

# RISK FACTORS ASSOCIATED WITH INSTITUTIONALIZATION AMONG ALZHEIMER'S DISEASE IN HONG KONG

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## Abstract

*Risk factors of institutionalization for Alzheimer's Disease (AD) have been widely reported in the Caucasian populations. However, there is lack of local data in Hong Kong. The objective of the study was to examine the clinical factors associated with institutionalization among Chinese AD patients in Hong Kong. This was a retrospective case series analysis from registry at a regional Memory Clinic. Case records of all consecutive patients attending the Queen Mary Hospital's Memory Clinic from January 1997 to June 2000 were reviewed. All patients who had probable AD by NINCDS-ADRDA criteria were recruited. Demographic data, presenting symptom, cognitive and non-cognitive symptoms, cognitive assessment scores, functional status and place of residence were documented and analyzed. Those AD patients living at home were compared to those living in institutions. 96 AD patients were recruited. 72.9% were female. The mean age at first visit was 77.3+6.6 years. 18.8% of the patients were living in institutions at first visit. The mean time from symptom onset to institutionalization was 36.8+29.3 months. Institutionalized AD patients were older, being widowed, had higher prevalence of atrial fibrillation, lower MMSE scores, more advanced stages of dementia, lower BADL and IADL scores, higher prevalence of unusual behaviours, poorer comprehension of language and more comorbidities. Multivariate logistic regression analyses reviewed that marital status, number of comorbidities and IADL scores were independent risk factors associated with institutionalization.*

**Keywords:** Alzheimer's Disease, risk factor, institutionalization

## Introduction

It is known that Alzheimer's disease (AD) will put an individual at a higher risk of institutional care and there have been a number of overseas studies reporting the rate and predisposing factors of institutionalization among elderly persons with Alzheimer's disease<sup>1,2</sup>. Between 62.5% to 76% of AD patients would have entered a nursing home after 5 years' follow-up. The principle predictors are the degree of cognitive impairment, the overall staging of the dementia, and the physical function of the patients<sup>3</sup>. In Hong Kong, Woo J et al<sup>4</sup> have also reported that cognitive impairment and depressive symptoms were risk factors predisposing to institutionalization among a random sample of community living elderly. No previous study has reported the risk factors or predictors of nursing home placement in AD patients in Hong Kong.

## Objective

The objective of this study was to examine the clinical factors associated with institutionalization among Chinese AD patients in Hong Kong.

## Method

96 patients with probable AD who had attended the Memory Clinic at Queen Mary Hospital from 1/1/1997 to 30/6/2000 were recruited. The case notes were reviewed and information regarding the demographic data, symptomatology, comorbidities

and the functional and mental assessment scores were extracted. The type of accommodation at first visit was recorded. The period of delay in institutionalization was also calculated retrospectively from onset of symptom to institutionalization. Details of the methodology have been described in another paper in this journal.<sup>5</sup>

### Statistical analyses

Descriptive analyses for all variables were first performed. Student's t-tests were used for continuous variables. Chi-square statistics or Fisher's Exact test were used for categorical data. Logistic regression model was used to find independent risk factors for institutionalization. P-value of less than 0.05 was regarded as statistically significant. The Statistical Package for the Social Sciences (SPSS) 7.5 for Windows was employed for statistical analyses.

### Results

#### Demographic characteristics

Of the 96 AD patients, 70 (72.9%) were female and their mean age at first visit was 77.3±6.6 years.

The mean Mini-mental State Examination (MMSE) score was 15.5±5.4, indicating mild to moderate degrees of cognitive impairment. 65.6% of the patients had mild dementia with Clinical Dementia Rating (CDR) 0.5 or 1. 25.0% had moderate dementia (CDR 2) and only 9.4% had severe dementia with CDR 3. The mean Bathrel Activities

Table 1: Univariate Analysis of features of AD patients living at home versus in institutions (n=96)

