Epidemiological Survey of Dementia and Depression among the Aged Living in the Community in Japan

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Abstract: The authors surveyed the prevalence of depression and dementia in the elderly in Ohira town in Japan from 1989 to 1990. The total population of this town was 26,712, with 2,778 people aged 65 and above, constituting 10.4% of the total population. The prevalence of dementia (n=128) was 6.1% and that of major depression (n=9) was 0.4%, according to the DSM-III-R criteria. The prevalence of a depressive state which did not fulfill the criteria for major depression (n=55) was 2.4%. The patients with multi-infarct dementia (n=49) suffered from depression (42.8%) more frequently than those with dementia of the Alzheimer type (11.1%). The rate of depression coexisting with dementia increased with aging, while the rate of depression without dementia did not change in all the age groups.

Key Words: *depression, dementia, epidemiology, DSM-III-R, community sample, Japan*

INTRODUCTION

The proportion of the population aged 65 and above in Japan is rapidly increasing and reached 11.2% of the total population in 1989. The speed of increase in the elderly persons is twice that of Western countries. Dementia and depression are common psychiatric disorders in late life. So, it is very important to know the prevalence of these psychiatric disorders in planning mental health and social services for the aged. In Japan, there were many studies on the prevalence of dementia, but only a few on the prevalence of depression. We surveyed the prevalence of dementia and depression simultaneously among the elderly in Ohira town, and have already reported some of the preliminary results.[18]

Ohira town is located in the middle-east of Japan, 80 km from Tokyo. The total population of this town in 1989 was 26,712 with 2,778 people aged 65 and above. The central

area of this town has recently been developed into a factory site belonging to a big corporation. The surrounding area is mainly farmland.

METHODS

The Sample

The survey sample was on all the inhabitants of Ohira town, who were 65 years of age or above as of June 1, 1989. The number of people surveyed was 2,778 (males 1,123 and females 1,655). The proportion of the persons aged 65 and above was 10.4% of the total population. This proportion of elderly people was slightly lower than the national average of Japan in 1989 (11.2%).

Procedure for Survey

The survey was carried out in two phases. In the first phase, a questionnaire survey was conducted by distributing questionnaires to all of the elderly persons aged 65 and above. The questionnaires were collected by welfare commissioners. Questions on the general health status, family structure, activity of routine life, troublesome behaviors and a self-rating depression scale (SDS) by Zung[24] were included in the questionnaires.

From the results of the first phase investigation, we selected persons who were suspected of having dementia or depression. The list of troublesome behaviors was used to select subjects who were probably suffering from dementia, and the SDS scores were used to identify subjects who probably had depression.

In the second phase, the subjects who were suspected to have dementia or depression were interviewed individually by a team consisting of a psychiatrist and a public health nurse. They visited the subjects door-to-door. The psychiatrist conducted a psychiatric examination on each subject and evaluated his/her physical conditions by means of a semi-structured interview form.

The diagnostic criteria of dementia and depression used in this study were those con-

tained in the revised third edition of the Diagnostic and Statistical Manual (DSM-III-R).[1] In addition, the Mini-Mental State[6] was applied. And, Hachinski's ischemic score[8] was used to differentiate multi-infarct dementia from senile dementia of the Alzheimer type.

RESULTS

In the first phase of investigation, 2,688 persons (males 1,086 and females 1,602) responded to the questionnaires (96.8%). Since we did not check the questionnaires individually when we gathered them, some of them contained incomplete answers.

Excluding the persons who died or were hospitalized or institutionalized, 222 (78.7%) out of 282 persons who had one or more troublesome behaviors related to dementia, and 184 (86.4%) out of 213 persons who had moderate or severe depression evaluated by the SDS were interviewed.

