, et al., 2021). Therefore, given the paucity of person-centered SC research in oral cancer, the aims of this study were to determine whether distinct profiles based on symptom severity exist in patients after undergoing surgery for oral cancer and examine if these profiles differ based on sociodemographic and clinical characteristics.

Methods

Guided by symptom management theory (UCSF School of Nursing Symptom Management Faculty Group, 1994), the parent convergent mixed-methods study relied on data from a quantitative survey and qualitative data using a phenomenologic approach to examine SC experiences in patients with oral cancer. Symptom management theory was chosen because of the strong evidence of its empirical and pragmatic adequacy and use in cancer symptom science (Mathew, Doorenbos, & Vincent, 2021). This study focused on the symptom experience dimension of symptom management theory, which includes an individual's perception of symptoms, judgments about the severity of co-occurring symptoms, the effects of symptoms on their lives, and the individual's response to symptoms (UCSF School of Nursing Symptom Management Faculty Group, 1994). This article reports the findings of the LPA performed on symptom data from the survey sample.

Power Analysis

Consensus on statistical power for detecting classes in LPA is still emerging (Nylund-Gibson & Choi, 2018). Factors such as class separation, number of classes, and class proportions have been shown to influence power, but these are unknown in advance and can be only estimated based on prior research (Gudicha et al., 2016; Tein et al., 2013). Previous studies have reported on LPA with sample sizes of 119 (Au et al., 2013), 187 (Dodd et al., 2011), and 222 (Thomas et al., 2011). Because no formal criterion exists for sample size calculation in LPA, the authors estimated the sample size using a formula based on a Monte Carlo simulation for class extraction: $N = m_{90}^{(w2)}/(w2)$, where N = sample size, w = modified Cohen's w, and $m_{90}^{(w2)}$ = estimated constant for predicting from w the required N to obtain a target power of 0.9 (Dziak et al., 2014). Because this formula required prior knowledge of the number of indicators and there is insufficient evidence on which symptoms cluster in the oral cancer population, the authors assumed the following based on clinical relevance and existing cancer SC literature: using 10–13 indicators, having unequal class sizes, and a moderate class separation (Hong et al., 2020; Miaskowski et al., 2015). Based on the formula, a minimum sample size between 175 (10 indicators) and 269 (13 indicators) was required to obtain a power of 0.9 (Dziak et al., 2014). Based on these estimations, a conservative sample size was set at 300.

Sample and Setting

Participants included a convenience sample of patients with oral cancer who had completed surgery. Patients were eligible if they were (a) aged 18 years or older; (b) treated with curative intent, defined as recommended for surgery upfront by the interprofessional tumor board; (c) disease-free at the time of recruitment; and (d) fluent in English, Tamil, or Hindi. Exclusion criteria included extension of the primary tumor into other HNC sites, not started on oral intake, cognitive impairment, history of depression or sleep disorders, and history of any malignancy.

Patients were recruited from two outpatient clinics (head and neck surgery and radiation oncology) at Christian Medical College, Vellore, in India. Christian Medical College is a 3,000-bed interprofessional teaching hospital, which treats about three million outpatients annually, of which about 6,000 are patients with HNC. Recruitment was conducted by A.M. in the two clinics on respective outpatient days. Potential participants were initially identified by regular clinic staff at the recruitment sites. A.M.

discussed the study purpose and procedures with participants and the approximate time required for data collection. If participants expressed interest and gave verbal consent, they were screened for eligibility using the eligibility checklist. Screen failures were recorded in the eligibility checklist. No data were obtained from screen failures. Once participants were found to be eligible, A.M. provided detailed research information in a language understandable to them. Language-specific (English, Tamil, or Hindi) patient information sheets were used to discuss the study details. Participants were given time to read the information sheet and clarify any concerns. No incentives were given for recruitment. All patients provided written informed consent. All study procedures were approved by the institutional review boards of the University of Illinois, Chicago, and Christian Medical College, Vellore. Data were collected between June and December 2021.

Measures

A researcher-developed survey was used to collect sociodemographic information, and patients' health records were reviewed for clinical information. Sociodemographic characteristics included age, sex, locality, marital status, patient status as head of family, education level, occupation, socioeconomic status, and insurance coverage. Clinical characteristics included site and stage of oral cancer, treatment completed, time since diagnosis, time since treatment completion, history of tobacco use, current use of symptom management medications, comorbidities, and whether the current cancer diagnosis was primary or a recurrence.

