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Association between family caregivers and depressive symptoms among community-dwelling older adults in Japan: A cross-sectional study during the COVID-19 pandemic

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ABSTRACT

Objectives: Novel coronavirus disease (COVID-19) pandemic could increase the mental health burden of family caregivers of older adults, but related reports are limited. We examined the association between family caregiving and changes in the depressive symptom status during the pandemic.

Methods: This cross-sectional study included 957 (mean age [standard deviation] = 80.8 [4.8] years; 53.5% females) community-dwelling older adults aged ≥ 65 years from a semi-urban area of Japan, who completed a mailed questionnaire. Based on the depressive symptom status assessed with the Two-Question Screen between March and October 2020, participants were classified into four groups: “non-depressive symptoms,” “incidence of depressive symptoms,” “remission from depressive symptoms,” or “persistence of depressive symptoms.” Participants were assessed in October 2020 for the family caregiving status, caregiving role, the severity of care recipients’ needs, and increased caregiver burden during the pandemic, each with the simple question. Multinomial logistic regression analysis was applied to obtain the odds ratios (ORs) and 95% confidence intervals (CIs) for changes in depressive symptom status.

Results: Compared to non-caregivers, family caregivers were associated with the incidence (OR [95% CI] = 3.17 [1.55–6.51], p < 0.01) and persistence of depressive symptoms (OR [95% CI] = 2.39 [1.30–4.38], p < 0.01). Primary caregivers, caregivers for individuals with severe care needs, and caregivers with increased burden during the pandemic had a high risk of depressive symptoms.

Conclusions: Family caregivers had a high risk of depressive symptoms during the pandemic. Our findings highlight the need for a support system for family caregivers.

1. Introduction

The novel coronavirus disease (COVID-19) has had a severe global impact, with a high morbidity and mortality rate (World Health Organization 2020b; World Health Organization, Regional Office for the Western Pacific 2020; Zhu et al., 2020), and was declared a pandemic by the WHO in March 2020 (WHO, 2020a). Owing to the insufficient establishment of effective pharmacological interventions, COVID-19 management depends on public health measures to mitigate its spread and flatten the curve. This includes implementing measures that restrict people’s gatherings and limit social behavior (e.g., bans on public gatherings, stay-at-home policies, and physical distancing strategies; Hartley & Perencevich, 2020).

Although these public health strategies assist in stopping the spread of infectious diseases (Islam et al., 2020; Kucharski et al., 2020), they may have unintended secondary effects. For instance, restricting social behavior, such as going out and interacting with others, could harm people’s mental health. Previous studies have shown that social-behavioral limitations during the COVID-19 pandemic could impair mental health (Iob, Frank, Steptoe, & Fancourt, 2020;
LTC services were used four times more by community residents than by Welfare, 2018). Of these, home care was overwhelmingly common, and members. A recent study in Japan reported that the use of LTC services, The Japanese LTC system is focused on home care, which heavily de
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In Japan, the country with the highest global aging rate, the number of older adults who need nursing care has increased rapidly (Cabinet Office, Government of Japan, 2019). To address this issue, a public long-term care (LTC) insurance system was initiated in 2000, and LTC services were provided for residents in nursing homes and community-dwelling older adults with disabilities (Campbell & Ike-gami, 2000). Overall, 6.45 million older adults (≥ 65 years old) were certified in 2018 to receive LTC services (Ministry of Health, Labour and Welfare, 2018). Of these, home care was overwhelmingly common, and LTC services were used four times more by community residents than by institutional residents (Ministry of Health, Labour and Welfare, 2018). The Japanese LTC system is focused on home care, which heavily de

Evidence of secondary health damages caused by the COVID-19 pandemic on family caregivers is essential in reducing the health disparities between caregivers and those who are not caregivers (Park, 2021). However, there are insufficient reports on the mental health conditions of family caregivers during the COVID-19 pandemic. Furthermore, identifying family caregivers suffering from more severe mental health problems is important when considering the provision of proper support for home care.

