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Original Article

A Cross-sectional Population-based Study on Senile Dementia in a Rural City

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Abstract

All residents aged 65 or over in a rural city (n=5340) were studied with a self-administered questionnaire on psychiatric symptoms, physical health status, medical history, and environmental factors. After the screening, the clinical diagnosis of senile dementia was made by psychiatrists. The overall prevalence was 4.0% among responders staying at home (201/4969). The prevalence increased with age for both males and females and tended to be higher for females than males. The multilogistic analysis of the above variables showed that in the cerebrovascular type, stroke and inactive physical status might be risk factors for both gender groups. For the Alzheimer's type, age and inactive physical status might be risk factors. For overall dementia, age, stroke, and inactive physical status might be risk factors.

Key words: senile dementia, risk factor, stroke, ADL, age

Introduction

In Japan as well as other developed countries, populations of aged people have increased. Age-related health problems such as osteoporosis, senile dementia, and impaired activities of daily living (ADL) including bed-bound status have become serious.

Several studies conducted up to the middle 1980's among Japanese elderly [1] were described in a Jorm *et al.*'s review article [2]. It was demonstrated in this review that the prevalence of senile dementia (SD) in Japan was similar to that in developed European countries. Moreover, sex differences in dementia types were noted among countries with cerebrovascular type (VD) being more prevalent in males than in females and with the Alzheimer's type of senile dementia (SDAT) being more in females than in males. VD exceeded SDAT in Japan, while SDAT was more in the USA and Western European countries than VD. Homma and Hasegawa [3] reviewed the 19 population-based studies on senile dementia performed up to 1986 in Japan: the prevalence was 4-5% among aged people and VD was more than SDAT. They also discussed possible explanations for VD being more than SDAT in Japan; 1) differences in diagnostic criteria, 2) the high rate of cerebrovascular diseases predisposing VD and masking SDAT , 3) certain constitutional or environmental factors playing a role in the development of SDAT being less in Japan.

Then Shibayama *et al.* [4] reported that as far as females were concerned, SDAT was more prevalent than VD. Recently, several reports from Japan [5, 6, 7, 8] demonstrated SDAT being more than VD.

Several case-control studies have revealed a number of risk factors for senile dementia, especially for SDAT [9,10]. In Japan, a case-control study [11] has pointed out physical inactivity and psychosocial inactivity as risk factors for Alzheimer's disease. Recently, in a prospective cohort study, Yoshitake *et al.* [12] found that regular moderate physical activity was a significant preventive factor for SDAT. In the EURODEM study [13], this factor was not discussed. It has not been clearly established whether inactive physical status is a risk factor for SDAT. More data including population-based epidemiological studies will be needed before the factors become clear. With respect to VD, no particular risk factors except for those related to stroke, which is a main cause of VD, have been demonstrated. To date, a very limited number of population-based studies have addressed risk factors [14].

This study was firstly aimed at clarifying current prevalences of SD of different types. Secondly, risk factors for different types of SD were also sought. We assumed that impaired physical

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status was associated with senile dementia, and therefore, we included it in a list of possible risk factors in the questionnaire.

In order to generate medical policy for the provision of home health services, in the last two decades, many local governments have carried out studies on the health conditions of aged people mainly living at home. The present study was designed partly as one of these studies.

