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Presbyphagia: the importance of an early diagnosis in the aging population

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Objectives. The aim of our study was to use the DRAS (Dysphagia Risk Assessment Scale) questionnaire in order to identify the percentage of the population over the age of 65 with unrecognized symptoms of dysphagia.
Materials and methods. The DRAS questionnaire was administered to a group of 100 subjects over or equal to 65 years old. The same questionnaire was administered to a group of 50 healthy control individuals. All patients underwent fiberoptic endoscopic evaluation of swallowing (FEES) to confirm or exclude dysphagia.
Results. Considering the cut off of 4, 33 subjects with positive a DRAS score (33%) were identified among the group of 100 subjects over the age of 65. In all of them dysphagia was confirmed by FEES. Based on the answers given by the 33 subjects with a positive DRAS score, we also identified which swallowing phase was more involved in different age groups.
Conclusions. The administration of a questionnaire to the apparently healthy population over 65 years can be used as a screening method to make an early diagnosis of presbyphagia, in order to follow the patient over time and to avoid the complicances of an unrecognized dysphagia.

Key words: presbyphagia, dysphagia, screening, questionnaire, DRAS

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INTRODUCTION

Oropharyngeal dysphagia (OD) is a growing health concern in our aging population [1]. According to "The oropharyngeal dysphagia as a geriatric syndrome", a document drafted by the Dysphagia Working Group, OD is in fact defined as a multifactorial clinical condition mainly observed at older age, associated with multiple comorbidities and bad prognosis [2].
Ageing is associated with multifactorial changes in swallowing physiology for which the term presbyphagia has been coined. A cause of malnutrition, dehydration, aspiration pneumonia, and even asphyxiation, dysphagia affects 7 to 13% of those aged 65 years or older; these percentages are destined to grow considerably since the older adult population itself is destined to undergo a significant increase in the next twenty years [3,4].
During ageing the swallowing function may be altered by changes to head and neck anatomy, the age-related reduction of tissue elasticity, decrease of oral moisture and sensory impairments, as well as oropharyngeal disorders or several other stressors (including diseases and medications) [5,6]. In old age muscles associated with swallowing are affected by sarcopenia which

causes atrophy and weakening of muscles thus affecting normal swallowing function. Difficulty in swallowing must be diagnosed early to avoid serious complications [7,8].
Often both doctors and patients can interpret presbyphagia as a normal consequence of ageing and it can be underestimated [9]. Early diagnosis of presbyphagia is therefore essential, especially to ensure a positive outcome for older patients: in support of that, the study by Tagliaferri et al confirms the existence of a link between the risk of dysphagia and physical and nutritional performance, which was observed in a group of non-hospitalized individuals [10].
In the last few years questionnaires have been increasingly used to collect data to diagnose dysphagia, before deciding on the method of feeding (oral versus alternative), as well as to clarify the need for objective and invasive evaluation (Fiberoptic Endoscopic Evaluation of Swallowing or videofluoroscopy) [11-13].
An important study was conducted by Fukada et al. for the development of a questionnaire, the Dysphagia Risk Assessment Scale (DRAS), aimed at assessing the risk of dysphagia in the elderly [14]. The questionnaire was initially developed with 24 items, adopting a 4-degree response method, with special attention to the early diagnosis of presbyphagia or dysphagia related to other pathologies. To select appropriate items, interviews were conducted with 81 institutionalised elderly patients and 658 non-institutionalized elderly subjects, while carrying out the questionnaire independently, to confirm their validity and reliability. A 3-ounce water swallow test was then performed, as a gold standard to assess the effective presence of alterations in the swallowing mechanism. The DRAS questionnaire showed 59.1% sensitivity and 75.9% specificity for the facility group of patients, and 57.1% sensitivity and 69.6% specificity for the at-home group of patients.
The aim of our study was to identify, through the DRAS questionnaire, which percentage of the population over the age of 65 had unrecognised symptoms of dysphagia. We also identified, based on the answers given to the DRAS questionnaire by the subjects with positive scores, which swallowing phase was more compromised, in order to identify the swallowing phase most involved by age group.

