

# Strength matters! Measuring the hand grip strength of Pakistani population.

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## ABSTRACT

**Introduction:** Assessment of hand power is very crucial for evaluating the functional outcome of any surgical procedure of upper limb. After performing any surgical procedure the most reliable method to evaluate the outcome is to compare the post-operative function with an already known set standard. The purpose of our study is to assess the power of prevailing and non-prevailing hand of adult Pakistani population.

**Material and Methods:** 400 subjects (168 women and 232 men) were approached from the patients waiting area of different hospitals. Demographics, hand dominance and hand strength were recorded from every subject using a generic questionnaire.

**Results:** 94% of the subjects were right-hand prevailing and 6% were left-hand prevailing. Hand grip strength of right hand was higher regardless of hand dominance and was significantly high in males than in females with the ratio 1.7:1. In both right- and left-hand prevailing groups, the prevailing hand was consistently stronger than the non-prevailing side. Comparing our results with the Malaysian study the grip strength of Pakistani population is 13% greater in males and 15% greater in females. However when comparing with the west, our grip strength was found to be 25% less than that of the western population.

**Conclusion:** Statistics obtained from western or even Asian natives cannot be enforced to an equivalent Pakistani population. Regional standardizing statistics are crucial for allusion and serve as unbiased figures for desired rehabilitation. Demographics including profession, gender, age, hand dominance, weight and height must all be taken into an account when endowing normal values for grip strength.

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**Key words:** Grip strength, Pakistani population , hand dominance

## Introduction

Assessment of hand power is very crucial for evaluating the functional outcome of any surgical procedure of upper limb. After

performing any surgical procedure, the most reliable method to evaluate the outcome is to compare the post-operative function with an already known set standard. In case of surgeries pertaining to upper limb a baseline as well as individual power of both prevailing and non-prevailing hand of healthy active individuals is crucial. The difference between the power of prevailing and non-prevailing in left and right handed people is still debatable. The grip strength

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brings an equitable index to functional integrity of hand.(1) The Jamar dynamometer proved to be the most authentic and adequate measures of grip strength(2-4). Most of the published data related to hand strength is from West(5-7) and none has been done so far in Pakistan. Already published statistics may not be true representation of the grip strength of the population at our part of the world(8).

### Materials and Methods

Hospital staff and doctors of different Hospitals at Pakistan, healthy individuals at clinic waiting areas were included. A standard questionnaire which included demographics, age, gender, weight and height was filled by the primary investigator for each individual included in the study. Those with diseases of the joints, neurological disorders , peripheral nerve injuries or any disease condition or injury minimizing the functional status of the upper limb was excluded from the study. The hand which was used for eating and writing was taken to be the prevailing hand .A Jamar grip strength measuring device was used to measure the grip strength of both the prevailing and non-prevailing hand. The grip strengths were measured after standardizing the position of individual with the elbow flexed shoulder adducted. Individuals completed three attempts for each measurement and the mean value of these efforts was recorded. Right hand power was

measured first followed by left hand and then again right hand with one minute rest in between each attempt to minimize the fatigue effect .For statistical analysis SPSS was used. Mann- Whitney U test and student’s t test were used to analyzed the data. p values equal to or less than 0.05 were accepted as significant.

### Results

This study comprised of 400 participants out of which 232 were males and 168 were females.Age ranged from 16-62 years (mean 30years).Majority of them were doctors, followed by students, labourers etc.Occupation of the individuals are given below. Fig.1

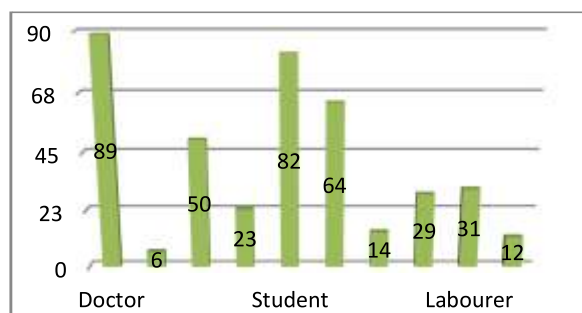


Fig.1 showing different profession of individuals

380 were right hand prevailing.The lowest , highest and mean values for grip strength of individual’s both hands, and the grip strengths of the prevailing hands of each gender is given in the table below(Table 1) .

Table I. The lowest and highest grip strength values for prevailing and non-prevailing hands.

