

Validation of the Arabic Version of the Swallowing Disturbance Questionnaire in Dysphagic Patients

Original
Article

Aisha Fawzy Abdel Hady, Hossam Mohamad El Dessouky, Abdulaziz Marzouq Saad Al-Rashidi, Ayatallah Raouf Sheikhan

Phoniatic unit, Department of Otolaryngology, Cairo University, Egypt.

ABSTRACT

Background: The Swallowing Disturbance Questionnaire contains 15 items covering the common swallowing disturbances that appear in the oral and pharyngeal phases of swallowing.

Aim: To evaluate the validity of an Arabic version of swallowing disturbance questionnaire in the screening of dysphagia resulting from various swallowing disorders to be used as an easily applicable self-reported questionnaire for early detection of dysphagic cases.

Patients and Methods: Forty patients with different etiologies of oropharyngeal dysphagia were asked to fill in the generated Arabic version of Swallowing Disturbance Questionnaire in addition to filling in the Dysphagia Handicap Index to detect the concurrent validity. Flexible endoscopic evaluation of swallowing was carried out to all patients to confirm the presence of dysphagia.

Results: Three questions related to laryngeal symptoms were excluded from the questionnaire as they showed low reliability (p value = 0.177). Cronbach's alpha coefficient of Arabic version of Swallowing Disturbance Questionnaire after removal of the three questions showed good reliability (p value = 0.768) and excellent test retest reliability. It showed a good concurrent validity when it was compared against Dysphagia Handicap Index. The two questionnaires had the same findings in the scores of dysphagia within the study groups with higher scores in Post-Stroke cases. Arabic version of Swallowing Disturbance questionnaire had a cut off level of 10 with (55.26%) sensitivity and (50.0%) specificity.

Conclusion: Given the proved validity of the Arabic version of Swallowing Disturbance questionnaire, the current study proposes its use to high-risk patients of swallowing problems.

Key Words: Dysphagia handicap index, oropharyngeal dysphagia, swallowing disturbance questionnaire, validity, .

Received: 25 November 2022, **Accepted:** 10 January 2023

Corresponding Author: Aisha Fawzy Abdel Hady, MD, Department of Phoniatics, Faculty of Medicine, Cairo University, Egypt. **Tel.:** 01224932611, **E-mail:** aishafawzy1@yahoo.com

ISSN: 2090-0740, 2023

INTRODUCTION

Oropharyngeal dysphagia is a swallowing disorder that involves changes in the interaction between the oral and pharyngeal phases, ranging from minimum difficulty in swallowing foods and liquids to disability with more severe complications^[1].

There are variable causes of dysphagia such as stroke, head and neck tumors, multiple sclerosis, Parkinson's disease, and dementia. Oropharyngeal dysphagia may lead to malnutrition, dehydration, aspiration pneumonia, or difficulty in managing secretions^[2, 3, 4]. It may also have consequences on social and psychological lives, with a negative impact on quality of life of the patients^[5].

Aspiration is the most severe swallowing disturbance^[6,7]. To lessen related complications, appropriate management is necessary through early detection and referral for suitable clinical evaluation and follow-up. Regular assessment of swallowing function can help achieve adequate nutrition and hydration^[8].

Videofluoroscopy or modified barium swallow (MBS), is the most widely used investigation for oropharyngeal dysphagia and is more sensitive than bedside testing alone^[9] as it has a dynamic nature, enabling assessment of the possible responses in real time to aspiration, such as throat clearing or coughing. Fibre-optic endoscopic evaluation of swallowing (FEES) is the main alternative assessment tool. It is advantageous in avoiding radiation and providing sensory testing, but may lead to some discomfort resulting from placement of the endoscope through the nose to the soft palate level^[10].

Instrumental analysis is a poor measure of overall functional disability, and recommendations based on their results alone may lead to a management approach that has little practicality to the patient^[11,12]. A qualitative, patient-centered assessment tool allows for reliable evaluation of the psychosocial burden associated with dysphagia, and the overall impact on quality of life (QOL)^[13, 14]. Self-reported assessments can be completed autonomously away from the clinical setting and results can identify patients who are in need of more invasive instrumental assessment^[15].

Several questionnaires have been developed to characterize an individual's oropharyngeal dysphagia^[16,17]. There are questionnaires that were designed particularly to assess the impact of dysphagia on QOL as the Eating Assessment Tool (EAT-10)^[13], Deglutition Handicap Index^[18] and the swallowing quality of life questionnaire^[19]. These questionnaires were translated into different languages including the Arabic language^[20,21,22].

Swallowing disturbance questionnaire (SDQ) was developed and validated for detecting dysphagia symptoms in patients with Parkinson's disease. It has since been recognized as a validated tool to detect early dysphagia in Parkinson's disease^[23]. This questionnaire was translated to other languages like Japanese^[24], Persian^[25] and Turkish^[26].

The SDQ has been used in dysphagic populations of different etiologies, including stroke, other neurodegenerative disease, gastrointestinal disease, and following head and neck surgery^[15]. Responses to the SDQ items have been found to correlate with results of structural and instrumental analysis such as oral motor examination and FEES with 79.7% sensitivity, and 73% specificity^[15]. The SDQ is short and does not take more than 10 minutes or less to complete^[11]. This raised the interest to translate it into Arabic and evaluate its validity in order to be used for early detection of patients with dysphagia of various swallowing etiologies.

The study aims at evaluating the validity of an Arabic version of swallowing disturbance questionnaire in the screening of dysphagia resulting from various swallowing disorders to be used as an easily applicable self-reported questionnaire for early detection of dysphagic cases.

PATIENTS AND METHODS:

This cross section analytical study was conducted on dysphagia patients of various swallowing disorders seeking advice at the Phoniatic unit - Kasr Al Ainy Hospital. The sample of the study included 40 Arabic speaking patients with age range between 20 and 65 years. The study was conducted from March 2022 to September 2022. Written consent was taken from all the patients. The study followed the principles outlined in the Declaration of Helsinki. The protocol of the study was approved by the scientific committee of Otorhinolaryngology department and the ethical committee of Faculty of medicine, Cairo University with a reference code of MS-134-2022.

The subjects under study were selected based on the following inclusion criteria; age range between 20 and 65 years and the presence of current history of swallowing problems due to any cause such as Head and neck Cancer patients, post radiotherapy, GERD and, mild and moderate cases of neuromuscular disorders (post stroke & movement disorders). Patients were excluded if they had a previous or

current history of psychiatric disorders, hearing or marked visual problem, symptoms of esophageal dysphagia and severe cognitive impairment.

2.1. Methodology:

2.1.1 Steps of preparation of the Arabic version of swallowing disturbance questionnaire:

Translation of the swallowing disturbance questionnaire^[15] into Arabic language was carried out by two bilingual phoniaticians to be used with Arabic patients. Then Back-translation (Arabic-English) of the Arabic translated swallowing disturbance questionnaire was done by an English teacher who was blinded to the study and had no prior knowledge about the instrument. Comparison of back-translations with the source version was done by a panel of expert committee (4 phoniatics professors) to confirm the prefinal version. The prefinal version was applied on a pilot study of 10 patients presenting with dysphagia to investigate if the wording and meaning of the questionnaire were clear and for the purpose to investigate the face and content validity. According to the pilot study, there were no needed modifications to be done and the final version of the swallowing disturbance questionnaire in Arabic language was prepared.

