Research Article

RELATIONSHIP BETWEEN MUSCLE MASS AND MID-UPPER ARM CIRCUMFERENCE WITH HANDGRIP STRANGE IN CHRONIC KIDNEY DISEASE PATIENTS ON DIALYSIS

Pratiwi Quranita [1]*, Syakib Bakri [2], Haerani Abdul Rasyid [2], Hasyim Kasim [2], A Makbul Aman [1], Husaini Umar [1], Arifin Sewang [3]

[1] Internal Medicine Department, Faculty of Medicine, Hasanuddin University
[2] Division of Nephrology, Internal Medicine Department, Faculty of Medicine, Hasanuddin University
[3] Department of Biostatistics and Public Health Hasanuddin University, Makassar, South Sulawesi, Indonesia
*Corresponding Author Email: pratiwiquranita@gmail.com

ABSTRACT

Malnutrition is common in patients with chronic kidney disease (CKD) particularly renal failure. Assessment of the nutritional status of CKD patients is necessary to be evaluated periodically before falling into a state of protein energy wasting (PEW). The assessment of muscle reduction and mid-upper arm circumference may be one of the good indicators for malnutrition that reflects PEW. Other anthropometric measurement such as handgrip strength (HGS) is a simple and useful tool for continuously and systematically assessing muscle mass. In this study, we aimed to evaluate the nutritional statusin patients with renal failure on hemodialysis using MUAC parameters and muscle mass and to determine their correlation with HGS. This was an descriptive analytic study with cross sectional design conducted at Wahidin Sudirohusodo Hospital Hemodialysis Centre from July to August 2019. The study population included CKD patients aged 18-50 years, undergoing HD more than 1 month with a frequency of 2-3 times each week. Nutritional status was assessed based on MUAC using the MUAC tape, muscle mass based on bioelectrical impedance analysis (BIA) and HGS based on the HGS dynamometry level. Pearson, chi square and independent t-test were used for the statistical analysis of the data. Total of 55 subjects were evaluated, consisted of 29 (52.7 %) male and 26 (47.3 %) female subjects with an average age of 36.6 ± 8.1. Range of muscle mass was 33-75.8 kg, mean = 39; range of MUAC 18-33.5 cm, mean = 25.15 cm and range of HGS = 8-45 kg, mean = 21.07. There was a significant positive correlation between Handgrip Strength with Mid-Upper Arm Circumference and Muscle Mass (R = 0.723, p < 0.001 and R = 0.585, p < 0.001 respectively). A direct relationship existed between MUAC, muscle mass and HGS if when MUAC and muscle mass value decrease so does HGS value. HGS can be used as an assessment of nutritional status in patients with renal failure on hemodialysis.

Keywords: malnutrition, upper arm circumference, muscle mass, handgrip strength

INTRODUCTION

Malnutrition is common in patients with chronic kidney disease (CKD), including those who perform hemodialysis (HD) and it has been identified as an important risk factor for complications and mortality.[1,2]. The prevalence of malnutrition in hemodialysis (HD) patients is high, ranging from 23-73 %.[3] Nutritonal assessments of CKD patients on hemodialysis is necessary to be evaluated periodically before falling into a state of protein energy wasting (PEW).[4] The assessment of muscle reduction may be one good indicator for PEW in CGK patients. There are several clinical, nutritional and biochemical markers that may be indicative of PEW in hemodialysis patients, including serum albumin, subjective global assessment (SGA), dietary intake assessment, handgrip strength (HGS) and anthropometry assessment.[5]

In the absence of a gold standard technique for assessing nutritional status, one has sought to identify new methods able to accurately diagnose malnutrition, but the validity of each of them is still under debate.[6] Handgrip strength (HGS) is a non-invasive, simple and fast parameter for muscle strength assessment that can be reliable in renal patients.[7,8] Mid upper arm circumference (MUAC) is a useful tool for a fast assessment of the nutritional status. It is an easy and inexpensive way to detect nutritional status and is used in developing countries for rapid and extensive nutrition surveillance and screening programs.[9] Other anthropometric measurements such as bio electrical impedance analysis (BIA) have been validated to measure muscle mass, fat mass, dan lean body mass (LBM).[10]

In this study, we aimed to evaluate the nutritional status in patients with renal failure on HD using MUAC parameters and muscle mass and to determine their correlation with HGS.

Methods

This was an descriptive analytic study with cross sectional design conducted at Wahidin Sudirohusodo Hospital Hemodialysis Centre from July to August 2019. This research has been approved by the Ethical Committee on Medical Research Faculty of Medicine Universitas Hasanuddin (No. 685/ un4.6.4.5.31/PP36/2019). The study population included CKD patients aged 18-50 years, undergoing HD more than 1 month with a frequency of 2-3 times each week. Nutritional status was assessed based on MUAC using the MUAC tape, muscle mass based on bioelectrical impedance analysis (BIA) and HGS based on the HGS dynamometry level. Pearson, chi square and independent t-test were used for the statistical analysis of the data. The level of statistical significance was of 5 % and the respective confidence intervals of 95 % (CI 95 %) were obtained. Significance was assumed at a P value less than 0.05.

