

Comparison of back muscle and leg muscle strength among different groups of female medical students

S Azad¹, MMH Khan², SH Lia³, S Ara⁴

Abstract

Background: Muscle strength is the ability of a muscle or muscle group to exert force. Good muscle strength increases physical performance and may be important in weight maintenance.

Objective: The present study aimed at comparing the back muscle and leg muscle strength among different groups of female medical students which might be used as base-line findings for other similar sedentary professionals.

Methods: A cross-sectional analytical study was conducted in the department of Anatomy, Dhaka Medical College, Dhaka, from January 2016 to December 2016. The study was performed on 118 female Bangladeshi medical students. It was conducted on three groups depending on body mass index- normal group, overweight group and obese group.

Results: Significant difference of mean back muscle and leg muscle strength was observed among normal, overweight and obese groups. The mean back muscle and leg muscle strength were higher in normal group than overweight group and lower in obese group. Significant difference ($p=0.030$) was observed between mean leg muscle strength of over-weight and obese group.

Conclusion: The results of the present study demonstrate that back muscle and leg muscle strength were significantly higher in normal group than overweight group and it is lower in obese group.

Key words: Back muscle strength, Leg muscle strength

Introduction

Strength is the quality or state of being physically strong and the ability to resist being moved or broken by a force.¹ Muscle strength is necessary for normal healthy living. It is correlated with muscle mass, muscle structure, body mass, neurological and physiological factors. Muscle weakness might impair normal functional movements.^{2,3} There is evidence that excessive participation in sedentary behaviours, such as sitting for work/study purposes, is associated with higher risk of overweight and obesity.⁴ Many medical students experience changes in their life patterns during their college years. They spend maximum hours in everyday on studying. Most of them are physically inactive. So, they lead a sedentary lifestyle.⁵ Sedentary activities have been associated with a range of adverse health outcomes independently from physical activity. Physical inactivity affects muscle strength. It results in large decreases in muscle mass and strength.^{6,7} Inadequate muscle strength is associated with increased

risk of injury, back pain, leg pain and joint pain. Back pain is one of the most common public health problems. Many lumbar problems are muscular in origin and persons suffering from back pain often have weak lumbar muscles.⁸ overweight and obese person suffers more frequently from knee and low-back osteoarthritis. Every student should have knowledge about the importance of back muscle and leg muscle strength that can help them to take measures for a healthy life.

Muscle strength is an important component of physical fitness. A positive relationship exists between physical activity and muscle strength. Measurement of muscle strength can be used to evaluate general physical condition and can indirectly provide a measure of healthy and active lifestyle.⁹

The present study aims at comparing back muscle and leg muscle strength among different groups of female medical students. The result may be used as

1. Samina Azad M.Phil, Associate Professor, Dept of Anatomy, Khulna Medical College, Khulna (saminaazad06@gmail.com)

2. Md. Mohibul Hasan Khan M.Phil, Assistant Professor, Dept of Anatomy, KMC (Formerly; Lecturer, DMC)

3. Shamima Hoque Lia M.Phil, Associate Professor, Dept. of Anatomy, SZRMC, Bogura (Formerly; Lecturer, DMC)

4. Shamim Ara FCPS, Professor, Department of Anatomy, Holy Family Medical College, Dhaka (Formerly; Professor, DMC)

baseline findings for other similar sedentary professionals and also to formulate a healthy workout plan for them.

Materials and Methods

This was a cross-sectional analytical study. One hundred eighteen female medical college students of 18-25 years of age were selected from different medical colleges of Dhaka city. Medical students usually get admitted in the medical college at or above the age of 18 years and complete their MBBS course at or above the age of 23 years. Hence, the medical students between the ages of 18-25 years were chosen as subjects.

Subjects were selected according to their availability and willingness. None of their weaknesses were exploited, nor was any undue pressure created to make them participate in the study. They were not suffering from any active disease or any deformity. Injury or fracture and any surgical procedure of leg and back were excluded. Information regarding inclusion and exclusion criteria of female medical students was obtained directly by questionnaire and by physical observation as far as possible. Their ages were determined by the national ID cards. Each participant was given an ID number to avoid repetition.

Grouping of participants (normal group, overweight group and obese group) were done according to their body mass index. Procedure of measurement of back muscle and leg muscle strength was measured by back muscle and leg muscle strength dynamometer. Back muscle and leg muscle strength dynamometer is a device that measures isometric force produced by back, leg and arm muscles (Figure 1).



Figure 1 : Back and leg muscle strength dynamometer

After 3 minutes of walking, the subject was positioned with body erect. The length of the chain was adjusted according to height of subject. Then knee was bent so that the grasping hand rests at about 5-7 cm above the knee. Then she was asked to lift the handle of the dynamometer by straightening the knee. She was also asked to incline her body forward at an angle of 60 degrees while the lower back had to maintain an appropriate lordotic curve. Participants were asked to keep this pull for 5 seconds. Then the strength of the back muscle was recorded on the dynamometer in Kg. The measurement of back muscle strength test was taken at three trials. Each back strength testing was recorded at one minute intervals (Figure 2a).

