

ORIGINAL ARTICLE

## Living alone is associated with depression among the elderly in a rural community in Japan

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### Abstract

**Aim:** This study aimed to investigate factors associated with depression in a sample of elderly Japanese individuals in a rural community and to examine differences among factors associated with individuals living alone or living with others.

**Methods:** Using a population-based sample from rural Japan, we assessed a total of 1552 participants aged 65 years or older by mailing a survey and evaluating responses based on the Geriatric Depression Scale. Factors associated with depression were also examined.

**Results:** We received 964 valid responses. Depressed subjects comprised 20.5% of the sample. Living alone was significantly related to depression. In individuals living alone, depression was associated with loss of appetite, suicidal ideation, financial strain, and worries in life. However, multiple linear regression analyses revealed that the influence of living alone was negated by having a good social support system.

**Conclusion:** These findings confirm that living alone is an important factor in depression among the elderly in a rural part of Japan. Results also confirm what others have found in Western cultures: high levels of social support, awareness of receiving social support, and willingness to receive assistance may reduce the risk of depression.

### INTRODUCTION

The ageing rate of the population in Japan is the highest in the world and is, at present, increasing.<sup>1</sup> In particular, rural districts see the most increases in ageing rates and depopulation. Thus, mental health problems, especially in elderly people living in rural districts, have become increasingly important. Generally, depression in the elderly, as well as dementia, is a common disease.<sup>2,3</sup> Additionally, previous studies have demonstrated that depression in the elderly is closely related to suicide or suicidal thoughts.<sup>4</sup> Depression and suicide ideation are two major risk factors for late-in-life suicide and are purported targets for prevention.<sup>5</sup>

Since 1998, the annual number of suicides has exceeded 30 000 in Japan. According to World Health Organization, the rate of suicide in Japan relative to its population size was ranked fifth in the world in 2010, the highest among developed countries. Japan has the world's highest longevity rate and also has high suicide mortality rate among the elderly. In men, the suicide mortality rate for the young-old is ranked second in the world while the suicide mortality rate for the old-old ranks fourth in the world. In women, the rate for both age groups is the highest in the Group of Eight nations.<sup>6</sup> Given these facts, measures against suicide in the elderly are growing in importance. The majority of suicide completers have pre-existing

mental disorders, largely mood disorders or major depression;<sup>4</sup> this is especially true of the elderly.<sup>7</sup>

Development of elderly depression could be explained by a multifactorial disease model,<sup>8</sup> as it is influenced by several bio-psycho-social factors. According to a systematic review on 74 community-based mental health surveys on depression in geriatric populations conducted in Asia, Europe, Australia, North America, and South America, living alone is potentially a major risk factor for depression in the geriatric population.<sup>9</sup> Living alone was also one of the most important risk factors for suicide.<sup>10</sup> In contrast, a few studies conducted on anti-suicidal interventions in the northern part of Japan showed that many cases of elderly suicides and depression occurred in a multigenerational family context rather than by individuals living alone.<sup>11–13</sup> To date, however, there have only been a few studies that have examined the association between depression and living alone in the Japanese elderly. Thus, the present study aimed to address the association between depression and living alone in the elderly.

In addition to whether individuals lived alone, we considered several other factors, such as social support, which is an important factor in protecting individuals from undesirable life events.<sup>14</sup> Also, we used regular doctor or hospital visits as a factor, as morbidity and chronic physical pain and disability increase the risk for depression.<sup>15</sup> Because there is a well-established association between depression and socioeconomic hardship, presence or absence of work with income and financial strain were factors.<sup>16</sup> Additionally, insomnia was included as a factor because it almost always occurs in clinical depression, and it has been suggested that it is a risk factor for depression in the elderly.<sup>17</sup> Similarly, loss of appetite has been found to be a risk factor for depression, and previous studies have demonstrated its association to depression.<sup>18</sup> Smoking and alcohol use were also considered risk factors. Several epidemiological studies have concluded that smokers have higher incidence rates and lifetime risk for depression compared to non-smokers.<sup>19</sup> Alcoholism and depression have been significantly linked to one another as well as strongly associated with suicide.<sup>20</sup> Although suicide is not a phenomenon specific to depression, it often results from depression. Widely known findings have indicated that most suicides had some sort of mental disorder, many of which were mood disorders.<sup>4</sup>

