

# Impact of Duration of Type 2 Diabetes Mellitus on Dynamic Postural Stability

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## Abstract:-

### ➤ Introduction

Diabetes mellitus (DM) is the most common endocrine disorder, affecting over 100 million people globally. Type 2 diabetes mellitus (T2DM) is particularly prevalent, with projections indicating a rise in global prevalence from 8.8% in 2017 to 9.9% by 2045. India, in particular, has the highest number of diabetic patients. T2DM patients often experience peripheral neuropathy and muscle weakness, leading to postural instability and gait issues. This study aims to assess the dynamic postural stability in T2DM patients and its correlation with the duration of diabetes.

### ➤ Methods

An observational study was conducted from February 2024 to June 2024 at the University College of Physiotherapy and the Department of Medicine, Guru Gobind Singh Medical College and Hospital, Faridkot. Thirty patients with T2DM, aged 40-60, were enrolled. The Y-Balance Test (YBT) was used to evaluate dynamic postural stability. Patients performed reach tests in three directions: anterior (AN), posteromedial (PM), and posterolateral (PL). The composite reach distance was calculated for each leg, and the composite percentage was determined.

### ➤ Results

The study included 16 males and 14 females with a mean age of 53.2 years and an average diabetes duration of 5.723 years. The composite reach percentages for the left and right legs were 68.43% and 68.37%, respectively. Significant correlations were found between the reach distances of both legs, particularly in the AN, PM, and PL directions. A negative correlation was observed between diabetes duration and composite reach percentages, indicating that longer diabetes duration is associated with greater impairment in dynamic postural stability.

### ➤ Discussion

The findings suggest that patients with longer durations of T2DM have compromised dynamic postural control, increasing their risk of falls and lower limb injuries. The YBT, derived from the Star Excursion Balance Test (SEBT), is effective in assessing these deficits. The results align with previous studies, confirming the impact of diabetes on postural stability.

### ➤ Conclusion

Dynamic postural stability declines with the increasing duration of T2DM, regardless of the presence of diabetic complications. Regular assessment using the YBT can help in early identification and management of postural instability in T2DM patients, potentially reducing fall risk and associated injuries.

## I. INTRODUCTION

Diabetes mellitus (DM) is commonest endocrine disorder that affects more than 100 million people worldwide.<sup>1</sup> According to the recent data by International Diabetic Federation (IDF), diabetes is on the rise worldwide, with a global prevalence in adults in 2017 being 8.8% of the world population, with the anticipation of a further increase to 9.9% by 2045.<sup>2</sup> India leads the world with largest number of diabetic subjects earning the dubious distinction of being termed the —diabetes capital of the world.

Patients with Type-II diabetes mellitus are more prone to peripheral neuropathy and muscular weakness and consequently suffer balance postural instability and gait problems.<sup>1</sup> Dynamic postural stability is crucial for maintaining balance during transitions from movement to stillness.<sup>3</sup> So, It becomes important to assess the balance and dynamic posture to prevent such problems in patients of type 2 diabetes mellitus. The main aim of this study was to analyse the dynamic postural stability in such patients and its relation with duration of diabetes.

## II. MATERIAL AND METHODOLOGY

This observational study was conducted from February, 2024 to June, 2024 at OPD, University College of Physiotherapy and Department of Medicine, Guru Gobind Singh Medical College and Hospital, Faridkot. A total of 30 patients, both male and females between the age group of 40-60 years, diagnosed with type 2 diabetes mellitus, with or without symptoms of diabetic neuropathy were enrolled. Deaf and blind patients, patients having any recent lower limb injury, diabetic foot and foot ulcers, patients having postural imbalance due any other neurological deficit are excluded from the study.

Patients were instructed about the procedure and shown how to perform the Y-balance test (YBT). The YBT consists

of a three-part test that is used to assess the dynamic postural stability. Patient was asked to stand on the center point of the Y with one foot, keeping the hands on the hips. Instructions were given to the patient to reach the foot forward along the anterior (AN) direction without touching the ground, and the maximum distance was recorded. Next, the patient was asked to move the foot posteriorly; toward the midline and away from the midline to record the maximum distance in posteromedial (PM) and posterolateral (PL) directions respectively. Finally, the patient performed the posterolateral (PL) reach by moving the foot diagonally backward and away from the midline and the maximum distance was recorded. The composite reach distance was calculated as the average of maximum reach distances in the three directions (AN, PM, PL) for each leg. Composite percentage was then calculated by average reach distance  $\times 100$ .