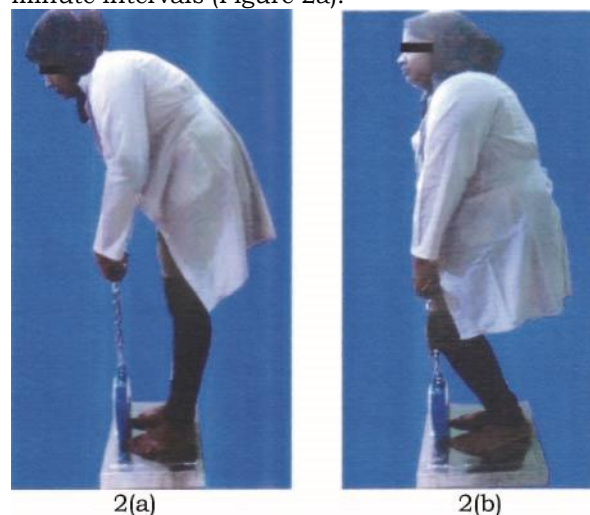


Figure 2: Photograph showing measurement of (a) back muscle strength and (b) leg muscle strength

The subject was asked to stand erect on the base of the dynamometer with the feet shoulder width apart. Then the length of the chain was adjusted with knee bent so that the grasping handle of the dynamometer rests about 5-7 cm above the knee. In this position participants head was held upright and was looking straight ahead. Then she was asked to pull the handle as hard as possible without bending her back and tries to straighten her leg. She was holding the center of bar with both hands and palms facing toward the body. Then the strength of the leg muscle was recorded on the dynamometer in Kg. The measurement of leg muscle strength test was taken at three trials. Each leg strength testing was recorded at one minute intervals (Figure 2b). All data were checked and edited after collection. Later the data were put into computer and were analyzed with the help of SPSS version 19.0 for windows. Statistical analyses were done by ANOVA test.

Results

The present study was carried out on 118 female medical students (18-25 years of age) of different medical colleges of Dhaka city. They were grouped into three categories according to body mass index. (Table I) They were normal group, overweight group and obese group.

Table I
Grouping of patients

Group	BMI (kg/m ²)	Number (n)
Normal	18.5 - 24.9	48
Overweight	25.0 - 29.9	40
Obese	>30	30

In normal group, back muscle strength ranged from 31.8-55.0 kg and the mean (+SD) back muscle strength was 40.9+6.4 kg. In overweight group, back muscle strength was ranged from 25.2-46.7 kg and the mean (+SD) back muscle strength was 38.1+5.8 kg. In obese group, back muscle strength was ranged from 23.7- 40.5 kg and the mean (+SD) back muscle strength was 33.3+4.9 kg. Difference between mean back muscle strength of normal and overweight groups was significant (p=0.023). Significant difference in mean back muscle strength was observed between normal and obese groups p<0.001. There was significant difference observed between back muscle strength of overweight and obese groups (p=0.001), (Figure 3).

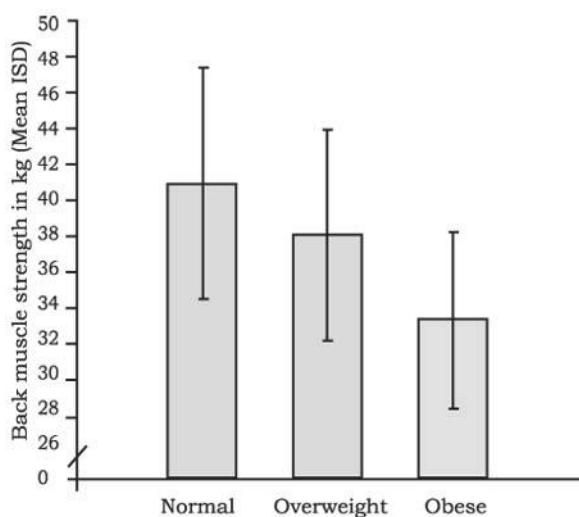


Figure 3 : Comparison of back muscle strength among normal, overweight and obese students

In normal group, leg muscle strength was ranged from 20.5-45.0 kg and the mean (+SD) leg muscle strength was 30.4+6.4 kg. In overweight group, leg muscle strength was ranged from 15.5-40.5 kg and the mean (+SD) leg muscle strength was 26.2+5.9 kg. In obese group, leg muscle strength ranged from 15.0-30.5 kg and the mean (+SD) leg muscle strength was 23.1+4.7 kg.

