Original Article

Evaluation of quality of life with Alzheimer disease

Tamer Yazar[1], Hulya Olgun Yazar[2]

[1]Ordu State Hospital, Clinic of Neurology, Ordu, Turkiye
[2]Ordu University Education and Research Hospital Department of Neurology, Ordu, Turkey

Abstract

Aim: In our study, the aim was to assess quality of life and associated factors among patients with Alzheimer disease (AD) and to collect data about reducing the disease load.

Material and Methods: Our study was performed with 117 patients with possible AD diagnosis according to National Institute of Neurological and Communicative Disorders and Stroke-Alzheimer's Disease and Related Disorders Association (NINCDS-ADRDA) diagnostic criteria and 102 healthy individuals. The Whoqol-Brief (WB) was used to assess quality of life of individuals in the AD and control groups, while the Quality of Life-Alzheimer's Disease (QOL-AD) scale was also administered to patients with AD.

Results: There were no significant differences between the AD and control groups in terms of sex and gender (p=0.952; 0.186). In the AD group, points obtained in all WB areas were found to be significantly low compared to the control group (p=0.000). With increasing disease stage, disease duration and patient age, the WB subareas and QOL-AD patient/family/weighted points were observed to display a statistically significant level of decrease (p=0.000). All WB areas and QOL-AD patient/family/weighted points for those who were illiterate, received care support and lived with children or relatives (apart from QOL-AD family) were found to be statistically significant low compared to those who were literate, had attended primary/middle and high school, lived on their own and did not receive care support (p>0.05).

Conclusion: Our data show that the quality of life of patients with AD is low. The fall in quality of life appears to be parallel to increasing disease stage, disease duration, patient age and low educational level, living outside their own home and care support needs.

Keywords: Alzheimer disease; quality of life; Whoqol-brief; quality of life-Alzheimer disease.

INTRODUCTION

With the increasing elderly population, dementia and AD, comprising nearly two thirds of all dementia cases, have become important problems for public health and neurology. With clinical tableau presenting as memory/language loss with progressive character, judgment/behavior disorders, and difficulty in completing daily life activities, age-related forgetfulness is classified as mild cognitive impairment and mild, moderate and severe stages. In parallel with the progression in clinical stages, variations developing in the patient's quality of life have become an important parameter to monitor the progression of disease (1-9).

When the limited effect of treatment administered after disease is diagnosed are noted, the necessity for a multidisciplinary approach to planning treatment and care services was determined. In addition to outcome measures like disease severity and patient functionality level, assessments of self-reported judgements about physical, psychological, socioeconomic and mental functioning have been completed more frequently in the literature in recent times and focus more on subjective parameters belonging to the patient (1-3,9).

"Quality of life related to health (QOLH)" may be defined as the difference between what will satisfy a person or what they expect from life and what they obtain in terms of a variety of dimensions of life. Nearly all neurologic diseases negatively affect quality of life. It is important to make identifications in relation to bodily, psychologic and social well-being status linked to the disease to evaluate the success of medical treatment (4,5,10-12).

In our study, the aim was to assess quality of life and associated factors for patients with AD diagnosis and to collect data in relation to reducing the disease load.

MATERIAL and METHODS

Population and Sample of the Research

Our study was completed with patients with probable

AD diagnosis according to NINCDS-ADRDA diagnostic criteria, monitored by the neurologic clinic for at least 1 year, with Clinical Dementia Rating Scale (CDR 1 and 2) and Mini Mental Test (MMT) administered and sex- and age-matched healthy controls (3).

A descriptive form about the socio-demographic status (age, sex, educational level, area of residence, disease duration, receiving care support or not) of patients and patient relatives was created by the researchers.

The Whoqol-Brief was used for assessment of quality of life of individuals in the AD and control groups, with the Quality of Life-Alzheimer's Disease (QOL-AD) scales also administered to patients with AD diagnosis.

Exclusion criteria
In the AD group, those with disease stage (CDR) 3 and with MMSE score below 11 were excluded from the study. Additionally, in patient and control groups the presence of chronic disease apart from controlled hypertension, smoking-alcohol consumption, malnutrition and obesity, and history of psychiatric disease and/or medication use were accepted as exclusion criteria.

Data collection tools
The WB is a 26-question scale comprising 2 questions from the Whoqol-100 scale general section (facet) and 1 question each from the remaining 24 facets. It assesses quality of life in areas like general health status, physical healthy, psychologic, social relations and environment (6,7,14-19).

