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Assessment of Sarcopenia and its Association with Hand Grip Strength in Elderly Population

Original Article

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Abstract

Background: Sarcopenia is a prevalent condition in older persons that is linked to significant morbidity and death. It was defined as an age-related loss of muscle mass and deterioration in muscle strength. Hand grip strength is significantly impacted by sarcopenia. Sarcopenia in older adults has significant effects on everyday functioning and general quality of life. Elderly mortality, diminished capacity to handle the stress of a serious illness, and disability are all influenced by sarcopenia.

Objective: This study aims to find the assessment of sarcopenia and its association with hand grip strength in elderly population.

Methods: A cross-sectional study was conducted, and the data was collected from hospitals (Iffat Anwar, Central Park Teaching hospital), private clinics and old homes (Aafiat) through non-probability convenience sampling technique. The sample size was 187. The tools used to collect data were Digital Handheld Dynamometer, SARC-F questionnaire, and a demographic questionnaire. Data was assessed by using SPSS version 27.

Results: There is a strong association between sarcopenia and Hand Grip Strength and the P value is less than 0.05. Mean Berg Balance scale value is 45.32% and mean hand grip strength is 18.88% among the participant**.**

Conclusion: Participants with sarcopenia showed positive association with hand grip strength and balance. There is a strong possibility that people with sarcopenia have impaired balance and hand grip strength.

Keywords: Sarcopenia, aging, handgrip strength, elderly, muscle mass.

INTRODUCTION

Sarcopenia is a prevalent condition in older persons that is linked to significant morbidity and death. It is described as a decline in muscle strength and muscle mass that occurs with aging. Sarcopenia is a frequent condition but still lacks a commonly accepted definition. Recent research and low evaluations of muscle mass have highlighted the significance of athletic performance and muscle strength. Primary and secondary sarcopenia are two types of the illness. There are two arts of Sarcopenia, namely primary and secondary sarcopenia. Primary sarcopenia is attributable to ageing, when no other specific cause is evident. Secondary sarcopenia is related to other factors than ageing(1, 2).

Muscular strength decreases in tandem with loss of muscular mass. Elderly people frequently have age-related degradation of their musculoskeletal system, and these systems are crucial for performing activities of daily living (ADL). This decrease in strength is not correlated with the loss of muscle mass, suggesting that sarcopenia is caused by factors other than muscle size, such as muscle quality and neuromuscular function. A key element of good aging is maintaining musculoskeletal health. The two main parts of the musculoskeletal system are muscle and bone. While diseases that either directly or indirectly impact bone and muscle, as well as age-related changes in lifestyle, can cause changes in bone and muscle structure, age-related changes in both.(3-5).

People who have less muscular mass have trouble recovering from changes in balance or uneven surfaces because it impacts their postural control processes It has been demonstrated that certain dietary strategies, such as getting enough protein, vitamin D, antioxidant substances, and long-chain polyunsaturated fatty acids, can effectively prevent sarcopenia. A number of variables that lead to a

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progressive loss of muscle mass, strength, and function are responsible for sarcopenia in the elderly. These variables can differ from person to person, but they typically involve underlying medical disorders, lifestyle choices, and physiology changes brought on by aging(6-8).

Muscle metabolism may be impacted by age-related hormonal changes, such as decreased levels of growth hormone and testosterone. Chronic Illnesses: Dystrophic diseases, diabetes, and chronic kidney illness can all make muscle atrophy worse. Low muscle mass combined with either low muscle strength or low physical performance confirms the diagnosis of sarcopenia. The idea of using sarcopenia as a clinical biomarker to detect physical impairment and poor health outcomes in older person. Sarcopenia prevalence ranges from 5% to 17% among older individuals living in the community, 14% to 85.4% in nursing homes, and 10% to 24.3% in acute hospitals(6, 9, 10).

