



SCIREA Journal of Clinical Medicine

ISSN: 2706-8870

<http://www.scirea.org/journal/CM>

June 26, 2022

Volume 7, Issue 4, August 2022

<https://doi.org/10.54647/cm32831>

Vitamin D Serum Level in Elderly: Its Association with The Incidence and Degree of Sarcopenia

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ABSTRACT

Today, In Indonesia has been increased the number of life expectancy from the population of elderly in every year. For some research found that after the age of 60 years, mass of muscle and muscle strength decreases by up to 3% per year. The prevalence of sarcopenia is increasing. One of the causes of sarcopenia is vitamin D deficiency. This research aims to determine serum vitamin D levels from elderly: the relationship with the incidence and degree of sarcopenia. This cross-sectional research has conducted at Pos Pembinaan Terpadu Makassar with 107 elderly contributed during May until June 2021. SPSS ver. 25 was used in analyzing the data. From 107 subjects, 74.8% of women were dominated by old age. The maximum age is 60-69 years as much as 71%. Serum vitamin D levels were highest in

conditions of insufficiency (52.3%), followed by sufficiency (36.4%) and deficiency (11.2%). From 107 subjects, 29 people (27.1%) had degree of sarcopenia: 27 people (93.1%) possible sarcopenia and 2 people (6.9%) sarcopenia. The mean serum vitamin D level was lower in sarcopenia (24.50 ng/ml) than in possible sarcopenia (28.26 ng/ml) with ($p=0.634$). The results of the analysis test showed that there was no statistically significant relationship between serum vitamin D levels: the relationship with the incidence and degree of sarcopenia ($p>0.05$). There is no relationship between Serum vitamin D levels in the elderly and degree of sarcopenia.

Keywords: Sarkopenia, Vitamin D, elderly

1. INTRODUCTION

The population of elderly in Indonesia has been increased in life expectancy every year. Over the past fifty years, the percentage of the population of elderly in Indonesia has increased from 4.5 percent in 1971 to around 10.7 percent in 2020.¹

Sarcopenia is a syndrome characterized by a progressive loss of muscle mass, physical performance, and/or muscle strength. Some research have shown that after the age of 60 years, mass of muscle and muscle strength decrease by about 3% per year.² The Asian Working Group for *Sarcopenia* (AWGS) also proposed diagnostic criteria for *sarcopenia* in Asian older people by adopting the recommendations of the European Working Group for *Sarcopenia*. European Working Group on *Sarcopenia* in Older People (EWGSOP) but consider of ethnic differences in skeletal muscle mass and muscle strength.³ A review of epidemiological studies from countries in Asia using the 2014 Asian Working Group for *Sarcopenia* (AWGS) criteria found that the prevalence of *sarcopenia* ranged from between 5.5% to 25.7%.⁴ Based on the research which conducted Putra et al, which involved 235 people in rural Bali, the prevalence of *sarcopenia* was 58.7%, increasing with age.⁵

Vitamin D deficiency is a common health problem worldwide. Hirani et al, reported that low serum 1,25(OH)2D3 and low 25(OH)D independently associated with the incidence of *sarcopenia* over the next 5 years.⁶ In contrast to the research of Conzade et al, in the Kora-Age study in German subjects, aged 65-93 years with a sample of 975 people concluded that

they could not show a significant relationship between low vitamin D 25(OH)D status and sarcopenia.⁷

Whereas vitamin D has an impact on quality of life, especially *Sarcopenia*. Based on this background, researchers are interested in examining serum vitamin D levels in the elderly: their relationship with the incidence and degree of *Sarcopenia*.

2. METHOD

This cross-sectional research was conducted at the Pos Bindu in Makassar, 107 elderly people was contributed during May until June 2021. This research follows the Declaration of Helsinki. The Hasanuddin University Medical Ethics Committee approved this research. The institutional ethics committee at the Faculty of Medicine, Hasanuddin University approved all research protocols (Letter of Recommendation No. 326/UN4.6.4.5.31/PP36/2021, with protocol number UH21040200). Thus, written informed consent was taken from all participants prior to any intervention.

This cross-sectional study was conducted at the Pos Makassar, involving 107 elderly including patients aged 60 years. The exclusion criteria for this study were a history of stroke, did not use walking aids such as a cane, did not malignancy, acute arthritis or acute infection. The data were collected based on patient characteristics, including demographic data, body mass index (BMI), co-morbidities and history of co-morbidities including diabetes mellitus, hypertension, coronary artery disease, chronic obstructive pulmonary disease, and chronic renal failure.

