

Questionnaire Survey Results on Swallowing in Yakumo Town Resident's Health Examination (Comparison between 2009 and 2019)

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Abstract

The purpose of this study was to understand the state of swallowing function in males and females in their 40s and 80s who live independently in Japan, which is a super-aging society. In Yakumo Town, Hokkaido, Japan, where there is almost no population movement, we conducted a self-administered questionnaire survey on swallowing function at the annual resident health checkup. Furthermore, this time, we compared the questionnaire survey on swallowing function conducted in 2009 with the questionnaire survey on swallowing function conducted in 2019. After 10 years, we used statistical methods to investigate whether the results of the questionnaire survey on swallowing function changed. As a result, in 2009, there was a statistically significant difference between males and females in 3 of the 15 questions regarding swallowing function. However, there was no significant difference between males and females in 2019. In a comparison 10 years later, 4 out of 15 items in the 50s to 80s in 2019 were statistically significantly lower than those in the 40s to 70s in 2009. It was suggested that the swallowing function for males may change faster than that of females. In the future, we would like to continue to conduct questionnaire surveys on swallowing function, dietary habits, exercise habits, muscle mass measurement, etc. to understand the situation regarding swallowing function from idle-aged to elderly people living independently.

Keywords: Healthy elderly people, Questionnaire survey, Swallowing, Residents' Health Examination.

Introduction

Japan, which is a super-aging society, is making various efforts to realize healthy longevity for many elderly people. Above all, we are focusing on efforts related to eating and swallowing to prevent undernutrition and prevent frailty [1-4] and sarcopenia [5]. As the muscle mass of the whole body decreases with aging [6], the swallowing function is likely to deteriorate [7]. It has been reported that undernutrition affects the swallowing muscles [8,5]. However, it has also been reported that head raising training [9,10] and tongue muscle strengthening training improve swallowing [11]. Even in Alzheimer's disease, maintenance of swallowing function leads to prevention of

many diseases because it was found to be associated with systemic muscle loss and dysphagia [12]. Therefore, in this study, we conducted a questionnaire survey on swallowing function in the health examination of residents in Yakumo Town, Hokkaido, Japan, where the population is almost no migration, and grasped the swallowing function status of residents living independently in their 40s to 80s. Furthermore, this time, we compared the questionnaire survey on swallowing function conducted in 2009 with the questionnaire survey on swallowing function conducted in 2019. We investigated the secular change in swallowing function after 10 years.

Material and Methods

Participants

A questionnaire survey was conducted among the participants of the Yakukmo Town Residents' Health Examination, among the participants who consulted the otolaryngology department.

Questionnaire survey

There was a total of 15 items in the questionnaire survey on swallowing. The questionnaire was self-administered to the participants. The contents of the question show below.

- 1) Do you have a hard time chewing solid foods (apples, cookies, rice crackers, etc?)
- 2) Does food remain in the mouth (chin or back of tongue) or get caught in the upper jaw after swallowing?
- 3) When eating or drinking, can food or drink come out of your nose?
- 4) Can food what you chew well drips form your mouth?
- 5) Do you feel a lot of drooling? (Have you ever felt drooling or difficult ot swallow?)
- 6) Do you swallow well-chewed food several times as it passes through your throat?
- 7) Do you have a hard time swallowing solid food?
- 8) Do you have a hard time swallowing mashed food?
- 9) Do you feel like a lump of food itch in your throat while eating?
- 10) Do you cough when swallowing liquid?
- 11) Do you cough when swallowing solid foods?

12) Does your voice change immediately after eating or drinking? (For example, the voice withers, the voice becomes quiet, etc.)

13) Can saliva enter the trachea and cause coughing or difficulty breathing except during meals (such as at night)?

14) Do you have difficulty breathing while eating?

15) Have you ever had pneumonia or bronchitis in the last year?

Results

Participants Age and Sex

The number of participants in the otolaryngology area of the Yakumo Town Residents Examination in 2009 was 158 males and 264 females (To see Table 1). Looking at the participants by age group, males were most likely to participate in their 60's (60 peoples), and females were most likely to be in their 60's (104 peoples).

The number of participants in the otolaryngology area of the Yakumo Town Residents Examination in 2019 was 44 males and 64 females (To see Table 2). Looking at the participants by age group, males were most likely to participate in their 60's (16peoples), and females were most likely to be in their 60's (25 peoples).