## METHODS

### Study overview

We selected participants from Asagiri, a rural community that collaborated with our research team and where public health nurses were actively practising. The town of Asagiri is located at the southern end of Kumamoto Prefecture, central Kyushu Island, which is the most southwest of Japan's four main islands. The size of this town is 159.49 km<sup>2</sup>, of which nearly 67% is occupied by forest and approximately 19% is used for agricultural land. Although the town's main industries are agriculture and forestry, the town is also well known for being home to several companies that brew *shochu* (a type of Japanese liquor). In 2008, the population of the town was 17 473, and the percentage of elderly individuals (65 years and older) was 30.2%. From 2003 to 2006, approximately eight people (of all ages) completed suicide each year, totalling nearly 24 deaths from suicide in this town. Thus, the suicide rate in this area is very high, reaching almost 40 people per 100 000 for 1 year. Nonetheless, this town does not have the necessary psychiatric medical facilities or services.

### Subjects

Survey questionnaires were mailed to 1552 residents age 65 years and older who lived in the central area of this town on prevalence day (1 January 2009). The study period was between 1 October and 3 December in 2009. A self-report questionnaire, informed consent document and self-addressed return envelope were mailed to each participant. A total of 964 participants (62.1%) provided complete answers for all the questionnaire items. All procedures for the present study strictly followed the 2009 Clinical Study Guidelines of the Ethics Committee of Kumamoto University Hospital (Kumamoto, Japan) and were approved by the Internal Review Board.

### Measures

We sought to identify factors related to depression in a community sample of elderly residents on the basis of expert knowledge of psychiatric medicine and epidemiology, and with reference to previous reports.<sup>10,21</sup>

Factors chosen as independent variables on the questionnaire were age, sex, hospital visits, long-term care insurance, living with others, spouse, social support, work with income, suicidal ideation, worries

in life, smoking habits, drinking alcohol, subjective sleeping and loss of appetite. As suicidal ideation could be considered to have a strong relationship with depression, it was not an independent variable; rather, we investigated suicidal ideation in relation to living alone.

The social support scale was composed of five questions, such as 'Do you have someone you can consult when you are in trouble?', with each question scored as a 'yes' or 'no' response.<sup>22</sup> The Geriatric Depression Scale (GDS), which has been extensively used in the fields of psychiatry and public health, was used to assess depression in the elderly.<sup>23</sup> The Japanese version of the GDS has been validated by other researchers, including Muraoka *et al.*<sup>24</sup> The GDS has two different versions: a standard version with 30 items and a shortened version with 15 items. For the present study, the shortened 15-item version of the GDS was administered. According to previous literature on the GDS, a score of 6 or greater is considered to measure the presence of 'possible depression'.<sup>24,25</sup>

### Statistical analyses

After incomplete responses were excluded, valid responses to each item were scored. The means and standard deviations were calculated for the following variables: age, social support, and GDS scores. In the group that lived alone and in the group that lived with others, statistical differences between depressed and non-depressed individuals (as measured by the GDS) were assessed using  $\chi^2$  tests for sex, hospital visits, long-term care insurance, presence of a spouse, number of generations living together, drinking alcohol, smoking habits, sleep, appetite, work with income, financial strain, worries in life and suicidal ideation. Age and social support were assessed with the Student's *t*-test.

We performed multiple regression analysis to examine the factors related to depression and hierarchical regression analysis (dependent variable: GDS) to clarify the effect of social support on depression. With the hierarchical multiple regression analysis, independent variables, such as social support, were entered in separate steps. When the *F*-value for variation of determination was significant for an individual step, the variable was considered significant. The magnitude of association between the dependent variable and depression, within each group of variables, was estimated with  $R^2$ , with a significance level

of 0.05. A statistical significance level of 0.05 (two-tailed) was set for all analyses and noted within the text and tables as follows: \* $P < 0.05$ , \*\* $P < 0.01$ , \*\*\* $P < 0.001$ . All data were analyzed with SPSS v. 18.0 statistical software package for Windows (IBM, Tokyo, Japan).

