SHORT REPORT

# Dementia associated mental and behavioural disturbances in elderly people in the community: findings from the first Nakayama study

**M Ikeda, R Fukuhara, K Shigenobu, K Hokoishi, N Maki, A Nebu, K Komori, H Tanabe**

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**Objective:** To determine the prevalence of mental and behavioural disturbances associated with dementia in elderly people living in the Japanese community of Nakayama.
**Methods:** A door to door three phase population survey was carried out on all persons aged 65 years and older living at home. The study included a psychiatric interview, neurological and neuropsychological examination, and cranial computed tomography. Participants with dementia were rated on the neuropsychiatric inventory.
**Results:** Of 1438 inhabitants, 1162 (81.0%) completed the protocol. The prevalence of dementia was 4.8%. Of the 60 participants with dementia (Alzheimer's disease 35%, vascular dementia 47%, and dementia from other causes 17%), 53 (88.3%) had shown one or more mental and behavioural disturbances. Apathy/indifference (56.7%), followed by agitation/aggression (35%), aberrant motor behaviour (31.7%), and irritability (31.7%) were the common symptoms. More productive (positive) symptoms such as delusions and aberrant motor behaviour were found in the Alzheimer group than in the vascular dementia group.
**Conclusions:** A wide range of dementia associated mental and behavioural disturbances developed in the majority of community dwelling individuals with dementia. The findings suggest that a screening programme focusing on identifying these symptoms should be included in the physician's diagnostic tools for dementia.

Behavioural and psychological symptoms of dementia (BPSD)[1] are distressing to patients and caregivers[2] and often lead to institutionalisation.[3] Behavioural symptoms include physical and verbal aggression, wandering, agitation, sexual disinhibition, and screaming, while psychological symptoms include depression, anxiety, delusions, and hallucinations. Appropriate management of BPSD lessens the burden of caregivers[4] and may postpone institutionalisation. Several studies have described the frequency of BPSD. Almost all relevant studies, however, have come from clinic derived samples such as patients in Alzheimer's disease research centres or nursing home populations. These sources are subject to referral bias.

Little is known about community prevalence of BPSD, and to our knowledge there have been very few population based studies.[5 6] Our aim in the present investigation was to address methodological shortcomings of previous studies and to determine the prevalence of mental and behavioural disturbances associated with dementia in elderly Japanese people living at home. We also compared mental and behavioural disturbances in the two most common types of dementia—Alzheimer's disease and vascular dementia.

## METHODS

Nakayama is a Japanese rural community (5038 residents). The study was conducted on all persons aged 65 years and older residing at home in Nakayama town on the prevalence day (1 January 1997). The ascertainment of cases was made between January 1997 and March 1998. Participants were examined by a neuropsychiatrist even at the screening interview. Before the screening interview, written informed consent was obtained from all participants (or relatives when necessary), with a full explanation of the procedures. A more detailed description of the methods has been reported previously.[7]

### Screening interview (phase I)

The screening interview consisted of a semistructured questionnaire (questions on education, occupation, and so on), followed by the mini-mental state examination (MMSE) for participants and the short memory questionnaire (SMQ)[8] for a family member of each participant. Participants were submitted to clinical evaluation according to the cut off point of these tests for the presence of a cognitive disorder, based on previous studies (MMSE, $\leqslant 23$; SMQ, $\leqslant 39$).

### Clinical evaluation (phase II)

The examination included a semistructured interview of the participant's medical history; standard physical and neurological examination; severity evaluation using the clinical dementia rating scale (CDR) and psychiatric evaluation using the neuropsychiatric inventory (NPI).[9 10] Based upon the results of these evaluation, participants were selected for phase III.

