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＜ Original ＞

Factors affecting xerostomia among community residents participating in a long-term care-prevention workshop: a cross-sectional study

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Abstract

Objectives: This cross-sectional study aimed to determine the influence of selected background characteristics of community residents who participated in a long-term care-prevention workshop on the presence and severity of xerostomia symptoms.

Methods: Of 1893 participants across 12 care-prevention workshops, 1137 participants gave written consent to participate in the survey. A self-administered questionnaire was administered. The main survey items were background characteristics of the participants and the Xerostomia Inventory (XI).

Results: Factors found to affect oral dryness were age, medication use, sleep quality, constipation, and the use of dentures. Xerostomia was also found to significantly influence quality of life.

Conclusions: When organizing long-term care-prevention workshops aimed at improving oral function, the background characteristics of participants should be taken into consideration.

keywords: xerostomia, long-term care, care-prevention, factors

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I. Introduction

The aging population in Japan is steadily growing and, as a result, Japan ranks first among super-aged societies worldwide[1]. Long-term care insurance was instituted in Japan in 2000, with system reforms applied in 2015. These system reforms attempted to reduce the need for long-term care through various care-prevention initiatives that aimed to prevent the need for severe nursing care, as the majority of the aging population needs only mild care. These care-prevention initiatives include efforts intended to improve musculoskeletal function, nutritional status, and oral function[2]. As the aging population expands and the burden of medical care and nursing care expenses increases, expectations for the effects of these workshops are also increasing.

Specific activities that have been shown to be effective in improving oral functionality include activities promoting oral exercise and oral care, such as oral hygiene instruction, facial and tongue muscle exercise, and salivary gland massage[3,4]. These screening and evaluation methods include the repeated saliva swallowing test (RSST) and food test (FT), as well as intraoral examination performed by a dentist. In recent years, mouth dryness has become an evaluation item for oral cavity function, and the evaluation of mouth dryness can be performed using an objective assessment such as the Saxon test[5] or subjective self-assessment. The Xerostomia Inventory (XI) is a subjective scale based on patient reports of dry mouth experiences[6].

Studies of community residents have found that xerostomia is influenced by several factors, including age[7], sex[8], use of medications[9], the presence of a nervous or mental disorder[10], and the use of removable dentures[11]. In a previous study, a significant positive correlation was found between lower urinary tract symptoms (LUTS) and xerostomia[12]. This finding suggests that xerostomia could be used as an indicator of various aspects of physical health, not limited to oral function. It has also been reported that

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xerostomia affects self-perceived quality of life (QOL)[13]. However, the participants of these studies are often patients of dental clinics, and there is no research targeting local community residents who are participating in long-term care prevention workshops. Participants of such workshops tend to be very health-conscious and they typically try to eat healthy food and pay attention to their health care to maintain good health[14].

In the present study, we aimed to determine the association and influence of participant characteristics in relation to xerostomia among community residents who participated in long-term care-prevention workshops. The results of our study will provide support for the integration of participants' background characteristics into the development of care-prevention activities aimed at improving oral function.

II. Methods

1. Participants

A total of 1,893 individuals participated in 12 care-prevention workshops in Gunma Prefecture, and of these, 1,352 residents consented to study participation. To recruit participants, we advertised the workshops on the bulletin board of each municipality. Reason for non-participation included individuals that did not agree with participating in this research and those that did not stay until the end of the workshop and so did not answer the questionnaire. Data collection was performed from 11th March to 8th December 2014. We asked the group head of the area to extensively advertise before the workshop and invite the participation of as many people as possible. Analyses were performed on participants who answered all 11 questions of the XI (n=1137).

2. Survey method and contents

1) Main survey items

Participants were asked to complete a self-administered questionnaire during the second half of the care-prevention workshop. The majority of survey questions were "yes/no" and included items on background characteristics of participants and self-reported experience of xerostomia. Background data obtained included eight characteristics: age, sex, hospital visits, medication use, denture use, regular exercise, sleep quality, and constipation. These variables are associated with xerostomia[7-11] and promoting independence and health of elderly community residents[14].

