



Original Article

Improvement of frailty prevalence: difference in factors affecting frailty prevalence among 75 year-old individuals between 2006 and 2019

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Abstract. [Purpose] This study aimed to examine and compare the prevalence of frailty in 75 year-old people sampled in two remote years, namely 2006 and 2019. [Participants and Methods] A total of 910 participants aged 75 years were included (502 people in 2006 and 408 people in 2019). We compared the total score of the Kihon checklist and each question for males and females between the two years. [Results] The prevalence of frailty decreased from 24.3% in 2006 to 15.2% in 2019. The comparison of the 2006 and 2019 Kihon checklists revealed significant differences in activities of daily living, physical function, oral function, outdoor activities, and cognitive function. [Conclusion] Frailty among 75 year-old individuals improved in 2019 compared to that in 2006. Improved activities of daily living, physical function, outdoor activities, and cognitive function were major causes of improved frailty in 2019.

Key words: Aging, Daily living, Frailty

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INTRODUCTION

Older adults (aged >65 years) accounted for 28.4% (36 million)¹⁾ of the total population of Japan in 2019 (126 million), which is the highest percentage of older adults in the world. With increased aging in the Japanese population, frailty in older adults has become a serious issue and has gained much attention. Frailty increases with age²⁾ and is associated with the risk of falls, hospitalization, disability, and death³⁾.

The Kihon checklist (KCL) was developed to identify frailty in older adults in Japan⁴⁾. The KCL is a self-assessment tool comprising 25 yes/no questions divided into seven categories: activities of daily living (ADL), physical strength, nutrition, oral function, outdoor activities, memory, and depressive mood. It is reported to be a reliable tool for predicting general frailty and aspects of frailty, such as functional disability, IADL limitations, depressive mood and others, in older adults⁵⁾.

A Japanese study in 2017⁶⁾ on the frailty prevalence in older adults (>65 years) reported that 7.4% were frailty, 48.1% were pre-frailty, and 44.4% were robust. The frailty prevalence by age group was 1.9%, 3.8%, 10.0%, and 35.1% in the age groups of 65–69, 70–74, 75–79, and 80–84 years, respectively, indicating increased prevalence with age. In addition, the prevalence of frailty was higher in females (8.1%) than males (7.6%). However, although the prevalence of frailty increases with age, no study has reported the difference in frailty prevalence, such as a comparison of current prevalence with earlier reports for the same age group, except for the study by Makizato et al.⁷⁾ mentioned below.

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Makizako et al.⁷⁾ examined the prevalence of frailty in 2012 and 2017 in older adults aged >65 years and reported a decreased frailty prevalence from 7.0% in 2012 to 5.3% in 2017. Further, they reported that the improvement in frailty was greater among those aged >75 years. A major limitation of the study by Makizako et al.⁷⁾ is that they analyzed prevalence changes over 5 years, which is a short period to examine a trend of annual change.

This study was conducted before the COVID-19 pandemic. In this study, we investigated changes in the prevalence of frailty among 75 year-old adults between 2006 and 2019. The reason for limiting participants to 75 years was based on the previous observation that the prevalence of frailty increases after 75 years⁶⁾ and that it has improved recently among older adults >75 years. Thus, this study aimed to identify and examine the differences in the factors; ADL, physical function, nutritional status oral function, outdoor activities, cognitive function, depressive mood, that constituted frailty in two different years, specifically 2006 and 2019, among 75 year-old individuals, and to help determine how to intervene in frailty. Hypothesis is that the prevalence of frailty will be better in 2019 than in 2006.

PARTICIPANTS AND METHODS

This study is a comparison of KCL data for 75 year old in 2006 and 2019. The population of the target area of this study City A in 2020 was 72,087, of which 20,936 (29.0%) people were ≥65 years⁸⁾ and 9,724 (13.5%) were ≥75 years old. In the 2006 survey, the KCL was distributed by mail or hand-delivered to 5,692 adults aged ≥75 years. Of the 5,504 (96.7%) who responded, 681 aged 75 years were included. In the 2019 survey, the KCL was distributed by mail to 1,772 adults aged 70 and 75 years. Of the 1,249 (70.5%) who responded, 491 aged 75 years were included. In total, 910 respondents were included in the analysis, excluding 179 respondents in 2006 and 83 respondents in 2019, whose KCL responses were incomplete (Fig. 1).