A number of variables that lead to a progressive loss of muscle mass, strength, and function are responsible for sarcopenia in the elderly. Sarcopenia in older adults has significant effects on everyday functioning and general quality of life. Older persons who have reduced muscle strength break. Accurate measurement and interpretation of HGS are increasingly important due to its widespread use in research and clinical practice. There is a lot of variation in the tools and procedures used to measure grip strength. In the elderly population, sarcopenia and osteoporosis are linked to higher rates of sickness and fatalities. In clinical settings, measuring hand grip strength with a hand dynamometer is a frequent and reliable way to assess muscle strength, even in people with sarcopenia(11-14). A hand dynamometer is used to assess hand grip strength, which is a proxy for overall muscle strength(15). Grip strength is related to and predictive of other health conditions(16).

Handgrip strength is directly and significantly impacted by the age-related loss of muscle mass, function, and strength. In clinical settings, measuring hand grip strength with a hand dynamometer is a frequent and reliable way to assess muscle strength, even in people with sarcopenia. Hand grip strength measured with a dynamometer is used diagnostically to assess muscle strength and function, which are affected by sarcopenia. It helps in identifying sarcopenia early, monitoring its progression, and assessing the effectiveness of interventions(17, 18).

However, literature's current scope has minimally addressed the term sarcopenia with handgrip strength. Studies indicate that elderly people with sarcopenia have affected handgrip strength due to loss of muscle mass, mobility issues and quality of life. Handgrip strength is a vital indicator of overall muscle function, mobility and quality of life. Additionally, its helps to understand the association of sarcopenia with hand grip strength and it fulfills the literature gap.

MATERIALS AND METHODS

The study was conducted in hospitals (Central Park teaching hospital, Iffat Anwar) Lahore, Pakistan, following approval by research ethics and support committee of university of management and technology. The sample size was 187 and calculated by WHO calculator (19). Designed as cross-sectional observational study, data collection spanned from 1 June 2024 to 1 August 2024. Data was collected through non probability convenience sampling. Eligibility criteria mandated age group between 65 to 85(both males and females), diabetic, hypertensive, proper cognition and understanding ability. Individual with dementia, any recent surgery or surgery in last one year, impaired cognition, mini mental scale below than 24 were excluded.

The data was collected by using Sarcopenic Questionnaire (20) and hand-held dynamometer(17). Prior to using a questionnaire to collect data, informed consent was obtained. There were no dangers to research participants. The local populace provided the data. The participant has the freedom to leave the study at any moment, and they have the option to decline. During data collection, Sarcopenic questionnaire used to check level of sarcopenia. Handheld dynamometers are used to measure muscle strength. Data analysis was done with the SPSS-27 program. A histogram was created and examined. The Chi square test and descriptive analysis were used in this investigation.

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Figure 2 Handheld Dynamometer

Component	Question	Scoring
Strength	How much difficulty do you have in lifting and carrying 10 pounds?	None = 0 Some = 1 A lot or unable = 2
Assistance in walking	How much difficulty do you have walking across a room?	None = 0 Some = 1 A lot, use aids, or unable = 2
Rise from a chair	How much difficulty do you have transferring from a chair or bed?	None = 0 Some = 1 A lot or unable without help = 2
Climb stairs	How much difficulty do you have climbing a flight of 10 stairs?	None = 0 Some = 1 A lot or unable = 2
Falls	How many times have you fallen in the past year?	None = 0 1 – 3 falls = 1 ≥ 4 falls = 2

Figure 1 SARC-F

RESULTS

The results of the study showed that, the mean age of 187 participants were 68.94+-4.25. among those 49.20 were males and 50.80 were females. Among 187 participants is hypertensive 66.8% or diabetic 49.7% there was no participants were added with dementia 1.6%, 34.2% participants who smokes or other co morbidity 33.69%. In research there is a strong association between

Table 1: Level of Sarcopenia

	Frequency	Percent	Valid Percent	Cumulative Percent
Low prone to Sarcopenic	172	92.0	92.0	92.0
Medium Sarcopenic	11	5.9	5.9	97.9
High greatest maximum Sarcopenic	4	2.1	2.1	100.0
Total	187	100.0	100.0	

