Predictors and Scoring System for Health-related Quality of Life in an Indonesian Community - Dwelling Elderly Population

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ABSTRACT

Aim: to determine factors that independently predict health-related quality of life of Indonesian community-dwelling elderly and to obtain scoring system to predict their quality of life.

Methods: this is a cross-sectional study covering a sample representative of the Indonesian community-dwelling elderly. The study was conducted among 487 elderly in 43 cities in Indonesia between November-December 2010. A structured questionnaire was applied to obtain independent variable such as age, sex, number of diseases, present activities, functional status (ADL score), cognitive status (AMT score), nutritional status (NRI score), and depression status. Quality of life as dependent variable was assessed by Euroqol-5D (Eq-5D). We defined good quality of life as 3 or more dimensions of Eq5D having score of 1. Predictors of quality of life were identified using multiple logistic regression analysis. We constructed a scoring system based on coefficients in multivariable analysis. Calibration performance of the score was evaluated by Hosmer-Lemeshow tests while discrimination performance was evaluated with the c-statistic.

Results: most of the subjects were male (52.2%) and aged between 60-70 years old (75.8%). Prevalence of poor quality of life in this study was 14.9%. Bivariable analysis showed that all independent variables were significantly associated with quality of life. Multiple logistic regression analysis showed that factors predicting poor quality of life were female (OR 1.9; 95% CI 1.0-3.6), poor nutritional status (OR 2.7; 95% CI (1.2-0.8), having >2 chronic diseases (OR 3.6; 95% CI 1.9-6.8), low functional status (OR 4.2; 95% CI 2.2-8.2), and depression (OR 6.3; 95% CI 3.3-12.1). Performance of the risk score revealed Hosmer Lemeshow test p=0.86 and c-statistic 0.87 (95% CI 0.83 – 0.92).

Conclusion: the following factors were identified as predictive factors of HRQoL in Indonesian community-dwelling elderly: sex, nutritional status, number of chronic diseases, functional status, and depression status. The risk score developed based on those predictors showed good performance to accurately predict poor quality of life.

Key words: quality of life, elderly, predictive factors.

INTRODUCTION

Elderly populations are increasing in the world. It is estimated that the number of elderly people in Asia will reach 1.2 billion (59% of the total elderly population in the world) by the year 2050.[1] As the number of elderly population is increasing, policies of health promotion are becoming an important issue for encouraging the elderly to remain active, independent and have a positive effect on their quality of life.[2]

One of the major causes of reduction in the quality of life in the elderly is aging due to its chronologic, biological, social, and psychological dimensions. Higher prevalence of disabilities and chronic diseases in the elderly compared to other age groups also lead to a reduction in the quality of life.[3] Quality of life is defined by The World Health Organization as 'an individual's perception of his or her position in life, in the context of the culture and value systems in which individual lives and in relation to goals, expectation, standards and concerns'.[4]

Studies show that quality of life can predict mortality rate in the elderly population.[5,6] Thus, studies about quality of life in elderly are important to describe wealth and health profile of elderly population multi-dimensionally. Identifying factors which influence quality of life in elderly is also important to provide direction and to make a policy for improving quality of life in this population. Quality of life and its associated factors are different among countries.[7,8] Study results about associated factors of quality of life from one

country cannot be directly applied in another country due to its different characteristics of each population.

Indonesia is a developing country with a total population of 237 million.[9] The elderly population of the country is currently approximately 19 million.[10] Elderly persons in this country have high prevalence of illness and co-morbidities. They mostly live under one roof with their children in both rural and urban areas. Considering the specific characteristics of Indonesian elderly, such as lower level of education, mostly depending on their family, limited access to health services, and inadequate economic security and healthcare services from the formal sectors which contribute to the vulnerability of this population, it is important to know the health-related quality of life in Indonesian elderly. Knowledge about predictors of health-related quality of life in Indonesian elderly would provide valuable information about strategies that professionals and providers of elderly care can address to improve health-related quality of life for elderly people in Indonesia.

