

Original Research Article

**STUDY OF CORRELATION BETWEEN BODY MASS INDEX WITH  
RIGHT AND LEFT HAND GRIP STRENGTHS IN LABORERS**

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**Abstract**

**Background:** The reliable and valid evaluation of hand grip is of importance in determining the effectivity of the different treatment strategies and procedure. And it is widely accepted that, grip strength provides an objective index of the functional integrity of the upper extremity. Many treatment protocols compare the strength of the injured limb with that of uninjured limb. There are controversies regarding the difference in the hand grip strength between dominant and non-dominant hand. So the main objective of this study is to evaluate the correlation between BMI and hand grip strength of right and left hand in laborers.

Hand function is determined by hand grip strength, so it becomes an integral part of hand assessment for estimation of hand function. There are many factors influencing hand function one among them is BMI. There is dearth of literature for grip strength in laborers especially in Parbhani Maharashtra. Thus becomes the need to find hand grip and its correlation with body mass index.

**Aim:** To find out correlation of BMI with right and left hand grip strengths in laborers.

**Method:** Fifty labourers who fulfilled the inclusion criteria were recruited for the study. Informed consent was obtained. Demographic data was collected and measurements were taken on both the hands. Hand grip strength was measured.

**Results and discussion:** Study provides normative data for grip strength in laborers working in Parbhani district. Pearson's correlation coefficient suggest a positive correlation between BMI with right and left hand grip strengths.

**Key Words:** BMI, hand grip strength, hand grip dynamometer

**Introduction:**

Hand is an intricate part of the upper extremity and is a structure consisting of four digits and a thumb each functioning significantly different from each other. There is a good interplay of bony architecture and muscle groups including flexors and extensors. Functions of hand consist of grasp, support, free movements, dexterity, expression and orientation. Hand function is determined by hand strength, therefore hand grip strength becomes an integral part of hand assessment for estimation of hand function and proper integrity of the muscles. It is imperative to assess for hand grip strength for rehabilitation of upper extremity work related musculoskeletal disorders, to diagnose and evaluate the level of indicating hand function for sports like wrestling, baseball, football, tennis, badminton, boxing, judo as well as to document ADL activities like eating and lifting heavy objects.

Hand grip strength is a physiological variable that is affected by a number of factors including age, gender and body size among others. The estimation of hand grip strength is of immense importance in determining the efficacy of different treatment strategies of hand and also in hand rehabilitation. The power of hand grip is the result of forceful flexion of all finger joints with the maximum voluntary force that the subject is able to exert under normal biokinetic conditions. Strong correlations between grip strength and various anthropometric traits, (weight, height, hand length etc.) were reported earlier<sup>1</sup> Basic body anthropometry includes age, gender, hand dominance<sup>2</sup>, BMI, posture<sup>3</sup> of shoulder, elbow and wrist angle.

There is a dearth of literature to explore the effects of these factors on hand grip strength among laborers. The information regarding the hand grip strength and BMI is minimal from the age group 16-40 years in Parbhani Maharashtra. Thus, becomes the need to find hand grip strength and its correlation with body mass index at Parbhani Maharashtra.

**Aims & Objectives:** To find out correlation of BMI with right and left hand grip strengths in laborers working in Parbhani district.

**Materials and methods:**

**Source of data:**

Laborers in the age group 16-40 years were recruited working in the campus of Parbhani medical college & research Institute.

**Methods of collecting data:**

**Study setting:** Department of Physiology, Parbhani medical college, RP Hospital & research Institute.

**Study design** Cross sectional study

**Sample procedures:** Purposive sampling

**Sample size:** Fifty subjects were taken from the age group 16-40 years.

**Inclusion criteria:**

Normal healthy male Laborers (16-40 years)

Right and left hand dominant individuals.

**Exclusion criteria:**

Work related musculoskeletal disorder affecting the upper limb.

Ambidextrous individuals.

Pain in the upper extremity.

Any restriction in the range of motion of upper limb especially shoulder, elbow and wrist that interferes with position of grip strength.

Neuromuscular disorders or system pathology that affects grip strength.

**Research tools:**

Body weight measured by weighing scale.

Body height measured by stadiometer.

Hand grip strength by Hand Dynamometer.

**Body mass index:**

Body mass index was calculated using a weighing machine for weight and stadiometer for height with the formula weight (kg)/height in (meter square).