METHODS

Through a bibliographical research on several databases (the online databases used for the research were Virtual Health Library LILACS, IBECS, MEDLINE, SciELO, Cochrane Library and PubMed) the possible questionnaires to be used were properly selected. For the selection of questionnaires, the following descriptors were used: “questionnaires”, “deglutition disorders”, “dysphagia”, and “swallowing disorders”. Specific questionnaires for dysphagia developed for diagnosis of neurodegenerative or cerebrovascular diseases and related entirely to the investigation of only one phase of swallowing were excluded. A fundamental research parameter in the selection of the questionnaire to be used in our study was the presence of questions that analysed the patient’s symptoms in relation to the various food consistencies.
We selected the Dysphagia Risk Assessment Scale questionnaire (DRAS), which showed acceptable reliability and validity, and was also applicable to older adults as a screening tool for safe swallowing.
With the analysis of the results of the questionnaire survey Fukada et al. subdivided the questionnaire questions as follows: 5 questions (A1 to A5) related to aspiration; 4 questions (PI and P5 to P7) related to pharyngeal dysphagia, particularly indicating poor pharyngeal clearance; 3 questions (O1, O2, and O4) related to oral preparatory and oral dysphagia associated with difficulty in posterior propulsion of bolus by the tongue, and 2 questions (P3 and P4) related to pharyngeal dysphagia associated with a delay in triggering the pharyngeal swallow; and 3 questions
(E1 to E3) related to esophageal dysphagia. Based on the results, 17 items were selected and a validity cut-off of 4 was set.
The Dysphagia Risk Assessment Scale, translated into Italian by a professional translator (Tab. I), was administered to a group of 100 subjects (50 males and 50 females, mean age of 72 years, range 65-91) recruited among the patients of the ENT Department of the Polyclinic Hospital, University of Bari “Aldo Moro”.
The inclusion criteria were the following: over or equal to 65 years of age, an adequate degree of collaboration, clear understanding of the questions and the capacity to answer them in a coherent and cohesive way.
The exclusion criteria were the presence of pathologies associated with dysphagia (neurological diseases, neoplastic diseases, muscular diseases, autoimmune and rheumatic diseases).
The same protocol was then applied to a group of 50 healthy control individuals, not affected by any pathology related to swallowing (25 males and 25 females, mean age of 39.6 years, range 22-63), recruited among hospital workers of the ENT Department of the Polyclinic Hospital in Bari.
All patients underwent fiberoptic endoscopic evaluation of swallowing (FEES) to confirm or exclude dysphagia.
The data was collected between April 2020 and June 2020.
All patients were approached and informed about the study objectives and significance. All the participants

Table I. Dysphagia Risk Assessment scale (Italian version and English translation).

Questions	Quasi mai / *Almost never* = 0 Raramente / *Rarely* = 1 Qualche volta / *Sometimes* = 2 Sempre / *Always* = 3			
1. Soffoca o tossisce durante la deglutizione?	0	1	2	3
Choking or coughing during swallowing.				
2. Soffoca o tossisce dopo la deglutizione?	0	1	2	3
Choking or coughing after swallowing.				
3. Soffoca o tossisce prima della deglutizione?	0	1	2	3
Choking or coughing before swallowing.				
4. Soffoca o tossisce mentre ingoia il riso?	0	1	2	3
Choking or coughing while swallowing rice.				
5. Soffoca o tossisce mentre ingoia i liquidi?	0	1	2	3
Choking or coughing while swallowing liquids.				
6. Il cibo rimane in gola dopo la deglutizione?	0	1	2	3
Food remains in your throat.				
7. Il cibo si blocca in gola?	0	1	2	3
Food becomes stuck in your throat.				
8. Presenta voce rauca durante o dopo i pasti?	0	1	2	3
Becoming hoarse while or after eating.				
9. Il cibo o i liquidi le vanno nel naso?	0	1	2	3
Food or liquid goes into your nasal cavity.				
10. Il cibo rimane sulla lingua dopo la deglutizione?	0	1	2	3
Food remains on your tongue after swallowing.				
11. Ha difficoltà a ingoiare il riso?	0	1	2	3
Difficulty in swallowing rice.				
12. Ha difficoltà a ingoiare i liquidi?	0	1	2	3
Difficulty in swallowing liquids.				
13. Il cibo fuoriesce dalla bocca mentre mangia?	0	1	2	3
Dropping food from your mouth while eating.				
14. Ha la sensazione di bocca secca?	0	1	2	3
Feeling oral dryness.				
15. Ha bruciore di stomaco?	0	1	2	3
Having heartburn.				
16. Il cibo o i liquidi acidi risalgono in gola dallo stomaco?	0	1	2	3
Food and sour liquid comes back up into your throat from the stomach.				
17. Il cibo si blocca in esofago?	0	1	2	3
Food becomes stuck in your esophagus.				

who agreed to participate in the study signed an informed consent form, previously approved by the local hospital Ethics Committee.