### RESULTS

Responses from 964 residents (367 men, 597 women) were considered to be valid. Table 1 presents the characteristics of the survey participants and the relationship between depression and sociodemographic factors in the group that lived alone and the group that lived with others. The percentage of elderly living alone was 16.3% ( $n = 157$ ). The percentage of depressed subjects (based on a GDS score of 5/6 or above) was 18.6% in men and 21.6% in women, with a total of 20.6%. Results indicated that the absence of family living together is significantly related to depression ( $P < 0.001$ ). Results also showed that the mean age for depressed subjects was significantly older than for non-depressed subjects in both groups. Other factors that were significantly related to depression included long-term care insurance, low levels of social support, loss of appetite, suicidal ideation, financial strain, and worries in life. Hospital visits, sleep loss, absence of work with income, and number of generations living together were related to depression but only for those living with others. In contrast, sex, presence of spouse, drinking alcohol and smoking were not significantly related to depression. The mean level for social support for those living with others was  $4.77 \pm 0.70$ , and for those living alone, it was  $3.54 \pm 1.64$ ; significant differences between the groups were found. We found significant differences in social support between depressed and non-depressed subjects, regardless of whether the subjects lived alone or with others.

Multiple regression analysis indicated that age ( $\beta = 0.168$ ,  $P < 0.001$ ), long-term care insurance ( $\beta = 0.186$ ,  $P < 0.001$ ), sleep loss ( $\beta = 0.154$ ,  $P < 0.001$ ), financial strain ( $\beta = 0.318$ ,  $P < 0.001$ ), loss of appetite ( $\beta = 0.196$ ,  $P < 0.001$ ), worries in life ( $\beta = 0.248$ ,  $P < 0.001$ ) and social support ( $\beta = 0.115$ ,  $P < 0.001$ ) were significantly associated with depression (Table 2). Living alone was also a significant factor ( $\beta = 0.170$ ,  $P < 0.05$ ), but in step-wise analyses, the addition of social support (at step 2) did not yield significant results.

**Table 1** Characteristics of subject and relationships between depression and each variable in each group of living alone and living together

	Living with others			Living alone		
	Depressed	Non-depressed	<i>P</i> -value	Depressed	Non-depressed	<i>P</i> -value
Subjects ( <i>n</i> (%))	149 (18.5)	658 (81.5)		50 (31.8)	107 (68.2)	***
Total ( <i>n</i> (%))	807 (83.7)			157 (16.3)		
Age <sup>†</sup> : mean (±SD)	78.1 ± 7.3	75.5 ± 6.3	***	78.9 ± 6.4	76.9 ± 5.4	*
Sex ( <i>n</i> (%))						
	Men	282 (82.0)	ns	8 (34.8)	15 (65.2)	ns
	Women	376 (81.2)		42 (31.3)	92 (68.7)	
Spouse ( <i>n</i> (%))	Presence	422 (84.1)	ns	2 (33.3)	4 (66.7)	ns
	Absence	236 (77.4)		48 (31.8)	103 (68.2)	
Number of generations living together ( <i>n</i> (%))	1	333 (84.7)	*	50 (31.8)	107 (68.1)	ns
	2	177 (74.7)				
	3	130 (82.8)				
	4 or more	18 (90.0)				
Long-term care insurance ( <i>n</i> (%))	Presence	45 (51.7)	***	13 (65.0)	7 (35.0)	**
	Absence	613 (85.1)		37 (27.0)	100 (73.0)	
Hospital visit ( <i>n</i> (%))	Presence	504 (79.2)	**	45 (33.8)	87 (66.2)	ns
	Absence	154 (90.1)		5 (19.2)	21 (80.8)	
Social support score <sup>†</sup> (mean ± SD)	4.53 ± 0.94	4.82 ± 0.63	***	3.19 ± 1.75	3.75 ± 1.55	*
Total (mean ± SD)	4.77 ± 0.70			3.54 ± 1.64		***
Alcohol use ( <i>n</i> (%))	Every day	110 (80.3)	ns	2 (33.3)	4 (66.7)	ns
	Sometimes/week	119 (84.4)		5 (25.0)	15 (75.0)	
	Several/a year	92 (90.1)		3 (14.3)	18 (85.7)	
	None	337 (78.7)		40 (36.4)	70 (63.6)	
Smoking ( <i>n</i> (%))	Over 20 a day	22 (75.0)	ns	2 (50.0)	2 (50.0)	ns
	Some a day	33 (25.0)		1 (25.0)	3 (75.0)	
	Non-smoking	603 (82.2)		47 (31.5)	102 (68.5)	
Appetite ( <i>n</i> (%))	Good	605 (86.1)	***	31 (27.0)	84 (73.0)	**
	Moderate	48 (56.3)		19 (51.4)	18 (49.6)	
	Poor	5 (29.4)		1 (20.0)	4 (80.0)	
Sleep ( <i>n</i> (%))	Well	406 (89.6)	***	15 (24.2)	47 (75.8)	ns
	Not well	233 (72.4)		28 (35.0)	52 (65.0)	
	Poor	19 (59.4)		7 (46.7)	8 (53.3)	
Work with income ( <i>n</i> (%))	Presence	133 (94.5)	**	6 (23.1)	20 (77.9)	ns
	Absence	525 (79.5)		44 (33.6)	87 (67.4)	
Worries in life ( <i>n</i> (%))	Presence	79 (55.6)	***	27 (51.9)	25 (48.1)	**
	Absence	579 (86.9)		23 (21.9)	82 (78.1)	
Financial strain ( <i>n</i> (%))	Presence	145 (61.7)	***	24 (53.3)	21 (46.7)	**
	Absence	513 (89.7)		26 (23.2)	86 (76.8)	
Suicidal ideation ( <i>n</i> (%))	Presence	80 (49.4)	***	29 (53.7)	25 (46.3)	***
	Absence	578 (89.6)		21 (20.4)	82 (79.6)	