**Grip strength**

Grip strength was tested in fundamental testing position with Jamar Dynamometer as recommended by American Society of hand therapist-Seated with shoulder adducted neutral rotation, 90<sup>0</sup> flexed elbow and neutral position of forearm, dorsiflexion of wrist between 0<sup>0</sup> and 30<sup>0</sup> and ulnar deviation between 0<sup>0</sup> and 15<sup>0</sup>. Subjects were asked to give their maximum force in one single effort when tested thrice. Hands were chosen alternately and were always recorded in kgs. Instructions to hold and squeeze the instrument with maximum force were given. The instrument was calibrated by resetting it to zero after every test. Three trials were performed alternating one hand to the other and 15 secs rest was given between each trial. Thus average of the three trials was taken for both hands.

**Data analysis:**

Data were analyzed using Microsoft excel. Mean and standard deviation are calculated for the data according to the age, height and weight. Pearson’s correlation was used.

**Results:** Mean age of subject was 27.44years, mean height was 163.58cms and mean weight was 56.904kgs. Mean right hand grip strength is 50.22kgs and mean left hand grip strength is 50.933kgs. Pearson’s correlation of BMI with hand grip strength was found positive. table 1 & 2.

Table 1: shows parameters with their Mean +SD

Parameters	Mean +SD
Age in years	27.44± 8.33
Height in cms	163.58 ± 5.85
Weight in kgs	56.904 ± 10.26
Right hand grip strength in kgs	50.22±7.35
Left hand grip strength in kgs	50. 993± 7.08

**Table 2: Pearson’s correlation of BMI with left and right hand grip strengths.**

BMI correlation with Right hand grip strength	0.528388587*
BMI correlation with left hand grip strength	0.468190511*

\*Positive Pearson’s correlation

**Discussion:**

The study was aimed to find out a correlation of BMI on grip strength of right and left hand. To our knowledge, there is no study which looked into the effect of BMI on grip strength in the population of Parbhani district. Fifty laborers were selected as subjects in the age group of 16 -40 years.

This study puts forth a normative data for the age group of 16-40 for grip strength of right and left hand. Mathiowetz et al. conducted a study for normative values of grip strength in the

United States.<sup>5</sup> The mean grip strength of the western population were found to be higher when compared to the Indians. Geographic variation and nutritional status may affect grip strength which may account of reduced strength in Indian population. But however, this study is in agreement with similar studies performed in Indian population. Bansal performed in the age group 18-25 years and compared dominant hand which shows mean  $29.79 \pm 9.7728$  and non-dominant hand shows mean  $27.8860 \pm 10.0129$ <sup>4</sup>. Koley et al. found in the age group 18-40 years, sedentary females with right dominant individuals showed grip strength mean for right hand  $22.75 \pm 3.89$  and left hand shows grip strength mean  $21.03 \pm 3.75$ <sup>2</sup>.

Body height and weight are strong predictors of grip strength. In this study mean and standard deviation scores of heights for laborers  $163.58 \pm 5.85$  and weight for laborers  $56.904 \pm 10.26$ . Normative data for grip and pinch strength helps to predict strength in normal population, to quantify the severity of hand injury, to direct goal on specific rehabilitation and to compare the deviations from the normal. A data on normative grip strength in India by Bansal reported an average of 29.7900 kgs and 27.88 kgs for the dominant and the non dominant hands respectively in the age group of 18-25 years.<sup>4</sup>

Body height and weight are directly correlated to grip strength.<sup>5,6</sup> Body mass index was found to be the strongest predictor of grip strength<sup>6,7,8,9</sup>. Under 25 and above 70 years age, higher BMI shows positive correlation to higher grip strength whereas higher BMI between these ages shows a correlation to low grip strength.<sup>8</sup>

Grip strength of right hand has mean scores of  $50.22 \pm 7.35$  in the subjects, grip strength of left hand has mean scores of  $50.993 \pm 7.08$ . BMI is considered as one of the strongest predictors of grip strength. Grip strength of right hand and left hand have positive correlation with BMI when compared with Pearson's correlation. Therefore, higher the BMI, grip strength increases. To support this, Westropp et al. proved that higher BMI between the age group under 25 and above 70 years shows a positive correlation to higher grip strength and higher BMI between the age group 25-70 years shows a positive correlation to low grip strength.<sup>8</sup>

### Conclusion:

in this study hand grip strength increases with increase in BMI in selected age group of laborers as there is positive correlation between BMI and right and left hand grip strengths. Although this study in no way exhaustive, further more studies considering hand dominance and gender prevalence of subjects need to be done.

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