2. Materials and methods
2.1. Study population
In the present cross-sectional study, we made secondary use of panel data collected through a mailed questionnaire to community-dwelling older adults living in Minokamo City, a semi-urban area in Japan. Surveys were conducted in the target municipality before and after two states of emergency declarations corresponding to the waves of the COVID-19 pandemic (Japan’s declaration of emergency mainly requested that individuals refrain from performing non-essential activities, maintain physical distancing, and called for self-restraint at re-

In both the first and second surveys, depressive symptoms were assessed using the Two-Question Screen consisting of the following questions: (1) “During the past month, have you often been bothered by feeling down, depressed, or hopeless?” and (2) “During the past month, have you often been bothered by little interest or pleasure in doing things?” with possible responses of “Yes” or “No” (Sato et al., 2021; Spitzer et al., 1994). Those who answered “Yes” to either or both questions were defined as showing depressive symptoms. This two-question screening has been validated and shows comparable performance with other instruments (Tsoi, Chan, Hirai, & Wong, 2017; Whooley, Avins, Miranda, & Browner, 1997): sensitivity = 96% and specificity = 57% for major depression; sensitivity = 91.8% and specificity = 67.7% for depressive symptoms. Based on the status of depressive symptoms in the first and second surveys, participants were classified into four groups: “non-case” (without depressive symptoms in both surveys), “incidence” (without depressive symptoms in the first, but with depressive symptoms in the second survey), “remission” (with depressive symptoms in the first, but without depressive symptoms in the second survey), and “relapse” (with depressive symptoms in the second, but without depressive symptoms in the first survey). Thus, in addition to the direct effects of the infection, sufficient attention should be paid to secondary health damages caused by restrictions on social behavior.

Because the severity of COVID-19 is marked in older adults (Richardson et al., 2020; WHO, Regional Office for the Western Pacific, 2020; Zhou et al., 2020), the pandemic has had a significant impact on the daily lives of older adults and their families. Particularly, restrictions on social activities and long-term care services for older adults could increase the burden on family caregivers at home, which can adversely affect family members’ health. According to the conceptual model of caregiving and the stress process (Pearlin, Mullan, Semple, & Skaff, 1990), beyond the primary stressors – such as hardships and problems directly related to caregiving – role strains, social support, and intrapsychic strains can also be stressors. Additionally, because caregiving has a dyadic nature (Lyons, Zarit, Sayer, & Whittatch, 2002), the psychosocial impact of older care recipients may increase the burden on family members. Thus, the COVID-19 pandemic and related measures, including concerns about the infection in older adults and restrictions on social behavior, can become additional stressors, which may cause more severe mental health crises for family caregivers. A previous study has shown that family caregivers are associated with several poor health conditions, including mental health during the pandemic, suggesting health disparities between caregivers and those who are not caregivers (Park, 2021). Those who answered

In the first survey included 2000 older adults and 1350 individuals responded to the survey (response rate: 67.5%). Of these, 1106 individuals who completed the second survey (follow-up rate: 81.9%) were included in the present study. We excluded those whose age and/or sex was un

In Japan, the country with the highest global aging rate, the number of older adults may be at risk of declining during the pandemic owing to Japan’s high aging rate and dependency on home care by family members. A recent study in Japan reported that the use of LTC services, especially outpatient care services, has decreased since the spread of COVID-19 (Ito et al., 2021), raising concerns about the increased burden on family caregivers. Thus, investigating the health effects of the COVID-19 pandemic on family caregivers is necessary to protect and support family caregivers’ health.

The present study aimed to examine the association between family caregiving and depressive symptoms during the COVID-19 pandemic among community-dwelling older adults in Japan. Specifically, we examined data on older adults, including family caregivers, as of October 2020, between the second and third waves of the COVID-19 pandemic in Japan. This study contributes to the literature by clarifying the impact of depressive symptoms on home caregivers and identifying severely affected caregivers during the pandemic in a country with the LTC insurance system.
the second survey), and “persistence” (with depressive symptoms in both surveys).

