# Relationship between Cognitive Function and Body Mass Index in Medical Students: A Cross-Sectional Study

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**Abstract:** _Background: Obesity is a global health issue, with a prevalence of 13.1% worldwide and 3.9% in India (WHO, 2020). Among Indian medical students, increasing rates of obesity are linked to stressful education, lack of physical activity, and irregular diets. Studies show obesity impairs cognitive functions, including executive function and memory. This study investigated the relationship between Body Mass Index (BMI) and cognitive function in medical students, with a focus on gender differences. Method: This cross-sectional study included 212 GMCH medical students selected via random sampling. BMI was measured using digital weight and height scales, and cognitive function was assessed with the 30-item Mini-Mental State Examination (MMSE). Data analysis utilized SPSS software, employing p-value, Pearson's correlation coefficient to evaluate the BMI-cognitive function relationship. Results: A significant correlation was found between higher BMI and lower cognitive function scores, with gender differences observed. These findings highlight the need for weight management strategies to enhance cognitive health in students. Conclusion: This study contributes to the understanding of how obesity impacts cognitive function in medical students, emphasizing the importance of addressing obesity to preserve cognitive health._

**Keywords:** BMI, Cognitive function, MMSE, Medical students, Obesity

## 1. Introduction

According to the World Health Organization (WHO) World Health Statistics Report 2020, the global age-standardised prevalence of obesity among adults is 13.1%, with India reporting a prevalence of 3.9%.[1] The rise in obesity and overweight conditions is becoming an emerging health issue among Indian medical students. [2-4]

This trend is attributed to various lifestyle-related risk factors including academic stress, lack of physical activity, poor dietary habits, sleep deprivation, and increased psychological burden.[5] There is growing evidence suggesting a link between obesity and impaired cognitive functions, including executive functioning and memory. [6-10]

### Aim and Objectives

**Aim:** To determine the relationship between cognitive function and Body Mass Index in medical students.

**Objectives:**
1) To assess the correlation between cognitive function and BMI.
2) To compare this relationship between males and females.

## 2. Methodology

**Study Design:** Cross-sectional study.

**Study Setting:** Gauhati Medical College and Hospital, Guwahati.

**Study Duration:** The study was completed within a period of 30 days.

**Study Population:** Students aged 18-30 years.

**Inclusion Criteria:**
- Students of Gauhati Medical College and Hospital
- Age group between 18–30 years
- Provided informed consent

**Exclusion Criteria:**
- Students unwilling to participate

**Sampling Method and Sample Size:** Simple random sampling was used to select 212 participants.

**Data Collection Procedure:** Body weight and height were measured using digital devices. BMI was calculated as weight in kilograms divided by the square of height in meters. Cognitive function was assessed using the Mini-Mental State Examination (MMSE), a 30-item questionnaire where higher scores indicate better cognition.

**Data Analysis:** Data were entered in MS Excel and analyzed using SPSS. Mean, standard deviation, and Pearson's correlation coefficient were calculated. A p-value < 0.05 was considered statistically significant.

**Reliability of the Study:** The study is reproducible in other similar populations. Results may vary across settings.

**Ethical Considerations:** Ethical approval was obtained from the Institutional Ethics Committee of Gauhati Medical College and Hospital, Guwahati.

## 3. Results

**Table 1:** Demographic Distribution of Study Participants by Gender and Age Group

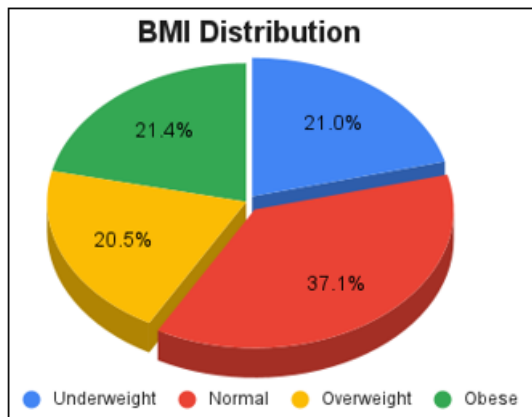| Category | Number | Percent (%) |
|---|---|---|
| All | 212 | |
| Male | 108 | 51% |
| Female | 104 | 49% |
| | | |
| age<=20 | 62 | 29.25 |
| 20<age<=25 | 73 | 34.43 |
| age>25 | 77 | 36.32 |