\**P* < 0.05; \*\**P* < 0.01; \*\*\**P* < 0.001. <sup>†</sup>Student's *t*-test, others:  $\chi^2$  test. GDS, Geriatric Depression Scale; ns, not significant.

## DISCUSSION

The present study aimed to investigate the association between depression and living status (whether living alone or with others) in the elderly. Overall results demonstrated that living alone (without a partner or spouse) was significantly associated with depression. In contrast, depression was not associated with individuals living with family members. These findings are inconsistent with previous work in Japan, specifically in studies from the northern part of Japan, but they were consistent with findings from Western countries and cultures.

Previous work from Japan investigating the link between suicide in the elderly and depression in those

living with others may have had differing results because the elderly, even if they lived with someone else, had not asked for the proper or necessary help perhaps because they did not want to burden family members. As a result, these elderly may be suffering from 'isolation within family'.<sup>26</sup> Another previous study indicated that many elderly had subclinical depression and thoughts of death or suicide; however, few people consulted or sought help from family, professionals, or others.<sup>27</sup> Moreover, in Japan, there is the notion that family members and cohabitants are responsible for the welfare and support of the elderly without social (or government) support. Because these elderly persons lived with family, support was



**Table 2** Hierarchical multiple linear regression analyses for Geriatric Depression Scale

Independent variables	Step 1		Step 2	
	$\beta_{\text{STD}}$	<i>P</i> -value	$\beta_{\text{STD}}$	<i>P</i> -value
Age	0.170	***	0.168	***
Sex <sup>†</sup>	-0.004	ns	0.000	ns
Hospital visits <sup>††</sup>	0.049	ns	0.049	ns
Long-term care insurance <sup>¶</sup>	0.186	***	0.186	***
Drinking alcohol	-0.002	ns	-0.003	ns
Smoking	-0.035	ns	-0.034	ns
Sleep	0.156	***	0.154	***
Appetite	0.196	***	0.196	***
Work with income <sup>‡</sup>	-0.030	ns	-0.031	ns
Financial strain <sup>§</sup>	0.316	***	0.318	***
Worries in life	0.265	***	0.248	***
Living alone	0.170	*	-0.025	ns
Social support			0.115	**
<i>R</i>	0.603		0.612	
<i>R</i> <sup>2</sup>	0.364		0.375	
Adjusted <i>R</i> <sup>2</sup>	0.354		0.364	
<i>R</i> <sup>2</sup> change	0.005		0.010	
<i>F</i> change	5.753	*	11.347	**

\**P* < 0.05; \*\**P* < 0.01; \*\*\**P* < 0.001. †man = 1; woman = 0. ‡,§,¶,††presence = 1; absence = 0.  $\beta_{\text{STD}}$ , standardized coefficient  $\beta$ ; ns, not significant.

limited to the home, and they had little occasion to use resources in the community. In other words, they had been isolated from society.