The QOL-Ad is an easily-applied scale to assess quality of life comprising 13 questions to be answered by the patient and carer. It is applied to AD patients with MMSE score of 10 or more in mild-moderate stage and includes items for self-assessment of physical status, mood, memory, functional skills, interpersonal relations, ability to participate in activities, financial status and global. Total scores are in the interval 13-52 /(16,17,20,21).

CDR is a scale with the aim of assessing the functional destruction of patients with AD diagnosis. Disease severity of patients is divided into 5 stages with assessment of memory, orientation, judgement and problem-solving, social activities, hobbies and personal care areas (22).

The Standardized Mini Mental Test (Mental State Examination)-(MMSE) is a short, useful and standard method used to define the cognitive level of orientation, recording memory, attention, calculation, recall and language. (23,24).

Ethical Aspects of the Research
The research ethics committee approved the study protocol with the decision number 2019/37. Informed consents were signed by patients or their family members.

Statistical Analysis
A statistical program was used for statistical analysis of data. Demographic data are summarized as number, mean and standard deviation. To test normal distribution, the Kolmogorov-Smirnov test was used for samples of more than 50, with the Shapiro-Wilk test used for smaller samples. The chi-square test was used for comparison of categoric variables. The Mann Whitney U test was used for comparison of numeric values in two groups for samples without normal distribution, while the independent samples t test was used for samples with normal distribution. Comparison of numeric values in three groups used the independent samples t test for samples without normal distribution and the one-way ANOVA for samples with normal distribution. After multiple comparisons, the post-hoc Tukey test was used to determine which group or groups caused the difference. For all tests, statistical significance level was taken as $p<0.05$.

RESULTS
The study included a total 117 patients with 67 female (57.26%) and 50 male (42.74%) and a total of 102 healthy controls sex-matched with patients of 58 females (56.86%) and 44 males (43.14%) (p=0.952). The ages of patients were from 63 to 92 years (mean 78.1±6.056) and ages of controls were from 67 to 89 (77.14±4.518) years and there was no difference between the groups in terms of statistics (p=0.186). When education, marital status and place of residence were compared, the AD group appeared to have statistically significantly high levels of illiterate cases, those not living with partners and those living with children compared to the control group (p=0.001, p=0.000, p=0.000). In the AD group, points received for all WB areas were found to be significantly low compared to the control group (p=0.000) (Table 1).

WB-GHS: Whoqol Brief General Health Status, WB-PH: Whoqol brief physical health, WB-PSY: Whoqol brief psychologic, WB-SR: Whoqol Brief social relations, WB-E: Whoqol brief environment

When data in the AD group are assessed according to disease stage, there were significant differences identified for all data. Patients with CDR stage 2 were found to have higher age and disease duration compared to those with CDR stage 1. The points obtained for other parameters (WB and QOL-AD) were observed to be statistically significantly low in CDR stage 2 compared to CDR stage 1 (p=0.000) (Table 2).

Statistical significance level p<0.05, CDR: Clinical Dementia Rating Scale, WB-GHS: Whoqol Brief General Health Status, WB-PH: Whoqol brief physical health, WB-PSY: Whoqol brief psychologic, WB-SR: Whoqol Brief social relations, WB-E: Whoqol brief environment, QOL-AD Patient: Quality of Life- Alzheimer Disease patient, QOL-AD Family: Quality of Life- Alzheimer Disease Family, QOL-AD Weighted: Quality of Life- Alzheimer Disease Weighted, MMSE: Mini Mental State Examination

In the AD group, females were found to have lower WB-E and QOL-AD patient points compared to males (p=0.002; p=0.017), with no statistically significant differences identified between females and males for other subgroups (p>0.05). Those with disease duration of 6 years or more were observed to have lower points for all WB areas and for QOL-AD patient/family/weighted points compared to those with disease duration 1-5 years (p=0.000). Similarly, patients aged 80 years or older were identified to have lower WB and QOL-AD points compared to those aged 70-79 years and 60-69 years (p=0.000) (Table 3).

