



Original Article

# Risk factors for falls among community-dwelling older adults during voluntary self-isolation: analysis based on frailty screening index subscales

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**Abstract.** [Purpose] This study aimed to assess fall-related risk factors among community-dwelling older adults during a period of voluntary self-isolation for preventing the spread of COVID-19. [Participants and Methods] This was a cross-sectional study. Survey questionnaire forms were distributed to 2,586 community-dwelling older adults in Takasaki City, Gunma Prefecture, Japan. Completed questionnaires were returned by mail. [Results] Of the 1,645 people who responded, 1,040 people aged 65 and over who did not apply for long-term care insurance and fully completed the questionnaire were included in this study. Since no in-person measurements were required, we utilized the Frailty Screening Index for the evaluations. We evaluated the relationship between questionnaire responses and fall rates among community-dwelling older adults. Among the results, “yes” responses to “Do you think you walk more slowly than before?” were identified as significantly associated with falls. [Conclusion] One must pay careful attention to subjectively assessing decreases in walking speed as a fall prevention measure during periods of self-restraint to prevent the spread of COVID-19 infection.

**Key words:** COVID-19, Walking speed, Self-isolation

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## INTRODUCTION

Since the novel coronavirus disease 19 (COVID-19) pandemic continues, an increasing number of countries and regions have adopted policies restricting movement of the general public, such as voluntary self-isolation, to prevent the spread of infection<sup>1)</sup>. The spread of COVID-19 resulted in 27.3% reductions in the mean global step count within 30 days after the World Health Organization declared COVID-19 to be a pandemic on March 11, 2020. In Japan, it has also been reported that the number of steps has decreased by up to 30% following the declaration of a state of emergency, from April 16 to May 25, 2020, due to attempts to discourage people from engaging in non-essential movement<sup>2)</sup>.

Since the frequency of outdoor movement during the pandemic was lower than that before the outbreak, it could be said that older people may have refrained from spending time outdoors due to the risk of infection<sup>3)</sup>. However, lockdowns in Japan had no legal basis. Thus, a self-quarantine, wherein people voluntarily avoid going out for unnecessary and non-urgent reasons, was suggested and expected to have a deterring effect on viral transmission<sup>4)</sup>.

On the other hand, it has been reported that after the state of COVID-19 emergency announcement, about half of com-

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munity-dwelling older adults felt physically weak<sup>5</sup>). In addition, decreased activity among older adults increased the risk of frailty<sup>6</sup>). It has been revealed that older adults with frailty had a high risk of falling<sup>7</sup>). Traditional fall prevention programs are based on identifying and mitigating existing fall risk factors<sup>8</sup>). Previous studies have indicated that appropriate assessment and prevention strategies may reduce incidence of falls in older adults<sup>9</sup>). However, considering the spread of COVID-19 infection, it is expected that non-face-to-face assessments that do not require measurement will be increasingly preferentially used. It is important to balance between the prevention of COVID-19 infection and preventing falls among at-risk older population. This study aimed to clarify fall-related factors among community-dwelling older adults during the period of voluntary self-isolation in Japan to prevent the spread of COVID-19.

## PARTICIPANTS AND METHODS

This was a cross-sectional study. Survey questionnaire forms comprising questions related to general attributes (age and gender, living with family), the Frailty Screening Index<sup>10</sup>), and falls within the last six months were developed. The questionnaire was distributed to 2,586 community-dwelling older adults (age  $\geq 65$  years) who had visited kayoinoba, such as recreational salons, or received surveillance support from the local welfare commissioner in Takasaki City, Gunma Prefecture, Japan. Completed questionnaires were returned by mail. The survey was conducted between November 11, 2020, and January 10, 2021. Based on the occurrence of falls within the last six months, those who fell at least once were included in the fall group, while those who did not fall were allocated to the non-fall group. This was based on a previous study's finding<sup>11</sup>) in which a prior history of falls was found to be a risk factor. Next, we analyzed variables, such as age, gender, living with family, total score of the Frailty Screening Index and the sub-items of it.

