

Factors Associated with Choking During Meals; a Risk Indicator for Repetitive Fevers in The Elderly Community

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Abstract

Background: Choking during meals is a common symptom in the elderly, however the factors associated with it have not been fully clarified. In this study, we examined the factors associated with choking during meals. **Methods:** The oral health status and practices that promote oral health conditions was surveyed in 1305 community dwelling elderly using a self-administered questionnaire. Eight items including satisfaction with their oral condition, denture fit, chewing ability, tooth brushing frequency, dental visits, exercises to train muscles for chewing and swallowing, choking during meals, and repetitive fever were selected for analysis. **Results:** 25.1% of the subjects experienced choking during meals, which was significantly associated with repetitive fever occurrence. Differences in satisfaction levels with their oral condition, denture fit, chewing ability, and tooth brushing frequency were observed between groups with and without choking. Age, satisfaction level, and chewing ability were significantly associated with choking during meals. **Conclusions:** This study demonstrated that choking during meals is a risk indicator for repetitive fever in the elderly living in community settings. Poor chewing ability and dissatisfaction with their oral condition were risk factors associated with choking. These results suggest that training the elderly to eat efficiently and safely and improving oral conditions is necessary for those who suffer from choking during meals to prevent repetitive fever.

Keywords: chewing, elderly, fever

Introduction

Pneumonia in the elderly population is a major cause of morbidity and mortality. It is mainly caused by the aspiration of oral bacteria containing substances including saliva, gastroesophageal reflux, dental plaque, tongue coating, and food debris.¹ The elderly are prone to developing aspiration pneumonia because of their decreased swallowing ability, cough reflex, and immune responses.^{2,3} Repetitive fever is one of the symptoms of aspiration pneumonia, and the management of these fevers is important. Several studies have demonstrated that improving oral hygiene leads to decreases in the frequency and duration of aspiration pneumonia.^{4,6} Elderly people suffer from oral dryness, tooth loss, decreased sensation, and decreased function of the masticatory muscles. Oral dryness is caused by decreased salivary flow, particularly after taking several kinds of medicine, and is exacerbated by a loss of chewing ability. Partial tooth loss and decreased sensation can induce difficulties in tooth cleaning. These symptoms can lead to the accumulation of dental plaque and increase the risk of aspiration pneumonia. To predict aspiration pneumonia several systemic risk

factors including age, dysphagia, stroke, dehydration, congestive heart failure, dementia, bedfast status, and some medications have been presented.^{7,9} Additionally, oral hygiene levels have been the main oral factor that is related to aspiration pneumonia.^{10,11} Choking during meals is a common symptom in the elderly however the factors associated with it have not been fully clarified. In this study, we found an association between choking during meals and repetitive fever and further investigated the associated oral factors, which may contribute to the prevention of aspiration pneumonia. To this end, we analysed a self-administered questionnaire regarding oral health status and practices to promote oral health conditions in 1305 community dwelling elderly people.

Methods

Residents (440 males, 865 females, average age: 77.4 ± 7.8 years, range: 65–99 years old) of M-City, Kagoshima Prefecture, Japan, participated in this survey in 2013. City staff explained the purpose and contents of this study to the residents and collected unsigned questionnaires. According to the guidelines for epidemiological studies in Japan, it was not necessary to obtain the approval of an

ethics committee for this type of study using anonymised data that cannot be re-identified.

The self-administered questionnaire, which was developed after discussion with city staff, comprised of 15 items relating to oral and general health status and practices to promote oral health conditions. The 8 items relating to the oral health condition and occurrence of repetitive fever that were selected for analysis included (1) "Are you satisfied with your oral condition?"; (2) "Does your denture fit comfortably?"; (3) "Can you chew any food?"; (4) "How often do you brush your teeth?"; (5) "Have you visited a dentist within the last year?"; (6) "Do you know and perform an exercise to train muscles that function in chewing and swallowing?"; (7) "Do you experience choking (a reflexive cough) during meals?"; and (8) "Do you suffer from repetitive fever?" For statistical analysis, the subjects were divided into two groups for each item. The satisfaction levels for their oral condition were divided into satisfied and dissatisfied (somewhat or very dissatisfied). Chewing ability was divided into good (can chew anything or to some extent hard food) and poor (can chew only soft food). Tooth brushing frequency was divided into every day and other (sometimes or not at all). Exercise

performance was divided into doing and not doing (including unknown). The experience of choking during meals was divided into yes (frequently or sometimes) and no (rarely). Oral health status and practices were compared between groups with and without choking by the chi-square test. Logistic regression analysis was performed with repetitive fever status (0 = no repetitive fever and 1 = repetitive fever), or choking experience (0 = no and 1 = yes) as the dependent variables. Independent variables were categorised as follows: age (65–74, 75–84, and ≥85 years), satisfaction level (satisfied, dissatisfied), denture fit (good, poor), chewing ability (good, poor), tooth brushing frequency (every day, other), dental visit (visited, not visited), exercise (doing, not doing), and choking during meals (yes, no). All of the data was analysed using SPSS ver. 20 (IBM, Tokyo, Japan). *p*-values < 0.05 were considered statistically significant.