### Diagnostic procedures (phase III)

Participants were asked to undergo cranial computed tomography (CT) and routine blood tests including serum vitamin B-12 and thyroid function tests. A final diagnosis was made based on combined information, using three diagnostic steps. The diagnosis of dementia was established according to DSM-III-R criteria. Finally, participants with dementia were classified into subgroups according to the cause of their dementia. Alzheimer's disease was defined according to the NINCDS-ADRDA criteria; vascular dementia was defined according to DSM-IV criteria with CT findings.

**Abbreviations:** BPSD, behavioural and psychological symptoms of dementia; CDR, clinical dementia rating scale; DSM, Diagnostic and Statistical Manual of Mental Disorders; MMSE, mini-mental state examination; NPI, neuropsychiatric inventory; SMQ, short memory questionnaire

### Assessment of behavioural and psychological symptoms of dementia

Informants of all participants with dementia were given the NPI by trained public health nurses in phase II. The NPI is a comprehensive instrument that evaluates 10 behaviours: delusions, hallucinations, agitation/aggression, depression/dysphoria, anxiety, euphoria/elation, apathy/indifference, disinhibition, irritability/lability, and aberrant motor behaviour. The informant was asked if the behaviour represented a change from that shown by the participant before the onset of dementia and was present during the past month. If a positive response was obtained from the screening questions, the behavioural domain was explored with scripted questions that focused on specific features of the behavioural disturbance. The informant then rated the behaviours. Scores from 1 to 4 were obtained for the frequency, and 1 to 3 for the severity of each behaviour (the NPI score for each domain was the product of the frequency and severity subscores, maximum 12).

### Statistics

Mann–Whitney U tests were used to compare the NPI scores for each BPSD and CDR staging in the Alzheimer's disease and vascular dementia groups. Student's *t* tests were used to compare age and MMSE score between two groups. A significance level of 0.05 (two tailed) was set for all analyses, which were done using SPSS for Windows, version 8.0.

## RESULTS

Of the 1438 residents aged 65 years and older at the prevalence day, 1162 (81.0%) completed the protocol. Sixty participants fulfilled the diagnostic criteria of dementia (38 women and 22 men). The mean (SD) age was 81.8 (7.3) years for women and 81.4 (5.8) for men. Twenty one (35%) were diagnosed as having Alzheimer's disease (17 women, four men), 28 (47%) as having vascular dementia (15 women, 13 men), one as having Alzheimer's disease with cerebrovascular disease, and 10 as miscellaneous. Among 60 participants with dementia, one was receiving antidepressant and four were receiving hypnotics.

Fifty three of the participants with dementia (88.3%) had shown one or more BPSD in the past month (table 1). The most common symptom was apathy/indifference (56.7%), followed by agitation/aggression (35%), irritability (31.7%), and aberrant motor behaviour (31.7%). NPI scores (the product of the frequency and severity) also reflected these frequencies, with apathy having the highest score.

No significant differences were found between participants with Alzheimer's disease and those with vascular dementia in age, sex, cognitive impairment, or severity of dementia. Table 1 compares the NPI scores in participants with Alzheimer's disease and with vascular dementia. The total NPI disturbances was similar in the two groups ($p = 0.1370$). However, participants with Alzheimer's disease were more likely to have delusions ($p = 0.0349$) and aberrant motor behaviour ($p = 0.0057$). Participants with Alzheimer's disease were also more likely to have hallucinations ($p = 0.1148$) and irritability/lability ($p = 0.0745$), even though differences did not reach statistical significance. More productive (positive) symptoms were found in the Alzheimer's disease group.

## DISCUSSION

This study is one of the most comprehensive and precise type-specific prevalence surveys of mental and behavioural disturbances associated with dementia. The point prevalence of any BPSD was 88.3%. The most common symptoms in rank order were apathy/indifference, agitation/aggression, irritability/lability, and aberrant motor behaviour. More productive (positive) symptoms such as delusions and aberrant motor behaviour were found in the Alzheimer's disease group than in the vascular dementia group.

