

RESEARCH ARTICLE

A comparative study of handgrip strength among sedentary and non-sedentary workers

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ABSTRACT

Background: India is a developing country with a rapid transformation in lifestyle including inappropriate diet and inadequate physical activity. More the physical activity greater will be the muscle strength. Handgrip strength is an indicator of muscle strength. **Aims and Objectives:** This study was conducted to compare handgrip strength among sedentary and active workers and to determine the relationship between body mass index (BMI) and handgrip strength. **Materials and Methods:** This cross-sectional study was conducted in Dakshina Kannada, Karnataka, India. 50 sedentary subjects and 50 constructive site active laborers were selected as study groups by convenience sampling. Anthropometric parameters such as height and weight, were recorded. Handgrip strength was recorded using a standard adjustable handgrip dynamometer. Handgrip strength was compared between the groups using independent *t*-test and Pearson's correlation was carried out to find relationship between anthropometric variables and handgrip strength. **Results:** We noted extremely statistically significant stronger handgrip strength in both the right and left hand of the active group compared to that of the sedentary group ($P < 0.0001$). There was no significant relationship between BMI and handgrip strength. There was a positive correlation with weight and handgrip strength of active group. **Conclusion:** The physically active group had higher handgrip strength compared to sedentary group. The sedentary group had significantly higher weight when compared to that of active group which provides evidence that low physical activity is related to weight gain and its complications. The above result emphasizes the need to indulge in regular physical activities.


KEY WORDS: Body Mass Index; Handgrip Strength; Lifestyle; Physical Activity; Sedentary

INTRODUCTION

Strength is the capacity of muscles to exert force against resistance. It is a product of voluntary muscle contractions caused by the neuromuscular coordination.^[1] Handgrip determines the strength of the muscles. Strength plays an integral role in performing day to day activities. Handgrip

strength is determined by various factors such as posture, gender, age, handedness, nutritional status, wrist and forearm position and psychological factor.^[2] Physical activity is essential for the general well-being of a person. It provides health benefits by reducing the risk of cardiovascular and metabolic diseases. It reduces the risk of bone fractures and developing depressive symptoms.^[3] Sedentary lifestyle of lying down, sitting, writing, slow walking, cooking food, washing dishes and watching screen-based entertainment has detrimental effects on the health of a person.^[4]

As per WHO, physical activity for health is divided into 3 age groups, 5-17 years, 18-64 years and 65 years and above.^[5] Recommended physical activity guidelines for healthy adults of Asian Indians should be 60 min every day, with at least

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30 min of moderate-intensity aerobic activity, 15 min of work-related exercise and 15 min of muscle-strengthening activity. Gradual increase in physical activity was recommended for physically inactive people.^[6]

Koley et al.^[7] carried out a study to compare handgrip strength among 100 laborers and sedentary females and reported higher height, weight, body mass index (BMI), hand length, hand breadth and handgrip strength in the dominant hand of sedentary females compared to active laborers. A study carried out in Karnataka found a significant difference in dominant handgrip strength among the active and sedentary groups. Further, it was observed that there was no significant difference in BMI among the groups.^[8] Handgrip strength was significantly higher in males when compared to females.^[9] Significant correlation of handgrip strength with hand dominance, height and weight were reported. Men were stronger than women in all the age-groups. In both right and left-handed dominant groups, the handgrip strength was significantly stronger in dominant hand when compared to the non-dominant hand.^[10]

Despite the health benefits of physical activity is known, the present generation is not involved in physical activities. Instead, they follow sedentary lifestyle like watching television, playing videos games by restraining outdoor games and consuming junk foods. As youngsters are an ideal setting for health promotion and it is our duty to motivate them to incorporate healthy lifestyle habits into their own life, family and friends. Hence, this study was conducted to compare handgrip strength among the sedentary population and non-sedentary constructive site workers.

MATERIALS AND METHODS

This cross-sectional study was conducted in Thumbay, Bantwal Tq, Dakshina Kannada, Karnataka, India. Approval of the Institutional Ethics Committee was taken before conducting the study. 50 sedentary subjects and 50 active constructive site male laborers aged between 18 and 40 years were selected as study groups by convenience sampling. Subjects having rheumatoid arthritis/osteoarthritis, recent surgery of upper limb, recent fracture bone of upper limb, those having carpal tunnel syndrome and diabetes mellitus were excluded from the study. Informed written consent was taken from the subjects before enrolling them for the study. The details and purpose of the study were discussed with the participants. A general physical examination including vital signs and complete systemic examinations was done. A detailed history including physical activity, diet, family, personal and drug history was taken.