Result

Oral condition. The distribution of subjects according to each item is shown in Figure 1. Almost all of the subjects (1293) wore dentures, and 82.9% (1072) answered that their dentures fit well. Regarding chewing ability, 86.9% of subjects answered that they could eat

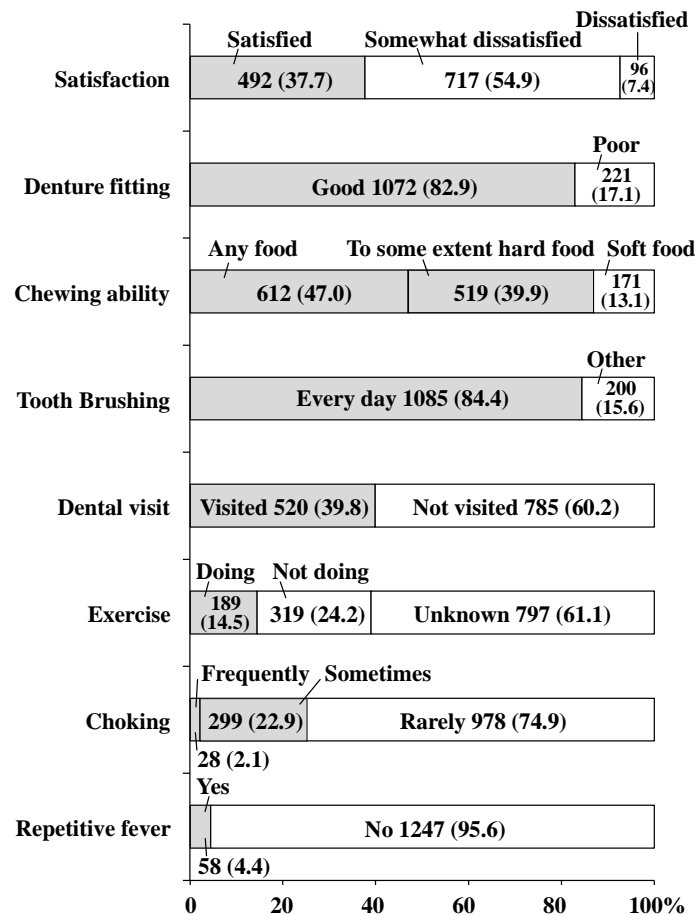


Figure 1. Distribution of Subjects according to each Questionnaire Item. Values mean a Number of Subjects (percentage)

anything or hard foods to some extent. Regarding choking during meals, 28 subjects (2.1%) experienced it frequently, and 299 subjects (22.9%) sometimes experienced it. Fifty-eight subjects (4.4%) suffered from repetitive fever, and 1247 subjects (95.6%) did not. There was a significant association between choking during meals and the occurrence of repetitive fever; the odds ratio in subjects with choking during meals was 2.67 compared to those without choking (Table 1). The odds ratio for occurrence of repetitive fever increased as the frequency of choking increased (Table 2).

Factors associated with choking. Significant differences in satisfaction levels with the oral condition, denture fit, chewing ability, and tooth brushing frequency were observed between groups with and without choking during meals (Table 3). Logistic regression analysis revealed that age, satisfaction level with the oral condition, and chewing ability were significantly associated with choking during meals (Table 4). Older subjects, subjects who were dissatisfied with their oral condition, and subjects with low chewing ability showed strong tendencies toward choking.

