

## **Study of Bidirectional Relationship between Sarcopenia and Type 2 Diabetes Mellitus at RIMS, Raichur**

**Dr Rohit Dixit**

Professor Department of pharmacology SVS medical College Mehaboobnagar ,  
Telangana, India

**Dr Arun M**

Associate professor department of general medicine RIMS  
Raichur

**Dr Chandrashekar**

Assistant professor, department of general medicine,  
RIMS Raichur

**Dr Bhaskara**

Assistant professor, department of general medicine, RIMS  
Raichur

### **ABSTRACT**

#### **BACKGROUND**

More than 95% of people with diabetes have type 2 diabetes. Apart from the micro and macrovascular complications people with diabetes especially patients with long standing diabetes have new complication with degenerative muscle disease called as sarcopenia. The prevalence of sarcopenia is more in diabetics and sarcopenia itself is a risk factor for diabetes mellitus. It's a controversial bidirectional association.

#### **OBJECTIVES / AIMS**

To study the clinical profiles and association of sarcopenia and non-sarcopenic patients with T2DM

#### **MATERIALS AND METHODS**

It is a cross sectional observational study done in RIMS hospital, Raichur. All the patients aged above 18 years and have been diagnosed with type II diabetes for the last 1 year had been included in the study. Patients were subjected to anthropometric measurements and we measured hand grip strength (HGS) using a medical handgrip dynamometer. Based on the observation we categorised them to sarcopenic group and non sarcopenic group. The clinical profile of both groups were then compared and statistically analysed.

#### **RESULTS**

A total of 100 patients were included in the study who met inclusion and exclusion criteria. Among them, 30 patients had sarcopenia. Mean age of presentation was 66.3 Years. Males were more in sarcopenic group. The mean BMI in sarcopenic patients group was 21.3 which were far less compared to non sarcopenic patients group (28.5).

#### **CONCLUSION**

Sarcopenia is common in adults over the age of 70 years and in males. BMI is a strong predictor of skeletal muscle mass. There is significant association with type 2 diabetes

mellitus and sarcopenia especially when the patients are having long standing diabetes and associated complications.

**KEYWORDS:** Muscle, Grip, Strength, Old age, Geriatrics, Progressive loss

## INTRODUCTION

Type 2 diabetes which was called non-insulin-dependent, or adult-onset results when body use insulin ineffectively. More than 95% of people with diabetes have type 2 diabetes. [1] The usual age of onset is above 40 years. Many people all over the world are battling with type II diabetes mellitus day by day. [2] Though many treatment options are available for the diabetics, their absolute number has increased in the recent years. This may be due to decreased mortality because of better health care services and advancement in prevention and treatment of complications. [3] Long standing diabetes patients have complications like macrovascular and microvascular complications. Macrovascular complications like cerebrovascular accidents, MI, peripheral vascular diseases. Microvascular diseases include diabetic retinopathy, neuropathy and nephropathy etc. [4] Apart from these micro and macrovascular complications people with diabetes especially patients with long standing diabetes have new complication with degenerative muscle disease called as sarcopenia. [5, 6 & 7]

Sarcopenia means loss of muscle mass, muscle strength or physical function which occurs usually with advancing age. [8 & 9] Quality of life is severely affected in these individuals. The prevalence of sarcopenia ranges from 10% to 40%, worldwide in different areas. [10] Sarcopenia has received more and more interest over the past few years and it is now considered as a separate disease by ICD (International Classification of Disease), and it has assigned the code M 62.84 for sarcopenia. [11] Sarcopenia is thought to be multifactorial and the various etiologies of sarcopenia are environmental causes, disease triggers, inflammatory pathway activation, mitochondrial abnormalities, loss of neuromuscular junctions, reduced satellite cell numbers, and hormonal changes etc. The biology or pathophysiology of sarcopenias in type II diabetes is not fully understood. However some theory suggest that insulin resistance which occurs in skeletal muscles, leads to improper glucose utilization and protein synthesis, which, in turn, aggravates insulin resistance and muscle loss, thus turning into a vicious circle. [12] Further, Type II diabetes is also one among various contributing factors for sarcopenia. Usually with advancing age, beyond 40 years there is progressive loss of muscle mass. But this progressive loss of muscle is said to more frequent in type II diabetes patients. The prevalence of sarcopenia was more in diabetics then in non-diabetics according to various studies. Some studies also suggest that Sarcopenia may contribute to the development and progression of T2DM. [6]

But this bidirectional relationship is a controversial topic since there remains a lot of research gaps and unanswered question to prove this association. Based on the above considerations, we tried to explore the clinical profiles of sarcopenia and non-sarcopenic patients with T2DM.