The degree of sarcopenia based on the AWGS was divided into possible sarcopenia, sarcopenia and severe sarcopenia. The Asian working group of sarcopenia 2019 argues that diagnosing sarcopenia requires measuring muscle quality and quantity and defining people with low muscle mass, low muscle strength, and low physical performance as having "severe sarcopenia". Specifically, the 2019 AWGS introduced "possible sarcopenia," defined by low muscle strength with or without decreased physical performance, which is recommended for use in primary health care and prevention services, but not in hospitals or research settings. Measurement of Skeletal Muscle Mass: The 2019 AWGS limits for low muscle mass in the diagnosis of sarcopenia are as follows: and <7.0 kg/m² in men and <5.7 kg/m² in women by bio-impedance analysis (BIA). Muscle Strength: The 2019 AWGS recommends a diagnostic limit of low muscle strength in grip <28.0 kg for men and <18.0 kg for women by a handgrip

dynamometer. Physical performance is measured by time and go test (TUG). Objective Criteria Instrument: said to be decreased if completing TUG >10 seconds.

Serum 25(OH)D levels were measured using electrochemiluminescence immunoassay (ECLIA) and expressed in units of ng/mL. Classification of levels of 25(OH)D according to the U.S. The Endocrine Society is divided into three classifications: sufficiency (serum 25(OH)D level >30 ng/mL), insufficiency (serum 25(OH)D level 21-29 ng/mL), and deficiency (serum 25(OH)D level <20 ng/mL).

2.1 Statistic Analyze

SPSS version 25 was used as data analyze. The method of analysis consisted of descriptive methods and statistical tests. The statistical test used was the Mann Whitney test and the Chi-square test. The results of the statistical test were considered significant if the p-test value was < 0.05. The results displayed in the form of a narrative equipped with a table.

3. Result

The subject of research consist of 107 who met the inclusion criteria. Women subjects were 80 (74.8%) while men subjects were 27 (25.2%) For subjects in the age range of 60-69 years as many as 76 people (71%) and age 70 years totaling 31 people (29%). From 107 subjects, in this study 78 non-sarcopenia people (72.9%), compared to the degree of sarcopenia (possible sarcopenia and sarcopenia) 29 people (27.1%). In this study, 27 people (93.1%) had possible sarcopenia, compared to 2 people (6.9%) had sarcopenia and no severe sarcopenia. Based on serum vitamin D levels, the highest serum vitamin D levels were insufficiency 56 people (52.3%) followed by Sufficiency of 39 people (36.5%) and deficiency of 12 people (11.2%). Other complete profiles can be seen in Table 1.

Table 1. Characteristics of the population vitamin D serum level in the elderly, incidence and degree of sarcopenia

Variable	n	%
Gender		
Men	27	25,2
Women	80	74,8
Age		
60-69 years old	76	71,0

70 years		31	29,0
Incidence of Sarcopenia			
Non- Sarcopenia		78	72,9
Possible sarcopenia and Sarcopenia		29	27,1
Degree of Sarcopenia			
<i>Possible</i> Sarcopenia		27	93,1
Sarcopenia		2	6,9
Severe sarcopenia		0	0
Serum vitamin D level			
Sufficiency		39	36,5
Insufficiency		56	52,3
Deficiency		12	11,2
Toxic		0	0

Table 2 and Table 3 show the relationship between serum vitamin D levels and the incidence of sarcopenia. The mean serum vitamin D level was found to be lower in the degree of sarcopenia patients (28.0) compared to non-sarcopenia subjects (28.46) with $p=0.634$. The percentage of vitamin D deficiency subjects was greater in the degree of sarcopenia (20.7%) than non-sarcopenia (7.7%) with $p=0.163$. The results of the analysis showed that there was no significant relationship between serum vitamin D levels and the incidence of sarcopenia ($p>0.05$).

