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Anxiety and Body Mass Index: Investigating Psychological and Physical Health Among Female Students of Different Educational Boards

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Abstract

This study investigates the relationship between anxiety levels and Body Mass Index (BMI) among female students from three major educational boards in India—WBCHSE, CBSE, and ICSE. A total of 300 female students, aged 16 to 18 years, were selected from schools in North 24 Parganas and Hooghly districts of West Bengal. The study aims to assess differences in anxiety (state and trait) across the three boards, explore the relationship between anxiety and BMI, and evaluate the impact of these factors on students' overall well-being. Data were collected using the State-Trait Anxiety Inventory (STAI) and BMI measurements. Statistical analyses, including ANOVA and Tukey's LSD test, were performed to identify significant differences. The findings provide insights into how academic pressures and BMI influence the mental and physical health of female students, with implications for educational policies and mental health interventions.

Keywords: Anxiety, Body Mass Index (BMI), Educational Boards, State-Trait Anxiety, Female Students

Introduction

Adolescence is a crucial developmental stage marked by physical, emotional, and psychological changes. Anxiety, a common mental health concern during this period, can negatively impact academic performance, social life, and overall well-being. Academic pressures, social expectations, and extracurricular responsibilities are significant contributors to elevated anxiety levels among students.

Anxiety is often linked to physical health conditions, including Body Mass Index (BMI), which categorizes individuals into different weight groups, from underweight to obese. Both extreme BMI levels (underweight or obese) have been associated with higher levels of psychological distress, including anxiety.

This study examines the relationship between anxiety and BMI among female students from three educational boards in India—WBCHSE, CBSE, and ICSE. These boards offer different academic environments and pressures, which may influence students' mental and physical health. The research explores how these factors

impact anxiety levels and BMI, with a focus on female students, as they tend to report higher anxiety levels than males during adolescence.

The goal is to understand how anxiety and BMI interact within different educational contexts and to inform policies and interventions aimed at improving students' psychological and physical well-being.

Literature Review

The relationship between mental and physical health, particularly in adolescents, has been extensively researched. Anxiety, one of the most prevalent psychological conditions, significantly impacts students' overall well-being. Anxiety is characterized by feelings of unease and nervousness, often accompanied by physiological symptoms like increased heart rate and muscle tension. While anxiety is a natural response to stress, its persistent presence can negatively affect academic performance, social life, and daily functioning. In adolescents, anxiety can manifest as generalized anxiety disorder, social anxiety, or test anxiety, all of which can harm academic performance and social interactions.

Adhikari and Siddiqui (2022) highlight the distinction between state anxiety, which is temporary and situation-specific, and trait anxiety, which is more persistent and part of an individual's personality. Their study found that female students, in particular, exhibited higher levels of both state and trait anxiety compared to male students, suggesting a gender difference in the experience of anxiety.

The educational system plays a critical role in shaping students' mental health. The competitive nature of boards like the Central Board of Secondary Education (CBSE) and Indian Certificate of Secondary Education (ICSE) may increase anxiety levels due to their rigorous academic demands. Conversely, the West Bengal Council of Higher Secondary Education (WBCHSE) is perceived as having a less competitive environment, which could result in lower anxiety levels. Thomas and Cassady (2021) explored how state anxiety, especially during tests, serves as a barrier to student performance, noting that the State-Trait Anxiety Inventory (STAI) is commonly used to measure anxiety and its impact on academic outcomes.

BMI, a physical health indicator, has also been associated with mental health outcomes like anxiety and depression. Studies suggest that individuals with extreme BMI values—either underweight or obese—are more likely to experience psychological distress. Herhaus et al. (2020) examined the relationship between BMI and mental health in a large sample, finding that individuals with obesity showed higher levels of anxiety and depression. The study also emphasized the role of general health in the relationship between BMI and mental health, suggesting that poor physical health may exacerbate feelings of anxiety. Similarly, Wang et al. (2019) conducted a meta-analysis in China, finding a significant association between obesity and increased levels of anxiety and depression among children and adolescents. These findings suggest that interventions should address both physical and psychological health to improve overall well-being.