2) The Xerostomia Inventory (XI) scores

The XI is a widely used rating scale for assessing xerostomia (Table 2). Participant XI scores were derived from self-reported answers to items on the XI[6]. The XI contains 11 items: "I sip liquids to aid in swallowing food"; "My mouth feels dry when eating a meal"; "I get up at night to drink"; "My mouth feels dry"; "I have difficulty eating dry foods"; "I suck sweets or cough lollies to relieve dry mouth"; "I have difficulties swallowing certain foods"; "The skin of my face feels dry"; "My eyes feel dry"; "My lips feel dry"; and "The inside of my nose feels dry." The study participants were then asked to indicate which one of the following five response options best described their symptoms over the preceding two weeks. The response options were: "never" (score, 1); "hardly ever" (score, 2); "occasionally" (score, 3); "fairly often" (score, 4); or "very often" (score, 5) [6]. In addition, we added a single, unique item to the questionnaire related to QOL, which asked the participants how much they felt xerostomia hindered their lives.

3. Analytical methods

We analyzed the relationship between XI scores and the following characteristics, using the Mann-Whitney U test: sex (male or female), regular hospital visits, good sleep, and constipation, talking medication, wearing denture. The relationship between age, complaints-xerostomia (QOL) and XI scores was analyzed using simple linear regression. All variables were entered in multiple linear regression model. A p-value of <0.05 was considered statistically significant. Analyses were performed using IBM SPSS Statistics software package (IBM SPSS version 22, Tokyo, Japan).

4. Ethical considerations

An oral explanation of the survey was provided to all participants. Participant consent was implied when the completed questionnaire sheet was returned. No individual identifying information was collected, and the questionnaire data were converted to numerical values for analysis. This study was conducted in full accordance with the World Medical Association Declaration of Helsinki and approved by the Epidemiology Ethics Committee from Gunma University of Medical Sciences (22-4).

III. Results

1. Participants' background data

Participants' background data are shown in Table 1. Of the 1,137 participants, 509 (44.8%) were ≤64 years old and 610 (53.6%) were ≥65 years old. The majority of participants were female (n=964: 85.0%; males, n=170: 15.0%). Approximately half of the participants regularly visited a hospital (n=551: 48.5%) and took medications (n=550: 48.4%). Most participants reported good sleep (n=931: 81.9%) and exercised regularly (n=703: 61.8%). Eighty participants (7.0%) suffered from constipation and about half of the participants (n=560: 49.2%) did not have dentures.

Table1　Background characteristics of participants

n=1137

Items		n	%
Age	≤ 64	509	44.8
	≥ 65	610	53.6
	Not answer	18	1.6
	Mean ± SD	63 ± 12.7	
Sex	male	170	15.0
	female	964	84.8
	Not answer	3	0.3
Regular hospital visits	yes	551	48.5
	no	553	48.6
	Not answer	33	2.9
Taking medication	yes	550	48.4
	no	548	48.2
	Not answer	39	3.4
Good sleep	yes	931	81.9
	no	170	15.0
	Not answer	36	3.2
Regular exercise	yes	703	61.8
	no	408	35.9
	Not answer	26	2.3
Constipation	yes	80	7.0
	no	1006	88.4
	Not answer	51	4.5
Wearing denture	no denture	560	49.2
	denture	484	42.6
	Not answer	93	8.2
Complaints-xerostomia (QOL)	never	657	57.8
	hardly ever	322	28.3
	occasionally	85	7.5
	fairly often	48	4.2
	very often	11	1.0
	Not answer	14	1.2