Socioeconomic status was assessed using the modified Kuppuswamy Socioeconomic Scale (Saleem, 2020). The Kuppuswamy Socioeconomic Scale includes three index parameters (monthly family income and occupation and education level of the head of family). Each parameter is further classified into subgroups, with scores allotted for each subgroup. Based on the summated scores, families are classified into five groups: upper class, upper middle class, lower middle class, upper lower class, and lower socioeconomic class (Saleem, 2020). The Kuppuswamy Socioeconomic Scale has been widely used for assessing socioeconomic status (Sharma & Saini, 2014).

Symptoms were assessed using the MD Anderson Symptom Inventory–Head and Neck Cancer Module (MDASI-HN) (Rosenthal et al., 2007; University of Texas MD Anderson Cancer Center, n.d.). The MDASI-HN consists of 13 core symptoms common across all cancer types, 9 HNC-specific tumor- and treatment-related symptoms most important to patients with HNC (acute and late functionally oriented symptoms), and 6 items on how symptoms interfere with patients' activities of daily living. Each item is rated on a scale ranging from 0 (not present) to 10 (as bad as you can imagine). Interference items are rated from 0 (did not interfere) to 10 (interfered completely). Patients were asked to rate each item according to its worst severity during the previous week. The MDASI-HN has been extensively used in the HNC population, and its validity and reliability have been demonstrated. The MDASI-HN has been found to be sensitive to disease severity and treatment status, to be able to accurately predict the severity of radiation therapy–induced mucositis, and to have coefficient alpha reliabilities of 0.88, 0.83, and 0.92, for the 13 core MDASI items, 9 HNC-specific items, and 6 interference items, respectively (Cleeland et al., 2000; Rosenthal et al., 2007, 2008). In this sample, the Cronbach's alpha was 0.88.

Data Analysis

Data were managed using REDCap electronic data capture tools (Harris et al., 2019) and analyzed using Mplus, version 8.0 (Muthén & Muthén, 2017), and Stata, version 16.0. Descriptive statistics were used to describe participant characteristics. The symptoms used to identify each subgroup were determined jointly by symptom prevalence and severity, a domain known as symptom experience (Dodd et al., 2001). Symptoms were included if they were present in 30% of the sample based on the use of a prevalence cutoff in previous studies (Franceschini et al., 2013; Hong et al., 2020; Miaskowski et al., 2014, 2015; Xiao et al., 2013). Severity scores were examined, and the top 10 severe symptoms that occurred in more than 30% of patients were initially considered for analyses. Two additional symptoms nearing the prevalence cutoff and with similar severity profile as the top symptoms were also included. Among these 12 symptoms, feeling distressed and sadness were strongly correlated $(r[20] = 0.88, p < 0.0001)$. Therefore, sadness was excluded, and feeling distressed was considered because of its higher prevalence and mean severity. Eleven symptoms were used as indicators for identifying subgroups. To name the various profiles, mild (score of 4 or fewer), moderate (score of 5–6), and severe (score greater than 6) cut points were defined for symptoms (Hanna et al., 2015; Rosenthal et al., 2014). In addition, difficulties with swallowing and

TABLE 1. Demographic and Clinical Characteristics (N = 300)

Characteristic	$\overline{X}$	n	Range
Age (years)	48.57	11.35	23–74

Characteristic		n	%
Cancer site			
Tongue		136	45
Buccal mucosa and lip		107	36
Alveolus, palate, and floor of mouth		57	19
Cancer stage			
I and II		107	36
III		62	21
IVA and IVB		131	44
Currently taking symptom management medications			
No		267	89
Yes		33	11
Gender			
Male		230	77
Female		70	23
Patient is head of family			
Yes		228	76
No		72	24
Head of family education level			
Illiterate		15	5
Completed primary school		33	11
Completed middle school		57	19
Completed high school		127	42
Completed college		68	23
Head of family employment			
Part- or full-time		285	95
Unemployed		15	5
History of tobacco use			
Yes		203	68
No		97	32
Insurance coverage			
No		277	92
Yes		23	8
Locality			
Urban		166	55
Not specified		134	45
Marital status			
Married		283	94
Not specified		17	6

