

PREVALENCE OF SARCOPENIA IN ADULTS HAVING DIABETES MELLITUS

Huzaifa Hanif**, Farooq Islam*, Sannan Khalid*, Malik Abdul Hannan*, Maham Aslam*, Asim Raza*

*Department of Rehabilitation Sciences, University of Chenab, Gujrat, Punjab, Pakistan

**University Institute of Physical Therapy, University of Lahore, Punjab, Pakistan

Abstract: The 4th decade of life begins to show a decline in muscle mass and strength. This progressive decline in mass and strength is an indication of Sarcopenia. It directly affects the diabetic population's ability to work independently. This can be correlated with a quantified value of physical activity using a tool being, PASE questionnaire.

Objective: To find out the prevalence of sarcopenia among adults having diabetes mellitus.

Methodology: A quantitative survey was conducted, and data was collected from individuals above the age of 55 diagnosed with type-II diabetes. SARC-F questionnaire was used to identify potentially sarcopenic individuals; a score of ≥ 4 on the SARC-F was the criteria for labelling an individual as sarcopenic. PASE questionnaire was utilized to quantify physical activity. A Spearman's rank-order correlation was run to determine the relationship between physical activity (PASE score) and SARC-F score.

Results: The prevalence of sarcopenia was 16.22% consisting of 36 participants of the 222 sample, of which 6.76% (15) of males and 9.46 % (21) of females were deemed to be sarcopenic (SARC-F score ≥ 4). There was a strong, negative correlation between PASE score and SARC-F score, which was statistically significant ($p = .001$)

Conclusion: Older adults with diabetes mellitus have a low prevalence of Sarcopenia in the city of Jhelum, Punjab, Pakistan.

Keywords: Sarcopenia, Muscle Mass, Muscle Strength, Diabetes Mellitus.

INTRODUCTION

As technology is evolving many things and tasks around us are getting easier and easier to perform. Complex and intricate tasks can now be done at just one touch from your fingertip. Taking into consideration of our cellular devices and mobile phones, we can not only contact to each other via calls, but send live feeds of our surroundings to millions of people all at the same time ¹. We have vehicles to move from one place to another, capable of travelling at high velocities and we have every facility at our doorstep ².

Life was not like before as it is today in front of our eyes. Beside all these positive factors there are a number of negative things too with respect to every field. In short, technology has made the world a global village but it is affecting human health in very adverse ways ³. Sedentary lifestyle is the next main goal for every person living here. Every person is making effort that he/she might get as sedentary lifestyle as he/she can. Due to this, sedentary lifestyle is introducing laziness and procrastination in human being ⁴. This is the main reason that every person on earth is getting bad effect of it in terms of everything, mainly health. Lack of exercise and lack of physical activity is making a person more and more susceptible to different diseases ².

In a growing individual, the muscular structure sees an upward trajectory in terms of strength and size up until or around the 4th decade of life. Throughout this part of life, the muscle maintains its strength and form, though it has been observed that, in most individuals, beyond this age bracket the muscular strength and size begins to deteriorate into a downward trajectorial manner ⁵. Isometric as well as concentric muscular strength

was shown to peak between the 2nd and 3rd decade where females showed to peak sooner than males and begin to decline earlier than males yet decline at a slower pace than males as well. The human body's strength remains static during the 4th or 5th decade with an average decline of 12% to 15% weakening every 10 years until the individual reaches his/her 80's^{6,7}. The lack of physical activity in a person is evidently recognized as an absolute risk factor in the development of numerous long-term illnesses, which include coronary heart disease (CHD), Stroke, Hypertension, Type II diabetes mellitus, Osteoporosis, Breast and Colon Cancer. Some added risk factors for the mentioned illnesses also comprise of obesity (being over-weight), diminished skeletal muscle mass, high blood pressure (not necessarily associated with hypertension), and high blood sugar (not necessarily associated with diabetes mellitus) and increase or decrease in blood cholesterol or accompanying elevated lipid levels⁸. One other major disease which may be characterized by a sedentary life style or general reduction of physical activity is the syndrome characterized by the involuntary, age-related decline in strength and/or function due to decrease in skeletal mass which promotes weakness and loss of independent living is termed as Sarcopenia⁹.