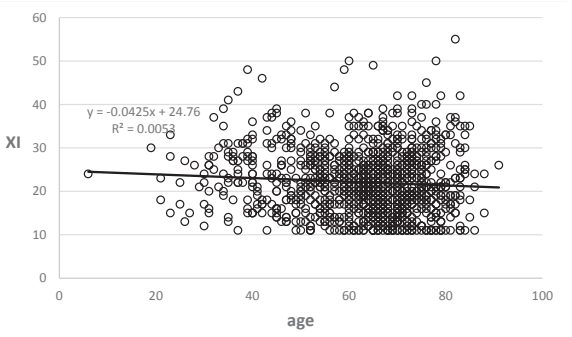

Figure 1　Correlation of the Xerostomia Inventory scores and age

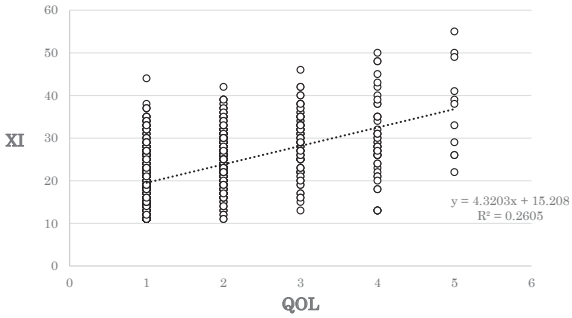

Figure2　Correlation of the Xerostomia Inventory scores and complaints-xerostomia(QOL)

Table2　Participants' XI data

n=1137

	Items	Never	score=1	Hardy ever	score=2	Occasionally	score=3	Fairly often	score=4	Very often	score=5			
		n	%	n	%	n	%	n	%	n	%	Mean	SD	Median
1	I sip liquids to aid in swallowing food	418	36.8	266	23.4	217	19.1	129	11.3	107	9.4	2.3	1.3	2.0
2	My mouth feels dry when eating a meal	639	56.2	278	24.5	134	11.8	69	6.1	17	1.5	1.7	1.0	1.0
3	I get up at night to drink	631	55.5	223	19.6	174	15.3	76	6.7	33	2.9	1.8	1.1	1.0
4	My mouth feels dry	424	37.3	260	22.9	298	26.2	128	11.3	27	2.4	2.2	1.1	2.0
5	I have difficulty in eating dry foods	644	56.6	274	24.1	152	13.4	57	5.0	10	0.9	1.7	0.9	1.0
6	I suck sweets or cough lollies to relieve dry mouth	575	50.6	227	20.0	232	20.4	88	7.7	15	1.3	1.9	1.1	1.0
7	I have difficulties swallowing certain foods	809	71.2	219	19.3	82	7.2	25	2.2	2	0.2	1.4	0.7	1.0
8	The skin of my face feels dry	414	36.4	257	22.6	287	25.2	138	12.1	41	3.6	2.2	1.2	2.0
9	My eyes feel dry	435	38.3	213	18.7	273	24.0	161	14.2	55	4.8	2.3	1.2	2.0
10	My lips feel dry	350	30.8	234	20.6	329	28.9	181	15.9	43	3.8	2.4	1.2	2.0
11	The inside of my nose feels dry	452	39.8	263	23.1	270	23.7	118	10.4	34	3.0	2.1	1.1	2.0

Abbreviations: SD, standard deviation

The majority of participants (n=657: 57.8%) reported that xerostomia did not hinder their lives, while the remaining participants (n=480: 42.2%) reported varying degrees of hindrance.

2. Participants' XI data

In the XI, which consists of 11 items, the question with the lowest percentage of "never (1 point)" was "My lips feel dry" (Table 2), which had a response of 350 participants (30.8%). However, the results showed that most participants had some symptoms of dry mouth.

