JURNAL KOMPLIKASI ANESTESI
VOLUME 13 NOMOR 3, August 2026
RESEARCH

Association between Comorbidities and Quality of Life Among Geriatric Patients Undergoing Anesthesia at Dr. Sardjito Hospital

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How to cite: Dewi BDR, et al, Association Between Comorbidities and Quality of Life Among Geriatric Patients Undergoing Anesthesia at Dr. Sardjito Hospital. Jurnal Komplikasi Anestesi. 13(3): 2026.

Received: March, 20, 2026
Accepted: August 05, 2026
Published: August 26, 2026

ABSTRACT

Background: Geriatricians undergo an aging process involving molecular and cellular changes that lead to physiological changes. These changes have led to the emergence of comorbidities suffered by 44% of geriatricians in Indonesia, such as hypertension, diabetes mellitus, chronic pulmonary obstruction, and others. Changing conditions during old age and comorbid factors affect a person's quality of life, especially in the geriatric population. This is a challenge for medical practitioners who will carry out anesthesia procedures. Quality of life is an important measure in assessing the success of patient treatment, especially geriatric patients with comorbidities undergoing anesthesia and operative procedures.
Objective: To determine the association between comorbid conditions and the quality of life of geriatric patients undergoing anesthesia procedures at Dr. Sardjito Hospital.
Methods: A retrospective observational study was conducted on secondary data of geriatric patients who underwent anesthesia at Dr Sardjito Hospital, Yogyakarta, in February-April 2021. Quality of life was measured using the Indonesian WHOQoL-BREF instrument, while comorbidity was measured using the Charlson Comorbidity Index (CCI) instrument. Association between CCI and WHOQoL-BREF was analyzed using the chi-square test, while multivariate analysis was carried out using logistic regression. ROC analysis was also carried out to determine the optimal cut-off point for the CCI score in predicting poor quality of life.
Results: The ROC graph shows that the cut-off score CCI=1 with a sensitivity of 64.4% and a specificity of 58.0% can predict WHOQoL-BREF <60, but with poor discrimination ability (AUC 0.612; 95% CI 0.515 – 0.709). CCI 1 - 2 comorbidities can reduce the quality of life of post-anesthesia geriatric patients by 86.1% compared to patients without comorbidities (OR 0.139; 95% CI 0.039 – 0.498; p = 0.002).
Conclusion: There is an association between comorbidities and a decrease in the quality of life of geriatric patients.

Keywords: Anesthesia, comorbidities, CCI, geriatrics, quality of life, WHOQoL

INTRODUCTION

Based on law number 13 of 1998 concerning the Welfare of the Elderly, a geriatrician is defined as someone over 60 years old.[1] In 2016, the geriatric population in Indonesia reached 22,630,882 people, and in 2020 it increased to 31,320,066 people.[2] The aging process involves molecular and cellular damage over time, causing physiological changes.[3] Apart from that, there are also cognitive changes and disorders in the elderly population. Changes in the neurological system increase the risk of dementia, in the cardiovascular system increase the risk of hypertension and thickening of the heart valves, in the respiratory system increase the risk of aspiration due to muscle weakness, gastrointestinal changes increase the risk of reflux and the ability to metabolize is also impaired, changes in the renal system increase the risk of experiencing urinary incontinence and changes to the musculoskeletal system increase structural instability.[4]

Comorbidity is defined as something related to a particular index condition, which in this context is the patient's comorbid disease. In Indonesia, it is estimated that around 44% of the elderly population has comorbidities, with the most common being hypertension.[2] Research shows that comorbidities such as kidney disease, acute myocardial infarction, and intracranial hemorrhage in geriatrics are the largest factors in predicting postoperative mortality.[5] Comorbidity assessment can be done using Charlson Comorbidity Index (CCI). This instrument has proven effective in measuring the risk of morbidity and mortality in geriatric patients. Research related to the validity of the CCI tool shows a moderate to large correlation.[6]

Comorbidities in geriatrics combined with age-related physiological changes can have a significant effect on the mechanism of action of anesthetic drugs. Changes in the central nervous system increase the pharmacodynamic sensitivity of anesthetics. Decreased autonomic control and dysfunction of baroreceptor reflexes to maintain hemodynamic stability diminish with age. In the respiratory system, there is a decrease in functional capacity resulting in an increased risk of respiratory complications. Age is a risk factor for postoperative kidney failure. Dose adjustments and avoidance of ketamine in patients at high cardiac risk are important considerations.[7]

