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Prevalence of Sarcopenia and its relation to Vitamin D in elderly females

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ABSTRACT

Objectives: To determine prevalence of sarcopenia in elderly females and to detect relationship between sarcopenia and serum vitamin D level. *Methods:* A two Phase's study which compromised: Phase 1: cross-sectional study on 350 elderly females to detect prevalence of sarcopenia in elderly females and Phase 2: case-control study to detect relation between sarcopenia and serum vitamin D level. Assessment of muscle mass was done using Bio Electrical Impedence Analysis (BIA). Assessment of hand grip strength by a Jammar Hand held Dynamometer, Assessment of muscle performance by the Timed Get-Up-and-Go (TGUG) test. Laboratorial Measurement of serum 25- Hydroxy Vitamin D is by (ELISA) technique. *Results:* Prevalence of sarcopenia in elderly

females was 11.7% and 9.1% of them have severe sarcopenia. No statistically significant difference was found between sarcopenic and non-sarcopenic as regard serum vitamin D level, while a highly significant difference was found between sarcopenic and non sarcopenic as regard the mean weight, mean fat level and mean FFM, the mean BMI, and mean bone mass, all being lower in sarcopenic in comparison to non- sarcopenic females. *Conclusion:* Prevalence of sarcopenia in community dwelling elderly females was 11.7%, no statistically significant difference was found between sarcopenic and non-sarcopenic as regard serum vitamin D level.

Keywords: Sarcopenia, Vitamin D, Elderly females

1. INTRODUCTION

Sarcopenia is an age related reduction of skeletal muscle quality, strength, and mass, which can reach up to 1% each year after age 50 years, sarcopenia was defined in 2009 as "age-related loss of skeletal muscle mass and functions, strength and performance as well" (Fielding et al., 2011). Nowadays, sarcopenia becomes recognized worldwide. Its consequences greatly affect muscle performance, cause functional decline, poor quality of life and even death in some patients (Walston, 2012). Furthermore, the healthcare costs for sarcopenia is high. Janssen and colleagues reported the estimated healthcare cost of sarcopenia of $18.5 billion in US in the year 2000 (1.5% of total health care expenditure) (Janssen et al., 2004). A 10% decrease in the prevalence of sarcopenia can save $1.1 billion dollars per year. Sarcopenia is an evolving health concern, as the life expectancy of the population is increasing and physical activity decreasing. It is associated with poor balance, gait speed, falls, fractures, and is a predictor of disability. Exercise is a possible treatment for sarcopenia, and low physical activity is believed to be an important risk factor for sarcopenia. Speed and strength are continually reduced after the age of 30 years (Ryall et al., 2008), even in well trained athletes. Evidence suggests that physical activity increases the capacity of skeletal muscle (Brioche et al., 2016).

It is likely that sarcopenia results to low vitamin D status. Sarcopenia was found to be an important predictor of disability and mortality in elderly population (Arunabh et al., 2003). Decreased physical activity and less time spent outdoors results in vitamin D insufficiency (Abiri et al., 2016). Also, sarcopenia is observed in obese individuals, who reveal significant muscle loss and increased fat mass (Kim et al., 2011). Promoted body fat mass leads to vitamin D trapping in the adipose tissue, and decreases the serum level of vitamin D (Arunabh et al., 2003). Furthermore, sarcopenia is associated with aging (Kim et al., 2011). Vitamin D deficiency and insufficiency are common all over the world, and insufficiency is defined as a serum 25-hydroxyvitamin D (25OHD) level of 20ng/mL by the Institute of Medicine (Gallagher, 2013). Institutionalized elderly are at greatest risk of having vitamin D deficiency (Hilger et al., 2014). In addition, vitamin D is related to gender, sun exposure, body mass index, physical activity, smoking, and alcohol consumption (Skaaby et al., 2016) & (Kienreich et al., 2013).

Vitamin D has effects on many genes, including the genes regulating cellular differentiation, proliferation, angiogenesis, and apoptosis. Vitamin D receptor (VDR) is found in most tissues of the body, and the active vitamin D has many biological functions (Holick, 2007). Low vitamin D levels were found to be related to many diseases and conditions that are found among elderly people, as osteoporosis, falls and fractures, diabetes, cancer, and cardiovascular disease (CVD), and sarcopenia (Holick, 2007) & (Meehan M & Penckofer 2014). In accordance with the European Working Group on Sarcopenia in Older People approach, a study reported that the prevalence of sarcopenia was 4.6% in community-dwelling men and 7.9% in women with a mean age of 67 in the United Kingdom (Patel et al., 2013). Among older adults with a mean age of 70.1, the prevalence of sarcopenia in another UK study was found to be 36.5% (Brown et al., 2016). Vitamin D deficiency causes muscle weakness (Holick, 2007) and muscles may need vitamin D to function optimally since muscles have VDR (Holick, 2007).