TABLE 1. Demographic and Clinical Characteristics (N = 300) *(Continued)*

Characteristic	n	%
Monthly household income (INR[a])		
Less than 10,000	60	20
10,000–30,000	113	38
30,001–50,000	90	30
50,001–75,000	32	11
More than 75,000	5	2
Number of comorbidities		
0	175	58
1	74	25
2	28	9
3 or more	23	8
Patient education level		
Illiterate	24	8
Completed primary school	29	10
Completed middle school	63	21
Completed high school	114	38
Completed college	70	23
Patient employment		
Part- or full-time	226	75
Housewife or student	56	19
Unemployed	18	6
Recurrent cancer		
No	280	93
Yes	20	7
Socioeconomic class		
Lower	5	2
Upper lower	98	33
Lower middle	147	49
Upper middle	50	17
Time since diagnosis		
6 months or fewer	113	38
7–12 months	47	16
1–3 years	77	26
3–5 years	41	14
5–10 years	18	6
More than 10 years	4	1
Time since symptom onset		
6 months or fewer	42	14
7–12 months	62	21
1–3 years	106	35
3–5 years	41	14
5–10 years	40	13
More than 10 years	9	3

TABLE 1. Demographic and Clinical Characteristics (N = 300) *(Continued)*

Characteristic	n	%
Time since treatment completion		
Less than 3 months	106	35
3–6 months	37	12
6–12 months	27	9
1–3 years	76	25
3–5 years	35	12
5–10 years	16	5
More than 10 years	3	1
Treatment completed		
Surgery and RT	145	48
Surgery and chemotherapy	126	42
Surgery, chemotherapy, and RT	29	10

[a] 1 U.S. dollar = 76 INR
INR—Indian rupee; RT—radiation therapy
Note. Because of rounding, percentages may not total 100.
Note. For time since symptom onset, time since diagnosis, and time since treatment completion, any time greater than 12 months (e.g., 1 year and 1 month) is included in 1–3 years, any time greater than 3 years (e.g., 3 years and 1 month) is included in 3–5 years, and any time greater than 5 years (e.g., 5 years and 1 month) is included in 5–10 years.

chewing are combined as one item on the MDASI and are referred to hereafter as dysphagia. There were no missing data on the indicator variables.

LPA

Robust maximum likelihood estimation was used for the LPA. First, an unconditional model was identified based on the number of latent classes that best fit the data with covariates. Then, eight covariates associated with symptom severity were evaluated in the LPA (time since treatment completion, use of symptom management medications, age, gender, comorbidities, treatment with radiation therapy, cancer stage, and recurrence). Each covariate was initially screened separately as an auxiliary variable, using the R3STEP command (Muthén & Muthén, 2017). Then, the covariates that were significant predictors of latent class membership were examined jointly within the model. The five covariates that were included in the final model were time since treatment completion, use of symptom management medications, treatment with radiation therapy, cancer stage, and recurrence.

Model fit was assessed using fit values and content decisions jointly (Spurk et al., 2020). The following indices were used: Akaike information criterion (Akaike, 1987), Bayesian information criterion

(BIC) (Schwarz, 1978), and sample size–adjusted BIC, all of which are goodness-of-fit measures with lower values indicating a better data fit. The Vuong-Lo-Mendell-Rubin likelihood ratio test (LRT), Lo-Mendell-Rubin–adjusted LRT, and bootstrapped LRT were used. Significant values in these tests indicated that the computed model had better data fit than the model with one fewer class. When inconsistent findings across fit indicators were observed, preferences were given to BIC, sample size–adjusted BIC, and bootstrapped LRT (Ferguson et al., 2020; Weller et al., 2020). Although not used to select a final model, entropy of each solution, with values ranging from 0 to 1, was also examined to support the accuracy of assigning individuals to profiles (Wang et al., 2017). Higher entropy values indicate more precise assignment of individuals to latent profiles, and values greater than 0.9 indicate that the subgroups are highly discriminative. Content decisions in model retention involved examining for profile discrimination, model parsimony, and profile size (Lanza & Rhoades, 2013; Spurk et al., 2020). An additional profile was not retained if it included less than 5% of the sample, or if it did not substantively differ from a profile in the previous solution (Kircanski et al., 2017; Spurk et al., 2020).

After identifying the latent profile solution that best fit the data, analysis of variance or chi-square tests were used to determine whether the profiles differed significantly on symptom scores, functional interference, and participant characteristics. Statistical significance was set at $p < 0.05$. Post hoc contrasts were performed using the Bonferroni procedure, with a corrected p value of 0.005.

Results

The mean age of the sample was 48.57 years. Most patients were male (n = 230, 77%), lived in an urban locality (n = 166, 55%), were married (n = 283, 94%), and had completed middle school or higher (n = 247, 82%). About 92% (n = 277) of patients did not have insurance coverage, 75% (n = 226) were employed part- or full-time, and 34% (n = 103) were considered lower or upper lower socioeconomic class. About 65% (n = 193) had stage III or IV cancer. Tongue was the leading site of oral cancer (n = 136, 45%). Participant characteristics are presented in Table 1.