The relationship between anxiety and BMI is complex and non-linear. Haghighi et al. (2016) found no linear correlation between anxiety and BMI, but observed an inverted U-shaped association, where medium to high BMI levels were linked to higher anxiety, while individuals with very low or very high BMI (underweight or obese) experienced lower anxiety. This aligns with the broader understanding that both extreme body conditions and moderate weight ranges can influence anxiety levels in different ways.

While much research has focused on anxiety and BMI separately, few studies have explored the impact of educational systems on these factors. This study aims to fill this gap by investigating the relationship between

anxiety levels and BMI among female students from three different educational boards—WBCHSE, CBSE, and ICSE—within urban schools. This will provide valuable insights into how educational systems influence both mental and physical health during adolescence.

Overall, the literature suggests that mental and physical health are interconnected, and interventions aimed at improving students' well-being should address both. This study seeks to contribute to the growing body of research on adolescent health by exploring how educational boards impact anxiety levels and BMI.

Research Questions

The primary aim of this study is to explore the relationship between anxiety levels and Body Mass Index (BMI) among female students from different educational boards in urban areas. The key research questions are:

1. What are the differences in anxiety levels (state and trait) among female students from the WBCHSE, CBSE, and ICSE boards?
2. Is there a significant relationship between BMI and anxiety levels (state and trait) among female students from these educational boards?
3. How do variations in BMI and anxiety levels across different educational boards impact the overall well-being of female students?

Objectives

The primary objective of this study is to investigate the relationship between anxiety levels and Body Mass Index (BMI) among female students from three different educational boards in urban areas. The specific objectives of the study are as follows:

1. To assess the differences in anxiety levels (state and trait) among female students from the WBCHSE, CBSE, and ICSE boards.
2. To examine the relationship between BMI and anxiety levels (state and trait) among female students from these educational boards.
3. To evaluate the impact of BMI and anxiety variations across the educational boards on the overall well-being of female students.

This objective aims to understand how the interplay between BMI and anxiety levels affects the physical and psychological health of students, providing a holistic view of their well-being in different educational settings.

Research Methodology

Research Design:

This study uses a comparative descriptive design to assess and compare anxiety levels (state and trait) and Body Mass Index (BMI) among female students from three educational boards: WBCHSE, CBSE, and ICSE.

Selection of Subjects:

A total of 300 female students aged 16 to 18 years from schools in North 24 Parganas and Hooghly districts of West Bengal were selected, with 100 students from each educational board.

Variables:

Independent Variables: Educational Board (WBCHSE, CBSE, ICSE), BMI

Dependent Variables: Anxiety Levels (state and trait anxiety)

Instruments and Tools Used:

State-Trait Anxiety Inventory (STAI): Measures state and trait anxiety.

BMI Calculation: $BMI = \text{Weight (kg)} / \text{Height (m}^2\text{)}$, measured using a stadiometer and weighing scale.

Procedure for Data Collection:

Height and weight will be measured to calculate BMI.

Students will complete the STAI questionnaire to assess state and trait anxiety.

Reliability and Validity:

Data will be collected by trained testers using standardized instruments, ensuring reliability and validity.

Statistical Analysis:

Descriptive statistics (mean, SD) will summarize data.

ANOVA will compare anxiety levels and BMI across educational boards.

Tukey's LSD test will identify specific differences.

Ethical Considerations:

Informed consent will be obtained from participants and their guardians. Data will remain confidential, and participation is voluntary.