First Phase of Investigation:
11 Items of Troublesome Behaviors
for Screening Dementia

For the screening of dementia, we used a list of 11 items which are characteristic features of dementia (Table 1). Two thousand and seventeen subjects (75.0% of 2,688) re-

Table 1: 11 Items of Troublesome Behaviors
for Screening Dementia

1. He (she) forgets that he has eaten.
2. He becomes suspicious and believes something false.
3. He sometimes hears what is not heard, or sees what does not exist.
4. He is forgetful and usually forgets what he was asked.
5. He makes a noise in a drowsy state at night.
6. He makes mistakes day and night.
7. He does not know well where he is, when he goes out.
8. He often misplaces something and claims it had been stolen.
9. He is incontinent and indifferent to it.
10. He is careless of using fire.
11. He sometimes does not know the time of the day.

sponded to the list of 11 items. One hundred and fifteen persons (5.7%) had two or more troublesome behaviors, and 329 persons (16.3% of all) had one or more troublesome behaviors.

The presence of one of these behaviors was regarded as a weak indicator of possible dementia. The presence of more than 2 troublesome behaviors was interpreted as a remarkable indicator of possible dementia. The presence of weak and remarkable indicators of possible dementia increased with age. The persons who had a weak or remarkable indicator of possible dementia were interviewed in the second phase of the investigation.

Self-Rating Depression Scale[24]

The subjects filled in the SDS by themselves. However, if they could not fill in the forms by themselves, their family members helped them. One thousand, nine hundred and fourteen persons (71.2%) of 2,688 responded to the SDS.

Table 2 shows the average score of the SDS by sex and age. The average score of all the subjects was 36.8±8.3 (35.9±8.3 for males and 37.4±8.3 for females). Each average score was within the normal range, and the score for females was significantly higher than that for males (U test, $p<0.0001$). The average score in each age group showed a tendency of increase from 65 to 84 years old (35.2±8.3 in the 65–69 age group, 36.3±7.8 in the 70–74 age group, 37.3±8.0 in the 75–79 age group, 40.6±8.7 in the 80–84 age group. (U test, $p<0.0001$)

According to the scores of the SDS, the sub-

jects were evaluated as not depressed or having mild, moderate or severe depression. Namely, a score of 20 to 39 points was evaluated as not depressed, 40 to 47 points as mild depression, 48 to 55 points as moderate depression and 56 or more points as severe depression. Table 3 shows the severity of depression evaluated by the SDS in each age group. The proportion of persons not depressed decreased with age. Correspondingly, the proportion of persons with mild and moderate depression increased with age. The relation between the severity of depression evaluated by the SDS and age was statistically significant. (qui square test, $p<0.000001$) The persons who were evaluated as moderately or severely depressed by the SDS were interviewed in the second phase of the investigation.

Second Phase of Investigation: Dementia

Prevalence of Dementia

One hundred and twenty-eight persons were diagnosed as suffering from dementia. On the assumption that the prevalence of dementia was the same among the persons who were interviewed (n=222) and those who were not interviewed (n=60), the prevalence of dementia among the people aged 65 or above was estimated at 6.1%.

Table 4 shows the prevalence of dementia according to sex and age. The prevalence was 5.1% for males and 6.7% for females. Females tended to have higher rates of dementia than males in all the age groups. The prevalence of dementia tended to increase with age.

Table 2: Average Score of the SDS
by Sex and Age

Age	N	Male	Female	Total
65–69	713	33.6±7.8	36.4±8.4	35.2±8.3
70–74	505	35.9±7.9	36.6±7.7	36.3±7.8
75–79	341	37.7±8.2	37.0±7.9	37.3±8.0
80–84	211	40.1±9.0	41.0±8.5	40.6±8.7
85–89	104	40.0±7.9	40.1±8.3	40.0±8.2
90–94	35	37.7±7.1	41.5±6.7	40.3±7.1
Total	1,914	35.9±8.3	37.4±8.3	36.8±8.3

