Orofacial mechanisms and swallowing abilities in a geriatric population in India

ORIGINAL ARTICLE

Shenbagavalli Mahalingam, MASLP, KV Vijay Kumar, MASLP

ABSTRACT

Background. Presbyphagia is common among elderly people. This cross-sectional study aimed to compare different geriatric age-groups in South India in terms of orofacial mechanisms, swallowing abilities, and dietary patterns.

Methods: Residents from three care homes for the elderly in Tamil Nadu, South India who were ≥ 60 years and conscious and oriented during assessment were recruited between January 2016 and December 2016. Participants were classified into age-groups of 60-70 years, 71-80 years, and >80 years. A protocol was developed and verified by two speech language pathologists. The protocol included orofacial mechanism examination, swallowing assessment, and dietary pattern assessment.

Results: A total of 67 men and 57 women aged 60 to 92 years were classified into age-groups of 60-70 years ($n=45$), 71-80 years ($n=44$), or >80 years ($n=35$). 69.4% of participants were taking medications for hypertension, diabetes, dyslipidaemia, or any of the combinations. Older age-groups showed more drooping of facial appearance ($p<0.001$), habitual posture of lips ($p<0.001$), tongue appearance ($p<0.001$), dentures ($p<0.001$), and lip mobility functions such as pursing ($p<0.001$), puckering ($p<0.001$), tongue movements and mobility ($p=0.003$), jaw mobility ($p<0.001$), dental alignment ($p=0.001$), and occlusion ($p=0.001$). Older age-groups also showed more tongue placement ($p<0.001$), oral spillage ($p<0.001$), drooling/increased secretions ($p=0.005$), pocketing of food ($p<0.001$), presence of cough during swallowing ($p<0.001$), reduced strength of cough ($p<0.001$), and presence of wet/gurgling voice immediately after swallowing ($p<0.001$). None had nasal regurgitation. As age increased, feeding time increased ($p<0.001$) and preferred food consistency changed from solids to semisolids and then to purees ($p<0.001$).

Conclusions: Older age-groups have poorer orofacial mechanisms and swallowing abilities. Elderly people in India are less concerned about swallowing issues because Indian food has a wide variety of food consistencies.

Key words: Deglutition disorders; Sarcopenia

Department of Speech, Language and
Hearing Sciences, Sri Ramachandra
Institute of Higher Education and Research

Correspondence to: KV Vijay Kumar. Email:
vijaykumarkv@yahoo.in

INTRODUCTION

Presbyphagia is the second most commonly reported symptom in geriatric medicine.¹⁻³ Sarcopenic changes in the oropharyngeal muscles result in reduced intake,^{4,5} prolonged chewing and/or reduced lingual pressure,^{1,6} reduced ability to control food or liquids in the mouth,⁷ and slowed swallowing.⁸ In addition, alteration in central drive for feeding, changes in taste, smell, and chemosensory inputs lead to weak cough and reduced intake of food.⁸ Increased frequency of aspiration and pneumonia is attributed to the biomechanical changes in swallowing structures.¹ Presbyphagia affects the quality of life of self and caregivers.⁹ Safe swallowing of food with different consistencies and textures ensures to meet the nutritional demand in elderly.^{10,11} Recent research in geriatrics emphasises on dietary modification and intake of supplementary sources.¹²

In India, life expectancy of the age-group of ≥ 60 years has increased 17.5% to 19.1%.¹³ Indian diet can be modified in texture and consistency without altering the nutritional value. This study aimed to compare different geriatric age-groups in South India in terms of orofacial mechanisms, swallowing abilities, and dietary patterns.

METHOD

This study was approved by the ethics committee of our institution (Ref: IEC-NI/15/APR/46/15). Informed consent was obtained from each participant. Between January 2016 and December 2016, residents were recruited from three care homes for the elderly in Tamil Nadu, South India who were aged ≥ 60 years and conscious and oriented during assessment. Those with known neurological conditions, cognitive impairment, head and neck surgeries, or chronic obstructive pulmonary disease were excluded. Mini Mental State Examination was administered to rule out the presence of neurocognitive disturbances.

Participants were classified into age-groups of 60-70 years, 71-80 years, and >80 years. A protocol was developed and verified by two speech language pathologists who had ≥ 10 years of experience in management of swallowing disorders. The protocol included orofacial mechanism examination (of appearance and functions of structures at rest and during swallowing), swallowing assessment, and dietary pattern assessment (**TABLE 1**). Different consistencies of staple food viz liquids, semisolids, and solids were used.

