# Original Article

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# Components of geriatric assessment and degree of sarcopenia on maintenance hemodialysis patients

## Abstract

*Background:* Sarcopenia is a serious public health problem because of its impact on human health and health care system. The prevalence of sarcopenia in elderly undergoing maintenance hemodialysis is increasing, with various components underlying the geriatric assessment.

*Methods:* This research used a cross-sectional study approach involving 40 samples taken by total sampling according to inclusion and exclusion criteria. The study population was the entire population aged ≥60 years, male dan female, who routinely undergo hemodialysis at the HD installation at Dr. Soetomo Hospital Surabaya. Data analysis was performed using SPSS Version 25.0.

*Results:* The research subjects were dominated by 62.5% male elderly with a median age of 64 years (60-93 years). The median duration of hemodialysis was 4 years (0.5-21). The proportion of sarcopenia was 82.5%. From the results of bivariate analysis, it was found that nutritional status as measured by MNA was the only component of CGA associated with sarcopenia p=0,002 (OR 25; IK 95% 3,302-189,259).

*Conclusion:* Nutritional status is an independent predictor of the incidence of sarcopenia to severe sarcopenia in geriatric patients with chronic kidney disease undergoing maintenance hemodialysis.

*Keywords:* Geriatric assessment, Sarcopenia, Hemodialysis.

Sarcopenia in elderly patients with end-stage renal disease undergoing continuous hemodialysis is a serious problem as it has a significant impact on the decline in quality of life and increased mortality in older adults. Sarcopenia, a condition characterized by progressive loss of skeletal muscle mass, muscle strength, and physical performance, is commonly found among older adults (1). The etiological factors causing muscle loss in end-stage renal disease are diverse and can be associated with various conditions, including kidney disease itself, dialysis procedures, and chronic low-grade inflammation typical in end-stage renal disease patients (2). Evaluation in geriatric patients requires a specific approach because geriatric conditions differ significantly from those of adult patients in general. The issues in geriatric patients are multiple, more complex, and interdependent. Evaluation is typically performed through comprehensive geriatric assessment, which includes a thorough assessment of geriatric patients (P3G), covering nutritional status, comorbidities, functional status, mental status, and cognitive status. Nutritional status can be assessed using the mini nutritional assessment (MNA) score, functional status using the Barthel Index of Activities of Daily Living (ADL) score, cognitive status using the mini-mental state examination (MMSE) score, mental status using the Geriatric Depression Scale (GDS) score, and comorbid status using the Charlson Comorbidity Index score (3). Previous study in Surabaya by Wardhana et al. found a sarcopenia incidence rate of 41.8% in elderly community-dwelling patients (4).

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Based on this data, it is highly likely that the prevalence of sarcopenia in patients undergoing continuous hemodialysis in Surabaya is also high. Considering the increasing prevalence of sarcopenia in the elderly population undergoing hemodialysis, along with various underlying risk factors, the researchers suggest conducting a study on the geriatric assessment components that affect the degree of sarcopenia in elderly patients undergoing continuous hemodialysis in Indonesia, particularly in Surabaya, especially on modifiable components.

## Methods

This research is a cross-sectional study conducted at the hemodialysis center in Dr. Soetomo General Hospital Surabaya in year 2020. Sampling was carried out sequentially (consecutively). The inclusion criteria of this study were patients (1) aged ≥60 years, (2) who have undergone continuous hemodialysis at the hemodialysis facility of Dr. Soetomo General Hospital, Surabaya and have other comorbidities covered in the Charlson index, including a history of myocardial infarction, congestive heart failure, peripheral vascular disease, cerebrovascular disease, dementia, chronic lung disease/asthma, connective tissue disease/rheumatism, peptic ulcer, diabetes mellitus with/without complications, chronic liver disease (Child-Pugh A-C), hemiplegia, solid tumors, acute/chronic leukemia, lymphoma, and AIDS. The exclusion criteria for this study were (1) patients with lower limb amputations, recent fractures or surgeries within the past 6 months (2) history of or currently undergoing hormonal therapy (3) history of or currently undergoing thyroid disease therapy (4) severe hypokalemia, (5) acute infection symptoms, (6) not currently taking cough medication such as N-acetylcysteine and (7) visual or hearing impairments that prevent completion of the test.

The determination of the sample size for multivariate analysis in this study follows the rule of thumb. The rule of thumb is based on the number of independent variables being investigated. According to the rule of thumb, the suggested sample size is 5 to 50 times the number of variables to be studied. The most commonly used multiplication factor is 10 times the number of variables. In this study, there are five variables to be investigated, so the sample size range that can be used in this research is between 25 and 250 samples. The researcher decided to use a sample size of 40, which corresponds to the total available samples, resulting in a research power of 79%. The Statistical Package for The Social Sciences (SPSS) Version 25 is used to process research data electronically.