Results

Personal Data of the Subject

The mean and SD value of personal data of W.B.C.H.S.E Board was presented in the Table 1 and relevant data were presented also in graphical form in fig. 1

Table No 1: Descriptive Statistics of Personal Data of Girls Students of W.B.C.H.S.E Board

Criterion Variables	Subjects(n)	Mean $\pm$ SD
Age (Year)	100	16.15 $\pm$ 0.93
Height(cm)		150.87 $\pm$ 6.18
Weight(kg)		48.35 $\pm$ 10.46

Table no 1 indicate that the mean $\pm$ SD value of age, height, and weight of the girl's students W.B.C.H.S.E Board

were 16.15 ± 0.93 , 150.87 ± 6.18 , and 48.35 ± 10.46 respectively.

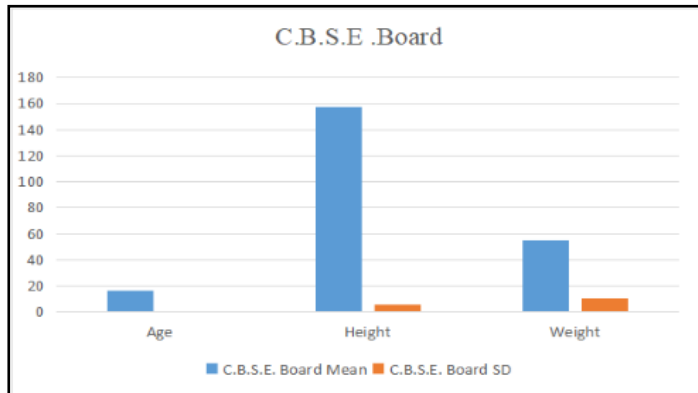


Fig-1: The Mean and SD of Age, Height and Weight of Girls' Students of W.B.C.H.S.E Board.

The Mean and SD value of personal data of C.B.S.E Board was presented in the Table 2 and relevant data were presented also in graphical form in fig.2

Table No 2: Descriptive Statistics of Personal Data of Girls Students of C.B.S.E Board

Criterion Variables	Subjects(n)	Mean $\pm$ SD
Age (Year)	100	16.35 ± 0.91
Height(cm)		157.32 ± 6.04
Weight(kg)		54.9 ± 10.87

Table no 9 indicate that the mean $\pm$ SD value of age, height, and weight of the C.B.S.E Board were 16.35 ± 0.91 , 157.32 ± 6.04 and 54.9 ± 10.87 respectively.

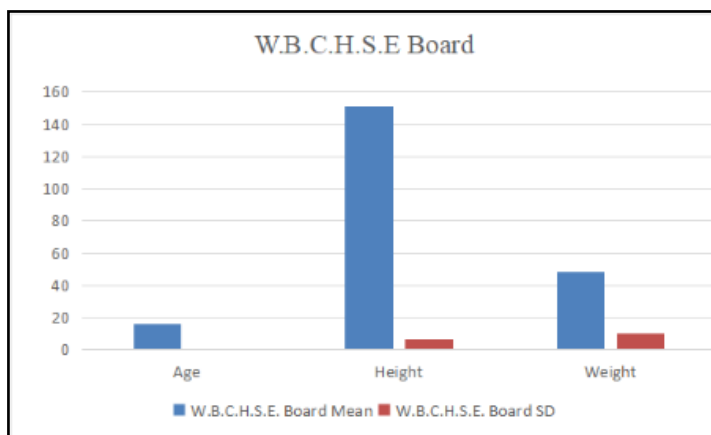


Fig-2: The Mean and SD of Age, Height and Weight of Girls Student of C.B.S.E Board.

The mean and SD value of personal data of I.C.S.E Board was presented in the Table no 3 and relevant data were presented also in graphical from in fig.3

Table No 3: Descriptive Statistics of Personal Data of Girls Students of I.C.S.E Board

Criterion Variables	Subjects(n)	Mean $\pm$ SD
Age (Year)	100	16.04 $\pm$ 0.79
Height(cm)		156.65 $\pm$ 7.24
Weight(kg)		54.1 $\pm$ 13.4

Table no 10 indicate that the mean $\pm$ SD value of age, height, and weight of the I.C.S.E Board were 16.04 $\pm$ 0.79, 156.65 $\pm$ 7.24 and 54.1 $\pm$ 13.4 respectively.