**Figure 1:** Distribution of Participants by BMI Categories
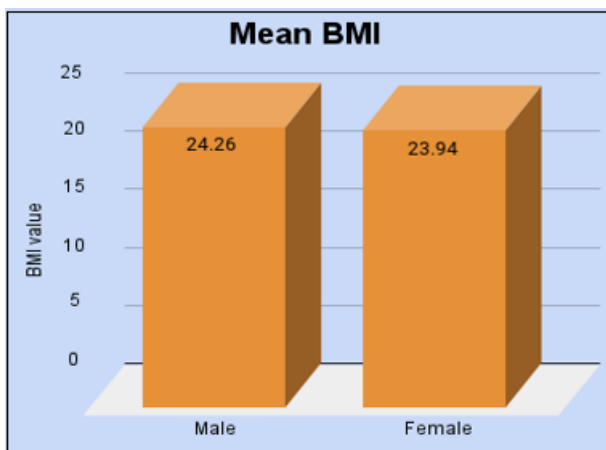


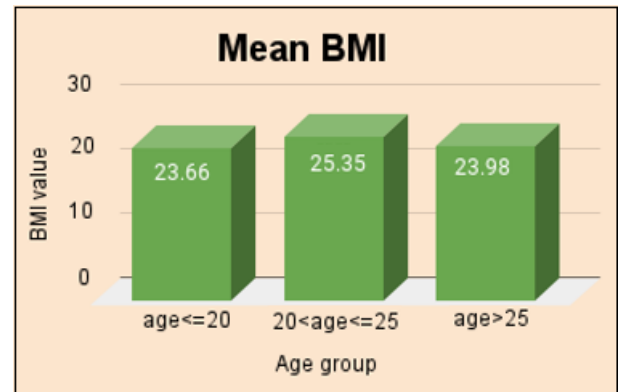**Figure 2:** Distribution of Participants by Mean BMI vs Gender



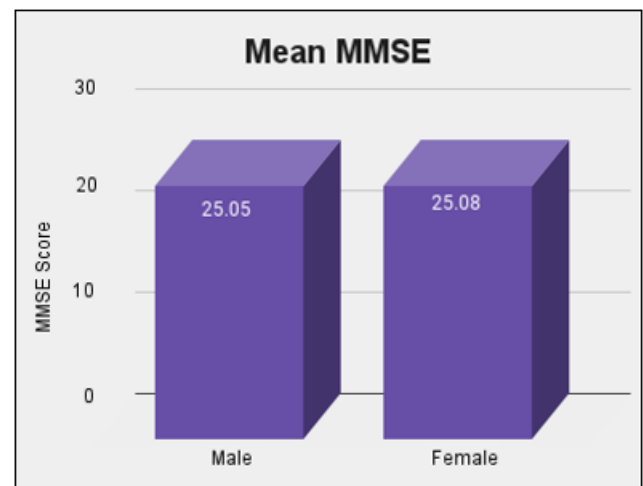**Figure 3:** Distribution of Participants by Mean BMI vs Different Age group



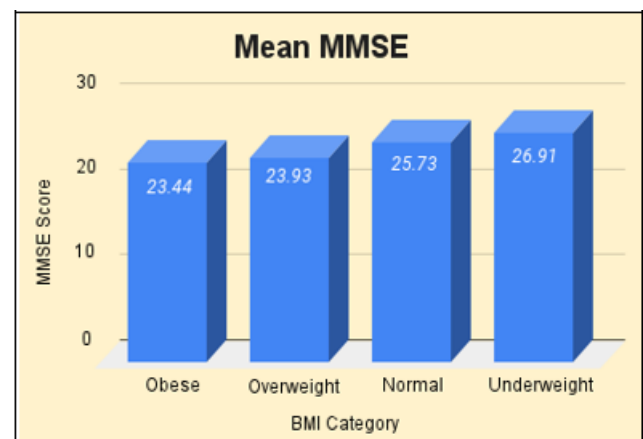**Figure 4:** Distribution of Participants by Mean MMSE Score vs Gender



**Figure 5:** Distribution of Participants by Mean MMSE Score vs BMI category
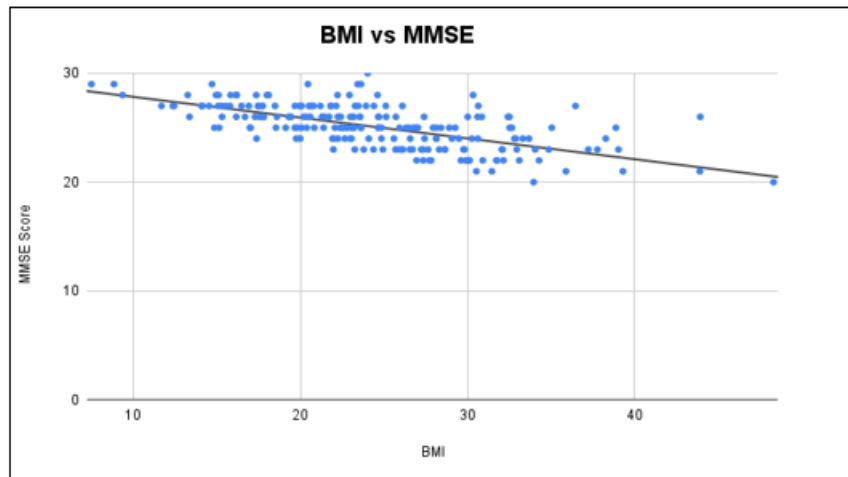
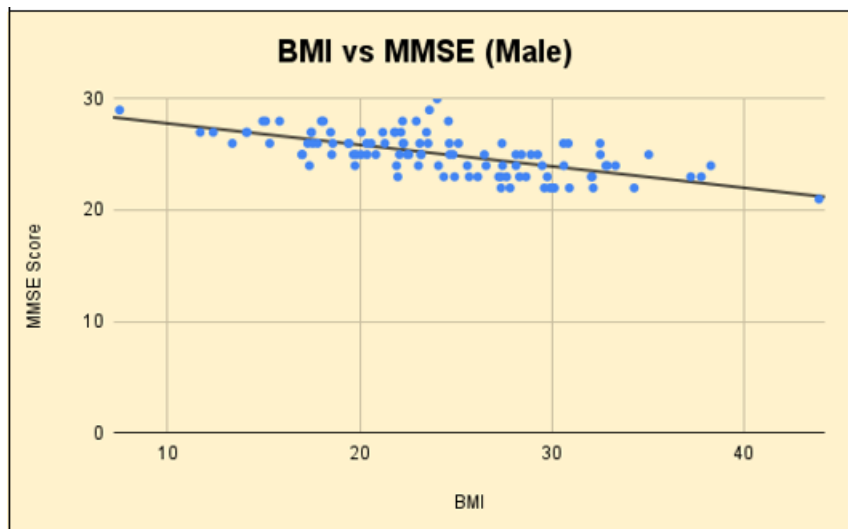**Figure 6:** Scatter Plot Showing Correlation Between BMI and MMSE Scores (Overall)



