Hand grip strength in mothers of Autism compared with controls

ABSTRACT

Back ground:Hand grip strength (HGS) is a simple way of predicting the risk of all-cause mortality in the general population.It is a strong predictor of quality of life and overall health which constitutes both physical and mental well being. Mental health of the parents could be thoroughly compromised with differently-abled child especially with Autism.The aim of this study was to compare hand grip strength of mothers of children with Autism to neurotypical controls.

Method: In this case control study design using Indian Scale for Assessment of Autism, 30 mothers, aged 20-40 years of children with Autism and 30 age matched mothers with neurotypical children volunteered to participate through convenience sampling. The dominant and non dominant hand grip strength was tested using digital hand grip dynamometer.

Results:The mean dominant and non dominant hand grip strength among mothers of children with Autism was significantly lower compared to that of controls (20.3±2.8kg   vs 22.1±2.6 kg) and (19.1±2.8kg   vs 20.4±4.1kg) respectively. There was statistically significant difference at 5% level of significance. There was a strong positive correlation between dominant and non dominant hand grip strength in mothers of children with Autism(r = 0.925, p value <0.001) and moderate positive correlation in controls(r = 0.475, p value <0.001).

Conclusion: The mothers of children with Autism had significantly poorer hand grip strength as compared to controls. Future studies are needed to determine extent of muscle weakness in the caregivers associated with mental health.

Key words: Hand grip strength, Dynamometer, Autism, Mother, Neurotypical

INTRODUCTION

Hand, the second brain consists of complex structures specialized for grip and sensation. These varied functions places the hand to be unparalleled and unique instrument of both motor and sensory organ of the humans. Besides, human hand serves not only a working means but a sensitive instrument of vital value for overall well being in general and activities of daily living in particular as it occupies large area cortically[1]. The grip is an act of placing any object, device or instrument within the hand with a firm hold.

Hand grip strength measurement is widely recognised as an objective index of upper extremity functional integrity[2.]Hand Grip Strength(HGS) can be quantified by measuring the amount of static force that the hand can squeeze around a dynamometer. It is a known fact that the most widely used tool to measure the hand grip strength is the Jamar dynamometer[3].However, it is evident from the research that Jamar "may not be the most appropriate for all patient populations[4]" the Jamar was not good enough to detect small changes in strength[5]instead digital hand dynamometer stands as a better alternative [6].Even with different assessors or different hand dynamometer brands used(Grippit,Trailite),hand grip strength measurement stands reliable if the methods are standardised and equipment is calibrated [7].The force is commonly measured in kilograms and pounds.[8]

Previous research supports gender related differences in grip strength with women being weaker [9].It serves as a significant predictor of general health [10]as well as mental health [11].Female caregivers reported poorer health than their male counterparts [12].The mental health of mothers of children with Autism Spectrum Disorder(ASD) was affected to a greater extent when compared to mothers of children with intellectual disability without ASD and mothers of typically developing children [13].Further, anxiety, depression, and low HRQOL are more common in mothers of children with autism [14].It is used as a strong indicator for overall health in clinical settings and a long term predictor of onset of dependency in activities of daily living[15].This suggests that higher the grip strength greater the independence.

Parents of children with Autism shoulder on responsibilities related to child's diagnosis, severity, general behaviour and participation in daily life [16].Hence it is appropriate and reasonable to consider the health status of the parents in order to have a better quality of living of the parents and thus rehabilitating the children.

MATERIALS AND METHODS

This was a case control design study conducted in private Occupational Therapy clinics in Chennai. Approval was taken from Research team of SRMIST,College of Occupational Therapy following thorough scrutinization of the relevant. The data was collected from 60 mothers of age group 20-40 years. Informed consent form was obtained from all subjects prior to data collection.

Inclusion criteria

Mothers of children with Autism (ISAA<70)

Mothers with neurotypical children (ISAA >70)

Age 20-40 years (Angst F, Drerup et al.,2010)

Exclusion criteria

Subjects having history of any systemic illness, recent hand surgery or an upper limb fracture and psychiatric disorder.