This study was approved by the Research Ethics Committee of Takasaki University of Health and Welfare (approval number: 2009) and registered with the University Hospital Medical Information Network (UMIN000040335).

In this study, we utilized a questionnaire for the elderly as an evaluation method that did not require in-person measurements. Furthermore, we evaluated the relationship between the Frailty Screening Index and fall rate.

The Frailty Screening Index is a questionnaire that comprises five items answered with simple Yes/No responses and scoring ranging from 0 to 5. The Frailty Screening Index has been widely used to determine frailty among community-dwelling older adults, and it can capture changes in vulnerability over time<sup>10</sup>). It does not require any actual measurement of grip strength or walking speed. It is recommended according to the 2017 Asia-Pacific Clinical Practice Guidelines for management of frailty<sup>12</sup>).

The Frailty Screening Index comprises the following five items: one point each is given for a “yes” to the questions “Have you lost two to three kg or more over the past six months? (Yes/No)”; “Do you think you walk slower than before? (Yes/No)”; and “Have you felt tired for no reason (for the past two weeks)? (Yes/No). Further, one point each is given for a “no” to the questions “Do you do physical exercise like walking at least once a week? (Yes/No)”; and “Can you recall what happened five minutes ago? (Yes/No)”. The frailty status was determined based on participant's score; a score  $\geq 3$  was defined as frail, 1 to 2 as pre-frail, and 0 as robust. It has been reported that those who were diagnosed with frailty had a higher chance of being certified as requiring long-term care in the next two years<sup>10</sup>).

Compared to studies that focused on the total score of the Frailty Screening Index, very few studies have analyzed responses to its sub-items<sup>13</sup>). Accordingly, we compared the study groups using sub-items of the Frailty screening index to extract more specific fall-related factors.

Before comparing age and total scores of the Frailty Screening Index between the groups, the Shapiro–Wilk test was used to test for normality. Since normality was not noted in the fall or non-fall groups, the Mann–Whitney U test was used. To compare scores of the sub-items of the Frailty Screening Index and gender, a chi-square test was utilized. Furthermore, the odds ratio and 95% confidence interval were calculated using binomial logistic regression analysis (forcibly input and adjusted for age, gender, and living with family), with occurrence or non-occurrence of falls as the dependent variable. However, the item in which a significant difference was found in the comparison between the groups was considered as the independent variable. Regarding statistical analysis, Excel statistics (BellCurve for Excel version 3.21) manufactured by Social Information Services Co., Ltd. (Tokyo, Japan) was used, and the significance level was set to 5%.

## RESULTS

Out of the 1,645 people who responded (total response rate of 63.6%), 1,040 people aged 65 and over, who did not apply for long-term care insurance and had no missing responses, were included in this study. There were 120 (11.5%) participants in the fall group and 920 (88.5%) participants in the non-fall group (Table 1). As a result of the comparison between the two groups, a significant difference was found in participant responses regarding their total score of the Frailty Screening Index ( $p < 0.001$ ). In terms of between-group comparisons in the sub-items of the Frailty Screening Index, significant differences were found in the following questions: “Do you think you walk slower than before? (Yes/No)” ( $p = 0.008$ ); and “Do you perform physical exercise such as walking at least once a week? (Yes/No)” ( $p = 0.030$ ). No significant differences were found regarding the other items (Table 2). Next, we excluded total scores of the Frailty Screening Index and used binomial logistic regression analysis after the two items with significant differences were forcibly input and adjusted for age, gender,

and living with family. As a result, “yes” responses to “Do you think you walk slower than before?” (odds ratio: 1.74, 95% confidence interval: 1.16–2.62,  $p=0.007$ ) were identified as the only remaining factor that was significantly associated with falls (Table 3).

## DISCUSSION

In this study, we used the Frailty Screening Index as an evaluation tool since it did not require in-person measurements, investigating the relationship between the questionnaire responses and fall rate among community-dwelling older adults. As a result, “yes” responses to “Do you think you walk slower than before?” were identified as significantly associated with fall events.

