Dysphagia and Its Impact on Quality of Life of Head and Neck Cancer Patients: Institution Based Cross sectional Study

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Research note

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Abstract

Objective: Assessing swallowing function using symptom-specific questionnaires on head and neck cancer (HNC) patients and supporting impaired swallowing to improve quality of life (QoL) of patients is recommended in different studies. However, there is no data that shows the effect of dysphagia on quality of life of Ethiopian patients. Hence, this study assessed the effect of dysphagia on quality of life domains of the MD Anderson Dysphagia inventory (MDADI) among head and neck cancer patients.

Results: The study sample consisted of mostly male (53.90%), employed (70.6%), single (57.80 %) and completed some level of formal education (66.60 %) with mean age of 42.58 years (SD ± 14.08 years) and medical expense for about 69.6% of patients was covered by the government. Most of the patients were suffering from advanced stage HNC (59.80%) and squamous cell carcinoma (62.70%) and the most prevalent tumor location was nasal cavity/ nasopharyngeal carcinoma (40.20%). The mean MDADI composite score was 53.29 (SD± 15.85). Being female, low income, suffering from laryngeal/ hypo pharyngeal cancer, suffering from advanced tumor and those undergoing a single modality therapy were key determinants of poor QoL related to swallowing problems in HNC patients.

Introduction

Dysphagia is a frequent sequel of head and neck cancer (HNC) and its treatment [1]. Patients with HNC report significant difficulty in swallowing [2, 3] which exacerbates with treatment intensification[4] and has a profound impact on social and physical well-being [5, 6] such as difficulty in eating solid foods, choking, cough up after swallow, strangling to swallow, taking extra time to swallow, altered social interactions, weight loss [4, 7, 8] and emotional consequences such as loss of enjoyment with eating, embarrassment, and dissatisfaction [9–12] throughout the course of a treatment and even after a completion of a therapy [13, 14].

Factors predictive of poor quality of life (QoL) due to dysphagia could be patient-related[15] such as smoking [16–18], alcohol abuse[16], age [16, 18, 19], lean mass [16], and gender [16, 19, 20]; tumor-related[15] such as advanced tumor stage [17, 21–24], location of HNC [25], such as patients with tongue [26], buccal[27], hypo pharyngeal [28] and laryngeal [29] tumors had worse dysphagia related QoL, type of treatment [15, 25, 30] in which higher level of dysphagia and lower QoL scores among patients who had radiotherapy [19], [31], [32], [29, 33] and surgery[19, 34, 35] and patients treated with concomitant chemotherapy have an exacerbated dysphagia and dietary problems[36]. Deterioration in swallowing function through time were also reported from before treatment to 3 months [3, 37, 38] and 6 months [17, 39] post treatment with some improvements at later times [17, 37, 38, 40].

Studies indicate the need for assessing QoL of cancer patients for a good understanding of the degree of improvement obtained with therapeutic procedures [2]. Despite this fact, no study in Ethiopia assessed this association and therefore, this study analyzed the association between dysphagia and QoL in patients undergoing treatment for HNC.

Methods

Patients and sampling strategy

The study population included both male and female adult head and neck cancer cancer survivors, aged >=18 years, who had no evident cognitive impairment and eating disorder which were selected by a consecutive sampling method among patients who visited oncology clinics at Tikur Anbessa Speciallized Hospital from February to April 2019.

The sample size was estimated using the population adjustment formula for single proportion estimation based on 95% confidence level, a precision of 5% and 50% expected prevalence since there was no prior study and a 10% non-response, yielding a total sample of 109 head and neck cancer patients.

Data collection tools

Document review

Patient cards were reviewed to identify patients diagnosed with head and neck cancer and to extract clinical characteristics as time elapsed since diagnosis, primary cancer site, cancer stage, type of carcinoma and type of treatment received.

Self-reported questionnaire

A self-reported questionnaire was also used to collect information on patients' socio-demographic, such as age, sex, marital status, level of education, working condition, residence, income and modality of payment coverage for medical expenses.

A 20-item psychometrically validated, and reliable Amharic version MDADI questionnaire which is specifically developed to evaluate the impact of dysphagia in QoL in patients with HNC [41] was used. Each question has 5 possible responses (strongly agree, agree, no opinion, disagree, and strongly disagree), and it is scored from 1 to 5. The Global domain is shown separately. The composite mean score is obtained by adding the other 3 domains, calculating their mean and multiplying this by 20. The composite mean score ranged from 20 (extremely low functioning) to 100 (high functioning). Thus, a better day-to-day functioning and a better day-to-day QoL is represented by a higher MDADI score.