2.3. Family caregiving

Family caregiving was assessed in the second survey using the question, “Do you care for your family currently?” Participants were dichotomized as “not caregiver” (answer: “not engaged in family caregiving”) and “caregiver” (answer: “primarily engaged in family caregiving” or “not primarily engaged in, but assists with family caregiving”).

In addition, the following family caregiving situations were assessed: caregiving role, the severity of care recipient’s needs, and increased caregiver burden during the COVID-19 pandemic. According to the caregiving role, participants were categorized as follows: “not caregiver,” “secondary caregiver,” and “primary caregiver.” According to the severity of care recipients’ needs, participants were divided into three groups: “not caregiver,” “caregiver, not severe care-level” (those at the support need levels or below the care need level 2, according to the Japanese LTC insurance system classification), “caregiver, severe care-level” (above the care need level 2), and “caregiver, care-level unknown.” Furthermore, participants were asked about the increased burden of caregiving during the COVID-19 pandemic. “Do you think that the burden of caregiving for yourself has increased for you compared to before the new coronavirus infection outbreak (before March 2020)?” with response options being “not at all,” “occasionally,” “sometimes,” “often,” or “always.” Based on their responses, participants were categorized as follows: “not caregiver,” “caregiver, not increased caregiver burden” (answer: “not at all” or “occasionally”), and “caregiver, increased caregiver burden” (answer: “sometimes,” “often,” or “always”).

2.4. Covariates

The covariates used data from the second survey and included the following variables: age, gender, living arrangement, educational attainment, subjective economic status, BADL, self-rated health, and present illness. Age (years) was categorized as “under 79,” “80 to 84,” and “85 or older.” Living arrangement was categorized as “living alone,” “living with spouse only,” “living with spouse and child(ren),” and “other.” Educational attainment (years) was categorized as “under 9,” “10 to 12,” and “13 or more.” Subjective economic status was categorized as “severe,” “normal,” and “rich.” BADL was assessed using the following question, “Do you need someone’s care or assistance in your daily life functioning” and was dichotomized into “no difficulty” (answer: “no need for care or assistance”) and “difficulty” (answer: “need some care or assistance but do not currently receive any”). Self-rated health was assessed using a single question, “What is your current health status,” and was dichotomized as “poor” and “good.” The present illnesses were divided into “yes” and “no” for cancer, heart disease, and stroke, respectively.

2.5. Statistical analysis

First, descriptive statistics were calculated to summarize the participants’ characteristics according to family caregiving. Second, the prevalence of depressive symptoms at the time of the first and second surveys was described according to family caregiving situations. Third, family caregiving status was described according to changes in depressive symptom status. Lastly, multivariable multinomial logistic regression analysis was performed to examine the association between family caregiving status and the changes in depressive symptom status; the odds ratios (ORs) and 95% confidence intervals (CIs) for the changes in depressive symptom status were obtained. In our main analysis, family caregiving (not caregiver or caregiver) was included as an explanatory variable. In the sub-analysis, the following explanatory variables were included: caregiving role, the severity of care recipient’s needs, and increased caregiver burden during the COVID-19 pandemic. Two analytical models were created using the crude and all-covariates adjusted models. Regarding the severity of the care recipient’s needs, those who answered “unknown” were excluded from the analysis because of the small sample number (n = 5).

To mitigate the potential biases caused by missing information, we used the multiple imputation approach under the missing at random (MAR) assumption (i.e., the missing data mechanism depends only on observed variables). We generated 20 imputed datasets using the multiple imputation by chained equations (MICE) procedure and pooled the results using the standard Rubin’s rule (White, Royston, & Wood, 2011). Additionally, as a sensitivity analysis, we performed a complete case analysis. The significance level was set at p < 0.05. We used R software (Version 3.6.3. for Windows; R Foundation, Vienna, Austria) for all statistical analyses. The multiple imputation approach used the MICE function (MICE package).

3. Results

The data from 957 participants were analyzed. Table 1 shows the characteristics of the participants according to their family caregiving status. The mean age was 80.8 years (standard deviation = 4.8) and 512 (53.5%) participants were females. Of the participants, 80 (8.3%) were engaged in family caregiving. Those engaged in family caregiving were likely to be older, living with others, less educated, had more severe subjective economic status, difficulty in BADL, and poor self-rated health.