TABLE 1
Parameters of orofacial mechanisms and swallowing abilities

Parameters	Assessment
Swallowing with teeth apart	During swallowing, the lower jaw drops down, the upper and lower teeth separate and provide room for the tongue thrust to a more comfortable position.
Protrusion of tongue while swallowing	During swallowing, the tongue protrudes to the anterior incisors.
Oral expectoration/spillage	During food chewing, a part of the bolus spills out owing to inadequate lip seal.
Nasal regurgitation	During swallowing, the bolus is regurgitated through nose owing to velopharyngeal inadequacy.
Drooling/increased secretions during swallowing	During swallowing, spillage of saliva anteriorly is referred as drooling.
Pocketing of food, mouth odour	After swallowing, food lodging in lateral vestibule is referred as pocketing of food.
Coughing/choking/throat clearing while swallowing	During or immediate after swallowing, coughing/clearing the throat frequently is exhibited before consuming the next spoon of food.
Gurgling/wet voice after swallowing	Immediately after swallowing, a change in voice quality results in a wet gurgling voice.
Strength of cough	Cough during swallowing and volitional cough is observed. Perception of hard glottal attack determines the strength of the cough.
Prolonged feeding time	≥ 30 minutes
Dehydration, temperature spike, pneumonia	Taken from in-house medical records
Weight loss	Taken from the annual in-house medical records
Food preference	After consumption of different consistencies of food, participants were asked about preferred food consistency.

TABLE 2
Comparison of three age-groups in terms of orofacial mechanisms and swallowing abilities

Parameter	Age-group			p Value
	60-70 years (n=45)*	71-80 years (n=44)*	>80 years (n=35)*	
Age, y	64.9±3.3	75.6±3.4	85.3±3.3	
No. of men:women	27:18	17:27	23:12	
Orofacial mechanisms				
Facial appearance				<0.001
Normal	44 (97.8)	15 (34.1)	3 (8.6)	
Drooping	1 (2.2)	29 (65.9)	32 (91.4)	
Lips appearance				-
Normal	45 (100)	44 (100)	35 (100)	
Deviant	0	0	0	
Lips habitual posture				<0.001
Closed	45 (100)	43 (97.7)	19 (54.3)	
Parted	0	1 (2.3)	16 (45.7)	
Lips mobility				<0.001
Pursing				
Adequate	45 (100)	44 (100)	22 (62.9)	
Inadequate	0	0	13 (37.1)	
Pouting				<0.001
Absent	43 (95.6)	18 (40.9)	3 (8.6)	
Present	2 (4.4)	26 (59.1)	32 (91.4)	
Spreading				0.278
Adequate	45 (100)	44 (100)	34 (97.1)	
Inadequate	0	0	1 (2.9)	
Jaw mobility				<0.001
Drooping	0	0	1 (2.9)	
Excessive	0	0	1 (2.9)	
Insufficient	0	14 (31.8)	25 (71.4)	
Sufficient	45 (100)	30 (68.2)	8 (22.9)	
Tongue appearance at rest				<0.001
Atrophy	0	7 (15.9)	17 (48.6)	
Atrophy, tremors	0	0	4 (11.4)	
Normal	44 (97.8)	35 (79.5)	7 (20.0)	
Tremors	1 (2.2)	2 (4.5)	7 (20.0)	
Tongue protrusion				0.003
Normal	45 (100)	40 (90.9)	27 (77.1)	
Tremors	0	44 (9.1)	35 (22.9)	
Tongue mobility				<0.001
Adequate	42 (93.3)	41 (93.2)	17 (48.6)	
Absence of elevation	3 (6.7)	0	0	
Absence of lateral movement	0	1 (2.3)	1 (2.9)	
Inability to lick their lips	0	0	5 (14.3)	
Inability to sweep from alveolar ridge to palate	0	2 (4.5)	12 (34.2)	
Teeth				<0.001
Dentures	0	9 (20.5)	11 (31.4)	
Missing	10 (22.2)	23 (52.3)	20 (57.1)	
Carries	10 (22.2)	32 (77.7)	31 (88.8)	
Tooth alignment				0.001
Misaligned	0	0	1 (2.9)	
Spaced	1 (2.9)	2 (4.5)	4 (11.4)	
Normal	44 (97.8)	33 (75)	19 (54.3)	
Not applicable	0	9 (20.5)	11 (31.4)	
Tooth condition (excluding those with dentures)				<0.001
Normal	27 (60.0)	14 (27.3)	6 (17.1)	
Decayed	18 (40.0)	23 (52.3)	18 (51.4)	

TABLE 2 (cont'd)

