

Impact of Diabetes on Hand Grip Strength of Young Males In Hail City-KSA

Ahmed Abdelmoniem Ibrahim

Ph D. PT. Department of Physical Therapy, College of Applied Medical Sciences, University Of Hail-KSA – Pox.2440- Or

Abstract

Background and purpose: Diabetes is a group of diseases characterized by high levels of blood glucose arising from defects in insulin production, insulin action, or both. Diabetes can lead to serious complications and early death.⁽¹⁾It is considered one of the most common risk factors for functional obstruction specially after a long duration of illness in diabetic people. DM II subjects have reported to be more disabled in self-care tasks and other daily living activities than non-diabetic because of many hand problems.⁽³⁾The aim of this study was to assess the effect of diabetes on hand grip and thumb strength .

Methodology: thirty subjects were selected from hail city K.S.A. These subjects were classified equally into two groups A and B ,15 subjects for each group , subjects of group A (non diabetic), and group B (diabetic),grip strength and thumb strength were recorded for each patients on both group.

Result :Our study revealed that there is a significant decrease of the hand grip and thumb strength in diabetic subjects compared with non-diabetic

Conclusion: our study was concluded that the hand grip and thumb strength are important parameters of hand function and it is significantly affected by diabetes mellitus , and increased risk of developing functional disabilities due to hand muscle weakness.

Key words: diabetes mellitus, hand grip , thumb strength

I. Introduction

DM is considered to be a major risk factor for cardiovascular disorders as ischemic heart disease, cerebral stroke and peripheral artery disease leading to increased mortality of diabetics.⁽²⁾Physician have long recognized the association between diabetes mellitus and several pathologic conditions of the hand. The most commonly recognized pathologies are stenosing tenosynovitis, Dupuytren's contracture (or Dupuytren's disease), carpal tunnel syndrome, and limited joint mobility.⁽⁴⁾Although all four affect persons without diabetes, their incidence is increased in the setting of diabetes, giving rise to a diathesis of hand pathology variably referred to as diabetic hand syndrome. Investigators have proposed a variety of etiologies for this constellation of hand problems, all of them related to the disease process of diabetes mellitus.⁽⁵⁾

Muscle weakness has been related with DMII can be attributed to increased insulin tissue resistance and hyperglycaemia, which cause a decrease in the number of mitochondria in the muscle cells, a decrease in glycogen synthesis and an increase in the amount of circulating systemic inflammatory cytokines, all of which have an adverse effect on the skeletal muscles⁽⁶⁾

II. Methodology

Cross-sectional study was carried out in university of hail physiotherapy physiotherapy , lab 30 male patients was recruited from city of hail divided into two group

1. 15 diabetic (study)
2. 15 non diabetic (control)

Inclusion Criteria:

- Patients have to be symptomatically stable with type 2 diabetes mellitus.
- Optimized pharmacological treatment that was be remained unchanged throughout the study.

Exclusion Criteria:

- neuropathy
- Peripheral vascular disease.
- Patients with unstable cardiac conditions .
- Orthopedic problems (fractures ,dislocation ,cervical problems).

Measurements;

1. Anthropometric data (age ,weight ,height, BMI)
2. Duration of illness

3. JAMAR Hydraulic hand dynamometer and a pinch gauge (5030J1 ,CANADA) were used to measure the hand grip strength and the key pinch respectively.

Grip Strength Testing Procedures

Have the individual sit with their shoulder adducted and neutrally rotated, elbow flexed at 90°, forearm in neutral position, and wrist between 0° and 30° dorsiflexion and between 0° and 15° ulnar deviations. Set the JAMAR® Hand Dynamometer to the second handle position from the inside. Lightly hold around the readout dial to prevent inadvertent dropping. After the individual is positioned properly, say, “Squeeze as hard as you can...harder!...harder!...relax.” Record the scores of three successive trials for each hand tested.

