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Differences in Body Composition, Handgrip Strength, Gait Speed and Risk of Fall among Sarcopenic Obese and Non Sarcopenic Obese Individuals

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Abstract: With ageing, there is a reduction in strength and size of the muscle in older individuals that results in functional limitations, an elevated risk of falls, disability, and death. The present study included 95 participants (42 sarcopenic obese and 53 non sarcopenic obese) who were compared for body composition, handgrip strength, gait speed and risk of fall. It was found that sarcopenic obese individuals had reduced handgrip strength, a slower gait speed, and higher fall risk in comparison to nonsarcopenic obese. Consequently, it can be concluded that sarcopenic obesity is a geriatric syndrome that causes general health problems and affects physical and functional status.

Keywords: Fall risk, Handgrip strength, Sarcopenia, Sarcopenic obesity, TUG.

I. Introduction

With ageing, there is a reduction in strength and size of the muscle in older individuals that results in functional limitations, an elevated risk of falls, disability, and death [1, 2]. The relationship between fat and muscle tissue has drawn more attention than the conventional risk factors for reduced muscle strength, which includes inactivity, nutritional deficiencies, and chronic illnesses [3, 4, 5]. It has been proposed that excessive fat may hasten the ageing process,reduce muscle bulk and power. The excess deposition of fatty or adipose tissue in the body is known as obesity. Among other health issues, it is associated with a higher risk of progressing diabetes mellitus, cardiovascular ailment, hypertension, and hyperlipidemia [6, 7]. Sarcopenia is a condition in which ageing brings about a decrease in muscle mass (MM), strength, and movement. Sarcopenic obesity was initially coined by Heber *et al.*, in 1996 and subsequently defined in functional terms by Baumgartner in year 2000 [8, 9, 10, 11]. Baumgartner described it as the conjunction of obesity and sarcopenia [12]. Additionally, this diagnosis was validated by a more recent, thorough evaluation of the meaning and standards for diagnosis of sarcopenic obesity, which was based on association between sarcopenia and obesity, including the dimensions of MM, muscle power, and physical functioning [12].

Since senior individuals are at an increased risk of falls and other health related problems, current investigation was undertaken to find the impact of sarcopenic obesity on handgrip strength, gait speed and fall risk in sarcopenic obese (SO) and non-sarcopenic obese (NSO).

II. Methodology

The present cross-sectional study included 95 participants (age range between 45-70 years). They were recruited from Delhi NCR. Before starting with the study, all participants were explained regarding the objective and procedure. Informed permission was signed in writing by each participant. The institutional ethics committee gave its approval to the study. All participants answered questions on demographic details, medical/surgical history and comorbidities. Individuals aged $\geq$ 45 years, BMI $\geq$ 29.9 kg/m^2, SARC-Fscore $\geq$ 4 were included. Participants were excluded if they had a history of musculoskeletal disorders, pacemaker implantation, valvular or congenital disease, heart failure and metabolic or endocrine disorders of muscular system, or abnormalities in system of cardiac conduction that precluded participation.

The cutoff point established by Baumgartner *et al*. was considered to determine sarcopenic obesity [12]. Height, weight, BMI, muscle mass, handgrip strength, gait speed and risk of fall were measured. Height, weight, and BMI were measured using a standardised stadiometer and a digital scale. Before taking measurements, participants had to take off their shoes, socks, and bulky clothing. BMI was computed by dividing the weight in kilograms by square of height in metres (Kg/m^2) [13]. Gait

speed was measured by 10 meter walk test. Participants were asked to cover 10 m distance and then speed was obtained by dividing it time consumed by 10 [14].

Body composition: Parameters related to body composition were evaluated using a bioelectrical impedance analyzer (BIA) (Model: Tanita). After a minimum of two hours of fasting and with an empty bladder, BIA was carried out. Handgrip power was measured using Jamar hydraulic dynamometer on dominant hand. With their elbows bent 90 degrees and wrists in a neutral position, those taking part used the dynamometer while seated. After three attempts at squeezing the dynamometer as hard as they could, with an interval of thirty seconds in between, the maximum value was noted in kilograms [15].