Statistical significance level p<0.05, WB-GHS: Whoqol Brief General Health Status, WB-PH: Whoqol brief physical health, WB-PSY: Whoqol brief psychologic, WB-SR: Whoqol Brief social relations, WB-E: Whoqol brief environment, QOL-AD Patient: Quality of Life- Alzheimer Disease patient, QOL-AD Family: Quality of Life- Alzheimer Disease Family, QOL-AD Weighted: Quality of Life- Alzheimer Disease Weighted

In the AD group, those who were illiterate, received care support and lived with children or relatives (apart from QOL-AD family) were observed to have statistically significantly low levels for all WB areas and for QOL-AD patient/family/

weighted points compared to those who were literate, had attended primary/middle and high school, and those who lived in their own home and received care support (p>0.05) (Table 4).

Statistical significance level p<0.05, WB-GHS: Whoqol Brief General Health Status, WB-PH: Whoqol brief physical health, WB-PSY: Whoqol brief psychologic, WB-SR: Whoqol Brief social relations, WB-E: Whoqol brief environment, QOL-AD Patient: Quality of Life- Alzheimer Disease patient, QOL-AD Family: Quality of Life- Alzheimer Disease Family, QOL-AD Weighted: Quality of Life- Alzheimer Disease Weighted

Table 1. Comparison of Descriptive Features of Alzheimer Patient and Control Groups							
Characteristic		AD			Control		p-value
	N	Mean±St.Dev	Min-Max	N	Mean±St.Dev	Min-Max	
Sex	117			102			0.952
Female	67 (57.26%)			58 (56.86%)			
Male	50 (42.74%)			44 (43.14%)			
Age (year)	117	78.1±6.056	63-92	102	77.14±4.518	67-89	0.186
Education	117			102			0.001
Illiterate	70 (59.83%)			37 (36.27%)			
Literate-primary-middle-high school	47 (40.17%)			65 (63.73%)			
Marital status	117			102			0.000
Married	62 (52.99%)			82 (80.39%)			
Widowed	55 (47.01%)			20 (19.61%)			
Place of residence	117			102			0.000
Own home	63 (53.85%)			82 (80.39%)			
With children	54 (46.15%)			20 (19.61%)			
WB-GHS	117	4.06±1.599	2-7	102	6.11±0.953	4-8	0.000
WB-PH	117	15.03±4.396	7-28	102	22.07±3.247	14-28	0.000
WB-PSY	117	13.18±3.466	6-24	102	19.19±2.362	15-25	0.000
WB-SR	117	4.63±1.284	3-10	102	6.39±0.977	4-9	0.000
WB-E	117	14.76±3.759	8-25	102	19.89±3.365	12-27	0.000
Statistical significance level p<0.05							

Table 2. Assessment of Alzheimer patients according to disease level							
Characteristic		CDR1			CDR2		p-value
	N	Mean±St.Dev	Min-Max	N	Mean±St.Dev	Min-Max	
Age	65	74.86±5.193	63-84	52	82.15±4.412	76-92	0.000
Disease duration	65	2.77±1.296	3-7	52	7.54±2.57	4-15	0.000
MMSE	65	20.42±1.144	19-23	52	14.83±0.678	13-16	0.000
WB-GHS	65	5.08±0.924	3-6	52	2.79±1.333	2-7	0.000
WB-PH	65	17.95±3.384	12-28	52	11.38±2.268	7-16	0.000
WB-PSY	65	15.37±2.571	11-24	52	10.44±2.296	6-14	0.000
WB-SR	65	5.15±0.939	3-7	52	3.98±1.365	3-10	0.000
WB-E	65	16.92±3.313	9-25	52	12.06±2.227	8-16	0.000
QOL-AD PATIENT	65	25.18±4.74	13-38	52	16±2.904	13-23	0.000
QOL-AD FAMILY	65	33.03±4.312	22-41	52	29.63±4.661	16-40	0.000
QOL-AD WEIGHTED	65	27.69±4.272	17-39	52	20.5±2.9	14-27	0.000

Table 3. Evaluation of quality of life in AD group according to sex, disease duration and patient age