III. Results

Data analysis

Statistical analysis was performed on the data obtained from 30 subjects . All statistical analysis was performed using SPSS for Windows 16.0; paired t-test was carried out to determine the significance of the outcome measurements in the two groups. P-value of less than 0.05 was used to determine the significance of the outcome measurements between the two groups for right and left hand strength.

In group A (non diabetics) composed of 15subjects their meanages ,weight and height are 48.1±5.1 years ,78.33±6.07 Kg ,169.9±4.3 Cm.

In group B (diabetic) composed of 15 subjects their meanages ,weight and height are 45.8±5.3 years ,77.73±9.5 Kg ,167.13±4.8 Cm.

there is no significant difference between both groups regarding to age, weight and height with P value ; 0.29 ; 0.83 ; 0.137 respectively (table (1)and figure (1) .

Table (1)the comparison between both group regarding to age ,weight and height

	age	Weight	Height
Group A	48.1±5.11	78.33±6.07	169.9±4.3
Group B	45.8±5.3	77.73±9.5	167.13±4.8
P value	0.29	0.83	0.137
Significance	N S	N S	N S

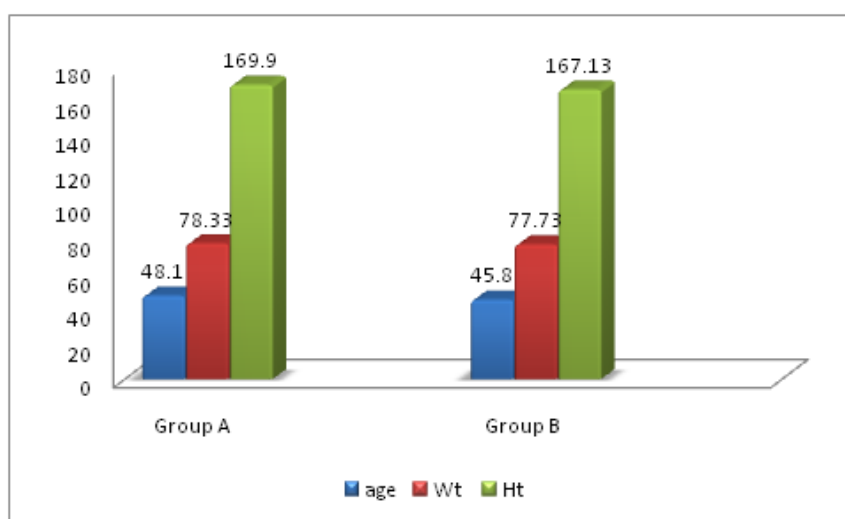


figure (1)the comparison between both group regarding to age ,weight and height

Table (2) and figure (2) showed the significant change between both groups ,the mean value of the right hand strength of the none diabetic patient group (A) was 67.5±5.3 Ib and 48.9±8.5 Ib in the diabetic patient group (B) and P value was 0.0001 .

The mean value of the left hand strength of the none diabetic patient group (A) was 61.9±4.1Ib and 45.2±5.5 Ib in the diabetic patient group (B) and P value was 0.0001 .

table (2) comparison between right and left hand grip strength

	RT hand grip	Lt hand grip
Group A	67.5±5.3	61.9±4.1
Group B	48.9±8.5	45.2±5.5
P value	0.0001	0.0001
Significance	S	S