As sarcopenia is one of the major health problems in aging, the current study objectives were to investigate the prevalence of sarcopenia in community-dwelling elderly females and to detect relationship between sarcopenia and serum vitamin D level.

2. METHODOLOGY

This study is two phases study which compromised:

Phase 1: cross-sectional study which was done to detect prevalence of sarcopenia in community dwelling elderly females.

Phase 2: case-control study: cases with sarcopenia were compared with age matched controls to detect relation between sarcopenia and serum vitamin D level.

350 elderly female patients (60 years old and above) were recruited from out-patient clinic and inpatient wards of Ain Shams University Hospital from the first of March 2017 till the end of August 2018. Systematic Random Sampling technique was used as follow: every 2nd patient (skip interval).

Cases with sarcopenia were found to be 41 cases, 4 cases refused sampling so 37 cases only were enrolled in Phase 2 study and were compared by age matched control (n: 46) and pre sarcopenic subjects were excluded from the study.

Cases (Sarcopenic): Patient diagnosed to be sarcopenic if Fat Free Mass Index (FFMI) was less than or equal to 13.9 plus one or more of the following [hand grip strength less than 20 Kg (and/or) TGUGT more than 13 seconds]

Controls (Non-Sarcopenic) : Subjects that had FFMI more than 13.9

Pre sarcopenic: Subjects that had FFMI ≤ 13.9 with normal hand grip strength (≥20 Kg) and TGUGT≤ 13 seconds.

Severe sarcopenia: Patient who had FFFMI ≤ 13.9 plus hand grip strength less than 20 Kg and TGUGT >13 seconds.

Inclusion criteria

Female's age of 60 years or older accepting to participate in the study and Verbal consent obtained from every participants.

Exclusion criteria

Patients that had any reason that might limit timed up and go test, patients who were unwilling to participate and patient with dehydration or peace maker insertion.

Patient consent

Informed consent was taken from every elderly participating in the current study.

Every study subject was subjected to the following: Careful history taking with stress on occupation, sun exposure, smoking, physical activity and past medical history, complete physical examination: Weight and height were measured and BMI was calculated.

Ethical approval

The study methodology was approved by the Research Board of the Geriatrics and Gerontology Department and the study was approved by the ethical committee of the Faculty of Medicine, Ain Shams University. Ethical committee approval number: FMASU MD 205/2017.

Measurements

I-Assessment of muscle mass

Assessment of body composition using Bio Electrical Impedence Analysis (BIA) Geratherm body analyzer scale where patient should stand on the scale after entering age, sex, height and physical activity, feet should be dry and each foot touching the two electrodes for at least 5 seconds until analysis end. Results appear in the form of weight, body mass index, fat mass, fat free mass, bone mass, body water% .

II-Assessment of muscle performance

Assessment of hand grip strength by a Jammar Hand held Dynamometer where three trials done by both hands separated by 1 min between each trial and average of the dominant hand was taken.

Assessment of muscle performance by the Timed Get-Up-and-Go (TGUG) test where patient received first an explanation for the test and then he sat on a stool about 45 cm from the ground and asked to stand without support and he can use assistive device and asked to walk with his own average speed for 3 m and to turn back and sit down again on the chair, time is calculated from the moment of the start till he sits down.

III-Laboratorial Measurement

Five millilitres of venous blood were collected under complete aseptic precautions from 83 participants (sarcopenic and non-sarcopenic groups). After clotting, samples were centrifuged at 1000 xg, and sera were stored at -20°C for assay of serum 25-OH Vitamin D.

Measurement of total 25-OH Vitamin D (Vitamin D2 and Vitamin D3) in serum was carried out by enzyme immunoassay using reagents provided by DRG® 25-OH Vitamin D (total) ELISA (EIA-5396) (DRG International, Inc. 841 Mountain Ave, Springfield Township, New Jersey, United States) (Pilz et al., 2011).