Subjects and Methods

All of the residents (n=5340) at the age of 65 and over, registered in the Japanese rural city of Katsuyama, Fukui Prefecture, were enrolled. A self-administered questionnaire including items on gender, age, psychiatric symptoms, disease history, and composition of family members, life-style factors (smoking, alcohol consumption), items on activity of daily living (ADL) and on physical health status were administered to these subjects. Physical health status concerned daily mobility and the questions on it addressed whether the patient was bed-bound, chair-bound, house-bound, neighborhood-bound, or as active as healthy people. Social welfare commissioners, nurses, public health nurses, and volunteers distributed a questionnaire to the elderly, or families. Firstly the elderly themselves, secondly their families were requested to fill in and return the questionnaire, and then the public health nurses interviewed no responders. Three months later, respondents to this questionnaire survey totalled 96.6% (5160/5340). The remainder (n=180), who were refused (n=129), institutionalized or hospitalized (n=1), or changed residence and absent (n=50), were excluded from the subjects. Individuals possibly suspected to have dementia were selected from the respondents according to the positive responses to the following questions: dementia symptoms such as impaired recent memory, impaired spatial orientation, and impaired personal orientation, history of cerebrovascular diseases, senile dementia, and psychiatric diseases, and impaired physical health status. This selection was referred to the technique which validity was confirmed in previous studies [15), 16)]. Those persons accounted for 883. Out of them, 692 underwent a home visit which was made three to six months after the questionnaire survey. A clinical diagnosis was made by 15 psychiatrists according to DSM-III-R [17)] and with references to results from the Mini-Mental State (MMS) test [18)], Hasegawa's Dementia Scale's revised version (HDS-R) [19)], physical and neurological examinations, and psychiatric interviews. To reduce variability among the psychiatrists, they discussed the final diagnosis obtained in several cases using DSM-III-R. Hatchinski's (HIS) test [20), 21)] was carried out to differentiate between VD and SDAT. VD was defined if HIS points were more than 6, and the SDAT was nominated in the case of the HIS score being under 4. Those criteria were adopted, because the prospective clinicopathologic correlations showed that the HIS test is fairly sensitive and specific for the differentiation of pure SDAT and VD, which were approximately 70% to 80% for both [22)]. The rest of those suspected to have senile dementia but not subjected to the home visit survey (n=191) were deceased (n=86), institutionalized (n =29), or refused it (n=76).

In brief, of the 5340 enrolled, 129 were non-responders to the first questionnaire survey, 242 were institutionalized, deceased or absent over the study period lasting about six months, and the rest (n=4969) were finally subjected to both the first questionnaire survey and, if chosen, the second home visit survey.

Statistical Analysis

Differences in prevalences of demographic factors, characteristics, and environmental variables between the dementia group and the non-dementia group were examined by chi-square test. Differences were considered to be significant when the P value was less than 0.05. Thereafter, multilogistic analyses of dementia were carried out on the variables by using a forward stepwise selection with significant level of 0.02 for both entry and stay. Age, a continuous variable, was included in all the multilogistic analyses. All of those analyses were made for each gender group. SPSS PC version 6.1J (SPSS Japan Inc.) was used for the computer analysis.

Results

Characteristics of Subjects with Dementia

Among 670 who underwent the home visit interview, 201 cases were finally diagnosed to have dementia. Characteristics of those with dementia, such as gender, age, and severity and various types of dementia, are shown in Table 1. Physical health status was grouped into three categories: 1) bed-bound, chair-bound, and house-bound, 2) neighborhood-bound, 3) as active as the healthy.

About one-third of those with dementia were males and two-thirds were females. SDAT was 40.3%, VD was 36.3%, mixed type was 10.0%, and the remaining (13.4%) could not offer enough information to allow differentiation (unknown). For the severity of senile dementia, those with a slight grade were 41.8%, a moderate grade were 32.8%, and a severe grade were 25.4%.

The prevalence of dementia was estimated to be 4.0% (201/4969) among responders staying at home. Figure 1 shows the prevalence of SD in each of the five-year age groups. The prevalence rate increased with age and in females aged 85 or over, the rate reached more than 15%. On the other hand, the males presented a much lower rate than the females. Figure 2 shows the prevalence of SD by gender, type of dementia and five-year age group. For males, the prevalence of VD was higher than that of SDAT in the younger half of them, but lower in the older half. In females the prevalence of both types increased with advancing age; the increase peaked in subjects aged 80 years or older.

Univariate Analysis of Dementia for Males and Females

Before univariate analysis of dementia compared to non-dementia, dichotomous or triplet categorizations were made: since current-smokers among females were few, ex-smokers were combined with the current-smokers into one group; those taking alcohol only on some days in a week were differentiated from non-drinkers; those living alone or together with his or her aged partner were grouped into one and the rest were unified into another group. It was shown, as in Tables 2 and 3, that both for males and females, age, stroke, and inactive physical status were related to dementia.

Multi-logistic Analysis of Dementia for Variant Factors

Table 1 Characteristcs of the demented subjects (n=201)