Normality test and univariate analysis were conducted on the data. Bivariate analysis using the chi-square test for testing two unrelated sample groups with ordinal data was performed and the Fisher's exact test was used if the assumptions are not met. Estimation of parameter for the ordinal logistic regression model was conducted. Simultaneous significance test of parameters was performed using the likelihood ratio test to examine the combined influence of independent variables on the dependent variable. Partial test to examine the individual influence of independent variables on the dependent variable was conducted using the Wald test. After obtaining the most significant variables, suitability and adequacy were assessed using the fit test to determine the fit of the obtained model. Contribution of independent variables to the dependent variable were assessed through pseudo $R^2$ value. Model was interpreted based on the odds ratio values.

## Results

**Subject recruitment:** There were 40 subjects who perform continuous hemodialysis at the hemodialysis installation unit of RSUD Dr. Soetomo Surabaya that meet the inclusion criteria. The analysis of basic characteristics of the research subjects, the components of geriatric assessment, and the correlation to the degree of sarcopenia are presented descriptively and analytically.

**Subject characteristics:** All total subjects in this study were 40, with 25 (62.5%) were males and 15 (37.5%) were females. There were 85% patients aged between 60-69 years, 10% patients aged 70-79 years, and 5.0% patients aged more than or equal to 80 years respectively. The findings illustrate that the age distribution tends to be greater in the age range of 60 to 69 years. The proportion of patient's marital status with married, unmarried, widows/ widowers due to the death of their spouse were 50%, 2.5%, and 17.5%. The highest educational level of the subjects is majority in high school/vocational level, with 30% patients, 25% patients had the lowest educational level is junior high school , 20%, 17.5% and 2.5% leftover.

In this study, subjects with unemployed, self-employed, private workers, and  retired civil servants had compotition of 50%, 7.5%, 15%  and 15% patients respectively. The amount of income was dominated by income groups below 1.5 million rupiahs per month (42.5%). Regarding the patients'cost of living , the majority of patients with chronic kidney disease who underwent hemodialysis on the basis in this study received full coverage or financial assistance/living expenses from others with 45% patients, while 30% patients bear the cost of living of working alone.

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Most of the subjects in this study had financial sufficiency for living costs, which was around 97.5% patients and 72.5% patients lived at home. Furthermore, it was found that 27.5% patients lived with children, daughters-in-law, and grandchildren in one residence, and 22.5% patients lived only with their wives. The most of basic diseases found in patients who continue to undergo hemodialysis in this study is diabetes mellitus (55%) of which more than 50% of all patients with chronic kidney disease in this study have comorbid of diabetes.

**Table 1. Demographic and clinical characteristics of subjects**

| Characteristic | N = 40 |
|---|---|
| **Age in years, median (min-max)** | 64 (60-93) |
| **Age range** | |
| 60-69 | 34 (85) |
| 70-79 | 4 (10) |
| ≥80 | 2 (5.0) |
| **Gender, n (%)** | |
| Male | 25 (62.5) |
| Female | 15 (37.5) |
| **Marital status, n (%)** | |
| Married | 32 (80) |
| Widow/widower | 7 (17.5) |
| Divorced | 0 (0) |
| Unmarried | 1 (2.5) |
| **Education, n (%)** | |
| Ungraduated Elementery School | 1 (2.5) |
| Graduated Elementery School | 8 (20) |
| Junior High School | 10 (25) |
| Senior High School/Vocational High School | 12 (30) |
| Associated Degree | 1 (2.5) |
| Bachelor | 7 (17.5) |
| Master | 1 (2.5) |
| **Job, n (%)** | |
| Unemployment | 20 (50) |
| Self employed | 3 (7.5) |
| Private worker | 6 (15) |
| Retired civil servants | 6 (15) |
| Etc | 5 (12.5) |
| **Income per month, n (%)** | |
| < 1.5 million rupiahs | 17 (24.5) |
| 1.5-3 million rupiahs | 14 (35) |
| > 3 million rupiahs | 9 (22.5) |
| **Closest caregiver, n (%)** | |
| Partnership | 30 (75) |
| Children | 8 (20) |
| Grandchildren | 0 (0) |
| Younger sibling | 2 (5) |
| **Insurer of living expenses, n (%)** | |
| Self-employed | 12 (30) |
| Some others | 8 (20) |
| Completely others | 18 (45) |
| Pension funds | 2 (5.0) |