A review of the literature suggests the following ranges for the classification of 25-OH Vitamin D status; <10 ng/mL indicates deficiency and 10-29 ng/mL in case of insufficiency whereas 30-100 ng/mL is considered sufficient and more than 100 ng/mL goes with toxicity (Holick , 2002).

Statistical Methods

The collected data were coded, tabulated, and statistically analyzed using IBM SPSS statistics (Statistical Package for Social Sciences) (V. 22.0) software version 22.0, IBM Corp., Chicago, USA, 2013. Descriptive statistics were done for quantitative research data as minimum & maximum of the range as well as mean ± SD (standard deviation), while it was performed for qualitative research data as number and percentage. Inferential statistical analyses were conducted for quantitative research variables by usage of independent t-test in cases of two independent research groups with parametric data. In qualitative data, inferential analyses for independent variables were conducted by usage of Chi square and Fisher's exact tests. Correlation analysis (using Pearson's method) is used to assess the strength of association between two quantitative variables. A probability value (P- value) <0.05 was considered significant (S) and P< 0.01 was highly significant (HS).

3. RESULTS

A two phase's study which compromised 2 phases:

Phase 1: cross-sectional study which was done on 350 elderly female patients to detect prevalence of sarcopenia in elderly females.

Phase 2: case-control study, in which cases with sarcopenia (37 patients) were compared with age matched control (46 subjects) to detect relation between sarcopenia and serum vitamin D level.

350 elderly female patients (60 years old and above) were recruited from out-patient clinic and inpatient wards of Ain Shams University Hospital. Systematic Random Sampling technique was used as follow: every 2nd patient (skip interval). The mean age of the participants was 65.574 ± 5.673 years, mean height was 158.949 ± 5.811 cm, mean weight was 78.542 ± 19.986 Kg, and mean BMI was 31.065±7.644 Kg/cm^2. The mean body fat was 36.861 ± 10.532 %, mean FFM was 40.489± 4.872 Kg, mean bone mass was 2.449 ± .465 and mean FFMI was 16.014 ± 1.688 Kg/cm^2. The mean hand grip strength was 16.971 ± 6.301 Kg, mean TGUGT was 22.057 ± 10.801 sec and mean vitamin D level was 13.67 ± 7.208 ng/dl.

Prevalence of sarcopenia in elderly females was 11.7% and 9.1% of them have severe sarcopenia, prevalence of pre sarcopenia in elderly females was 2% (Table 1).

Table 1 Prevalence of sarcopenia (no: 350)

Parameter	No	Percent
Sarcopenic	41	11.7
Non Sarcopenic	302	86.3
Pre-sarcopenia	7	2.0
Total	350	100.0

No statistically significant difference was found between sarcopenic and non-sarcopenic as regard serum vitamin D level, while a highly significant difference was found between sarcopenic and non sarcopenic as regard the mean weight being lower in sarcopenic in comparison to non-sarcopenic females. Also a significant difference was found between sarcopenic and non sarcopenic as regard the mean height being higher in sarcopenic in comparison to non- sarcopenic females. A highly significant difference between sarcopenic and non sarcopenic as regard the mean fat level and the mean BMI, being lower in sarcopenic in comparison to non- sarcopenic females. A highly statistically significant lower mean FFM and lower mean bone mass among sarcopenic in comparison to non- sarcopenic females (Table 2).

Table 2 Comparison between Sarcopenic and Non-Sarcopenic as regard Vitamin D Level, Height and Weight, Fat Level, BMI, FFM and Bone Mass.

Parameter	Sarcopenic (n: 37)		Non-Sarcopenic (n: 46)		Student t test	P(sig)
	Mean	±SD	Mean	±SD		
Vitamin D Level ng/ml	14.83	6.894	12.27	5.562	1.624	.108(NS)
Weight (Kg)	58.781	13.385	81.954	16.205	-6.988	.000(HS)
Height (cm)	160.405	5.674	157.826	4.758	2.253	.027(S)
Body Fat %	25.662	12.137	40.354	8.699	-7.306	.000(HS)
BMI (Kg/cm^2)	23.027	5.131	32.689	6.595	-6.417	.000(HS)
FFM (Kg)	34.857	2.689	41.400	4.044	-8.449	.000(HS)
Bone Mass	2.086	.354	2.593	.431	-5.764	.000(HS)

Body Mass Index (BMI) Fat Free Mass (FFM) Student t-test P < 0.01 HS

A highly significant difference between sarcopenic and non sarcopenic as regard the mean fat level and the mean BMI, being lower in sarcopenic in comparison to non- sarcopenic females (Figures 1, 2).