Measuring quality of life in elderly persons is not easy due to many influencing factors to be taken into account. One of reliable and widely validated tools in measuring quality of life is EQ-5D developed by EuroQol Group. EQ-5D measures health-related quality of life by generating a single index value (ranging from 0 to 100) for health status from 5 dimensions: mobility, self care, usual activity, pain/discomfort, and anxiety/ depression. In practice, using a single index value of EQ-5D is not clinically meaningful since there is no cut-off value which can differentiate good and poor quality of life. Furthermore, in the clinical setting, it is more valuable to predict a state of quality of life based on various clinical parameters, such as sex, nutritional status, functional status, cognition, depression, and presence of chronic diseases.

The aim of the present study was to determine factors that independently predict health-related quality of life in Indonesian community-dwelling elderly and to obtain scoring system to predict quality of life of elderly.

METHODS

Design, Setting, and Study Population

A cross-sectional study was conducted among 487 community-dwelling elderly (aged 60 years and older) in 43 cities in Indonesia between November-December 2010, who visited the private bank of pensioners in the city. The exclusion criteria were those who have inability to answer the assessment questionnaire due to serious hearing problems or severe communication disorders, and refused to participate in the study.

All subjects were informed about the objectives and contents of the study, and verbal informed consents were obtained.

Assessment of Predictors and Health-related Quality of Life

All subjects were evaluated by face to face interview technique done by a trained staff. A structured questionnaire was applied to collect demographic data such as age, sex, and educational status, number of chronic diseases, present activities with question such as "are you still actively do something every day?", functional status, cognitive status, nutritional status, depression status, and quality of life.

Functional status was measured by Activity of Daily Living (ADL) index Barthel questionnaire, which consisted of 10 questions. We defined independent functional status as ADL score equals to 20, and dependent functional status as ADL score <20. Abbreviated Mental Test (AMT) was used to evaluate cognitive status of subjects. Abbreviated Mental Test consisted of 10 questions. The cut-off value for AMT was: cognitive impairment AMT <7; AMT normal >8. Geriatric depression scale (GDS) questionnaire was used to evaluate depression status. We defined depression or susceptibility of depression if GDS score >5 and normal if GDS score <5. Nutritional status was measured by Geriatric Nutritional Risk Index (NRI) which consisted of 16 questions. The cut-off value for NRI was: risk of undernutrition NRI >7; normal NRI <6. Number of diseases were classified as two or less diseases and more than two diseases.

Quality of life was assessed by Euroqol-5D (Eq-5D). The Eq5D is a generic instrument to measure HRQoL which describes health status according to five dimensions: mobility, self care, usual activity, pain/ discomfort, and anxiety/depression. Each dimension has 3 three levels of score, namely 1 for no problem; 2 for some problems; and 3 for severe problem. We defined good quality of life as 3 or more dimensions having score 1 and poor quality of life as 2 or less dimension score 1.

Data Analysis

Characteristics of subjects are presented as number and percentage; including age, sex, education, and quality of life. Bivariable analysis using Chi square test was done between each predictor and quality of life. Then a multivariable analysis using logistic regression with quality of life as the outcome variable and the predefined predictors as the independent variables was performed. To build a practical calculation on health-related quality of life, we developed a scoring system.

Each coefficient from the equation was transformed to a rounded number. As the coefficient reflects the relative weight of each variable in prediction, they were converted to a number of points, by dividing each coefficient by the smallest coefficient close to zero. The number of points was rounded to the nearest integer. The total score for each individual subject was calculated by assigning the points for each variable present and adding them up. Then the score was transformed to a dichotomous category, which classified subjects as good or poor quality of life. Sensitivity and specificity of categorized values of the score were determined. Performance of the score was assessed by calibration and discrimination. Calibration refers to the agreement between observed outcomes and predicted risks. Calibration was described by Hosmer Lemeshow (HL) goodness-of-fit-testing. Discrimination refers to the ability to accurately distinguish those with and those without the outcome, and quantified by the c-statistic and described by Receiver Operating Characteristic (ROC) curves and areas under the curves (AUC). For binary outcomes, the c-statistic is identical to the AUC of ROC curves. The c-statistic lies between 0.5 and 1, and is better if closer to 1. A 2-sided p-value less than 0.05 was considered to indicate statistical significance. In order to perform internal validation, we evaluated the calibrative and discriminative performance on a dataset of 1000 random samples with replacement which were drawn from the original dataset with complete data on all predictors. Data were analyzed using SPSS 17.0 for Windows.