2.1.2 Protocol of the study:

The selected dysphagia patients were interviewed and informed about the idea of the study and a written consent was taken. The patients were subjected to history taking to collect the personal data, medical and surgical history if present. All the patients were asked to fill in the Arabic swallowing disturbance questionnaire by themselves or by the help of the investigator or caregivers if they were illiterate or had any motoric hand weakness. The questions of the questionnaire cover the common swallowing disturbances that appear in the oral and pharyngeal phases of swallowing. Five questions (questions 1–5) are related to the oral phase of swallowing and 10 questions (questions 6–15) are related to the pharyngeal phase. Fourteen questions are rated by a four-point (0–3) scale (0 for no disturbance and 3 for severe disturbance). The fifteenth question was a “yes/no” question. For each of the first 14 questions, the patient was given a score of 0 = Never, 1 = Seldom (once a month or less), 2 = frequently (1–7 times a week), 3 = Very frequently (>7 times a week) and the last one is a “yes/no” question (Yes, was scored 2.5 and No was scored 0.5).

Items of Swallowing Disturbance questionnaire include asking about: the oral phase includes questions about difficulty chewing solid food, like an apple, cookie, or a cracker, the presence of any food residues in mouth, cheeks, under the tongue or stuck to palate after swallowing, food or liquid come out of nose when eating or drinking and

chewed-up food dribble from your mouth and presence of too much saliva in mouth; drooling or having difficulty swallowing saliva.

The pharyngeal phase includes questions asking about the need to swallow chewed-up food several times before it goes down throat, the difficulty in swallowing solid food, the experience of difficulty in swallowing pureed food, the feeling of a lump of food is stuck in throat while eating, coughing while swallowing liquids, coughing while swallowing solid foods, change in voice, such as hoarseness or reduced intensity immediately after eating or drinking, coughing or difficulty breathing as a result of saliva entering windpipe, difficulty in breathing during meals and suffering from a respiratory infection (pneumonia, bronchitis) during the past year.

The patients were asked to fill in the swallowing disturbance questionnaire again after 2 weeks for the purpose of investigating the reliability and the internal consistency of the questionnaire. Two weeks interval is chosen to avoid the bias resulted from changing nature of dysphagia.

The Arabic version of the Dysphagia Handicap Index (A-DHI)^[20] was used to establish the concurrent validity of the Arabic version of swallowing disturbance questionnaire. The DHI is the one of the internationally recognized self-report instrument for swallowing disordered patients translated into Arabic. The DHI contains detailed subscales of three possible swallowing handicap domains (physical, functional, and emotional).

All the selected patients were evaluated using the Fiberoptic Endoscopic Evaluation of Swallowing using different food consistencies (thin fluid, thick fluid, puree, and solid food) to determine the underlying physiological breakdown in the swallowing mechanism of the patients and to later correlate with the results of the questionnaire. The consistencies were given by the assessor from thin fluid to solid. The endoscope was placed inside the patient's nose and passed to the oropharynx to allow static and dynamic evaluation of the oro-hypo-pharyngeal and laryngeal structure and the pre-swallowing and post-swallowing findings including if there were any penetration (scored by the use of aspiration/ penetration scale^[27], residue, glottic closure problem, velopharyngeal valve incompetence, premature spillage, pharyngeal mobility problem. The patient was given a score of 1 in presence of any of the previous problems and a score of zero in absence of the problem.

RESULTS:

3.1 Statistical analysis:

Data analysis was done using IBM SPSS® v.28. Data was summarized using median and IQR for not-normally

distributed data. Non-parametric tests were conducted to test the statistical difference between groups. Internal consistency and test-retest reliability were done for the translated questionnaire.

3.2 Statistical results:

3.2.1 Characteristics of the subjects:

The sample of the study included 40 Arabic speaking patients among the participants. The age distribution of the dysphagia subjects, the respondents ranged from 30 to 65 years old with median age 53 years old. 62% were males (25/40) and 38% were females (15/40). The patients were divided according to etiology into three groups; a group of Post-Stroke 11 patients (27.5%), a group of Vocal Fold Immobilization 12 patients (30.0%) and a group of Miscellaneous 17 patients (42.5%) with different etiologies involving the highest percentage 12.5% was for GERD, followed by 10% was for hemi-laryngectomies (Right and Left), then Bell's palsy & Motor accidents represented (7.5% & 5.0% respectively) while the least percentage 2.5% was for Right hemi-glossectomy, Right neck abscess excision and Behcet's disease. In addition to 20 normal adults as a control group to establish the cutoff level in the current study. Retest using the Swallowing Disturbance Questionnaire was carried out on a number of 40 Patients.

According to FEES findings, 95.0% of patients under study had an evidence of penetration while 5.0% had no evidence of penetration, 80% had residue, 67.5% had glottic closure problem, 35.0% had pharyngeal mobility problem, 17.5% had premature spillage and while none of them had evidence of velopharyngeal valve incompetence.

Mean of the A-SDQ was 16.8, the median was 15.5 and the range was between (12.5 & 28.5). The mean of A-SDQ retest was 16.7, the median was 15.5 and the range was between (12.5 & 28.5) and the mean of A-DHI was 50.4, the median was 46 and the range was between (36 & 76) as shown in (Table 1).

Table 2 illustrates the percentages of responses of subjects under study to each question in the Swallowing Disturbance questionnaire about both the oral and pharyngeal phases as follows; regarding the oral phase, the highest response (65.0%) was for "Never" to the experience of difficulty chewing solid food, the highest response, (50.0%) was for "Never" to the presence of residue in the oral cavity after swallowing, the highest response (67.5%) was for "Never" to the food or liquid come out of nose when eating or drinking, the highest response (72.5%) was for "Never" to the chewed-up food dribble from your mouth and the highest response (30.0%) was for "Never" to the presence of too much saliva in mouth; drooling or having difficulty swallowing saliva.

In the pharyngeal phase, the highest response (65.0%) was for “Frequently” to the need to swallow chewed-up food several times before it goes down throat, the highest response (42.5%) was for “Frequently” the difficulty in swallowing solid food, the highest response (35.0%) was for “Seldom” to the experience of difficulty in swallowing pureed food, the highest response (52.5%) was for “Frequently” to the feeling as if a lump of food is stuck in throat while eating, the highest response (52.5%) was for “Very frequently” to the coughing while swallowing liquids, the highest response (77.5%) was for “Never” to the coughing while swallowing solid foods, the highest response (50.0%) was for “Very frequently” to the change in voice, such as hoarseness or reduced intensity immediately after eating or drinking, the highest response (37.5%) was for “Never” to the coughing or difficulty breathing as a result of saliva entering windpipe, the highest response (37.5%) was for each response of “Never & Frequently” to the difficulty in breathing during meals, the highest response (95%) was for “Yes” to the suffering from a respiratory infection (pneumonia, bronchitis) during the past year.

Table 3 reveals statistically significant difference among the three dysphagia groups. Pairwise comparison among the 3 dysphagia groups regarding scores of A-SDQ, A-SDQ retest and A-DHI as follows; there is significant difference between Miscellaneous & Post-Stroke regarding A-SDQ and A-SDQ retest while there is highly significant difference between Vocal fold immobilization & Post-Stroke regarding scores of A-SDQ, the retest and A-DHI and a highly significant difference between Miscellaneous & Post-Stroke groups regarding scores of A-DHI.