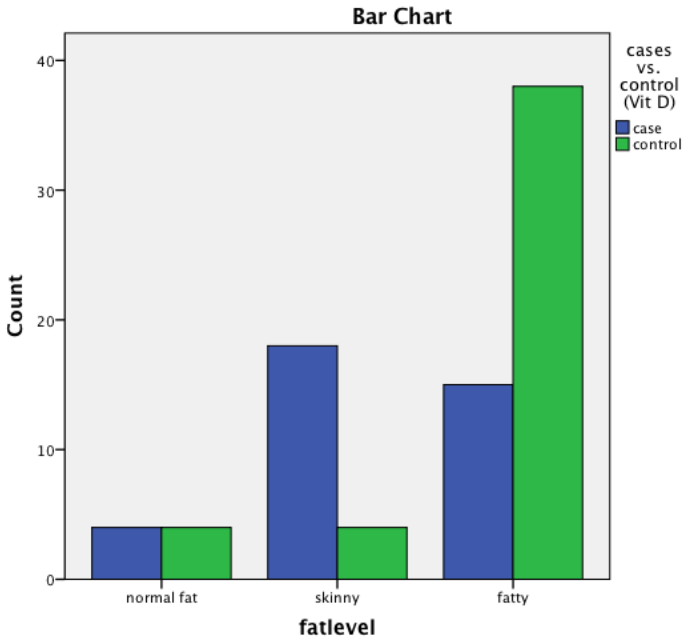

Figure 1 Comparison between Sarcopenic and Non-Sarcopenic as regard Fat Level.

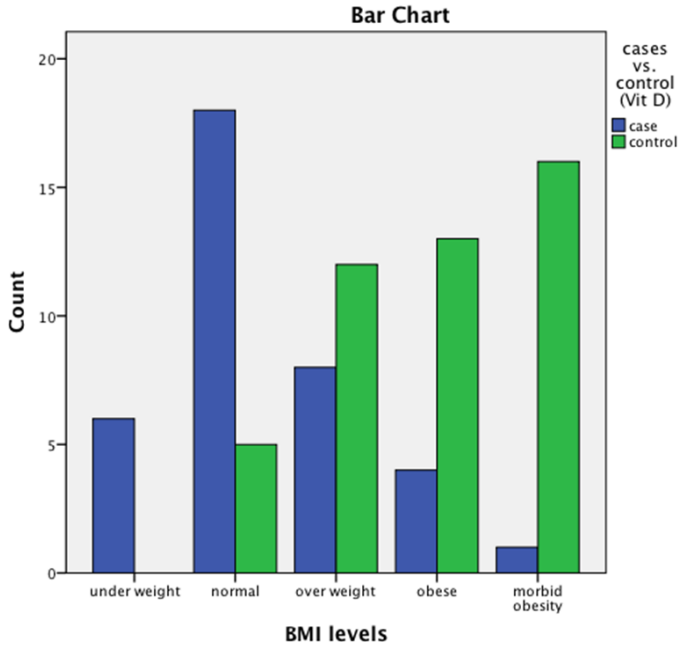

Figure 2 Comparison between Sarcopenic and Non-Sarcopenic as regard BMI.

There was no statistically significant difference between sarcopenic and non-sarcopenic as regard TGUGT, hand grip strength and physical activity (Table 3).

No statistically significant difference was found between sarcopenic and non-sarcopenic as regard TGUGT, hand grip strength (Figures 3, 4).

Table 3 Comparison between Sarcopenic and Non-Sarcopenic as regard TGUGT, Hand Grip Strength and Physical Activity

Parameter		Sarcopenic (n: 37)		Non-Sarcopenic (n: 46)		Chi Square	
		N	%	N	%	X^2	P(Sig)
TGUGT (sec)	normal	7	18.9%	5	10.9%	1.074	.300(NS)
	impaired	30	81.1%	41	89.1%		
Hand Grip Strength (Kg)	normal	2	5.4%	9	19.6%	.101	.059(NS)
	impaired	35	94.6%	37	80.4%		
Physical Activity	Not active	24	64.9%	33	71.7%	.450	.502(NS)
	active	13	35.1%	13	28.3%		