RESULTS

Table 1 summarizes subject characteristics. Most subjects were male (52.2%) and age between 60-70 years old (75.8%). More than half of subjects had education of senior high school and higher (67.5%). Prevalence of poor quality of life in this study was 14.9%.

Table 2 shows the results of Chi-square test using quality of life as dependent variable and some dichotomous variables as independent variables. Significance was found in all independent variables.

Table 1. Characteristics of subjects

Characteristics	n (%)
Age (years old)	
- 60-70	369 (75.8)
- >70	118 (24.2)
Sex	
- Male	254 (52.2)
- Female	233 (47.8)
Education	
- No school	17 (3.5)
- Elementary school	69 (14.2)
- Junior high school	72 (14.8)
- Senior high school	195 (40.0)
- Academy/University	134 (27.5)
Quality of life	
- Good	414 (85.1)
- Poor	73 (14.9)

Table 2. Bivariable analysis on predictors of quality of life in elderly

Variables	Quality of life		OR (95% CI)	p value
	Good	Not Good		
Age (years old)				
- 60-70	321 (86.9)	48 (13.0)		
- ≥70	93 (78.8)	25 (21.2)	1.8 (1.1-3.1)	0.032
Sex				
- Male	227 (89.4)	27 (10.6)		
- Female	187 (80.3)	46 (19.7)	2.1 (1.2-3.5)	0.005
Activity				
- Active	80 (93.0)	6 (7.0)		
- Non-active	334 (83.3)	67 (16.7)	2.7 (1.1-6.4)	0.022
Cognitive status (AMT)				
- Normal	394 (87.6)	56 (12.4)		
- Impaired cognitive status	20 (54.1)	17 (45.9)	5.9 (2.9-12.1)	0.00
Nutritional status (NRI)				
- normal	389 (88.6)	50 (11.4)		
- risk of undernutrition	25 (52.1)	23 (47.9)	7.2 (3.8-13.6)	0.00
Number of chronic diseases				
- ≤2	336 (89.6)	39 (10.4)		
- >2	78 (69.6)	34 (30.4)	3.8 (2.2-6.3)	0.00
Functional status (ADL)				
- Independent	342 (92.9)	26 (7.1)		
- Dependent	72 (60.5)	47 (39.5)	8.6 (4.9-14.8)	0.00
Depression status (GDS)				
- Normal	374 (92.8)	29 (7.2)		
- Succeptibility to depression and depression	40 (47.6)	44 (52.4)	14.2 (8.0-25.1)	0.00

Table 3. Multivariate analysis on predictors of poor quality of life in the elderly

Variables	Coefficient	OR (95% CI)	p value	Contribution to score
Sex	0.6	1.9 (1.0-3.6)	0.04	1
Nutritional status	0.9	2.7 (1.2-5.9)	0.01	1
Number of chronic diseases	1.3	3.6 (1.9-6.8)	0.00	2
Functional status	1.4	4.2 (2.2-8.2)	0.00	2
Depression status	1.8	6.3 (3.3 12.1)	0.00	3
Constanta	-3.8			