It is a generalized, multifactorial skeletal muscular disorder and can be progressive in nature if not diagnosed or managed appropriately^{10,11}. It was at some point only being recognized in the fields of geriatric and medical specialties however with the advancement in research, it encompasses several other pillars of health such as the maintenance of proper nutrition associated with the lack of physical activity/function such as Activities of Daily Living (ADLs) over a longer duration of time within the realm of physical therapy^{12,13}.

Sarcopenia is an age-related thing which happens to every person in his old age years. It occurs very often, not only by factors affecting sarcopenia but also have an effect on genetic sequence and most commonly lifestyle throughout lived life. It also gets started and come in mid-life years if a person is suffering from other conditions too¹⁴.

The term, Sarcopenia is a derivation from Greek that literally means "Poverty of Flesh"¹⁵. It was introduced in 1980s and an age-related disease which degrades the performance of musculoskeletal system simultaneously decreasing the body weight of such persons with mobility, bounding them to dependency and immobility. Back in some years, sarcopenia has become a focused and common discussion point in term of research. Sarcopenia slows down of normal human musculoskeletal function, increases frailty and in some cases can contribute to mortality and mortality factors. Great increases in the prevalence of Sarcopenia is predicted due to a rise in life-changing technologies that require less and less physical activity, especially those with any to multiple co-morbidities¹⁶. Chances of an individual to get into sarcopenia's circle increases as his age get advanced and are higher in some common clinical settings like acute hospital admission, nursing and old age homes.

Gender greatly affects the population of sarcopenia as is more commonly seen in men¹⁷. Also presence or absence of physically active lifestyle (sedentary lifestyle) greatly affects the rate of sarcopenia in an individual¹⁸. Stroke and cognitive impairments can lead a person towards sarcopenia as a study conducted by Maeda et al. indicates that chance for sarcopenia is increased in individuals with stroke and cognitive impairment yet they are still a separate debatable variables to discuss on¹⁹.

Co-morbidities and accommodating other illnesses are directly related to sarcopenia as a study conducted by TC Borges states that comorbidities are 29% directly in relation with sarcopenia whereas nutritional factor are at 49% with a greater amount of risk²⁰. Diabetes is the state of abnormal glucose level in blood and body serums. The abnormality of blood glucose levels can be defined as hyperglycemic means higher levels of glucose in human arterial blood and hypoglycemic means having lower level of glucose in human arterial blood. Both are considered as a state of an abnormality in medical practice everywhere around the globe²¹.

It is one of the chronic diseases now a day and is growing to level of epidemic numbers in

some specific populations. The two most common types found in literature were, the type 1 diabetes mellitus and the type 2 diabetes mellitus. Type-1 Diabetes Mellitus (DM) is considered as destruction of beta cells by our body's immune system. Type-2 Diabetes Mellitus (DM) is found in such persons who have built resistance against human body insulin. It can be due obesity or decreased level of insulin secretion by natural body mechanism²².

Some of the common symptoms which were mentioned in the literature that help a medical practitioner to distinguish either a person is carrying out Diabetes Mellitus with him/her or not are as follow: Increased Thirst, Polyuria, Extreme tiredness, Weight loss, Genital Itching, Blurred vision²³.

After reviewing several things from existing literature, it is clear that Diabetes Mellitus can adversely affect our body and can give us organ failures as well as issues regarding our musculoskeletal system of our body too²⁴. Following the above stated things, it is clear that Diabetes Mellitus is a silent killer that dominates the destruction of human body by introducing minor inflammation and difference in PBMC levels²⁴. Main purpose of our study is to find out the prevalence of sarcopenia among adults having diabetes. As both of these illnesses are commonest diseases round the world and are getting the attention of researchers and medical practitioners day by day. Following the results of our study, there will be a clear path for many researchers to fill up the gap and to discover more about both of these things individually and collectively.

METHODOLOGY

A quantitative survey was conducted, and data was collected from individuals above the age of 55 diagnosed with type-II diabetes. SARC-F questionnaire was used to identify potentially sarcopenic individuals; a score of ≥ 4 on the SARC-F was the criteria for labelling an individual as sarcopenic. PASE questionnaire was utilized to quantify physical activity. A Spearman's rank-order correlation was run to determine the relationship between physical activity (PASE score) and SARC-F score.