The unconditional models differed from the model with covariates, and fit indices for both models are presented in Table 2. Five distinct subgroups of patients were identified based on their severity ratings of the 11 symptoms. Five profiles were selected

because of (a) lower BIC and sample size–adjusted BIC, (b) profile size (5%), (c) significant bootstrapped LRT despite having insignificant Vuong-Lo-Mendell-Rubin LRT and Lo-Mendell-Rubin–adjusted LRT, and (d) lack of meaningful new insight in a sixth profile. The final solution exhibited high classification accuracy (entropy = 0.942). This decision was consistent with previous research and existing recommendations on selecting the best model (Dahling et al., 2017; Lanza & Rhoades, 2013; Spurk et al., 2020).

Differences in Symptom Severity Among Profiles

Table 3 presents the differences in symptom severity scores among the five profiles. Based on the F statistic value, symptoms that were the three largest contributors to subgroup identification were sleep disturbances, increased mucus, and dysphagia. The patterns of severity of these three and other co-occurring symptoms differentiated the profiles (see Figure 1). Certain co-occurring symptoms were more severe in some profiles than others, so the pattern of symptom severity differed in each profile. For example, patients in four profiles reported severe dysphagia and moderate to severe problems with

teeth and/or gums. The severity of other symptoms co-occurring with dysphagia and teeth problems differed in each profile. In these four profiles, the severity patterns of mucus-related symptoms (e.g., increased mucus, dry mouth), speech difficulty, and psychoneurologic symptoms (e.g., sleep disturbances, pain, distress, fatigue) were different. The patterns of symptom severity were used to name the profiles. Profile 1 (all mild) consisted of 69 patients (23%) with all mild symptoms. Profile 2 (dry dysphagic) was the largest subgroup, with 128 patients (43%) who reported severe dysphagia, severe teeth problems, and moderate dry mouth, whereas all the other symptoms were mild. Profile 3 (psychoneurologic dry dysphagic) consisted of 40 patients (13%) who reported severe dysphagia, moderate teeth problems, and moderate dry mouth, but also reported having higher sleep disturbances, fatigue, pain, and distress than the first two profiles. Profile 4 (moist dysphagic) consisted of 47 patients (16%) with severe dysphagia, moderate teeth problems, increased mucus, and moderate speech difficulties. Lastly, profile 5 (psychoneurologic moist dysphagic) had the smallest subgroup, with 16 patients (5%) who reported severe dysphagia,

TABLE 2. Fit Indices by Class

Class	Log Likelihood	FP	AIC	BIC	SABIC	VLMR-LRT[a]	LMR Adj LRT[a]	Entropy	Smallest CP (%)
Unconditional model									
2	–7,671.47	34	15,410.941	15,536.869	15,429.041	< 0.0001	< 0.0001	0.917	26
3	–7,513.338	46	15,118.675	15,289.049	15,143.165	0.0005	0.0005	0.925	19
4	–7,414.969	58	14,945.937	15,160.757	14,976.815	0.0525	0.0551	0.936	10
5	–7,342.776	70	14,825.552	15,084.817	14,862.818	0.1495	0.1535	0.956	9
6	–7,272.998	82	14,709.997	15,013.707	14,753.652	0.113	0.1169	0.963	3
Model with covariates									
2	–7,630.321	39	15,338.641	15,483.089	15,359.404	< 0.0001	< 0.0001	0.914	27
3	–7,434.22	56	14,980.441	15,187.853	15,010.254	0.0002	0.0002	0.928	22
4	–7,349.938	73	14,845.877	15,116.253	14,884.74	0.0871	0.0901	0.946	9
5	–7,265.272	90	14,710.545	15,043.885	14,758.458	0.256	0.2605	0.942	5
6	–7,211.814	107	14,637.627	15,033.932	14,694.591	0.2398	0.2398	0.949	4

[a] H0: K – 1 classes; H1: K

adj—adjusted; AIC—Akaike information criterion; BIC—Bayesian information criterion; CP—class proportion; FP—free parameters; H—hypothesis; LMR—Lo-Mendell-Rubin; LRT—likelihood ratio test; SABIC—sample size–adjusted Bayesian information criterion; VLMR—Vuong-Lo-Mendell-Rubin

Note. For the bootstrapped LRT, p < 0.0001 for all classes in both models.

severe teeth problems, and increased mucus, as well as the highest scores for sleep disturbances, fatigue, pain, and distress. Patients reporting dysphagia with increased mucus (profiles 4 and 5) had higher speech difficulties than those in the other profiles. Two subgroups (19% of the total sample) reported severe dysphagia with co-occurring sleep disturbances, pain, and fatigue, but were different in terms of having either dry mouth or increased mucus.