Table 4 reveals that there is a statistical significant difference among the three dysphagia groups regarding the score of self-reported dysphagia severity of A-DHI with the post stroke group showing higher percentages in both “moderate and severe” degrees of severity. There is a statistical significant difference among the three dysphagia groups regarding the scores of the presence of residue with the highest percentages in vocal fold immobilization and post stroke groups. There is a statistical significant difference among the three dysphagia groups regarding the scores of the presence of glottis closure problem with the highest percentage in vocal fold immobilization. There is a statistical significant difference among the three dysphagia groups regarding the score of the presence of pharyngeal mobility problem with the highest percentage in the group of post stroke. There is non-significant difference among the three dysphagia groups regarding the presence of penetration according to the Penetration/Aspiration Scale and FEES findings of premature spillage and velopharyngeal valve incompetence.

Table 5 reveals that there is statistical significant difference between both groups regarding the presence of residue by the FEES with higher score in those having penetration (p value=0.036). There is no statistical difference between both groups regarding the SDQ scores and the remaining findings of FEES.

Table 6 reveals that there is only significant difference between those having pharyngeal mobility problem and those without in the scores of A-SDQ with increase of the score in those having pharyngeal mobility problem (p value=0.008).

Comparison was done between those with residue and those without residue regarding all the questions of the questionnaire and it revealed that the only significant difference was in Q9 (While eating, do you feel as if a lump of food is stuck in your throat?) (P value = 0.017). It was also done between those with glottic closure problem and those without glottic closure problem and revealed significant differences in Q10, Q 12, Q 13, Q 14 (Do you cough while swallowing liquids?, Do you experience a change in your voice, such as hoarseness or reduced intensity immediately after eating or drinking?, Other than during meals, do you experience coughing or difficulty breathing as a result of saliva entering your windpipe ?, Do you experience difficulty in breathing during meals?) (P value ranges between 0.002 to < 0.001) while the comparison between those with premature spillage and those without premature spillage regarding the scores of all the questions of the questionnaire revealed no significant difference.

Table 7 shows significant difference between those with pharyngeal mobility problem and those without pharyngeal mobility problem regarding all the questions in the questionnaire (p value ranges between 0.01 to < 0.001) except for Q. 8, Q.9, Q.15 (Do you experience difficulty in swallowing pureed food?, While eating, do you feel as if a lump of food is stuck in your throat? and Have you suffered from a respiratory infection (pneumonia, bronchitis) during the past year?).

The internal consistency measured by the Cronbach’s alpha coefficient of the A-SDQ including 15 items was 0.177 and after deleting 3 questions (Do you cough while swallowing liquids? Do you experience a change in your voice, such as hoarseness or reduced intensity immediately after eating or drinking? Do you experience difficulty in breathing during meals?), the Cronbach’s Alpha was 0.768.

Table 8 shows that Q1, Q3, Q4, Q5, Q6, Q7, Q8, Q13 showed perfect test-retest reliability with coefficient of stability =1), while Q2, Q9, Q11 showed excellent test-retest reliability with coefficient of stability of 0.971 to 0.991.

Concurrent Validity by correlation between A-SDQ and DHI was excellent (r value = 0.842, p value < 0.001) while the concurrent validity and correlation between the A-SDQ (after removing 3Q) & Total A-DHI was good (r value = 0.581, p value = < 0.001).

Table 9 shows that the Arabic version of SDQ after removing the three questions at a cut-off score 10/35.5 is sensitive and can detect penetration among (55.26%) of respondents and is specific and can detect subjects without penetration among (50.0%) of respondents.

Table 1: Shows the summary statistics among the study participants for the 3 questionnaires (A- SDQ, A-SDQ retest and A-DHI).

	Mean (\pm SD)	Median (IQR)	Range
Arabic version of SDQ (A-SDQ)	16.8 (\pm 4.1)	15.5 (13.5-18.5)	(12.5-28.5)
Arabic version of SDQ (retest)	16.7 (\pm 4.1)	15.5 (13.5-18.5)	(12.5-28.5)
Arabic version of DHI	50.4 (\pm 12)	46 (40-58)	(36-76)

A-SDQ = Arabic version of Swallowing Disturbance Questionnaire, A-DHI = Arabic version of Dysphagia Handicap Index.

Table 2: Results of the Arabic version of Swallowing Disturbance Questionnaire (A-SDQ).

Oral phase					
1	Do you experience difficulty chewing solid food, like an apple, cookie or a cracker ?	26 65.0%	1 2.5%	8 20.0%	5 12.5%
2	Are there any food residues in your mouth, cheeks, under your tongue or stuck to your palate after swallowing ?	20 50.0%	5 12.5%	9 22.5%	6 15.0%
3	Does food or liquid come out of your nose when you eat or drink ?	27 67.5%	6 15.0%	7 17.5%	0
4	Does chewed-up food dribble from your mouth?	29 72.5%	2 5.0%	7 17.5%	2 5.0%
5	Do you feel you have too much saliva in your mouth; do you drool or have difficulty swallowing your saliva ?	12 30.0%	7 17.5%	19 47.5%	2 5.0%
Pharyngeal phase					
6	Do you need to swallow chewed-up food several times before it goes down your throat ?	6 15.0%	4 10.0%	26 65.0%	4 10.0%
7	Do you experience difficulty in swallowing solid food (i.e., do apples or crackers get stuck in your throat) ?	16 40.0%	3 7.5%	17 42.5%	4 10.0%
8	Do you experience difficulty in swallowing pureed food ?	13 32.5%	14 35.0%	13 32.5%	0
9	While eating, do you feel as if a lump of food is stuck in your throat ?	5 12.5%	6 15.0%	21 52.5%	8 20.0%
10	Do you cough while swallowing liquids ?	7 17.5%	7 17.5%	5 12.5%	21 52.5%
11	Do you cough while swallowing solid foods ?	31 77.5%	5 12.5%	4 10.0%	0
12	Do you experience a change in your voice, such as hoarseness or reduced intensity immediately after eating or drinking ?	9 22.5%	5 12.5%	6 15.0%	20 50.0%
13	Other than during meals, do you experience coughing or difficulty breathing as a result of saliva entering your windpipe?	15 37.5%	9 22.5%	14 35.0%	2 5.0%
14	Do you experience difficulty in breathing during meals ?	15 37.5%	10 25.0%	15 37.5%	0
15	Have you suffered from a respiratory infection (pneumonia, bronchitis) during the past year ?	38(95%)*	2(5%)**		

*participants responded "Yes" were scored (2.5 points), participants responded "No" were scored (0.5 points).

Table 3: Comparison between the three groups of dysphagia regarding the scores of the two questionnaires of A-SDQ and A-DHI.

Questionnaire score	Causes			P-value
	Post-Stroke (n=11)	Vocal Fold Immobilization (n=12)	Miscellaneous (n=17)	
A-SDQ	18.5 (17.5-25.5)	13.5 (12.5-15.25)	15.5 (13.5-18.5)	<0.001
A-SDQ retest	18.5 (17.5-25.5)	13.5 (12.5-15.25)	15.5 (13.5-18.5)	<0.001
A-DHI	66 (58-70)	43 (38.5-49)	42 (37-50)	<0.001

A-SDQ = Arabic version of Swallowing Disturbance Questionnaire, A-DHI = Arabic version of Dysphagia Handicap Index, P-value < 0.05 is considered significant, P-value < 0.001 is highly significant.

Table 4: Characteristics among the 3 dysphagia groups regarding Self-reported severity dysphagia , Penetration-Aspiration Scale and FEES findings.