Table 3: Severity of Depression Evaluated
by the SDS

Age	Normal	Mild	Moderate	Severe	Total
65–69	516 (72.4)	140 (19.6)	45 (6.3)	12 (1.7)	714
70–74	350 (69.3)	112 (22.2)	36 (7.1)	7 (1.4)	505
75–79	214 (62.8)	87 (25.5)	31 (9.1)	9 (2.6)	341
80–84	105 (49.8)	61 (28.9)	33 (15.6)	12 (5.7)	211
85–89	53 (51.0)	30 (28.8)	16 (15.4)	5 (4.8)	104
90–94	16 (45.7)	12 (34.3)	7 (20.0)	0 (0.0)	35
Total	1,257	444	168	45	1,914

Table 4: Prevalence of Dementia according to Sex and Age (%)

	65–69	70–74	75–79	80–84	85–89	90–94	Total
Male	1.2	2.3	7.2	13.4	16.0	12.8	5.1
Female	1.8	3.5	6.4	15.7	20.5	37.5	6.7
Total	1.6	3.1	6.7	16.2	19.3	29.4	6.1

Table 5: The Types of Dementia by Sex and by Age

Sex/Age	N	D.A.T.	M.I.D.	S.D.N.O.S.	Others
Male	40	6 (15.0)	19 (47.5)	14 (35.0)	1 (2.5)
Female	88	21 (23.9)	30 (34.1)	36 (40.9)	1 (1.6)
65–69	12	3 (25.0)	6 (50.0)	2 (16.7)	1 (8.3)
70–74	15	2 (13.3)	6 (40.0)	7 (46.7)	0 (0.0)
75–79	24	5 (20.8)	14 (58.3)	5 (20.8)	0 (0.0)
80–84	40	10 (25.0)	11 (27.5)	19 (47.5)	0 (0.0)
85–89	24	6 (25.0)	7 (29.2)	10 (41.7)	1 (4.2)
90–	13	1 (7.7)	5 (38.5)	7 (53.8)	0 (0.0)
Total	128	27 (21.1)	49 (38.3)	50 (39.1)	2 (1.6)

Atiolotical Classification of Dementia

Table 5 shows the type of dementia by sex and by age. Multi-infarct dementia constituted 38.3% of all dementias, dementia of the Alzheimer type 21.1% and senile dementia not otherwise specified 39.1%. The number of multi-infarct dementia cases was higher than that of dementia of the Alzheimer type. This tendency is a characteristic in Japan. Multi-infarct dementia was more common in males while dementia of the Alzheimer type was more common in females. In all the age groups, multi-infarct dementia was more prevalent than senile dementia of the Alzheimer type.

Table 6 shows the etiological classification and severity of dementia. More than half of the cases were mild dementia (56.3%). The most characteristic finding in this table is that 82.0% of senile dementia not otherwise specified was mild. On the other hand, while severe dementia was predominant in multi-infarct dementia, 28.6% of multi-infarct dementia was severe.

Table 6: Etiological Classification and Severity of Dementia

	N	Mild	Moderate	Severe
D.A.T.	27	12 (44.4)	11 (40.7)	4 (14.8)
M.I.D.	49	18 (36.7)	17 (34.7)	14 (28.6)
S.D.N.O.S.	50	41 (82.0)	7 (14.0)	2 (4.0)
Others	2	1 (50.0)	0 (0.0)	1 (50.0)
Total	128	72 (56.3)	35 (27.3)	21 (16.4)

D.A.T.: dementia of the Alzheimer type, M.I.D.: multi-infarct dementia, S.D.N.O.S.: senile dementia not otherwise specified.