Table 2 Comparison Average of Serum Vitamin D levels between degree of sarcopenia and non-sarcopenia

Sarcopenia status	N	Average vitamin D levels	SD	p-value*
Non-sarcopenia	78	28,46	6,09	0,634
Possible sarcopenia+sarcopenia	29	28,00	7,89	

Mann-Whitney test

Table 3 Association of Serum Vitamin D Levels with the incidence of sarcopenia

Sarcopenia status		Status Vitamin D			Total	
		Suficiency	Insufficiency	Deficiency		
Non-sarcopenia	n	30	42	6	78	
	%	38,5%	53,8%	7,7%	100,0%	
Possible sarcopenia+sarcopenia	n	9	14	6	29	
	%	31,0%	48,3%	20,7%	100,0%	
Total		n	39	56	12	107
		%	36,4%	52,3%	11,2%	100,0%

Chi Square test (p=0,163)

Tables 4 and 5 show serum vitamin D levels with the degree of sarcopenia. The mean serum vitamin D was found to be lower in sarcopenia subjects (24.50) than in possible sarcopenia subjects (28.26) with $p=0.606$. The percentage of subjects with vitamin D deficiency was greater in possible sarcopenia (5 people) compared to sarcopenia (1 person), but this was difficult to assess statistically because there were only 2 sarcopenia subjects.

Table 4 Comparison Average of Serum Vitamin D levels according to degree of sarcopenia

Sarcopenia status	N	Average vitamin D levels	SD	p-value*
Possible-sarcopenia	27	28,26	7,92	0,606
Sarcopenia	2	24,50	9,19	

Mann-Whitney test

Table 5 Association of Serum Vitamin D Levels with degree of sarcopenia

Degree of Sarcopenia		Status Vitamin D			Total
		Suficiency	Insufficiency	Deficiency	
Possible-sarcopenia	n	8	14	5	27
	%	29,6%	51,9%	18,5%	100,0%
Sarcopenia	n	1	0	1	2
	%	50,0%	0,0%	50,0%	100,0%

Total	n	9	14	6	29
	%	31,0%	48,3%	20,7%	100,0%

Chi Square test (p=0,337)

4. DISCUSSION

In this research, the percentage of vitamin D deficiency subjects was more in the degree of sarcopenia (20.7%) compared to non-sarcopenia (7.7%) but there was no significant difference. The relevant study was conducted through the cross sectional study and a prospective study by Conzade et al, in a study of age groups in Germany aged 65-93 years a sample of 975 people found that they could not show a significant relationship between low vitamin D (25(OH)D) status with sarcopenia, but this study after 3 years of follow-up found a strong positive association with low baseline 25(OH)D levels <25 nmol/L compared to >50 nmol/L with high risk of sarcopenia and death. In his study, vitamin D deficiency with an OR of 3.18 times and insufficiency with an OR of 1.84 times was associated with a high risk of sarcopenia and death.⁷

The biological role of vitamin D on skeletal muscle function has been extensively investigated, in recent years the expression (vitamin D receptors) of the VDR in skeletal muscle cells has been questioned.⁸ Functional in vitro studies have demonstrated a direct biological role of the active form of the vitamin D in the regulation of genes and signaling pathways influencing calcium and phosphate homeostasis, muscle cell proliferation and differentiation.⁹

In contrast to the longitudinal study of Hirani et al, 1,705 subjects reported low serum 1,25(OH)2D3 and 25(OH)D independently associated with the incidence of sarcopenia over the next 5 years.¹⁰ A cross-sectional study in Surabaya by Indirayani et al, 104 elderly subjects had 53 people with sarcopenia and 55.8% had vitamin D deficiency.¹¹ Longitudinal study, Okuno et al, reported insufficiency status in 89% and deficiency in 28% of a sample of 80 elderly Japanese women over the age of 65 and rates Vitamin D insufficiency and deficiency showed a 56.3% incidence of falls during the three-month observation period.¹²

In this research, sarcopenia subjects had lower serum vitamin D levels than possible sarcopenia subjects but not statistically significant. According to Murphy et al, in a prospective cohort study of 9 years of follow-up of 2,928 elderly subjects aged 70-79 years obtained healthy elderly subjects, only 7% switched from pre-sarcopenia to sarcopenia, whereas none switched from normal to sarcopenia.¹³

Early screening and intervention for sarcopenia is critical to reducing national public health costs. Timely intervention can be carried out on possible sarcopenia to prevent further development of sarcopenia which improves the quality of life of the individual. Recent evidence suggests that vitamin D supplementation of 1,000 IU per day in vitamin D insufficiency and deficiency subjects is beneficial for body function, muscle quality, muscle strength, may bring more benefits and may represent a nutritional intervention strategy to prevent sarcopenia.^{14,15}

A limitation in our study is that the cross-sectional design performed at one time did not describe the course of vitamin D deficiency until sarcopenia occurred. Prospective research is needed to see this relationship. Another factor in this study, The use of measurement of inactive serum vitamin D levels, where the mechanism of action of vitamin D is strongly influenced by the active form of 1,25(OH)₂D₃ which is influenced by the kidneys, so it needs to be examined. Kidney function to rule out factors that affect the action of vitamin D.