Compared to 2009, the number of participants in 2019 has decreased to 1/4, so it is difficult to compare of the swallowing data. However, we think the trend will be shown.

Table 1. Age distribution of participant in Yakumo study 2009 years

	40's	50's	60's	70's	80's
Male (n=158)	11	24	60	45	18
Female (n=264)	29	66	104	56	9
Total (n=422)	40	90	164	101	27

Table 2. Age distribution of participant in Yakumo study 2019 years

	40's	50's	60's	70's	80's
Male (n=44)	3	6	16	14	5
Female (n=64)	11	7	25	15	6
Total (n=108)	14	13	41	29	11

Questionnaire survey results

In 2009, the average number of male and female respondents who answered that there was no problem in answering Question 1 (Do you have a hard time chewing

solid foods?) exceeded 80%. In 2010, the average number of male and female respondents who answered that there was no problem in answering Question 1 exceeded 70%.

Table3. Do you have a hard time chewing solid foods (apples, cookies, rice crackers, etc.)? 2009

	Male (n=158)		Female (n=264)	
	No	%	No	%
40's (M=11,F=29)	11	100	25	86
50's (M=24, F=66)	23	96	58	88
60's M=60, F=104)	48	80	81	78
70's (M=45, F=56)	27	60	47	84
80's (M=18, F=9)	13	72	9	100
Average	24.4	81.6	44.0	87.2
Standard deviation	14.8	16.6	28.1	8.1
Unpaired t-test	P<0.5174			

Table4. Do you have a hard time chewing solid foods(apples, cookies, rice crackers, etc.)? 2019

	Male (n= 44)		Female (n=64)	
	No	%	No	%
40's (M=3, F=11)	3	100	10	91
50's (M=6, F=7)	6	100	4	57
60's (M=16, F=25)	14	88	22	88
70's (M=14, F=15)	8	57	10	67
80's (M=5, F=6)	1	20	4	67
Average	6.4	73.0	10.0	74.0
Standard deviation	5.0	34.5	7.3	14.8
Unpaired t-test	P<0.9539			

In 2009, the average number of male and female respondents who answered that there was no problem in answering Question 2 (Does food remain in the mouth or get caught in the upper jaw after swallowing?) exceeded

70%. In 2010, the average number of male and female respondents who answered that there was no problem in answering Question 1 exceeded 65%.

Table5. Does food remain in the mouth (chin or back of tongue) or get caught in the upper jaw after swallowing? 2009

	Male (n=158)		Female (n=264)	
	No	%	No	%
40's (M=11,F=29)	8	73	27	83
50's (M=24, F=66)	20	83	57	86
60's M=60, F=104)	43	72	81	78
70's (M=45, F=56)	35	78	40	71
80's (M=18, F=9)	9	50	6	67
Average	23.0	71.2	42.2	77.0
Standard deviation	15.6	12.6	28.6	8.0
Unpaired t-test	P<0.4106			

Table6. Does food remain in the mouth (chin or back of tongue) or get caught in the upper jaw after swallowing? 2019

	Male (n= 44)		Female (n=64)	
	No	%	No	%
40's (M=3, F=11)	2	67	10	91
50's (M=6, F=7)	5	83	6	86
60's (M=16, F=25)	12	75	23	92
70's (M=14, F=15)	9	64	10	67
80's (M=5, F=6)	2	40	3	50
Average	6.0	65.8	10.4	77.2
Standard deviation	4.4	16.2	7.6	18.2
Unpaired t-test	P<0.3267			

In 2009, the average number of male and female respondents who answered that there was no problem in answering Question 3 (When eating or drinking, can food or drink come out of your nose?) exceeded 95%. In 2010,

the average number of male and female respondents who answered that there was no problem in answering Question 1 exceeded 85%.