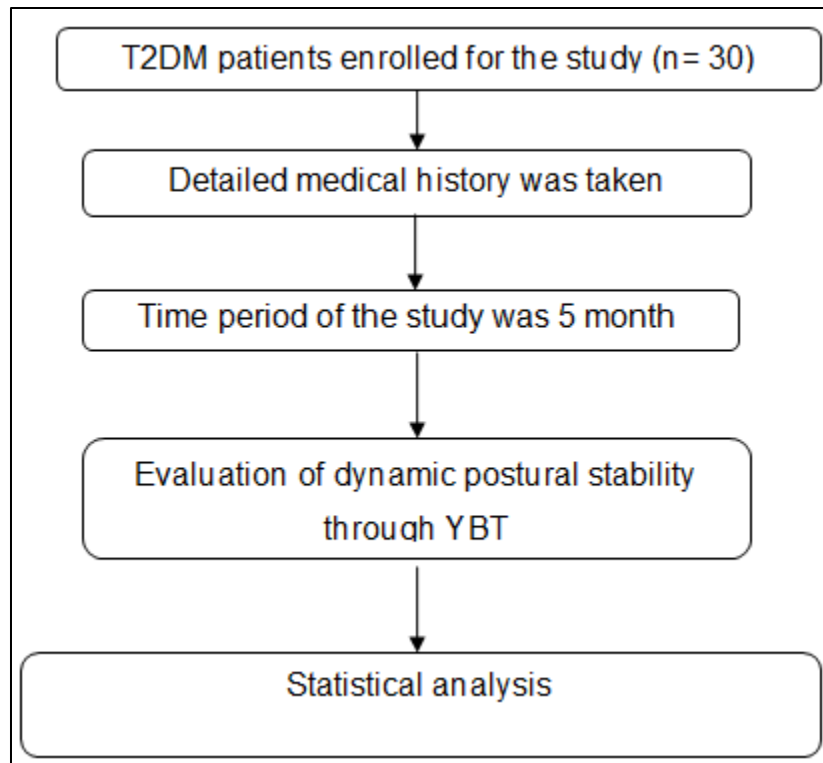


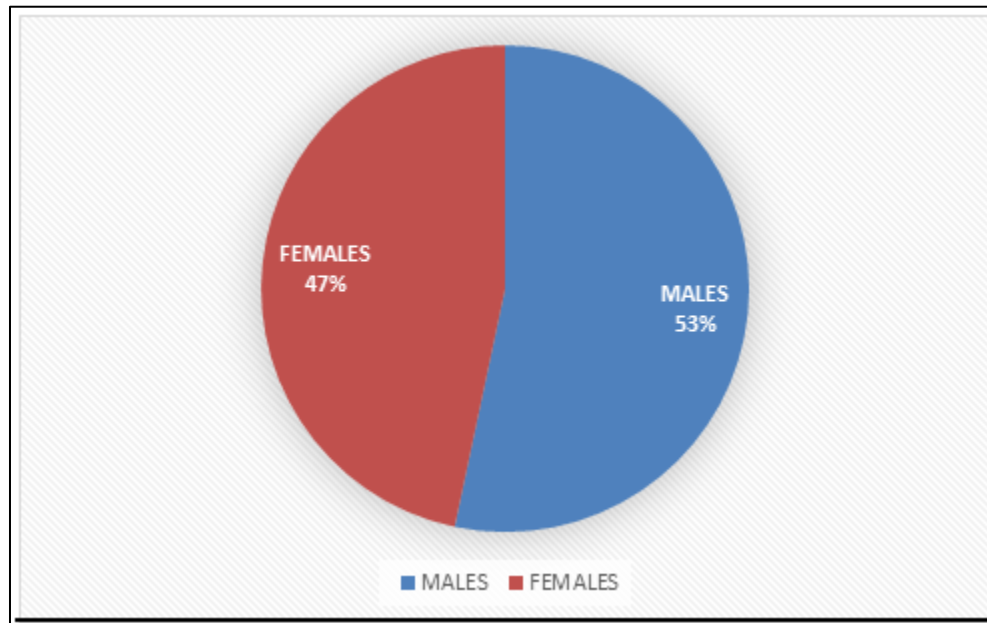
Fig 1: Flow Chart of the Procedure

## III. RESULTS

In the current study, there were a total of 30 patients with Type-II diabetes mellitus of which 16 were male and 14 were female with an age limit of 40-60 years.

