Prevalence of Cognitive Impairment and Related Factors Among the Elderly in Rural Communities of Jeju Province

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Purpose. The purpose of this study was to survey the prevalence rate of cognitive impairments and to identify the factors influencing cognitive impairment in the elderly in rural communities of Jeju Province..

Methods. 590 elderly in 6 rural communities of Jeju Province were interviewed, using a questionnaire consisting of sociodemographic characteristics, health behavior, quality of life, and MMSE-K

Results. Prevalence of cognitive impairment was 33.1% (39.1% of females, 16.76% of males). Prevalence of dementia was 12.4% (16.3% of females, 2.87% of males). Factors related to cognitive impairment were age, sex, education, standard of living, employment status, and subjective health state.

Conclusions. In community health care for the elderly, factors relating to cognitive impairment have to be considered. When planning community health care, priority should be given to the elderly; who need care but live alone; who lack social support; who have a low standard of living; who experience discomfort in the activities of daily living; who believe they are not in a good state of health; or whose life satisfaction is low.

Key Words: Cognition Disorders, Dementia, Elderly, Rural Community.

INTRODUCTION

People value happy, healthy and long lives. The effective management of lifestyle and cognitive resources contributes to adaptation and enjoyment of old age. The elderly who maintain the best cognitive function are also those with a high level of social interaction.

It has been generally assumed that cognitive function declines in old age because of morphologic changes in cerebral tissue and decreases in circulatory capacity and neurotransmitters. Older people always perform more slowly than younger people in tasks involving neuromuscular learning, because of slower reaction time and an increase in cautious behavior.

Cognitive functioning is a broad construct that includes a number of categories: attention span, concentration, intelligence, judgement, learning ability, memory, orientation, perception, problem solving, psychomotor ability, reaction time, and social interaction (Ebersole & Hess, 1998). While cognitive impairment is a severe threat to social function, the psychopathology of the elderly is in turn influenced by socioenvironmental factors. The decline of memory is the key component of dementia and one of the risk factors of age-related dementia (Park & Kim, 1997).

Much of cognitive impairment care is provided in the home by family members. The elderly who suffer from dementia and who need help in performing daily activities become a burden to family members responsible for their care (Oh, 1995; Kang et al., 1999).

As the population ages, health problems of the elderly, including functional disorders and cognitive impairment, have become one of the most important social issues in

Korea. The health problems of the elderly in rural communities not served by medical doctors are of particular concern. Therefore, it is necessary to determine and manage for cognitive impairment in the elderly, even if they are not diagnosed as suffering from dementia.

However, there are limited health care and social service systems and institutions available to the elderly suffering from dementia, and to their families. There is also a shortage of professional personnel and facilities. The systems that exist are not well integrated. Furthermore, the precise number and actual conditions of such people is not well known.

Dementia is usually regarded by lay people as a normal aging process. The lack of social support and proper coping techniques increase the problems of the elderly with dementia, and their families.

It is very important to find out the influencing factors related to cognitive function plays a key role to maintain healthy lives of the aged and the prevalence of cognitive impairment of the aged was shown higher(Cho, Hahm, Jhoo, Bae, & Kwon, 1998; Park, Ko, Ha, Park, & Jung, 1991) than that in western coutries(Fratiglioni et al., 1991; Landerman, Blazer, & Anthony, 1991)

The aim of this study was to survey the rate of prevalence of cognitive impairment, to investigate the factors influencing cognitive impairment, and to offer basic data useful for the prevention and management of cognitive impairment.

METHODS

Sample

The subjects of this study were residents 65 years old and older, selected randomly in six rural communities, using cluster sampling method. Three of the rural communities were in North Jeju County, and three were in South Jeju County. The total number of residents in these areas who were 65 years old and older was 779. Of these, 189 were absent when the interviewer visited their houses, in a state of imminent death, or uncooperative. A total of 590 people became subjects of this survey.

Instruments

A structured questionnaire and MMSE-K instrument were used for the survey. The questionnaire contained 7 items of demographic characteristics, 4 items of health behavior, and 5 items regarding quality of life. MMSE-K

(the Korean version of the Mini Mental State Examination) was developed by Folstein, and modified and standardized by Kwon & Park (1989), to screen dementia in the elderly in Korea. MMSE-K is composed of 7 items and 30 points, i.e. 5 points for time orientation, 5 points for place orientation, 3 points for memory registration, 3 points for memory recall, 5 points for attention and calculation, 7 points for verbal ability, and 2 points for comprehension and judgment.