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| Characteristic | N = 40 |
|---|---|
| **Adequacy of living costs, n (%)** | |
| Not enough at all | 0 (0) |
| A little less | 1 (2.5) |
| Enough | 39 (97.5) |
| More than enough | 0 (0) |
| **Residence, n (%)** | |
| Home | 29 (72.5) |
| Children's home | 9 (22.5) |
| Sibbling's house | 0 (0) |
| Lease | 1 (2.5) |
| Etc | 1 (2.5) |
| **Number of household members, n (%)** | |
| Wife | 9 (22.5) |
| Husband, children | 6 (15) |
| Wife, son, daughter-in-law | 7 (17.5) |
| Son, son-in-law, grandchildren | 11 (27.5) |
| Husband, children, grandchildren | 6 (15) |
| Husband, son, daughter-in-law, grandchildren | 1 (2.5) |
| **Underlying disease, n (%)** | |
| Diabetes | 22 (55) |
| Hypertension | 15 (37.5) |
| Kidney stone | 3 (7.5) |

**Basic characteristics based on geriatric profile in research subjects:** The geriatric profile from this study was based on several components of the plenary assessment of geriatric patients consisting of nutritional (Mini Nutritional Assessment score), comorbid (Charlson comorbidity index score presented), functional (Barthel index of ADL), mental (Geriatric Depression Scale), and cognitive status (Mini Mental Stase Examination). The data showed in the table 2. Based on the MNA score 47.5% patients had a risk of malnutrition and 32.5% patients had experienced malnutrition, while only 20% with normal MNA scores. This findings illustrate that patients with chronic kidney disease who underwent continuous hemodialysis in this study had nearly half of the degree of nutritional status deficient. However, if a measurement of nutritional status is made based on the calculation of body mass index (BMI), it can be found that there are 52.5% with normal BMI, 45% with overweight, 2.5% with underweight, and no patients who are obese (BMI ≥30 kg / m2). The geriatric assessment by cognitive status was found that more than 50% of patients still had normal cognitive status and only 22.5% of patients had mild cognitive impairment and none of them had severe cognitive impairment. Based on the results of the GDS score that assessed the level of depression in the study subjects, it was found that there were 27.5% patients likely to have depression, while 72.5% were still in normal condition or did not experience depression. Analysis of ADL score showed that the most of patients went about daily activities independently (65%), while 35% of patients experienced mild dependence. Based on the comorbid status, this study found that there were 80% of patients with CCI scores classified as severe comorbid status and 20% with moderate comorbid status. The findings illustrate that the most of subjects with chronic kidney disease who underwent hemodialysis in this study had severe comorbid status.

**Basic characteristics based on hemodialysis profile in study subjects:** The data presented in table 3 show the medical profile of hemodialysis of the study subjects. Based on the results of the analysis, it can be found that the median

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length of hemodialysis patients in this study is 4 years with the shortest duration is 6 months and the longest is up to 21 years. All subjects in this study had a hemodialysis frequency of 2 times a week with the median duration in one hemodialysis was 4.5 hours, the longest was 5 hours, while the duration of hemodialysis for a week was 9 hours. As many as 75% of subjects in this study acquired erythropoietin in the last 3 months. There are 17.5% and 15% of patients who have been diagnosed with hepatitis B and C infection, respectively. Data on laboratory parameters in research subjects, such as hemoglobin has a median value of 9.15 mg / dl, with 85% of patients having hemoglobin levels more or equal to 8 g / dl and there were 15% patients who had severe anemia and hemoglobin values below the value of 8 g / dl. The median values of BUN and creatinine serum was 71 mg/dl and 12.2 mg/dl, respectively. The albumin value is still relatively in normal range, which has a range between 2.8-3.8 mg / dl with a median value of 3.39

mg / dl. In addition, other laboratory parameters are calcium with a median value of 8.75 mg / dl and phosphate with a median value of 5.7 mg / dl.

**Basic characteristics of the profile of the degree of sarcopenia in elderly patients with chronic kidney disease undergoing hemodialysis:** From 40 subjects involved in this study, 12.5% patients belong to the normal group, 5% patients of the presarcopenia group, 12.5% of the sarcopenia group, and 28 70% patients belonging to the severe sarcopenia group (figure1). This study categorized patients under normal conditions and presarcopenia as a group without sarcopenia and with severe sarcopenia. In figure 2, it can be seen that in this study there were 82.5% of patients who had experienced sarcopenia, while some others did not experience sarcopenia. This percentage illustrates that the majority of subjects in this study have experienced sarcopenia, ranging from sarcopenia to severe sarcopenia.