Depression

Nine persons were diagnosed of having major depression. In addition, 55 persons were suffering from a depressive state which did not fulfill the DSM-III-R criteria for major depression, but psychiatrists diagnosed them as being depressed and in need of clinical treatment. Though we did not apply the DSM-III-R criteria, they might be diagnosed as dysthymia, depressive disorder not otherwise specified or adjustment disorder with a depressed mood. On the assumption that the

Table 7: Prevalence of Depression in Each Age Group (%)

	65–69	70–74	75–79	80–84	85–89	90–94	Total
Male	0.6	1.6	2.9	3.8	3.9	1.4	2.0
Female	2.5	2.5	2.8	5.5	6.1	10.3	3.4
Total	1.7	2.1	3.2	5.2	5.6	7.4	2.8

Table 8: The Correlation between the Types of Dementia and Depression

	M.I.D.	D.A.T.	S.D.N.O.S.	Others	Total
Not depressed	28 (57.1)	24 (88.9)	46 (92.0)	2	100 (78.1)
Depressive state	18 (36.7)	2 (7.4)	2 (4.0)	0	22 (17.2)
Major depression	3 (6.1)	1 (3.7)	2 (4.0)	0	6 (4.7)
Total	49	27	50	2	128

M.I.D.: multi-infarct dementia, D.A.T.: dementia of the Alzheimer type, S.D.N.O.S.: senile dementia not otherwise specified.

prevalence of depression in those who were interviewed (n=184) and those who were not interviewed (n=29) was the same, the prevalence of major depression was estimated at 0.4% (males 0.3% and females 0.4%) and that of the depressive state was 2.4% (males 1.8% and females 2.9%). Major depression and depressive state were more common in females than in males.

Table 7 shows the prevalence of depression (major depression and depressive state) in each age group. The prevalence of depression tended to increase with age. And, in almost all the age groups, depression was more common in females than in males.

Correlation between Dementia and Depression

Table 8 shows the correlation between the types of dementia and depression in our study. In subjects with dementia, 6 persons (4.7%) had major depression and 22 (17.2%) persons were in a depressive state. A total of 28 out of 128 demented people suffered from depression, or a rate of dementia with depression of 21.9%. This rate of depression coexisting with dementia cases (21.9%) was much higher than the prevalence of depression which we esti-
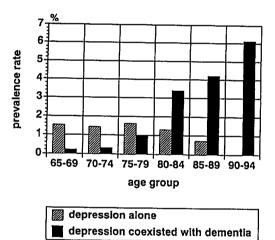

Fig. 1: The prevalence of depression alone and coexisted with dementia.

mated for the community-aged population (2.4%). Six point one percent of multi-infarct dementia cases were diagnosed as having major depression, and 36.7% were in a depressive state, making a total of 42.8% of multi-infarct dementia cases were suffering from depression. The subjects with dementia of the Alzheimer type and senile dementia not otherwise specified who were suffering from de-

pression (11.1%, 8.0%, respectively) were fewer than those with multi-infarct dementia.

Depression was diagnosed in 8.1% of mild dementia cases, 31.4% of moderate dementia cases and 19.0% of severe dementia cases. The subjects with moderate dementia suffered from depression most frequently.

Fig. 1 shows the prevalence of depression alone and depression coexisting with dementia. The prevalence of depression coexisting with dementia increased with age, while that of depression alone did not change in all the age groups.

DISCUSSION

This study is unique in several aspects. Firstly, we surveyed the entire elderly population living in a town and did not use a random sample. Secondly, we researched the prevalence of dementia and depression simultaneously in the same subjects, and demonstrated the correlation between dementia and depression. Thirdly, we used the DSM-III-R criteria which are used worldwide in diagnosing dementia and depression.

This survey was carried out in two phases. In the first phase, a number of troublesome behaviors was used to screen for dementia. Although this scale had not been standardized, we had compared this scale with the Mental status questionnaire (MSQ) by Kahn[11] used in our other investigation for dementia. Table 9 shows the correlation between the MSQ score and the numbers of troublesome behaviors in other investigations. Each x/y means the rate of dementia/not dementia. The number of the left of x/y shows the rate of dementia of each category. From the results of a discriminative analysis, the discriminative correlation coefficient is 0.216 for the MSQ and −0.293 for the number of troublesome behavior. The rate of hit was calculated at 66.5% ($p < 0.00001$). From these results, the ability of this scale to detect dementia was almost equal to that of the MSQ. So, we think that this scale is adequate for dementia screening.