Subjects were divided into 3 groups in accordance with the suggestion of Park, Park, & Ko (1991). The state of those who scored 25 points and higher was classified as "normal state", of those who scored between 21 and 24 points as "doubtful dementia", and or those scoring 20 points and lower as "confirmed dementia". All those who scored 24 or fewer points were classified as having "cognitive impairment".

Procedure

Form October 3, 2001 to October 31, 2001, six research assistants collected data through interviews, using a questionnaire and the MMSE-K. These research assistants were the directors of 6 primary health care centers in areas not served by a medical doctor. The research assistants were educated in data collection protocol. While data were being collected, members of the research team met with research assistants to share opinions about the questionnaire and matters demanding special attention. The directors who were chosen as assistants of this study had a good relationship with the subjects in their districts and knew well their conditions. Before started questioning the subjects of this study informed about this study and asked for their permission to participate. And then subjects were interviewed at the nursing care center or in their own home. The directors read and explained the questions for the subjects those who couldn't read and understand and checked their response according to the questions.

Data analysis

The data were analyzed using the Statistical Package for Social Sciences.

The characteristics of the variable were analyzed using the actual number, percentage, Chi square, and Multiple Logistic Regression analysis.

RESULTS

The general characteristics of subjects are shown in Table 1. 590 subjects participated in this study. Of these, 174 (29.5%) were male, and 416 (70.5%) were female. Distribution of subjects in the six geographical research areas was: Egue (20.5%), Kumak (16.9%), Sunheul (15.3%), Gapa (12.0%), Shinphung (17.3%), and Kwangryung (19.0%). There are some gender differences in marital status, residence, education and working state. The number of male subjects who were married was 158 out of 174 (90.8%) and the number of female subjects who were married was 118 out of 416 (28.4%). And 91.6% of male subjects and only 57.7% of female subjects were living with spouse or offspring. More men

Table 1. General characteristics of subjects

Variable		Male 174 (29.5)	Female 416 (70.5)	Total 590 (100)
		N (%)	N (%)	N (%)
Area	Egui	40 (23.0)	81 (19.5)	121 (20.5)
	Keumak	22 (23.0)	78 (18.8)	100 (16.9)
	Sunheul	23 (12.6)	67 (16.1)	90 (15.30
	Gapa	24 (13.8)	47 (11.3)	71 (12.0)
	Shinphung	31 (17.8)	71 (17.1)	102 (17.3)
	Kwangryung	34 (19.5)	72 (17.3)	106 (18.0)
Age	65–69	100 (57.5)	133 (32.0)	233 (39.5)
	70–74	29 (16.7)	99 (23.8)	128 (21.7)
	75–79	20 (11.5)	75 (18.0)	95 (16.1)
	80–	25 (14.4)	109 (26.2)	134 (22.7)
Marital status	Married	158 (90.8)	118 (28.4)	276 (46.8)
	Not-married	16 (09.2)	298 (71.6)	314 (53.2)
Residence	Live alone	14 (08.4)	174 (42.3)	188 (32.5)
	With spouse or offspring	153 (91.6)	237 (57.7)	390 (67.5)
Standard of living	Low	36 (21.4)	141 (34.4)	177 (30.6)
	Middle	100 (59.5)	236 (57.6)	336 (58.1)
	High	32 (19.0)	33 (08.0)	65 (11.2)
Education	Non formal education	38 (22.0)	332 (83.4)	370 (64.8)
	Formal education	135 (78.0)	66 (16.6)	201 (35.2)
Working state	Yes	112 (67.5)	188 (47.2)	300 (53.2)
	No	54 (32.5)	210 (58.2)	264 (46.8)
Smoking	No	35 (20.7)	367 (95.6)	402 (72.7)
	Ex-smoker	68 (40.2)	7 (01.8)	75 (13.6)
	Current	66 (39.1)	10 (02.6)	76 (13.7)
Drinking	No	56 (32.9)	377 (96.7)	433 (77.3)
	Ex-drinker	40 (23.5)	4 (01.0)	44 (07.9)
	Current	74 (43.5)	9 (02.3)	83 (14.8)
Exercise	Yes	60 (36.1)	42 (10.7)	102 (18.3)
	No	106 (63.9)	350 (89.3)	456 (81.7)
3 meals a day	Yes	156 (91.2)	370 (90.9)	526 (91.0)
	No	15 (08.8)	37 (09.1)	52 (09.0)
Life Satisfaction	Unsatisfied	43 (24.9)	143 (34.7)	186 (31.8)
	Satisfied	130 (75.1)	269 (65.3)	399 (68.2)
Subjective Health state	Bad	44 (25.3)	157 (37.8)	201 (34.1)
	Average	72 (41.4)	160 (38.6)	232 (39.4)
	Good	58 (33.3)	98 (23.6)	156 (26.5)
Social support	Not good	23 (13.2)	86 (20.8)	109 (18.6)
	Good	151 (86.8)	327 (79.2)	478 (81.4)
Discomfort in ADL	Yes	159 (94.1)	365 (88.2)	524 (89.9)
	No	10 (05.9)	49 (11.8)	59 (10.1)
Chronic Disease	No	80 (46.0)	160 (38.5)	240 (40.7)
	Yes	94 (54.0)	256 (61.5)	350 (59.3)