MATERIALS AND SCALES USED

1.Trailite digital hand dynamometer

2.Measuring tape

3.Weighing machine

4. Scoring data form

5. Pen/pencil

6. Indian Scale for Assessment of Autism (ISAA)

PROCEDURE

Subjects were screened with Indian Scale for Assessment of Autism (ISAA) and selected through convenience sampling according to the inclusion and exclusion criteria. After receiving the written consent form with doubts cleared, the data form was filled and the procedure was started.

Height was measured with subject standing against the wall without foot wear.

Body weight was measured with a weighing scale.

BMI was calculated using the Quetelet's Index.

BMI = weight (kg)/{height (m)}2

The subjects were divided into two groups, mothers of children with Autism (cases) and mothers of neuro typical children(controls) based on ISAA score.Then the hand grip strength of both the hands i.e. dominant and non-dominant hand was assessed using the Trailite digital hand grip dynamometer.

POSITION OF TESTING:

The Standard testing position as described by the American Society Of Hand

Therapists (ASHT)[17,18&19] was followed.Handgrip strength was measured with Trailite hand grip dynamometer in the following manner:

The subjects seated in a standardized,position used by the American Society of Hand Therapists in which the hips and knees are flexed at 90º, the shoulder adducted in neutral position, the elbow flexed at 90º and the forearm in mid prone position without radial or ulnar deviation. The participants grip the dynamometer alternately with dominant and non-dominant hands, performing 3 trials, with 1-minute rest between the measurements [18].The average trial was considered for statistical analysis.

Statistical analysis

Pearson Chi square Analysis was done to find the association between demographic variables and group status. Difference between Cases and Controls was assessed using the non parametric Mann Whitney U Test at 5% level of significance. Karl Pearson's correlation coefficients were applied to determine the correlations of dominant and non dominant hand grip strength with age and BMI in both case and controls.

RESULTS

In table 1, general characteristics of the respondents age and BMI depicted. There was no association between group status vs age / BMI as depicted in table 2. There exist a significant difference in dominant HGS, Non dominant HGS between cases and controls. In table 3,the dominant and non dominant HGS had significant positive correlation(r=0.925,p<0.001) but not correlated with age and BMI as illustrated in table 4.However in table 5,the dominant and non dominant HGS in controls had a moderately positive correlation (r=0.475,p <0.001) but age and dominant HGS is strong positively associated(r=0.706,p<0.001).

DISCUSSION

Hand grip strength is the easiest and of supreme importance for overall general well being. It gives a quick information of one's general health. In our study 60 mothers were evaluated for hand grip strength using Trailite digital hand dynamometer.The mean dominant and non dominant in cases was observed to be 20.3±2.8kgs and 19.1±2.8kgs where as in controls 22.1± 2.6 and 20.4± 4.1kgs respectively. In both the groups, the dominant grip strength was stronger than non dominant hand and this is in accordance with the results of Umama et al in 2012 [20].Usually hand grip strength is associated with age, weight, height and BMI [21].Unlike previous evidence, in this study both the cases and controls hand grip strength was not associated with BMI as supported by Umama et al.,2012 [20] but HGS of controls was strongly associated with age.The findings of this study indicate that both dominant and non dominant grip strength was poorer in cases than controls. Subjectively the mothers of children with Autism complained of weakness of upper extremity which are a result of overburdened caregiving responsibilities. But inspite of difficulty they displayed exerting greater strength with each trial.

LIMITATIONS AND SCOPE FOR THE FUTURE

The sample size being small these results cannot be reflected. Convenience sampling was used.Severity of the Autism was not taken into consideration. As various studies have reported greater care giving responsibilities and compromised health with severity,it could be taken into consideration in further studies. Subjects who were identified subjectively stressful by the researcher were comparatively had poorer hand grip strength,so future research should consider mental health. Other anthropometric measurements could be included for more wider associations.

CONCLUSION

From this study on mothers of children with Autism, there are few important findings to be considered. The first and foremost being the dominant and non dominant grip strength of mothers of children with Autism was weaker than mothers of neurotypical children. The second finding was a clear positive correlation between dominant and non dominant hand grip strength in both the groups. Finally, both cases and control's grip strength on both the sides was not correlated with BMI. Findings of this study may guide grip strength evaluation as a quick screening tool for caregivers.