	Female N=67	Male N=50	p-value	(1-5 years) N=72	(6 years or more) N=45	p-value	(60-69 years) N=12	(70-79 years) N=58	(80 years and older) N=47	p-value
				Disease duration			**Patient age**			
	Mean± St.Dev			**Mean± St.Dev**			**Mean± St.Dev**			
WB-GHS	4.06±1.65	4.06±1.54	0.980	4.75±1.28	2.96±1.43	0.000	5.75±0.62	4.48±1.49	3.11±1.31	0.000
WB-PH	14.31±4.25	16±4.43	0.086	17.19±3.94	11.58±2.45	0.000	22.58±3.37	15.78±3.04	12.19±3.28	0.000
WB-PSY	12.64±3.38	13.9±3.47	0.052	14.75±3.08	10.67±2.40	0.000	17.5±2.93	13.66±2.77	11.49±3.26	0.000
WB-SR	4.4±0.93	4.94±1.59	0.067	4.96±1.06	4.11±1.43	0.000	5.58±0.91	4.78±0.97	4.21±1.53	0.000
WB-E	13.85±3.20	15.98±4.11	0.002	16.39±3.53	12.16±2.40	0.000	18.67±3.11	15.4±3.22	12.98±3.57	0.000
QOL-AD Patient	19.94±5.79	22.66±6.19	0.017	24.14±5.52	16.24±306	0.000	28.6±4.88	22.28±5.48	17.72±4.72	0.000
QOL-AD Family	31.6±4.51	31.42±5.11	0.843	32.44±4.82	30.04±4.31	0.004	37±2.985	31.12±4.39	30.62±4.72	0.000
QOL-AD Weighte	23.72±4.91	25.54±5.35	0.054	26.85±4.87	20.73±2.89	0.000	31.33±4.01	25.12±4.78	21.98±3.98	0.000

Table 4. Evaluation of quality of life in the AD group according to educational level, place of residence and receiving care or not

	Educational level (Literate-primary/middle-high school) N=47	Educational level (illterate) N=70	p-value	Own home N=63	Child/relation N=54	p-value	Receives care support N=74	Does not receive care support N=43	p-value
	Mean±St.Dev			**Mean±St.Dev**			**Mean±St.Dev**		
WB-GHS	4.57±1.44	3.71±1.62	0.004	4.48±1.47	3.57±1.62	0.002	3.35±1.50	5.28±0.85	0.000
WB-PH	17.4±4.33	13.44±3.68	0.000	17.05±4.41	12.69±3.01	0.000	12.7±2.95	19.05±3.48	0.000
WB-PSY	14.87±3.04	12.04±3.28	0.000	14.27±3.53	11.91±2.94	0.000	11.76±3.01	15.63±2.78	0.000
WB-SR	5.02±1.09	4.37±1.34	0.000	4.86±1.12	4.37±1.42	0.002	4.22±1.31	5.35±0.87	0.000
WB-E	16.68±3.99	13.47±2.99	0.000	16.06±3.76	13.24±317	0.000	13.31±3.14	17.26±3.44	0.000
QOL-AD Patient	24.79±5.61	18.63±5.09	0.000	24.02±5.69	17.7±4.63	0.000	18.15±4.73	26.19±4.67	0.000
QOL-AD Family	32.98±4.16	30.54±4.92	0.005	31.81±4.42	31.19±5.15	0.624	30.61±5.12	33.09±3.62	0.015
QOL-AD Weighted	27.45±4.76	22.51±4.445	0.000	26.49±5.01	22.17±4.33	0.000	22.22±4.35	28.42±3.98	0.000

DISCUSSION

Quality of life is an individual's subjective assessment of themselves. The World Health Organization defines quality of life as a form of perception related to the status of a patient's life in terms of their cultural structure, their own aims, expectations, standards and worries (6,7,25). Measurements of outcomes of diseases assumed to affect quality of life generally have a general aim and the use of at least one disease specific scale is recommended (11). In our study, the WB and QOL-AD scales were used to assess quality of life and the factors we consider to mainly affect quality of life of patients with AD diagnosis.

The most common early clinical symptom observed in AD is difficulty of patients in remembering recent events. Over the progression of the disease other symptoms emerge, such as: mood swings, confusion, sleep disorders, walking problems, disorientation, and struggle in speech. Hence, AD severely affects the daily life quality of patients and their relatives (1,2,13,20). In accordance with the literature, our study data observed significantly low levels of points for all WB areas for AD patients compared to the control group. The significant correlations observed between the WB areas of general health status points with physical health, psychologic, environmental, and interpersonal relations points comply with the literature (26). Our data emphasize the necessity to pay attention to factors affecting quality of life of AD patients in treatment choice and patient monitoring and the importance of protective approaches.