AUTHOR CONTRIBUTION

NA, WU and AS were the principal investigators of the study. SB, HR, HK, MI and AS were included in preparing the concept and design. WU and AS revisited the manuscript and critically evaluated the intellectual contents. All authors participated in preparing the final draft of the manuscript, revised the manuscript and critically evaluated the intellectual contents. All authors have read and approved the content of the manuscript and confirmed the accuracy or integrity of any part of the work

REFERENCES

- [1] Badan pusat statistik. Statistik penduduk lanjut usia 2021[Internet]. Jakarta: Badan Pusat Statistik; 2021 [cited 2022 feb 23]. Available from: <http://www.bps.go.id>
- [2] Setiati S, Dwimartutie N. Sarcopenia. In: Setiati S, Alwi I, editors. Buku Ajar Ilmu Penyakit Dalam. 4th ed. Jakarta: Interna Publisher; 2015. p. 3717–23.
- [3] Jang HC. How to diagnose sarcopenia in korean older adults? *Ann Geriatr Med Res*. 2018;22(2):73–9.
- [4] Chen L, Woo J, Assantachai P, Auyeung T, Chou M, Iijima K, et al. Asian Working Group for Sarcopenia : 2019 Consensus Update on Sarcopenia Diagnosis and Treatment. *J Am Med Dir Assoc* [Internet]. 2020; Available from: <https://doi.org/10.1016/j.jamda.2019.12.012>
- [5] Putra IGAW, Aryana IGPS, Astika IN, Kuswardhani RT, Putrawan IB, Purnami KR.

Prevalensi sarkopenia dan frailty di desa Pedawe, Mangupura, Serai dan Songan. *Intisari Sains Medis*. 2020;11(2):546.

- [6] Aspell N, Laird E, Healy M, Lawlor B, O'sullivan M. Vitamin D deficiency is associated with impaired muscle strength and physical performance in community-dwelling older adults: Findings from the english longitudinal study of ageing. *Clin Interv Aging*. 2019;14:1751–61.
- [7] Conzade R, Grill E, Bischoff-Ferrari HA, Ferrari U, Horsch A, Koenig W, et al. Vitamin D in Relation to Incident Sarcopenia and Changes in Muscle Parameters Among Older Adults: The KORA-Age Study. *Calcif Tissue Int* [Internet]. 2019;105(2):173–82. Available from: <https://doi.org/10.1007/s00223-019-00558-5>
- [8] Bischoff-Ferrari H, Borchers M, Gudat F. Vitamin D Receptor Expression in Human Muscle Tissue Decreases with Age. *J Bone Miner Res*. 2004;19(2):265–9.
- [9] Kim DH, Meza CA, Clarke H, Kim JS, Hickner RC. Vitamin D and Endothelial Function. *Nutrients*. 2020;12(2):1–17.
- [10] Hirani V, Cumming RG, Naganathan V, Blyth F, Couteur DGL, Hsu B, et al. Longitudinal associations between Vitamin D metabolites and Sarcopenia in older Australian men: The concord health and aging in men project. *Journals Gerontol - Ser A Biol Sci Med Sci*. 2018;73(1):131–8.
- [11] Indirayani HW, Widajanti N, Firdausi H. Hubungan Defisiensi Kalsidiol Serum dan Derajat Sarkopenia pada Komunitas Usia Lanjut di Surabaya. *J Penyakit Dalam Indones*. 2020;7(1):29.
- [12] Okuno J, Tomura S, Yabushita N, Kim M ji, Okura T, Tanaka K, et al. Effects of serum 25-hydroxyvitamin D3 levels on physical fitness in community-dwelling frail women. *Arch Gerontol Geriatr*. 2010;50(2):121–6.
- [13] Murphy RA, Ip EH, Zhang Q, Boudreau RM, Cawthon PM, Newman AB, et al. Transition to Sarcopenia and Determinants of Transitions in Older Adults : A Population-Based Study. *J Gerontol A Biol Sci Med Sci*. 2014;69(6):751–8.
- [14] Tessier AJ, Chevalier S. An update on protein, leucine, omega-3 fatty acids, and vitamin d in the prevention and treatment of sarcopenia and functional decline. *Nutrients*. 2018;10(8):1–17.
- [15] Schneider DA, Trencle DL. Possible role of nutrition in prevention of sarcopenia and falls. *Endocr Pract*. 2019;25(11):1184–90.