		Post-Stroke patients (n=11) N (%)	Vocal Fold Immobilization (n=12) N (%)	Miscellaneous (n=17) N (%)	P-value
Self-reported severity dysphagia classification of A-DHI	Mild	1 (9.1)	5 (41.7)	12 (70.6)	<u>0.006</u>
	Moderate	8 (72.7)	7 (58.3)	5 (29.4)	
	Severe	2 (18.2)	0	0	
Penetration-Aspiration Scale	Penetration	11 (100)	12 (100)	15 (88.2)	0.499
	Residue	11 (100)	11 (91.7)	10 (58.8)	<u>0.019</u>
FEES findings	Glottic closure problem	6 (54.5)	12 (100)	9 (52.9)	<u>0.01</u>
	Premature spillage	2 (18.2)	2 (16.7)	3 (17.6)	1
	Pharyngeal mobility problem	9 (81.8)	0	5 (29.4)	<0.001
	Velopharyngeal valve incompetence	0	0	0

P-value < 0.05 is considered significant, P-value < 0.001 is highly significant, FEES= Fiberoptic Endoscopic Evaluation of Swallowing.

Table 5: Comparison between patients with penetration and those without penetration regarding the scores of SDQ and FEES findings.

Variable Without Penetration (n=2) N (%)	PAS classification		P-value	
	Penetration (n=38) N (%)			
SDQ scores	15 (13.5-16.5)*	15.5 (13.5-18.5)*	0.574	
FEES findings				
	Residue	Yes 0	32 (84.2)	<u>0.036</u>
Glottic closure problem	No	2	6 (15.8)	
	Yes	0	27 (71.1)	1
Premature spillage	No	2	11 (28.9)	
	Yes	0	7 (18.4)	1
Pharyngeal mobility problem	No	2	31 (81.6)	
	Yes	2	12 (31.6)	0.117
Velopharyngeal valve incompetence	No	0	26 (68.4)	
	Yes	0	0
	No	2	38

*: median (IQR), PAS = Penetration Aspiration Scale, A-SDQ = Arabic version of Swallowing Disturbance Questionnaire, FEES = Fiberoptic Endoscopic Evaluation of Swallowing, P-value < 0.05 is considered significant, P-value < 0.001 is highly significant.

Table 6: Comparison between subjects with positive FEES findings and those without positive FEES findings regarding A-SDQ scores

FEES	A-SDQ		<i>P-value</i>
	+ve FEES findings	-ve FEES findings	
Residue	15.5 (12.5-18.5)	15.5 (12.75-18.25)	0.415
Glottic closure problem	15.5 (13.5-19.5)	17.5 (14-18.5)	0.842
Premature spillage	14.5 (12.5-15.5)	17.5 (13.5-18.5)	0.063
Pharyngeal mobility problem	18.5 (16-25.5)	14.5 (13.5-17.5)	0.008

A-SDQ = Arabic version of Swallowing Disturbance Questionnaire, FEES = Fiberoptic Endoscopic Evaluation of Swallowing, *P-value* < 0.05 is considered significant, *P-value* < 0.001 is highly significant.

Table.7: Comparison between subjects with pharyngeal mobility problems and those without pharyngeal mobility problems regarding the scores of all the items of the questionnaire:

Questions		No Pharyngeal mobility problem (n=26)	Pharyngeal mobility problem (n=14)	<i>p-value</i>
1	Do you experience difficulty chewing solid food, like an apple, cookie or a cracker?	0	2	0.01
2	Are there any food residues in your mouth, cheeks, under your tongue or stuck to your palate after swallowing?	0	2	0.005
3	Does food or liquid come out of your nose when you eat or drink?	0	1	<.001
4	Does chewed-up food dribble from your mouth?	0	1.5	0.012
5	Do you feel you have too much saliva in your mouth; do you drool or have difficulty swallowing your saliva?	1	2	<.001
6	Do you need to swallow chewed-up food several times before it goes down your throat?	2	2	0.013
7	Do you experience difficulty in swallowing solid food (i.e., do apples or crackers get stuck in your throat)?	0	2	<.001
8	Do you experience difficulty in swallowing pureed food?	1	1	0.705
9	While eating, do you feel as if a lump of food is stuck in your throat?	2	2	0.067
10	Do you cough while swallowing liquids?	1	3	0.001
11	Do you cough while swallowing solid foods?	0	0.5	0.029
12	Do you experience a change in your voice, such as hoarseness or reduced intensity immediately after eating or drinking?	3	1	0.002
13	Other than during meals, do you experience coughing or difficulty breathing as a result of saliva entering your windpipe?	2	0	<.001
14	Do you experience difficulty in breathing during meals?	0	1.5	<.001
15	Have you suffered from a respiratory infection (pneumonia, bronchitis) during the past year?	0.5	0.5	0.705

Table 8: Correlation Coefficient was run to determine the test-retest reliability using the A-SDQ (after removing the three questions).

Question	Coefficient of stability
Q1 Do you experience difficulty chewing solid food, like an apple, cookie or a cracker?	1.000
Q2 Are there any food residues in your mouth, cheeks, under your tongue or stuck to your palate after swallowing?	0.991
Q3 Does food or liquid come out of your nose when you eat or drink?	1.000
Q4 Does chewed-up food dribble from your mouth?	1.000
Q5 Do you feel you have too much saliva in your mouth; do you drool or have difficulty swallowing your saliva?	1.000
Q6 Do you need to swallow chewed-up food several times before it goes down your throat?	1.000
Q7 Do you experience difficulty in swallowing solid food (i.e., do apples or crackers get stuck in your throat)?	1.000
Q8 Do you experience difficulty in swallowing pureed food?	1.000
Q9 While eating, do you feel as if a lump of food is stuck in your throat?	0.985
Q11 Do you cough while swallowing solid foods?	0.971
Q13 Other than during meals, do you experience coughing or difficulty breathing as a result of saliva entering your windpipe?	1.000

Table 9: Sensitivity, Specificity and Cut-off level of A-SDQ after removing the three questions.

Cut-off level	Normal	Penetration
< 10	1	17
> 10	1	21
Total	2	38
Sensitivity	55.26 %	
Specificity	50.0 %	
Positive Likelihood Ratio	1.11	
Negative Likelihood Ratio	0.89	
Positive Predictive Value	95.5 %	
Negative Predictive Value	5.6 %	
Accuracy	55.0 %	

DISCUSSION

The questionnaires have an important role in the evaluation of patients with dysphagia and aims to determine its presence, severity, changes that it may cause in quality of life, and the rehabilitation plan. Screening tests are generally designed to be fast and easily applicable.

Although dysphagia questionnaires are easy applicable but some disadvantages were present as follows, the EAT-10 has not been evaluated in longitudinal studies and therefore its effectiveness in the measurement of dysphagia progression over time is unknown. Also, in the original validation study of Dysphagia Handicap Index (DHI), most of the participants reported mild to moderate dysphagia, with only a few reporting severe symptoms. Therefore, the relationship between the variability of response to dysphagia therapy is unknown^[28]. Swallowing Quality

of Life (SWAL-QOL) Questionnaire takes long time to complete compared to other swallowing questionnaires. The longer administration time results in increased clinical burden and may limit the widespread use of the SWAL-QOL in clinical practice^[13]. The complexity of the wording in the SWAL-QOL also restricts its use in populations with lower literacy levels^[29].