The KCL questionnaire includes the following items: ADL (Q1–5), physical function (Q6–10), nutritional status (Q11–12), oral function (Q13–15), outdoor activities (Q16–17), cognitive function (Q18–20), depressive mood (Q21–25). Each question is answered with a “yes” or “no” and scored on a scale of 0 or 1. Total scores 1–7 were classified as non-frailty, and scores >8 were classified as frailty, based on a previous study⁹⁾, increased with the score.

Consent for this study was obtained using an opt-out method, in which the study was explained on the website of City A. Participants’ data were analyzed after the data were anonymized. This study was conducted by following the Declaration of Helsinki, the privacy protection guidelines of City A, and the outsourcing agreement. The analyses were conducted after obtaining approval (21-Io-38-2) from the International University of Health and Welfare Ethics Committee.

The data are presented as numbers and proportions. Participants’ height, weight, and body mass index (BMI) were compared between the 2006 and 2019 groups using unpaired t-tests. A χ^2 test was used to compare the relationship between year and sex. The total scores of the seven subscales were compared between 2006 and 2019 groups using the Mann–Whitney U test. The KCL total scores between the 2006 and 2019 groups were compared using the unpaired t-test.

RESULTS

We analyzed data for 910 out of 1,172 participants without missing values aged 75 years in 2006 and 2019 (Fig. 1). The participants’ height and weight were significantly higher in 2019 than in 2006, whereas BMI did not differ significantly. There was no association between year and sex (Table 1).

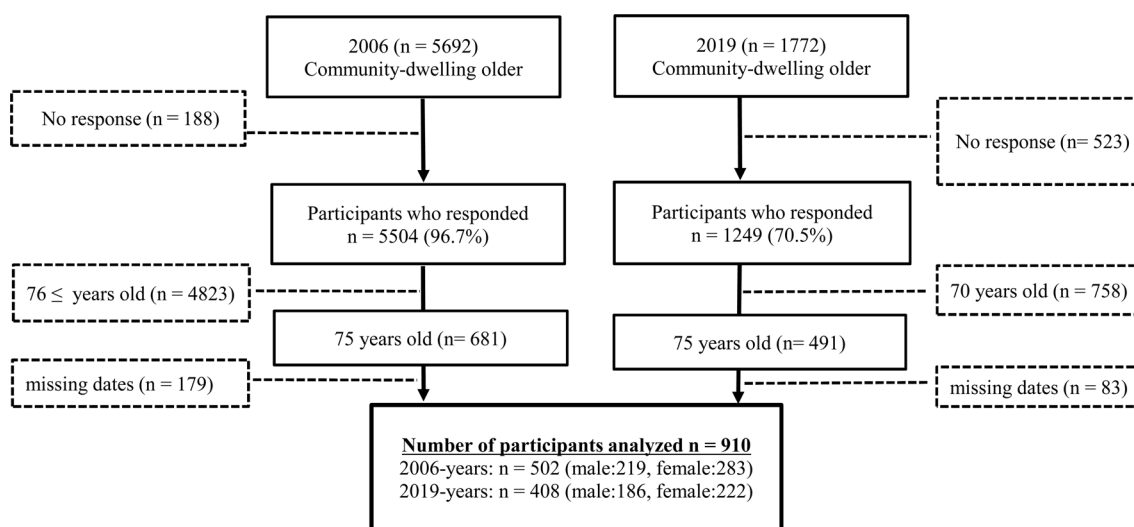


Fig. 1. Diagrammatic representation of participant selection.

There was a significant association between year and frailty in the overall population and among female participants ($p < 0.001$ and $p < 0.004$, respectively). The incidence of frailty was significantly lower in 2019 for both the overall population and female participants (Table 2).

The difference between responses to the questions in the KCL for the years 2006 and 2019 was significant for ADL, (Q1, 2, and 3: $p = 0.00$, $p = 0.00$ and $p = 0.018$, respectively), physical function (Q7, 8, and 10: $p = 0.029$, $p = 0.024$ and $p = 0.003$, respectively), nutrition (Q11: $p = 0.046$), oral function (Q14 and 15: $p = 0.001$, $p = 0.025$, respectively), outdoor activities (Q16 and 17: $p = 0.000$, $p = 0.016$, respectively), cognitive function (Q18: $p = 0.001$), and depressive mood (Q23: $p = 0.046$) (Table 3).

The subscale scores were significantly higher in 2006 than in 2019 for ADL, physical function, outdoor activities, and cognitive function, whereas they were higher for oral function in 2019 than in 2006. The total KCL scores were significantly higher in 2006 than in 2019 (Table 4).