Statistical analysis

The overall reliability of this measure was determined to be very good (Cronbach's coefficient alpha=0.924) and the subscale also had acceptable internal consistency (emotional, 0.79; functional, 0.71; physical, 0.89).

Questionnaire responses were used to construct categorical variables. Patients that were diagnosed with cancer within six months prior to data collection were defined as 'newly diagnosed', patients who were divorced, widowed, separated and never married are categorized as 'Single'. Level of income was

determined based on their ability to cover their medical expenses and patients were categorized as ‘fee paying’ if they were economical able to pay their medical expenses and those patients who were involved in any income generating activity were categorized as employed. Furthermore, patients who took any combination of treatment modalities were categorized under ‘Multi-modality treatment’ and cancer stages III & IV were categorized under ‘Advanced’. Details of the categories of all variables could be found in “Results” section.

Descriptive statistics were used to analyze demographic and clinical characteristics of participants. In addition, the independent t-test (for two groups) and one-way ANOVA (for more than two groups) were used to compare means between the demographic and clinical features with 4 domains and the composite mean score of the MDADI and $P < 0.05$ was considered significant. Once it was determined that differences exist among the means, post hoc range tests and pairwise multiple comparisons were conducted to determine which means differ. All statistical tests were performed using version 24 SPSS statistical software.

Results

Patient characteristics

The study population consisted of 102 HNC patients (93.6% response rate), mostly males (53.90%), employed (70.6%), single (57.80%) and completed some level of formal education (66.60%) with mean age of 42.58 years (SD ± 14.08 years). Majority (69.6%) belonged to extremely low economic status and their medical expense was covered by the government. Most were suffering from advanced stage HNC (59.80%) and squamous cell carcinoma 64 (62.70%) and the prevalent tumor location was nasal cavity/ nasopharyngeal carcinoma (40.20%) and about 34.3% of patients were newly diagnosed. Combination of treatment modalities, including chemotherapy, radiation therapy, and surgery was the most prevalent type of treatment in which 55.90% of the patients had this all treatments (Supplementary file 1& 2).

MDADI scores

The composite mean MDADI [28] score of 53.29 (15.85) and overall question score of 53.34 (16.96) was observed and the lowest scores were shown for the global score (44.51) and physical domain (49.4) (Supplementary file 3).

Tables 1 and 2 shows the mean differences in MDADI scores among different groups. Among socio-demographic characteristics, women had significantly lower composite mean($p = 0.036$) and functional ($p = 0.030$) scale scores and, patients who were economically able to pay for their medical expenses had significantly higher composite mean scores in all MDADI domains except the global domain. Other socio-demographic variables which includes age, marital status, level of education, employment status, place of residence and smoking habit did not differ between each domain (Table 1).

Table 1
Mean Differences of MDADI Subscales according to Socio Demographic Characteristics of Participants

Variable	MDADI (Mean ± SD)					
	All questions	Composite mean	Global	Emotional	Functional	Physical
Sex						
Male	56.3 ± 18.5	56.3 ± 16.6	47.6 ± 25.1	58.7 ± 18.9	61.2 ± 17.6	52.6 ± 21.3
Female	49.8 ± 14.4	49.7 ± 14.3	40.8 ± 19.9	54.3 ± 15.3	53.6 ± 16.8	45.7 ± 15.9
P	0.054	0.036	0.139	0.204	0.030	0.069
Age in years						
18 to 43	50.7 ± 16.0	51.6 ± 14.9	41.8 ± 22.6	53.7 ± 17.1	55.3 ± 17.7	47.1 ± 17.8
Above 43	56.5 ± 17.7	55.3 ± 16.8	47.8 ± 23.3	60.2 ± 17.3	60.5 ± 17.0	52.3 ± 20.7
P	0.086	0.241	0.189	0.060	0.140	0.169
Marital status						
Living alone	55.4 ± 16.8	54.7 ± 15.5	47.8 ± 24.4	58.9 ± 17.3	59.3 ± 16.8	51.5 ± 19.1
Living with partner	50.4 ± 16.9	51.4 ± 16.3	40.0 ± 20.5	53.6 ± 17.4	55.5 ± 18.5	46.6 ± 19.4
P	0.141	0.301	0.091	0.130	0.292	0.210
Level of education						
No formal Education	52.7 ± 14.7	53.3 ± 13.6	44.7 ± 20.3	55.2 ± 15.6	56.0 ± 15.0	49.8 ± 16.8
Primary	50.6 ± 14.8	50.4 ± 13.9	39.2 ± 20.8	53.9 ± 15.8	53.2 ± 17.0	48.0 ± 16.5
Secondary	54.1 ± 22.5	52.9 ± 21.2	50.0 ± 28.5	57.2 ± 21.5	60.7 ± 20.1	48.1 ± 25.7
Higher	56.2 ± 17.8	56.3 ± 16.5	45.4 ± 24.4	60.6 ± 18.3	62.0 ± 18.8	51.3 ± 20.5
P	0.705	0.630	0.508	0.534	0.263	0.929
Employment status						
Employed [a]	54.8 ± 17.6	54.4 ± 16.6	46.9 ± 24.5	58.0 ± 17.9	59.3 ± 17.6	50.8 ± 20.4