3. XI scores, QOL, and age (Table 3, Fig 1, Fig 2)

Age was a significant predictor of XI scores (B=-0.043,

Table3 Comparisons of the XI scores based on participants' background characteristics

Items		XI scores B (95% CI)		R2	p-value
Age		-0.043(-0.077, -0.008)		0.005	0.014
		XI scores Mean	SD	Median	p-value
Sex	male	21.4	7.5	21	0.114
	female	22.3	7.3	22	
Regular hospital visits	yes	22.8	7.6	22	0.043
	no	21.5	7.1	21	
Taking medication	yes	23.1	7.7	22	0.004
	no	21.4	7.0	21	
Regular exercise	yes	21.8	7.3	21	0.032
	no	22.6	7.4	22	
Good sleep	yes	21.6	7.3	22	p<0.001
	no	24.8	7.6	24	
Constipation	yes	23.5	8.6	21	p<0.001
	no	21.9	7.2	21	
Wearing denture	no denture	21.6	6.9	21	0.275
	denture	22.3	7.5	21	

Analysis using the simple linear regression: Age
Mann-Whitney U test: except for age

Table4 Multiple linear regression model of the XI scores

Predictors	B (95% CI)	p-value
Age	-0.088 (-0.132, -0.043)	< 0.001
Sex	0.310 (-0.982, 1.601)	0.638
Regular hospital visits	-0.381 (-2.137, 1.374)	0.670
Taking medication	2.251 (0.467, 4.035)	0.013
Regular exercise	0.211(-0.799, 1.221)	0.682
Good sleep	2.523(1.220, 3.825)	< 0.001
Constipation	3.107(1.360, 4.855)	0.001
Wearing denture	1.143(0.149, 2.138)	0.024
Model summary:	R2=0.066 F=8.126	

Sex; 0: Males, 1: Females
Regular hospital visits; 0:no visits, 1: regular hospital visits
Taking medication; 0: no medication, 1: taking medication
Regular exercise; 0: regular exercise, 1: no regular exercise
Good sleep; 0: good sleep, 1: no good sleep
Constipation; 0: no constipation, 1: constipation
Wearing denture; 0: no denture, 1: wearing denture

95% CI: -0.077, -0.008, p=0.014) and XI scores was significantly correlated with QOL (B=4.320, 95% CI: 3.894, 4.747, p<0.001).

4. Comparisons of XI scores based on participant background characteristics

Significant differences in XI scores were observed between sub-groups with the Mann-Whitney test (Table 3), classified according to the following background characteristics: age, regular hospital visits, medication use, regular exercise, sleep quality, constipation, and use of denture. Participants who regularly visited a hospital scored significantly higher on the XI scores compared to those who did not. Medication users scored significantly higher on the XI scores relative to non-medication users. Participants who exercised regularly scored significantly higher than non-exercisers. Those who reported poor sleep quality scored significantly higher on the XI scores compared to those reporting good sleep quality. In addition, participants with constipation scored significantly higher on the XI scores compared to those without. When all variables were added into a multiple linear regression model, age, medication use, good sleep, constipation, and denture use had a significant influence on the XI scores (Table 4).

IV. Discussion

In the present study, significant differences in XI scores were observed between participant sub-groups classified according to age, medication use, sleep quality, constipation, and the use of denture. Specifically, participants under 65 years of age, who regularly visited a hospital, used medication(s), did not exercise regularly, suffered from poor sleep quality, and experienced constipation reported greater severity of xerostomia when compared to their respective counterparts.

It has been demonstrated that dry mouth is a side effect of many medications[15]. Moreover, one study has found that saliva secretion is significantly reduced in individuals who take two or more medications, compared to people who take one or fewer[16]. The issue of polypharmacy is currently under vigorous debate[17]. Nevertheless, community residents participating in long-term care-prevention workshops should be informed about this risk.

It has also been noted that individuals fitted with dentures report being dissatisfied with chewing and speaking[18]. Our finding – that the use of denture influences xerostomia severity – is in accordance with these studies. In dry mouth, mucous membranes are more likely to be injured when wearing denture, and adsorption also deteriorates.