Comorbid conditions that are often found in geriatric patients are one of the factors that influence the quality of life of geriatric patients. Quality of life is an important measure in assessing the success of patient treatment, especially in the geriatric population, which has unique characteristics and is vulnerable to various medical conditions. According to the World Health Organization Quality of Life Group, or in English known as World Health Organization Quality of Life (WHOQOL), quality of life is an individual's perception of his position in life, which is influenced by the culture and value system in which he lives, which is related to his goals, hopes, standards, and concerns (The World Health Organization Quality of Life assessment).[8] WHO has developed a short questionnaire, namely the WHOQOL-BREF questionnaire, which evaluates 4 domains, namely physical health, psychological health, social relationships, and the surrounding environment through 26 items. This questionnaire has high internal consistency and validity values.[9] The WHOQOL-BREF questionnaire was translated into Indonesian for the first time in 2004, and the results of the validity study showed good results.[10]

In general, in the first 4 months after surgery, patients experience a decrease in functional and mental quality of life. However, at 12 months there was an improvement in quality of life in all patients, including those with complications.[11] Research shows that comorbidities are independent predictors of long-term reduction in quality of life. To improve long-term quality of life after surgery, it is critical to assess potential risk factors, both before and during anesthesia and surgical procedures. Comorbidities pose a clear challenge for practitioners, especially for geriatric patients undergoing anesthesia for surgical procedures.[12]

RSUP Dr. Sardjito, as one of the referral hospitals in Indonesia, handles many geriatric patients undergoing anesthesia. Therefore, it is important to know the association between

comorbidities and the quality of life of geriatric patients undergoing anesthesia at RSUP Dr. Sardjito. It is hoped that this research will provide useful information for medical practitioners, especially anesthesiologists, in planning and carrying out better and safer anesthesia procedures for geriatric patients.

METHODS

This research is a secondary data study from a retrospective observational study entitled "Association between Comorbidities and Quality of Life in Geriatric Patients Undergoing Anesthesia at RSUP Dr. Sardjito." This research is part of a multicenter study entitled". Profile of Anesthesia Services and Intensive Therapy for Geriatric Patients in Indonesia: Study of Characteristics, Management, and Outcomes" carried out by the Collegium of Anesthesiology and Intensive Therapy in 14 Hospitals in Indonesia.

The target population is all geriatric patients who underwent anesthesia in the operating room at Dr. Sardjito Hospital Yogyakarta in February-April 2021. Inclusion criteria in this study included patients aged 60 years or more who underwent surgery and required anesthesia, both inside and outside the operating room. Dr. RSUP operation. Sardjito. Meanwhile, exclusion criteria include respondents with incomplete medical records and questionnaires. This research uses purposive sampling techniques, which involve all patient data that meets the criteria during the study period, namely from February to April 2021.

This research is part of a multicenter study entitled "Profile of Anesthesia Services and Intensive Therapy for Geriatric Patients in Indonesia: Study of Characteristics, Management, and Outcomes" which has been carried out with a code of ethics Ref. No: KE/FK/1381/EC/2020.

Data on the characteristics of research subjects are presented in the form of descriptive statistical values. Numerical variables with a normal distribution will be presented in the form of mean and standard deviation. Numerical variables that are not normally distributed will be presented in the form of median and range (minimum-maximum). Categorical variables will be presented in the form of frequencies and percentages. Test the normality of numerical variable data using the Kolmogorov-Smirnov test. If $p > 0.05$, then the data are said to be normally distributed. Association between the independent variable (CCI score) and the dependent variable (WHOQoL-BREF) was analyzed by testing differences in proportions between two groups using chi-square. The CCI score data will be used to calculate.

the optimal cut-off using the ROC curve, which will be displayed in the form of an image. In addition, the AUC, sensitivity, and specificity values are also displayed in tabular form. Analysis of differences in patient WHOQoL scores before and after surgery was analyzed using the paired t-test and mc-nema McNemar test.