Table7. When eating or drinking, can food or drink come out of your nose? 2009

	Male (n=158)		Female (n=264)	
	No	%	No	%
40's (M=11,F=29)	11	100	29	100
50's (M=24, F=66)	23	96	63	95
60's M=60, F=104)	56	93	100	96
70's (M=45, F=56)	41	91	53	95
80's (M=18, F=9)	18	100	9	89
Average	29.8	96.0	50.8	95.0
Standard deviation	18.4	4.1	34.6	3.9
Unpaired t-test	P<0.7030			

Table8. When eating or drinking, can food or drink come out of your nose? 2019

	Male (n= 44)		Female (n=64)	
	No	%	No	%
40's (M=3, F=11)	2	67	11	100
50's (M=6, F=7)	6	100	7	100
60's (M=16, F=25)	16	100	25	100
70's (M=14, F=15)	14	100	15	100
80's (M=5, F=6)	4	80	4	67
Average	8.4	89.4	12.4	93.4
Standard deviation	6.2	15.2	8.2	14.8
Unpaired t-test	P<0.6843			

In 2009, the average number of male and female respondents who answered that there was no problem in answering Question 4 (Can food what you chew well drips form your mouth?) exceeded 90%. In 2010, the average

number of male and female respondents who answered that there was no problem in answering Question 1 exceeded 85%.

Table9. Can food what you chew well drips form your mouth? 2009

	Male (n=158)		Female (n=264)	
	No	%	No	%
40's (M=11,F=29)	11	100	27	93
50's (M=24, F=66)	23	96	66	100
60's M=60, F=104)	58	97	102	98
70's (M=45, F=56)	41	91	53	95
80's(M=18, F=9)	15	83	7	78
Average	29.6	93.4	51.0	92.8
Standard deviation	19.6	6.7	36.5	8.7
Unpaired t-test	P<0.9055			

Table10. Can food what you chew well drips form your mouth? 2019

	Male (n= 44)		Female (n=64)	
	No	%	No	%
40's (M=3, F=11)	3	100	11	100
50's (M=6, F=7)	5	83	7	100
60's (M=16, F=25)	13	81	25	100
70's (M=14, F=15)	12	86	15	100
80's (M=5, F=6)	4	80	4	67
Average	7.4	86.0	12.4	93.4
Standard deviation	4.7	8.2	8.2	14.8
Unpaired t-test	P<0.3552			

In 2009, the average number of male and female respondents who answered that there was no problem in answering Question 5 (Do you feel a lot of drooling?)

exceeded 90%. In 2010, the average number of male and female respondents who answered that there was no problem in answering Question 1 exceeded 85%.

Table11. Do you feel a lot of drooling? (Have you ever felt drooling or difficult ot swallow?) 2009

	Male (n=158)		Female (n=264)	
	No	%	No	%
40's (M=11,F=29)	9	82	26	90
50's (M=24, F=66)	23	96	66	100
60's M=60, F=104)	53	88	98	94
70's (M=45, F=56)	40	89	53	95
80's (M=18, F=9)	14	98	9	100
Average	27.8	90.6	50.4	95.8
Standard deviation	18.4	6.5	34.7	4.3
Unpaired t-test	P<0.1717			

Table12. Do you feel a lot of drooling? (Have you ever felt drooling or difficult to swallow?) 2019

	Male (n= 44)		Female (n=64)	
	No	%	No	%
40's (M=3, F=11)	3	100	10	91
50's (M=6, F=7)	6	100	6	86
60's (M=16, F=25)	16	100	24	96
70's (M=14, F=15)	10	71	14	93
80's (M=5, F=6)	4	80	5	83
Average	7.8	90.2	11.8	89.8
Standard deviation	5.3	13.8	7.7	5.3
Unpaired t-test	P<0.9532			

In 2009, the average number of male and female respondents who answered that there was no problem in answering Question 6 (Do you swallow well-chewed food several times as it passes through your throat?) exceeded

75%. In 2010, the average number of male and female respondents who answered that there was no problem in answering Question 1 exceeded 80%.

Table13. Do you swallow well-chewed food several times as it passes through your throat? 2009

	Male (n=158)		Female (n=264)	
	No	%	No	%
40's (M=11, F=29)	10	91	28	97
50's (M=24, F=66)	22	92	52	79
60's (M=60, F=104)	52	87	96	92
70's (M=45, F=56)	40	89	47	84
80's (M=18, F=9)	4	22	8	89
Average	25.6	76.2	46.2	88.2
Standard deviation	20.2	30.4	32.8	7.0
Unpaired t-test	P<0.4141			

Table14. Do you swallow well-chewed food several times as it passes through your throat? 2019

	Male (n= 44)		Female (n=64)	
	No	%	No	%
40's (M=3, F=11)	2	67	10	91
50's (M=6, F=7)	6	100	6	86
60's (M=16, F=25)	16	100	24	96
70's (M=14, F=15)	10	71	12	80
80's (M=5, F=6)	4	80	5	83
Average	7.6	83.6	11.4	87.2
Standard deviation	5.5	15.7	7.6	6.4
Unpaired t-test	P<0.6474			

In 2009, the average number of male and female respondents who answered that there was no problem in answering Question 7 (Do you have a hard time swallowing

solid food?) exceeded 85%. In 2010, the average number of male and female respondents who answered that there was no problem in answering Question 1 exceeded 80%.