Statistical analysis

Statistical data was expressed as percentages and proportions. DRAS scores are recorded as average and standard deviation (SD) for each age group.

Results were then submitted to statistical analysis by comparing mean values of the DRAS scores and we used Student's test with $p = 0.05$ significance level after evaluating the t value for each Age group.

RESULTS

Considering the cut off of 4, 33 subjects with a positive DRAS score (33%) were identified among the group of 100 subjects over the age of 65.

Dysphagia in patients with a positive DRAS score was confirmed by FEES.

Among the 33 subjects with a positive score, we identified 15 male (45.45%) and 18 female subjects (54.54%). In the age group 65-69, 9 subjects (2 females and 7 males) with a positive DRAS score (DRAS Mean score = 8.4) were found. In the age group 70-79, 14 subjects

(9 females and 5 males) with a positive DRAS score (DRAS Mean score = 7.6) were found.
In the age group 80-89, 9 subjects (6 females and 3 males) with a positive DRAS score (DRAS Mean score = 6.2) were found.
In the age group 90+, 1 subject (1 female) with a positive DRAS score was found.
67 patients with a negative DRAS score underwent a FEES examination which was negative in 61 patients (92,4%) of cases. (Tab. II)
With a significance level at 0.05, values obtained by means of Student's t test (calculated) in the DRAS score between the 65-69 age group (SD) = 4.61) and the 70-79 age group (SD = 4.07) are not statistically significant (p = 0.6384).
Values obtained by means of Student's t test (calculated) in the DRAS score between the 65-69 age group (SD = 4.61) and the 80-89 age group (SD = 2.33) are not statistically significant (p = 0.2155).
Values obtained by means of Student's t test (calculated) in the DRAS score between the 70-79 age group (SD = 4.07) and the 80-89 age group (SD = 2.33) are not statistically significant (p = 0.3787).
67 subjects (32 females and 35 males) presented with a negative DRAS score. In 6 subjects (4 females and 2 males) with a negative DRAS score, signs of subclinical dysphagia were found at FEES. No cases of laryngeal penetration or tracheal aspiration were observed.
Ultimately, we divided the studied population into age groups (Tab. II).
The results of the DRAS questionnaire were then submitted to statistical analysis by comparing mean values of the DRAS score of each age group. We used Student's test with p = 0.05 significance level after evaluating the t value in each age group (Tab. III).
Based on the subdivision of the questionnaire questions presented by Fukada et al. according to the swallowing phase involved, we identified the following data in the 33 subjects with a positive DRAS score:

- 75.75% of the studied population answered positively to the questions related to oral dysphagia symptoms;
- 75.75% of the studied population answered positively to the questions related to esophageal dysphagia symptoms;
- 66.7% of the studied population answered positively to the questions related to aspiration symptoms;
- 54.54% of the studied population answered positively to the questions related to pharyngeal dysphagia symptoms.

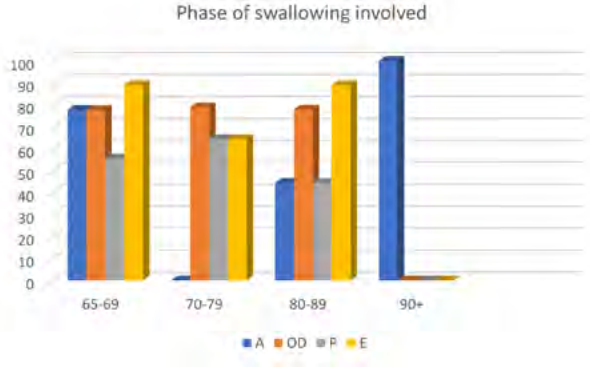
We also divided the answers given to the DRAS questionnaire by the 33 subjects with a positive DRAS score according to the phase of swallowing involved for the different age groups (Fig. 1).
In the 65-69 age group: 77.7% of the studied population answered positively to the questions related to aspiration symptoms and oral dysphagia symptoms, 88.9% answered positively to the questions related to esophageal dysphagia symptoms; 55.5% answered positively to the questions related to pharyngeal dysphagia symptoms.
In the 70-79 age group, 78.8% of the studied population answered positively to the questions related to oral dysphagia symptoms, and 64.3% of the studied population answered positively to the questions related to esophageal and pharyngeal dysphagia symptoms and to aspiration symptoms.
For the 80-89 age group, 77.8% of the studied population answered positively to the questions related to oral dysphagia symptoms, 88.9% answered positively to the questions related to the esophageal dysphagia symptoms, 44.4% answered positively to the questions