Table 3 shows the results of multiple logistic regression. We found several factors that significantly predict poor quality of life were female (OR 1.9; 95% CI 1.0-3.6), poor nutritional status (OR 2.7; 95% CI (1.2-0.8), >2 chronic diseases (OR 3.6; 95% CI 1.9-6.8), low functional status (OR 4.2; 95% CI 2.2-8.2), and the presence of depression (OR 6.3; 95% CI 3.3-12.1). The logistic regression equation for probability of poor quality of life was as follows:

$$Y = (1/ e-(-3.8 – 0.6[\text{sex}] + 0.9 [\text{nutritional status}] + 1.3 [\text{number of chronic diseases}] + 1.4 [\text{functional status}] + 1.8 [\text{depression status}]))$$

- Sex : 0=male; 1=female
- Nutritional status : 0=normal; 1=risk of under-nutrition
- Number of chronic diseases : 0= < 2; 1 = >2
- Functional status : 0=independent; 1=dependent
- Depression status : 0=normal; 1 = succeptibility to depression and depression

From the equation above, we did further analysis to obtain risk score to predict quality of life of patients. Hosmer lemeshow test (p=0.86) and c-statistic (Are under curve = 0.87; 95% CI 0.83 – 0.92) showed that the score has good calibrative and discriminative performance. **Figure 1** shows ROC curve of scoring in this study. **Table 4** shows the score and cut-off score to predict poor quality of life. A cut-off point >2 was chosen as the threshold for poor quality of life, and revealed sensitivity of 67.1% and specificity 88.6%. The score's predictive performance after internal validation was maintained with Hosmer Lemeshow test 1.00 and c-statistic 0.79 (95% CI 0.78 – 0.79).

DISCUSSION

Using Eq5D as a generic instrument for measuring HRQoL in elderly persons, the current study provides
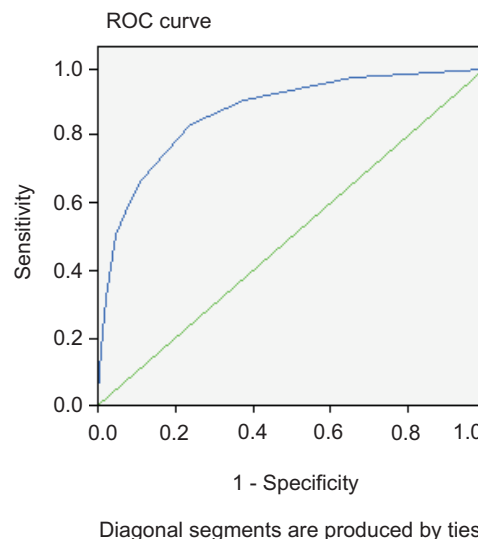
Figure 1. ROC curve of risk score to predict poor quality of life in elderly

Table 4. Risk score to predict quality of life in elderly

No.	Question	Patient Score Yes	Patient Score No	Patient Score
1	Is patient woman?	1	0	
2	Does patient have risk of undernutrition? (NRI score ≥7)	1	0	
3	Does patient have 2 or more chronic diseases?	2	0	
4	Does patient have impaired functional status? (ADL score <20)	2	0	
5	Does patient have depression or susceptibility to depression? (GDS score ≥5)	3	0	
	Total Score			

Note : Score >2 = poor quality of life

Score <2 = good quality of life

For example :

If the patient is woman, has good nutritional status, 3 chronic diseases, independent functional status, and no depression, the total score of the patient is 3. The score indicates that patient may have poor quality of life.

new data about predictive factors of the quality of life in Indonesian community-dwelling elderly. Eq5D is commonly used to measure HRQoL in elderly population and has been shown to be responsive, internally consistent, and reliable.[11,12]

Being female is a higher risk for poor quality of life in this study. This result is in line with study done by Merryn et al, which found being female was associated with a reduced score of SF36.[13] Other

studies also have identified lower quality of life among elderly women.[14,15] In contrast, Yessim et al found no significant gender-related differences in quality of life scores.[16] Worse HRQoL among women in elderly remains unclear whether this is due to differential reporting patterns, or whether there is a real difference in health status. Orfila et al concluded that worse reported HRQoL in elderly women is mainly due to a higher prevalence of disability and chronic condition.[17] The same result was also obtained by Navarro et al which found worse HRQol in elderly women related to visual impairment.[18]