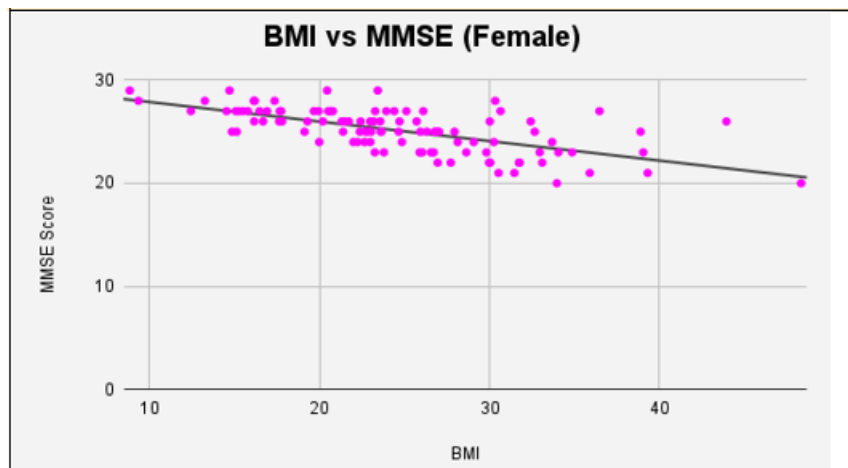**Figure 7:** Scatter Plot Showing Correlation Between BMI and MMSE Scores (Male)



**Figure 8:** Scatter Plot Showing Correlation Between BMI and MMSE Scores (Female)

**Table 2:** Summary Statistics of Body Mass Index and MMSE Scores by Gender and Age Groups

| SUMMARY | | | | | | |
|---|---|---|---|---|---|---|
| Category | Median BMI | Mean BMI | Std dev | Median MMSE | Mean MMSE | std dev |
| All | 23.57 | 24.36 | 6.8 | 25 | 25.09 | 2 |
| Male | 23.59 | 24.26 | 6.39 | 25 | 25.05 | 1.89 |
| Female | 23.59 | 23.94 | 7.24 | 25 | 25.08 | 2.11 |
| | | | | | | |
| age<=20 | 23.23 | 23.66 | 6.74 | 26 | 25.34 | 1.94 |
| 20<age<=25 | 24.71 | 25.35 | 6.27 | 25 | 24.84 | 2.03 |
| age>25 | 23.05 | 23.98 | 7.31 | 25 | 25.14 | 2 |

**Table 3:** Correlation Between BMI and MMSE Scores Among Different Demographic and BMI Categories

| Category | R (rounded) | P value |
|---|---|---|
| All | -0.651 | 0 |
| Male | -0.651 | 0.0102 |
| Female | -0.652 | 0.0307 |
| | | |
| age<=20 | -0.609 | 0.0339 |
| 20<age<=25 | -0.69 | 0.0002 |
| age>25 | -0.643 | 0.0018 |
| Underweight | -0.416 | 1 |
| Normal | -0.036 | 0.7335 |
| Overweight | -0.369 | 0.0224 |
| Obese | -0.196 | 0.0013 |

## 4. Discussion

A significant negative correlation was found between BMI and MMSE scores, indicating that higher BMI is associated with reduced cognitive function. This finding aligns with studies by John et al. [6], Elias et al. [7], and Khade et al. [9], which also reported executive dysfunction and memory decline in individuals with higher BMI.

The gender-based comparison also showed a consistent inverse pattern in both male and female students. These findings underscore the importance of promoting healthy weight and lifestyle modifications among medical students to safeguard cognitive health.

## 5. Limitations

This study was limited to a single institution with a relatively small sample size. Longitudinal and multi-centric studies are recommended for broader generalizability.

## 6. Conclusion

The study confirms that BMI is negatively associated with cognitive function among medical students. Early interventions aimed at promoting healthy lifestyle choices may help improve cognitive outcomes and academic performance.

## References

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