



ASSESSMENT OF BODY MASS INDEX INFLUENCE ON FOREARM SKELETAL MUSCLE ENDURANCE USING MOSSO'S ERGOGRAPH AMONG FIRST-YEAR MEDICAL STUDENTS OF GOVERNMENT MEDICAL COLLEGE, JAMMU

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Abstract

Background: Skeletal muscle endurance reflects the ability of a muscle to sustain repeated contractions against resistance. Body mass index (BMI), a marker of nutritional status and body composition, may influence muscular performance and fatigue patterns.

Objective: To evaluate the association between BMI and forearm skeletal muscle endurance among first-year MBBS students using Mosso's ergograph.

Methods: A cross-sectional observational study was conducted on 100 first-year MBBS students. BMI was calculated using WHO criteria. Forearm muscle endurance was assessed using Mosso's ergograph with a 2-kg load at 20 contractions per minute until exhaustion. Total work done (kg-m) was calculated. Data were analyzed using one-way ANOVA and Pearson correlation.

Results: Mean endurance was highest in the normal BMI group (72.0 ± 8.4 kg-m), followed by overweight (55.3 ± 7.1 kg-m) and underweight (45.6 ± 6.8 kg-m). The difference was statistically significant ($F = 64.82, p < 0.001$). BMI showed a moderate positive correlation with endurance within the normal range ($r = 0.62, p < 0.001$).

Conclusion: BMI significantly influences skeletal muscle endurance. Students with normal BMI demonstrated superior performance, suggesting that optimal body composition contributes to better muscular efficiency.

Keywords: BMI, Skeletal muscle endurance, Mosso's ergograph, Fatigue, Medical students.

Introduction

Skeletal muscle endurance is defined as the capacity of a muscle to sustain repeated contractions over time without fatigue¹. It depends on muscle fiber composition, glycogen reserves, neuromuscular coordination, and overall nutritional status.

Body Mass Index (BMI) is widely used to classify individuals based on weight relative to height². Both undernutrition and excess adiposity can affect muscle metabolism, oxygen utilisation, and mechanical efficiency³.

Medical students often experience irregular lifestyle patterns that may influence physical fitness. Evaluating muscle endurance in relation to BMI provides insight into functional health status in young adults.

This study was undertaken to determine whether BMI significantly affects forearm skeletal muscle endurance among first-year MBBS students.

Aim And Objectives

- 1.To measure forearm skeletal muscle endurance using Mosso's ergograph.
- 2.To compare endurance among different BMI categories.
- 3.To assess the statistical relationship between BMI and muscle endurance.

Materials And Methods

Study Design

Cross-sectional observational study.

Study Population

100 first-year MBBS students of GMC Jammu.

Inclusion Criteria

Healthy students aged 17–22 years.

Exclusion Criteria

History of neuromuscular disorder, recent upper limb injury, metabolic disease.

Anthropometric Measurements

- ☐ Height measured using stadiometer
- ☐ Weight measured using calibrated digital scale
- ☐ BMI calculated as weight (kg)/height (m²)
- ☐ Classified according to WHO criteria⁶

Assessment of Muscle Endurance

Mosso's ergograph was used with:

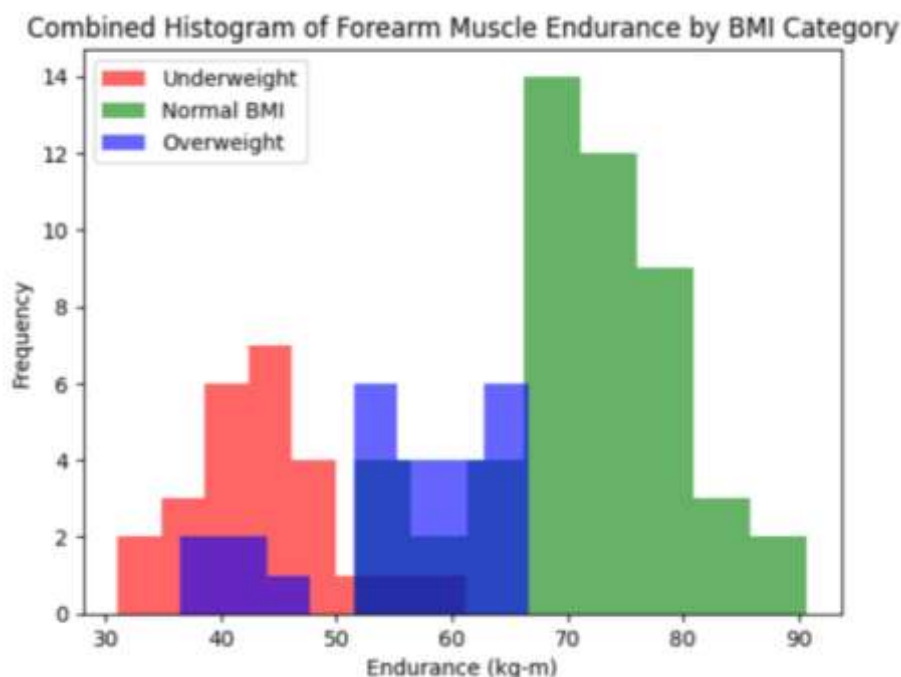
- ☐ Load: 2 kg
- ☐ Frequency: 20 contractions/min
- ☐ Exercise continued until exhaustion
- ☐ Total work done calculated in kg-m

Statistical Analysis

Data analyzed using SPSS.

- ☐ Mean $\pm$ SD calculated
- ☐ One-way ANOVA used for group comparison
- ☐ Pearson correlation applied
- ☐ $p < 0.05$ considered significant

Results



Distribution of Participants

BMI Category	n
Underweight	25
Normal	50
Overweight	25

Mean Endurance (kg-m)

BMI Category	Mean $\pm$ SD
Underweight	45.6 $\pm$ 6.8
Normal	72.0 $\pm$ 8.4
Overweight	55.3 $\pm$ 7.1

A total of 100 first-year MBBS students participated in the study. Based on WHO BMI classification, 25% were underweight, 50% had normal BMI, and 25% were overweight.

Comparison of Mean Endurance Across BMI Groups

The mean forearm muscle endurance was:

- ☐ Underweight: 45.6 ± 6.8 kg-m
- ☐ Normal BMI: 72.0 ± 8.4 kg-m
- ☐ Overweight: 55.3 ± 7.1 kg-

ANOVA

$F(2,97) = 64.82$

$p < 0.001$

Post-Hoc (Tukey)

- ☐ Normal vs Underweight: $p < 0.001$
- ☐ Normal vs Overweight: $p < 0.001$
- ☐ Overweight vs Underweight: $p = 0.002$

Correlation

Pearson $r = 0.62$

$p < 0.001$

Discussion

The present study demonstrated a significant association between BMI and forearm muscle endurance. Students within the normal BMI range showed superior endurance compared to both underweight and overweight groups.

Underweight individuals may have reduced glycogen reserves and lower muscle mass, predisposing them to early fatigue⁴. Conversely, excess adiposity in overweight individuals may reduce mechanical efficiency and oxygen utilization⁵.

Our findings align with previous research indicating that optimal body composition enhances physical performance and reduces fatigue susceptibility⁷⁻¹¹.

Conclusion

BMI is a significant determinant of skeletal muscle endurance. Students with normal BMI demonstrated the highest endurance levels, highlighting the importance of maintaining optimal body composition for functional health.

Limitations

- ☐ Single-center study
- ☐ Limited sample size
- ☐ Cross-sectional design prevents causal inference

Recommendations

- ☐ Encourage lifestyle modification among medical students
- ☐ Larger multi-center studies recommended
- ☐ Include body composition analysis (DEXA/BIA) in future research

Ethical Clearance :

As per Approval issued in this regard vide No.: IEC/GMCJ/2025/2092, dated: 11-02-2025. The project belongs to Cat-C as per SoPs & ICMR guidelines under Registration No: C-556.

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