RESULTS

There were a total of 222 participants included in the study; 132 (59.4%) of the participants were male, whereas 90 (40.5%) participants were female (Table 1) (Figure 1). Minimum age was 55 years and maximum age was 100 years with 62.53 being the mean age, with a Standard Deviation of ± 8.232 (Table 1) (Figure 2). 155 participants fell into the age group 55-64 constituting 69.8% of the total sample, while 46 participants fell into the 65-74 age group (20.7%), 13 participants fell into 75-84 age group (5.9%), 6 participants fell into 85-94 age group (2.7%), while 2 participants fell into the 95-104 age group constituting of 0.9% of the total sample (Table 1).

The maximum duration of work per day was found as 18 hours a day while the minimum hours were 0 hours, making the mean hours 4.28 hours per day, with a Standard Deviation of ± 4.88 (Table 1) (Figure 4). 115 participants said they work 0 hours in a day, which contributes to 51.8% of the total sample. 11 respondents work between 1 to 5 hours per day (5%), 76 respondents worked between 6 to 10 hours per day (34.2%), 16 respondents worked between 11-15 hours per day (7.2%), while 4 individuals worked between 16-18 hours per day which constitutes to 1.8% of the sample (Table 2).

104 participants, being 46.8% of the total sample were employed, 92, being 41.4% were unemployed individuals while the remaining 26, being 11.7% of the sample size were retired individuals (Table 2). SARC-F questionnaire was used to identify potential sarcopenic individuals. A score of 4 or more was indicative of sarcopenia. The frequency of sarcopenia was 16.2%; 6.76% (15) of men and 9.46% (21) of women were deemed to be sarcopenic (SARC-F score ≥ 4) (Table 3). When analyzed individually, men were found to have an 11.4% (15 out of 132 participants) prevalence of Sarcopenia (Table 8), while women were found to have a 23.3% (21 out of 90 participants) prevalence of Sarcopenia (Table 3).

Individual SARC-F components were found to have the following frequencies, Strength component consisted of 136 participants falling in the category of "None" (61.3%), 46 participants in

the category of "Some" (20.7%), and 40 participants in the category of "A lot of unable" (18%) (Table 3). In the Assistance in Walking component, 182 participants fell into the category of "None" (82%), 32 participants in the category of "Some" (14.4%), and 8 in the category of "A lot, unable or uses aid" (3.6%) (Table 3).

In the Rise from Chair component, 181 participants fell into the category of "None" (81.5%), 32 participants in the category of "Some" (14.4%), while 9 participants in the category of "A lot, unable or uses aid" (4.1%) (Table 3). In the Climb from Stair component, 119 participants fell into the category of "None" (53.6%), 80 participants in the category of "Some" (36%), while 23 participants in the category of "A lot or unable" (10.4%) (Table 3).

In the final component of SARC-F of Falls, 175 participants fell into the category of "None" (78.8%), 40 participants in the category of "Some" (18%), while 7 participants in the category of "A lot or unable" (3.2%) (Table 3). A Spearman's rank-order correlation was run to determine the relationship between physical activity (PASE score) and SARC-F score. There was a strong, negative correlation between PASE score and SARC-F score, which was statistically significant ($r_s(222) = -.968, p = .001$) (Table 4).

A Spearman's rank-order correlation was also run to determine the relationship between Prevalence of Sarcopenia and Age of the participants. There was a weak, positive correlation between the prevalence of Sarcopenia and the ages of the participants, which was statistically significant ($r_s(222) = .202, p = .001$) (Table 4). A Spearman's rank-order correlation was run to determine the relationship between Duration of Work and SARC-F Score. There was found to be a moderate, negative correlation between both variables which was statistically significant ($r_s(222) = -.368, p = .001$) (Table 4).

A Spearman's rank-order correlation was also run to determine the relationship between Duration of Work and PASE Score. There was found to be a moderate, positive correlation between both variables which was statistically significant ($r_s(222) = .513, p = .001$) (Table 4).