Fig. 1 shows the prevalence of depressive symptoms in March (38.7%) and October (41.8%) 2020. The prevalence of depressive symptoms among those who were not caregivers was almost the same as among individuals overall (37.6% in March and 39.8% in October), whereas it later increased among caregivers (47.5% in March and 63.7% in October). For family caregivers, the prevalence of depressive symptoms increased in parallel regardless of the caregiving role and severity of care recipients’ needs. Regarding the increased caregiving burden during the pandemic, those who experienced increased caregiving burden reported a considerable increase in the prevalence of depressive symptoms.

Table 2 shows the descriptive statistics of family caregiving and its situations according to changes in depressive symptom status. Regarding the changes in depressive symptoms in March and October, 408 (42.6%) participants were “non-case,” 116 (12.1%) were “incidence,” 107 (11.2%) were “remission,” and 261 (27.3%) were “persistence.”

Table 3 presents the association between family caregiving and changes in depressive symptom status. The multivariable multinomial logistic regression analysis revealed that family caregiving was significantly associated with the incidence and persistence of depressive symptoms after adjusting for covariates, including age, gender, living arrangement, subjective economic status, BADL, self-rated health, and present illness. Compared to “not caregiver,” ORs (95% CIs) of “caregiver” was 3.17 (1.55 to 6.51) for the incidence of depressive symptoms (p = 0.002), 1.17 (0.47 to 2.91) for remission from depressive symptoms (p = 0.743), and 2.39 (1.30 to 4.38) for persistence of depressive symptoms (p = 0.005).

Additionally, regarding the caregiving role, secondary caregivers were associated with the incidence of depressive symptoms after adjusting for covariates. Primary caregivers were associated with the incidence and persistence of depressive symptoms. Regarding the severity of care recipients’ needs, caregivers with not severe care-level family were marginally associated with the incidence and persistence of depressive symptoms, whereas caregivers with severe care-level family were significantly associated with the incidence and persistence of depressive symptoms. Regarding increased caregiver burden during
were significantly associated with the incidence and persistence of not associated, whereas those who experienced an increased burden 

**4. Discussion**

...the pandemic, those who did not experience an increased burden were not associated, whereas those who experienced an increased burden were significantly associated with the incidence and persistence of depressive symptoms.

These results were confirmed in a similar trend in the complete case analysis (Supplementary Table 1).