## Table 2. Geriatric profile subjects

| Variable | | Total N (%) |
|---|---|---|
| **BMI** | Underweight | 1 (2.5) |
| | Normal | 21 (52.5) |
| | Overweight | 18 (45) |
| | Obesity | 0 (0) |
| **Nutritional Status** | Normal (MNA 24-30) | 8 (20) |
| | Malnutrition risk (MNA 17-23,5) | 19 (47.5) |
| | Malnutrition (MNA < 17) | 13 (32.5) |
| **Cognitive Status** | Normal (MMSE 24-30) | 31 (77.5) |
| | Mild cognitive impairment (MMSE 18-23) | 9 (22.5) |
| | Severe cognitive impairment (MMSE <18) | 0 (0) |
| **Mental Status** | Normal (GDS 0-4) | 29 (72.5) |
| | Depression Possibility (5-9) | 11 (27.5) |
| | Depression (GDS ≥10) | 0 (0) |
| **Functional Status** | Independent (ADL 20) | 26 (65) |
| | Mild dependency (ADL 12-19) | 14 (35) |
| | Moderete dependency (ADL 9-11) | 0 (0) |
| | Severe dependency (ADL 5-8) | 0 (0) |
| | Total dependency (ADL 0-4) | 0 (0) |
| **Comorbidity Status** | Mild (CCI 1-2) | 0 (0) |
| | Moderete (CCI 3-4) | 8 (20) |
| | Severe (CCI ≥ 5) | 32 (80) |

**Table 3. Profile of hemodialysis medical data of research subjects**

| Variable | | Total (N, %) |
|---|---|---|
| **Basic data** | | |
| **Frequency of Hemodialysis** | Twice a week | 40 (100) |
| | Once a week | 0 (0) |
| **Once duration of Hemodialysis (hour)** | Median (*range*) | 4.5 (4-5) |
| **A week duration of Hemodialysis** | Median (range) | 9 (8-10) |
| **Treatment of Erythropoietin in the last 3 months** | Yes | 30 (75) |
| | No | 10 (25) |
| **Hepatitis B** | Yes | 7 (17.5) |
| | No | 33 (82.5) |
| **Hepatitis C** | Yes | 6 (15) |
| | No | 34 (85) |
| **Physical Examination** | | |
| **Sistolic Blood Pressure** | ≤ 139 mmHg | 18 (45) |
| | 140-159 mmHg | 18 (45) |
| | ≥ 160 mmHg | 4 (10) |
| **Ultrafiltration (liter)** | Median (*range*) | 2.55 (0-5) |
| **Laboratory Data** | | |
| **Hemoglobin (mg/dl)** | Median (*range*) | 9.15 (5.90-13.40) |
| | < 8 | 6 (15) |
| | ≥ 8 | 34 (85) |
| **Netrofil (%)** | Median (*range*) | 70.65 (32.90-91.19) |
| **Limfosit (%)** | Median (*range*) | 16.85 (3.10-36.20) |
| **NL ratio** | Median (*range*) | 4.2 (1.07-29.39) |
| **BUN (mg/dl)** | Median (*range*) | 71 (26-105) |
| **Creatinine serum (mg/dl)** | Median (*range*) | 12.2 (4.4-17.4) |
| **Albumin (mg/dl)** | Median (*range*) | 3.39 (2.76-3.8) |
| **Calcium (mg/dl)** | Median (*range*) | 8.75 (6.7-29.6) |
| **Phosphate (mg/dl)** | Median (*range*) | 5.7 (2.4-9.7) |
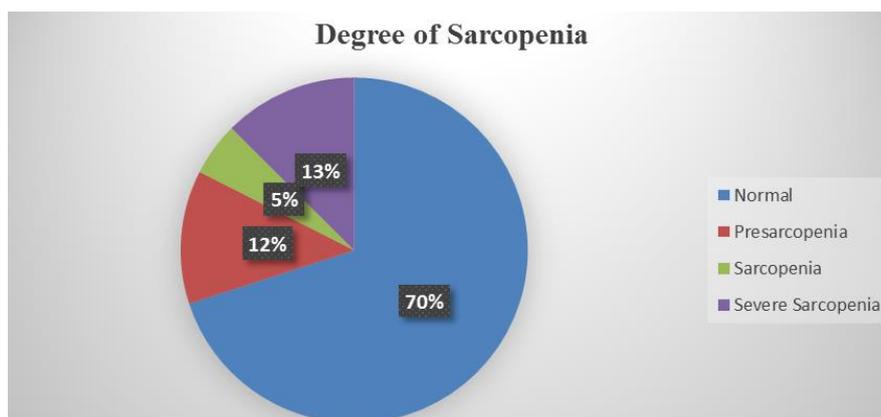


