

Original article

Analysing the Effect of Cognitive Function and Activities of Daily Living on Quality of Life among the Elderly in Malang, Indonesia

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Abstract: *Background* — As people become older, they naturally experience many changes that affect their physical and mental health, including decline in physical strength and cognitive function, which affects their ability to perform daily activities. If this condition persists, it may negatively affect their quality of life (QoL). However, there is a lack of research focusing on QoL among the elderly in Indonesia.

Objective — This study aimed to analyze the effect of activities of daily living (ADL) and cognitive function on QoL among older adults in Malang, Indonesia.

Methods — This is a cross-sectional study using a purposive sampling method. A total of 83 participants were recruited from multiple nursing homes in Malang between April and September 2023. Inclusion criteria were as follows: 60 years of age or older and not having a diagnosis of dementia. The instruments used were: Short Portable Mental Status Questionnaire (SPMSQ) to assess cognitive function, Barthel Index to measure ADL and Short Form 36 (SF-36) to assess QoL. The data were analyzed using independent t-tests, analysis of variance (ANOVA) and Pearson correlation coefficient to assess the relationship between two variables. Multivariate linear regression analysis was performed to examine the relationship between the predictors and QoL.

Results — Multivariate linear regression analysis showed that improved cognitive function and improved ADL were statistically significantly associated with higher QoL, and the adjusted R² of this regression model was 0.18.

Conclusion — The results of this study have important implications for policy making. Policies aimed at improving cognitive function and QoL are likely to have a positive impact on the QoL of the elderly.

Keywords: cognitive, activities of daily living, quality of life.

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Introduction

The elderly represent the final phase of the human life cycle marked by numerous physical and mental changes. Physical changes include gray hair, facial wrinkles, sensory impairments, and reduced immunity [1]. Mentally, older adults may experience personality changes, loss of motivation, and interest [2]. They also often experience social decline characterized by withdrawal from social activities. These changes can affect their health, making them more dependent, and if prolonged, can affect their quality of life (QoL) [3]. In 2023, the elderly population accounted for approximately 26.77% (54 million) in Indonesia; while in entire Southeast Asia, it accounted for about 38% of the population [4]. This number is expected to continue to grow rapidly until 2030 [5, 6].

In addition to the natural aging process, cognitive decline is a common problem among the elderly [7, 8]. Cognitive function is influenced by several factors, including language, reasoning, memory, and intelligence, all of which tend to decline with age [9]. Risk factors that often contribute to cognitive decline in older

adults include age, family history, gender, depression, and comorbidities [10]. This decline is due to degeneration of the central nervous system, which can lead to forgetfulness. In some cases, it can progress from mild cognitive impairment to dementia [11]. Research shows that approximately 39% of people aged 50-59 years are forgetful, and in people over 80 years, the rate is over 85% [12, 13]. Although early forgetfulness may not initially interfere with daily functioning, it can develop into more serious conditions that affect psychosocial well-being and daily functioning [14].

While activities of daily living (ADL) assess an older adult's ability to perform daily tasks such as bathing, toileting, dressing, and moving around [15]. People who have difficulty performing these tasks may feel less satisfied with life, which may negatively impact their QoL [16]. Low QoL in the elderly is often due to various health problems that make it difficult for them to perform daily tasks [17]. Declining mental abilities, changing social roles, and conditions such as dementia and depression further complicate these problems [18, 19]. Thus, analyzing the factors that influence QoL is crucial to maintaining the health and well-

being of older adults. Although studies have been conducted to analyze QoL among the elderly in Indonesia, none have examined the combined effects of cognitive function and ADL on QoL [20, 21]. Consequently, the objective of this study was to analyze the effects of cognitive function and ADL on QoL among the elderly in Malang, Indonesia.

Material and Methods

Study design

This study employed a cross-sectional study design. We recruited 83 elderly people who resided in a nursing home in Malang (Pondok Lansia Al-Islah, Rumah Sosial Gempol Sukun, Komunitas Lansia Joyogrand, and Rumah Sosial Belas Kasih) from April to September 2023. Participants were recruited using purposive sampling methods with the following inclusion criteria: (a) 60 years of age or older, (b) fully conscious and capable of communicating in Indonesian, and (c) willing to participate in this study. Individuals diagnosed with dementia were excluded from participation.

Participants

Table 1 presents the main sociodemographic characteristics and their differences based on QoL indicators. A total of 83 participants were included in this study. Almost 70% of them were aged 65 years or above, and 80.8% were male. Regarding BMI, 45.8% of the respondents were overweight, while 28.9% were obese. Most of the participants were married (54.2%), had secondary education (56.5%) and lived in urban areas (56.6%). Although there were no significant differences in QoL based on sociodemographic characteristics ($p > 0.05$), higher QoL scores were observed among healthy weight participants and university educated participants: 67.32 pts and 68.21 pts, respectively.