Differences in Participant Characteristics Among Profiles

Tables 4 and 5 present the differences in participant characteristics among the profiles. Significant differences were found among the five profile subgroups in interference to functioning, number of co-occurring symptoms, cancer site, cancer stage, use of symptom management medications, time since diagnosis, time since treatment completion, and treatment completed. Patients in profiles with higher psychoneurologic symptoms (profiles 4 and 5) reported the highest interference to activities of daily living and the greatest number of symptoms. A greater percentage of patients in profile 4 had cancers in the buccal mucosa or alveolus compared to other profiles. All patients in this profile had stage IVA and IVB cancers. A greater percentage of patients in profiles 4 and 5 were using symptom management medications. Finally, profiles differed regarding how far they were in the disease trajectory (time since diagnosis and treatment completion) and the type of treatment completed. On average, patients reporting dysphagia with increased mucus (profiles 4 and 5) were around three to five months postdiagnosis

TABLE 3. Differences in Symptom Severity Among the Subgroups Identified by Latent Profile Analyses (N = 300)

Symptom	Profile 1 (N = 69)		Profile 2 (N = 128)		Profile 3 (N = 40)		Profile 4 (N = 47)		Profile 5 (N = 16)		F	p
	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD		
Difficulty swallowing/ chewing	1.28	1.9	7.29	1.69	6.53	2.88	7.74	1.58	8.06	1	136.77	< 0.0001
Difficulty with voice/speech	1.06	1.36	4.12	2.76	3.12	2.63	5.62	1.91	5.56	2.28	34.02	< 0.0001
Distress	1	2.06	2.72	2.54	3.63	2.82	3.02	2.75	4.5	3.01	11.12	< 0.0001
Disturbed sleep	0.2	0.72	0.22	0.7	5.25	1.58	0.72	1.3	6.56	1.41	321.39	< 0.0001
Dry mouth	1.3	2.03	4.38	3.02	4.93	3.27	1.28	2.13	2.38	2.83	24.57	< 0.0001
Fatigue	0.48	1.27	1.55	2.05	3.43	2.99	2.15	2.24	3.94	2.52	17.49	< 0.0001
Numbness or tingling	0.91	1.75	1.32	2.15	1.23	1.86	2.17	2.32	1.69	2.33	2.77	0.0275
Pain	0.58	1.23	1.02	1.57	3.03	2.53	2.26	2.22	4.75	2.24	28.68	< 0.001
Problem with mucus	0.23	0.89	0.23	0.73	0.28	0.78	5.55	1.8	5.44	2.13	282.46	< 0.0001
Problem with tasting food	0.51	1.6	1.71	2.86	2.8	3.35	1.64	2.71	2.38	4.01	5.01	0.0006
Problem with teeth or gums	1.58	2.21	6.02	2.73	4.75	3.32	4.81	3.73	6.69	3.44	27.95	< 0.0001

profile 1—all mild; profile 2—dry dysphagic; profile 3—psychoneurologic dry dysphagic; profile 4—moist dysphagic; profile 5—psychoneurologic moist dysphagic

Note. For all symptoms, degrees of freedom = 4.295.

FIGURE 1. Symptom Mean Scores by Profile (N = 300)
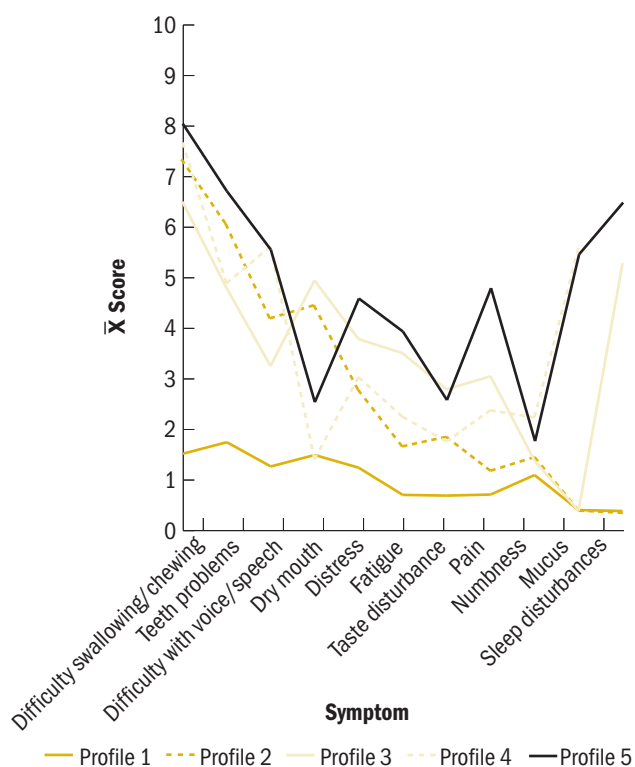
profile 1—all mild; profile 2—dry dysphagic; profile 3—psychoneurologic dry dysphagic; profile 4—moist dysphagic; profile 5—psychoneurologic moist dysphagic