had formal education (78.0%) than women (16.6%). The percentage of subjects those who were in working state, even though they were part time or intermittent job, was 53.2% (male 67.5%, female 47.2%). The percentage of current drinker was 14.8%(male; 43.5%, female; 0.2%). The percentage of current smoker was 13.7% (male; 40.2%, female; 0.26%). 18.3% of the subjects answered that they exercised (male; 36.1%, female; 10.7%). 68.2% of the subjects of this survey responded that they are satisfied with their lives, 81.4% of the subjects showed that they had good social support.

MMSE-K scores of the subjects by sex and age are shown in Table 2. The mean MMSE-K of subjects was 25.77 (SD=5.07). The mean MMSE-K of females (24.98) was lower than that of males (27.43). Especially among women, the older subjects tended to have higher scores.

The prevalence of cognitive impairment according to sex and age is shown in Table 3. The prevalence of cognitive impairment was shown as 33.3%, or 195 of 590 subjects, including 16.76% of males and 39.9% of females. The incidence of cognitive impairment measured as MMSE-K 24 according to age group was: 65-69 (21.5%), 70-74 (28.1%), 75-79 (37.1%), and over 80 (55.2%).

The prevalence of dementia according to sex and age is shown in Table 4. The prevalence of dementia defined by MMSE 20 was 12.4% (2.87% of males and 16.3% of females). There is a gender difference in MMSE-K scores.

The prevalence of cognitive impairment and crude & adjusted age and sex odds ratio by general characteristics using Chi-square tests & Logistic regression were shown in Table 5. The higher the standard of living, the less the cognitive impairment rate they had. Those who had formal education had higher rate of cognitive impairment rate than that of those who had no formal education. This result seemed to be caused by the fact that most female subjects (332 out of 398, 83.4%) had no formal education and adjusted by sex and age on this Chi-square test. Those who were in working state had less cognitive impairment rate than that of those who were not. Ex-drinker had higher cognitive impairment rate than current drinker's. Those who had life satisfaction and no discomfort in ADL showed lower cognitive impairment rate than those who hadn't and discomfort in ADL. The better subjective health state, the less cognitive impairment they had.

These significant factors, which had adjusted age and sex, related to prevalence of cognitive impairment, sex, age, and marital status were analyzed by using Multiple Logistic Regression. Table 6 shows Odds Ratio and 95% confidential intervals for odds ratios for the level of significant factors: aged over 80=3.469 (95%CI 1.83-6.57), female=4.070 (95%CI 2.09-7.94), no formal education group=2.867 (95%CI 1.57-5.25), low standard of living group 3.484 (95%CI 1.46-8.34), working group 2.386

Table 2. MMSE-K scores of subjects by sex & age (N = 590)

Age	Male			Female			Total		
	N	Mean	SD	N	mean	SD	N	Mean	SD
65-69	100	27.64	3.07	133	26.78	4.05	233	27.15	3.68
70-74	29	27.69	3.37	99	26.22	4.61	128	26.55	4.39
75-79	20	26.58	4.39	75	25.25	4.69	95	25.52	4.64
80-	25	26.92	3.79	109	21.45	6.50	134	22.47	6.44
Total	174	27.43	3.38	416	24.98	5.46	590	25.70	5.07

Table 3. Prevalence of Cognitive Impairment(MMSE-K $\leq$ 24) by sex & age

Age	Male		Female		Total	
	N	(%)	N	(%)	N	(%)
65-69	15	(15.00)	35	(26.3)	50	(21.5)
70-74	6	(20.69)	30	(30.3)	36	(28.1)
75-79	4	(21.05)	31	(41.3)	35	(37.2)
80-	4	(16.00)	70	(64.2)	74	(55.2)
Total	29	(16.76)	166	(39.9)	195	(33.1)

Table 4. Prevalence of Dimentia(MMSE-K $\leq$ 20) by sex & age

Age	Male		Female		Total	
	N	(%)	N	(%)	N	(%)
65-69	0	(0.00)	10	(07.5)	10	(04.3)
70-74	0	(0.00)	8	(08.1)	8	(06.3)
75-79	3	(15.00)	10	(13.3)	13	(13.7)
80-	2	(8.00)	40	(36.7)	42	(31.3)
Total	5	(2.87)	68	(16.3)	73	(12.4)

(95%CI 1.45–3.88), and bad subjective health status group 1.970 (95%CI 1.09–3.57).