Table 1. Sociodemographic characteristics of the patients(N=83)

Variables	N	%	QoL Mean (SD)	p-value
Age (years)				0.082
60-64	23	27.7	64.81 (7.69)	
65-69	35	42.2	62.02 (7.49)	
70+	25	30.1	58.38 (6.93)	
Body Mass Index (BMI)				0.211
Underweight (<18.5)	5	6.0	65.78 (6.69)	
Healthy Weight (18.5-25)	16	19.3	67.32 (6.20)	
Overweight (25-<30)	38	45.8	64.98 (7.23)	
Obesity (>30)	24	28.9	64.90 (4.03)	
Gender				0.061
Male	16	19.2	64.78 (7.76)	
Female	67	80.8	64.60 (6.68)	
Marital status				0.331
Single	38	45.8	65.01 (6.66)	
Married	45	54.2	64.61 (7.18)	
Education level				0.140
No primary school	5	6	65.33 (8.54)	
Elementary School	15	18.1	64.83 (5.23)	
Junior High School	25	30.1	63.67 (5.45)	
Senior High School	22	26.5	66.83 (5.44)	
University	16	19.3	68.21 (5.45)	
Living area				0.170
Urban	47	56.6	64.86 (7.78)	
Rural	36	43.4	64.76 (6.28)	

* $p < 0.05$; ** $p < 0.001$; M, mean; SD, standard deviation.

Table 2. Correlation coefficients between cognitive function, activities of daily living (ADL), and quality of life (QoL)

	QoL	Cognitive Function	ADL
QoL	1		
Cognitive function	0.24**	1	
ADL	0.18*	0.22	1

* $p < 0.05$; ** $p < 0.001$.

Table 3. Multiple linear regression of the quality of life (QoL)

	Unstandardized coefficients		Standardized coefficients	P-value
	B	SE	β	
Age (reference: 60-64 years)				
65-69 years	0.27	0.13	0.08	0.052
70+ years	0.24	0.18	0.10	0.063
Body Mass Index (BMI) (reference: Underweight)				
Healthy weight (18.5-25)	0.75	0.65	0.04	0.078
Overweight (25-<30)	0.64	0.23	0.11	0.124
Obesity (>30)	0.72	0.18	0.05	0.213
Gender (reference: Male)	0.61	0.35	0.06	0.323
Marital status (reference: Single)	1.03	0.64	0.06	0.280
Education level (reference: No primary school)				
Elementary School	0.08	1.30	0.01	0.058
Junior High School	0.16	1.43	0.06	0.056
Senior High School	0.37	1.76	0.11	0.064
University	0.58	1.88	0.30	0.060
Living area (reference: Urban)	0.38	1.02	0.08	0.328
Cognitive function	1.99	0.61	0.12	0.000**
Activities of daily living (ADL)	0.42	0.05	0.29	0.031*

Adjusted $R^2 = 0.18$; * $p < 0.05$; ** $p < 0.01$.

Measurements

Short Portable Mental Status Questionnaire (SPMSQ). The Short-Term Portable Mental State Questionnaire (SPMSQ) was developed by E. Pfeiffer [22]. The Indonesian version of the SPMSQ [23] was used to assess the cognitive functions of the participants in this study. The questionnaire consists of 10 questions (Suppl. 1), with incorrect answers scored as 0 pts and correct answers as 1 pt. The score ranges from 0 to 10 pts, with higher scores indicating higher cognitive function. The questionnaire covers various cognitive aspects, including orientation to the environment, attention to current events, thinking skills, short-term and long-term memory, sequential arithmetic skills, and general knowledge. According to previous studies, the Cronbach's alpha for this instrument is 0.82 [22].

The Barthel Index. The Barthel Index was used to assess ADL [24]. This measurement instrument includes 10 sub-items, including feeding, moving around, personal hygiene, getting on/off the toilet, bathing, walking on flat surfaces, climbing stairs, dressing, and controlling bowel and bladder function. The maximum possible score on this scale was 100, with a higher score indicating higher functional independence. According to previous studies, the Cronbach's alpha for participants with mild to moderate cognitive impairment for this instrument is 0.91 [25].

Short Form 36. The Short Form 36 (SF-36) questionnaire was employed to assess the QoL in respondents [26]. This instrument allows assessing the physical, mental and social health status of the elderly. The SF-36 questionnaire has previously shown its suitability for clinical research and practice in various populations [27]. This questionnaire includes 36 items that assess 8 domains, viz.: general health, physical functioning, role limitations and physical health status, body pain, energy and vitality, emotional

health, and general health. Scores for each domain were converted to scores from 0 to 100, where a higher score corresponds to a higher level of QoL. This instrument demonstrates good validity and reliability in assessing the elderly in the community context [28].

Sociodemographic characteristics

Participants were also asked to provide sociodemographic data using a self-administered questionnaire. The questionnaire included information on their age (60-64/65-69/70+); gender (male/female); body mass index (BMI) (underweight, healthy weight, overweight, obese); marital status (single/married); educational level (no primary school diploma, primary school, middle school, high school, university) and place of residence (urban/rural).