Quality of life is affected by many different variables like age, sex, marital status, educational level, place of residence (rural-urban), physical activity and socioeconomic status. In the literature, advanced age, female sex, living alone, low

education and socioeconomic level, insufficient physical activity and progression of disease degree area associated with low quality of life in many studies (4,27-34). Our study data recorded that disease stage, patient age, disease duration, educational level, place of residence and care support were important for quality of life of patients with AD. Low quality of life appeared to be in parallel with increasing disease stage, disease duration, patient age and low education level, living outside their own home and requiring care support. Different to the literature data, only WB-E and QOL-AD patient points were observed to be significantly different according to sex, which may be associated with limitations of our study. The fall in quality of life occurring with increasing disease stage, patient age and disease duration is thought to be associated with the progression of cognitive function disorders in patients and developing physical and psychological limitations causing difficulty in completing daily life activities. Education is effective on problem solving of external-environmental problems affecting quality of life developing linked to disease. Additionally, increasing education level may be effective on increasing quality of life through well-being linked to socioeconomic level. The reason for the increase in quality of life due to the patient living in their own home and not receiving care support may be associated with the person still maintaining their daily life activities without support or with low levels of support.

When the sample in our study is compared in terms of education, marital status and place of residence, the AD group had statistically significantly high levels of illiterate cases, those not living with partners and those living with children compared to the control group. This and the cross-sectional nature of the study were revealed to be the most important limitations, which prevents us from determining causative relations between variables. The lack of assessment of environmental factors, socioeconomic level, physical activity, nutritional features and anthropometric measurements, the possible effects of the drugs used were not assessed in the groups and small sample size are other important limitations. Similarly, the fact that caregivers' quality of life and caregiver characteristics (education, socioeconomic status, etc.) has not been evaluated on the quality of life of the patients was considered as another limitation. As a result, there is a need for prospective, comprehensive and broad population studies to assess quality of life in AD patients.

CONCLUSION

The change caused by the disease in the lives of patients and family is an important parameter that needs to be noted. It appears awareness of QOLH by health workers, led by doctors, is a complementary area for patient assessment in daily routine applications that requires more interest.

Tamer Yazar ORCID: 0000-0003-3054-6613
Hulya Olgun Yazar ORCID:0000-0003-2768-6092

REFERENCES

1. Kumar P, Tiwari SC, Goel A, et al. Novel occupational therapy interventions may improve quality of life in older adults with dementia. Int Arch Med 2014;7:26.
2. Mate KE, Pond CD, Magin PJ, et al. Diagnosis and disclosure of a memory problem is associated with quality of life in community based older Australians with dementia. Int Psychogeriatr. 2012;24:1962-71.
3. Duggleby WD, Swindle J, Peacock S, et al. A mixed methods study of hope, transitions, and quality of life in family caregivers of persons with Alzheimer's disease. BMC Geriatr 2011;11:88.
4. Yazar T, Yazar HO, Demir EY, et al. Assessment of the mental health of carers according to the stage of patients with diagnosis of Alzheimer-type dementia. Neurol Sci 2018;39:903-8.
5. Olgun Yazar H, Yazar T, Günday A, ve ark. Sağlık kurulunda nörolojik hastalıkları nedeniyle ağır özürlü olarak değerlendirilen hastaların bakım verenlerinin ruh sağlığı durumlarının değerlendirilmesi. Symrna Med J 2018;1;1-10.
6. WHOQOL-BREF Introduction, Administration, Scoring and Evaluation of the General Edition. 1996. https: //www. who. int / mental_health / media / en / 76.pdf? ua = 1. Field Trial Edition December 1996. Mental health world health organization, Geneva. https: //www.who. int / mental_health / media / en / 76.pdf? ua =1.
7. Field Trial WHOQOL-100 February 1995. 100 questions with response scale. Mental health organization, Geneva. https:// apps.who.int/iris/bitstream/handle/10665/77084/who_ hıs_hsı_rev.2012.01_eng.pdf?sequence=1&isallowed=y
8. Kahle-Wrobleski K, Ye W, Henley D, et al. Assessing quality of life in Alzheimer's disease: Implications for clinical trials. Alzheimers Dement (Amst) 2016;6:82-90.
9. Lucas-Carrasco R, Skevington SM, Gómez-Benito J, et al. Using the WHOQOL-BREF in persons with dementia: a validation study. Alzheimer Dis Assoc Disord 2011;25:345-51.
10. Olgun Yazar H, Yazar T, Yancar Demir E, et al. Assessment of mental health of carers according to patient stage of idiopathic parkinson's disease. Ideggyogy Sz 2018;71:205-12.
11. Eser E. Fundamentals of conceptual isuues and measurement of health related quality of life. Turkish J Neurol 2014;1:1-4.
12. Aydemir Ö. Use of quality of life in clinicial practice. Turkish J Neurol 2014;1:5-9.
13. McKhann G, Drachman D, Folstein M, et al. Clinical diagnosis of Alzheimer's disease: report of the NINCDS-ADRDA Work Group under the auspices of Department of Health and Human Services Task Force on Alzheimer's Disease Neurol 1984;34:939-44.
14. Wang LQ, Chien WT, Lee IY. An experimental study on the effectiveness of a mutual support group for family caregivers of a relative with dementia in mainland China. Contemp Nurse 2012;40:210-24.
15. Elmas Z, Adapınar DÖ, Elmalı NT, et al. Quality of life and its measurement in dementia. Turkish J Neurol 2014;1:24-8.
16. Eser E, Fidaner H, Fidaner C, et al. Psychometric properties of the WHOQOL-1OO and WHOQOL-BREF. J Psychiatry Psychol Psychopharmacol 1999;7:5-13.