In addition, multivariate analysis was carried out to determine the association of other variables/confounding variables with the dependent variable (WHOQoL). First, bivariate analysis was performed. Categorical data will be analyzed using the chi-square test. Numerical data will be analyzed using the independent t-test (if normally distributed) or Mann-Whitney (if not normally distributed). After that, variables with $p<0.25$ will proceed to multivariate analysis with the logistic regression test.

RESULT

Research data collection was carried out at RSUP Dr. Sardjito Yogyakarta with secondary data subjects of patients over 60 years of age who underwent surgery and required anesthesia, both in the operating room and outside the operating room, in February-April 2021. There were 237 patients who met the inclusion criteria, but 82 patients were excluded because they did not have complete data, so the number of research subjects was 157 people.

Characteristics of Research Subjects

Data normality analysis was carried out using tests Kolmogorov Smirnov because the sample numbered more than 50 people. From the data normality analysis, it was found that the variables age, weight, and height were not normally distributed ($p > 0.05$), so

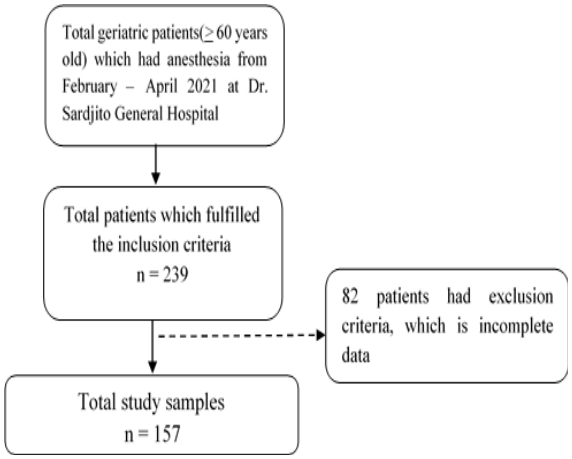

Figure 1. Research Sample Flow

they were presented in median form. Subject characteristics are depicted in the table above. Of the 157 subjects, the median patient age was 65 years, consisting of 88 men (56.1%) and 69 women (43.9%). A total of 60 patients (38.2%) had normal body mass index, followed by overweight (36 people; 22.9%) and obesity grade I (34 people; 21.7%). All patients (100%) received elective surgery. The type of surgery most frequently performed was oncology surgery (47 people, 29.9%), followed by ophthalmology (28 people; 17.8%), and orthopedics (16 people, 10.2%). Most of the patients were in ASA

Table 1. Characteristics of Research Subjects

Variable	n (%) / Median (minimum – maximum)
Age, years	65.00 (60 – 89)
Body weight, kg	55.00 (30 – 85)
Body Height, cm	155.00 (135 – 178)
Gender	
Man	88 (56.1)
Woman	69 (43.9)
Body mass index	
Underweight	18 (11.5)
Normal	60 (38.2)
Overweight	36 (22.9)
Obese grade I	34 (21.7)
Obese grade II	9 (5.7)
Operation classification	
Elective	157 (100.0)
Emergency	0 (0.0)
Operational action	
Trauma	1 (0.6)
Oncology	47 (29.9)
Cardiothorax	0 (0.0)
Digestive	14 (8.9)
Obstetrics	0 (0.0)
Gynecology	12 (7.6)
Neurology	2 (3,2)
Ophthalmology	28 (17.8)
orthopedics	16 (10.2)
THT	2 (3.2)
Plastic	2 (1.9)
Urology	7 (4.5)
Vascular	2 (1.3)
ASA classification	
SO I	0 (0.0)
THAT'S HOW IT IS	2 (1.3)
ASA III	149 (94.9)
AS IV	2 (3.8)
AS V	0 (0.0)
Types of Anesthesia	
General Anesthesia	119 (75.8)
Regional Anesthesia	
Spinal Anesthesia	36 (22.9)
Epidural Anesthesia	14 (8.9)
Peripheral Block Anesthesia	2 (1.3)

category III (149 people, 94.9%) and received general anesthesia (119 people, 75.8%).