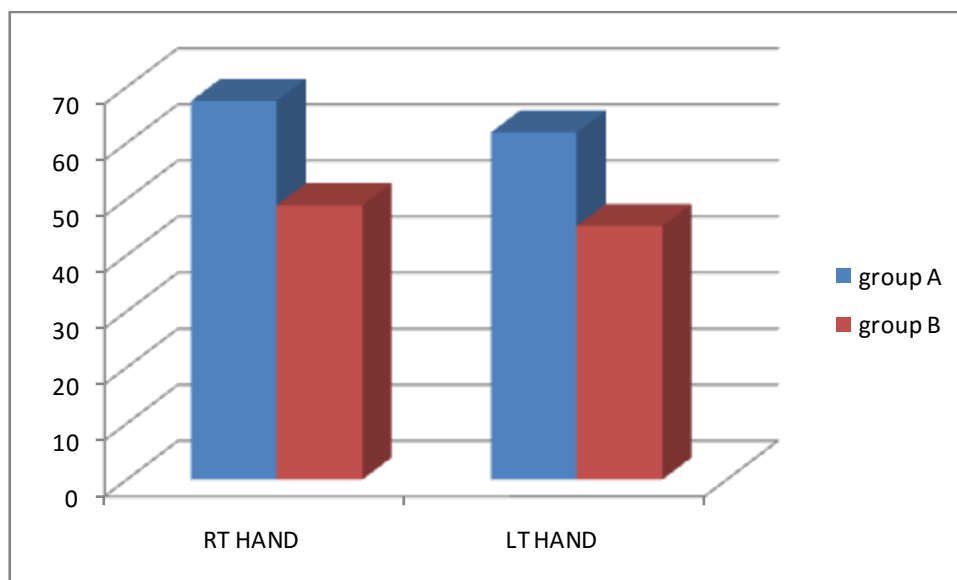


Figure (2) comparison between right and left hand grip strength

table (3) comparison between right and left thumb strength

	RT thumb	Lt thumb
Group A	17.9±4.08	16.3±3.9
Group B	12.3±3.44	11.4±2.6
P value	0.0002	0.001
Significance	S	S

Table (3) and figure (3) showed the significant change between both groups ,the mean value of the right thumb strength of the none diabetic patient group (A) was 17.9±4.08Ib and 12.3±3.44Ib in the diabetic patient group (B) and P value was 0.0002.

The mean value of the left thumb strength of the none diabetic patient group (A) was 16.3±3.9Ib and 11.4±2.6Ib in the diabetic patient group (B) and P value was 0.001 .

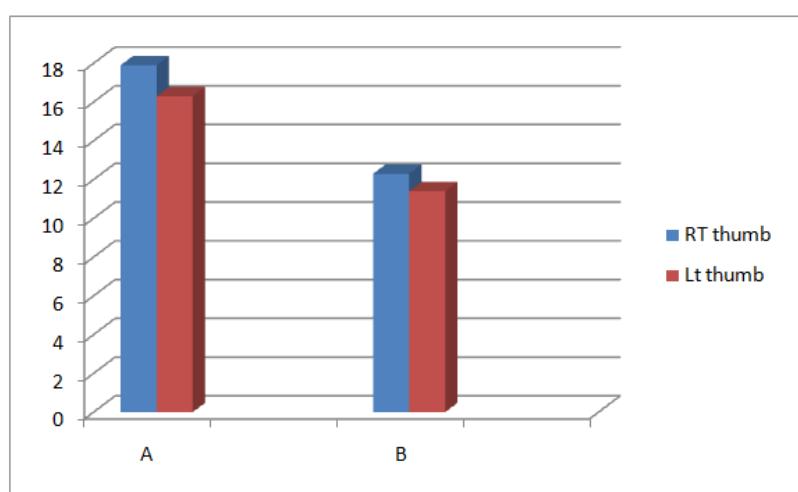


Figure (3)comparison between right and left thumb strength

IV. Discussion

Diabetes mellitus is usually associated with mild hand muscle weakness associated with peripheral sensory neuropathy in DM patients.⁷To the best of our knowledge, in this study used to measure the influence of diabetes on grip strength and emphasize the importance of measuring hand functions as a measure for prevention and treatment of hand complications caused by DM. Our study revealed that there is a significant decrease of the hand grip strength using the Jamar dynamometer in the diabetic subjects compared with non-diabetic subjects. The grip strength test was commonly done to evaluate the performances of hand muscles by measuring the maximal grip force that could be executed in one muscular contraction.⁸