17. Eser E, Aydemir Ö. Generic quality of life scales. Turkish J Neurol 2014;1:10-7.
18. Wong FY, Yang L, Yuen JWM, et al. Assessing quality of life using WHOQOL-BREF: a cross-sectional study on the association between quality of life and neighborhood environmental satisfaction, and the mediating effect of health-related behaviors. BMC Public Health 2018;18:1113.
19. Development of the World Health Organization WHOQOL-BREF quality of life assessment. The WHOQOL Group. Psychol Med 1998;28:551-8.
20. Logsdon RG, Gibbons LE, McCurry SM, et al. Quality of life in Alzheimer's disease: Patient and caregiver reports. J Ment Health and Aging 1999;5:21-32.
21. Akpınar B, Küçükgüçlü Ö. The validity and reliability of the Turkish version of the quality of life scale for patients with alzheimer's disease (QOL-AD). J Neurol Sci 2012;29:554-65.
22. Hughes CP, Berg L, Danziger WL, et al. A new clinical scale for the staging of dementia. Br J Psychiatry 1982;140:566-72.
23. Folstein MF, Folstein SE, McHugh PR. Mini-mental state. J Psychiat Res 1975;12:189-98.
24. Güngen C, Ertan T, Eker E, et al. Reliability and validity of the standardized mini mental state examination in the diagnosis of mild dementia in turkish population. Turkish J Psychiatry 2002;13:273-81.
25. Study protocol for the World Health Organization project to develop a Quality of Life assessment instrument (WHOQOL). Qual Life Res 1993;2:153-9.
26. Howell RT, Kern ML, Lyubomirsky S. Health benefits: meta-analyticallydetermining the impact of well-being on objective health outcomes. Health Psychol Rev 2007;1:83-136.
27. Brajsa-Zganec A, Merkas M, Sverko I. Quality of life and leisure activities: how do leisure activities contribute to subjective well-being? Soc Indic Res 2011;102:81-91.
28. Lodhi FS, Montazeri A, Nedjat S, et al. Assessing the quality of life among Pakistani general population and their associated factors by using the World Health Organization's quality of life instrument (WHOQOL-BREF): a population based cross-sectional study. Health Qual Life Outcomes 2019;17:9.
29. Johansson LM, Lingfors H, Golsäter M, et al. Can physical activity compensate for low socioeconomic status with regard to poor self-rated health and low quality-of-life? Health Qual Life Outcomes 2019;17:33.
30. Osborn CY, Kripalani S, Goggins KM, et al. Financial strain is associated with medication nonadherence and worse self-rated health among cardiovascular patients. J Health Care Poor Underserved. 2017;28:499-513.
31. Trachte F, Geyer S, Sperlich S. Impact of physical activity on self-rated health in older people: do the effects vary by socioeconomic status? J Public Health (Oxf) 2016;38:754-9.
32. Cruz LN, Polanczyk CA, Camey SA, et al. Quality of life in Brazil: normative values for the Whoqol-bref in a southern general population sample. Qual Life Res 2011;20:1123-9.
33. Montgomery W, Goren A, Kahle-Wrobleski K, et al. Alzheimer's disease severity and its association with patient and caregiver quality of life in Japan: results of a community-based survey. BMC Geriatr. 2018;18:141.
34. Hessmann P, Seeberg G, Reese JP, et al. Health-related quality of life in patients with Alzheimer's disease in different German health care settings. J Alzheimers Dis 2016;51:545-61.