Correlation of Charlson Index with WHOQoL-BREF

Analysis chi-square analysis was carried the out to assess association between CCI and WHOQoL-BREF. CCI score 1-2 was found to be statistically significantly related to WHOQoL-BREF (OR 0.43; 95% CI 0.20–0.90; p=0.026). Most CCI 0 patients (80.2%) had better quality of life (WHOQoL-BREF>60). Meanwhile, 19.8% of CCI 1 – 2 patients had WHOQoL-BREF < 60, as did all CCI patients > 5 (2 people, 100%) had WHOQoL-BREF <60.

Determination of Cut-Off Points for CCI scores in Predicting Quality of Life. ROC analysis was performed to determine the cut-off CCI score to classify patients with good quality of life (WHOQoL-BREF > 60) and poor quality of life WHOQoL-BREF < 60. The cut-off selected is the furthest point from the curve to the diagonal line, which mathematically provides optimal prognostic performance (combination of sensitivity and specificity). The results of the ROC graph are presented in figure 4 above.

Based on the ROC analysis presented in Table 3, the optimal cut-off point for the CCI score was 0.5. However, because the CCI score is an integer value, a practical cut-off point that can be applied is 1. Accordingly, the distribution of patients with good and poor quality of life based on this cut-off point is presented in Table 4 below.

From the 2x2 table above, you can calculate the CCI score >1 had a sensitivity of 64.4% and

Table 2. Correlation between CCI Scores and WHOQoL-BREF

Shoes CCI	Total n(%)		WHOQoL <60 n(%)		WHOQoL ≥60 n(%)		P value	OR (I 95%)
CCI 0	81	100%	16	19,8%	65	80,2%	-	-
CCI 1-2	66	100%	24	36,4%	42	63,6%	0,026*	0,43 (0,20 – 0,90)
CCI 3-4	8	100%	3	37,5%	5	62,5%	0,254	0,41 (0,09 – 1,90)
CCI > 5	2	100%	2	100,0	0	0,0%	0,999	-

Determination of Cut-Off Points for CCI scores in Predicting Quality of Life

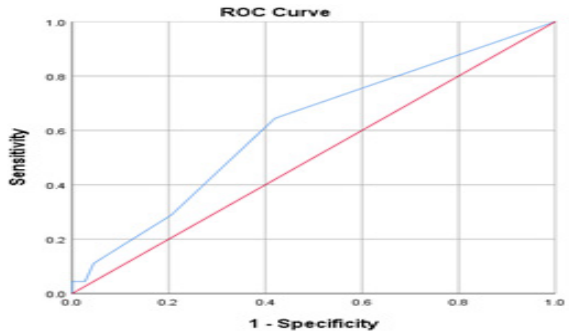

Figure 2. ROC Curve between CCI and WHOQoL scores

Table 3. Sensitivity, Specificity, and Youden's Index Cut-off Values Based on the ROC Curve

MarkCut-Off	Sensitivity	Specificity	Youden's Index
-1	1.000	0.000	0.000
0.5	0.644	0.580	0.225
1.5	0.289	0.795	0.084
2.5	0.111	0.955	0.066
3.5	0.044	0.973	0.018
5.0	0.044	1.000	0.044
7.5	0.022	1.000	0.022
10.0	0.000	1.000	0.000

Table 4. Frequency Distribution of Quality of Life Based on CCI Score = 0 and CCI Score> 1

	WHOQoL-BREF <60	WHOQoL-BREF >60	Total
Shoes CCI ≥ 1	29	47	76
Shoes CCI	16	65	81
Total	45	112	

CCI = Charlson Comorbidity Index

Table 5. Diagnostic Value of CCI as a Predictor of WHOQoL-BREF

Parameter	Cut-off point	Sensitivity	Specificity	PPV	NPV	AUC	p	ME 95%
Shoes CCI	1	64,4%	58,0%	38,2%	80,2%	0,612	0,029	0,515 – 0,709