Timed Get-Up-and-Go test (TGUGT) Chi Square test p >0.05 NS

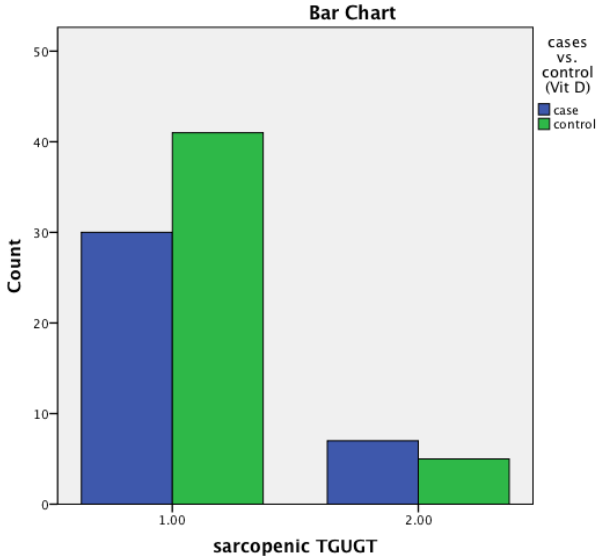

Figure 3 Comparison between Sarcopenic and Non-Sarcopenic as regard Timed Get-Up-and-Go test (TGUGT)

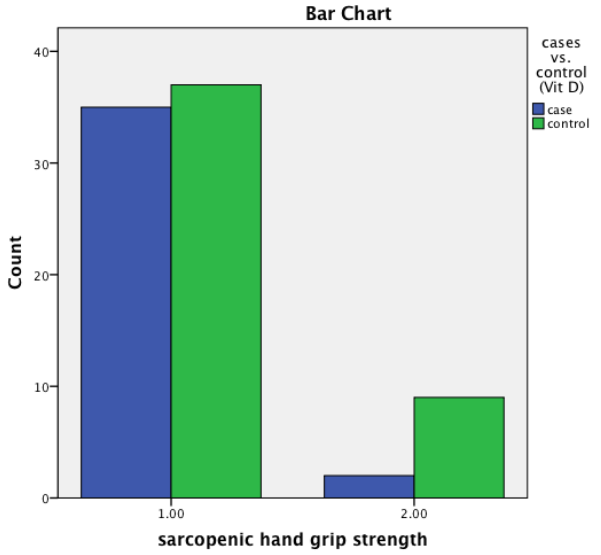

Figure 4 Comparison between Sarcopenic and Non-Sarcopenic as regard Hand Grip Strength

A statistically highly significant negative correlation was found between age and FFM, FFMI, hand grip strength, physical activity and body fat level, also highly statistically significant positive correlation was found between age and TGUGT (Table 4). The Prevalence of vitamin D deficiency in the elderly females was 15.7% while the prevalence of vitamin D insufficiency was 81.9% (Table 5).

Table 4 Correlation between Age and FFM, FFMI, Hand Grip Strength, TGUGT, Physical Activity and Body Fat Level

	Age (n: 350)	
	Pearson Correlation	Sig
FFM	-.243	.000(HS)
FFMI	-.191	.000(HS)
Hand Grip Strength	-.304	.000(HS)
TGUGT	.245	.000(HS)
Physical Activity	-.147	.006(HS)
Body fat level	-.187	.000(HS)

Fat Free Mass (FFM) Fat Free Mass Index (FFMI) Timed Get-Up-and-Go test (TGUGT) P<*0.01 HS correlation*

Table 5 Prevalence of Vitamin D Deficiency and Vitamin D insufficiency in studied group (n: 83)

Parameter	No	Percent
Vitamin D Deficiency	13	15.7
Vitamin D insufficiency	68	81.9
Normal Vitamin D	2	2.4
Total	83	100.0

Vitamin D normal value: 30-100ng/ml, deficiency < 10ng/ml, insufficiency 10-29ng/ml