**Table 1**

| Participants’ characteristics | Overall | Family caregiving Caregiver p-value*
|---|---|---|---|
| **Age (years), n (%)** | | | |
| Under 80 | n = 957 | n = 842 | n = 80 | 0.087 |
| (47.0) | (47.7) | (23.8) |
| 80 to 85 | 292 | 264 | (31.4) |
| (30.5) | (31.4) |
| 85 or older | 215 | 176 | 25 (31.2) |
| (22.5) | (20.9) |
| **Gender, n (%)** | | | |
| Male | 445 | 390 | 36 (45.0) | 0.907 |
| (46.5) | (46.3) |
| Female | 512 | 452 | 44 (55.0) |
| (53.5) | (53.7) |
| **Living arrangement, n (%)** | | | |
| Living alone | 145 | 131 | 7 (8.8) | 0.202 |
| (15.3) | (15.7) |
| With spouse only | 414 | 365 | 33 (41.2) |
| (43.8) | (43.9) |
| With living and child (ren) | 262 | 227 | 29 (36.2) |
| (27.7) | (27.3) |
| Other | 124 | 109 | 11 (13.8) |
| (13.1) | (13.1) |
| **Educational attainment (years), n (%)** | | | |
| Under 9 | 318 | 274 | 31 (38.8) | 0.564 |
| (33.8) | (33.1) |
| 10 to 12 | 469 | 417 | 36 (45.0) |
| (49.8) | (50.3) |
| 13 or more | 154 | 138 | 13 (16.2) |
| (16.4) | (16.6) |
| Subjective economic status, n (%) | | | |
| Rich | 103 | 95 (11.4) | 4 (5.0) | 0.130 |
| (10.8) |
| Normal | 670 | 588 | 57 (71.2) |
| (70.5) | (70.4) |
| Severe | 177 | 152 | 19 (23.8) |
| (18.6) | (18.2) |
| **Basic ADL, n (%)** | | | |
| Not difficulty | 856 | 763 | 65 (81.2) | 0.018 |
| (89.4) | (90.6) |
| Difficulty | 101 | 79 (9.4) | 15 (18.8) |
| (10.6) |
| **Serf-rated health, n (%)** | | | |
| Good | 752 | 667 | 58 (72.5) | 0.147 |
| (79.3) | (80.0) |
| Poor | 196 | 167 | 22 (27.5) |
| (20.7) | (20.0) |
| **Cancer, n (%)** | | | |
| No | 910 | 798 | 77 (96.2) | 0.791 |
| (95.1) | (94.8) |
| Yes | 47 | 44 (5.2) | 3 (3.8) |
| (4.9) |
| **Heart disease, n (%)** | | | |
| No | 849 | 749 | 69 (86.2) | 0.460 |
| (88.7) | (89.0) |
| Yes | 108 | 93 (11.0) | 11 (13.8) |
| (11.3) |
| **Stroke, n (%)** | | | |
| No | 932 | 818 | 79 (98.8) | 0.716 |
| (97.4) | (97.1) |
| Yes | 25 | 24 (2.9) | 1 (1.2) |
| (2.6) |

ADL = activities of daily living.

*Chi-square test comparison of the not caregiver and caregiver groups.

Missing data: family caregiving, n = 35; living arrangement, n = 12; educational attainment, n = 9; subjective economic status, n = 7; self-rated health, n = 9.

### 4. Discussion

The present study examined the association between family caregiving and changes in depressive symptom status among older adults during the COVID-19 pandemic. Our results indicated that family caregivers were at a higher risk of incidence and persistence of depressive symptoms. Our findings suggest a crisis in the mental health of family caregivers during the COVID-19 pandemic. Support for family caregivers is urgently needed to protect their mental health.

Family caregivers were associated with the incidence and persistence of depressive symptoms during the COVID-19 pandemic. There is much evidence of the association between family caregiving and poor mental health (Adelman, Tmanova, Delgado, Dion, & Lachs, 2014; Pinquart & Sörensen, 2003; Saito, Kondo, Shibata, Murata, & Kondo, 2018), and our results indicate that family caregivers could have an even higher risk of depressive symptoms during the pandemic. The Japanese government has not implemented “lock-down measures” as other countries did and mainly focused on controlling the spread of the disease by limiting people’s social behaviors (Looi, 2020; Shimizu, Wharton, Sakamoto, and Miossios, 2020). However, home care services for older adults were affected. After the COVID-19 outbreak, a decrease in the number of home care service users, especially outpatient care services, has been observed (Ito et al., 2021), which may have reduced the rest time of family caregivers and increased their burden. Although we have not included a comparison to normal times, family caregivers could be experiencing mental health crises during the pandemic. Furthermore, long-term epidemics related to infectious diseases would result in more severe conditions for family caregivers; further investigations are needed to examine the long-term effects on family caregivers, including caregivers’ burden and quality of life, as well as effective interventions, such as outreach and peer support for home caregivers. We believe that support for family caregivers during the pandemic is an urgent issue.

Our results showed that primary caregivers, caregivers providing care to recipients with severe care needs, and caregivers experiencing increased caregiver burden had an increased risk of depressive symptoms. The tendency of impaired mental health among primary caregivers and caregivers of severe care need recipients is similar to the results of previous studies when no pandemic was present (Bédard et al., 2001; Fekete, Tough, Siegrist, & Brinkhof, 2017; He et al., 2019). As our study design did not include a comparison to normal times, the specific impact of the pandemic could not be determined; however, our results suggest that primary caregivers and caregivers of recipients with severe care needs should receive priority support even during the pandemic. Meanwhile, those who experienced increased caregiver burden during the pandemic were at a dramatically increased risk of depressive symptoms, while those who experienced no increased burden did not. These results emphasize the importance of addressing caregiver burden specifically during the pandemic to protect their mental health.