Table15. Do you have a hard time swallowing solid food?
2009

	Male (n=158)		Female (n=264)	
	No	%	No	%
40's (M=11,F=29)	11	100	27	93
50's (M=24, F=66)	20	83	62	94
60's M=60, F=104)	54	90	96	92
70's (M=45, F=56)	37	82	51	91
80's (M=18, F=9)	15	83	9	100
Average	27.4	87.6	49.0	94.0
Standard deviation	17.9	7.6	33.4	3.5
Unpaired t-test	P<0.1274			

Table16. Do you have a hard time swallowing solid food? 2019

	Male (n= 44)		Female (n=64)	
	No	%	No	%
40's (M=3, F=11)	2	67	8	73
50's(M=6, F=7)	6	100	5	71
60's (M=16, F=25)	15	94	24	96
70's (M=14, F=15)	11	79	12	80
80's (M=5, F=6)	3	60	5	83
Average	7.4	80.0	10.8	80.6
Standard deviation	5.5	17.1	7.9	9.9
Unpaired t-test	P<0.9475			

In 2009, the average number of male and female respondents who answered that there was no problem in answering Question 8 (Do you have a hard time swallowing

mashed food?) exceeded 95%. In 2010, the average number of male and female respondents who answered that there was no problem in answering Question 1 exceeded 90%.

Table17. Do you have a hard time swallowing mashed food?
2009

	Male (n=158)		Female (n=264)	
	No	%	No	%
40's (M=11,F=29)	11	100	29	100
50's (M=24, F=66)	24	100	64	97
60's M=60, F=104)	58	97	104	100
70's (M=45, F=56)	42	93	54	96
80's (M=18, F=9)	17	94	9	100
Average	30.4	96.8	52.0	98.6
Standard deviation	19.3	3.3	36.2	1.9
Unpaired t-test	P<0.3214			

Table18. Do you have a hard time swallowing mashed food?
2019

	Male (n= 44)		Female (n=64)	
	No	%	No	%
40's (M=3, F=11)	3	100	11	100
50's (M=6, F=7)	6	100	6	86
60's (M=16, F=25)	16	100	25	100
70's (M=14, F=15)	13	93	14	93
80's (M=5, F=6)	5	100	5	83
Average	8.6	98.6	12.2	92.4
Standard deviation	5.6	3.1	8.0	7.8
Unpaired t-test	P<0.1388			

In 2009, the average number of male and female respondents who answered that there was no problem in answering Question 9 (Do you feel like a lump of food itch in your throat while eating? exceeded 85%. In 2010, the

average number of male and female respondents who answered that there was no problem in answering Question 1 exceeded 75%.

Table19. Do you feel like a lump of food itch in your throat while eating? 2009

	Male (n=158)		Female (n=264)	
	No	%	No	%
40's (M=11,F=29)	10	91	24	83
50's (M=24, F=66)	21	88	58	88
60's M=60, F=104)	54	90	90	87
70's (M=45, F=56)	41	91	47	84
80's (M=18, F=9)	17	94	8	89
Average	28.6	90.8	45.4	86.2
Standard deviation	18.3	2.2	31.7	2.6
Unpaired t-test	P<0.0159*			

Table20. Do you feel like a lump of food itch in your throat while eating? 2019

	Male (n= 44)		Female (n=64)	
	No	%	No	%
40's (M=3, F=11)	3	100	10	91
50's (M=6, F=7)	5	83	4	57
60's (M=16, F=25)	13	81	23	92
70's (M=14, F=15)	7	50	13	87
80's (M=5, F=6)	4	80	3	50
Average	6.4	78.8	10.6	75.4
Standard deviation	4.0	18.0	8.1	20.2
Unpaired t-test	P<0.7863			

In 2009, the average number of male and female respondents who answered that there was no problem in answering Question 10 (Do you cough when swallowing

liquid?) exceeded 85%. In 2010, the average number of male and female respondents who answered that there was no problem in answering Question 1 exceeded 80%.