**Figures 1. Degrees of sarcopenia in the subject of study**

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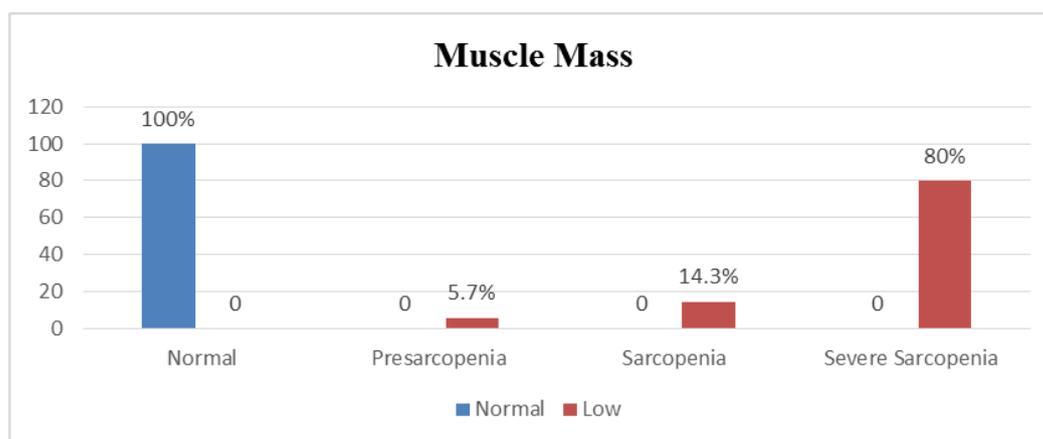
**Figures 2. Sarcopenia incidence categories based on sarcopenia degree**

The group without sarcopenia patients has 100% normal muscle mass which shows that all patients in the normal group have normal muscle mass as well. In addition, 5 (14.3%) of 35 patients with low hand grip strength and 5 (13.9%) of 36 patients with low physical performance belonged to the normal group. There were 2 people (5.7%) out of 35 patients with low muscle mass belonging to the presarcopenia group and there were 2 people (40%) out of 5 patients with normal hand grip strength and 2 people (50%) out of 4 patients with normal physical performance had presarcopenia.

Furthermore, patients with sarcopenia consisted of 3 (8.3%) of 36 patients with low physical performance, 2 (5.7%) individuals from 35 patients with low grip strength, and 5 (14.3%)subjects from 35 patients with low muscle mass experienced sarcopenia in this study. The last group, patients with severe sarcopenia, dominated the percentage of patients in this study subject; There were 28 (80%) people out of 35 patients with low muscle mass with severe sarcopenia, 28(80%)individuals out of the 35 patients with low hand grip strength and 28 (77.8%)people out of the 36 patients with low physical performance had severe sarcopenia. The findings showed that more than 50% of patients with low muscle mass, hand grip strength, and physical performance experienced severe degrees of sarcopenia in this study (figure 3).

Table 4 found that 94.3% of the total patients who experienced sarcopenia experienced a decrease in muscle mass compared to patients with normal muscle mass. In addition, 85.7% of patients with sarcopenia had decreased hand grip strength and 86.1% of patients with sarcopenia had lower physical performance. Majority of patients with sarcopenia experience interference with these three parameters. However, statistically significant differences were only found in low muscle mass in sarcopenia patients compared to normal patients. Table 5 shows that male patients and female patients are more likely to experience sarcopenia than not experiencing sarcopenia in their population groups. In addition, 79.4% of patients who experience sarcopenia are patients aged between 60-69 years. Related to the underlying disease, most subjects with chronic kidney disease who underwent continuous hemodialysis turned out to have the underlying disease diabetes mellitus and hypertension.

**Table 4. Parameter profile of sarcopenia components against sarcopenia incidence in research subjects**

| Variable | | Group | | P-value |
|---|---|---|---|---|
| | | No Sarcopenia N (%) | Sarcopenia N (%) | |
| **The components of sarcopenia parameters** | | | | |
| **Muscle mass** | Normal | 5 (100) | 0 (0) | <0,001 |
| | Low | 2 (5.7) | 33 (94.3) | |
| **Hand grip strength** | Normal | 2 (40) | 3 (60) | 0,204 |
| | Low | 5 (14.3) | 30 (85.7) | |
| **Physical performance** | Normal | 2 (50) | 2 (50) | 0,134 |
| | Low | 5 (13.9) | 31 (86.1) | |