Table 1: Descriptive analysis of demographic data

Variables	Mean \pm S.D
Mean Age	62.53 \pm 8.23
Duration of work	4.28 \pm 4.89

Table 1: Demographic characteristics of participants

Variables	Response	Frequency	Percentage
Gender	Male	132	59.40%
	Female	90	40.50%
	55-64	155	69.80%
Age Groups	65-74	46	20.70%
	75-84	13	5.90%
	85-94	6	2.70%
	95-104	2	0.90%
	0	115	51.80%
Hours per Day	1 to 5	11	5%
	6 to 10	76	34.20%
	11 to 15	16	7.20%
	16 to 18	4	1.80%
Occupation	Employed	104	46.80%
	Unemployed	92	41.40%
	Retired	26	11.70%

Table 3: Frequency distribution of participants

Variables	Response	Frequency	Percentage	
Prevalence of Sarcopenia	Gender	Male	15	6.76%
		Female	21	9.46%
		Total	36	16.20%
Prevalence of sarcopenia	In men	Yes	15	11.40%
		No	117	88.60%
		Total	132	100%
Prevalence of Sarcopenia	In women	Yes	21	23.30%
		No	69	76.70%
		Total	90	100%
SARC-F Strength Component	Measure	None	136	61.30%
		Some	46	20.70%
		A lot or unable	40	18%
SARC-F Assistance in Walking Component	Measure	None	182	82%
		Some	32	14.40%
		A lot, unable or uses aid	8	3.60%
SARC-F Rise from Chair Component	Measure	None	181	81.50%
		Some	32	14.40%
		A lot, unable or uses aid	9	4.10%
SARC-F Climb from Stair Component	Measure		119	53.60%
		Some	80	36%
		A lot or unable	23	10.40%
SARC-F Falls Component	Measure	1 to 3 falls	40	18%
		4 or more falls	7	3.20%

Table 4: PASE scoring and P values

Variables	R-value	P-value
SARC-F Score * PASE Score	-0.968	<0.001*
Prevalence of Sarcopenia * Age	0.202	<0.001*
Duration of Work * SARC-F Score	-0.368	<0.001*
Duration of Work * PASE Score	0.513	<0.001*

DISCUSSION

The purpose of this research was to determine the prevalence of Sarcopenia in the population of Jhelum, Punjab, Pakistan among individuals over the age of 55 years, and who have been diagnosed with diabetes mellitus for more than one year. Sarcopenia in Pakistan is still an understudied topic of research which reflects the significance of this research as along with Sarcopenia, it aims to develop a relation between other comorbidities like diabetes mellitus.

The significant findings of this research exhibit that about 16.2% of the sample exhibited a prevalence of Sarcopenia. Within this finding men had a prevalence of 6.76% and whereas women showed a prevalence of 9.46% cumulative of the recorded value of 16.2%. However individually, men had a prevalence of 11.4% (15 out of 132 participants), while women were found to have a prevalence of 23.3% (21 out of 90 participants).

This shows that women have a higher prevalence of Sarcopenia as compared to men. Women from the sample also showed to work less hours in a day as compared to men from the same age group. Similarly, more women also were unemployed as compared to men. Gender greatly affects the population of sarcopenia as is more commonly seen in men¹⁷. Also presence or absence of physically active lifestyle (sedentary lifestyle) greatly affects the rate of sarcopenia in an individual¹⁸.

When compared to the average adult with no disease or disability, this prevalence is 6.2% higher than the world average with adults who have not been diagnosed with diabetes mellitus, which is prevalence of 10%²⁵. Men from this research specifically showed a 1.4% higher prevalence compared to the world average, while women from the sample showed a 13.3% higher prevalence compared to the world average who do not have diabetes mellitus, which is 10% for both men and women²⁵.

Compared to the world prevalence who have been diagnosed with diabetes mellitus, the current sample showed a higher prevalence of 0.3% such that the prevalence was found to be 15.9% in

diabetic adults worldwide compared to the 16.2% from the recorded study population²⁶. This general increase among this sample population is somewhat contradictory to some researches such that Non-Asian(19% in Non-Asian men and 20% in Non-Asian women) individuals were found to have higher prevalence of Sarcopenia as opposed to Asian adults (10% in Asian men and 11% Asian in women)²⁵.