Why did the results of our study about living alone and depression contrast with those from previous studies in the northern part of Japan? First, the reason could be due to regional differences. Differences in certain factors between the northern and southern parts of Japan are assumed. Climate, history, culture, prefectural traits and characteristics may cause some differences, but at present, there is a lack corroborative evidence for this notion. The theory that extended daylight hours influences serotonin in the brain and improves depression may be a factor that explains regional difference.<sup>28,29</sup> Second, the contrasting results may be due to the eras when the research was conducted. A few studies from northern part of Japan were conducted more than 20 years ago. During the past two decades, globalization has reached rural Japan, resulting in the Westernization of Japanese society to some degree. Consequently, the traditional Japanese mentality may have changed. Furthermore, changes in Japanese society and family structure have been typified by a trend toward the nuclear family.

Depression is not induced or facilitated only by living alone. Thus, we speculate that several additional factors may influence and contribute to the

development of depression. Multivariate analyses revealed that within the group who lived with others, important factors associated with depression were sleep, loss of appetite, suicidal ideation, financial strain, and worries in life. In the group who lived alone, significant factors were suicidal ideation and worries in life, two factors that affected depression equally in both groups. These results suggest that attentiveness to these two factors might be useful in detecting depression in the elderly in rural Japan, regardless of whether individuals live alone or with others. The results regarding suicidal ideation were unexpected, in that there were many who had experienced it. However, this may have resulted from the way we asked the question ('Do you think about death often?'). The vague phrasing of the question could have been interpreted to encompass the general idea of death in the future. Our results through both logistic and multiple linear regression analyses demonstrated that living alone was related to depression. However, when social support was high, significant differences (and associations) with depression disappeared. It suggests that sufficiency of social support protects the elderly from depression, even if they are living alone, which was one of the factors relevant to the development of depression.

Alexandrino-Silva *et al.* demonstrated that symptomatic depression in elderly men was associated with a perceived lack of social support.<sup>30</sup> Namely, what is important is not only whether social support exists, but also whether the elderly regard social support as potential support and utilize it. This suggests that social support does not function in cases where the elderly do not seek out help to avoid causing trouble or being a burden on their families. Moreover, Bilotta *et al.* reported that quality of support and physical-psychological ability to seek assistance were more important than living with others and concluded that the quality of life in elderly individuals living alone was independently associated with 'social relationships and participation' and 'home and neighborhood'.<sup>21</sup> Specifically, environmental sufficiency, customary relationships with relatives, and neighbours as caregivers prevent psychosocial isolation, even if elderly individuals live alone. At the same time, resources for the elderly and socializing are also important, particularly if the elderly can build certain beneficial relationships with the community and participate in social activities.

Cohabiting with others was found to be an important protective factor against the development of depression in the elderly. However, according to our data, depression can also be influenced by factors intrinsic to the elderly themselves, including economic factors, physical factors (e.g. the use of medical and nursing care, loss of appetite) and psychological state (e.g. worries in life and suicidal ideation). Our results also demonstrated that a sufficient social support system and good health from proper care are protective factors against developing depression, regardless of living status and arrangements. Confirmation of our findings will require accumulation of further comprehensive investigation including proper intervention methods.

### Limitations

The results from the present study should be considered within the context that the information was gathered. Firstly, our results cannot directly be compared to past reports from Japan because of the different examination methods and measures used to evaluate depression. Also, our definition of 'depression' is based only on GDS scores, without corroborating clinical evaluation. However, the GDS is a well-validated instrument for assessing depression and its use is widespread and international.

### Conclusions

In conclusion, our results demonstrate that living with someone else was an important factor in the prevention of depression. These results fell in line with previous studies conducted on elderly subjects from Western countries. Our results suggest that various additional (background) factors were involved in the expression of depression in both individuals living with others and individuals living alone. A social support system and its condition may be more important than living arrangements of the elderly.

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