Table III. SD: Standard deviation. With significance level at 0,05, values obtained by means of Student t test (calculated) in the DRAS score for each age group are not statistically significant.

Age group	SD	T-test
65-69	4.61	p = 0.6384
70-79	4.07	
65-69	4.61	p = 0.2155
80-89	2.33	
70-79	4.07	p = 0.3787
80-89	2.33	

Table II. Subdivision of subjects by age group, number of subjects with a DRAS positive score, sex (F: females; M: males), DRAS mean score.

Age group	Number of subjects with a DRAS positive score	Sex		DRAS Mean score
		F	M	
65-69	9	2	7	8.4
70-79	14	9	5	7.6
80-89	9	6	3	6.2
90+	1	1		8



A: aspiration symptoms; OD: oral dysphagia symptoms; P: pharyngeal dysphagia symptoms; E: esophageal dysphagia symptoms

Figure 1. Phase of swallowing involved for the different age groups.

related to pharyngeal dysphagia symptoms and to aspiration symptoms.

For the 90+ age group, 100% of the studied population answered positively to the questions related to aspiration symptoms.

The DRAS questionnaire was also administered to a control group of 50 healthy individuals under the age of 65: all the questionnaires resulted negative for dysphagia symptoms (Percentage of positive subjects = 0%).

In the control group dysphagia was also excluded by FEES.

DISCUSSION

Our administration of the DRAS questionnaire to a healthy population of subjects over the age of 65 showed that almost one third of the elderly population had symptoms attributable to presbyphagia.

The complications associated with dysphagia mainly correspond to malnutrition, dehydration and aspiration pneumonia, and therefore having adequate identification is critical. In this regard, the study conducted by Tagliaferri et al. [10] estimated the prevalence of oropharyngeal dysphagia among the non-institutionalized elderly population and the consequent relationships with malnutrition and physical changes. In a sample of 773 elderly people, the Eating Assessment Tool-10 and the Mini Nutritional Assessment Short Form were used to identify the risk of dysphagia and malnutrition, while the Short Physical Performance Battery and the evaluation of the grip force were independently associated with a higher risk of dysphagia. A study conducted by Madhavan et al. [15] analysed data from several databases (PubMed, PsychInfo, Google Scholar, EBSCO, PROQUEST, Web of Science and WorldCat) which highlighted the prevalence and risk factors of dysphagia in the elderly population and concluded that the incidence is decidedly high and that dysphagia is actually a problem with a strong impact on public health.

Another important study was conducted by Carrion et al. [16] which evaluated the nutritional status of elderly patients with OD in clinical situations of chronicity or acute illness. They examined 95 elderly patients who had dysphagia related to or because of the physiological deterioration of swallowing functions due to age or neurodegenerative diseases, as well as 23 elderly patients with OD with community-acquired acute pneumonia, using videofluoroscopy. To those was added the evaluation of 15 patients without swallowing problems. It was observed that the risk of malnutrition and sarcopenia among elderly dysphagic patients both in clinical conditions of acute and chronic disease is extremely high.

Dysphagia can be traced back to various causes and it has previously been pointed out that, in addition to the long list of pathologies of heterogeneous origin that are related to dysphagia, it should also be taken into consideration the possibility that it arises as the physiological result of a series of ageing mechanisms responsible for primary presbyphagia [17].

Our results showed that the age group most affected by presbyphagia is between 70 and 79 years old: we can hypothesize that in the healthy population of this age, the true beginning of the structural and functional decay of the structures responsible for swallowing, which manifests itself, according to the answers given by the subjects to the questionnaire, in an impairment of the oropharyngeal phase of swallowing.