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**Table 5. Distribution of sarcopenia based on the basic characteristics of the study subject**

| Variable | | N (%) | Group | |
| --- | --- | --- | --- | --- |
| | | | No Sarcopenia N=7 | Sarcopenia N=33 |
| **Profile by sociodemographic variable** | | | | |
| **Gender** | Male, N (%) | 25 (62.5) | 6 (24) | 19 (76) |
| | Female, N (%) | 15 (37.5) | 1 (6.7) | 14 (93.3) |
| **Age Range** | 60-69 year, N (%) | 34 (85) | 7 (20.6) | 27 (79.4) |
| | 70-79 year, N (%) | 4 (10) | 0 (0) | 4 (100) |
| | ≥ 80 year, N (%) | 2 (5) | 0 (0) | 2 (100) |
| **Underlying Disease** | Diabetes, N (%) | 22 (55) | 3 (13.6) | 19 (86.4) |
| | Hypertension, N (%) | 15 (37.5) | 4 (26.7) | 11 (73.3) |
| | Kidney Stone, N (%) | 3 (7.5) | 0 (0) | 3 (100) |
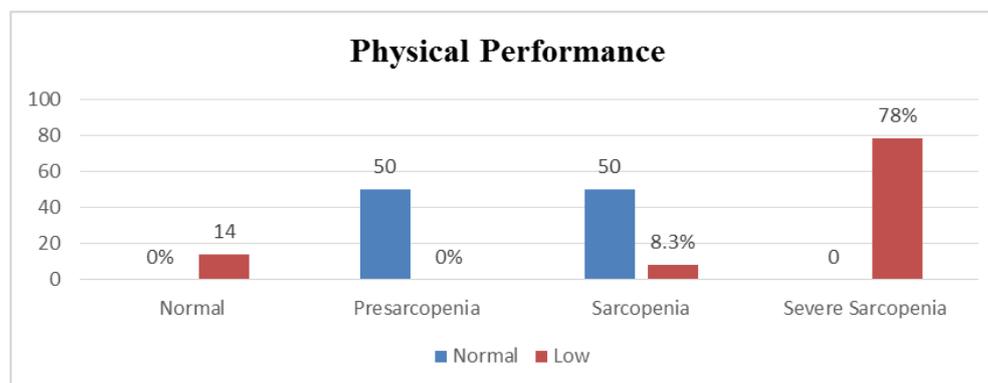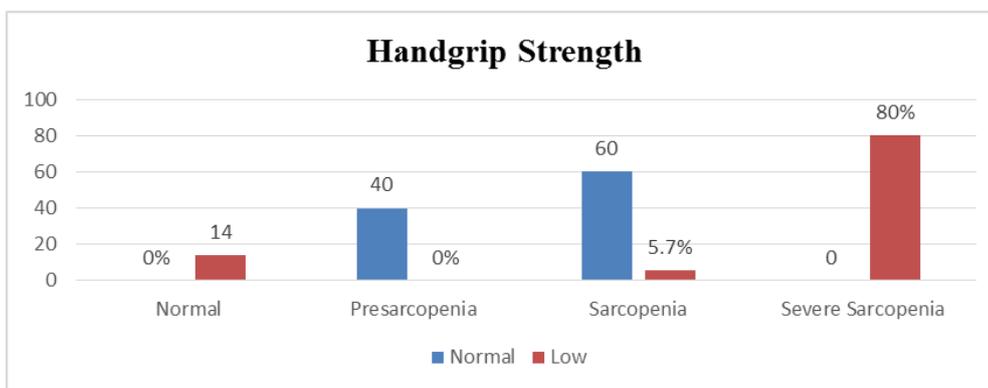




**Figures 3. Degrees of sarcopenia in research subjects**

**Correlation of baseline characteristics to degree of sarcopenia:** Bivariate analysis is presented in table 6, it can be found that there is a statistically significant correlation between nutritional status evaluated based on MNA scores on the incidence of sarcopenia in patients with chronic kidney disease undergoing continuous hemodialysis, namely with p-values <0.05. Patients with low MNA scores developed sarcopenia (92.3%). Further analysis with logistic regression could not be continued because only the nutritional status variable was meaningful even though there were several other variables with a p-value of <0.25, consists of sex and duration of hemodialysis (not analyzed because it was not included in the variables studied). From table 6, it can be found that nutritional status is an independent predictor factor of the incidence of sarcopenia (sarcopenia to severe sarcopenia) in geriatric patients with chronic kidney disease undergoing continuous hemodialysis with P = 0.002.

