Original Research Article

Alterations of Handgrip Strength in Type 2 Diabetes Mellitus Patients

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Abstract

Background:Peripheral Neuropathy is most prevalent chronic complication in diabetes.Diabetes affect sensory and motor function including progressive loss of somatosensory sensitivity,Insufficient muscle strength and functional Impairment.Objective of this study isto Analyse Hand grip strength in Diabetes patients with or without Neuropathy.

Methods: Descriptive study in Government medical college Thoothukudi,100 Patients attending Outpatient Department for Diabetes were analysed.Duration of study 6 months.Demographic data and medical history was noted after informed consent.Michigan Neuropathy Screening Instrument applied.Hand grip was tested using Electronic digital hand Dynamometer and compared with 40 age matched healthy volunteers.Findings described in simple descriptive manner.SPSS version 24 used for statistical analysis.

Results:Mean Age 62.40+/-6.435 Vs Control group 58.55+/-6.921.Male 58%,Female 42%.Between 45-54yrs(8%),55-64yrs(62%),65-75yrs(30%).Mean duration of diabetes 8.31+/-2.770 years.Michigan Neuropathy Screening Instrument score mean 4.98+/-1.484.Mean Hand grip Right hand(kg) 20.723+/-7.688 Vs Control 24.978+/-7.1427.Mean Hand grip Left hand(kg) 19.153+/-7.2436 vs Control 22.890+/-6.8664.Mean Hand grip right hand male compared to control 45-54yrs(27.66+/-6.63 vs 35.34+/-4.16),55-64yrs(27.14+/-6.31 vs30.95+/-2.55)65-75yrs(16.47+/-5.89 vs 21.24+/-2.32). Mean hand grip female 45-54yrs(18.2+/-4.79 vs 26.74+/-3.17),55-64yrs(17.22+/-4.63 vs 19.88+/-2.14),65-75yrs(13.34+/-2.85 vs 14.84+/-1.16).

Conclusions:Handgrip strength is lower in participants with Diabetes compared to age matched controls.Mean hand grip values also showed decrease with age in both study participants and healthy volunteers.

Keywords: Handgrip,Diabetes,Peripheral neuropathy

Introduction

Peripheral Neuropathy is most prevalent chronic complication in diabetes.Diabetes affect sensory and motor function including progressive loss of somatosensory sensitivity and impact hand dexterity,Insufficient muscle strength and functional Impairment.[1] Diabetic peripheral neuropathy can impact proprioceptive and grip force control.[2] Age ,Body mass Index are also risk factors for decreased Hand grip.[3 4] It has been associated with even Sarcopenia.[5] Objective of this study is to Analyse Hand grip strength in Diabetes patients with or without Neuropathy.

Methods

Cross sectional study in a tertiary care cen-tre(Government Medical College Thoothukudi) in South India. Total **Study duration** of 6 months (July 2022-Dec 2022). 100 patients attending outpatient department for Diabetes were analysed. Data including age, sex, dura-tion of diabetes, medical history noted. Mich-igan neuropathy screening Instrument was applied. Hand grip analysed using Electronic Hand Dynamometer (Camry, Electronic Dyna-mometer,USA). With Participants seated with Shoulder adducted, Elbow flexed to 90 degrees and forearm in neutral position. Hand grip

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were compared with 40 age matched healthy volunteers with no comorbidities.Findings described in simple descriptive manner. SPSS version 20 was used for statistical analysis.Qualitative (categorical) variables were represented by frequency and percentage analysis.The study was conducted after due consideration of all Ethical Issues and informed consent from all participants.

Inclusion criteria

1) Patients with Type 2 Diabetes on treatment for past 5 years.
2) Patients with no acute complications of Diabetes.
3) Patient upto 75years of age.

Exclusion criteria

1) History of Stroke, Parkinsons disease and other Central system Diseases.
2) Hands with disability or ulcers.
3) Fracture or Trauma.
4) Patients with Impairment of Cognition.
5) Renal,Chronic Liver Disease, Thyroid, HIV.

Results

Mean Age 62.40+/-6.435 Vs Control group 58.55+/-6.921. Male 58%, Female 42%. Between 45-54yrs (8%), 55-6 4 yrs (62%), 65-75yrs (30%). Mean duration of diabetes 8.31+/-2.770 years. Michigan Neuropathy Screening Instrument score mean 4.98+/-1.484. Mean Hand grip Right hand (kg) 20.723+/-7.688 Vs Control 24.978+/-7.1427. Mean Hand grip Left hand (kg) 19.153+/-7.2436 vs Control 22.890+/-6.8664. Mean Hand grip right hand male compared to control 45-54 yrs (27.66+/-6.63 vs 35.34+/-4.16), 55-64 yrs (27.14+/-6.31 vs 30.95+/-2.55) 65-75 yrs (16.47+/-5.89 vs 21.24+/-2.32). Mean hand grip female 45-54 yrs (18.2+/-4.79 vs 26.74+/-3.17),55-64 yrs (17.22+/-4.63 vs 19.88+/-2.14), 65-75 yrs (13.34+/-2.85 vs 14.84+/-1.16).