DISCUSSION

Cognitive function in the aged is often measured against the norms of young or middle-aged people, which may not be appropriate to the distinctive characteristics of the aged. The elderly often perform poorly on test items because they are less likely to guess, and also less likely to answer items that seem ambiguous to them. For this study, the prevalence of cognitive impairment was measured using the MMSE-K instrument. One or two points were added in certain instances to the measured scores in this study, in accordance with the correc-tion method developed by Kwon & Park(1989).

The prevalence of cognitive impairment in this study (MMSE-K ≤ 24) was 33.1% (17.76% of males and 39.9% of females). This is higher than the 31.2% result of the study by Park et al. (1991) and lower than the 37.1% (18.8% of males and 47% of females) in the study by Cho et al. (1998). Compared with other countries, the result of 33.1% is higher than that of the ECA's American study (20%) (Landerman et al., 1991) and a Swedish study (21.3%)(Fratiglioni et al., 1991)

The prevalence of cognitive impairment (MMSE-K ≤ 24) was examined in four age groups. The results were: 21.5% in the 65–69 age group, 28.1% in the 70–75 group, 37.1% among those aged 75–79, and 55.2% among those over 80. Cognitive function decreased with

Table 5. Prevalence of cognitive impairment(mmse-K ≤ 24) and crude & adjusted age and sex OR by General characteristics

Variables		N(%)	COR	95%	CI	AOR	95%	CI
Marital status	Married	60(21.8)	1.00	(*1.88–	3.89)	1.00		
	Not married	135(43.0)	2.70			1.16	(0.73–	1.84)
Residence	With spouse or Offspring	116(29.8)	1.00			1.00		
	Live alone	76(40.4)	1.60	(*1.11–	2.30)	0.97	(0.65–	1.44)
Standard of	High	9(13.8)	1.00			1.00		
living	Middle	93(27.7)	2.38	(*1.13–	5.00)	1.88	(0.86–	4.12)
	Low	90(51.1)	6.51	(*3.03–	13.96)	4.62	(*2.06–	10.35)
Education	Formal education	51(25.4)	1.00			1.00		
level	No formal Education	129(35.0)	1.58	(*1.08–	2.32	0.44	(*0.26–	0.75)
Working state	Yes	59(19.7)	1.00			1.00		
	No	129(49.0)	3.93	(*2.71–	5.71)	2.35	(*1.53–	3.06)
Smoking	No	143(35.6)	1.00			1.00		
	Ex-drinker	17(23.0)	0.54	(*0.30–	0.96)	1.34	(0.57–	3.17)
	Current	13(17.1)	0.37	(*0.20–	0.70)	0.92	(0.39–	2.15)
Drinking	No	147(33.9)	1.00			1.00		
	Ex-drinker	13(30.2)	0.84	(0.43–	1.67)	2.69	(*1.06–	6.82)
	Current	14(16.9)	0.39	(*0.21–	0.73)	1.21	(0.53–	2.78)
Exercise	Yes	17(16.7)	1.00			1.00		
	No	158(34.7)	2.66	(*1.53–	4.63)	1.62	(0.89–	2.93)
3 meals a day	Yes	170(32.4)	1.00			1.00		
	No	22(42.3)	1.53	(0.86–	2.73)	1.46	(0.79–	2.69)
Life	Satisfied	102(25.4)						
Satisfaction	Unsatisfied	90(51.1)	3.07	(*2.12–	4.45)	2.65	(*1.79–	3.93)
Subjective	Good	29(18.6)	1.00			1.00		
Health state	Average	78(33.6)	2.22	(*1.36–	3.61)	2.21	(*1.32–	3.70)
	Bad	88(44.0)	3.44	(*2.11–	5.62)	3.03	(*1.80–	5.10)
Social support	Good	149(31.2)	1.00			1.00		
	Not good	43(39.4)	1.43	(0.93–	2.21)	1.15	(0.73–	1.82)
Discomfort in	Yes	160(30.5)	1.00			1.00		
ADL	No	35(60.3)	3.46	(*1.98–	6.05)	2.28	(*1.24–	4.16)
Chronic	No	81(33.8)	1.00			1.00		
Disease	Yes	114(32.7)	0.95	(0.67–	1.35)	0.91	(0.63–	1.32)