Table 6. Bivariate Analysis of WHOQoL-BREF

Independent Variable	Total N (%) / Median (min – max	WHOQoL <60 N (%) / Median (min - max)	WHOQoL ≥60 N (%) / Median (min - max)	P
Charlson				
CCI 0	81 (100)	16 (19.6)	68 (80.2)	-
CCI 1-2	66 (100)	24 (36.4)	45 (63.6)	0.026*
CCI 3-4	8 (100)	3 (37.2)	6 (62.5)	0.254
CCI > 5	2 (100)	2 (100.0)	0 (0.0)	0.999
Age, years	65.00 (60 – 89)	67.0 (59 – 83)	65.00 (60 – 89)	0.354
Body weight, kg	55.00 (30 – 85)	53.00 (30 – 85)	56.00 (38 – 83)	0.222
Body Height, cm	155.00 (135 – 178)	155.00 (145 – 170)	155.00 (135 – 178)	0.431
Gender				0.179
Woman	69 (100.0)	45 (28.7)	53 (76.8)	
Man	89 (100.0)	29 (33.0)	59 (67.0)	
Body mass index				
Normal	60 (100.0)	16 (26.7)	44 (73.3)	-
Underweight	18 (100.0)	8 (44.4)	10 (55.6)	0.157
Overweight	36 (100,0)	9 (25.0)	27 (75.0)	0.857
Obese gr I	34 (100.0)	9 (26.5)	25 (73.5)	0.984
Obese gr II	9 (100.0)	3 (33.3)	6 (66.7)	0.677
Operational action				
Low risk	36 (100.0)	4 (11.1)	32 (88.9)	0.011
Intermediate risk	28 (100.0)	10 (35.7)	18 (64.3)	0.363
High risk	77 (100.0)	26 (33.8)	51 (66.2)	0.165
ASA classification	2 (100.0)	0 (0.0)	2 (100.0)	-
THAT'S HOW IT IS	149 (100.0)	42 (28.2)	107 (71.8)	0.999
ASA III	6 (100.0)	3 (50.0)	3 (50.0)	0.999
AS IV				
Types of Anesthesia	119 (100.0)	31 (26.1)	88 (73.9)	0.200
General Anesthesia	36 (100.0)	12 (33.3)	24 (66.7)	0.480
Regional Anesthesia:	14 (100.0)	5 (35.7)	9 (64.3)	0.492
Spinal	2 (100.0)	1 (50.0)	1 (50.0)	0.545
Epidural				
Peripheral Block				

Table 7. Multivariate Analysis of WHOQoL-BREF Scores

Variable	P	OR	ME 95%
Shoes CCI 1 -2	0,002*	0.139	0.039 – 0.498
Body weight	0,774	1.022	0.881 – 1.185
Gender	0,096	3.514	0.801 – 15.408
Underweight	0,162	0.300	0.056 – 1.620
Low risk surgery	0,442	0.483	0.076 – 3.086
High risk surgery	0,096	0.309	0.078 – 1.231

CCI = Charlson Comorbidity Index

Table 8. Differences in WHOQoL-BREF Scores Before and After Anesthesia

	Before Anesthesia	After Anesthesia	p
WHOQoL-BREF	62.17 + 12.60	62.73 + 11.66	0.571

Table 9. Differences in Quality of Life Frequency Distribution Based on Patient CCI Scores Before and After Anesthesia

		After operation		P value
CCI 0	Before Surgery	Bad	Good	
	Bad	11	39	<0,001
	Good	5	26	
	Before Surgery	After operation		P Value
		Bad	Good	
	Bad		17	0.108
	Good		25	
CCI 3 - 4	Before Surgery	After operation		p-value
		Bad	Good	
	Bad	2	0	1.000
	Good	1	5	

specificity of 58.0% in predicting poor quality of life (WHOQoL-BREF<60). The ROC analysis of the CCI score yielded an AUC of 0.612 (p = 0.029). These results indicate that the CCI score is a statistically significant predictor of quality of life as measured by the WHOQOL-BREF. However, its discriminatory ability is weak, as reflected by the relatively low AUC value. The optimal cut-off point was determined using Youden's Index, which identifies the point with the maximum distance from the chance line and is calculated using the formula: Sensitivity + Specificity – 1.

Correlation Bivariate and Multivariate Analysis of WHOQoL-BREF

Bivariate analysis showed that apart from the CCI score 1-2, there was a significant association between surgery low risk and quality of life (p=0.011). Compared to the group with good quality of life, patients with poor quality of life (WHOQoL-BREF<60) had an older median age (67.5 vs 65.0 years) and lower body weight (54.0 kg vs 55.0 kg) , but the association was not statistically significant (p=0.579).