Characteristics	No. of the Subjects (%)
Gender	
Male	78 (39)
Female	123 (61)
Age	
65-69	19 (9)
70-74	26 (13)
75-79	57 (29)
80-84	51 (25)
85-	48 (24)
Type of Dementia	
Cerebrovascular type (VD)	73 (36)
Alzheimer's type (SDAT)	81 (40)
Mixed	20 (10)
Unknwon	27 (13)
Grade of Dementia	
Slight	84 (42)
Moderate	66 (33)
Severe	51 (25)
Disease History	
Hypertension	41 (20)
Stroke	61 (30)
Brain Trauma	3 (1)
Psychiatric Diseases	9 (4)
Others	16 (8)
Environmental Factor	
Smoking Habit	
Current-smoker	22 (11)
Ex-smoker	43 (21)
Non-smoker	136 (68)
Alcohol Consumption	
Daily Drinking	18 (9)
Sometimes Drinking	21 (10)
Ex-drinker	34 (17)
Non-drinker	126 (64)
Family Member	
Single	1 (1)
Living together only with elderly	23 (12)
Living with his or her own child's partners	162 (79)
with grandchildren	113 (55)
without grandchildren	49 (24)
Others	15 (8)
Physical Health Status	
Severly Inactive	92 (47)
Moderately Inactive	80 (40)
Active	27 (13)

Table 2 Results from univariate analysis of dementia on different variables among males

Variables	Prevalence of Dementia	Significance
Age		<0.01
65-69	0.9	
70-74	2.6	
75-79	7.2	
80-84	6.6	
85-	11.3	
Disease History of Stroke		<0.01
yes	15.2	
no	2.1	
Family Composition		NS
Single or living only with aged partners	2.6	
Others	4.4	
Smoking		NS
Current or ex-smoker	4.0	
Non-smoker	3.6	
Alcohol Intake		NS
Daily or sometimes drinker	3.7	
Non-drinker	4.4	
Physical Health Status		<0.01
Sever inactive	21.1	
Moderate inactive	11.4	
Active	1.0	

NS: Non-significant by X^2 test

Table 3 Results from univariate analysis of dementia on different variables among females

Variables	Prevalence of Dementia	Significance
Age		<0.01
65-69	1.2	
70-74	1.8	
75-79	4.7	
80-84	9.1	
85-	16.0	
Disease History of Stroke		<0.01
yes	19.2	
no	2.9	
Family Composition		NS
Single or living only with eldely partners	2.0	
Others	4.9	
Smoking		NS
Current or ex-smoker	3.5	
Non-smoker	4.4	
Alcohol Intake		NS
Daily or sometimes drinker	3.7	
Non-drinker	4.4	
Physical Health Status		<0.01
Severely inactive	35.3	
Moderately inactive	8.8	
Active	0.5	

NS: Non-significant by X^2 test

Table 4 Significant risk factors for dementia proved from multilogistic analysis

Variables	Males Relative Risk (95% CI)	Females Relative Risk (95% CI)
Whole Dementia		
Age	1.434 (1.307-1.573)	1.265 (1.172-1.365)
Disease History of Stroke	4.370 (3.341-5.718)	3.492 (2.760-4.418)
Inactive Physical Status	3.136 (2.671-3.681)	6.341 (5.420-7.418)
Cerebrovascular Dementia		
Disease History of Stroke	20.687 (12.913-33.139)	21.832 (14.606-32.635)
Inactive Physical Status	3.128 (2.519-3.884)	5.047 (3.957-6.438)
Alzheimer's Type Dementia		
Age	2.043 (1.762-2.370)	1.481 (1.349-1.625)
Inactive Physical Status	1.836 (1.404-2.403)	4.617 (3.829-5.567)

CI: Confidence interval

The univariate analysis has revealed that age, stroke, and inactive health status are associated with dementia. These and other variables not related to dementia (smoking, alcoholic consumption) were included in the multilogic analysis. Results from this multivariate analysis are shown in Table 4 for each gender group and for each type of dementia. With respect to the dementia overall, age, stroke, and inactive physical status might be risk factors for both the male and the female groups. Again, the multilogistic analyses showed that for both the male and the female VD dementia, disease history of stroke and physical inactivity might be independent risk factors. With respect to SDAT, it was shown by the analysis that age and inactive physical health status might be risk factors for both gender groups.

Discussion

The current study included only residents staying at home.