The SDQ was developed and validated for detecting dysphagia symptoms in patients with Parkinson's disease and compared its finding to an objective anatomical and functional swallowing assessment. The idea for the development of the SDQ emerged from knowledge about the importance of early diagnosis and treatment of swallowing disturbances arising from different etiologies. The SDQ is a useful tool for detecting symptoms of dysphagia and for providing important information on clinical abnormalities of swallowing^[23].

Swallowing Disturbance Questionnaire was not translated to Arabic language. So, the current study aimed at evaluating the validity of an Arabic version of swallowing disturbance questionnaire which initially targeted patients with Parkinson disease. This study was a trial to investigate its validity to be used as an easy applicable screening in different kinds of patients presented with dysphagia.

The subjects' age under this study ranged from 30 to 65 years with median age 53 years. Males constituted 62.5% and females constituted 37.5%. Dysphagia is a symptom of many etiologies that are present in different age groups. In the middle-aged population, gastroesophageal and immunologic causes of dysphagia manifest, whereas in the elderly population neurologic and oncologic causes are observed^[30]. The current study showed increased percentage of oropharyngeal dysphagia in males than females and this can be due to the underlying etiologies encountered in this study which are mostly related to stroke and neurological conditions that are more prevalent in males^[31]. This result is not in agreement with Cho *et al*^[32] who stated that dysphagia is more prevalent in women than men across all age groups.

Oropharyngeal dysphagia in the current study were presented in post stroke, vocal fold immobilization cases. In addition to other etiologies such as GERD, hemilaryngectomy, neck abscess and Behcet's disease. Oropharyngeal dysphagia is common in cases with neurological impairment mostly in Post-Stroke patients. This may be caused by sensory and/ or motor impairment^[33]. Oropharyngeal dysphagia can occur in Vocal Fold Immobilization due to improper protection of the airway leading to choking^[34]. Oropharyngeal dysphagia can occur in gastroesophageal reflux disease (GERD) due to severe reflux esophagitis associated with coughing, penetration or aspiration^[35]. Oropharyngeal dysphagia can occur in Behcet's Disease due to stenosis into oropharynx and/or pharynx^[36]. Oropharyngeal dysphagia can occur in Hemilaryngectomy due to changes in structural anatomical lead to exhibit a variety of disorders in both speech and swallowing. Oropharyngeal dysphagia can occur in Bell's Palsy due to peripheral facial nerve paralysis lead to difficulty in controlling a bolus in the mouth especially liquids, drools from the paretic side to the outside and later on the remaining liquid material can slide down into pharyngeal cavity and second swallowing occurs^[37].

The results of the current study revealed that 95.0% of patients had evidence of penetration while 2 GERD patients 5.0% had no evidence of penetration. This could be interpreted by the fact that most of our cases commonly had dysphagia due to neurological

diseases that might lead to penetration or aspiration as was supported by Clavé *et al*^[38] who explained that neurological dysphagia is associated with impaired airway protection and neuromuscular weakness. On the other hand, the 2 patients of GERD had mild degree of reflux. This result is in agreement with Yamagishi *et al*^[39] whose subjects with mild reflux esophagitis had no history of penetration or aspiration in comparison to cases with severe form of reflux esophagitis who were associated with more severe form of dysphagia manifested with penetration or aspiration.

In the current study, FEES was carried out to confirm the diagnosis of presence of dysphagia in patients under study. It was also used to investigate the validity of the translated SDQ. The results in the current study revealed that the most prevalent finding by FEES was residue; 80% followed by glottic closure problem; 67.55%, pharyngeal mobility problem; 35.0% then premature spillage; 17.5%. None of the cases under study had any evidence of velopharyngeal valve incompetence. FEES was investigated in comparison with VFSS in a study by Giraldo-Cadavid *et al*^[40] and the study pointed to that FEES has greater sensitivity to aspiration, penetration, and residue than VFSS and both tests had similar sensitivity to premature spillage.

Mean of the A-SDQ was 16.8. The mean of A-SDQ retest was 16.7 and the mean of A-DHI was 50.4 as shown in Table 1. The mean of A-SDQ of 16.8 and for the original study of Cohen & Manor^[23] was 14.53. The mild difference between our scores and their scores was due to the difference in the categories of patients and the difference in severity of dysphagia. The A-SDQ (retest) was applied after 2 weeks interval to have less chances of answers changes because of the individual dysphagia changes of symptoms^[41]. This is manifested in the current study as the mean of the A-SDQ retest; 16.7+ 4.1 was very near to the mean of the A-SDQ test; 16.8+ 4.1. The mean of scores of A-DHI for cases under the current study were higher than the results obtained by Farahat *et al*^[21] which was 32.489, that could be attributed to the different etiologies of dysphagia included in the two studies. Their study included cere-brovascular accidents, brain tumors, Alzheimer's, vocal fold paralysis, glomus jugulare, carotid body tumor, post-mandibular surgeries, laryngopharyngeal reflux disorder, gastric resection, esophageal surgeries, and hiatal hernia, and post-cardiothoracic surgeries.

The symptomatology profile of patients under study were found mostly to be pharyngeal in nature and to lesser extent oral as above (50.0%) of the cases under study in the range between (50.0% to 72.0%) of the cases never had difficulty chewing solid food, residue in the oral cavity, food or liquid come out of

nose when eating or drinking and chewed-up food dribble from their mouth. On the other hand, nearly half of patients under study (47.5%) “frequently” had too much saliva in mouth, drool or had difficulty swallowing saliva as shown in Table 2.

The very frequent symptom was coughing while swallowing liquids (52.5%) and change of voice in (50.0%) of cases. The higher percentage; 95% of cases under study had a history of respiratory infection in the past year. 77.5% of cases never experienced cough while swallowing solid food.

According to both A-SDQ and the A-DHI questionnaires, Post-Stroke patients had the highest score in swallowing difficulty for the subjects under the study. Similar results were proved by the use of A-SDQ as those obtained by the valid widely used A-DHI questionnaire as shown in table 3. This highlights the capability of the A-SDQ in detecting dysphagia in the subjects under the study. The mean of A-SDQ of patients under the study was 18.5 for the Post-Stroke group, 13.5 for the Vocal Fold Immobilization group and 15.5 for the Miscellaneous group, while Cohen & Manor^[23] showed that the mean of Neurologic disorder group was the highest in their patients (17.89), their Head and neck tumor group was (16.7), their Gastrointestinal disease group was (6.5) and their non-diagnosed group was (8.96). The total mean of the A-SDQ in the current study was 16.8 and for Cohen & Manor^[23] was 14.53. The minor difference between the current scores and the scores of Cohen & Manor^[23] was again due to the difference in the categories of patients between the two studies and the difference in severity of dysphagia.

The findings by FEES as an instrumental evaluation shown in table 4 goes with the highest score of dysphagia in Post-Stroke patients detected by A-SDQ. This highlights the role played by the questionnaires in detecting the cases with true swallowing disturbance and the importance to send them later for thorough instrumental evaluation not only to confirm the presence of dysphagia but determines the underlying breakdown in swallowing mechanism to help addressing the defects in the rehabilitation programs. This is in agreement with previous studies in the literature as Manor *et al*^[42] who proposed that the SDQ should be routinely administered during clinical visits with the hope that Parkinson’s disease patients with swallowing disturbances will be detected, evaluated, and treated at earlier stages to prevent aspiration pneumonia and for maintaining a good quality of life.