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**Table 6. Bivariate analysis of sociodemographics, medical profile, and geriatric assessment factors against sarcopenia**

| Variable (N, %) | | N (%) | Group | | P-*value* | OR (CI 95%) |
|---|---|---|---|---|---|---|
| | | | No Sarcopenia, N=7 | Sarcopenia, N=33 | | |
| Group of Age | Young elderly < 70 year | 34 (85) | 7 (20.6) | 27 (79.4) | 0.567* | 0.794 (0.669-0.942) |
| | Middle-elderly ≥ 70 year | 6 (15) | 0 (0) | 6 (100) | | |
| Gender | Male | 25 (62.5) | 6 (24) | 19 (76) | 0.224* | 3.60 (0.479-27.08) |
| | Female | 15 (37.5) | 1 (6.7) | 14 (93.3) | | |
| Hemoglobin (g/dl) | < 8 | 6 (15) | 0 (0) | 6 (100) | 0.567* | 1.259 (1.061-1.494) |
| | ≥ 8 | 34 (85) | 7 (20.6) | 27 (79.4) | | |
| Duration of Hemodyalisi (year) | < 4 | 19 (47.5) | 1 (5.3) | 18 (94.7) | 0.095* | 0.184 (0.024-1.394) |
| | ≥ 4 | 21 (52.5) | 6 (28.6) | 15 (71.4) | | |
| Lymphosit Neutrophils Ratio | < 4 | 4 (10) | 1 (25) | 3 (75) | 0.552* | 1.50 (0.236-9.519) |
| | ≥ 4 | 36 (90) | 6 (16.7) | 30 (83.3) | | |
| Education | < SMA | 19 (47.5) | 4 (21.1) | 15 (78.9) | 0.689* | 1.474 (0.377-5.755) |
| | ≥ SMA | 21 (52.5) | 3 (14.3) | 18 (85.7) | | |
| Income per moth | < 3 juta | 31 (77.5) | 5 (16.1) | 26 (83.9) | 0.645* | 0.726 (0.168-3.132) |
| | ≥ 3 juta | 9 (22.5) | 2 (22.2) | 7 (77.8) | | |
| Nutrition Status | Normal (total score MNA 17-30) | 27 (67.5) | 6 (22.2) | 21 (77.8) | 0.002 | 25 (3.302-189.259) |
| | Abnormal (total score MNA <17) | 13 (32.5) | 1 (7.7) | 30 (92.3) | | |
| Comorbidity Status | Mild-moderate (CCI 1-4) | 8 (20) | 2 (25) | 6 (75) | 0.611 | 1.6 (0.279-11.6) |
| | Severe (CCI ≥ 5) | 32 (80) | 5 (15.6) | 27 (84.4) | | |
| Cognitive Status | Normal (MMSE 24-30) | 31 (77.5) | 6 (19.4) | 25 (80.6) | 1.000 | 1.92 (0.200-18.432) |
| | Cognitive Impairment (MMSE < 24) | 9 (22.5) | 1 (11.1) | 8 (88.9) | | |
| Mental Status | Not Depression (GDS 0-4) | 29 (72.5) | 6 (20.7) | 23 (79.3) | 0.650 | 2.609 (0.277-24.588) |
| | Depression (GDS ≥5) | 11 (27.5) | 1 (9.1) | 10 (90) | | |
| Functional Status | Independent (ADL 20) | 26 (65) | 6 (23.1) | 20 (76.9) | 0.387 | 3.900 (0.420-36.240) |
| | Dependent (ADL < 20) | 14 (35) | 1 (7.1) | 13 (92.9) | | |

## Discussion

The total male subjects in this study are more than the female subjects with 25 males (62.5%) and 15 females (37.5%). The median age was 64 years old. These findings are in accordance with a study conducted in 2019 in Malaysia, which stated that the male sex is more in the population of elderly CKD patients undergoing hemodialysis (55.4%) and also the average age of geriatric patients with CKD undergoing hemodialysis around 67 years old (5). All patients undergo hemodialysis 2 times a week. The data illustrated that in this study, patients had hemodialysis routines up to 2 times every week with an age range between 60-69 years. The last educational status in

this study subject was dominated by high school and junior high school which were respectively 30% and 25%. This finding is in line with the results of research conducted by Mohd Shahrin et al. in 2019 which stated that elderly patients with chronic kidney disease have an educational level that majority of them is in secondary education, which is 47.3% (5).

Almost all patients in this study felt that the adequacy of living costs so far was sufficient. Low socioeconomic status makes it difficult to obtain adequate nutritional intake, which causes protein and energy needs to be unmet. Studies by Alexandre et al. found that lower income is associated with sarcopenia in both men and women (6). The income

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level of the subjects of this study found that the subjects were dominated by groups with low income (<1.5 million rupiah), which amounted to 42.5% (7). Diabetes mellitus is one of the largest basic or comorbid diseases owned by patients in this study, which is 55% and then followed by hypertension with 37.5% and kidney stones with 7.5% (8). In Indonesia, the basic disease in chronic kidney disease undergoing hemodialysis is the second largest caused by diabetes mellitus and subsequently by hypertension (9).