	Home (n=78)	Institution (n=18)	p value
Gender (female)	74.4%	66.7%	0.515
Age at first visit (years)	76.4±6.4	81.1±5.9	<b>0.006*</b>
Age at onset of symptom	73.3±6.8	77.7±6.2	<b>0.014*</b>
Duration of illness (years)	3.11±1.89	3.36±2.48	0.626
Education (years)	4.01±4.71	3.53±5.16	0.708
Marital status			
Widow/single/divorced	53.8%	88.9%	<b>0.007*</b>
Family history of AD/ dementia	11.5%	5.6%	0.682
At least one vascular risk factor present	76.9%	77.8%	1.00
Number of vascular risk factors	1.27±1.03	1.78±1.31	0.076
Number of co-morbidity	2.32±1.45	3.44±1.69	<b>0.004*</b>
HT	51.3%	55.6%	0.743
DM	24.4%	16.7%	0.756
IHD	10.3%	22.2%	0.229
AF	6.4%	27.8%	<b>0.019*</b>
MMSE <sup>†</sup>	16.2±5.5	12.5±4.1	<b>0.009*</b>
CDR 2 or 3	29.5%	55.6%	<b>0.040*</b>
GDS <sup>†</sup>	7.64±5.53	8.83±5.79	0.414
HIS	1.41±1.53	1.61±1.50	0.616
BADL	18.63±2.92	15.56±4.64	<b>0.014*</b>
IADL	5.32±2.25	2.94±1.98	<b>&lt;0.001*</b>

HT=Hypertension; DM=Diabetes Mellitus; IHD=Ischaemic Heart Disease; AF=Atrial Fibrillation; MMSE=Mini-mental State Examination; ADAS-Cog=Alzheimer's Disease Assessment Scales-Cognitive Subscale; CDR 2 or 3=Clinical Dementia Rating 2 or 3; GDS=Geriatric Depression Scale; HIS=Hachinski Ischemic Score; BADL=Bathel Activities of Daily Living; IADL= Instrumental Activities of Daily Living

\* denotes statistically significant (p<0.05)

<sup>†</sup>denotes n=95

(9.4%), chronic rheumatic heart disease (9.4%), gout (9.4%), hyperlipidaemia (9.4%). Cardiovascular risk factors were present in 77.1% (74) of our patients. The mean number of vascular risk factor per patient was  $1.36 \pm 1.1$ . The number of vascular risk factor was directly correlated with the Hachinski Ischaemic Score (Spearman's rho correlation coefficient=0.379;  $p < 0.01$ ).

**Institutionalization**

The characteristics of AD patients who were residing in institutions or at home at first visit were compared (Table 1). 18.8% of the patients were living in institutions at first visit. Among them, 16.7% were in Subvented Care and Attention Homes while 83.3% lived in private old age homes.

At clinical presentation, institutionalized AD

patients were older. They were more likely to be widowed, single or divorced. These subjects developed the disease at an older age, had lower MMSE scores, more advanced stages of dementia, lower BADL and IADL scores than those patients who lived at home (Table 1). Poor comprehension of language and unusual behaviour were significantly more prevalent among institutionalized patients than patients living at home (72.2% vs 39.7%,  $p = 0.019$  and 22.2% and 3.8%,  $p = 0.021$  respectively) (Table 2). More comorbidities were found in institutionalized AD ( $3.44 \pm 1.69$  vs  $2.32$  ( $1.40$ ,  $p = 0.004$ ). Atrial fibrillation was the only comorbidity which was significantly more prevalent among the institutionalized AD group in this cohort (27.8% vs 6.4%,  $p = 0.019$ ) (Table 1). In multivariate logistic regression analyses, marital status,

*Table 2: Univariate analysis of cognitive and non-cognitive symptomatology of AD patients living at home and in institution at first visit*

	Home(n=78)	Institution(n=18)	p value
Number of cognitive domain	5.73±1.60	6.33±1.14	0.071
Number of non-cognitive domain	1.63±1.07	1.67±1.19	0.893
Number of Cognitive & non-cognitive domain	7.36±2.01	8.00±1.78	0.217
Poor short-term memory	100%	100%	1.00
Poor long-term memory	6.4%	0.0%	0.580
Disorientation	70.5%	88.9%	0.142
<i>Time</i>	47.4%	66.7%	0.138
<i>Place</i>	56.4%	77.8%	0.114
<i>Person</i>	23.1%	33.3%	0.377
Poor attention	5.1%	5.6%	1.00
Impaired calculation	67.9%	72.2%	0.786
Language problem	52.6%	77.8%	0.066
Poor comprehension of language	39.7%	72.2%	<b>0.018*</b>
Apraxia	76.9%	94.4%	0.112
Agnosia	24.4%	16.7%	0.756
Impaired executive function	84.6%	88.9%	1.00
Mood changes	24.4%	22.2%	1.00
Depressive feature	16.7%	11.1%	0.729
Irritability	11.5%	5.6%	0.682
Perceptual change/ psychotic feature	51.3%	50.0%	1.00
Delusional/ paranoid ideation	47.4%	50.0%	1.00
Hallucination	10.3%	11.1%	1.00
Behavioral change	57.7%	66.7%	0.481
Incontinence	9.0%	5.6%	1.00
Repetitive behaviours	17.9%	16.7%	1.00
Aggressive behaviours	10.3%	0.0%	0.345
Disturbing behaviours	11.5%	11.1%	1.00
Unusual behaviours	3.8%	22.2%	<b>0.022*</b>
Wandering behaviour	6.4%	16.7%	0.168
History of getting lost	38.5%	44.4%	0.641
Sleep pattern change	28.2%	22.2%	0.772