Parameter	Age-group			p Value
	60-70 years (n=45)*	71-80 years (n=44)*	>80 years (n=35)*	
Tooth occlusion				0.001
Normal	42 (93.3)	31 (70.5)	18 (51.4)	
Not applicable	0	9 (20.5)	11 (31.4)	
Over jet	3 (6.7)	4 (9.1)	6 (17.1)	
Hard palate appearance				
Normal	45 (100)	44 (100)	35 (100)	
Soft palate				
Normal appearance	45 (100)	44 (100)	35 (100)	
Symmetry in mobility	45 (100)	44 (100)	35 (100)	
Presence of gag reflex	45 (100)	44 (100)	34 (97.1)	0.278
Normal uvula	45 (100)	44 (100)	35 (100)	
Swallowing abilities				
Swallowing with teeth apart				0.089
Present	0	1 (2.3)	3 (8.6)	
Absent	45 (100)	43 (97.7)	32 (91.4)	
Protrusion of tongue while swallowing				<0.001
Present	0	1 (2.3)	15 (42.9)	
Absent	45 (100)	43 (97.7)	20 (57.1)	
Oral expectoration/spillage				<0.001
Present	0	5 (11.3)	20 (57.1)	
Absent	45 (100)	39 (88.6)	15 (42.9)	
Nasal regurgitation				-
Present	-	-	-	
Absent	45 (100)	44 (100)	35 (100)	
Drooling/increased secretions during swallowing				0.005
Present	0	0	4 (11.4)	
Absent	45 (100)	44 (100)	31 (88.6)	
Pocketing of food, mouth odour				<0.001
Present	5 (11.1)	17 (38.6)	20 (57.1)	
Absent	40 (88.9)	27 (61.4)	15 (42.9)	
Coughing/choking/throat clearing while swallowing				<0.001
Present	1 (2.2)	18 (40.9)	26 (74.3)	
Absent	44 (97.8)	26 (59.1)	9 (25.7)	
Gurgling/wet voice after swallowing				<0.001
Present	4 (8.9)	18 (40.9)	24 (68.6)	
Absent	41 (91.1)	26 (59.1)	11 (31.4)	
Strength of cough				<0.001
Adequate	44 (97.8)	43 (97.7)	22 (62.9)	
Weak	1 (2.2)	1 (2.3)	13 (37.1)	
Prolonged feeding time				<0.001
Present	1 (2.2)	18 (40.9)	25 (71.4)	
Absent	44 (97.8)	26 (59.1)	10 (28.6)	
Dehydration, temperature spike, pneumonia				0.075
Present	0	0	2 (5.7)	
Absent	45 (100)	44 (100)	33 (94.3)	
Weight loss				0.006
Present	1 (2.2)	10 (22.7)	9 (25.7)	
Absent	44 (97.8)	34 (77.3)	26 (74.3)	
Food preference				<0.001
No preference	22 (48.9)	0	2 (5.7)	
Solids	6 (13.3)	3 (6.8)	0	
Solids + semisolids	0	1 (2.3)	1 (2.9)	
Semisolids	17 (37.8)	35 (79.6)	7 (20.0)	
Semisolids + purees	0	2 (4.6)	8 (22.9)	
Purees	0	3 (6.8)	16 (45.7)	
Liquids	0	0	1 (2.9)	

* Data are presented as mean±standard deviation or No. (%) of participants

Statistical analysis was performed using SPSS (Macintosh version 25; IBM Corp, Armonk [NY], US). The three age-groups were compared using Chi-squared test.

RESULTS

A total of 67 men and 57 women aged 60 to 92 (mean±standard deviation, 74±8.89) years were classified into age-groups of 60-70 years (n=45), 71-80 years (n=44), or >80 years (n=35) [TABLE 2]. 69.4% of participants were taking medications for hypertension (15.3%), diabetes (21.6%), dyslipidaemia (0.02%), or any of the combinations (24.3%).

The three age-groups were comparable in terms of lips spreading and gag reflex ($p=0.278$), but older age-groups showed more drooping of facial appearance ($p<0.001$), habitual posture of lips ($p<0.001$), tongue appearance ($p<0.001$), dentures ($p<0.001$), and lip mobility functions such as pursing ($p<0.001$), puckering ($p<0.001$), tongue movements and mobility ($p=0.003$), jaw mobility ($p<0.001$), dental alignment ($p=0.001$), and occlusion ($p=0.001$).