From bivariate analysis, several variables were obtained that had P<0.25, namely CCI score 1-2, body weight, gender, body mass index underweight, operational action low risk (ENT, ophthalmology, and plastic surgery), as well as surgical procedures high risk (neurology, cardiothoracic, oncology, and digestive). These variables were then analyzed multivariate to find out which variables had more influence on the WHOQoL-BREF score. The results of the

multivariate analysis in the table above show that the CCI score is independently associated with decreased quality of life, where a CCI score of 1–2 can reduce post-anesthesia quality of life by 86.1% compared to patients without comorbidities (WHOQoL-BREF> 60) (OR 0.139; 95% CI 0.039 – 0.498; p = 0.002).

Differences in Quality of Life Before and After Anesthesia

WHOQoL-BREF scores were compared before and after anesthesia procedures using analysis paired t-test. From this analysis, there was no significant change in the mean WHOQoL-BREF score after the anesthesia procedure (p=0.571).

Analysis of differences in the proportion of patients who had poor quality of life (WHOQoL-BREF<60) and good quality of life (WHOQoL-BREF>60) before and after anesthesia was analyzed using McNemar test as shown in table 9. From this table, it can be seen that in the group of patients who did not have comorbidities, 39 out of 81 patients (48.15%) experienced an increase in quality of life after the anesthesia procedure (p<0.001). Meanwhile, in the CCI 1 – 2 group, 17 of 66 patients (25.76%) experienced an increase in quality of life and 8 of 66 patients (12.76%) experienced a decrease in quality of life after the anesthesia procedure. The difference in the proportion of quality of life before and after anesthesia in patients with a CCI score of 1 – 2 was not statistically significant (p=0.108).

DISCUSSION

This study was conducted to assess the association between the Charlson Comorbidity Index (CCI) score and the quality of life of geriatric patients undergoing anesthesia for surgical procedures, both inside and outside the operating room. The CCI was used to evaluate the impact of comorbidities on postoperative quality of life. Physiological changes affecting multiple organ systems may occur as a result of anesthesia, particularly in geriatric patients who experience age-related functional decline. Quality of life was assessed 30 days after surgery using the WHOQoL-BREF questionnaire. A total of 157 patients were included in the study, with a median age of 65 years. Of these, 56.1% were men and 43.9% were women, and all participants (100%) underwent elective surgery.

The association between CCI scores and quality of life in this study was analyzed by categorizing the CCI scores. Comorbidities were classified as mild (CCI score 1–2), moderate (CCI score 3–4), and severe (CCI score >5). Based on this classification, the association between CCI scores and WHOQoL-BREF was analyzed using the chi-square test.

The analysis showed that mild comorbidities (CCI score 1–2) were significantly associated with poor quality of life (WHOQoL-BREF <60). Patients with mild comorbidities had a 57% lower likelihood of having a good quality of life (WHOQoL-BREF >60) compared with patients without comorbidities (OR = 0.43; 95% CI: 0.20–0.90; p = 0.026).

Although all patients with severe comorbidities (CCI score >5) had poor quality of life, this association was not statistically significant (p = 0.999). This may be due to the limited number of patients with moderate and severe comorbidities included in the study, with only eight patients in the moderate comorbidity group and two patients in the severe comorbidity group. In addition, the number of patients with severe comorbidities who completed the WHOQoL-BREF assessment was limited because their clinical condition made it impossible for them to participate in the interview.

Several studies have previously investigated the association between CCI scores and quality of life in geriatric patients. A study involving 115 geriatric patients with chronic illnesses in Taiwan found that lower CCI scores were associated with better psychological well-being (r = −0.237; p < 0.05). However, the association between CCI scores and the physiological, social, and environmental domains of quality of life was not statistically significant.[14] This shows that there is a negative association between the CCI score and the patient's psychological status. The more comorbidities a geriatric patient has, the lower their quality of life, especially in the psychological domain. The geriatric population suffering from multiple chronic diseases may

have limited movement and activity control. Therefore, the geriatric population tends to worry easily and have emotional stress which can give rise to negative thoughts and feelings.[14] Although not in patients receiving anesthesia, this study supports the results of this study which showed an association between CCI scores and WHOQoL scores <60.