4. DISCUSSION

The current study demonstrated that the prevalence of sarcopenia in elderly Egyptian females is 11.7%, and 9.1% of them have severe sarcopenia. The current study was in line with Kim et al., 2009 who conducted a cross-sectional study on 526 elderly to detect prevalence of sarcopenia and sarcopenic obesity in Korea. Also agreed with Iannuzzi-Sucich et al., 2002 who conducted a cross-sectional study on 337 older, community-dwelling research volunteers. They found that the prevalence of sarcopenia in females was 4.1% and 22.6% respectively. Park et al., 2014 conducted a cross-sectional study on 3005 female in the 2009–2010 Korean NHANES, Patel et al., 2013 conducted a cross-sectional study on 103 elderly in UK, and Kim et al., 2011 conducted a cross-sectional study on 1789 older Koreans female. They found that the prevalence of sarcopenia was 7.9%, 6.8% and 8.05% respectively. Yu et al., 2014 conducted a prospective cohort study on 4000 elderly to examine the incidence of sarcopenia and their related factors over a 4-year period, and Sanada and Miyachi, 2012 conducted a cross-sectional study on 1,488 in Japanese elderly. They found that the prevalence of sarcopenia was 9.0% and 33.6% respectively. Also Smoliner et al., 2014 conducted a cross-sectional study on 198 elderly among hospitalized patients in acute geriatric ward of a general hospital. They found that thirteen patients (6.6%) were sarcopenic and 37 (18.7%) were severely sarcopenic. This difference may be due to different mean age (82.8 ± 5.9 yrs) in that study while the mean age in the current study was 65.5 ± 5.6 yrs). Alexandre et al., 2013 conducted a cross-sectional study to detect prevalence of sarcopenia in Brazil; they found that the prevalence of sarcopenia in females was 16.1%. They used data are from the SABE Study where sarcopenia was defined using the EWGSOP criteria (Cruz-Jentoft et al., 2010).

The current study showed a highly significant difference between sarcopenic and non sarcopenic as regard the mean weight and mean height, with mean weight being lowered in sarcopenic in comparison to non- sarcopenic females. This agreed with Patel et al., 2013 who conducted a cross- sectional study to detect prevalence of sarcopenia in UK, and found that there was a highly significant difference between sarcopenic and non sarcopenic as regard the mean weight being lower in sarcopenic in comparison to non-sarcopenic, but that study found that the mean height was lower in sarcopenic in comparison to non- sarcopenic. Also this agreed with Norshafarina et al., 2013 who conducted a cross- sectional study among older adults in an urban area of Malaysia and found that there were reductions in weight in sarcopenic subjects compared with non sarcopenic subjects in both men and women. This can be explained as with aging there is loss of muscle mass along with weight loss due to many factors eg; anorexia of aging (Waters et al., 2010), which may be due to decreased taste and smell, social isolation and economic limitations that lead to decreased food intake (Buford et al., 2010), which is an important risk factor for decreased weight and development of sarcopenia in elderly. Also as

there is inverse relation-ship between FFMI and height [FFMI= FFM/height2 (Schutz et al., 2002), so with increasing height the FFMI will be decreased so sarcopenic subjects were taller than non-sarcopenic subjects.

The current study showed no statistically significant difference between sarcopenic and non-sarcopenic as regard TGUGT, hand grip strength and physical activity. This agreed with Norshafarina et al., 2013 who found that there was no significant difference between sarcopenic and non-sarcopenic as regard exercise or hand grip strength. This disagreed with Patel et al., 2013 who conducted a cross-sectional study in UK, in which Physical performance was assessed by a battery comprising chair rises and a timed up and go test (TUG). They found highly significant difference between sarcopenic and non sarcopenic as regard physical performance. This can be explained by difference of tests used to assess the physical performance. This disagreed with Sanada and Miyachi, 2012 who conducted a cross-sectional study on Japanese elderly, and found that handgrip strength in females with sarcopenia was significantly lower than in normal females. This disagreed with Alexandre et al., 2013 who conducted a cross sectional study in Brazil, Physical activity was assessed using the Brazilian version of the International Physical Activity Questionnaire (IPAQ) (Guedes et al., 2005). Physical performance was assessed using gait speed, determined by the walk test of the Short Physical Performance Battery. They found that participants with sarcopenia were significantly more likely to have lower physical activity, lower handgrip strength and gait speed than non-sarcopenic. This can be explained by the use of different tests in determining muscle performance. This disagreed with Kim et al., 2011 who conducted a cross-sectional study on older Koreans and found that participants with sarcopenia were significantly less likely to exercise regularly in comparison to non-sarcopenic participants, this can be explained as that study defined regular exercise as more than 20 minutes of vigorous exercise done more than three times per week while in the current study it was defined as at least 30 minutes of moderate exercise more than 3 times per week. This can be explained as in the current study, the prevalence of impaired muscle function (85.6% had impaired TGUGT and 86.7% had impaired hand grip strength) more than the prevalence of impaired muscle mass 13.7% as the loss of muscle mass and strength are two different processes with different pathophysiology (Visser & Schaap, 2011)). Also, the age-related loss of muscle power is more rapid than that of muscle strength which is also more rapid than the loss of muscle mass (Deschenes, 2004).