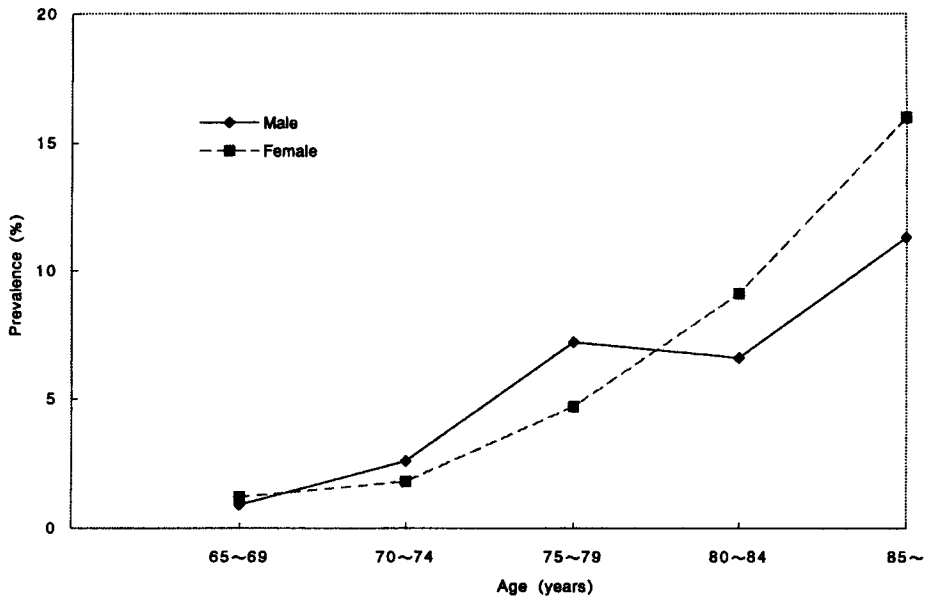

Fig. 1 Prevalence of senile dementia among residents aged 65 and over by gender and five-year age groups

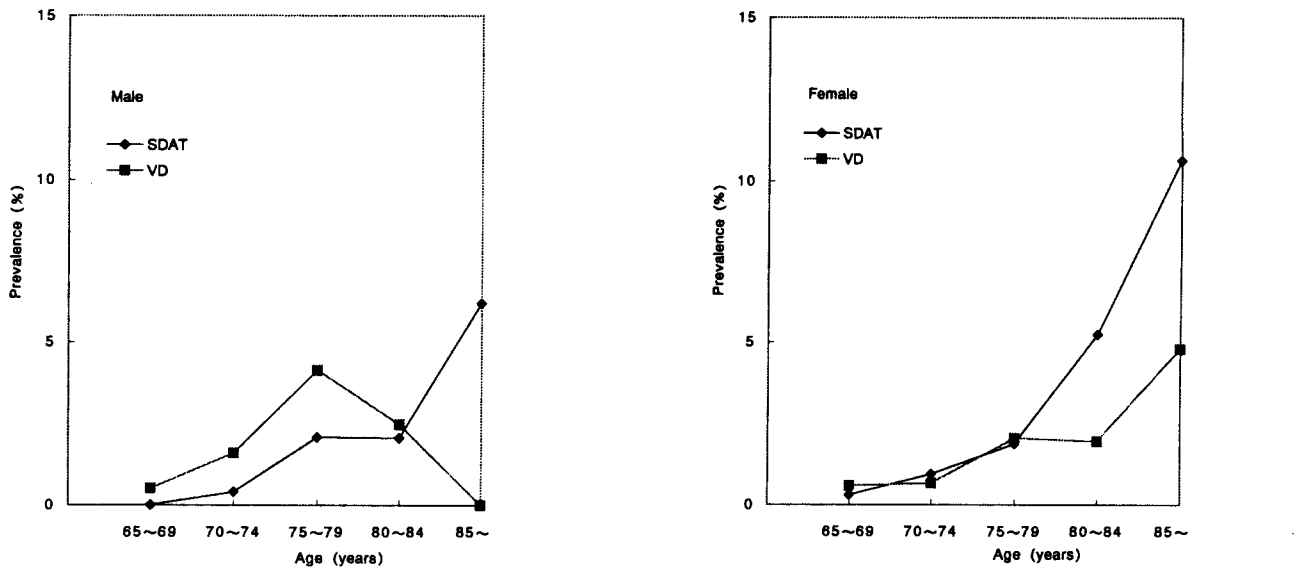

Fig. 2 Prevalence of dementia by gender, type of dementia and five-year age groups

Before the study, those institutionalized in a nursing home (n=58), even though they were aged 65 or more, were excluded. It has been said that institutionalized individuals have a higher prevalence of SD than those living at home[3]. This means that the present study does not give the prevalence of dementia among the whole aged population, unlike the European epidemiological studies[23,24,25]. As seen from the datum on the prevalence at nursing homes in Japan (54.3%)[26], it is suspected that 31 cases had dementia among the 58 who were excluded before the study. Thus it is deduced that the prevalence of SD among the whole aged population in this city is 4.6% (232/5027).