Table 1: Demographic Details of the Patients of Type 2 Diabetes Mellitus

	AGE	DURATION OF DIABETES
MEAN	53.2	5.723
SD	6.09	0.902



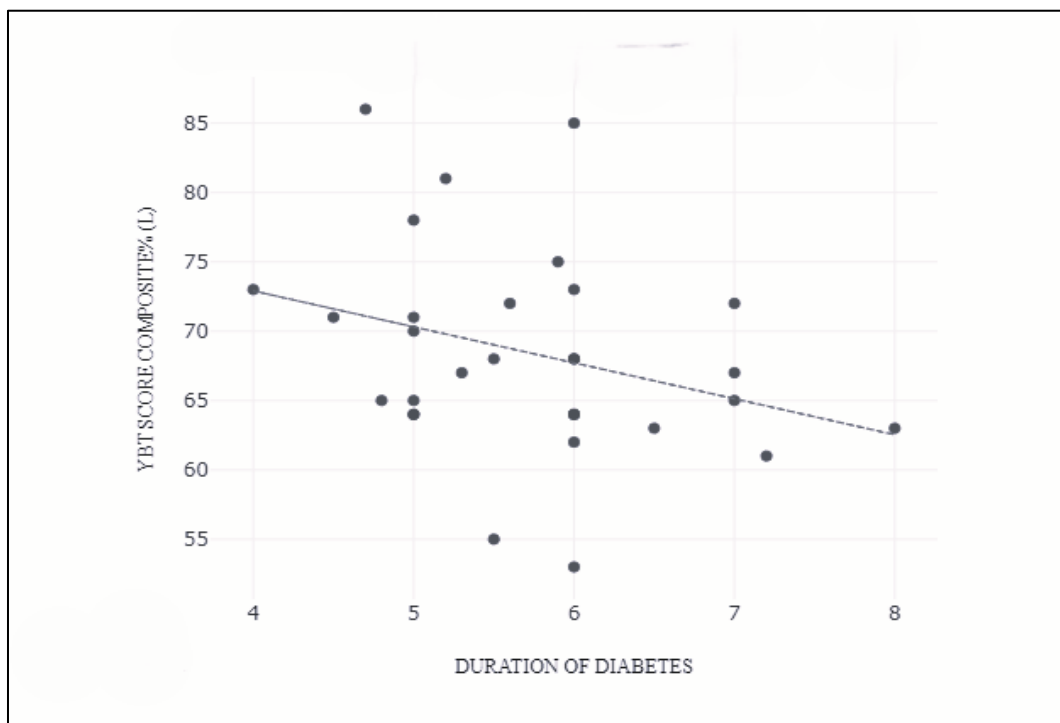
**Fig 2 : Graphical Representation of Percentage of Male and Female Patients**