Statistical analyses

Descriptive univariate statistics included frequency and percentage for categorical variables. For quantitative variables (QoL, cognitive function, and ADL), normality was tested using the Kolmogorov-Smirnov test, which showed that all variables were normally distributed ($p > 0.05$). Then, depending on the type of variable, independent t-test, analysis of variance (ANOVA), or Pearson correlation coefficient were used to evaluate the association between two variables. Multivariate linear regression analysis was performed to examine the relationship between predictors and QoL. The level of statistical significance was set at $p < 0.05$, and all analyses were performed using SPSS version 20 (SPSS, Chicago, IL, USA).

Ethical considerations

Ethical approval for this study was obtained from the Ethics Committee of University of Muhammadiyah Malang, Indonesia (No. E.5.a/231/KEPKUMM/VIII/2023). In addition, all participants signed an informed consent form before data collection.

Results

[Table 2](#) presents the results of the Pearson correlation analysis, which examined the relationship between cognitive function, ADL, and QoL. The results showed that both cognitive function and ADL directly and significantly correlated with QoL ($p < 0.05$), with correlation coefficients of 0.24 and 0.18, respectively. However, no significant correlation was revealed between cognitive function and ADL.

[Table 3](#) presents the results of the multiple linear regression analysis, which examined the predictors of QoL in older adults. After accounting for other variables, cognitive function and ADL were found to be the most significant factors of QoL in the elderly ($p < 0.05$). Higher cognitive function and higher ADL scores were positively associated with higher QoL, with β values of 0.12 and 0.29, respectively. The adjusted R^2 of this regression model was 0.18.

Discussion

Among the 83 participants recruited in this study, it was found that better cognitive function and higher ADL scores significantly contributed to better QoL among the elderly. This finding is consistent with previous studies [29, 30], which reported that

cognitive function plays a critical role in determining QoL as it includes perception, reasoning, problem solving and memory. With age, these cognitive capabilities gradually decline, which can significantly affect the ability to perform daily activities [29-31]. In severe cases, old-age-related mental illnesses can develop [8]. If this condition persists, it can negatively affect QoL. Previous studies [32, 33] also reported that cognitive decline corresponds to a reduction in physical function and health-related quality of life. In addition, their study also found an increase in depression and a decrease in QoL associated with lower cognitive levels among the elderly. Cognitive impairment has been found to have a significant impact on QoL, with studies showing that cognitive decline can reduce QoL by approximately 7% in the elderly [29, 30, 34].

ADL were also directly associated with QoL. A previous study found that independent older adults living in urban areas had twice the QoL as the elderly with disabilities in the same setting [20]. Furthermore, studies have shown that older adults with good ADL functioning were strongly associated with higher QoL. In contrast, lower ADL capacity was strongly associated with depression and lower QoL in three different countries [13,35]. Older adults who have difficulty with ADL due to age, illness, or disability may experience reduced QoL as a result of loss of independence [16, 36]. Therefore, maintaining ADL can contribute to improving QoL [37, 38] as it allows older adults to engage in leisure and social activities that enhance their sense of satisfaction and self-fulfillment. Therefore, improving ADL and cognitive function in older adults should be a primary goal in health and rehabilitation programs aimed at improving QoL of community-dwelling older adults.

Although this study contributes to the understanding of the factors associated with QoL of the elderly in Malang, Indonesia, several limitations should be considered. First, due to the limited number of variables examined, other important factors associated with QoL, such as balance, gait, and functional activity, were not analyzed. Second, the cross-sectional nature of the study does not allow drawing causal inferences regarding the relationships between explanatory factors and QoL. However, despite these limitations, our study provides valuable evidence on the importance of considering cognitive function and ADL in both research and practice to improve QoL of older adults in Malang.

Conclusion

This study showed that cognitive function and ADL were positively associated with improved QoL. Therefore, it is necessary to develop an individualized intervention plan that includes regular assessment of physical function, cognitive function, and ability to perform ADL. In addition, early detection and intervention strategies should be implemented to improve the QoL of the elderly.

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Ethical approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Declaration of Helsinki and its later

amendments. This study was approved by the Institutional Review Board of the Ethics Committee of Muhammadiyah University Malang, Malang, Indonesia, under number E.5.a/231/KEPKUMM/VIII/2023.

Conflict of interest

All contributing authors declare no conflicts of interest regarding this study.

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Supplement 1

The Indonesian version of SPMSQ

<i>Question/ Pertanyaan</i>	<i>Response/ Jawaban</i>	<i>Incorrect response/ (Apabila Jawaban Salah)</i>
1. Tanggal berapakah hari ini? (What is the date, month, and year?)		
2. Hari apakah sekarang? (What is the day of the week?)		
3. Apakah nama lokasi ini? (What is the name of this place?)		
4. Berapakah nomer telepon Anda? (What is your phone number?)		
5. Berapakah usia Anda? (How old are you?)		
6. Kapanakah Anda lahir? (When were you born?)		
7. Siapakah Presiden Indonesia saat ini? (Who is our current president?)		
8. Siapakah Presiden pada periode sebelumnya? (Who was the president before him?)		
9. Siapakah nama lahir Ibu kandung Anda? (What was your mother's maiden name?)		
10. Dapatkah Anda menghitung mundur dari angka 20 dikurangi dengan angka 3 secara berturut-turut? (Can you count backwards from 20 by 3?)		