	Right hand	Left hand	Prevailing hand	Non-prevailing hand	Male prevailing hand	Female prevailing hand
Lowest-highest(mean)	8-62(30)	4-58(27)	4-62 (30)	8-58(27)	10-76(36)	4-60(21)

When data of the two groups were evaluated, in 62%, the power of the prevailing hand was greater than the non-prevailing hand while in 29% individuals non-prevailing hand was stronger than the prevailing hand. In 8% the power was equal irrespective of the hand prevalence.

The grip strength scores were 7.8% higher in the prevailing hand when compared to the non-prevailing hand with the disparity being statistically significant ( $p < 0.05$ ).

The difference of hand grip strength values between prevailing and non-prevailing hand were found to be more significant in the right handed group.

When the right and left handed groups were individually evaluated, in the latter group percentage of non-prevailing hand was higher as compared with the prevailing hand but not statistically significant (0.06) . Table 2. There was no compelling affiliation of BMI and height with the grip strength of hand.

Table 2. The lowest and highest grip strength values for prevailing and non-prevailing hands, of right and left handed individuals

	Prevailing	Non-Prevailing
Right Handed	30	27
Left Handed	29	30.5

The grip strength irrespective of gender was noted to increase exponentially from 19 to 29 years of age reaching a plateau around 39 years. A decline in the grip strength was

noted there onwards which was marked after the age of 50 years Fig.2

Males were found to have mean grip strength of 34kilograms while it was 20kilograms in females. In males, the grip strength remained quite static from 20 to around 50 years. While in females the maximum strength was observed at around 20 years and maintained till around 40 years. The decline in the grip strength in females was noted to be steeper than the males. Fig.3

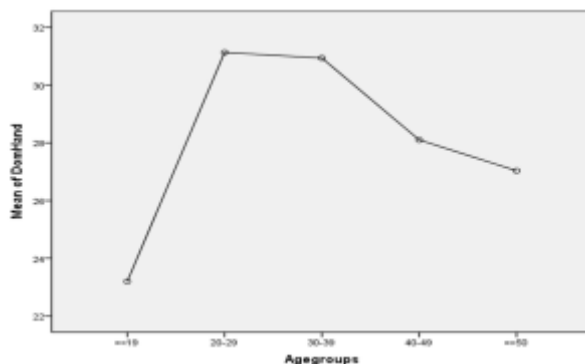


Fig. 2 showing correlation of hand strength with the age

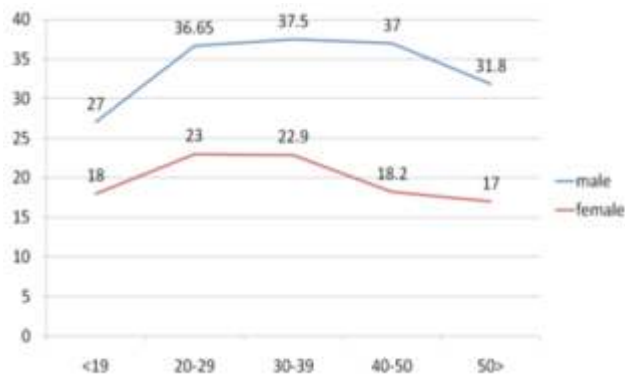


Fig. 3 Showing correlation of hand strength with age and gender.

### Discussion

The hand grip strengths of Pakistani individuals were undoubtedly weaker than those reported for Europeans American

individuals.(5-7) Table 3 correlates our results with those of a preceding studies Most of the published data related to hand strength is from West and none has been done so far in Pakistan. The published data may not be an ideal reflection of the grip strength of the population of our part of the world.

Grip strength has been reported in the past correlated with age , gender (9,10,11) and hand prevalence . It is critical to consider other demographical factors, to anticipate grip strength(12). In this study, grip strength was correlated with height and weight. Both showing not compelling impact on grip strength. One study in the past compared weight and height with grip strength, but particulars of the affiliation was not described.(9)

Males had more grip strength reporting a mean value of 34kilograms in comparison to females whose mean grip strength was 20 kilograms.

In males, the grip strength remained quite static from 20 to around 50 years. While in females, the maximum strength was observed at around 20 years and maintained till around 40 years. The decline in the grip strength in females was noted to be steeper than the males. This trend was also described by Mathiowetz et al.(2)

Literature states that the prevailing hand is 10% more stronger than the non-prevailing hand(5,13).In our study, The mean grip strength of prevailing hand was 29 Kg while the mean grip strength of the non prevailing hand was 27 kgs. There was a 7.8% difference in the strength of the prevailing hand when compared to the non-prevailing hand.