ACKNOWLEDGEMENT

Table 1 : General Characteristics of the respondents

		Case		Control	
		Count	Percentage	Count	Percentage
Age	25-29 Years	3	10.0	7	23.3
	30 - 34 Years	14	46.7	6	20.0
	35 - 39 Years	13	43.3	17	56.7
BMI	Underweight	2	6.7	0	0.0
	Normal	23	76.7	17	56.7
	Overweight	2	6.7	9	30.0
	Obese	3	10.0	4	13.3

Table 2   Association between demographic variables and group status.

	Pearson Chisquare	P value
Group Vs Age	7.497	0.058
Group Vs BMI Levels	5.333	0.069

Table 3 Difference in dominant and non dominant HGS between Cases and Controls

HGS	Case	Control	Mann Whitney U test	P value
DominantHGS *(kgs)	20.3±2.8	22.1± 2.6	273.500	0.009*
Non dominant HGS*(kgs)	19.1±2.8	20.4± 4.1	295.000	0.022*

*Values are mean ± SD   Dependent variable –grip strength

Table 4 Correlation coefficient(r) of dominant and non dominant HGS with age and BMI in cases.

Variables	Pearson Correlation	P value
Age vs Dominant HGS	0.036	0.849
BMI vs Dominant HGS	0.281	0.133
Non dominant HGS vs Dominant HGS	0.925	<0.001*

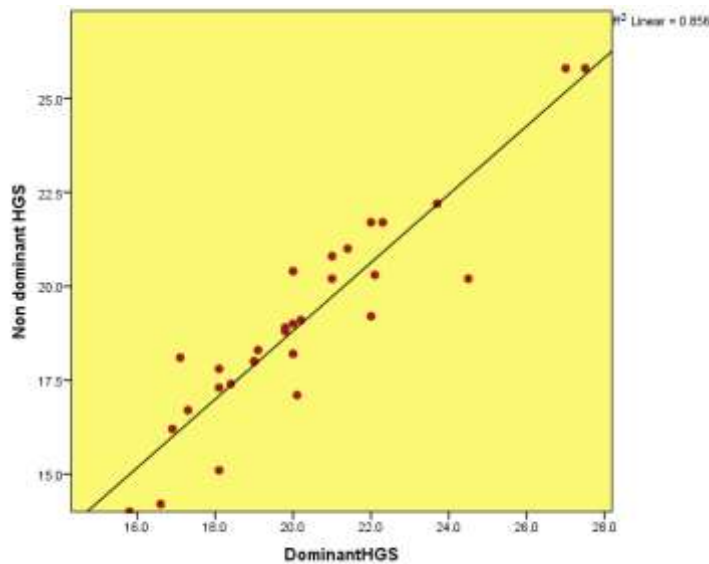Fig 1: **Correlation between demographic variables and Hand grip strength: Cases**

Table 5 Correlation coefficient(r) of dominant and non dominant HGS with age and BMI in controls.

Variables	Pearson Correlation	P value
Age vs Dominant HGS	0.706	<0.001*
BMI vs Dominant HGS	0.164	0.386
Non dominant HGS vs Dominant HGS	0.475	0.008*

Fig 2: **Correlation between demographic variables and Hand grip strength: Cases**
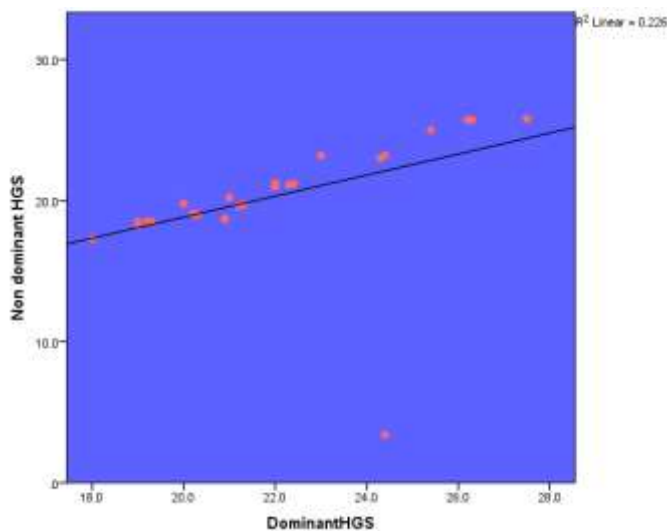
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