## MATERIALS AND METHODS

This was a cross sectional observational study. The study was done at RIMS Hospital, Raichur road from Mach 2020 to February 2021. Ethics committee clearance was obtained

before starting the study. All the patients aged above 18 years and have been diagnosed with type II diabetes for the last 1 year had been included in the study. Patients with serious co-morbidities and severe complications were excluded from the study. After obtaining informed consent from the participants, patients were subjected to anthropometric measurements. We measured the participants' hand grip strength (HGS) using a medical handgrip dynamometer according to the methodology recommended by Roberts et al. [13]. Each individual sat on a chair with armrests after removing rings, watches, and other objects from their hands and wrists. Examiners were instructed to provide a verbal motivational stimulus to determine the individual's maximum strength at each measurement. Three measurements were obtained for each hand in an alternating manner, and the maximum strength was defined as the greatest of all three measurements. Weakness was defined according to the Foundation for the National Institutes of Health Sarcopenia Project (FNIH) cutoff point as a HGS < 26 kg in men and <16 kg in women. Data was collected and recorded on a preset study proforma and the data was analysed by SPSS Ver 21.

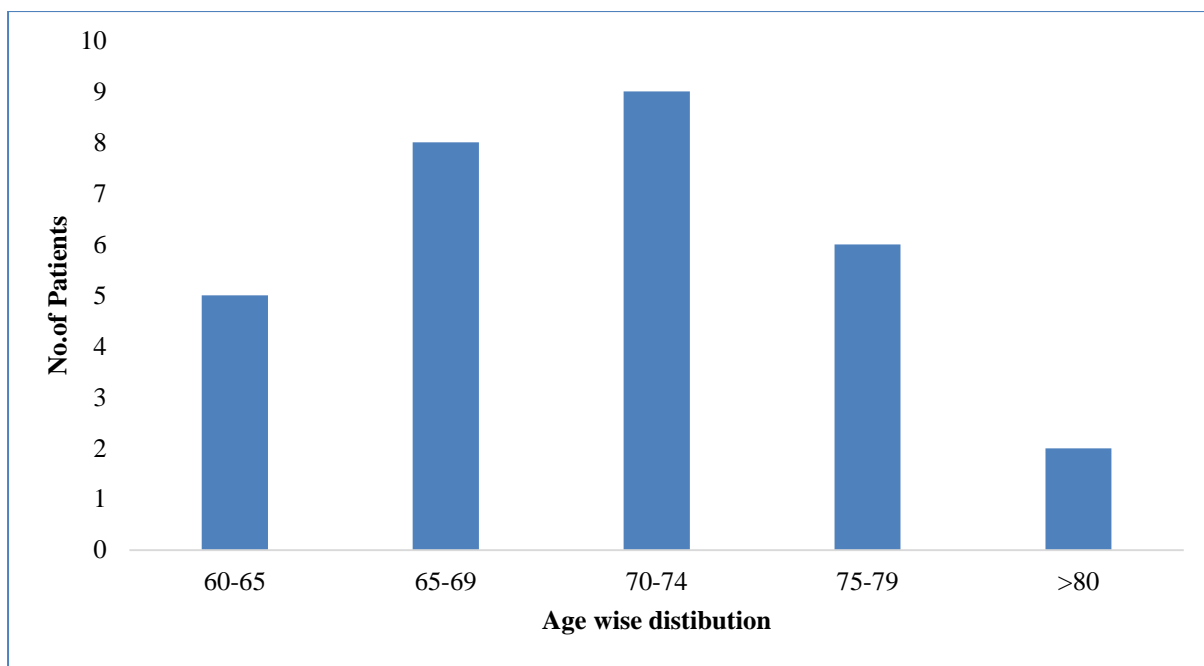
## RESULTS

A total of 100 patients were included in the study who were diagnosed with type 2 diabetes mellitus in the past 1 year. Among them, 30 patients had sarcopenia. Patients of age ranging from 60 to 85 years were included in the study. Maximum patients had their age between 70-75 years and the mean age of presentation was 66.3 Years. Among the 30 sarcopenic patients, 20 (66.66%) patients were males and 10 (33.33%) were females, whereas in non-sarcopenic group 38 (54.28%) were males and 32 (45.71%) were females. The mean BMI in sarcopenic patients group was 21.3 which were far less compared to non sarcopenic patients group (28.5). Other patient demographic characteristics are shown in table 1 and figure 1.