Note. Mean symptom scores ranged from 0 to 10, with higher scores indicating greater symptom severity.

and two to three months post-treatment. Patients reporting dysphagia with dry mouth (profiles 2 and 3) were around one to two months postdiagnosis and 1–1.5 years post-treatment. A greater percentage of patients reporting dysphagia with dry mouth (profiles 2 and 3) received radiation therapy, whereas greater percentages of patients reporting dysphagia with increased mucus (profiles 4 and 5) had not received radiation therapy.

Discussion

This study is the first to identify patient subgroups or profiles based on symptom severity in oral cancer. The findings provide significant insight into the variability in perception of SCs and how concurrent symptoms are perceived differently by different patient subgroups. Through the identification of qualitatively distinct profiles of patients, this study contributes to a new understanding of the heterogeneity of the

experience of dysphagia among patients undergoing surgery for oral cancer. Considering the limited evidence on SCs experienced by patients with oral cancer postsurgery, this study reveals important findings. Dysphagia, copious mucus, and sleep disturbances contributed to subgroup identification, supporting inclusion of these symptoms in future person-centered SC research in this population. In addition, the average number of co-occurring symptoms significantly varied among profiles. Caution must be exercised in using the average number of symptoms to interpret SC burden in this population.

Dysphagia co-occurring with copious mucus or dry mouth is clinically significant, providing validation of statistically estimated profiles. Although dry mouth is well researched in HNC and the effects of hyposalivation pose significant concerns for patients, copious mucus is relatively underreported (Broderick et al., 2020). Patients may experience increased saliva because of restricted tongue or lip movement; difficulties with deglutition; sensory deficits; scarring of the perioral musculature; and altered oral anatomy with loss of labial, lingual, and buccal sulci (Pace-Balzan et al., 2011). Lack of saliva and salivary control issues are debilitating post–cancer treatment sequelae and negatively affect patients' quality of life (Broderick et al., 2020; Hawkins et al., 2018). The current assessment of patient characteristics provides further insight into the types of patients in the identified profiles. On average, patients who reported dysphagia and copious mucus were two to three months post-treatment, with a majority not having received radiation therapy. Significant dysphagia and dry mouth were reported even at 1–1.5 years post-treatment, mostly in patients who had received radiation therapy. Knowing this would enable nurses to actively seek information on these symptoms, particularly in the context of a time-constrained clinical visit. This is important considering that patients could be reluctant to broach the issues of distressing physical symptoms following a life-threatening illness.

In this study, patients in all profiles except those in profile 1 reported moderate to severe problems with teeth and/or gums. These problems involved complete loss of teeth or missing premolars and molars, affecting their ability to grind and chew food. Missing teeth were because of preoperative teeth extractions as decided during mandatory pretreatment dental screening and clearance or the result of site-specific tumor resections. Loss of teeth has been shown to be a determinant of patients' quality of life, and the greater number of teeth lost during

therapy has a significant negative impact on weight, dietary intake, and self-perceived oral health status (Gellrich et al., 2015; Pace-Balzan et al., 2011). This study also identified two patient profiles (profiles 4 and 5) that had higher speech difficulties than others. Post-treatment, speech is dependent on the quantity, quality, and mobility of the residual oral and oropharyngeal structures (Pace-Balzan et al., 2011). Altered mobility and anatomy of oral structures also affect ability to chew and/or swallow, intensifying the distress of patients with copious mucus because of the inability to swallow saliva. The results of this study support the co-occurrence of dysphagia, increased mucus, and speech difficulties. Dysphagia, problems with teeth and/or gums persisting as much as one year after treatment completion, and speech difficulties are supported by previous research reporting a high prevalence of nutritional and speech concerns

in this patient population (Moore et al., 2014). Improved tailored interprofessional patient support in oral health and rehabilitation is needed.