Previous studies have also suggested that a decline in walking speed as a physical function was an important risk factor for predicting disability and mortality among older adults<sup>14</sup>. Preventing declining walking speed in older adults is a public health problem, and it is important to clarify its associated risk factors<sup>15</sup>.

Decreased walking speed has always been pointed out as a risk factor of falls. However, it is a result of actual measurement. This result indicated the significance of paying careful attention to subjective assessment of decrease in self-walking speed as a risk of falling.

The fall-related factors extracted in this study were items related to subjective assessment of self-walking speed and can be expected to lead to motivation of their maintenance and improvement. In addition, it is presumed that the result of this study is likely to have a concrete common understanding when considering fall prevention interventions in community-dwelling older adults, regardless of whether these interventions are conducted via face-to-face or remote methods.

This study has several limitations and challenges. Primarily, there was insufficient information regarding biometrics and other characteristics of the study participants, which limited the generalizability of these results. Furthermore, as this was a cross-sectional study, it can only reveal cross-sectional relationships between factors related to falls during the period in question. Consequently, a longer-term survey must be conducted to identify all risk factors associated with falls. In the future, we intend to conduct a longitudinal study considering the participants in this study<sup>16</sup>.

**Table 1.** The group comparisons for age, gender, living arrangement, total score of the frailty screening index

	Overall (n=1,040)	Fall group (n=120)	Non-fall group (n=920)
Age (years), median (interquartile range)	78 (73–82)	77 (73–82)	78 (73–82)
Gender (males/females), n (% females)	259/781 (75)	32/88 (73)	227/693 (76)
Living with family (with cohabitan/alone), n (% alone)	488/552 (53)	56/64 (53)	432/488 (54)
Frailty Screening Index (score), median (interquartile range)**	1 (0–2)	1 (1–2)	1 (0–1)

Age and total score of the frailty screening index: Mann–Whitney U test; gender and living with family:  $\chi^2$  test.  
\*\* $p<0.01$ .

**Table 2.** The group comparisons for scores on the sub-items of the frailty screening index

	Overall (n=1,040)	Fall group (n=120)	Non-fall group (n=920)
“Have you lost two to three kg or more over the past six months? (Yes/No)”, n (% Yes)	93/947 (9)	16/104 (13)	77/843 (8)
“Do you think you walk slower than before? (Yes/No)”, n (% Yes)**	515/525 (49)	73/47 (61)	442/478 (47)
“Do you do physical exercise like walking at least once a week? (Yes/No)”, n (% Yes)*	768/272 (74)	79/41 (66)	689/231 (73)
“Can you recall what happened five minutes ago? (Yes/No)”, n (% Yes)	976/64 (94)	113/7 (94)	863/57 (92)
“Have you felt tired for no reason (for the past two weeks)? (Yes/No)”, n (% Yes)	120/920 (12)	19/101 (16)	101/819 (11)

Sub-items of the frailty screening index:  $\chi^2$  test.

\*\* $p<0.01$ , \* $p<0.05$ .

**Table 3.** Results of binominal logistic regression analysis

Independent variable	Odds ratio	95% Confidence interval
“Do you think you walk slower than before? (Yes)”***	1.74	1.16–2.62
“Do you do physical exercise like walking at least once a week? (No)”	1.44	0.95–2.18

Binomial logistic regression analysis was performed after the three items with significant differences were forcibly input and adjusted according to age, gender and living arrangement.

\*\* $p<0.01$ .

Despite these limitations, it remains important not only to evaluate the risk of frailty by the total score of the Frailty Screening Index, but also pay careful attention to answers of the sub-items of the Frailty Screening Index as fall-related factors. This result suggests the significance of paying careful attention to the sub-items even if the Frailty Screening Index corresponds to pre-frail. It is necessary to pay careful attention to subjective assessment of decrease in walking speed as a fall prevention measure during the period of self-restraint from going out to prevent the spread of COVID-19 infection.

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### *Conflicts of interest*

The authors declare no conflicts of interest.

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