Malnutrition in the elderly is often associated with functional impairment, disability, and impaired health. Among non-institutionalized, independently living elderly the prevalence of malnutrition is generally low.[19,20] In this study, we found prevalence of elderly who having of undernutrition was 9.9%. Elderly with risk of nutritional status have higher risk of having poor quality of life compared in this study. This result in line with study done by Kyamme JM, et al which found that HRQoL was significantly reduced in elderly at risk of malnutrition.[21] Malnutrition in elderly could lead to sarcopenia, wasting or cachexia which can impair functional abilities and finally lead to impairment of quality of life.[22]

Cognitive impairment rate is generally higher in elderly living in institutions rather than those living in the community, and reported new cases of cognitive impairment are alarming in the developing countries.[23] Our study found prevalence of cognitive impairment was 7.6%. This prevalence was lower compared to other study done among elderly Singapore in community, which found prevalence of cognitive impairment 13.2%.[24] We found no association between cognitive impairment and quality of life in logistic regression analysis. Study done by Paolo also conclude that cognitive impairment does not seem to worsen subjective perception of quality of life in elderly.[25] Nagatomo also found that elderly quality of life is not influenced by degree of cognitive impairment.[26]

Uncontrolled chronic diseases can lead to incapacity and limit the independence and quality of life of elderly people. Study done by Margareth among 1958 Brazilian elderly individuals in community found that the greater the number of comorbidities reported by an individual, the more acute the negative effect on health related quality of life. The presence of two or more diseases had substantial negative effects on HRQoL Scales.[27] Our study also found the association between number of chronic diseases with quality of life. Elderly who had two or more chronic diseases will have a higher risk of poor quality of life. Other study among elderly with heart failure also found that people reported four or more commorbidities were particularly at risk of reduced quality of life.[13]

The Barthel ADL Index was commonly used to describe functional status of elderly. In this study we found functional status measured by Barthel ADL index was associated with quality of life. Dependent elderly (ADL less than 20) have higher risk of having poor quality of life. A study done by Paskulin et al among Brazilian older adults also found dependence in ADL associated with quality of life.[28]

Mental management such as depression is considered to be important to maintain a high level of quality of life in the elderly.[29] Depression is the most prevalent functional mental disorder of elderly. Prevalence of depression in our study was 25.5%, which is lower compared to study done by Taizo et al (33.8%).[30] Elderly who has depression in this study has higher risk of poor quality of life. This result is in line with other study done by Taizo et al, Chan et al, and Ina et al.[30-32]

We should pay more attention to predictive factors of quality of life in order to improve quality of life in the elderly. Problems affected health status such as chronic diseases and nutritional problem should be diagnosed and treated properly, and abilities in doing daily activities should be maintained. This study emphasizes the importance of maintaining health status of elderly from many aspects such as functional status, nutritional status, and depression status as well as chronic medical conditions. The role of a geriatric team and the need for multidisciplinary care for older people living in the community is apparent.

In the present study we developed a simple scoring system which can be applied in the community by healthcare professionals or even by community health workers to identify elderly persons who have poor quality of life. Identification of such persons is very important, especially in early stage, to create individual modifying program according to underlying aspects. One of the limitations of the present study was information on chronic diseases based on self reported information. The accuracy of such information differs according to the type of disease and the severity of symptoms. But since these differences were not correlated with the measurement of quality of life by EQ-5D instrument, we believe that there is no information bias in this study.

CONCLUSION

The following factors were identified as predictive factors of HRQoL in Indonesian community-dwelling elderly: sex, nutritional status, number of chronic

diseases, functional status, and depression status. From the equation obtained in this study, we developed a risk score to predict poor quality of life in elderly. The score's predictive performance after internal validation is the performance that can be expected when the score is applied to future similar population. Furthermore, an external validation study to evaluate performance of this score in other populations is encouraged.

ACKNOWLEDGEMENT

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