Table 1. Logistic Regression Analysis for Factors Relating to Recurrent Fever Occurrence

Variable	Odds ratio	<i>p</i>	95% CI
Age	1.17	0.429	0.791 - 1.736
Satisfaction	1.44	0.296	0.728 - 2.833
Denture fit	1.18	0.644	0.579 - 2.420
Chewing	1.35	0.435	0.637 - 2.846
Brushing	1.01	0.97	0.476 - 2.161
Dental visit	0.88	0.682	0.485 - 1.605
Exercise	1.25	0.620	0.514 - 3.048
Choking	2.67	< 0.001	1.497 - 4.746

Table 2. Relationship between Choking Frequency and Repetitive Fever Occurrence

Choking frequency	Repetitive fever		Odds ratio
	(+)	(-)	
Rarely	29	949	1
Sometimes	25	274	2.99
Frequently	4	24	5.45

Table 3. Comparison of Oral Health Status and Practices to Promote Oral Health Conditions by Choking Occurrence

Choking	Satisfaction		Denture fit		Chewing		Brushing		Dental visit		Exercise	
	Satisfied	Dissatisfied	Good	Poor	Good	Poor	Every day	Other	Visited	Not visited	Doing	Not doing
(+)	82	245	250	73	253	72	256	65	121	206	45	282
(-)	410	568	822	148	878	99	829	135	399	579	144	834
<i>p</i> *	< 0.001		0.004		< 0.001		0.010		0.240		0.717	

Table 4. Logistic Regression Analysis for Factors Relating to Choking Occurrence

Variable	Odds ratio	<i>p</i>	95% CI
Age	1.56	<0.001	1.295 - 1.869
Satisfaction	2.00	<0.001	1.472 - 2.710
Denture fit	1.09	0.631	0.764 - 1.556
Chewing	1.89	<0.001	1.296 - 2.744
Brushing	1.16	0.417	0.812 - 1.656
Dental visit	1.03	0.834	0.775 - 1.371
Exercise	0.91	0.630	0.617 - 1.340

Discussion

We used a self-administered questionnaire to examine the mutual associations of oral health status and practices in 1305 community-dwelling elderly people. We found that choking during meals was significantly associated with the occurrence of repetitive fever. Choking during meals occurs in response to the presence of liquids or solid foods in the laryngeal area, which is caused by dysphagia and abnormal oral and pharyngeal swallowing. Dysphagia is typically seen in patients with multiple neurological diseases including stroke, multiple sclerosis, and Parkinson's disease¹² and several reports have shown an association between dysphagia and aspiration pneumonia.^{13,14} Choking during meals seems to be caused by mild dysphagia, and Smith Hammond reported that coughing whilst eating and drinking may indicate aspiration.¹⁵ Therefore, choking during meals could be a risk indicator for repetitive fever resulting from aspiration pneumonia.

We examined the factors associated with choking during meals, and found that satisfaction levels with the oral condition were associated with its occurrence; 62.3% of the subjects showed dissatisfaction with their oral condition (Figure 1), and approximately one-third complained of their denture condition (data not shown). Dentures are a reservoir for respiratory pathogens, and denture hygiene practices are important to reduce the risk of respiratory infection.¹⁶ In this study, a significant difference in denture fit was observed between groups with and without choking. Son *et al.* reported that a removable denture might have negative effects on swallowing, which may be due to impaired sensation in the oral cavity or impaired masticatory performance induced by the denture.¹⁷ Poor denture fit may induce abnormal swallowing, which can lead to choking. Reasons for dissatisfaction, other than denture fit, should be clarified in further studies. The relationship between poor chewing ability and choking occurrence was then analysed. Chewing is an important function to grind and digest foods to help normal swallowing, and an association between chewing ability and swallowing ability has been demonstrated.¹⁸ Masticatory muscles and the tongue cooperate during chewing and Ono *et al.* found that tongue pressure contributed to the propulsion of the food bolus from the oral cavity into the pharynx, which is helpful for normal swallowing.¹⁹ A lack of chewing ability might induce abnormal swallowing, which can lead to choking. To prevent choking during meals swallowing rehabilitation, which is an effective approach to increase safe oral intake, would be necessary.²⁰ An association between the subjects' age and choking occurrence was noted. A progressive loss of a cough and swallowing reflexes occurs with ageing, and this condition may induce choking in older subjects. Regardless of the adverse effects of ageing on cough and swallowing reflexes, several reports have demonstrated

that both reflexes showed no decrease with ageing in individuals who lived active daily lives.^{21, 22} Strategies to keep normal cough and swallowing reflexes seem to be necessary and Ebihara *et al.* indicated that remedies to enhance sensory nerve terminals and sensory cortical areas related to these reflexes might be useful to prevent aspiration pneumonia in the elderly.²

Conclusions

We demonstrated that choking during meals is a risk indicator for repetitive fever in community-dwelling elderly people. Poor chewing ability and dissatisfaction with the oral condition were risk factors associated with choking. These results suggest that training elderly people to eat efficiently and safely and improving their oral conditions are important for those who suffer from choking during meals to prevent repetitive fever.

Conflict of Interest Statement

The authors declare that there is no conflict of interest regarding the publication of this paper.

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