In the second phase of the investigation, we

Table 9: The Correlation between the MSQ Score and the Numbers of Troublesome Behaviors

MSQ Score	Numbers of Troublesome Behaviors										Total (%)
	0	1	2	3	4	5	6	7	8	9	
10		2/9 18.2	2/9 18.2	1/2 33.3	1/0 100						6/20 23.1
9	1/2 33.3	1/3 25.0									2/5 28.6
8	13/16 44.8	2/1 66.7	0/1	1/1 50							16/19 45.7
7	8/7 53.5	3/1 75.0	1/0 100			0/1		1/0 100			12/9 57.1
6	3/6 33.3	2/1 66.7	1/0 100	1/1 50							7/8 46.7
5	7/2 77.8	1/1 50.0	3/0 100	4/0 100		1/0 100					15/3 83.3
4	2/2 50.0	3/0 100		1/0 100	3/0 100	1/0 100					8/2 80.0
3	1/2 33.3	1/0 100		1/0 100		1/0 100	1/0 100	1/0 100			7/2 77.8
2	2/0 100	0/1 0	3/0 100				1/0 100		2/0 100	1/0 100	6/1 85.7
1	1/2 33.3	1/0 100					2/0 100		2/0 100	1/0 100	5/2 71.4
0	5/2 71.4	3/0 100	2/0 100	1/0 100	3/0 100	3/0 100	4/0 100	2/0 100	4/0 100	2/0 100	19/2 90.5
Total	42/43 49.4	20/17 54.1	8/10 44.4	11/5 68.8	5/0 100	6/1 85.7	4/0 100	2/0 100	4/0 100	2/0 100	x/y (%)

used the DSM-III-R criteria to diagnose dementia. However, it was difficult to apply the DSM-III-R criteria when the dementia was mild. The diagnosis of dementia by the DSM-III-R criteria is qualitative and not quantitative, and there is no clear cut-off point between dementia and normal state. In our study, there were many cases of senile dementia not otherwise specified, and they were relatively older in age and in a milder form of dementia. Due to the qualitative nature of the DSM-III-R criteria, it was very difficult to determine whether they had mild dementia or were normal. In order to achieve a consensus in the diagnosis of dementia, we discussed the nature of dementia after every interview. Better criteria for the diagnosis of mild dementia are needed.

We assumed that the prevalence of dementia (or depression) was equal between those who were interviewed and those who were not interviewed. If we estimated the prevalence rate of dementia and depression simply, the prevalence of dementia is calculated dividing 128 (all of the demented subjects) by 2,688 (the subjects who responded the questionnaires). The prevalence of dementia was calculated at 4.8%. In the same way the prevalence of major depression, dividing 8 by 2,688, and the prevalence of depression which did not fulfill the DSM-III-R criteria, dividing 55 by 2,688, were 0.3%, 2.0% respectively. We think that the screened subjects have a higher rate of being dementia or depression. Therefore, we make the assumption like the above, and take into account the numbers of subjects who were not interviewed to estimate the prevalence rate of dementia and depression.

Many epidemiological investigations of dementia and depression in the late life have been performed in many countries. The prevalence of dementia varies from 0.5% in Lin's[15] study in China to 31.8% in Pfeiffer's[19] study in North Carolina. The prevalence of depression varies from 0.7% in Blazer's[3] study in North Carolina to 23.6% in Stenback's[21] study in Finland. These differences may be due to the different criteria used by different researchers for the diagnosis of dementia and depression. Therefore, we compared our results to those of other studies using the same criteria (DSM-III or DSM-III-R).

As shown in Table 10, the prevalence of dementia determined by the DSM-III or DSM-III-R criteria is almost identical in all the studies.[10 14 22 23] Our results (5.5%, 6.1%) showed a moderate degree of agreement.