The timed up-and-go test (TUG) was used to assess the risk of falls. To take the test, participants had to get off of a chair, move at their normal pace for three metres, turn around, go back to the chair, and sit down. The test was executed three times, and the average amount of time spent completing each task was reported.

III. Data Analysis

Descriptive statistics, such as mean and standard deviation, were used to assess the information using an excel spreadsheet.

IV. Results

62 females and 33 maleswere included for the study. The average age of sarcopenic obese (SO) was 65.25±7.25 and the non-sarcopenic obese (NSO) was 62.31±7.86 years. Out of all the selected participants 44% (42) were SO and 66% (53) were NSO (Fig. 1).

Table I: Demographic and Anthropometric Characteristics

	SO	*NSO*
Age (years)	65.25±7.25	62.31±7.86
Weight (Kg)	66.73±8.24	68.93±8.37
Height (cm)	148.97±4.17	146.23±4.55
BMI (Kg/m^2)	31.28±3.89	30.35±4.85

Table I displays the age and anthropometric measurements for all the participants. The average age of the entire participants was 64.25. ± 6.7 years. All of them had a BMI in the World Health Organization-defined obese categories class I. Differences in all variables were apparent (Fig. 2).

Table II: % Body Fat, MM, HGS and GS in SO and Non-Sarcopenic Obese (NSO)

	Body Fat (%)	*MM (Kg)*	*HGS (Kg)*	*Gait Speed (m/sec)*
SO	42.61±2.87	16.24±1.23	16.26±1.56	0.67±0.13
NSO	38.35±2.65	25.84±2.34	22.43±1.32	1.23±0.45

As shown in Table II, the percentage of body fat high was high in sarcopenic obese with mean value of 42.61±2.87 and lower in NSO with value of 38.35±2.65. In contrast, the muscle mass and handgrip strength value was lower in SO group and higher in NSO group (Fig. 3).

Table III: Risk of Fall among SO and NSO using TUG Test

	TUG (Seconds)
SO	15.56±3.12
NSO	11.78±2.13

Table III demonstrates the risk of fall among participants. The results indicated that the individuals with sarcopenic obesity had significantly higher scores on timed up and go test when compared to the other group (Fig. 4). The participants who took ≥12 seconds to complete the TUG was at risk for falling.