In the methodological aspects, we used a self-administered questionnaire the validity of which was confirmed in previous studies[15,16]. The control examination was performed in these studies, which showed the screening to be reliable. Therefore, the results from the current study can be compared with previous Japanese studies using the same methods, although the current study did not take the control examination. Again the present study has shown a similar prevalence of dementia among those aged 65 or over to the previous Japanese studies made in these two decades[5,6,7,8].

HIS test[20,21] has been carried out to differentiate between VD and SDAT. The differentiation is made according to scores obtained, which may have a limit such as mixed type: prospective clinicopathologic correlations show that HIS test is relatively insensitive to the presence of mixed type (17% to 50%)[22]. But HIS test is fairly sensitive and specific for the differentiation of pure AD and VD (approximately 70% to 80%)[22]. It is considered from epidemiological point of view that the differentiation is useful enough to grasp the distribution of types

and to determine risk factors.

The Hisayama studies [19], a Japanese representative cohort study, revealed a decrease in the stroke incidence and, in association with this, a decrease in the onset of VD. The evidence from the authors' study that the SDAT was more prevalent than the VD is in agreement with the Hisayama studies. At the same time, longevity in Japan as well as in other developed countries may be another reason for the increase in SDAT.

In Japan as well as in developed countries, female life expectancy has increased. Although the recent studies including the Hisayama study [12] and the Homma and Hasegawa' review [3] have shown that while the incidence rate of dementia has decreased, the prevalence of dementia has not decreased. This is very likely because the proportion and the actual numbers of the aged people have increased. In Japan, females (with an average life-expectancy of 83.8 years) live longer than males (who have an average life-expectancy of 75.3 years). A difference in the prevalence of two types of dementia between the two gender groups classified by age, as shown in the present study, may be a result of the difference in average life-expectancy, and the prevalence of VD in the males which has a peak between the ages of 75 to 79.

We assume that institutionalization itself can provoke dementia. In Japan, patients become frequently bed-bound or chair-bound after institutionalization, unlike in the European countries. Then institutionalization may be a risk factor among the whole aged populations. By contrast, the current study on those staying at home was concerned with health conditions resulting from home health service occasionally provided by the local government. Therefore, relationships between limited daily living activities in institutionalization and risk factors relating to institutionalization should be elucidated by different studies.

The results of our study have shown that age, the medical history of cerebrovascular diseases, and inactive physical status are probably independent risk factors for the overall dementia. Stroke is a very well-known cause for the VD. Risk factors for VD and for SDAT, respectively, were the same, consistently, for both gender groups. Previous age-matched case-control studies can not detect age as a risk factor because of its feature. By contrast, population based studies covering various age groups as in the present study can identify age as a risk factor for SDAT. A case-control study from Japan reported that those with psychosocial inactivity and physical inactivity were at risk for SDAT [11]. And the present study confirmed that inactive physical status might be a risk factor for SD. It is difficult to judge whether physical inactivity is a state of pre-dementia or a symptom of dementia. But in a recent prospective cohort study [12], it was found that regular moderate physical activity was a significant preventive factor for SDAT. It is understandable that inactive physical capability makes people house bound, chair bound, and then bed bound, leading to dementia.

Smoking, a possible risk factor for SDAT suggested in some studies reviewed by Henderson [5] and van Duijr *et al.* [13], was not reproduced in the current study. Neither was alcohol, a risk factor for VD, suggested to be a risk factor for SD in the current study. This may be the result of low numbers of subjects smoking cigarettes or consuming a large amount of alcohol.

Very recently, several cohort studies of the incidence of dementia have been published [27), 28), 29)]. Among them, two Japanese [12), 28)] studies described an incidence of about 2%. Moreover, cohort studies [12), 29)] which followed non-dementia elderly in Japan and took the onset of dementia as the end point suggested prior stroke episodes or high systolic blood pressure, and alcohol consumption to be risk factors for VD. Age and physical inactivity were also shown to be risk factors for SDAT. Since results from the present cross-sectional study on a large population coincide with these follow-up studies in terms of risk factors, it can be confirmed that persons staying at home, occasionally taking home health services are at risk for SD by the common underlying mechanism.

Prevention of cerebrovascular diseases has the potential for preventing dementia among the aged because cerebrovascular diseases is the second serious problem in our country as a cause of death. Providing support to minimize physical inactivity in aged people may be necessary for the prevention of SD.

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