As detected by FEES, the main difficulty of Post-stroke patient was in the pharyngeal phase confirmed by the presence of pharyngeal mobility problem leading

to both residue especially in the pyriform fossae and penetration while for the vocal fold immobilization, the main breakdown was the insufficiency of airway protection due to glottic closure problem. This is in agreement with a study of Cabib *et al*^[43] who found that chronic Post-Stroke oropharyngeal dysphagia was associated with stroke severity. In their study, they found that impaired conduction and cortical integration of pharyngeal sensory inputs at the stroke site were key features of Post-Stroke oropharyngeal dysphagia.

Comparison between the group of patients under study who had penetration and patients without penetration by PAS regarding the scores of SDQ and FEES findings, revealed statistically significant difference between both groups only regarding the presence of residue as shown in Table 5. These findings can be attributed to the fact that oropharyngeal dysphagia can result in pharyngeal residue, which is a risk factor for penetration-aspiration. Pharyngeal residue is secretions before swallowing and bolus residue after swallowing in pharynx which cannot be completely cleansed by swallowing. This is in agreement with a study by Paramita *et al*^[44] who found a significant correlation between pharyngeal residue in vallecula and pyriform sinus with penetration-aspiration. This is not in agreement with Han *et al*^[45] who found no significant difference in the pharyngeal stage between their two groups; stroke survivors with penetration or aspiration and stroke survivors without penetration or aspiration.

The non-significant difference of A-SDQ score between the penetrating and non-penetrating groups could be explained by that although residue and penetration are indicators of dysphagia, but they may be bypassed and not significantly clinically felt by some patients as far as there are no other warning symptoms of choking or gurgly voice. In the current study, patients under study earned scores between 2 and 5 in the penetration/aspiration scale. Most of the patients were between 3 and 5; A score of 3 was represented by (20.0%), a score of 4 was represented by (48.0%) and a score of 5 was represented by (12.0%) of subjects under study. That means that secretions got contact with the vocal folds, but the patients managed to clear them by cough reflex with no evidence of aspiration.

This is not in agreement with Meyer *et al*^[46] whose study about the influence of residue on quality of life independently of penetration & aspiration in head and neck cancer patients emphasized that residue, an important component of swallowing function, had a significant impact on the patient’s perception of quality of life as their willingness to eat in public, and ability to participate in social gathering. The difference between the result of the current study

and with Meyer *et al.*'s^[46] study is that their patients had both oral and pharyngeal residues. Their patients were mainly bothered by food sticking in their mouth and factors related to oral motor weaknesses and oral phase difficulties. The patients in the current study had mainly pharyngeal phase problem with less oral symptoms as mentioned before.

Comparison between the patients under study with positive FEES findings and those without FEES findings regarding the scores of A-SDQ findings revealed only significant difference between those having pharyngeal mobility problem and those without in the scores of A-SDQ with increase of the score in those having pharyngeal mobility problem as shown in Table 6. Further comparison was done between those with pharyngeal mobility problem and those without pharyngeal mobility problem regarding the scores of all the questions of the questionnaire and revealed higher scores with significant difference in almost all the questions as shown in table 7. The results previously mentioned in the current study about the characteristics of the patients and the percentages of their responses clarified that their high percentages were for pharyngeal symptoms. This finding is in agreement with Cohen & Manor^[23] who found a correlation between the laryngopharyngeal phase questions of SDQ and FEES indicating that the questionnaire had good sensitivity to detect pharyngeal phase problems in dysphagic patients.

By measuring the internal consistency, the Cronbach's alpha coefficient of the A-SDQ including 15 items was (0.177) while it was (0.768) after deleting 3 questions which showed low reliability; (Do you cough while swallowing liquids? Do you experience a change in your voice, such as hoarseness or reduced intensity immediately after eating or drinking? Do you experience difficulty in breathing during meals?). This raised an interesting point to investigate and may point to that the questionnaire is more reliable with the pharyngeal rather than the laryngeal symptoms.

The Arabic version Swallowing Disturbance Questionnaire (A-SDQ) presented good internal consistency. The Cronbach's alpha of the current study was (0.768) which was slightly lower than the original English version of the questionnaire which was (0.89). This may be attributed to the fact that the original English version by Manor *et al.*^[43] was performed on only one type of patients who were diagnosed with Parkinson's disease showing dysphagia while the current study had different and multiple etiologies of dysphagia. When Cohen & Manor^[23] performed their questionnaire on various etiologies of the dysphagia, the Cronbach's alpha was (0.8). They mentioned that values of Cronbach's alpha more than 0.7 were

regarded as an acceptable reliability coefficient. However, the measured Cronbach's alpha coefficient for the SDQ varied within literature as it was (0.63) in the study of Ayres *et al.*^[47] and was (0.86) in the study of Rajaei *et al.*^[25]. Both studies were carried out on Parkinson cases.

Correlation coefficient was run to determine the test-retest reliability using the A-SDQ (after removing the three less reliable questions). It revealed perfect to excellent test-retest reliability as shown in Table 8. This finding could point to that the trait being measured, oropharyngeal dysphagia, is stable over time. Remaining constant, this will help the re-administration of the instrument to result in scores like the first score. It is important and highly recommended to conduct retest shortly after first test to control for influencing variables as stated in a study by Munro^[48]. The previous findings supported that the A-SDQ was a reliable tool in detecting oropharyngeal dysphagia in subjects under study.

The P-value and correlation coefficient between age and scores of A-SDQ (full questionnaire and after removing of three questions) & A-DHI showed no significant correlation between age and the total scores of questionnaires. This is not in agreement with a study by Holland *et al.*^[49] who found a significant positive correlation between total swallow score (Sydney oropharyngeal dysphagia questionnaire) and age, and this was maintained following linear regression analysis, suggesting that increasing age was associated with increased severity and prevalence of dysphagia. The difference between their study and the current study was due to the difference of the subjects under study. They performed their study on a healthy elderly population and attributed this to that a proportion of the age-related increase in dysphagia is likely to result from the increased incidence of comorbidity, such as stroke, which is known to occur with aging. However, given the healthy nature of the study population, they pointed to that the biological determinants of age-related decline in swallowing function remain uncertain and require further exploration.

Concurrent validity is a type of criterion validity and it refers to a comparison between the measure in question and an outcome assessed at the same time^[50,51]. Concurrent validity measures how a new test compares against a validated test, called the criterion or "gold standard." The tests should measure the same or similar constructs, and allow to validate new methods against existing and accepted ones. If the results of the new test correlate with the existing validated measure, concurrent validity can be established^[48].

Concurrent validity between A-SDQ and A-DHI was assessed using Spearman's rank correlation coefficient. The concurrent validity was carried out by measuring the correlation between the scores of A-SDQ and A-DHI and it was found to be excellent (0.842) while the concurrent validity and correlation between the A-SDQ (after removing 3Q) & the total A-DHI was good (0.581) as shown in Table 8. This indicates that Arabic version of SDQ can be used as a valid questionnaire to detect dysphagia among cases under study. Other Arabic translated questionnaires were validated using different methods for example; In their study, Farahat *et al*^[21] stated that the final version of A-DHI was validated using content validity. Two independent, experienced, and bilingual phoniaticians judged all items of the final Arabic version for language and cultural appropriateness and found them to be completely relevant to the purpose for which the A-DHI was meant. While for validation of Arabic version of swallowing quality of life questionnaire (A-SWAL-QOL) with those in the DHI, in the study by Abdou *et al*^[22], they found a strong correlation (0.5-1) between the eating desire, eating duration, and food selection in A-SWAL-QOL and the functional domain in Dysphagia Handicap Index (DHI). This was found as well between the mental health and social functioning in ASWAL-QOL and the emotional domain in DHI. However, there was a moderate correlation (0.30 & 0.49) between the symptoms scale in ASWAL-QOL and the physical domain in DHI.