DISCUSSION

To the best of our knowledge, the current study is the first to examine the difference in frailty prevalence between 2019 and 2006 for the same age group (75 year-old individuals) using the KCL. One of the important findings of this study is that the prevalence of frailty was lower in 2019 than in 2006. In 2019, older people had improved KCL scores in ADL, physical function, outdoor activities, and cognitive function compared to those in 2006.

In this study's, frailty prevalence among 75 year-old adults was 24.3% in 2006 and 15.2% in 2019. A previous study⁷⁾ also reported a decline in frailty prevalence among Japanese older adults of the same age over five years. The decrease in frailty prevalence between 2006 and 2019 can be explained by improved physical function, ADL, outdoor activities, and cognitive function in the KCL subscales.

The KCL scores for physical function were significantly lower in 2019 than in 2006. This may be attributed to the rejuvenation of physical function in older adults. For example, Suzuki's¹⁰⁾ longitudinal study reported that walking speed and grip strength of Japanese older people aged >65 years improved compared with those reported in the same age group 10 years earlier. Further, the decline in walking speed and grip strength among older adults has slowed recently¹¹⁾, again indicating a rejuvenation of physical functions. Another analysis from City A revealed that the balance function of standing and walking improved among older adults in 2019 compared with those in 2006¹²⁾. These findings suggest that improvement in physical function helped decrease the prevalence of frailty.

The KCL scores for ADL were significantly better in 2019 than in 2006. As mentioned earlier, the improved physical functions of older people may have provided increased opportunities to go outdoors. Additionally, according to the Annual Report on the Ageing Society 2019¹³⁾, 283 and 564 per 10,000 adults aged 75 years and older in 2007 and 2018, respectively, had a driving license. Thus, their range of activities may have increased, thereby making them more active, and the improvement in ADL may have had a positive impact on the prevalence of frailty.

Table 1. Characteristics of participants

	2006 (n=502)	2019 (n=408)
Height (cm)	153.9 ± 8.2	156.9 ± 8.5*
Weight (kg)	55.2 ± 8.9	57.6 ± 9.7*
BMI (kg/m ²)	23.2 ± 3.1	23.3 ± 3.2
Sex (male/female)	219/283	186/222

Values are presented as mean ± standard deviation. $p < 0.05$. *p-value for the unpaired t-test for 2006 vs. 2019 for height, weight, and BMI. χ^2 test was used to analyze the difference in sex between 2006 and 2019. BMI: body mass index.

Table 2. Association of year and frailty

		2006	2019
All* (n=910)	Non-frail	380 (75.7)	346 (84.8)
	Frail	122 (24.3)	62 (15.2)
Male (n=405)	Non-frail	172 (78.5)	159 (85.5)
	Frail	47 (21.5)	27 (14.5)
Female* (n=505)	Non-frail	208 (73.5)	187 (84.2)
	Frail	75 (26.5)	35 (15.8)

$p < 0.05$. N (%). *p-value for the χ^2 test of the relationship between year and frailty for all, males, and females.

Table 3. Differences between years and responses to each question in the KCL

Questions	Answer (score)	2006 (n=502)	2019 (n=408)
ADL			
*Q1. Do you go out by bus or train by yourself?	No (1)	197 (39.2)	37 (9.1)
*Q2. Do you go shopping to buy daily necessities by yourself?	No (1)	81 (16.1)	18 (4.4)
*Q3. Do you manage your own deposits and savings at the bank?	No (1)	83 (16.5)	45 (11.0)
Q4. Do you sometimes visit your friends?	No (1)	84 (16.7)	75 (18.4)
Q5. Do you turn to your family or friends for advice?	No (1)	71 (14.1)	46 (11.3)
Physical function			
Q6. Do you normally climb stairs without using handrail or wall for support?	No (1)	170 (33.9)	121 (29.7)
*Q7. Do you normally stand up from a chair without any aids?	No (1)	92 (18.3)	53 (13.0)
*Q8. Do you normally walk continuously for 15 min?	No (1)	83 (16.5)	46 (11.3)
Q9. Have you experienced a fall in the past year?	Yes (1)	121 (24.1)	84 (20.6)
*Q10. Do you have a fear of falling while walking?	Yes (1)	216 (43.0)	136 (33.3)
Nutritional status			
*Q11. Have you lost 2kg or more in the past 6 months?	Yes (1)	58 (11.6)	31 (7.6)
Q12. If BMI is less than 18.5, this item is scored.	Yes (1)	31 (6.2)	23 (5.6)
Oral function			
Q13. Do you have any difficulties eating tough foods compared to that 6 months ago?	Yes (1)	142 (28.3)	105 (25.7)
*Q14. Have you choked on your tea or soup recently?	Yes (1)	72 (14.3)	92 (22.5)
*Q15. Do you often experience having a dry mouth?	Yes (1)	89 (17.7)	97 (23.8)
Outdoor activities			
*Q16. Do you go out at least once a week?	No (1)	79 (15.7)	13 (3.2)
*Q17. Do you go out less frequently compared to that last year?	Yes (1)	123 (24.5)	73 (17.9)
Cognitive function			
*Q18. Do your family or your friends point out your memory loss? e.g., “You ask the same question over and over again”.	Yes (1)	94 (18.7)	44 (10.8)
Q19. Do you make a call by looking up phone numbers?	Yes (1)	478 (95.2)	389 (95.3)
Q20. Do you find yourself not knowing today’s date?	Yes (1)	94 (18.7)	68 (16.7)
Depressive mood			
Q21. In the last 2 weeks have you felt a lack of fulfillment in your daily life?	Yes (1)	72 (14.3)	51 (12.5)
Q22. In the last 2 weeks have you felt a lack of joy when doing the things you used to enjoy?	Yes (1)	53 (10.6)	39 (9.6)
*Q23. In the last 2 weeks have you felt difficulty in doing what you could do easily before?	Yes (1)	146 (29.1)	144 (35.3)
Q24. In the last 2 weeks have you felt helpless?	Yes (1)	82 (16.3)	59 (14.5)
Q25. In the last 2 weeks have you felt tired without a reason?	Yes (1)	131 (26.1)	102 (25.0)