Anthropometric parameters such as height, weight and handgrip strength were recorded in the constructive site of their working place and residential area in and around Thumbay. BMI was computed from the above data using

Quetlet's formula, $BMI = \text{Weight (kg)}/\text{height}^2 \text{ (m)}.$ ^[11] Handgrip strength was recorded using a standard adjustable handgrip dynamometer. The grip strength of both dominant and non-dominant hand was recorded in standing position with shoulder adducted and neutrally rotated and elbow in full extension. The subjects were asked to put maximum force on the dynamometer thrice from both the hands. The first recording was taken on the right hand and the successive readings were recorded following a rest period of 3 min. The average value was recorded in kilograms.

The data of study parameters were tabulated in excel sheet. Statistical analysis was performed using SPSS for windows, IBM SPSS Statistics 23 Version. Data were represented as mean \pm standard deviation. The analysis was performed using independent *t*-test and Pearson's correlation. $P < 0.05$ was considered statistically significant.

RESULTS

The study participants were grouped as sedentary and active group. Table 1 shows their mean age and anthropometric measurements.

All the participants were right-hand dominant in both sedentary and active group. The mean handgrip strength of sedentary group as well as active group had higher strength in right hand when compared to that of left hand (Table 2). Independent *t*-test revealed that there was extremely statistically significant ($P < 0.0001$) stronger handgrip strength in both the right and left of the active group compared to that of sedentary group (Table 2).

Anthropometric variables were correlated with right and left handgrip strength of sedentary and active group. We found that there was a statistically significant positive correlation between weight and handgrip strength of active group (Table 3).

DISCUSSION

In our study, we observed higher handgrip strength in both the right and left hand of the active group when compared

Table 1: Baseline characteristics of the participants (n=100)

Parameters	Sedentary group (n=50)	Active group (n=50)
Age (years)	27.7 \pm 8.36	27.7 \pm 7.36
Height (cm)	169.39 \pm 7.36	164.07 \pm 7.03
Weight (kg)	67.2 \pm 11.81	62.02 \pm 8.12
BMI (kg/m ²)	21.09 \pm 3.59	20.78 \pm 2.84

Values are expressed as mean \pm SD. BMI: Body mass index, SD: Standard deviation

Table 2: Handgrip strength of sedentary and active group (n=100)

Parameters	Sedentary group (n=50)	Active group (n=50)
Right hand	28.02±5.57	35.16±6.1***
Left hand	24.16±4.7	30.58±5.5***
Weight (kg)	67.2±11.81	62.02±8.12*
BMI	21.09±3.59	20.78±2.84

Independent *t*-test. ****P*<0.0001 extremely statistically significant, **P*<0.05 statistically significant, BMI: Body mass index

Table 3: Pearson's correlation of various variables with handgrip strength of sedentary and active group (n=100)

Parameters	Sedentary group (n=50)	Active group (n=50)
	Right hand	Right hand
Height (cm)	0.079	0.147
Weight (kg)	0.105	0.312*
BMI (kg/m ²)	0.059	0.195

Pearson's correlation. **P*<0.05 statistically significant, BMI: Body mass index

to that of sedentary group. Koley et al.^[7] reported significant higher handgrip strength in the sedentary group compared to that of active group which is against our report and stated that it may be because of nutritional deficiency in their diet. While a study by Mattioli et al.^[12] reported that there was no difference in handgrip strength between the sedentary and active group.

We have found no relationship between BMI and handgrip strength. While a study carried out by Lad et al.^[13] to assess the relationship between BMI and handgrip strength reported that there was higher handgrip strength among the normal BMI group compared to low and high BMI group.

There was a positive correlation with weight and handgrip strength of active group and no such relationship with the sedentary group. Liao^[14] conducted a study in 2015 in Taiwan on 200 participants and reported a positive correlation with handgrip strength, height and weight while we found significant relation only with weight.

Active group had significant higher handgrip strength which may be due to the regular physical activity which they perform routinely at their workplace. Muscle mass and muscle strength is positively correlated.^[15] This is in contrast with the sedentary group where they spend most of their time sitting at their workplace. Positive correlation between weight and handgrip strength among active group may be due to increase in muscle mass and strength, and this relationship was not noted in the sedentary group.

The mean weight of sedentary group was more compared to that of active group which is probably due to physical inactivity and increase in body fat. Golubic et al.^[16] conducted a study on 230 participants to determine the correlation between physical activity, sedentary activity time and gain in body fat. The participants were followed up for 7 years. They reported that over the time, increase in moderate to vigorous physical activity and decreasing the time spent in sedentary activities, there was a significant reduction in body fat and weight.

CONCLUSION

Physically active group demonstrated statistically significant higher handgrip strength compared to the sedentary group. There was no statistically significant relationship between BMI and handgrip strength. Sedentary group had statistically significant higher weight with relation to active group, which provides evidence that low physical activity is related to weight gain and its complications. The above result emphasizes the need to indulge in regular physical activities. Relatively smaller sample size, males as participants and nutritional status being the confounding factor which was not assessed are the limitations of this study. Larger sample size including both genders form the future scope of the study.

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