\* denotes statistically significant ( $p < 0.05$ )

Table 3: Logistic regression of risk factors of institutionalization at first visit (n=96)

Variables	Home	Institution	O.R.	95% C.I.		p value
	(n=78)	(n=18)		Lower	Upper	
Marital status (married)	46.2%	11.1%	0.13	0.02	0.67	0.015
Number of co-morbidity (mean±s.d.)	2.32±1.45	3.44±1.69	1.88	1.19	2.98	0.007
IADL (mean±s.d.)	5.32±2.25	2.94±1.98	0.57	0.42	0.79	0.001

number of co-morbidity and IADL scores were found to be independent risk factors for institutionalization (Table 3).

#### Time to institutionalization

At first visit, 18 patients were already under institutional care. From the history, the time from symptom onset to institution was available in 10 of them. 2 patients were transferred to institution even before onset of symptom for social reason. The remaining 8 patients were institutionalized at a mean of 26.3±37.1 months (0-108 months) after symptom onset. 4 (40%) patients were arranged to institutions at the onset of AD illness.

The mean duration of follow-up for all subjects was 14.8±12.1 months (range 0-40 months). 11 AD (13.9%) patients were subsequently transferred to institutions after a mean follow-up of 10.9±9.5 months (range 1-34 months). The time from the onset of symptom to institutional care was 44.5±20.6 months (range 9-84 months) for these 11 AD patients. Together with the 8 patients with known "time to institutionalization" at first visit, 19 institutionalized subjects were available for the overall calculation. The mean time from symptom onset to institutionalization was calculated (i.e. best estimate) to be 36.8±29.3 months (range 0-108 months).

## Discussion

### Comorbidities

In our patients, the mean number of co-morbidity per person was 2.5, which was similar to that reported in an Italian study recently<sup>6</sup>. This figure was higher than the figure of 1.8 co-morbidities per person from another memory clinic in Hong Kong<sup>7</sup>. However, in the latter study (n=31), only 20% of the subjects had AD and 30% were normal (i.e. not demented and not clinically depressed). There was no separate data on the number and nature of co-morbidities on the AD subgroup. This might account for the difference in the number of co-morbidity per person between the two studies.

There was no association found between the number of co-morbidity and the IADL or BADL scores in our patients. This could be explained by the fact that the commonest three medical

conditions in this studied group were hypertension (52.1%), diabetes mellitus (22.9%) and cataract (15.6%). These diseases per se, unlike stroke or fracture, usually have minimal influence on the functional status of the individual. Previous hip fractures occurred in 7.3% of our patients. They all had hip replacement operations. None had history of clinical stroke. Therefore, mobility function was not affected by any of these physical diseases.

### Cardiovascular risk factors

Cardiovascular risk factors were common. It was present in three-quarter of our patients. The prevalence of hypertension, diabetes mellitus, ischaemic heart disease, atrial fibrillation and hyperlipidaemia each was 10% or more. It has been reported that cerebrovascular brain infarction may play an important role in the clinical expression of AD<sup>8</sup> and vascular changes may co-exist with AD<sup>9</sup>. On the other hand, AD patients with vascular risk factor may benefit more from treatment of an acetylcholinesterase inhibitor<sup>10</sup>. It would be interesting to study whether this potential positive therapeutic effect could be seen in the Hong Kong AD patients in future prospective studies.

### Institutionalization

It is estimated from overseas data that up to 50% of nursing home residents have a dementing illnesses<sup>11</sup>. In Hong Kong, a recent survey in private nursing homes found that dementia was the fourth most common medical diagnosis<sup>12</sup>. It was present in 17.3% of the residents.