In this study, ROC analysis was carried out andYouden's Index to determine cut-off optimal CCI score to differentiate groups of patients with poor (WHOQoL-BREF <60) and good (WHOQoL-BREF) quality of life> 60). The results of the ROC analysis show a cut-off point optimal at 0.5 with an AUC of 0.612 (95% CI 0.515 – 0.709). Because the CCI score is an integer and considers other coordinate points in the ROC graph, this study uses a CCI score of 1 cut-off point which can be applied. This means that the presence of just one type of comorbidity with a score of 1 can already be considered as a possibility for the patient to have a poor quality of life. With CCI score = 1 cut-off point, obtained a sensitivity of 64.4% and a specificity of 58.0%. However, because the AUC value was <0.7 the CCI score had poor discrimination ability in this study.

Previous research that analyzes cut-off point The value of CCI on the quality of life of geriatric patients receiving anesthesia is still difficult to find, especially as described through WHOQoL-BREF. However, a study involving 102 patients undergoing hemodialysis in Korea found that CCI scores were not associated with any of the WHOQoL-BREF domains, namely the physical health domain (r = -0.088; p = 0.388), psychosocial domain (r = -0.033; p = 0.745), social relationships (r = -0.101; p = 0.319), and environment (r = 0.066; p = 0.515).[15] Similar results were observed in a study involving 115 geriatric patients with chronic diseases in Taiwan.[14] From this study, the CCI score was not related to the physiological, social and environmental domains (r = -0.153; r = - 0.147; r = -0.111; p>0.05). Although not analyzed using ROC, these studies showed no significant association between CCI scores and most WHOQoL-BREF domains. This can support the poor discrimination ability of the CCI score against WHOQoL in this study.[14,15] In theory, in elderly patients, normal responses to surgical stress and anesthesia can lead to dysfunction of hemodynamic, endocrine, and immune responses. Due to physiological changes, geriatric patients are more susceptible to neurological complications. Neurological complications that occur can include thinning of the brain cortex, especially the prefrontal and parietal areas, which are very important for memory and orientation. Reduction of synapse junctions and dendritic trees in the prefrontal area also occurs. This can affect the executive function of geriatric patients, which indirectly affects quality of life. A reduced number of neurotransmitters and neuroreceptors has also been shown to be a risk factor for depression and neurodegenerative diseases, such as Alzheimer's. Therefore, patients who have undergone anesthesia and surgery usually experience postoperative cognitive dysfunction, which is characterized by impaired consciousness, attention, perception, thinking, memory, behavior and emotions that appear after surgery and can last up to a maximum of the first 3 months.[16]

Energy reserves and pre-operative comorbidities influence geriatric responses to surgical stress and anesthesia, both hemodynamic, endocrine and immune responses, which lead to worsening of postoperative neurological and anesthetic complications.[16] Although no studies have specifically assessed the association between comorbidities and postoperative WHOQoL-BREF scores in patients receiving anesthesia, a study conducted in Taiwan evaluated the association between comorbidities and postoperative mortality among patients aged ≥65 years who underwent anesthesia.[11] This retrospective study based on one million health insurance data showed that the main comorbidities contributing to post-operative mortality were chronic renal failure (OR=2.806), acute myocardial infarction (OR=4.58), and intracranial hemorrhage (OR=3.758). These three diseases are also components of CCI.[12] Therefore, despite having different dependent variables, the presence of comorbidities, described by the CCI score, may also lead to

other, milder postoperative complications in geriatric patients receiving anesthesia, including poor patient quality of life as indicated by the WHOQoL-BREF score.

The poor responses of each body system in geriatric patients who receive anesthesia and have comorbidities can support the results of the multivariate analysis in this study. Multivariate analysis showed that the CCI score was an independently associated variable with a decrease quality of life. A CCI score of 1–2 will reduce a patient's quality of life by 86.1% compared to patients without comorbidities (OR 0.139; 95% CI 0.039 – 0.498; p = 0.002).