Twelve questions were included in the final Arabic version of SDQ after removing the less reliable three questions. A-SDQ showed at a cut-off score of (10/35.5). It showed a sensitivity of (55.26%) in detecting penetration among the subjects under the current study and it showed a specificity of 50%. in detecting subjects without penetration in cases under the study as shown in Table 9. This differs from the cut off level score in the study by Cohen & Manor^[23] as the "optimal" score (cut off level score) for SDQ (oral and laryngopharyngeal) of swallowing was 12.5, with a sensitivity of (71.88%) and a specificity of (78.38%). This is again due to the difference of the cause of dysphagia in subjects under each study.

CONCLUSION

The current study investigated the reliability and validity of the Arabic translated Swallowing Disturbance Questionnaire to detect oropharyngeal dysphagia among 40 patients with different etiologies including Post-Stroke, Vocal Fold Immobilization and a Miscellaneous groups of various causes of dysphagia. The questionnaire drew the oropharyngeal dysphagia profile of the patients with more pharyngeal rather than oral symptoms. Both A-DHI questionnaire and instrumental evaluation by FEES in

addition to Penetration/Aspiration scale were carried out to confirm dysphagia in patients under study on one hand and to determine validity, cut off level scores, sensitivity and specificity of the translated questionnaire. Three questions related to laryngeal symptoms were excluded from the questionnaire as they showed low reliability. A-SDQ Cronbach's alpha coefficient after removal of the three questions showed good reliability and excellent test retest reliability. It showed a good concurrent validity when it was compared against A-DHI. The A-SDQ and the A-DHI had the same findings in the scores of dysphagia within the study groups with higher scores in Post-Stroke cases. A-SDQ had a cut off level of 10 with (55.26%) sensitivity and (50.0%) specificity. The current study proposes A-SDQ to be administered to high-risk patients for swallowing problems during their visits to phoniatic, otolaryngologic, neurologic, and gastroenterologic clinics so that swallowing disturbances will be detected, then referred as suspected group for thorough instrumental evaluation to be treated without delay.

CONFLICT OF INTEREST

There are no conflicts of interest.

REFERENCES

1. Hipólito V, Junior M, Pernambuco L, Lima K C & Ferreira M AF. Screening for oropharyngeal dysphagia in older adults: A systematic review of self-reported questionnaires. *Gerodontology*.2018; 35:162–169.
2. Britton D, Karam C & Schindler JS (2018). Swallowing and secretion management in neuromuscular disease. *Clin Chest Med*. 2018; 39:449-457.
3. Verin E, Clavé P, Bonsignore MR, *et al*. Oropharyngeal dysphagia: when swallowing disorders meet respiratory diseases. *Eur Respir J*. 2017; 49:1602530.
4. Wada A, Kawakami M, Liu M, *et al*. Development of a new scale for dysphagia in patients with progressive neuromuscular diseases: the neuromuscular disease swallowing status scale (NdSSS). *J Neurol*. 2015; 262:2225-2231.
5. Salera S, Menni F, Moggio M, Guez S, Sciacco M, Esposito S. Nutritional challenges in Duchenne muscular dystrophy. *Nutrients*.2017; 9:594.
6. Lindgren S, Janzon LS. Prevalence of swallowing complaints and clinical findings among 50- to 79-year-old men and women in an urban population. *Dysphagia*.1991; 6:187–192.

7. Cohen JT, Eini M, Belkovitz S, Manor Y, Fliss DM. Fiberoptic endoscopic evaluation of swallowing—the Tel Aviv Voice and Swallowing Disorders Clinic. *Harefuah*.2006;145: 572–576.
8. Espitalier F, Fanous A, Aviv J. International consensus (ICON) on assessment of oropharyngeal dysphagia. *Eur Ann Otorhinolaryngol Head Neck Dis*. 2018; 135(Suppl):S17-S21.
9. Smithard D G, O’Neill PA, Park C. Can bedside assessment reliably exclude aspiration following acute stroke? *Age Ageing* . 1998; 27:99–106.
10. Langmore SE, Schatz K, Olson N. Fiberoptic endoscopic examination of swallowing safely: a new procedure. *Dysphagia*. 1998; 2:216–9.
11. Evatt ML, Chaudhuri KR, Chou KL, Cubo E, Hinson V, Kompoliti K, Yang C, Poewe W, Rascol O, Sampaio C, Stebbins GT, Goetz CG. Dysautonomia rating scales in Parkinson's disease: sialorrhea, dysphagia, and constipation - Critique and recommendations by movement disorders task force on rating scales for Parkinson's disease. *Movement Disorders*. 2009; 24(5), 635-646.
12. Threats T T. Use of the ICF in dysphagia management. In *Seminars in speech and language*. THEIME MEDICAL PUBLISHERS INC. 2007; 28(4): 323.
13. Belafsky PC, Mouadeb DA, Rees CJ. Validity and reliability of the Eating Assessment Tool (EAT-10). *Ann Otol Rhinol Laryngol*.2008;117:919–924.
14. Wallace KL, Middleton s, Cook I J. Development and validation of a self- report symptom inventory to assess the severity of oral-pharyngeal dysphagia. *Gastroenterology*. 2002; 118(4): 678-687.
15. Cohen JT, Manor Y. Swallowing disturbance questionnaire for detecting dysphagia. *The Laryngoscope*.2011;121(7): 1383-1387.
16. Leslie P, Drinnan M J, Finn P, Ford GA, Wilson JA. Reliability and validity of cervical auscultation: a controlled comparison using video fluoroscopy. *Dysphagia*. 2004;19:231–240.
17. Lim SH, Lieu PK, Phua SY, *et al*. Accuracy of bedside clinical methods compared with fiber optic endoscopic examination of swallowing (FEES) in determining the risk of aspiration in acute stroke patients. *Dysphagia*.2001; 16:1–6.
18. Crestani S, Moerman M, Woisard V. The “Deglutition Handicap Index” a self-administrated dysphagia-specific quality of life questionnaire: Sensibility to change. *REV LARYNGOL OTOL RHINOL*.2011; 132:1:3-7.
19. McHorney CA, Bricker D E, Kramer AE, Rosenbek JC, Robbins J, Chignell KA. *et al*.The SWAL-QOL outcomes tool for oropharyngeal dysphagia in adults: I. Conceptual foundation and item development. *Dysphagia*; 2000, 15:115–121.
20. Farahat M, Mesallam TA. Validation and Cultural Adaptation of the Arabic Version of the Eating Assessment Tool (EAT-10). *Folia Phoniatric Logop*. 2015; 67(5):231-7.doi:10.1159/000442199.
21. Farahat M, Malk KH, Mesallam, TA, Bukhari, M, Alharethy S. Development of the Arabic Version of Dysphagia Handicap Index (DHI). *Dysphagia*. 2014; 29:459–467 DOI 10.1007/s00455-014-9528-7
22. Abdou RM, Elsayed, HE, Adel SM. Validation of the Arabic version of swallowing quality of life questionnaire. *Egypt J Otolaryngol*. 2021; 37: 6. <https://doi.org/10.1186/s43163-021-00072-2>
23. Cohen J, Manor Y. Swallowing Disturbance Questionnaire for Detecting Dysphagia. *Laryngoscope*. 2011; 121(7):1383-7.
24. Toshiyuki Y, Kensuke I, Harumi U, Masako M, Miho M. Validation of the Japanese translation of the Swallowing Disturbance Questionnaire in Parkinson’s disease patients. *Quality of life research: an international journal of quality of life aspects of treatment, care and rehabilitation*. 2011; 21: 1299-303. 10.1007/s11136-011-0041-2.
25. Rajaei A, Azargoon SA, Nilforoush MH, Bafrooei EB, Ashtari F, Chitsaz A. Validation of the Persian Translation of the Swallowing Disturbance Questionnaire in Parkinson’s Disease Patients. *Hindawi Publishing Corporation Parkinson’s Disease*, Article ID. 2014; 159476-159482. <http://dx.doi.org/10.1155/2014/159476>
26. Demir N, Serel Arslan S, İnal Ö, Ünlüer NÖ, Karaduman AA. Reliability and Validity of the Turkish Version of the Swallow Quality Of Life Questionnaire, *Turk J Physiother Rehabil*.2016; 27(1):19-24.
27. Rosenbek J C, Robbins J A, Roecker E B, Coyle J L, Wood J L. A penetration-aspiration scale. *Dysphagia*. 1996; 11 (2): 93-98.