The first correlation was determined between the SARC-F scores from the sample which is the indicative factor for diagnosing Sarcopenia and the PACE score which is used to measure the capability of physical activity of the individual. Both questionnaires are reliable tools for determining physical health^{27, 28}. This correlation is significant in determining the rate of perceived physical capability using different questioning approaches. In this correlation there was a strong, negative correlation which is consistent with the design of both questionnaires. The PACE questionnaire measures the perceived physical capabilities of an individual such that a higher score indicates greater physical health whereas the SARC-F questionnaire is used to assess the difficulty or inability of an individual to perform specific tasks. A lower SARC-F score is indicative of greater physical health which exhibits how both measures are designed to be inversely proportional to one another. This trend is reflected in the current study population as well.

The second and more significant correlation was run between the age of the respondents with their prevalence of Sarcopenia. Prevalence was measured by categorizing individuals with a score of 4 or higher as Sarcopenic. Sarcopenic individuals showed weak but strong correlation with the increasing ages of these individuals. This shows that an increase in age is a determinant of having Sarcopenia. This trend is consistent with the theory that Sarcopenia is an age-related disease and has a higher onset in aged individuals²⁹.

Another two correlation were found between the duration of work with the SARC-F score of the individuals and the PACE scores of the individuals respectively. The correlation of the duration of work with the SARC-F score

indicated a weak, negative correlation such that individuals with a lower SARC-F score exhibited more hours of physical work within a day, while individuals with higher SARC-F scores exhibited lesser hours of work within a day³⁰. On the contrary, the correlation between the duration of work and the PACE score of these individuals reflected a moderate, positive correlation exhibiting that an increased PASE score was seen in diabetic individuals who work longer durations in a day³¹.

Limitations: There is insignificant data to accurately represent the true prevalence of Sarcopenia in Pakistani healthy individuals, hence it is not possible to compare the findings from the current research of diabetic adults in Pakistan to existing Pakistani literature regarding Sarcopenia. The SARC-F has high specificity but low sensitivity; it is an effective tool that may screen potentially sarcopenic individuals, but a definite diagnosis may not be reached which requires further testing.

Recommendations This same measurement of prevalence should be carried out among other cities and areas of Pakistan. Calculate a national average and prevalence.

CONCLUSION

Older adults with diabetes mellitus have a low prevalence of Sarcopenia in the city of Jhelum, Punjab, Pakistan.

Conflict of Interest

There was no conflict of interest.

Financial Statement

No fundings were given by any authorities; it was a project thesis of doctor of physical therapy.

Data availability

Data will be provided on the demand by corresponding author.

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First Author: Huzaifa Hanif*

Student (DPT), University Institute of Physical Therapy, University of Lahore, Lahore, Punjab, Pakistan, raja.huzaifa46@gmail.com

Second Author: Farooq Islam

PhD (Scholar), Assistant Professor, Department of Rehabilitation Sciences, Allied Health Sciences, University of Chenab, Gujrat, Punjab, Pakistan. farooq.islam@uipr.uol.edu.pk, <https://orcid.org/0000-0002-2663-8673>

Third Author: Sannan Khalid

Student (DPT), University Institute of Physical Therapy, University of Lahore, Lahore, Punjab, Pakistan, sannankhalid111@gmail.com

Fourth Author: Malik Abdul Hannan

Student (DPT), University Institute of Physical Therapy, University of Lahore, Lahore, Punjab, Pakistan, hannanmalik360@gmail.com

Fifth Author: Maham Aslam

Student (DPT), University Institute of Physical Therapy, University of Lahore, Lahore, Punjab, Pakistan, mahamaslam15@gmail.com

Sixth Author: Asim Raza, PhD (Scholar), M.Phil. (Epidemiology and Public Health), M.Sc. (Biostatistics), Assistant Professor (Epidemiology and Biostatistics), Allied Health Sciences, University of Chenab, Gujrat, Punjab, Pakistan, asimrazathakur@gmail.com, <https://orcid.org/0000-0002-7667-1869>

***Corresponding Authors:**

Asim Raza¹
asimrazathakur@gmail.com
0092345-5923485

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