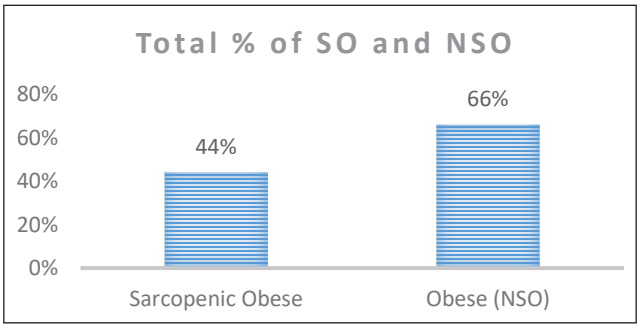

Fig. 1: Percentage of Sarcopenic Obese and Non-Sarcopenic Obese

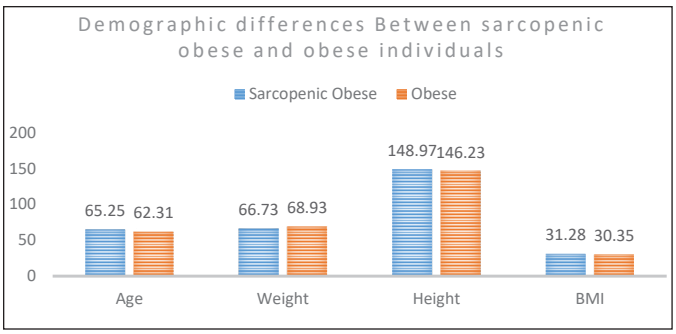

Fig. 2: Demographic Details of the Participants

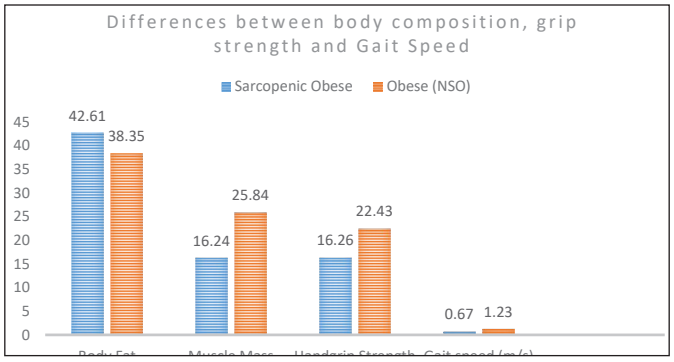

Fig. 3: Differences between Body Composition, HGS and GS

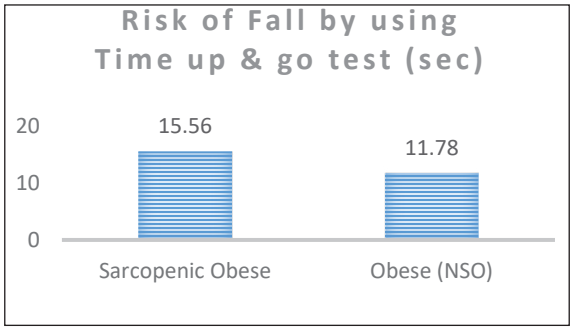

Fig. 4: Risk of Fall among Participants

V. Discussion

The current investigation was undertaken to find the influence of SO on % body fat, muscle mass, handgrip strength and fall risk among individuals who were obese and sarcopenic as well as those who were not. The current study supported earlier findings by finding a relationship between SO and lower skeletal body mass and handgrip strength. It was plausible that the impact of grip strength was counteracted by the elevated BMI and body fat percentage.

Sarcopenia-related obesity may have negative effects on mortality, functional decline, falls, fractures, depression, osteoporosis, and extended hospital stays, according to earlier research. Compared to obesity or sarcopenia alone, SO exhibits an integrated impact that carries greater clinical significance [14]. Participants with sarcopenic obesity had reduced gait speeds and handgrip strength in comparison to participants with obesity alone [16]. In addition, sarcopenic obese group took more time to complete TUG test that further indicates high risk of falling.

According to Huo et al., older adults who were obese and sarcopenic reported more falls themselves than those who were obese or sarcopenic alone [17]. An increasing amount of research shows that grip strength is linked to several health outcomes, including older adult mortality [18]. Furthermore, a meta-analysis revealed a correlation between reduced handgrip strength and higher risks of cardiac ailments and all-cause mortality. In a prospective study involving 6,040 healthy men between the ages of 45 and 68 who were monitored for more than 30 years, adult men in the lowest tertile of HGS at initials were found to be at higher risk of dying, regardless of body mass index [16]. Because ageing and obesity increase the risk of chronic diseases, inflammation, and decreased organ function, they can both lead to disability. Participants are more likely to experience impaired physical performance, chronic pain from skeletal muscle system degeneration, imbalance, and falls during this process, which also results in lesser scores in the physical domains of quality of life for older adults [19]. Out of all the individuals 28% of people had sarcopenic obesity. Marquesa et al. looked into the relationships between sarcopenia, SO, HGS, and QoL in older Brazilians residing in the community (60 years and above) [11]. The "EpiFloripa Ageing" cohort study was used to conduct a cross-sectional analysis. QoL was assessed using the CASP-16 Brazil instrument, with scores ranging from 0 (no QoL) to 48. However, other research revealed a positive and significant correlation between the handgrip strength and a number of SF-36 test dimensions, indicating the handgrip strength's significance as an elderly person's quality of life predictor [18].

VI. Conclusion

Reduced handgrip strength, a slower gait speed, and higher fall risk values were linked to the results. This study confirms earlier results by showing that handgrip strength and TUG are an inexpensive, simple-to-use measurement tools that can be included into healthcare practitioners' clinical routines to support intervention and prevention efforts. Consequently, in order to prevent falls among senior citizens in communities and address the handgrip strength deficiency associated with sarcopenic obesity, appropriate interventions are required.

VII. Limitation

Because the current study's sample size is restricted to obese seniors living in Delhi NCR, its conclusions cannot be generalised to all obese populations. The relevance of these outcomes needs to be confirmed by additional research.

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