3 Minute Walk Test In Type 2 Diabetes Mellitus

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Abstracts: Background & Objective**:** Type 2 Diabetes mellitus(DM) is a chronic disease. It isone of the important causes of increasing morbidity and mortality in India, which is now known as 'Capital of Diabetes'. It affects all the major systems in the body bringing down the quality of life of the patient. Objective is to assess the Three - minute walk distance in patients and to compare it with the age and gender matched healthy controls. Methodology: A cross- sectional tertiary care Government hospital based study was conducted in forty diagnosed patients of type 2 DM taking oral hypoglycemics, aged between 40-60 years. All the patients were thoroughly interviewed by a well structured questionnaire, which included personal details as well as the history of complications. 3- Minute walk test was conducted, as per the standardized technique in diabetic patients as well as age and gender matched healthy controls. The distance was compared by applying unpaired t test. Results: The mean 3-minute walk distance in patients of type 2 DM was 139.55±54.90 meters as compared to controls which was 200.01± 45.40 meters. The decrease in distance was statistically highly significant ($p<0.001$). Conclusion: Type 2 Diabetes mellitus affects walking distance of the patient bringing down the quality of life. These findings are useful for targeting the importance of treatment of diabetes, which needs to be addressed with priority to improve the quality of life. [Shah S NJIRM 2016; 7(1):67-70]

Key Words: Walk Test, Diabetes Mellitus, Type 2 DM

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Introduction: Diabetes Mellitus(DM) is one of the most common chronic disease, affecting 8.3% of the world's population. Diabetes mellitus is a cluster of metabolic diseases characterized by increase in blood glucose level resulting from defects in insulin action, insulin secretion, or both.[1] Currently the number of cases of diabetes is estimated to be around 366 million worldwide. This number is estimated to rise to 552 million by 2030. Type 2DM is a cause of growing public health concern in both developed and developing countries.[2]

It is interesting to refer to the World Health Organization's latest classification of the natural history of chronic diseases, describing three evolutionary stages: deficiency, incapacity, and social disadvantage. [3] Incapacity is clinically characterized by dyspnea, pain in the lower limbs, and intermittent claudication.[4]Itis very important to evaluate the incapacity factor, as it can predict the future functioning of the patient and quality of life of the patient. Therefore it is essential to determine exercise tolerance, for example, a field test such as the 6-minute walk test (6MWT), which explores the cardio-respiratory and muscle chain.[5]

McGavin introduced walking test in 1976, since then has been considered the standard method for the functional evaluation of patients with chronic obstructive pulmonary disease (COPD). Moreover it is used in various clinical situations for evaluation of cardio-respiratory fitness. The test is simple, easy and non-incremental.[6]More recently, the walking test has been shortened for greater comfort.[7,8] 3 minute walk test(3MWT) is another important valid test which can give an idea about cardio-respiratory fitness. According to study by Iriberri M et al no significant differences were observed between the distance covered during the 3MWT and the distance in the first 3minuteof the 6minute walking test. They have even suggested that the 3MWT is a submaximal strength test which is simple and easy to carry out both in the hospital as well as outpatients environment. The test is not costly at all. It helps in evaluation of the functional capacity of Chronic Obstructive Pulmonary Disease.[9]Another study by Cao ZB demonstrated a significant correlation between 3MWT distance and VO2max obtained during a Graded exercise with bicycle ergo meter in healthy adult men and women proving that 3MWT is a valid tool for assessing Cardio Respiratory Fitness.[10]

With this background, we undertook this study which was aimed to assess and compare the 3 min walk test distance in type 2 DM patients and age and gender matched normal healthy controls.

Material and Methods: It was a cross- sectional hospital based study, conducted in Tertiary care Government Hospital. Institutional Ethics Committee approval was taken for the study. We selected 40 male patients of type 2 DM diagnosed by treating Physician as per the standard guidelines for diagnosis of DM.[11]All the

patients were on oral hypoglycemics, aged between 40-60 years and non smokers. All the patients were thoroughly interviewed by a well structured questionnaire which included personal details as well as the history of complications.

Exclusion criteria: Smokers, patients on insulin, patients with cardio respiratory complications, neuromuscular disorders and musculoskeletal disability.

3 – minute walk test was conducted, as per standardized technique followed by Iriberri et al in diabetic patients as well as age and gender matched healthy controls.[6]The walking test was performed in a 30meterlong hospital corridor. Reproducibility was determined by carrying out the test for three consecutive days, three test walks per day with a 20-minute rest between each walk. Each patient performed 9 walks. Visual or hearing encouragement of any kind while carrying out the test was avoided. Walking speed had to be the patient's maximum, who was asked not to stop, but to set his own walking pace. The patient was not accompanied by the physician during the walk.