Table21. Do you cough when swallowing liquid? 2009

	Male (n=158)		Female (n=264)	
	No	%	No	%
40's (M=11,F=29)	10	91	26	89
50's (M=24, F=66)	21	88	60	91
60's M=60, F=104)	53	88	90	87
70's (M=45, F=56)	37	82	46	82
80's (M=18, F=9)	16	89	9	100
Average	27.4	87.6	46.2	89.8
Standard deviation	17.5	3.4	31.2	6.6
Unpaired t-test	P<0.5258			

Table22. Do you cough when swallowing liquid? 2019

	Male ((n= 44)		Female (n=64)	
	No	%	No	%
40's (M=3, F=11)	3	100	9	82
50's (M=6, F=7)	6	100	6	100
60's (M=16, F=25)	12	75	23	92
70's (M=14, F=15)	12	86	13	87
80's (M=5, F=6)	3	60	4	67
Average	7.2	84.2	11.0	85.6
Standard deviation	4.5	17.1	7.5	12.3
Unpaired t-test	P<0.8858			

In 2009, the average number of male and female respondents who answered that there was no problem in answering Question 11 (Do you cough when swallowing

solid foods?) exceeded 85%. In 2010, the average number of male and female respondents who answered that there was no problem in answering Question 1 exceeded 85%.

Table 23. Do you cough when swallowing solid foods? 2009

	Male (n=158)		Female (n=264)	
	No	%	No	%
40's (M=11,F=29)	10	91	28	97
50's (M=24, F=66)	21	88	64	97
60's M=60, F=104)	55	92	101	97
70's (M=45, F=56)	40	89	52	93
80's (M=18, F=9)	15	83	9	100
Average	28.2	88.6	50.8	96.8
Standard deviation	18.8	3.5	35.2	2.5
Unpaired t-test	P<0.0026**			

Table24. Do you cough when swallowing solid foods ? 2019

	Male (n= 44)		Female (n=64)	
	No	%	No	%
40's (M=3, F=11)	3	100	11	100
50's (M=6, F=7)	6	100	7	100
60's (M=16, F=25)	14	88	22	88
70's (M=14, F=15)	12	96	14	93
80's (M=5, F=6)	4	80	4	67
Average	7.8	92.8	11.6	89.6
Standard deviation	4.9	8.7	6.9	13.6
Unpaired t-test	P<0.6697			

In 2009, the average number of male and female respondents who answered that there was no problem in answering Question 12 (Does your voice change immediately after eating or drinking?) exceeded 90%. In

2010, the average number of male and female respondents who answered that there was no problem in answering Question 1 exceeded 90%.

Table25. Does your voice change immediately after eating or drinking? (For example, the voice withers, the voice becomes quiet, etc.) 2009

	Male (n=158)		Female (n=264)	
	No	%	No	%
40's (M=11,F=29)	11	100	28	97
50's (M=24, F=66)	22	92	65	98
60's M=60, F=104)	58	97	103	99
70's (M=45, F=56)	41	91	51	91
80's (M=18, F=9)	15	83	9	100
Average	29.4	92.6	51.2	97.0
Standard deviation	19.7	6.5	36.0	3.5
Unpaired t-test	P<0.2205			

Table26. Does your voice change immediately after eating or drinking? (For example, the voice withers, the voice becomes quiet, etc.) 2019

	Male (n= 44)		Female (n=64)	
	No	%	No	%
40's (M=3, F=11)	3	100	11	100
50's (M=6, F=7)	6	100	6	86
60's (M=16, F=25)	16	100	25	100
70's (M=14, F=15)	12	86	14	93
80's (M=5, F=6)	4	80	5	83
Average	8.2	93.2	12.2	92.4
Standard deviation	5.6	9.5	8.0	7.8
Unpaired t-test	P<0.8884			

In 2009, the average number of male and female respondents who answered that there was no problem in answering Question 13 (Can saliva enter the trachea and cause coughing or difficulty breathing except during

meals?) exceeded 75%. In 2010, the average number of male and female respondents who answered that there was no problem in answering Question 1 exceeded 80%.