COR = Crude Odds Ratio, AOR = Adjusted Odds Ratio, CI = Confidence Interval
*p < 0.05

Table 6. Multiple Logistic regression analysis of the effects of general characteristics on caseness of cognitive impairment (MMSE-K ≤ 24)

Variables		Parameter Estimate	Standard Error	Wald ChiSquare	p-value	Odds Ratio	95% Confidence	Interval
Age(years)	65-69							
	70-74	-0.091	0.305	0.089	0.765	0.913	0.502	1.660
	75-79	0.406	0.331	1.504	0.220	1.501	0.784	2.874
	80-	1.244	0.326	14.558	0.000**	3.469	1.831	6.572
Sex	Male							
	Female	1.404	0.341	16.990	0.000**	4.070	2.088	7.935
Education	Formal education							
	No formal edu.	1.053	0.308	11.657	0.001*	2.867	1.566	5.247
Standard of living	High							
	Middle	0.572	0.425	1.806	0.179	1.771	0.769	4.077
	Low	1.248	0.445	7.851	0.005**	3.484	1.455	8.342
Working state	Yes							
	No	0.862	0.251	11.748	0.001**	2.368	1.446	3.876
Subjective health status	Good							
	Average	0.462	0.288	2.568	0.109	1.587	0.902	2.793
	Bad	0.678	0.302	5.050	0.025*	1.970	1.091	3.560
Marital status	Married							
	Not married	0.112	0.275	0.167	0.683	1.119	0.653	1.916
Discomfort in ADL	No							
	Yes	0.228	0.350	0.424	0.515	1.256	0.632	2.496
Intercept		-7.883	1.134	48.346	0.000	0.000		

* $p < 0.05$, ** $p < 0.005$

age, especially in women. In men, there was no clear distinction in cognitive function according to age groups.

The study by Cho et al.(1998) was divided into 5 age group: 65-69 (19.2% showing cognitive impairment); 70-74 (38.5%); 75-79 (57.8%); 80-84 (60.0%); and over age 85 (72.2%). Comparing those results, the decline of cognitive function among the elderly in Jeju proceeded more slowly. Some people appear to further deteriorate in terms of cognitive function, while others remain in a long-term respite state. In our study, no reason was found for these differences. However, in order to apply intervention to slow the progression of cognitive impairment, it is necessary to explore the reasons for, and underlying biosociological factors affecting differences in cognitive impairment. It is the limitation to our study that we didn't find them out and we suggest that the following study should focus on the reasons for, and factors affecting differences in cognitive impairment of the elderly to be found out.

In this study, the prevalence of dementia (MMSE-K ≤ 20) was 12.4% (2.87% of males and 16.3% of females). This result is higher than Woo et al.'s study(1997), which found dementia in 9.5% of subjects, Park et al (1991) with a result of 11.3% (7.2% of males and 15.4% of females), and Hyun's 2000 study (11.6% of subjects).

The factors related to cognitive impairment in the aged differ from study to study. The results of this study showed that the factors influencing cognitive function among the elderly include age, sex, education, marital status, residence status, standard of living, amount of pocket money, smoking, drinking, exercise, social support, life satisfaction, subjective health state, and discomfort in activities of daily living.

Previous studies reported that the prevalence of cognitive impairment among the elderly, measured using the MMSE-K instrument, was influenced by many factors such as: education (Cho et al., 1998; Hyun, 2000; Kim, Ahn, Lee, & Kil, 2001; Park, 1989; Park et al., 1997; Shim et al., 1999), age (Cho et al., 1998; Hyun, 2000; Kim et al., 2001; Park et al., 1997; Park & Kim, 1997; Shim et al., 1999) and sex difference (Cho et al., 1998; ; Hyun, 2000; Park et al., 1997; Shim et al., 1999). The relative risk of death among the elderly might be related to severe cognitive decline, male sex, and old age (Park, 1999). To preserve the cognitive function was to lessen the risk of death among the elderly and furthermore, to help maintain the well-being of the aged.

Dementia is a problem that occurs with aging. There is a gender difference in cognitive function because the average life span of women is longer than that of men. And as manifested in general characteristics, women fared worse than men in factors related to socioeconom-

:c state, such as standard of living, marital status, residence status, education etc.

A framework for intervention in the care of the elderly must be determined by particular conditions and individual needs. When planning community health care for the elderly, priority must be given to those who are vulnerable to impaired cognitive function. In this study, those who are very old, lacking social support, with a low standard of living, or living along and in need of care have higher rate of cognitive impairment than that of those who are not. And those who think their health is not good, or whose satisfaction with life is low have higher rate of cognitive impairment than those who think their health is good, or whose satisfaction with life is high.

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