The results of our study partially replicate findings of the Cache County study reported by Lyketsos *et al*.[5] In that study the reported prevalence rates of any mental and behaviour disturbance, apathy, agitation/aggression, and depression were 61%, 27%, 24%, and 24%, respectively. This pattern is similar to ours, although the prevalence rates of these symptoms in the current study are higher than in the Cache County study. The reason of higher rate in our study may be our stricter method of assessment, in which all informants were interviewed. In the Cache County study participants were given the NPI. The principal method of assessment relied on informants and not on direct examination of participants.[9]

We found higher rates of the productive (positive) symptoms such as delusions and aberrant motor behaviours

**Table 1** Frequency and neuropsychiatric inventory scores of mental and behavioural disturbances in the first Nakayama study for all subjects with dementia, those with Alzheimer's disease, and those with vascular dementia

| | Dementia (n = 60) | | | Alzheimer's disease (n = 21) | | | Vascular dementia (n = 28) | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| *Characteristic* | | | | | | | | | | |
| Age (years)* | 81.6 (6.7) | | | 83.2 (7.5) | | | 81.0 (5.9) | | | |
| Sex, female: male | 38:22 | | | 17:4 | | | 15:13 | | | |
| CDR, grade 0.5:1:2:3 | 7:22:22:9 | | | 3:6:8:4 | | | 3:12:10:3 | | | |
| MMSE score* | 16.4 (6.8) | | | 15.1 (7.3) | | | 18.1 (6.1) | | | |
| **NPI domain†** | **n** | **%** | **NPI score** | **n** | **%** | **NPI score** | **n** | **%** | **NPI score** | **p Value** |
| Delusions | 16 | 26.7 | 1.0 | 9 | 42.9 | 1.4 | 4 | 14.3 | 0.7 | 0.0349 |
| Hallucinations | 9 | 15.0 | 0.8 | 5 | 23.8 | 1.0 | 2 | 7.1 | 0.4 | 0.1148 |
| Agitation/aggression | 21 | 35.0 | 2.0 | 10 | 47.6 | 2.7 | 7 | 25.0 | 1.5 | 0.1338 |
| Depression/dysphoria | 13 | 21.7 | 1.1 | 5 | 23.8 | 1.7 | 6 | 21.4 | 0.8 | 0.6283 |
| Anxiety | 14 | 23.3 | 1.1 | 5 | 23.8 | 1.0 | 6 | 21.4 | 0.8 | 0.8248 |
| Euphoria/elation | 5 | 8.3 | 0.4 | 3 | 14.3 | 0.9 | 1 | 3.6 | 0.1 | 0.1734 |
| Apathy/indifference | 34 | 56.7 | 4.2 | 9 | 42.9 | 3.4 | 20 | 71.4 | 5.1 | 0.1288 |
| Disinhibition | 5 | 8.3 | 0.8 | 2 | 9.5 | 1.1 | 3 | 10.7 | 0.8 | 0.9847 |
| Irritability/lability | 19 | 31.7 | 1.7 | 10 | 47.6 | 2.3 | 6 | 21.4 | 1.2 | 0.0745 |
| Aberrant motor behaviour | 19 | 31.7 | 2.0 | 12 | 57.1 | 4.0 | 6 | 21.4 | 0.9 | 0.0057 |
| Total | 53 | 88.3 | 15.0 | 19 | 90.5 | 19.6 | 26 | 92.9 | 12.2 | 0.1370 |

*Mean (SD); other values are numbers of patients and percentages.
†Numbers across columns do not add up to the total number.
CDR, clinical dementia rating; MMSE, mini-mental state examination; NPI, neuropsychiatric inventory.

in Alzheimer's disease, although there was no difference in total NPI score between Alzheimer's disease and vascular dementia. The prevalence of each symptom of Alzheimer's disease in our study was similar to that in clinical samples.[11] However, the prevalence of productive symptoms in the subjects with vascular dementia in our study was lower than in clinical samples.[12] It is likely that there are many sufferers from vascular dementia without productive symptoms who are living in the community.