Patients were informed prior to the test that the distance covered over 3 min would be quantified. After 3min, the distance covered was recorded by a simple measuring tape in meters.[6]The distance was compared by applying unpaired t test. Patients of DM were told to continue their usual oral anti diabetic medication. To minimize intraday variability and the effects of biological rhythms, the 6MWT were made in the morning (8 am to 10 am).[5]

Results: Mean difference in age, height and weight of Diabetic patients and normal healthy control was statistically not significant (p>0.05,Table 1). The mean 3-minute walk distance in patients of type 2 DM was 139.55±54.90 meters as compared to controls which is 200.01± 45.40 meters. The decrease in distance was statistically highly significant (p<0.001, table2, figure1).

Table 1: Physical characteristics of subjects

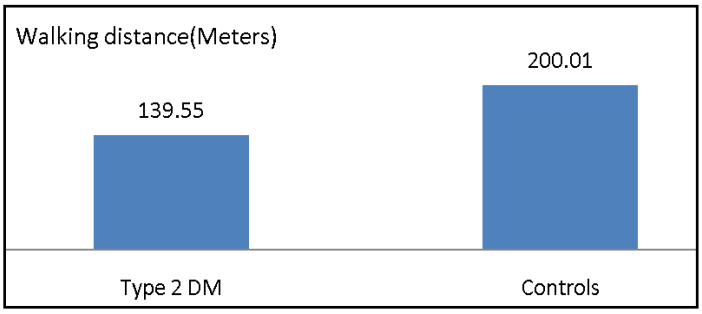
Parameters	Patients of type 2 DM n=40 Mean ± S.D.	Normal controls n=40 Mean ± S.D.	p value
Age (yrs)	53.90 ± 8.45	54.88 ± 8.28	p > 0.05
Height(cms)	159.23 ± 7.86	161.28 ± 7.33	p > 0.05
Weight(Kgs)	61.57 ± 7.38	64.42 ± 8.70	p > 0.05

Table- 2: Comparison of 3 min walk distance in patients of type 2 DM and normal controls

Parameter	Patients of type 2 DM n=40 Mean ± SD	Normal Controls n=40 Mean± SD	p value
3 minute walk distance (meters)	139.55± 54.90	200.01±45.40	p < 0.001**

P<0.001** statistically highly significant

Figure 1: Comparison of 3 minute walk distance in patients of type 2DM patients and healthy normal controls



Discussion: Our study showed that the 3 minute walk distance was reduced statistically significantly in diabetic patients as compared to age and gender matched healthy controls. This is in accordance with previous studies showing reduced 6 minute walk distance in diabetic patient compared to normal healthy controls.[12] In our study we have measured 3 minute walk distance by3-minute walk test, which is a simple procedure with applicability in most Emergency Department for taking decisions for dischargein patients with cardiopulmonary diseases.[13]

Type 2 DM is a general disease, with main patho-physiological mechanism being insulin resistance.[11]Recently it has been proved that skeletal muscle dysfunction occurs in type 2 DM. Studies have shown that upper and lower muscle strengths were reduced in type 2 DM.[14,15] Decreased lower limb strength and aerobic capacity could be the probable reason for reduced 3 min walk distance. Reduction in submaximal aerobic capacity could be due to myopathy.[16]There are many factors resulting in Myopathy in type 2 DM. Inflammation in muscles

degenerates them by altering the ubiquitin-proteasome system.[16,17].

Stimulation of apoptosis also results in muscle degeneration.[18]Oxidative stress, which is generally associated with inflammation is an important factor in causing muscle dysfunction.[19] Moreover, DM results in morphological and functional abnormalities viz: alterations in the hormonal system, enzymes, transport systems, use of energy substrates, and modulation of blood flow.[20]The disturbances of carbohydrate metabolism[21]and lipid metabolism are additional factors resulting in myopathy.[22]

Abnormal microcirculation in type 2 DM results in decrease in local blood flow and capillary density. This results into less availability of energy substances to muscles resulting in decreased walking distance.[20]

There occurs deconditioning of peripheral muscles in type 2 DM. Structurally there is a decrease in oxidative type I fibers and increased type II fibers, less insulin sensitivity, and low endurance.[23,25]All these mechanisms are responsible for decreased skeletal muscle strength and decrease availability of energy substrate. This results in decrease in walking distance in DM patients. When we correlated the walking distance with fasting blood glucose levels, we did not get any significant correlation between them. This shows that apart from blood glucose levels, there are certain other factors which are responsible for decrease in walking distance decreasing overall physical quality of life.

Globally, many recommendations for DM management have been put forward by scientific societies.These recommendations mainly focus on blood glucose tests, lipid profile, renal function tests, blood pressure etc. However, none of these societies recommend the evaluation of muscle strength and dysfunction.[24,25] Walking distance is a reflection of the ability to maintain a number of daily-life activities for patients. Therefore, it is an important Quality of Life component.[5] 3 minute walk test is a simple measure to assess the walking distance and the physical fitness in Diabetes patients. It is a very important aspect in judging the quality of life.

Conclusion: There is reduced submaximal aerobic capacity of in type 2 DM. This explains the diminished physical strength and activity. The walking distance reduces significantly in diabetic patients affecting the quality of their life. These findings are useful for targeting importance of overall treatment of diabetes, which needs to be addressed with priority to improve the quality of life.

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