With the rapid aging of society, the informal caregiver burden has become more apparent. Particularly, in Japan, due to the strong filial piety norms, the increasing burden on family caregivers has become worrisome (Arai & Washio, 1999; Tamiya et al., 2011). Even after the establishment of the public LTC system, the burden of family members on home care cannot be ignored (Sugihara et al., 2012). In the event of an unexpected disaster, such as an infectious disease outbreak, the burden of informal caregiving could greatly exceed the capacity of family members, resulting in impairment of their mental health. Thus, our findings suggest that a social system in which the family caregiver burden does not drastically increase during natural disasters, such as epidemics, needs to be developed to reduce the negative impact on family caregivers’ health. We highlight that policy makers of long-term care insurance need to politically enhance the support of family caregivers even in peacetime, and believe in the need to early detect high-risk caregivers through proactive outreach to them, provide material and psychological support, and ensure stable care services in times of disaster.

Although several important insights were gained from the present study’s findings, several limitations should also be considered. First, although depressive symptoms were examined for changes between
Fig. 1. Prevalence of depressive symptoms according to family caregiving situations between March and October 2020. For the prevalence, Figure A shows according to family caregiving status, Figure B shows according to caregiving role, Figure C shows the severity of care recipient’s needs, and Figure D shows according to the increased caregiver burden, respectively. The prevalence of depressive symptoms between March and October 2020: All = 38.7% and 41.8%; Not caregiver = 37.6% and 39.8%; In Figure A, Caregiver = 47.5% and 63.7%. In Figure B, Secondary caregiver = 42.9% and 59.5%; Primary caregiver = 52.6% and 68.4%. In Figure C, Caregiver, not severe care-level = 50.0% and 61.9%; Caregiver, severe care-level = 51.7% and 65.5%; In Figure D, caregiver, not increased burden = 52.4% and 57.8%; Caregiver, increased burden = 53.6% and 78.6%.

Table 2
Family caregiving and its situations according to changes in depressive symptom status.

|                        | Overall | Changes in depressive symptoms status* |                  |
|------------------------|---------|----------------------------------------|------------------|
|                        |         | Non-case | Incidence | Remission | Persistence |
|                        | n = 957 | n = 408  | n = 116   | n = 107   | n = 261     |
| Family caregiving, n (%)|         |     |         |           |             |          |
| Not caregiver          | 842     | 377    | 96 (12.2) | 96 (12.2) | 221 (28.0) |
| Caregiver              | 80 (8.7)| 20 (26.7)| 17 (22.7) | 6 (8.0)   | 32 (42.7)  |
| Caregiving situations  |         |     |         |           |             |          |
| Not caregiver          | 842     | 377    | 96 (12.2) | 96 (12.2) | 221 (28.0) |
| Caregiver              | 80 (8.7)| 20 (26.7)| 17 (22.7) | 6 (8.0)   | 32 (42.7)  |
| Caregiving role, n (%) |         |     |         |           |             |          |
| Not caregiver          | 842     | 377    | 96 (12.2) | 96 (12.2) | 221 (28.0) |
| Caregiver              | 80 (8.7)| 20 (26.7)| 17 (22.7) | 6 (8.0)   | 32 (42.7)  |
| Caregiver, not severe care-level | 42 (4.6) | 11 (27.5) | 8 (20.0) | 4 (10.0) | 17 (42.5) |
| Caregiver, severe care-level | 29 (3.2) | 7 (25.0) | 6 (21.4) | 2 (7.1) | 13 (46.4) |
| Unknown                 | 5 (0.5) | 0 (0.0) | 2 (50.0) | 0 (0.0) | 2 (50.0)  |
| Increased burden of caregiving during the pandemic, n (%) |         |     |         |           |             |          |
| Not caregiver          | 842     | 377    | 96 (12.2)| 96 (12.2)| 221 (28.0)|
| Caregiver              | 80 (8.7)| 20 (26.7)| 17 (22.7)| 6 (8.0)  | 32 (42.7) |
| Caregiver, not increased burden of caregiving | 45 (4.9) | 13 (31.0) | 7 (16.7) | 4 (9.5) | 18 (42.9) |
| Caregiver, increased burden of caregiving | 28 (3.1) | 5 (17.9) | 8 (28.6) | 1 (3.6) | 14 (50.0) |