A major limitation of our study is the relatively small sample size of the Alzheimer and vascular dementia groups. Many BPSD besides delusions and aberrant motor behaviours failed to reach statistical significance between these groups, but may have shown differences in a larger sample. Moreover, we could not analyse the BPSD in subjects with dementia with Lewy bodies, owing to the small sample size. This could be a significant cause of BPSD.[11]

The high rates of mental and behavioural disturbances in community dwelling dementia sufferers are important because these symptoms may cause distress in people with dementia and their caregivers, and lead to earlier institutionalisation. The findings also suggest that a screening programme focusing on identifying these symptoms should be included in the physician's diagnostic work-up for dementia and in community based surveys of dementia.

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### Authors' affiliations

**M Ikeda, R Fukuhara, K Shigenobu, K Hokoishi, N Maki, A Nebu, K Komori, H Tanabe,** Department of Neuropsychiatry, Ehime University School of Medicine, Ehime, Japan

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Correspondence to: Dr M Ikeda, Department of Neuropsychiatry, Ehime University School of Medicine, Shigenobu, Onsen-gun, Ehime 791-0295, Japan; mikeda@m.ehime-u.ac.jp

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## REFERENCES

1 **Finkel SI**, ed. Module1: an introduction to BPSD. *In BPSD Educational Pack*. Cheshire, UK: Gardiner-Caldwell Communications, 1998:1–23.
2 **Rabins PV**, Mace NL, Lucas MJ. The impact of dementia on the family. *JAMA* 1982;**248**:333–5.
3 **Steele C**, Rovner B, Chase GA, *et al*. Psychiatric symptoms and nursing home placement of patients with Alzheimer's disease. *Am J Psychiatry* 1990;**147**:1049–51.
4 **Shigenobu K**, Ikeda M, Fukuhara R, *et al*. Reducing the burden of care for Alzheimer's disease through the amelioration of ''delusions of theft'' by drug therapy. *Int J Geriatr Psychiatry* 2002;**17**:211–7.
5 **Lyketsos CG**, Steinberg M, Tschanz JT, *et al*. Mental and behavioral disturbances in dementia: findings from the Cache County Study on memory in aging. *Am J Psychiatry* 2000;**157**:708–14.
6 **Chan D-C**, Kasper JD, Black BS. Prevalence and correlates of behavioral and psychiatric symptoms in community-dwelling elders with dementia or mild cognitive impairment: the Memory and Medical Care Study. *Int J Geriatr Psychiatry* 2003;**18**:174–82.
7 **Ikeda M**, Hokoishi K, Maki N, *et al*. Increased prevalence of vascular dementia in Japan: a community based epidemiological study. *Neurology* 2001;**57**:839–44.
8 **Koss E**, Patterson MB, Ownby R, *et al*. Memory evaluation in Alzheimer's disease: caregiver's appraisals and objective testing. *Arch Neurol* 1993;**50**:92–7.
9 **Cummings JL**, Mega M, Gray K, *et al*. The neuropsychiatric inventory: comprehensive assessment of psychopathology in dementia. *Neurology* 1994;**44**:2308–14.
10 **Hirono N**, Mori E, Ikejiri Y, *et al*. Japanese version of the Neuropsychiatric Inventory: a scoring system for neuropsychiatric disturbances in dementia patients. *Brain Nerve* 1997;**49**:266–71. [In Japanese]
11 **Hirono N**, Mori E, Tanimukai S, *et al*. Distinctive neurobehavioral features among neurodegenerative dementias. *J Neuropsychiatry Clin Neurosci* 1999;**11**:498–503.
12 **Sultzer DL**, Levin HS, Mahler ME, *et al*. A comparison of psychiatric symptoms in vascular dementia and Alzheimer's disease. *Am J Psychiatry* 1993;**150**:1806–12.