**Basic characteristics based on geriatric profile:** Based on BMI, none of the subjects were obese. The results of MNA scores were used to assess the nutritional status of patients, it was found that the majority of subjects had a risk of malnutrition of 47.5%, while 32.5% had experienced malnutrition. In a longitudinal analysis, Otsuka et al. showed that energy intake decreased in both men and women from their 40s to 70s, but in particular, among men, the reduction was greater in older age groups (10). This theory can be one of the bases for the high incidence of malnutrition and the risk of malnutrition in elderly patients. Cognitive status also has effect on the patients output. This study showed that 77.5% of patients had normal cognitive status, 22.5% had mild cognitive impairment, and none had severe cognitive impairment. These results are consistent with previous studies that patients with chronic kidney disease undergoing hemodialysis who experienced cognitive impairment based on MMSE were only 14% (11).

Assessment of daily physical activity with ADL scores found that most (65%) subjects carried out daily activities independently and only 35% of subjects experienced mild dependence. Based on the GDS score, subjects with a probability of depression were obtained at 27.5%. ESRD patients are prone to depression. Many factors that influence among them are limitations in work, fatigue, and feelings of dependence on HD (12). In this study, a linear correlation was found between CCI and muscle mass index and between CCI and gait speed (13). Although not significant, this study obtained results that are in accordance with research by Gong et al. This happened because patients with more serious comorbidities tend to have low muscle mass and poor physical performance. In another study, it was found that there was no relationship between CCI scores and life expectancy in patients with sarcopenia (4).

**Basic characteristics based on hemodialysis profile:** The median value of hemodialysis duration performed by subjects in this study was 4 years and all patients underwent hemodialysis with a frequency of 2 times per week. In this study, measured the duration of hemodialysis in a week with the median value of 9 hours / week, showed that the subjects of this study still did not reach the ideal value, which is 10-

15 hours / week. Furthermore, based on laboratory parameters, the median values of hemoglobin and albumin were around 9.15 mg / dl and 3.4 respectively. In addition, 85% of the study subjects had hemoglobin values greater than or equal to 8 mg / dl. Low hemoglobin levels in hemodialysis patients are a common phenomenon due to reduced function to produce erythropoietin. Any administration of erytopoietin may not be very effective in elderly patients due to the low response to this therapy (14).

**Profile of degree of sarcopenia in elderly patients with chronic kidney disease undergoing continuous hemodialysis:** Sarcopenia is a progressive loss of muscle mass and function. In this study, it was found that there were 70% of patients who experienced severe sarcopenia, 12.5% patients who experienced sarcopenia, 5% had presarcopenia, and 12.5% were still in normal condition. If simplified, then the incidence of sarcopenia in all subjects of this study was 82.5% and some others did not experience sarcopenia (15).

The incidence of sarcopenia was found mostly in elderly patients, especially in 60-69 years old, while in the age group over 70 years old all subjects experienced sarcopenia. The varying prevalence of sarcopenia in CKD patients undergoing HD is thought to be due to differences in the age of subjects and the sarcopenia diagnosis criteria used (16). More than 50% of all subjects with sarcopenia had muscle mass, hand grip strength, and low physical performance. Muscle mass parameter is the most important according to the sarcopenia and can be as best indicator for the prognosis of sarcopenia. This is in accordance with the AWGS algorithm which confirms that muscle mass determines whether a person is said to be sarcopenia or not (17). Subjects with impaired nutritional status were dominated by the sarcopenia group by 93.8% compared to patients with impaired nutritional status without sarcopenia (P = 0.002). This result is in accordance with a study conducted on patients in the Surabaya elderly community that nutritional status disorders are dominated by the sarcopenia group, which is 65.2% (17). Nutritional status was the only geriatric assessment parameter that had a significant correlation in bivariate analysis among the variables studied. In this study, it was found that the nutritional status component was an independent predictor of the incidence of statistically meaningful sarcopenia. MNA is a measurement tool that not only includes nutritional status assessment, but also includes anthropometric measurements and includes assessment of cognitive, functional status, and screening for depression. This may be a strong reason why MNA was the only meaningful variable in this study. Nutritional status is an independent predictor of the

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Caspian Journal of Internal Medicine 2025 (Summer); 16(3): 542-552
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incidence of sarcopenia (sarcopenia to severe sarcopenia) in geriatric patients with chronic kidney disease undergoing maintenance hemodialysis.

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