The study done by **Khallaf M. et.,al2014** showed a significant decrease of the hand grip and pinch power strength among patient with long standing diabetes as compared to healthy matched group.⁹ On the other hand, the results of our study is in close agreement with **Ezema and colleagues** who stated that DMII seems to result in a decrease in handgrip strength in both male and female adults. This physical limitation may contribute to low productivity in people with DMII.⁸Our results also is consistent with other studies that reported that DMII is associated with poorer upper limb muscle strength and quality. These features may contribute to upper limb functional limitation and physical disability in individuals with long-standing type 2 diabetes.^{10,11,12}

V. Conclusion

The results of our study concluded that the hand muscles grip and thumb strength are important parameters of hand function and it is significantly affected by diabetes mellitus, and increased risk of developing functional disabilities due to hand muscle weakness.

References

- [1]. Centers for Disease Control and Prevention. National Diabetes Fact Sheet, 2011. Atlanta, GA: Centers for Disease Control and Prevention, US Department of Health and Human Services; 2011. http://www.cdc.gov/diabetes/pubs/pdf/ndfs_2011.pdf. Accessed April 16, 2012
- [2]. Kristova, V., Liskova S., Sotnikova, R., Vojtko, R. and Kurtansky, A. :Sulodexide Improves Endothelial Dysfunction in Streptozotocin- Induced Diabetes in Rats.Physiol. Res. 57: 491-494, 2008.
- [3]. Badran M ,Laher I. Type II Diabetes Mellitus in Arabic-Speaking Countries. Int J Endocrinol.2012;902873.
- [4]. Mota M, Panus, C, Mota E, Sfredel V, Patras, cu A, Vanghelie L, et al. Hand abnormalities of the patients with diabetes mellitus. RomJ Intern Med 2000-2001;38-39:89-95.
- [5]. Cagliero E, Apruzzese W, Perlmutter GS, Nathan DM. Musculoskeletal disorders of the hand and shoulder in patients with diabetes mellitus. Am J Med 2002;112:487- 490.
- [6]. Helmersson JB, Larsson VA, Basu. Association of type 2 diabetes with cyclooxygenase-mediated inflammation and oxidative stress in an elderly population. Circulation 2004, 109: 1729-1734.
- [7]. Infante JR, Rosenbloom AL, Silverstein JH, Garzarella L, Pollock BH. Changes in frequency and severity of limited joint mobility in children with type 1 diabetes mellitus between 1976-78 and 1998. JPediatr 2001;138:33-7.
- [8]. Ezema CI, Iwelu EV, Abaraogu UO, Olawale OA. Handgrip Strength in Individuals with Long-Standing Type 2 Diabetes Mellitus: A preliminary report. AJPARS 2012, 4(1): 67 - 71.
- [9]. Khallaf .M et.,al :effect of longstanding diabetes mellitus type II on hand grip strength and pinch power of females in the city of Hail-KSA .IOSR Journal of Nursing and Health Science (IOSR-JNHS) ;Volume 3, Issue 1 Ver. V (Feb. 2014), PP 41-44.
- [10]. Park SW, Goodpaster BH, Strotmeyer ES, de RekeneireN,Harris TB, Schwartz AV, et al. Decreased muscle strength and quality in older adults with type 2 diabetes: the health,aging, and body composition study. Diabetes 2006;55:1813-8
- [11]. Bus SA, Yang QX., Wang JH, Smith MB, Wunderlich, Cavanagh PR., Intrinsic muscle atrophy and toe deformity in the diabetic neuropathic foot: a magnetic resonance imaging study, Diabetes Care 2002, 25: 1444-1450.
- [12]. Clerke A, J. Clerke. A literature review of the effects of handedness on isometric grip difference of the left and right hands. American Journal of Occupational Therapy 2001, 55(2): 206-11.