Table27. Can saliva enter the trachea and cause coughing or difficulty breathing except during meals (such as at night)? 2009

	Male (n=158)		Female (n=264)	
	No	%	No	%
40's (M=11,F=29)	9	82	25	86
50's (M=24, F=66)	18	75	57	86
60's M=60, F=104)	48	80	90	87
70's (M=45, F=56)	37	82	44	79
80's (M=18, F=9)	14	78	8	89
Average	25.2	79.4	44.8	85.4
Standard deviation	16.6	3.0	31.4	3.8
Unpaired t-test	P<0.0235*			

Table28. Can saliva enter the trachea and cause coughing or difficulty breathing except during meals (such as at night)? 2019

	Male (n= 44)		Female (n=64)	
	No	%	No	%
40's (M=3, F=11)	3	100	10	91
50's (M=6, F=7)	5	83	5	71
60's (M=16, F=25)	12	75	21	84
70's (M=14, F=15)	12	86	14	93
80's (M=5, F=6)	3	60	5	83
Average	7.0	80.8	11.0	84.4
Standard deviation	4.6	14.7	6.7	8.6
Unpaired t-test	P<0.6944			

In 2009, the average number of male and female respondents who answered that there was no problem in answering Question 14 (Do you have difficulty breathing

while eating?) exceeded 90%. In 2010, the average number of male and female respondents who answered that there was no problem in answering Question 1 exceeded 90%.

Table29. Do you have difficulty breathing while eating? 2009

	Male (n=158)		Female (n=264)	
	No	%	No	%
40's (M=11,F=29)	10	91	29	100
50's (M=24, F=66)	23	96	65	98
60's M=60, F=104)	58	97	100	96
70's (M=45, F=56)	42	93	52	93
80's (M=18, F=9)	17	94	9	100
Average	30.0	94.2	51.0	97.4
Standard deviation	19.7	2.4	34.8	3.0
Unpaired t-test	P<0.0970			

Table30. Do you have difficulty breathing while eating? 2019

	Male (n= 44)		Female (n=64)	
	No	%	No	%
40's (M=3, F=11)	3	100	11	100
50's (M=6, F=7)	6	100	7	100
60's (M=16, F=25)	16	100	25	100
70's (M=14, F=15)	13	93	14	93
80's (M=5, F=6)	4	80	5	83
Average	8.4	94.6	12.4	95.2
Standard deviation	5.8	8.7	7.9	7.5
Unpaired t-test	P<0.9097			

In 2009, the average number of male and female respondents who answered that there was no problem in answering Question 15 (Have you ever had pneumonia or bronchitis in the last year?) exceeded 95%. In 2010, the

average number of male and female respondents who answered that there was no problem in answering Question 1 exceeded 95%.

Table31. Have you ever had pneumonia or bronchitis in the last year? 2009

	Male (n=158)		Female (n=264)	
	No	%	No	%
40's (M=11, F=29)	11	100	28	96
50's (M=24, F=66)	23	96	65	98
60's (M=60, F=104)	57	95	90	87
70's (M=45, F=56)	44	98	54	96
80's (M=18, F=9)	18	100	9	100
Average	30.6	97.8	49.2	95.4
Standard deviation	19.2	2.3	31.6	5.0
Unpaired t-test	P<0.3559			

Table32. Have you ever had pneumonia or bronchitis in the last year? 2019

	Male (n= 44)		Female (n=64)	
	No	%	No	%
40's (M=3, F=11)	3	100	11	100
50's (M=6, F=7)	6	100	7	100
60's (M=16, F=25)	15	94	25	100
70's (M=14, F=15)	13	93	15	100
80's (M=5, F=6)	5	100	5	83
Average	8.4	97.4	12.6	96.6
Standard deviation	5.3	3.6	7.9	7.6
Unpaired t-test	P<0.8367			

In order to investigate the decline in swallowing function due to aging, we compared the 40s to 70s in 2009 with the 50s to 80s in 2019. As a result, there was no statistically significant difference in all 15 questions for females to

know swallowing function even after 10 years. However, in 4 out of the 15 items for knowing swallowing function, males were statistically significantly getting worse in their 50s to 80s in 2019 than in their 40s to 70s in 2009.