With the association between the CCI score of 1-2 and the WHOQoL-BREF score, it can be estimated that the patient's quality of life after anesthesia procedures in patients who have comorbidities will decrease. However, the analysis results of this study show that in patients with a CCI score of 1–2, the proportion of quality of life between before and after surgery does not have a significant difference. There were 25.76% of patients in the CCI 1 – 2 group who experienced an improvement in quality of life and 12.76% experienced a worsening quality of life after the anesthesia procedure (p=0.108). However, the results of this study showed that almost half of the patients who did not have comorbidities (48.15%) experienced a significant improvement in quality of life after anesthesia procedures (p<0.001). This can support the association of comorbidities with the patient's quality of life after surgery. Geriatric patients without comorbidities have a minimal risk of physiological changes due to postoperative stress and anesthesia compared to patients with comorbidities. In this way, elective surgery will provide therapeutic benefits that are greater than the risks, because the problems before surgery no longer exist, so the quality of life for patients without comorbidities can be better.[17] For example, a literature study from 21 studies from 2011–2020 shows that patients with cataract surgery have significantly improved quality of life, because postoperative ocular outcomes are not the only target of surgery, but there is an increase in non-ocular outcomes, such as increased productivity, income, and social activities so that patients have a good quality of life after cataract surgery.[18] Nasal polyposis patients who receive endoscopic sinus surgery also experience improved quality of life postoperatively due to improvement in symptoms of nasal obstruction, facial pain, ear disorders, and sleep disorders.[19] A study involving patients undergoing elective laparoscopic cholecystectomy, open inguinal hernia repair, and pilonidal sinus excision showed that, compared with the preoperative period, patients had higher WHOQoL-BREF scores from postoperative day 2 until hospital discharge. This improvement was attributed to early mobilization, reduced dependence on medical equipment, and the ability to resume daily activities.[17]

Bivariate analysis of this study showed that there was no significant relationship between age, weight, body mass index, gender, ASA classification, and type of anesthesia on the WHOQoL-BREF score of geriatric patients receiving anesthesia. Previous research also did not find specific age groups that were more susceptible to the neurological effects of anesthesia, although in theory there is damage to groups of neurons with age.[16] This can support the non-association of the age variable with the quality of life of post-operative patients, considering that all patients were already in the geriatric category.

In the context of the direct association between anesthesia and brain health, previous studies have failed to show significant differences in outcomes between regional anesthesia and general anesthesia. Additionally, there is no strong evidence to suggest that any particular anesthetic agent should be indicated or avoided in general anesthesia to prevent cognitive complications after anesthesia.[20] Several previous studies regarding the incidence of postoperative neurological complications in elderly patients also found no difference in morbidity between the use of regional or general anesthesia. Several studies have shown no differences in cardiovascular complications, intensive care unit use, or overall hospitalization costs in elderly anesthesia patients.[16] This may be the basis for the absence of a significant

association between the type of anesthesia and the WHOQoL-BREF score in this study.

Regional anesthesia may have more severe effects in the geriatric population than in younger patients due to reduced compensatory mechanisms caused by chronic diseases and comorbidities, such as hypertension, atherosclerosis, coronary heart disease, cardiac hypertrophy or dilatation, and reduced ejection fraction, in addition to changes in physiological as age itself increases. On the other hand, a link has been found between administering general anesthesia and Alzheimer's disease. There are two histopathological markers in this disease, namely phosphorylated Tau protein amyloid plaques. Studies have shown that anesthesia plays an important role in accelerating the pathogenesis of Tau protein, which is affected by hypothermia.[16]

This research has limitations, namely that not all information can be documented properly and completely. Data limitations are felt especially in the WHOQoL-BREF score variable, especially in patients with poor quality of life. The poor quality of research data due to inadequate data control is also a limitation of this research. Quality of life can also be influenced by multifactorial factors, including education and socioeconomic conditions. In this study, subjects had varying educational and socioeconomic levels, but were not analyzed in the study due to insufficient data, which may have influenced the quality of life results.

CONCLUSION

There is an association between comorbidities (CCI score 1 – 2) and decline quality of life of post-anesthesia geriatric patients (OR 0.139; 95% CI 0.039 – 0.498; p = 0.002).

RECOMMENDATIONS

Future research is expected to involve more other factors that can influence quality geriatric patients' lives, such as educational, social and economic factors, so that they can provide more accurate results and produce significant differences between each variable. Research can be carried out prospectively so that sampling can be done better and more completely, and other confounding factors that can affect the patient's quality of life can be controlled. Data quality can be improved by increasing the amount of data, introduction and deletion outlier, as well as adequate supervision when collecting data so that the resulting data is more representative.

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