* $p < 0.05$. N (%). * χ^2 test was used of the relationship between Yes or No and year for each KCL. KCL: kihon checklist; ADL: activities of daily living; BMI: body mass index.

The KCL outdoor activities scores improved significantly in 2019 compared to 2006. In the Cabinet Office survey¹⁴⁾ on community participation of older adults in 1993 and 2013, the percentage of older respondents answering “I have participated in some group activity” increased from 42.3% to 61.0%. Local governments are working to establish comprehensive community care systems and improve nursing care, medical care, and daily life support to reduce the need for nursing care and enable older adults to continue living in their neighborhoods¹⁵⁾. Consequently, it can be assumed that the environment in which older adults can easily participate in community activities has improved, thereby improving the social activities KCL scores.

The KCL scores for cognitive function were significantly lower in 2019 than in 2006. Estimates on the incidence of dementia¹⁶⁾ suggest an increase from 4.62 million (15.0%) in 2012 to a maximum of 7.3 million (20.6%) in 2025. However, in this study, the cognitive function scores of KCL showed improvement in 2019 relative to 2006. Risk factors for cognitive function include educational history, smoking, marital status, and living alone^{17, 18)}. As these risk factors were not investigated in detail in this study, further investigation is needed to clarify the causes of the differences in cognitive function between 2006 and 2019.

Table 4. Comparison of KCL by 7 subscales

Questions	2006 (n=502)	2019 (n=408)
ADL*	1 (0–2)	0 (0–1)
Physical function*	1 (0–2)	1 (0–2)
Nutritional status	0 (0–0)	0 (0–0)
Oral function*	0 (0–1)	0 (0–1)
Outdoor activities*	0 (0–1)	0 (0–0)
Cognitive function*	0 (0–1)	0 (0–0)
Depressive mood	0 (0–2)	0 (0–1)
Total KCL score*	4.96 ± 4.31	3.97 ± 3.96

* $p < 0.05$. Central value (1st quartile–3rd quartile). Results of the Mann–Whitney U test for analysis of the total scores of the seven subscales between the 2006 and 2019 groups; Results of the unpaired t-test for the analysis of the KCL total scores between the 2006 and 2019 groups; mean ± standard deviation. KCL: kihon checklist; ADL: activities of daily living.

This study has some limitations. First, the sample was limited to older adults aged 75 years in one region; therefore, the findings should be cautiously generalized. Second, the KCL questionnaire survey did not measure confounding factors that can affect frailty, such as grip strength, walking speed, presence or absence of disease, medications, dietary patterns, educational history, and social status.

This study compared factors affecting frailty in 75 year-old adults in 2006 and 2019 and found that the prevalence of frailty among 75 year-olds in 2019 had improved. Furthermore, differences in influencing factors of frailty between 75 year-olds in 2006 and 2019 were investigated, and it was found that regional differences, shopping, dysphagia, weight loss, and going out were the different influencing factors of frailty. Therefore, interventions for frail individuals should be modified to adjust for the differences between past and present prevalence and factors that influence frailty.

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Conflict of interest

There are no conflicts of interest to declare.

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