Discussion

Mean age of both the study group and control group was similar.Control group consisted of healthy volunteers including Nursing staffs,security personals,medical officers,ward boys.Mean duration of diabetes was 8-10 years (Fig 1). 18% had more than 10 years of diabetes. Diabetes was associated with hypertension in 24% and 21% were Alcoholic which were counfonding factors for neuropathy. Carpal tunnel syndrome and Diabetic Polyneuropathy can occur together.[6] Most of the patients complained of numbness ,pricking pain,muscle cramps,generalized weakness as their complaints. These were scored using Michigan Neuropathy screening Instrument[7] (Fig 2). Mean hand grip were more for right hand compared to left hand. It also showed age based variations.Diabetes alters dynamic structure of first Dorsal interosseous and Abductor pollicis Brevis during precision grip[8] It affects upper extremity endurance and upper extremity disability level.[9] For Age group of 45-54 years

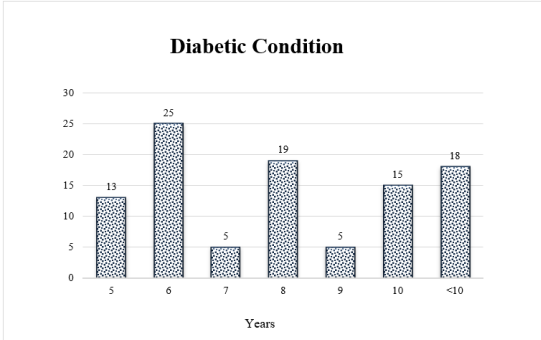

Figure 1:Duration of Diabetes in age groups in years

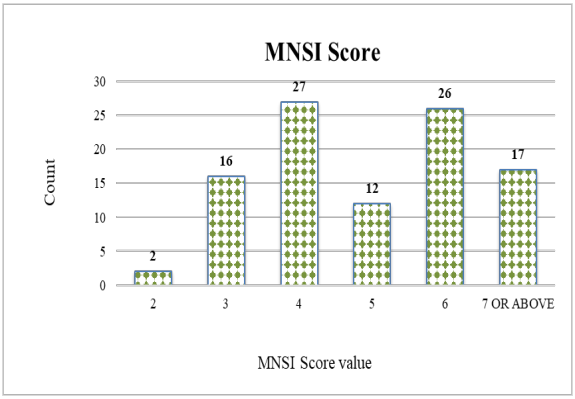

Figure 2: Distribution of patients in Michigan Neuropathy Screening Instrument score

males it was ranging from 21 kg to 34 kg while it was higher for age matched non diabetic ranging from 31 kg to 39kg. For females for the age group 45-54yrs it was 13 to 25 kg compared to control of 23 to 29 kg. For age group 55-64 years Male it was 20-33 kg while for control group it was 28-33kg and for females of same age group it was 11-22 kg for a control of 17 -23 kg.For age group of 65-75 years male it was 10-22 kg for a control of 18-23 kg. For female of the same age group it was 9-15kg for a control of 13-15kg. Pinch power values were also found to be lower in patients with T2DM than age matched control subjects.[10] Age group more than 75 years are likely to have age related neuropathy as well as many comorbidities so were not considered in this study.Increasing age, female gender,Type 2 Diabetes mellitus were significantly related to reduced hand grip.[11] Hand grip strength in patients with adequate glycemic control were equivalent to non diabetic controls.A decrease in protein synthesis results in decreased muscle mass which can be detected by hand grip strength.[12] Greater hand grip strength predicts lower risk of developing diabetes over 10 years in Japanese americans.[13] People with T2DM with 5 years and above are at possible risk of Hand disability.[14] In Elderly with Diabetes decrease in hand dexterity is among the motor function limitation.[15] Mean Hand Grip were lower in study Population with Diabetes compared to control across all age groups both for Males and Females. Mean Hand grip also showed Progressive reduction with age in both study groupand control groupsimilar to previous studies.[16] (Fig 3). Exercise can improve motor score and specific activities of daily living.[17] So Physiotherapy has a role in improving hand grip strength.These findings signify the need to maintain good glycemic control as well as the need to have a healthy life style including physical exercise for improving activities of daily living.

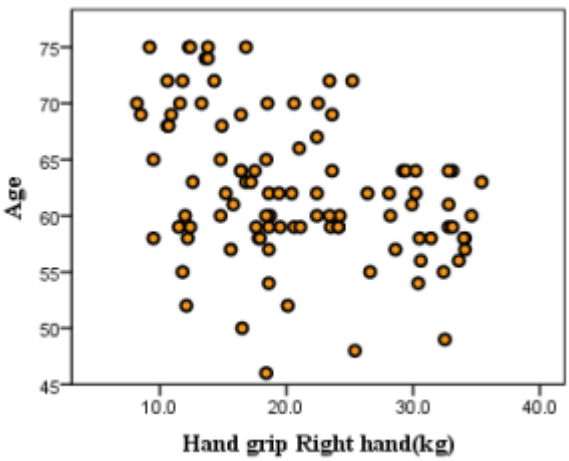

Figure 3: Scatter plot showing Decreasing Hand grip with advancing age

Conclusion

Mean values for Hand grip is lower in participants with Diabetes compared to age matched controls.Mean hand grip values also showed decrease with age in both study participants and healthy volunteers. Hand grip strength in patients with good glycemic control and healthy life style was equivalent to Non Diabetic Individuals.

Limitations

This study was conducted in a single center on limited sample size.A larger study involving multi centre and higher sample population will be needed for definitiveInference.

Declaration

This study has been conducted inGovernment Medical college Thoothukudiafter due ethical considerations,did not require funding and there is no conflict of interest.

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