Two distinct profiles comprising 19% of the study population had severe dysphagia (dry or moist) and co-occurring sleep disturbances, pain, and fatigue. Moderate to strong correlations among pain, fatigue, and sleep disturbances and their co-occurrence have been frequently observed and are often considered a part of the psychoneurologic SC (Kim et al., 2012). These subgroups also had the highest interference to activities of daily living, which is supported by previous research that reported significant functional limitations and lower quality of life in patients with high psychoneurologic symptom scores (Dirksen et al., 2016; Kim et al., 2012). Patients in these profiles reported higher distress scores than other profiles, although these were not statistically significant.

TABLE 4. Differences in Sociodemographic Characteristics Among Patient Subgroups Identified by Latent Profile Analyses (N = 300)

Characteristic	Profile 1 (N = 69)		Profile 2 (N = 128)		Profile 3 (N = 40)		Profile 4 (N = 47)		Profile 5 (N = 16)		χ^2	p
	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD		
Age (years)	47.97	11	48.7	10.72	48.73	13.23	47.94	12.46	51.63	10.11	0.38	0.825
Characteristic: ref	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**χ^2**	**p**
Education: completed middle school	43	62	84	66	22	55	25	53	10	63	3.02	0.554
Gender: male	53	77	105	82	25	63	37	79	10	63	8.45	0.076
Insurance coverage: no	68	99	115	90	37	93	42	89	15	94	5.52	0.238
Locality: urban	41	59	71	55	22	55	25	53	7	44	1.42	0.84
Marital status: married	65	94	122	95	35	88	46	98	15	94	4.84	0.304
Monthly income: less than 50,000 INR[a]	65	94	110	86	35	88	39	83	14	88	4.04	0.401
Patient employment: part- or full-time	52	75	101	79	26	65	37	79	10	63	4.89	0.299
Patient is head of family: yes	51	74	105	82	27	68	36	77	9	56	7.73	0.102
Socioeconomic status: middle class or lower	55	80	75	59	24	60	32	68	11	69	9.64	0.047

[a] 1 U.S. dollar = 76 INR
INR—Indian rupee; profile 1—all mild; profile 2—dry dysphagic; profile 3—psychoneurologic dry dysphagic; profile 4—moist dysphagic; profile 5—psychoneurologic moist dysphagic; ref—reference
Note. Because of rounding, percentages may not total 100.

TABLE 5. Differences in Clinical Characteristics Among Patient Subgroups Identified by Latent Profile Analyses (N = 300)

Characteristic	Profile 1 (N = 69)		Profile 2 (N = 128)		Profile 3 (N = 40)		Profile 4 (N = 47)		Profile 5 (N = 16)		F	p
	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD		
BMI	25.48	3.56	23.66	4.21	23.6	4.78	23.38	4.31	22.94	2.79	3.08	0.017
Interference to functioning	0.87	2.37	4.55	5.53	10.08	10.02	6.98	6.22	9.44	5.94	19.18	< 0.0001
Time since diagnosis (months)	36.1	36.71	24.5	24.26	15.58	15.51	5.4	10.11	3.38	5.2	14.13	< 0.0001
Time since treatment completion (weeks)	143.97	157.26	88.44	94.82	54.85	65.33	13.45	38.16	7.56	19.37	14.66	< 0.0001
Total number of MDASI symptoms	3.29	2.05	7.04	2.24	9.45	2.95	8.47	2.48	10.13	2.33	65.39	< 0.0001
Characteristic: ref	n	%	n	%	n	%	n	%	n	%	χ^2	p
Comorbidities: 1 or more	29	42	51	40	17	43	18	38	10	63	3.267	0.514
History of tobacco use: yes	36	52	93	73	26	65	35	74	13	81	11.5	0.021
Medications: yes	1	1	6	5	8	20	12	26	6	37	36.56	< 0.001
Recurrent cancer: no	67	97	117	91	37	93	43	91	16	100	3.78	0.436
Site: buccal mucosa or gums	28	41	84	66	19	48	21	45	12	75	17.12	0.002
Stage: IV	8	12	65	51	17	43	25	53	16	100	53.88	< 0.001
Characteristic: ref	n	%	n	%	n	%	n	%	n	%	χ^2	p
Treatment completed											63.63	< 0.001
Surgery and/or NACT	37	54	27	21	13	32	34	72	15	94	–	–
Surgery and/or NACT, and RT	32	46	101	79	27	68	13	28	1	6	–	–

BMI—body mass index; MDASI—MD Anderson Symptom Inventory; NACT—neoadjuvant chemotherapy; profile 1—all mild; profile 2—dry dysphagic; profile 3—psychoneurologic dry dysphagic; profile 4—moist dysphagic; profile 5—psychoneurologic moist dysphagic; ref—reference; RT—radiation therapy
Note. Because of rounding, percentages may not total 100.
Note. Symptom severity was rated on a numeric scale ranging from 0 (not present) to 10 (as bad as you can imagine); interference items were rated on a scale ranging from 0 (did not interfere) to 10 (interfered completely).