The current study showed a highly significant difference between sarcopenic and non sarcopenic as regard the mean fat level being lowered in sarcopenic in comparison to non- sarcopenic females. Also a highly significant difference was found between sarcopenic and non sarcopenic as regard the mean BMI being lowered in sarcopenic in comparison to non- sarcopenic females. This agreed with Kirchengast and Huber, 2010 who conducted a cross-sectional study to test the association between body mass index (BMI) and appendicular skeletal muscle mass adjusted for height and total skeletal muscle mass adjusted for height, in which muscle mass was estimated by DEXA. They found that both skeletal muscle masses were positively associated with BMI. Overweight women (BMI < 30.00) had a significantly less risk of developing sarcopenia in comparison with the normal weight females. This agreed with Sanada and Miyachi, 2012 who found that in subjects with class 1 sarcopenia, BMI and percentage of body fat were significantly lower than in normal subjects. This agreed with Mason et al., 2013 who conducted a randomized controlled trial in postmenopausal women, they found that women with sarcopenia, had a lower mean BMI but a higher mean % body fat in comparison to women without sarcopenia. This agreed with Patel et al., 2013 who conducted a cross- sectional study in UK, Norshafarina et al., 2013 who conducted a cross-sectional study in an urban area of Malaysia, and Alexandre et al., 2013 who conducted a cross-sectional study in Brazil and they found that participants with sarcopenia were significantly more likely to have lower BMI than non-sarcopenic.

This can be explained as the normal-weight and over-weight (not obese) females had a higher amount of subcutaneous fat tissue than under-weight females which is a source of sex steroids (Ahima and Flier 2000), due to the extra-ovarian estrogen synthesis, as the conversion of androgens to estrogens occurs in the adipose tissue (Burger et al., 2002). This decreases the effects of hormonal changes that decreased muscle mass with aging. But in obese females, excess deposition of fat lead to loss of lean tissue via inflammatory mechanisms, as cytokines have catabolic effects on muscle (Wüst and Degens, 2007).

The current study showed that there was a highly statistically significant lower mean FFM among sarcopenic in comparison to non- sarcopenic females. This agreed with Norshafarina et al., 2013 who found that Sarcopenic subjects in both men and women have lower Skeletal muscle index (SMI) than the non sarcopenic. The women also showed a lower level of fat free mass (FFM) among sarcopenic subjects, rather than non-sarcopenic. This can be explained as EWGSOP defined sarcopenia as a syndrome of progressive and generalized loss of skeletal muscle mass (or fat free mass) and strength (Morley & Cruz-Jentoft, 2012) which may be due to many factors eg: inflamm-aging (Rosenberg, 1997), genetics (Lee et al., 2007), and others. Inflammation is linked to the oxidative stress. Inflamm-aging is an age-related elevation of the proinflammatory markers and cytokines as TNF-α and IL-6 (Roubenoff, 2007). The current study showed no statistically significant difference between sarcopenic and non-sarcopenic as regard serum vitamin D level. This agreed with Marantes et al., 2011 who studied stratified random sample of community adults to detect the association of skeletal muscle mass by DEXA and strength by handgrip force and each of 25OHD, 1,25(OH)2D and PTH quartiles. They found no consistent association between 25OHD or PTH and any of the measurements of muscle mass or strength, in either

men or women. This agreed with Yu et al., 2014 who conducted a prospective cohort study to examine the incidence of sarcopenia and their associated factors over a 4-year period using (EWGSOP) criteria and found that vitamin D intake were not significantly associated with sarcopenia incidence or its reversibility. This disagreed with Kim et al., 2011 who conducted a cross-sectional study to detect whether vitamin D level is associated with sarcopenia in older Koreans. They found that groups with sarcopenic obesity and sarcopenia had lowered 25(OH) D levels than the non-sarcopenia groups. This difference may be due to the different definition of sarcopenia between that study and the current study and different age of the participants involved.