In this study, we compared the features of AD patients who were living in institution with those who were living at home at first visit. Compared to those living at home, AD patients who lived in institution were more likely to be older at clinical presentation and at disease onset, more cognitively impaired (as illustrated by the MMSE and CDR scores), more physically dependent (as illustrated by BADL and IADL). These results are compatible with the findings from Heyman A et al<sup>3,4</sup> who found that age and severity of dementia (as measured by 17-point Blessed scale of activities of daily living, MMSE, and CDR) were predictive of nursing home

placement. In our study, AD living in institution had more co-morbidities and unusual behaviours. This suggests that disease-related variables play a role in the patterns of institutional placement among AD. It was interesting to note that atrial fibrillation was more prevalent in the institutionalized AD group than the AD group living at home. However, it was not an independent risk factor in logistic regression model.

Marital status significantly influenced the risk of institutionalization. Our AD patients who were living in institutions at first visit were more likely to be widowed, single or divorced. This is in agreement with other findings<sup>13,14</sup> that being unmarried (widowed, single or divorced) resulted in a higher risk of institutionalization or nursing home admission among AD population. Furthermore, some authors thought that carers' factors are potent predictors of institutionalization than patient or dementia variables<sup>15</sup>. In fact, there were studies showing carers' psychological distress to be important factors associated with institutionalization.<sup>1, 16</sup>

Multivariate analysis reviewed that marital status, the number of co-morbidity and IADL score were independent factors associated with institutionalization. Our results therefore suggest that social, functional and disease-related variables are major risk factors influencing institutionalization in AD patients. This might have the implication that enhancing social support, preventing of functional decline and good control of comorbid diseases are interventional strategies to consider in order to decrease institutionalization rate. A randomized controlled trial from Mittelman MS et al<sup>17</sup> had found that a comprehensive support and counseling program could substantially increase the time spouse/ caregivers are able to care for AD patients at home. This could then hopefully postpone or prevent nursing home placement of patients with AD. Whether this could apply to our local AD patients will await further investigations.

#### *Time to institutionalization*

In a study reported by Jost et al<sup>18</sup>, 76 autopsy-confirmed AD patients aged 65 or above were found to have been institutionalized 21 months after clinical diagnosis. In our study, of the 78 AD patients who were living at home at first visit, 11 (14%) of them were admitted to old age homes after a mean follow-up of 11 months. The difference in the time to institutionalization from first clinic visit between Jost's and our study was due to the duration of follow-up in the two AD groups. In Jost's study<sup>18</sup>, the AD population was reviewed

retrospectively at the time of death. The mean follow-up period for these patients (until death) was 5.5 years. In our study, we have only followed-up these AD patients at a mean of 1.2 years. There are still a number of them living at home and will be followed-up in the future. Therefore, if we could follow-up these patients longer or until their death and review them again, the time to institutionalization would definitely be higher than the present finding of 11 months. Similarly, the time to institutionalization from symptom onset was shorter in our study. It was 36.8 months while in Jost's study<sup>18</sup>, the corresponding figure for those 76 AD patients was 51.6 months. Another possible explanation is a difference in social support for the AD patients and carers in the community. The community support services for AD patients and their carers were less well developed in Hong Kong compared to overseas countries.

#### *Limitations*

The subjects were recruited from a specialized Memory Clinic. Those patients with predominant behavioural or psychotic symptoms from psychiatric institutions or clinics were not studied. Furthermore, the general physical function and overall cognitive status of our study group was quite well. They have a mean Barthel index of 18 and over half of them have CDR 0.5 or 1.0. Those highly dependent and advanced AD patients might not have been included in the present study. All these subjects represent the high-risk group for institutionalization. Therefore, generalization of the study findings is most likely affected by the referral bias.

This was a cross-sectional study. The characteristics of institutionalized AD patients and those living at home was compared. Thus, results from our study would reflect an association and might not be causative factors. Future studies should evaluate prospectively AD patients who initially live at home and determine the predictors leading to institutionalization.

#### **Conclusion**

The number of co-morbidity, impaired IADL functioning and being widowed, single or divorced are risk factors associated with institutionalization among this group of AD patients. The time from symptom onset to institutionalization is approximately three years. Future studies may investigate the impact of various AD treatments on the institutionalization rates in our Hong Kong AD patients.

### **LEARNING POINTS**

- 1. Mean time from diagnosis of Alzheimer's Disease to institution is 36.8 months .**
- 2. Independent risk factors for institutionalization include: marital status (single, widower), increasing number of comorbidities and poor IADL scores.**

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