Our data also showed that high XI scores were more common among participants with poor sleep quality, and participants who experienced constipation. This seems to signify that both physical and oral functions are reduced in individuals who are unable to exercise. Movement of the tongue in the oral cavity stimulates the salivary glands, and saliva is secreted. Constipation commonly results from a lack of water or a lack of exercise, both of which may predispose people to xerostomia. Our findings suggest that exercise levels, sleep quality, and physical symptoms such as xerostomia do not occur in isolation, but rather interact with and mutually influence one another.

Many studies have found xerostomia to be more severe in adults and elderly individuals[7-9]. In the present study, however, we observed that participants under 64 years of age scored higher on the XI than those aged 65 years or older. One previous study reported that salivary flow rate does not correlate with age[19], and age is not a direct cause of saliva reduction. Elderly individuals tend to experience a decrease in saliva secretion due to the use of multiple medications or by being prone to systemic diseases that may influence xerostomia. Therefore, workshops aimed at improving oral function must consider participant background characteristics other than age in the development of care-prevention activities. Moreover, in designing workshops for improvement of oral cavity function, it is necessary to pay attention not only to the age of participants, but also to the medications they are taking, their sleep quality, and their excretory patterns.

When conducting care-prevention activities aimed at improving oral function, professionals must consider attendees' subjective evaluations of their own xerostomia in addition to understanding attendees' health in an integrated manner, combining multiple aspects of their medical care. These aspects of care include hospital visitation patterns and the potential influence of the medications they are taking on various aspects of their lifestyle, such as exercise, sleep, and excretion. Recently, activities promoting preventative care in community residents have increased across Japan, as xerostomia is a common problem reported by elderly people[20]. Many care-prevention activities that have been developed separately focus on motor function, nutritional status, and oral function. Nutritional status is mutually related to both oral and motor functions[21]. Therefore, it would be advantageous for all care-prevention activities to incorporate components of relevant health targets in a coordinated manner.

In the present study, a significant correlation was observed between participants' XI scores and decreased QOL. Factors that lower QOL are not limited to the feeling of dry mouth, but may also include LUTS and constipation[22]. People participating in care-prevention activities may potentially have a physical disorder that involves xerostomia. Professionals engaged in the provision of health and medical care must develop care-prevention activities from the perspective of improving the comprehensive health and lifestyles of participants, while taking into account the specific characteristics of each community.

One limitation of this research was a selection bias, since the participants were volunteers who could come to the research venue, and their behavior may differ from the people who would not, or could not attend. People who could not attend may not be interested in the health issues discussed because they may not have ever encountered any health problems. The present study utilized a cross-sectional research design. As such, causal relationships could not be established. In the future, we aim to carry out a longitudinal study to examine the factors related to xerostomia.

V. Conclusions

Background conditions of the local residents participating in the workshops, such as age, denture use, sleep quality, and medication use, affected self-reported symptoms of xerostomia.

Acknowledgments

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Conflict of Interest

None declared.

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介護予防研修会に参加する地域住民の口腔乾燥に影響する背景条件：横断研究

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抄録

目的：本研究の目的は地域で開催される研修会に参加する地域住民の口腔乾燥感に影響する背景条件を明らかにすることである．

方法：対象は12ヶ所の介護予防研修会に参加した1893人のうち，調査に同意を得て口腔乾燥感一覧（XI）に回答した1137人とした．方法は自記式質問紙調査とし，主な調査項目は対象者の背景条件，口腔乾燥感一覧（XI）とした．

結果：口腔乾燥感に影響する背景条件は，年齢，服薬，睡眠，便秘，義歯の有無であった．また，口腔乾燥感はQOLに影響を及ぼしていた．

結論：口腔機能の改善を目的とした長期介護予防ワークショップを開催する場合は，参加者の背景的特徴を考慮する必要がある．

キーワード：口腔乾燥感，長期療養ケア，介護予防，因子