RESULTS

A total of 55 patients were eligible and signed to participate into the study, consisted of 29 (52.7 %) male dan 26 (47.3 %) female subjects with aged from 22 – 49 years (36.6 ± 8.1 years). Range of muscle mass was 33-75.8 kg, mean = 39; range of MUAC was 18-33.5 cm, mean = 25.15 cm and range of HGS was 8-45 kg, mean = 21.07.

There was a significant positive correlation between muscle mass and HGS (R = 0,723; p < 0,001) (Figure 1)
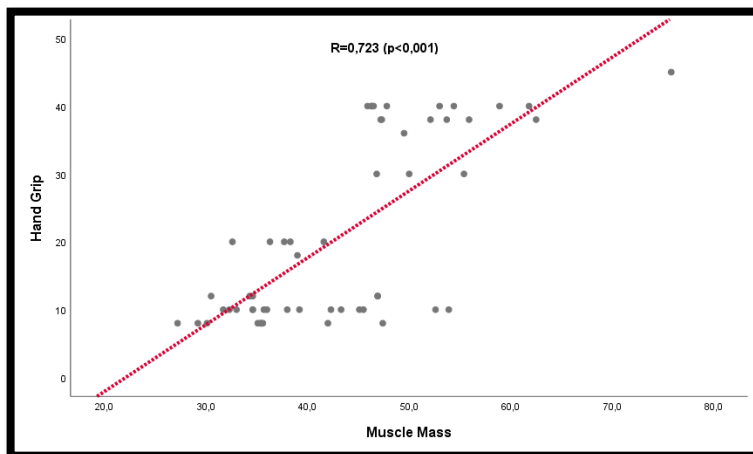
Figure 1: Correlation between Muscle Mass and HGS
HGS: hand grip strength

Scatter plot showing the overall direct correlation between hand grip strength and muscle mass based on bioelectrical impedance analysis in subjects. R = 0.723, P < 0.001. There was a significant positive correlation between MUAC and HGS (R = 0,585; p = 0.003) (Figure 2).
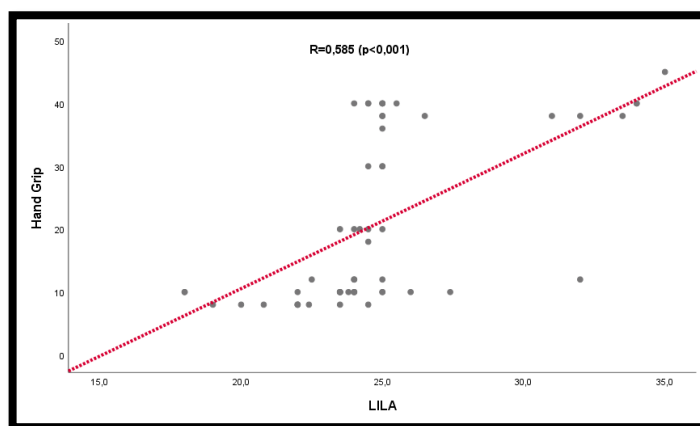
Figure 2: Correlation between MUAC and HGS
MUAC: mid upper arm circumference; HGS: hand grip strength

Scatter plot showing the overall direct correlation between hand grip strength hand mid-upper arm circumferences in subjects. R = 0.585, P < 0.001

DISCUSSION

Malnutrition is common in patients with chronic kidney disease (CKD), including those who perform hemodialysis (HD), and it has been identified as an important risk factor for complications and mortality.[1,2] The prevalence of malnutrition in hemodialysis (HD) patients is high, ranging from 23-73 %.[3] Nutritional assessment of CKD patients on hemodialysis is necessary to be evaluated periodically before falling into a state of protein energy wasting (PEW).[4] The assessment of muscle reduction may be one good indicator for PEW in CGK patients. There are several clinical, nutritional, and biochemical markers that may be indicative of PEW in hemodialysis patients, including serum albumin, subjective global assessment (SGA), dietary intake assessment, handgrip strength (HGS), and anthropometry assessment.[5]

The positive correlation between MUAC and HGS in this study suggested a direct relationship between MUAC and HGS if when MUAC value decreases so does HGS value. In this study, muscle mass was assessed based on BIA showed a significant positive correlation between muscle mass and HGS. Other methods of assessing body composition include dual-energy x-ray absorption metry (DEXA) and bioelectrical impedance. These techniques are accurate, but at present their use is limited to research purposes because of equipment availability, radiation dose, patient acceptance, and cost.[12] A systematic review by Leal *et al*, reported that HGS is regarded as a method of examining muscle

mass which is associated with the nutrient status of a dialysis patient. Despite of this fact, the standardization of this examination becomes the crucial point in its application.

CONCLUSION

This study supported that HGS can be used as an assessment of nutritional status in patients with renal failure on hemodialysis.

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