Variable	MDADI (Mean ± SD)					
	All questions	Composite mean	Global	Emotional	Functional	Physical
Unemployed	49.9 ± 14.9	50.6 ± 13.7	38.7 ± 18.1	53.3 ± 15.9	53.9 ± 17.1	46.3 ± 16.1
P	0.187	0.263	0.098	0.219	0.157	0.283
Place of residence						
Addis Ababa	48.8 ± 17.1	49.1 ± 17.7	39.2 ± 22.9	52.9 ± 17.5	55.1 ± 19.1	43.8 ± 20.3
Regional /rural	54.9 ± 16.7	54.7 ± 15.0	46.3 ± 22.9	57.9 ± 17.4	58.6 ± 17.0	51.4 ± 18.6
P	0.118	0.119	0.177	0.214	0.382	0.081
Level of income/ medical expenses coverage						
Fee paying	60.7 ± 19.7	58.9 ± 19.8	50.9 ± 25.7	64.3 ± 17.9	65.7 ± 19.3	56.8 ± 24.2
Covered by government	50.1 ± 14.6	50.8 ± 13.2	41.7 ± 21.3	53.3 ± 16.2	54.2 ± 15.6	46.2 ± 15.8
P	0.003*	0.018*	0.061	0.003*	0.002*	0.010*
Smoking						
Yes	52.3 ± 15.4	52.4 ± 14.9	43.4 ± 22.2	56.4 ± 15.6	56.6 ± 16.6	47.9 ± 17.8
No	57.5 ± 22.3	56.8 ± 19.5	49.0 ± 26.3	57.5 ± 24.1	62.0 ± 21.0	55.6 ± 24.0
P	0.229	0.266	0.333	0.806	0.222	0.109

Notes: t test (for two groups comparison) and one-way ANOVA (for three and above group comparison) were employed, * significant at p- value less than 0.05.

Table 2
Mean Differences of MDADI Subscales according to Clinical and Treatment Variables of Participants

Variable	MDADI (Mean ± SD)					
	All questions	Composite mean	Global	Emotional	Functional	Physical
Time since diagnosis						
New	52.1 ± 17.1	51.9 ± 15.4	44.6 ± 24.3	55.9 ± 16.9	56.5 ± 17.9	47.4 ± 19.0
6 to 12 months	52.9 ± 17.4	53.1 ± 16.2	46.7 ± 24.4	54.4 ± 18.9	55.8 ± 17.2	50.7 ± 18.9
More than year ago	55.3 ± 16.6	55.1 ± 16.3	41.9 ± 20.2	60.1 ± 16.2	61.3 ± 17.4	50.2 ± 20.3
P	0.729	0.333	0.707	0.389	0.389	0.749
Primary tumor site						
Oral cavity/ Oropharyngeal	57.4 ± 20.8	57.4 ± 18.4	52.0 ± 28.1	59.3 ± 20.9	60.7 ± 20.5	54.5 ± 22.8
Nasal cavity/ Nasopharyngeal	55.0 ± 16.4	54.7 ± 16.1	43.9 ± 21.1	59.0 ± 16.4	59.9 ± 16.9	50.8 ± 19.8
Larynx/ Hypo pharyngeal	47.2 ± 11.5	47.5 ± 11.2	38.1 ± 18.2	50.9 ± 13.8	51.9 ± 14.1	42.7 ± 12.2
P	0.044*	0.040*	0.058*	0.086	0.084	0.045*
Tumor T stage						
Initial	57.5 ± 18.2	57.7 ± 15.8	50.7 ± 24.9	60.5 ± 18.4	61.8 ± 16.8	53.4 ± 20.8
Advanced	50.6 ± 15.6	50.3 ± 15.3	40.3 ± 20.8	54.0 ± 16.4	54.9 ± 17.6	46.8 ± 17.9
P	0.042*	0.019*	0.024*	0.067	0.049*	0.092
Type of carcinoma						
Squamous cell	53.0 ± 16.6	53.3 ± 15.8	44.4 ± 22.1	56.0 ± 17.8	57.2 ± 17.2	49.5 ± 18.8