**Table 1: Patient demographics**

Characteristics	Sarcopenia group	Non sarcopenia group	Total	P Value
No. of Patients(n)	30	70	100	
Mean age (Mean±SD)	71.1±4.2	64.3±5.1	66.3±6.7	<0.01
Male	20	38	58	
Female	10	32	42	
BMI, Kg/m <sup>2</sup> Mean±SD	21.3±3.5	28.5±4.2	26.2±3.8	<0.05
Smoking	12	22	34	
Alcohol	15	32	74	

\* P value is significant



**Figure 1: Age distribution of patients**

Based on the available history, clinical examination and available reports we could explore the details of their diabetes, their co-morbid conditions and complications of diabetes. All these data is depicted in table 2.

**Table 2: Clinical characteristics of patients**

Characteristics	Sarcopenia group	Non sarcopenia group	Total	P Value
<b>Details of diabetes</b>				
Mean duration (years)	12	8	10	0.008 *
Insulin users (%)	15 (50%)	21 (30%)	36 (36%)	0.09 *
<b>Co-morbidities</b>				
HTN(%)	10 (33.3%)	20 (28.5%)	30 (30%)	0.63
Thyroid Disorders(%)	2 (6.6%)	5 (7.14%)	7 (7%)	0.931
Dyslipidemia	8 (26.6%)	24 (34.3%)	32 (32%)	
<b>Complications</b>				
Neuropathy	8 (26.6%)	12 (17.1%)	20 (20%)	0.271
Nephropathy	4 (13.3%)	6 (85.7%)	10 (10%)	0.466
Retinoopathy	6 (20%)	10 (14.28%)	14 (14%)	0.475
Stroke	3 (10%)	1 (1.4%)	4 (4%)	0.045 *

\* P value is significant

## DISCUSSION

There is an increase incidence of sarcopenia in diabetes mellitus especially those who are long standing and are of older age. The present study was conducted in a sub urban centre to study the clinical profile and find out association of sarcopenia and type 2 diabetes

mellitus. As stated in the results a total of 100 participants were included in the study. Majority of the patients were male. This finding is in line with the observation found by papadopoulou et al [14] which was also done in a similar study setting. Another study by Reijnierse [15] stated that male patients are more likely to suffer from sarcopenia than females however the mechanism is unclear and postulated to be related to hormone effects.

A total of 30 out of 100 patients had sarcopenia and the mean age of those with sarcopenia is more than those without it and it is statistically significant. Larsson L et al in their study have stated that after the age of 40 the muscle mass starts declining and after the age of 70 the loss of motor neurons also has an significant effect in leading to loss of function and sarcopenia development. [16] The mean duration of diabetes mellitus was also more and there were higher insulin users. In some studies, it was seen that the longer the duration of diabetes, the higher the prevalence of sarcopenia [17, 18 & 19]. In particular, the paper by Cui et al. showed that dividing participants according to diabetes duration, the prevalence of sarcopenia was 27.6%, 21.8%, and 52.6%, respectively in the groups with diabetes duration below 10, between 10 and 20, and above 20 years [20]. However, other studies [21, 22] did not find any association between disease duration and sarcopenia. This was confirmed by the meta-analysis of Anatagostis et al. showing no difference in sarcopenia prevalence between individuals with a mean T2DM duration of 9 years or <8.5 years [23]. However there is no proper literature of the effect of HbA1c and the development of sarcopenia nor insulin use.

Sarcopenia was also associated with higher percentage of complications especially neurological and CVS disorders. Studies have shown that there is higher risk of sarcopenia in patients having micro and macro vascular complications of diabetes, [5] more association have been found with neuropathy which might further impair the quality of life of these patients, as well as increase the social and economic burden, cognitive impairment, gait disorder, depression, and morbidity.

## CONCLUSION

Sarcopenia is common in adults over the age of 70 years and in males. BMI is a strong predictor of skeletal muscle mass. There is significant association with type 2 diabetes mellitus and sarcopenia especially when the patients are having long standing diabetes and associated complications. These results are to be confirmed by large scale multi-centric study involving all sections of the society to find out the effect on the occurrence of sarcopenia.

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