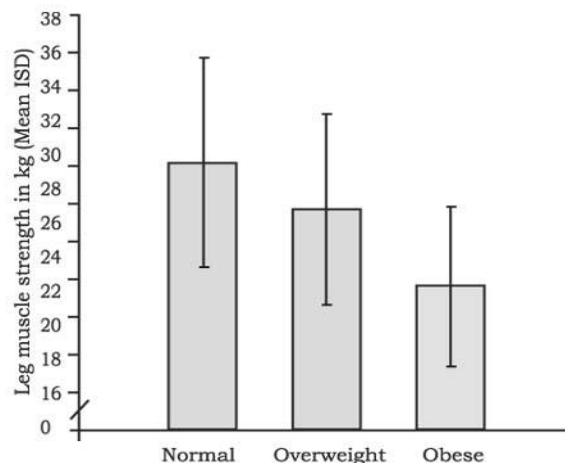


Figure 4 : Comparison of leg muscle strength among normal, overweight and obese students

Difference between mean leg muscle strength of normal and overweight groups was significant (p<0.001). Significant difference was observed between normal and obese groups (p<0.001) in mean leg muscle strength. There was significant difference observed between mean leg muscle strength of overweight and obese groups (p=0.03), (Figure 4).

Discussion

The present study was carried out on adult Bangladeshi females comprising of three groups depending on body mass index. The findings of the study were statistically analyzed and revealed important information about back muscle and leg muscle strength of female Bangladeshi medical students.

Yaparak reported that mean back muscle strength was 70.7+9.8 kg in university students. When compared with the present study, the mean back muscle strength of normal group of the present study was significantly lower (P<0.001) than the findings of Yaparak.

Miyatake et al. reported 46.9+10.1 kg mean leg muscle strength in Japanese adolescents. The mean leg muscle strength of normal group of the present study was significantly lower (P<0.001) than the findings of Miyatake et al. Mezzaroba and Prati reported 30.5+9.3 kg mean leg muscle

strength in female individuals. The mean leg muscle strength of overweight group of the present study was significantly lower than the findings of Mezzaroba and Prati.

The present study was conducted on a small sample size. Only 118 female students were included in this study. So the students of the present study do not represent all the female medical students of Bangladesh. There was no published work on back muscle and leg muscle strength in female medical students. So the result of the study could not be compared with such other studies. Few numbers of publications by other researchers with similar study on different groups of people were available to compare with the findings of the present study.

The study is limited by small sample size and use of traditional measuring scale for muscle strength. The more advanced HOGGAN Scientific MicroEFT2 Hand held Dynamometer could be used to get more detailed and accurate information about back and leg muscle strength.

Conclusion

Significant difference of mean back muscle and leg muscle strength were observed among normal, overweight and obese groups. Mean back muscle and leg muscle strength were higher in normal group in comparison to overweight group and lowest in obese group.

References

1. Saini M, and Sinha A. Comparison of Leg Strength Grip Strength and Back Strength among the Wrestlers Weightlifters and Judokas of College Students. *International Journal of Physical Education Fitness and Sports* 2014; 3: 100-107
2. Nikolaidis P. Development of isometric muscular strength in adolescent soccer players. *Journal of Physical Education and Sport* 2012; 10: 231-242
3. Tuba M, Defne O, Bilgehan B, et al. Muscle strength in relation to body composition in the Turkish male national judo team. *Journal of Physical Education and Sports* 2012; 12: 175-181
4. Deliëns T, Deforche B, Bourdeaudhuij DI, et al. Determinants of physical activity and sedentary behaviour in university students: a qualitative study using focus group discussions. *BMC Public Health* 2015; 15: 1-9
5. Majeed F. Association of BMI with diet and physical activity of female medical students at the University of Dammam, Kingdom of Saudi Arabia. *Journal of Taibah University Medical Sciences* 2015; 10: 188-196
6. Hamer M, and Stamatakis E. Screen based sedentary behavior, physical activity and muscle strength in the English longitudinal study of ageing. *Journal of Physical Activity* 2013; 8:1-5
7. Bogdanis CG. Effects of physical activity and inactivity on muscle fatigue. *Journal of Frontiers in Physiology* 2012; 3: 1-15
8. Yaprak Y. The effects of back extension training on back muscle strength and spinal range of motion in young females. *Journal of Biology of Sports* 2013; 30: 201-206
9. Hulens M, Vansant G, Lysens R, et al. Assessment of isokinetic muscle strength in women who are obese. *Journal of Orthopaedic & Sports Physical Therapy* 2002; 32: 347-356
10. Mittal R. Goyal MM, Dasude CR, et al. Measuring obesity: results are poles apart obtained by BMI and bio-electrical impedance analysis. *Journal of Biomedical Science and Engineering* 2011; 4: 677-683
11. Koley S, Khajuria A, and Melton S. The correlation between back strength and leg strength among Indian inter university male cricketers. *Physical Education and Sport* 2010; 8: 125-132
12. Miyatake N, Miyachi M, Tabata I, et al. Relationship between muscle strength and anthropometric, body composition parameters in Japanese Adolescents. *Journal of Sport and Health Science* 2012; 4: 1-5
13. Mezzaroba VP, and Prati A. Influence of strength training on variables related to elderly autonomy. *Journal of Health Sciences* 2012; 34: 157-162