Variable	MDADI (Mean ± SD)					
	All questions	Composite mean	Global	Emotional	Functional	Physical
Adenocarcinoma	55.6 ± 19.5	54.7 ± 17.4	48.7 ± 25.5	58.3 ± 18.9	60.2 ± 20.2	51.5 ± 22.0
Other	51.3 ± 15.1	51.2 ± 14.4	38.7 ± 23.3	56.7 ± 13.9	56.0 ± 15.0	45.8 ± 17.2
P	0.730	0.803	0.425	0.874	0.725	0.676
Treatment modality						
Single modality Treatment	50.5 ± 14.7	50.1 ± 14.0	40.9 ± 20.7	55.4 ± 15.9	55.7 ± 16.9	45.2 ± 16.7
Multi-modality treatment	55.5 ± 18.3	55.8 ± 16.9	47.2 ± 24.5	57.5 ± 18.6	59.2 ± 17.9	52.6 ± 20.6
P	0.148	0.072	0.170	0.555	0.328	0.054

Notes: t-test (for two groups comparison) and one-way ANOVA (for three and above group comparison) were employed, * significant at p- value less than 0.05.

Regards to clinical features, statistically significant mean differences were observed between different primary tumor sites in all domains except the emotional and functional domains. In addition, patients with initial tumor stages (TI and II) had better scores in total questions (*p = 0.042*), composite mean score (*p = 0.019*), global (*p = 0.024*) and functional (*p = 0.049*) domains while worse scores in physical domain (*p* = 0.054) was observed among patients who were undergoing single modality treatment. Time since diagnosis and type of carcinoma did not differ between each domain (Table 2).

Compared with patients with oral cavity/ oropharyngeal cancer, those patients with laryngeal/ hypo pharyngeal cancer had significantly lower score in total questions (*p* = 0.048), composite mean score (*p* = 0.039), global (*p = 0.047*) and physical (*p = 0.042*) domains (Table 3).

Table 3
Multiple comparisons (Tukey HSD) between primary tumor site

Dependent Variable	Primary tumor site	Primary tumor site	Mean Difference	P	95% CI	
					Lower	Upper
Total questions	Oral cavity	Nasal cavity	2.3	.830	-7.2	11.8
		Larynx	10.2*	.048	0.1	20.3
	Nasal cavity	Larynx	7.9	.120	-1.6	17.3
Composite mean	Oral cavity	Nasal cavity	2.7	.748	-6.2	11.6
		Larynx	9.8*	.039	0.4	19.3
	Nasal cavity	Larynx	7.1	.135	-1.7	15.9
Global	Oral cavity	Nasal cavity	8.1	.299	-4.8	21.0
		Larynx	13.9*	.047	0.2	27.7
	Nasal cavity	Larynx	5.8	.525	-7.0	18.6
Physical	Oral cavity	Nasal cavity	3.7	.701	-7.1	14.4
		Larynx	11.8*	.042	0.4	23.3
	Nasal cavity	Larynx	8.2	.167	-2.5	18.9

Notes: *: The mean difference is significant at the 0.05 level.

Discussion

Considering the hypothesis that the presence of dysphagia increases the chances that the patient diagnosed and treated for HNC will present a reduction in their QoL, this study detected a composite mean of 53.29 in the MDADI, reflecting a mean reduction in the QoL due to swallowing changes in majority of studied patients, that is, the majority of patients reported that their swallowing limits their daily activities.