Among the studies conducted to evaluate the various alterations that physiologically incur with advancing age impairing the swallowing function, we can consider the study by Shaw et al. [18], who observed the influence of age on the oropharyngeal phase of swallowing, evaluating 14 non-dysphagic individuals with average age of 76 years and 11 non-dysphagic individuals with an average age of 21 years using video-fluoroscopy and esophageal manometry. It was observed that advancing age induces the lengthening of the oropharyngeal phase of swallowing, hindering the opening of the upper esophageal sphincter.

Several studies have shown that dysphagia is often underestimated but is a frequent symptom in geriatric clinical practice. This can be attributed to the elderly patient's reduced awareness of his/her dysfunction, being in fact able to implement automatic compensation mechanisms which, although partially effective, allow him/her to avoid laryngeal penetration or aspiration of the bolus. Specifically, the study conducted by Boczko et al. [20], which included 74 male and 125 female patients between the ages of 50 and 98 who were given

screening tools for dysphagia, required an affirmative or negative response from the subject on the basis of 9 pre-selected clinical indicators of dysphagia: difficulty retaining liquids in the oral cavity, coughing after taking liquids, detecting respiratory problems during fluid intake, coughing after taking solid foods, evaluation of leftover food in the oral cavity or throat after the swallowing act, difficulty in managing saliva, detection of changes in voice after a meal. Subsequently, a speech therapy examination of swallowing was carried out evaluating the same 9 indicators. The conclusions of this study indicated that even if the patient is able to identify swallowing problems, these will not correspond to the degree of severity that the expert operator can detect.

It is crucial to consider that the selected questionnaire to carry out the screening must have a high specificity and sensitivity, and that it must be easy to administer for both the operator and the patient. It is paramount that the questions analyse the fundamental aspects related to swallowing as much as possible, so that information is not omitted or underestimated, which will allow for a more precise diagnosis.

This is the main reason why standardized questionnaires are far more preferable to a free medical history, collected at the operator's convenience.

Although the population we studied is apparently healthy, the presence of an unrecognized dysphagia in some elderly subjects, which may be a sign of diseases yet to be diagnosed, cannot be excluded.

However, the role played by the impairment of the esophageal phase in all age groups should not be overlooked: the accentuation of the symptoms given by inadequately treated gastroesophageal reflux could be responsible for the onset of presbyphagia symptoms in the healthy older population over time. At the same time, the prolonged intake of drugs such as NSAIDs can be considered responsible for the onset of esophagitis in the elderly population.

Lastly, there are some limitations of our study. The sample size was small, and the findings are difficult to generalize, therefore it will need to be enlarged.

Moreover, drug therapy was not collected to understand the true impact of drugs on the swallowing function of the elderly population.

CONCLUSIONS

We can affirm that the administration of a questionnaire to the apparently healthy over 65 population can make early diagnosis of presbyphagia possible and also allow the patient to be referred to an ENT specialist who can perform a FEES to ascertain the presence of dysphagia and follow the patient over time, modifying the textures of foods and the compensatory postures to be assumed during eating, in order to avoid the more serious consequences to which unrecognised dysphagia can lead.

It is therefore expected that in the future the use of questionnaires like DRAS will be introduced in the check-up of older patients by general practitioners, in hospital departments, as well as in senior citizen homes, in order to optimize and capillarize control over presbyphagia. The DRAS questionnaire is also not specific for a phase of swallowing, therefore it can be considered extremely useful as a screening method.

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Conflict of interest

The Authors declare no conflict of interest.

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Author contributions

GC, MLF: conceptualization; GC, MP, MLF: data curation; GC, MP, MLF: formal analysis; GC, MLF: writing – original draft; GC, EN, MS, NQ, MLF: writing – review & editing.

Ethical consideration

This study was approved by the Institutional Ethics Committee (Comitato Etico Indipendente Azienda Ospedaliero-Universitaria "Consorziale Policlinico" Bari) (prot. 67172/DS, 02/08/2021).

The research was conducted ethically, with all study procedures being performed in accordance with the requirements of the World Medical Association's Declaration of Helsinki.

Written informed consent was obtained from each participant/patient for study participation and data publication.

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