The current study showed highly statistically significant negative correlation between age and FFM, FFMI, hand grip strength, physical activity and body fat level. Also highly statistically significant positive correlation was found between age and TGUGT. This agreed with Kirchengast and Huber, 2010 who conducted a cross-sectional study to detect the association between body mass index (BMI) and appendicular skeletal muscle mass adjusted for height and total skeletal muscle mass adjusted for height. They found that the age groups differed significantly in body weight, BMI and stature, while no significant differences were found in neither appendicular skeletal muscle mass nor total skeletal muscle mass adjusted for height. Body weight as well as BMI increased steadily up to the 70th decade of life and then decreased. This also agreed with Pijlisma et al., 2013 who conducted a cross-sectional study to detect prevalence of sarcopenia among Caucasian population and found that skeletal lean mass and grip strength were significantly lower in the older age groups. This can be explained as there are age associated changes in muscle mass, strength and function with aging (Rosenberg, 1997) eg; decrease of type 2 muscle fiber (Deschenes, 2004), loss of satellite cell function, mitochondrial dysfunction and inflamm-aging (Kwan, 2013).

The current study showed that the prevalence of vitamin D deficiency in studied group is 15.9% and the prevalence of vitamin D insufficiency in studied group is 81.8%. This agreed with Marantes et al., 2011 who studied 311 men and 356 women representing an age-stratified, random sample of community adults and found that vitamin D deficiency (levels < 20 ng/mL) was found in 42% of subjects (37% in men; 45% in women). Severe vitamin D deficiency (< 10 ng/mL) was present in only 4.5% (2.6% in men; 6.2% in women), while the proportion with 25OHD ≥ 30 ng/mL was 18% (17% in men; 19% in women). While Houston et al., 2007 used data from the InCHIANTI study; They found that Approximately 28.8% of women and 13.6% of men had vitamin D levels indicative of deficiency (serum 25OHD < 25.0 nmol/L) and 74.9% of women and 51.0% of men had vitamin D levels indicative of vitamin D insufficiency (serum 25OHD < 50.0 nmol/L).

The current study showed no statistically significant correlation between vitamin D level & BMI, body fat level, FFM, FFMI, hand grip strength and TGUGT. This agreed with Bischoff et al., 2000, who conducted a cross-sectional study to investigate the relationship between muscle strength and serum levels of vitamin D metabolites in 319 ambulatory elderly, Muscle strength was measured as leg extension power (LEP) in watts. They found that serum 25OHD was significantly correlated with LEP in men only. This agreed with Marantes et al., 2011 who conducted a study to investigate the association of serum 25-hydroxyvitamin D (25OHD), 1,25-dihydroxyvitamin D (1,25(OH)2D), and parathyroid hormone (PTH) levels with skeletal muscle mass and strength in an age-stratified, random sample of community adults. They found that there was no significant association between 25OHD or PTH and any of muscle mass or strength, in either men or women. This agreed with Houston et al., 2012 who conducted a prospective cohort to detect the cross-sectional and longitudinal associations between 25OHD and physical performance and strength over 4 years of follow-up and found that approximately one-third of participants had 25OHD <50 nmol/L, and two-thirds had 25OHD <75 nmol/L and that participants with 25(OH)D <50 nmol/L have a higher BMI. This agreed with Mason et al., 2013 who conducted randomized controlled trial testing the effects of caloric restriction and/or exercise on circulating hormones and other outcomes, and found that Serum 25OHD was inversely correlated with % body fat and positively associated with lean mass, but was not significantly correlated with appendicular lean mass or SMI at baseline. This disagreed with Scott et al., 2010 who conducted Prospective, population-based study on 686 community-dwelling older adults to describe prospective associations between 25OHD, muscle parameters, and Physical activity (PA) in community-dwelling older adults. Appendicular lean mass percentage (%ALM) and body fat assessed by DEXA, leg strength by dynamometer, leg muscle quality (LMQ), PA assessed by pedometer, and serum 25OHD measured by radioimmunoassay, they found that Participants with 25OHD ≤50 nmol had lower mean %ALM, leg strength, LMQ and PA. This can be explained as the current study used BIA in determining of FFM and body fat while that study used DEXA.

5. CONCLUSION

Prevalence of sarcopenia in community dwelling elderly females was 11.7%, no statistically significant difference was found between sarcopenic and non-sarcopenic as regard serum vitamin D level. Further studies are needed to explore the prevalence of sarcopenia in elderly males and females and to detect its relation with serum vitamin D level.

Conflicts of Interest

All authors have no financial or any other kind of personal conflicts.

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