The composite MDADI mean scores in this study was considerably lower than 63.36 reported in Brazil [42], 64.06 and 67 and reported in USA [1, 43] and 67.08 reported in Taiwan [27] indicating the severity of this problem in Ethiopia. The variation may be due to the fact that patients in Ethiopia lack access to early treatment and support since there is a single cancer center in the country that provide comprehensive cancer care.

Similar to previous studies that reported patient-related factors such as, gender [16, 19, 20] and financial burden [18, 44, 45], tumor-related factors such as advanced tumor stage[21–23], location of HNC [25–29] and type of treatment [15, 25, 30] ,this study also identified that female sex, low income (who can't cover

their medical expenses), suffering from laryngeal/ hypo pharyngeal cancer, suffering from advanced tumor are key determinants of poor QoL related to swallowing problems in HNC patients. These results have direct implications at improving the care of HNC patients by highlighting the need to incorporate swallowing function in the assessment and clinical management of patients.

In contrast, unlike previous studies that reported factors such as, age[16, 18, 19], marital status [46], and smoking [16–18] and deterioration in swallowing function through time [17, 37, 38], no associations were observed between age, smoking habit, marital status, time since diagnosis and type of carcinoma in this study.

Female cancer patients in this study experienced poor swallowing related QoL consistent with earlier studies[16, 19, 20]. Women were more emotionally distressed, frustrated, embarrassed and depressed due to the inability to enjoy mealtime [20] compared with male counterparts.

In this study, low - income patients scored lower MDADI scores in most of the domains which is consistent with the previous studies that linked financial burden from cancer with poor QoL [18, 44, 45].

Our results were consistent with prior studies that identified the negative impact of stage and location of cancer on swallowing related QoL. It is interesting to note that worse MDADI scores among patients with advanced tumor stages and that had laryngeal/ hypo pharyngeal tumors observed in prior studies [17, 21–29] were consistent with the risk observed for poorer QoL scores in our population. Patients that had oral cavity/ oropharyngeal tumor and at initial tumor stages had better MDADI scores compared to patients with laryngeal/ hypo pharyngeal and an advanced stage cancer emphasizing the need to rigorously address swallowing function in such cancer patients.

Unlike the finding of studies done in Spain, Brazil and USA, [2, 23, 47, 48], those patients received a multi-modality treatment were found to have a better scores compared to those with single modality treatment. This difference might be related to the fact that those patients with advanced stage cancer were less likely to had surgery and radiotherapy and any form of combination therapy due to their condition. Therefore, future studies should separately address the effect of therapy on swallowing problems for patients with early and advanced stage HNC patients in Ethiopia. As the burden of swallowing problems in HNC patients was established, it is crucial to incorporate swallowing function in routine cancer therapy protocols to mitigate the effect of dysphagia on QoL.

Limitations

To our knowledge, this study was the first in Ethiopia that assessed the effect of dysphagia on QoL and identified associated factors for poor dysphagia related QoL in HNC patients and provided baseline data that are essential to evaluate the progress of swallowing function in HNC patients. However, some limitations of this study warrant caution in interpreting the results. Mainly, cross-sectional nature of this study does not allow drawing any causal inferences. However, owing to the dearth of literature in this area, our results could direct future studies by allowing hypothesis generation and providing useful

information to target vulnerable populations. As self-reporting was used to collect patient information, our study was prone to recall bias. Furthermore, our questionnaire tailored to account for cultural sensitivities of Ethiopian patients may not be suitable for wider adoption without further validation.

Abbreviations

ANOVA: Analysis of Variance

ETB: Ethiopian Birr

HNC: head and neck cancer

MDADI: MD Anderson Dysphagia inventory

QoL: Quality of Life, SD: Standard Deviations

SPSS: Statistical Package for the Social Sciences

USA: United States of America

Declarations

Ethics approval and consent to participate

A written informed consent was obtained from all the participants. The study received ethical approval from Institutional Review Board of College of Health Sciences, School of Nursing and Midwifery [8/19/SNM].

Consent for publication

Not applicable

Availability of data and materials

The datasets used in this study are available upon request.

Competing interests

The authors declare that they have no competing interests

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Authors' contributions

TA SK NG NT were involved in the conception and design of this study. TA and NT designed the final model and performed the experiments. TA completed final data analysis and wrote the first draft of the manuscript. All authors read and approved the final manuscript.

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