Table 11 shows the prevalence of major depression reported in recent investigations[2–4 12 13] which used the DSM-III or DSM-III-R criteria. Although the same criteria for depression were used, the prevalence was different from one study to another. The prevalence of major depression in our survey (0.4%) is lower than that of other studies. Hasegawa[9] reported that the prevalence of major depression determined by the DSM-III criteria was 0.9% in Tokyo metropolitan. The prevalence of major depression in Japan is less than that in other countries. This difference may be due to socio-cultural differences. Hasegawa considered that the low prevalence of depression in Japan was due to the family

Table 10: The Prevalence of Dementia which used DSM-III or DSM-III-R Criteria

Year	Investigator	Country	Prevalence
1985	Kramer	U.S.A.	6.4%
1985	Sulkawa	Finland	6.7%
1985	Weissman	U.S.A.	5.4%
1986	Hasegawa	Japan	4.8%
1990	Dartigues	France	3.6%
1992	Komahashi & Ohmori	Japan (Ohira Town)	6.1%
1992	Ohmori & Komahashi	Japan (Tochigi Pref.)	5.5%

Table 11: The Prevalence of Depression which used DSM-III or DSM-III-R Criteria

Year	Investigator	Country	Age	Sample	Prevalence
1985	Kay	Australia	70–79	158	6.3%
1987	Blazer	U.S.A. (North Carolina)	60–	1,304	0.7%
1987	Copeland	U.S.A. (New York)	74 (Ave.)	841	4.6%
1988	Kivela	Finland	60–	1,529	3.7%
1988	Bland	Canada	65–	995	0.1%
1990	Komahashi & Ohmori	Japan (Ohira)	65–	2,689	0.4%

structure and we agree with his views. In Japan, many elderly persons live with other family members so they do not feel lonely or get depressed.

Comparing with the wide range of the prevalence of depression in various studies, the range of the prevalence of dementia is narrow. This suggests that dementia is not influenced by socio-cultural conditions.

In this study, we investigated the prevalence of dementia and depression simultaneously and demonstrated a correlation between dementia and depression. There were a few studies which surveyed the prevalence of dementia and depression simultaneously in a given community and referred to the correlation between dementia and depression. Copeland *et al.*[5], Morgan *et al.*[17] and Livingston *et al.*[16] surveyed the prevalence of dementia and depression simultaneously and estimated the prevalence of dementia at 5.2%, 3.2% and 4.6%, and the prevalence of depression at 11.3%, 9.8% and 15.9%, respectively. However, they did not use the DSM-III-R criteria. In addition, they did not refer to the correlation between dementia and depression, because they considered that depression does not involve cognitive impairment basically. Reifler[20] used the DSM-II criteria for dementia and the Research Diagnostic Criteria for depression, and reported that 23% of demented outpatients had depression. Greenwald[7] used the DSM-III criteria for dementia and depression, and reported that 11% of demented inpatients had depression. We estimated the rate of dementia with depression to be 4.7% when we limited depres-

sion to major depression based on the DSM-III-R criteria, and 21.9% when we included the depressive state which did not fulfill the DSM-III-R criteria but needed clinical treatments. The results of our research demonstrated that dementia and depression coexist frequently. The rate of the coexistence of depression and dementia (21.9%) was significant higher than the rate of the prevalence of depression without dementia in the elderly (2.4%) in our study (qui square test, p<0.01).

SUMMARY

1.   We surveyed the prevalence of dementia and depression among the elderly in Ohira town community in Japan.

2.   The prevalence rates were 6.1% for dementia, 0.4% for major depression and 2.4% for the depressive state.

3.   In the dementia cases, 4.7% of the subjects had major depression and 21.9% were in a depressive state.

4.   Depression was more common in multi-infarct dementia cases than the other types of dementia. Six point one percent of subjects with multi-infarct dementia suffered from major depression and 42.8% in a depressive state.

5.   The prevalence of depression coexisting with dementia increased with age, while the prevalence of depression alone did not change in all age groups.

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