This table showed the level of sarcopenia in our selected population as our mean populations were 68.9 they are 92.0% were low prone to sarcopenia, 5.9% were medium sarcopenia or only 2.1% were high greatest maximum sarcopenia

Table 2: Handgrip strength

	Mean	Std. Deviation	N
Hand Grip Strength in Kg	18.8861	8.56154	187
Level_of_sarcopenia	1.1016	.36713	187

This table showed mean hand grip strength (Mean18.8861), (SD 8.56154) of our selected population. As a result, we have found that there was a positive association between sarcopenia and handgrip strength. Above result showed that the elderly populations have reduced handgrip strength in those who are Sarcopenic.

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Table 3: Correlation between sarcopenia and handgrip strength

		Hand Grip Strength in Kg	Level of Sarcopenia
Hand Grip Strength in Kg	**Pearson Correlation**	1	-.306**
	Sig. (2-tailed)		.000
	N	187	187
Level of Sarcopenia	**Pearson Correlation**	-.306**	1
	Sig. (2-tailed)	.000	
	N	187	187

**. Correlation was significant at the 0.01 level (2-tailed).

There is strong correlation between handgrip strength and sarcopenia as the P-value was less than 0.05. According to our results, there was a strong association between sarcopenia and handgrip strength as our P value is less than 0.05. Mean handgrip strength (Mean18.8861), (SD 8.56154) of our population. There is strong correlation between handgrip strength and sarcopenia as the P-value is less than 0.05.

DISCUSSION

The study's findings revealed that the average age of the 187 participants was 68.94 +/- 4.25. Of those, 50.80 percent were female and 49.20 percent were male. Of the 187 individuals, 49.7% have diabetes and 66.8% have hypertension. 1.6% of individuals did not have dementia, 34.2% of participants smoked, and 33.69% of participants had other co-morbidity. Our P value of less than 0.05 indicates a robust correlation between sarcopenia and hand grip strength in the senior population. Tatangelo Toni highlighted in their narrative review. Relationship between lower limb muscular strength, handgrip strength, and physical function in older individuals. Considering lower limb muscle strength, and dynamic balance were positively correlated with HGS(21). Additionally, the research conducted by Titin Kristiana sheds light on the Muscle mass and muscle strength are associated with physical performance in the elderly. Muscle strength was shown to be positively and moderately correlated with physical performance (hand grip strength and balance). This study was similar to our study as their positive correlation exist(22).

Di-Ya Tu investigated sarcopenia in the older population by a comprehensive review and meta-analysis of randomized control trials. These results were identical to ours. Jun Pei Lim investigated the impact of average versus maximal hand grip strength on sarcopenia. This study was similar to our study because poor physical performance is related to sarcopenia and Hand grip strength(23).

According to Kaja Teraž's study, participants did better on motor tests than those found in other studies of a similar nature, even though age-related deterioration was predicted to result in lower scores on tests of sarcopenia parameters. Participants with diagnosed sarcopenic patients were included in this article's methodology, and patients with diabetes and hypertension were included in our study along with both diagnosed and undiagnosed participants(24).

Several studies align with our findings, reinforcing the association between sarcopenia and handgrip strength in older adults. For instance, research by Titin Kristiana highlights the positive correlation between muscle strength and physical performance, particularly in terms of handgrip strength and balance, similar to our study's observations. Additionally, Di-Ya Tu's meta-analysis of randomized control trials confirms the impact of sarcopenia on functional decline, mirroring our findings that individuals with sarcopenia experience reduced grip strength and balance issues. Our results are also consistent with the work of Jun Pei Lim, which emphasized the role of handgrip strength in assessing sarcopenia and predicting poor physical performance. These studies, together with our data, underscore the importance of handgrip strength as a reliable indicator of sarcopenia and its broader effects on mobility and quality of life in the elderly population.

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CONCLUSION

This study looked at the relationship between handgrip strength and sarcopenia in the elderly. The two variables have a strong positive association, according to our findings. Elderly people with sarcopenia are more likely to have diminished handgrip strength as seen by the positive link between sarcopenia.

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