Difficulty swallowing and/or chewing, as well as mucus problems (dry or moist), are considered to be nutrition impact symptoms, which have negative effects on patients' nutrition (Neoh et al., 2020). Although distress scores were mild to moderate in these profiles, persisting or undermanaged symptoms have the potential to increase distress in patients already experiencing nutrition impact symptoms. Considering that nutrition impact symptom–induced distress and other outcomes related to nutrition impact symptoms are underexplored (Crowder et al., 2018), the current study's results provide additional evidence on the extent and variations of nutrition impact symptoms. The results also support that chronic nutrition impact symptoms and associated distress could be a significant challenge for patients with oral cancer. The higher distress scores reported by the patient profiles are supported by research, which identified that stress independently determined membership to a high psychoneurologic symptom subgroup (Kim & Malone, 2019). This study augments the knowledge base on psychoneurologic clustering with nutritional symptoms, which warrants multisymptom intervention development, necessitating an interprofessional approach to survivorship care.

Limitations

This study was conducted at a single tertiary care center using cross-sectional data from a convenience sample. Although LPA is a powerful statistical procedure, one of the main limitations is that it assigns profiles based on probabilities. The identified profiles may not always refer to actual subgroups within the population. Therefore, further validation studies are required with larger sample sizes.

Implications for Nursing

Distinct dysphagia profiles exist in patients following surgery for oral cancer, and efforts to identify and target these profiles could improve patient outcomes. Information on variations in dysphagia is significant for planning nursing interventions, which can subsequently influence nutritional and functional status in oral cancer survivors. For example, patients experiencing dysphagia co-occurring with dry mouth may tend to adopt dietary changes, such as consuming mashed or soft foods. They are also at greater risk for nutritional deficiencies and would benefit from specific education on nutritious foods that have a soft and wet consistency. Interventions to keep patients' oral mucosa moist, such as the use of saliva-stimulating

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KNOWLEDGE TRANSLATION

- Distinct dysphagia profiles were found in patients after surgery for oral cancer, and the severity patterns of mucus-related symptoms, speech difficulty, and psychoneurologic symptoms differed in these profiles.
- Two patient subgroups reported severe dysphagia with co-occurring sleep disturbances, pain, and fatigue, but were distinct regarding experiences of dry mouth or increased mucus. These patients also reported the highest interference to activities of daily functioning.
- On average, patients reporting dysphagia and increased mucus were around two to three months post-treatment. Patients reporting dysphagia and dry mouth were around 1–1.5 years post-treatment.

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agents, would be useful. Continuous use of saliva substitutes, such as oral moisturizing jelly for at least a month, has been shown to alleviate dry mouth and swallowing problems (Nuchit et al., 2020). Patients experiencing dysphagia co-occurring with copious mucus may require interventions for maintaining optimal nutrition, as well as practical tips on managing excessive salivation. For patients with psychoneurologic symptoms, multimodality interventions for sleep hygiene, pain relief, and fatigue may be needed. In addition, efforts to increase psychological flexibility through interventions based on acceptance and commitment therapy have been shown to be useful postcompletion of cancer treatment (Mathew, Doorenbos, Jang, & Hershberger, 2021). By engaging patients in accepting and committing to value-based action instead of employing avoidance strategies, acceptance and commitment therapy–based interventions have the potential to alleviate distress and other psychological symptoms. The results of this study found that patients who received radiation therapy postsurgery were at risk for severe dysphagia one year after treatment completion, indicating the importance of actively assessing dysphagia at follow-up appointments. In addition, beginning a swallowing therapy program within one year of completion of radiation therapy has the potential to improve dietary and swallowing performance and quality of life (Van Daele et al., 2019).

Future research can examine the replicability of the five dysphagia profiles with larger sample sizes, which would help to establish the validity of the profiles. Theoretically or clinically relevant outcomes could also be compared across these profiles. Future studies in oral cancer could use LPA to identify

patient subgroups with distinct dysphagia profiles in multiple assessments or employ prospective designs to examine symptom profiles over time using latent transition analysis.

Conclusion

LPA identified five distinct profiles of patients who had undergone surgery for oral cancer. Based on the results, nurses can support patients who are at high risk for dysphagia by using profile-specific symptom management strategies to improve outcomes. Multisymptom intervention development and delivery, including an interprofessional approach to survivorship care in oral cancer, is warranted.

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