28. Keage M, Delatycki M, Corben L, Vogel A. A systematic review of self-reported swallowing assessments in progressive neurological disorders. *Dysphagia* . 2015; 30(1), 27-46.
29. Silbergleit A K, Schultz L, Jacobson B H, Beardsley T, Johnson A F. The dysphagia handicap index: development and validation. *Dysphagia*. 2012; 27 (1), 46-52.
30. Roden D F, Altman, K W. (2013). Causes of dysphagia among different age groups: a systematic review of the literature. *Otolaryngologic Clinics of North America*. 2013; 46(6), 965-987.
31. Zuleika P, Ghanie A, Purwasari I. Fiberoptic Endoscopic Examination of Swallowing (FEES) Evaluation in Post Stroke Patients. *Bioscientia Medicina: Journal of Biomedicine and Translational Research*. 2020; 4 (4), 8-14.
32. Cho S Y, Choung RS, Saito YA, Schleck CD, Zinsmeister A R, Locke III G R, Talley N J. Prevalence and risk factors for dysphagia: a USA community study. *Neurogastroenterology & Motility*. 2015; 27 (2), 212-219.
33. Cabib C, Nascimento W, Rofes L, Arreola V, Tomsen N, Mundet L, ... , Ortega O. Neurophysiological and Biomechanical Evaluation of the Mechanisms Which Impair Safety of Swallow in Chronic Post-stroke Patients. *Translational stroke research*. 2020; 11 (1), 16-28.
34. Kim C M, Dewan K. Vocal fold paralysis and dysphagia. *Current Otorhinolaryngology Reports*. 2021; 9 (2): 101-106.
35. Yamagishi H, Koike T, Ohara S, Abe Y, Iijima K, Imatani A, ... Shimosegawa T. Clinical characteristics of gastroesophageal reflux disease in Japan. *Hepatogastroenterology*. 2009; 56 (93):1032-1034.
36. Efthymiou M, Raftopoulos S, Kortan P. Pharyngeal webs in a patient with dysphagia and Behcet's disease. *Endoscopy*. 2012; 44 (S 02): E374-E374.
37. Giordano C, Gonella M L. The diagnosis and treatment of dysphagia. *Acta Otorhinolaryngologica Italica: Organo Ufficiale Della Societa Italiana di Otorinolaringologia e Chirurgia Cervico-facciale*. 1992; 12 (3): 289-293.
38. Secil Y, Aydogdu I, Ertekin C. Peripheral facial palsy and dysfunction of the oropharynx. *Journal of Neurology, Neurosurgery & Psychiatry*. 2002; 72(3): 391-393.
39. Clavé P, De Kraa M, Arreola V, Girvent M, Farre R, Palomera E, Serra-Prat M. The effect of bolus viscosity on swallowing function in neurogenic dysphagia. *Alimentary pharmacology & therapeutics*. 2006; 24 (9): 1385-1394.
40. Yamagishi H, Koike T, Ohara S, Abe Y, Iijima K, Imatani A, ... Shimosegawa T. Clinical characteristics of gastroesophageal reflux disease in Japan. *Hepatogastroenterology*. 2009; 56 (93): 1032-1034.
41. Giraldo-Cadavid L F, Leal-Leaño L R, Leon-Basantes G A., Bastidas A R, Garcia R, Ovalle S, Abondano-Garavito JE. Accuracy of endoscopic and videofluoroscopic evaluations of swallowing for oropharyngeal dysphagia. *The Laryngoscope*, 2017; 127(9): 2002-2010.
42. McHorney C A, Robbins J, Lomax K, Rosenbek JC, Chignell K, Kramer A E, Earl Bricker D. The SWAL-QOL and SWAL-CARE outcomes tool for oropharyngeal dysphagia in adults: III. Documentation of reliability and validity. *Dysphagia*. 2002; 17(2): 97-114.
43. Manor Y, Giladi N, Cohen A, Fliss D M, Cohen J T. Validation of a swallowing disturbance questionnaire for detecting dysphagia in patients with Parkinson's disease. *Movement Disorders*. 2007; 22(13):1917-1921.
44. Cabib C, Ortega O, Vilardell N, Mundet L, Clavé P, Rofes L. Chronic post-stroke oropharyngeal dysphagia is associated with impaired cortical activation to pharyngeal sensory inputs. *European Journal of Neurology*. 2017; 24 (11): 1355-1362.
45. Paramita D V, Juniati S H, Romdhoni A C. Correlation of Pharyngeal Residue with Penetration-Aspiration in Post-Radiotherapy Nasopharyngeal Carcinoma Patients with Oropharyngeal Dysphagia. *Medico-Legal Update*. 2021; 21(2):460-467.
46. Han H, Shin G, Jun A, Park T, Ko D, Choi E, Kim Y. The relation between the presence of aspiration or penetration and the clinical indicators of dysphagia in poststroke survivors. *Annals of Rehabilitation Medicine*. 2016; 40 (1), 88-94.

47. Meyer T K, Pisegna J M, Krisciuna G P, Pauloski B R, Langmore S E. Residue influences quality of life independently of penetration and aspiration in head and neck cancer survivors. *Laryngoscope* . 2017; 127(7):1615-1621.
48. Ayres A, Ghisi M, Rieder C R D M, Manor Y, Olchik M R. Translation and cultural adaptation of swallowing disturbance questionnaire for brazilian portuguese. *Revista CEFAC*. 2016; 18: 828-834.
49. Munro B H. *Statistical methods for health care research (Vol. 1)*. lippincott williams & wilkins.2005.
50. Holland G, Jayasekeran V, Pendleton N, Horan M, Jones M, Hamdy, S. Prevalence and symptom profiling of oropharyngeal dysphagia in a community dwelling of an elderly population: a self-reporting questionnaire survey. *Diseases of the Esophagus*. 2011; 24(7):476-480.
51. Frost M H, Reeve B B, Liepa A M, Stauffer J W, Hays R D, Mayo/FDA Patient Reported Outcomes Consensus Meeting Group. What is sufficient evidence for the reliability and validity of patient-reported outcome measures?. *Value in Health*. 2007; 10:S94-S105.