**Table 2: Inter-Limb Leg Length Differences of Left Leg and Right Leg.**

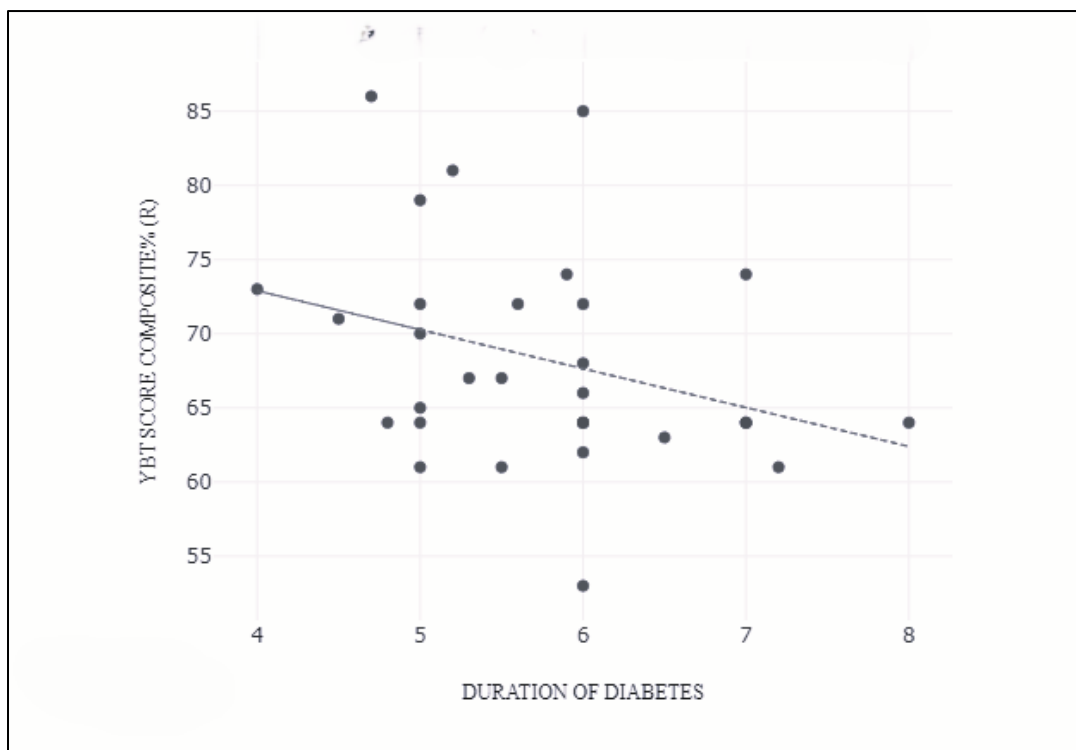
	Left Mean±SD	Right Mean±SD
<b>Leg length(cm)</b>	89.067±5.930	89.067±5.93
<b>Anterior(cm)</b>	62.133±6.99	62.1±7.36
<b>Posterolateral(cm)</b>	62.77±8.43	61.7±6.80
<b>Posteromedial(cm)</b>	59.133±9.134	58.77±9.51
<b>Composite%</b>	68.43±7.546	68.37±7.47

**Table 3: Correlation in Inter-Limb Leg Length Differences in Different Pair.**

		Correlation	Significance
<b>Pair 1</b>	Duration of diabetes and composite% (L)	-0.3097	0.096
<b>Pair 2</b>	Duration of diabetes and composite% (R)	-0.3168	0.088
<b>Pair 3</b>	Posterolateral reach distance of right leg and posterolateral reach distance of left leg	0.682	0.001
<b>Pair 4</b>	Anterior reach distance of right leg and anterior reach distance of left leg	0.947	0.000
<b>Pair 5</b>	Posteromedial reach distance of right leg and posteromedial reach distance of left leg	0.978	0.000
<b>Pair 6</b>	Composite % of left leg and Composite % of right leg	0.978	0.000



**Fig 4: Showing Correlation Between Duration of Diabetes and Composite% of Left Leg.**



**Fig 6: Showing Correlation Between Duration of Diabetes and Composite% of Right Leg**

#### IV. DISCUSSION

The current study aims to evaluate the dynamic postural stability among the patients of type 2 diabetes mellitus by using Y balance test. The Y-balance test (YBT) is a derivative of the Star Excursion Balance Test (SEBT) which is linked to lower-extremity deficits as well as it is an injury predictor.<sup>3</sup> For application of the YBT in daily clinical practice, reference values are required for an accurate interpretation of the test results. These normative values would be used by clinicians to determine the performance levels of patients.

An observational study conducted by Momina Mehmood, et al. (2022) to analyse the Dynamic Postural Stability through Y-Balance Test among Patients with Type-II Diabetes Mellitus and concluded the significant differences appearing in the anterior reach distance than posterolateral and posteromedial reach distances, especially in females ( $P \leq 0.05$ ).<sup>3</sup>

Another study was conducted by Cédric Bonnet, et al. (2009) on Diabetes and Postural Stability and concluded that the development of postural sway is linked to diabetes either motor neuropathy, central neuropathy, autonomic neuropathy. The present study may be concluded based on the similar outcomes from these two studies that patients with increased duration of type 2 diabetes mellitus have more compromised dynamic postural control and are more likely to experience falls and lower limb injuries.<sup>4</sup>

#### V. CONCLUSION

Dynamic postural stability status of patients with Type-II diabetes mellitus through the Y-balance test concluded that with increase in duration of diabetes mellitus lead to increase in the impairment of dynamic postural stability of the patients with or without the presence of any kind of complication due to diabetes.

#### REFERENCES

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