Older age-groups also showed more tongue placement ($p<0.001$), oral spillage ($p<0.001$), drooling/increased secretions ($p=0.005$), pocketing of food ($p<0.001$), presence of cough during swallowing ($p<0.001$), reduced strength of cough ($p<0.001$), and presence of wet/gurgling voice immediately after swallowing ($p<0.001$). None had nasal regurgitation.

As age increased, feeding time increased ($p<0.001$) and preferred food consistency changed from solids to semisolids and then to purees ($p<0.001$). In the age-group of 60-70 years, 48.9% (n=22) did not have preference for any particular consistency/texture and 51/1% preferred semisolids or solids. In the age-group of 71-80 years, 91% (n=40) preferred solids, semisolids, and/or purees. In the age-group of >80 years, 68.6% preferred purees and/or semisolids and 20.0% preferred semisolids only. The three age-groups were comparable in terms of swallowing with teeth apart, presence of dehydration, temperature hike, and history of pneumonia.

DISCUSSION

Oral stage

Atrophy of the skin and loss of collagen and elastin fibres results in weak facial muscle tone and elasticity

and hence drooping of perioral musculature. Poor lip function and jaw instability were observed in participants aged >80 years, consistent with other studies that have reported age-related decline in endurance, mobility, and strength in elderly people resulting in poor lip closure and jaw instability.^{14,15} The incidences of atrophy of the tongue and tremors in the tongue increase with age. Decreased tongue muscle fibre diameter may contribute to tongue atrophy.⁶ Lower endurance may induce tremors in the tongue. Decreased skeletal muscle fibre diameter results in reduced tongue strength and range of motion of the tongue and hence weak propulsion of bolus to the posterior of the oral cavity.¹⁶

Tongue thrust is common in elderly people.¹⁷ In participants aged >80 years, protrusion of tongue was observed in edentulous patients and those with missing teeth or dentures. Oral spillage, drooling, and pocketing of food was observed more frequently in older age-groups. Proprioception, temperature sensitivity, and oral stereognosis decline as age increases.⁸ This may result in altered sensation in oral cavity and lip, jaw, and tongue mobility, leading to increased secretions during swallowing, oral spillage, and pocketing of food. No structural and functional deviances were observed in hard palate, soft palate, and uvula.

Pharyngeal stage

The primary concerns in the pharyngeal phase of swallowing are weak coughing and gurgling voice immediately after swallowing.¹⁸ The reason for weak cough is multifactorial, but it is hypothesised that changes in bronchial smooth muscle tone may result in an altered cough reflex.¹⁹ Delay in laryngeal vestibule closure also results in penetration/aspiration in elderly people.²⁰ Gurgling voice immediately after swallowing may indicate presence of swallowing disorder. Delayed trigger in swallowing reflex resulting in premature swallowing and reduced pharyngeal peristalsis may lead to penetration of bolus and gurgling voice.¹ These findings suggest that elderly people are at risk of aspiration, but only two participants aged >80 years reported to have pneumonia recently, and most participants did not develop any complication secondary to swallowing issues.

Sarcopenic changes in the oral structures, pharyngeal, and upper oesophageal sphincter limit the choice over food consistency and texture.²¹

Purees and semisolids are preferred as age increases. Liquids (thin and thick) increase the risk of aspiration, and solids are difficult to swallow owing to poor dentition.¹² Altering the food consistency to meet the nutritional demands and needs indicate the coping/compensatory mechanism for swallowing issues.

Traditional Indian food has a wide variety of consistencies. Rice can be consumed as mashed steamed rice, *upma* (soft solid), porridge (thick liquid consistency), or *murukku* (solid). Anecdotally, diversity in staple food and choice over food enables elderly people to opt for comfortable consistencies. Although 83.3% of participants had preferences for food, none reported of change in diet pattern as a supplementary process. Rather, they reported it as a variant of a regular diet, and swallowing difficulties may go unnoticed. In swallowing rehabilitation, combination of compensatory manoeuvres and modification in food consistency and texture improves swallowing functions.²²⁻²⁴ Use of isolated modified food consistencies in the management of swallowing difficulty is questionable.

Limitations

Our swallowing assessment was subjective. Objective evaluation using the modified barium swallow could have validated the subjective assessment of swallowing parameters. Analysing the effects of medication on feeding may yield interesting results. Weight loss, food preference, dehydration, and pneumonia should have been documented for a longitudinal study.

CONCLUSION

Older age-groups have poorer orofacial mechanisms and swallowing abilities. Elderly people in India are less concerned about swallowing issues because Indian food has a wide variety of food consistencies.

DECLARATION

No financial support was obtained to carry out this research. The authors have no conflict of interest to disclose.

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