Table 33 Comparison of results of questionnaire survey on swallowing function:
Changes over 10 years from 2009 to 2019
(Comparison between 40s to 70s in 2009 and 50s to 80s in 2019)

	Q1		Q2		Q3		Q4		Q5	
	2009	2019	2009	2019	2009	2019	2009	2019	2009	2019
Male	P<0.5180		P<0.6097		P<0.1639		P<0.0082**		P<0.0591	
Female	P<0.3155		P<0.1446		P<0.1215		P<0.2078		P<0.4369	
	Q6		Q7		Q8		Q9		Q10	
	2009	2019	2009	2019	2009	2019	2009	2019	2009	2019
Male	P<0.0035**		P<0.2727		P<0.3717		P<0.0028**		P<0.09770	
Female	P<0.6803		P<0.3082		P<0.3135		P<0.3686		P<0.0823	
	Q11		Q12		Q13		Q14		Q15	
	2009	2019	2009	2019	2009	2019	2009	2019	2009	2019
Male	P<0.3653		P<0.1912		P<0.8401		P<0.0496*		P<0.9245	
Female	P<0.6408		P<0.5559		P<0.2225		P<0.2204		P<0.1945	

Unpaired t-test

Discussion

In this test, a questionnaire survey on swallowing was conducted at the Yakumo Town Residents' Health Examination, and the results were obtained. There were 15 questions, and both males and females were tabulated by age group, and the number of people who answered that there was no problem (No) was divided by the number of participants in each age group and compared by the percentage value obtained.

Initially, I thought that by comparing the 40s to 70s in 2009 with the 50s and 80s in 2019, we could know the changes in 10 years. However, since the number of participants in the resident health checkup is 1/4 in 2019 compared to 2009, we would like to use this result only to grasp future trends. Ten years later, females did not have a statistically significant difference in their answers to the 15 swallowing questions between their 40s to 70s in 2009 and their 50s to 80s in 2019. However, for males, in the answers to the 15 questions regarding swallowing, there was a statistically significant difference in 4 items in the comparison between the 40s to 70s in 2009 and the 50s to 80s in 2019. In males, 4 items (Can food what you chew well drips form your mouth? Do you swallow well-chewed food several times as it passes through your throat? Do you feel like a lump of food itch in your throat while eating? Do you have difficulty breathing while eating?) showed a decreased swallowing function after 10 years. From this result, we think that facial muscles and swallowing muscles may weaken faster in male than in female. In addition, it has been reported that muscle mass decreases without occlusion of natural teeth [13], so it is necessary to confirm the presence or absence of teeth in the future. It may also be necessary to measure muscle mass, as it has been reported that muscles weaken systemically with age [6]. Since muscle weakness of swallowing-related muscle groups is closely related to dysphagia [14,15], it is necessary to detect and rehabilitate early to prevent sarcopenia [7,16-18] and frailty syndrome [1-4] and to prevent Alzheimer's disease [12]. I will be necessary to measure muscle strength (grip strength test) at the same time as the questionnaire survey of swallowing function in the future. In addition, there are reports that swallowing function declines in relation to lifestyle and eating habits [19,20], so we think it is necessary to increase the number of questions including undernutrition [5]. In

order to prevent deterioration of swallowing function, it is necessary for the super-aging society in the future to perform rehabilitation [9,11,21] and aim for healthy longevity.

Conclusion

A questionnaire survey on swallowing function was conducted during a resident health checkup in Yakumo Town. As result, there was no statistically significant difference in the responses between males and females in 2019. However, in 2009, there was a statistically significant difference between males and females in 3 of the 15 questionnaire survey items related to swallowing function. In Question 9(Do you feel like a lump of food itch in your throat while eating?), males answered that there was no problem compared to females, and there was a statistically significant difference (P<0.0159*). In Question 11(Do you cough when swallowing solid foods?), females answered that there was no problem compared to males, and there was a statistically significant difference (P<0.0026**). In Question 13(Can saliva enter the trachea and cause coughing or difficulty breathing except during meals (such as at night)?), females answered that there was no problem compared to males, and there was a statistically significant difference (P<0.0235*). In order to investigate the decline in swallowing function due to aging, we compared the 40sto 70s in 2009 with the 50s to 80s (10 years later) in 2019. As a result, there was no statistically significant difference in all 15 questions for females to know swallowing function even after 10 years. However, In 4 (Can food what you chew well drips form your mouth?, Do you swallow well-chewed food several times as it passes through your throat?, Do you feel like a lump of food itch in your throat while eating?, Do you have difficulty breathing while eating ?) out of the 15 items for knowing swallowing function, males were statistically significantly getting worse in their 50s to 80s in 2019 than in their 40s to 70s in 2009. We would like to continue to investigate and understand the state of swallowing function of elderly people from the middle ages who are living independently.

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