*Percentage of cases in each group for changes in depressive symptom status.
†Chi-square test.
‡Excluding “unknown” group.
§Divided into two by the level of care recipient’s needs in the Japanese public long-term care insurance system: “not severe” (the support need levels or below the care need level 2, according to the Japanese LTC insurance system classification) and “severe” (above the care need level 2).
Missing data: changes in depressive symptom status, n = 65; family caregiving, n = 35; caregiving role, n = 35; severity of the care-recipient’s needs, n = 39; increased the caregiver burden during the pandemic, n = 42.
March 2020 (first survey) and October (second survey) in 2020, family caregiving was assessed only in the second survey. Therefore, the temporal relation between family caregiving and depressive symptoms could not be examined and its cross-sectional nature means that there may be potential for reverse causality. Further studies with longitudinal analytical design are required. Second, we did not have information about the status of the participants’ depressive symptoms during non-pandemic circumstances and could not consider it. Our first survey (March 2020) took place when the COVID-19 pandemic had already begun in Japan (Karako, Song, Chen, Tang, & Kokudo, 2021), which may have already impaired people’s mental health. However, because Japan had far fewer cases than other countries during the first wave (WHO, 2020c) and our first survey data was relatively close to non-pandemic conditions. Third, many of the variables used in this study were based on self-administered questionnaires, which may have caused information bias in key variables, such as depressive symptoms, caregiving, and BADL. These could have affected the internal validity of our results. However, despite these limitations, we believe there is some meaning in reporting the effects on caregivers during the pandemic. Fourth, we did not have much information about caregivers and care recipients. Caregiving is dyadic, which means that caregivers and care recipients could influence each other (Lyons et al., 2002). For instance, we could not examine the effects of differences in family relationships, including caregiving for a spouse or others. In addition, most of the information on care recipients could not be evaluated (e.g., their illness, including dementia, and their use of care services); these factors could have caused residual confounding. Further studies using detailed dyadic data about caregivers and care recipients are needed. Fifth, we only evaluated the presence of family caregiving and could not objectively evaluate its burden. This may have caused misclassifications in the evaluation of family caregiving. Sixth, this study was based on the secondary use of public survey data from the targeted municipality; thus, the sample size estimation was not performed and the small number of samples for caregivers may have caused instability in the estimates. Finally, our study participants were slightly older than the typical community-dwelling older adults and our survey was limited to a semi-urban area in Japan. These issues may reduce the generalizability of our results.

5. Conclusions

In conclusion, the present study indicated that family caregiving was associated with the incidence of depressive symptoms and caregivers remained depressed during the COVID-19 pandemic. Particularly, primary caregivers, caregivers providing care to individuals with severe care needs, and caregivers who experienced increased caregiver burden during the pandemic had an increased risk of depressive symptoms. Whereas in our study there could be biases in measuring variables for depressive symptoms and caregiving, our findings suggest that family caregivers could be suffering from depressive symptoms during the pandemic, and developing a support system for them is urgently needed.

Data statement

All datasets have ethical or legal restrictions for a public deposition because of the inclusion of sensitive information about the human participants.

CRediT author contributions statement

Taiji Noguchi: Conceptualization, data curation, formal analysis, funding acquisition, investigation, methodology, resources, visualization, and writing - original draft. Takahiro Hayashi, Yuta Kubo, Naoki Tomiyama, Akira Ochi, and Hiroyuki Hayashi: Data curation, funding acquisition, and writing - reviewing and editing.

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Declaration of Competing Interest

The authors declare no conflict of interest.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.archger.2021.104468.

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