Comparing our results with the Malaysian study the grip strength of Pakistani population is more in genders, 13% greater in males and 15% greater in females. However when comparing with the west our grip strength was found to be 25% less than that of the western population (Table3).

Table .3 Showing comparison of hand strength of Pakistani population with previous studies

		Male Hand strength in Kg	Female Hand strength in Kg
Kamarul et al Malaysia	Right	31.3	18.6
	Left	28.2	16.8
Mathiowetz et al Milwaukee, United sates	Right	47.3	28.5
	Left	42.2	24.4
Our study	Right	35.9	21.8
	Left	33.3	19.4

This appeared that grip strength pattern from the western populations is not truly representing the regional population and therefore local reference values are required. A constraint of our study was that we inducted individuals from hospital building, which can not be an entire depiction of the whole country.

Another constraint was the less number of left-hand prevailing subjects (n=20), leading to a skewed distribution of data. Thence we integrated the data of the left-hand prevailing group into the right-hand group to form a study population as a whole. Similar technique was used in the preceding studies.(1–4 )In our scrutiny of grip strength of left-hand prevailing subjects, none of the tests showed any compelling results except when in the comparison of the grip strengths between male and female subjects. Studies to be conducted in future should incorporate more left handed individuals to establish better chance in calculating of normal statistics and better anticipation of grip strength pattern across different age-groups and genders. To correct the accuracy and authenticity of hand strength assessment, proper instruction, standardized posture, an average of at minimum 3 measurements, and a standard measuring device should be used. Scores should be compared after taking into account of height, weight, hand dominance, and occupation, not merely age and gender. Dynamometer should be evaluated regularly and the same evaluated instrument used for all data collection.

### Conclusion

Statistics obtained from western or even Asian natives cannot be enforced to an equivalent Pakistani population. Regional standardizing statistics are crucial for allusion and serve as unbiased figures for

desired rehabilitation. Demographics including profession, gender, age, hand dominance, weight and height must all be taken into an account when endowing normal values for grip strength.

### References

1. Balogun JA, Akomolafe CT, Amusa LO. Grip strength: Effects of testing posture and elbow position. *Arch Phys Med Rehab* 1991; 72:280-3.
2. Mathiowetz V, Kashman N, Volland G, Weber K, Dowe M, Rogers S. Grip and pinch strength: Normative data for adults. *Arch Phys Med Rehab* 1985; 66:69-74.
3. Schmidt RT, Toews J.V. Grip strength as measured by the Jamar dynamometer. *Arch Phys Med Rehab* 1970; 51:321-7.
4. Lagerstrom C, Nordgren B. On the reliability and usefulness of methods for grip strength measurement. *Scand J Rehab Med* 1998; 30:113-9.
5. Petersen P, Petrick M, Connor H, Conklin D. Grip strength and hand dominance: challenging the 10% rule. *Am J Occup Ther* 1989;43:444–7.
6. Mathiowetz V, Kashman N, Volland G, Weber K, Dowe M, Rogers S. Grip and pinch strength: normative data for adults. *Arch Phys Med Rehabil* 1985;66:69–74.
7. Crosby CA, Wehbe MA, Mawr B. Hand strength: normative values. *J Hand Surg Am* 1994;19:665–70
8. Lam NW, Goh HT, Kamaruzzaman SB, Chin AV, Poi PJ, Tan MP. Normative data for hand grip strength and key pinch strength, stratified by age and gender for a multiethnic Asian population. *Singapore Med J*. 2016 Oct;57(10):578-584
9. Agnew PJ, Maas F. Hand function related to age and sex. *Arch Phys Med Rehabil* 1982;63:269–71.
10. Omar MT, Alghadir A, Al Baker S. Norms for hand grip strength in children aged 6-12 years in Saudi

- Arabia.DevNeurorehabil. 2015  
Feb;18(1):59-64
11. Hanten WP, Chen WY, Austin AA, Brooks RE, Carter HC, Law CA, et al. Maximum grip strength in normal subjects from 20 to 64 years of age. *J Hand Ther*1999;12:193–200.
  12. Bohannon RW. Muscle strength: clinical and prognostic value of hand-grip dynamometry. *Curr Opin Clin NutrMetab Care*. 2015 Sep;18(5):465-70
  13. Armstrong CA, Oldham JA. A comparison of dominant and nondominant hand strengths. *J Hand Surg* 1999; 24B(4):421-5.