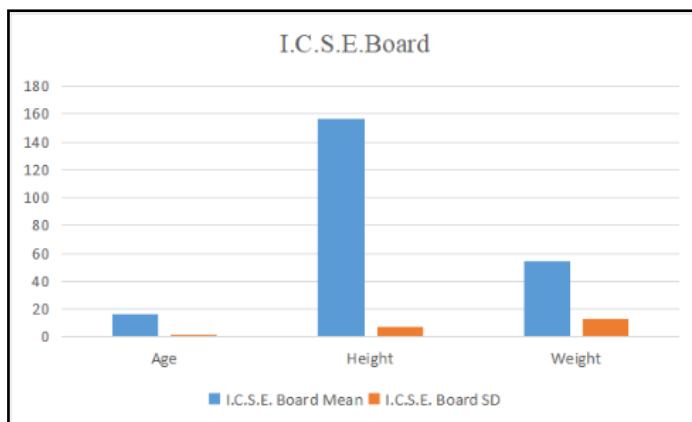


Fig-3: The Mean and SD of Age, Height and Weight of Girls' Student of I.C.S.E Board

BMI of Girls Students of Different Educational Board

The Mean and SD value of BMI Status of girl's students of the different educational board (W.B.C.H.S.E, C.B.S.E, and I.C.S.E Board) was presented below in the table.

Table No 4: Descriptive Statistics of BMI of Girls Students of Different Educational Board

Different Educational Board	Mean $\pm$ SD
W.B.C.H.S. E	21.18 $\pm$ 4.12
C.B.S. E	22.16 $\pm$ 4.1
I.C.S. E	22.01 $\pm$ 4.94

Table no 4 indicate that the mean $\pm$ SD value of BMI of different educational board (W.B.C.H.S.E, C.B.S.E and

I.C.S.E) were 21.18 ± 4.12 , 22.16 ± 4.1 and 22.01 ± 4.94 respectively.

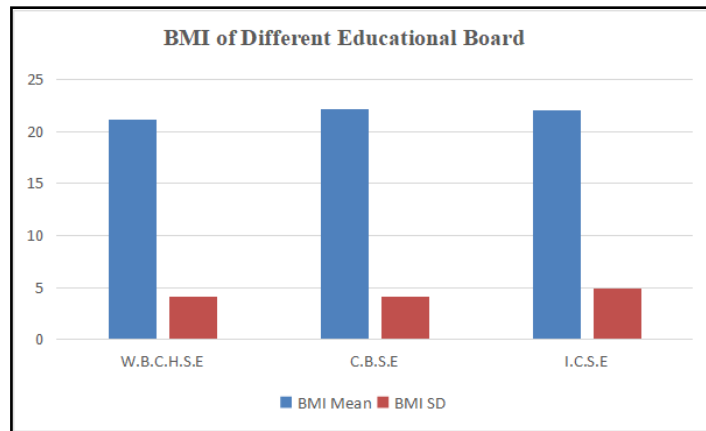


Fig-4: The Mean and SD of BMI of Different Educational Board

Table No 5: ANOVA of BMI among the Girls Students of Different Educational (W.B.C.H.S.E, C.B.S.E and I.C.S.E) Board.

Source of Variation	Sum of Square	df	Mean Square	f-value
Between Groups	55.803	2	27.902	1.440 n's
Within Groups				
Total	5753.518	297	19.327	
	5809.321	299		

* $F_{0.05, 299} = 2.25$ n's=not significant

Table 5 indicate that the mean $\pm$ SD value in respect of BMI of different educational board (W.B.C.H.S.E, C.B.S.E and I.C.S.E) were 21.18 ± 4.12 , 22.16 ± 4.1 and 22.01 ± 4.94 respectively.

To observe the mean different of ANOVA was computed and the F value was found 1.440 which was statistically not significant at 0.05 level of confidence. But some differences were among the mean values in different board which is not significant difference.

Psychological Variables (Anxiety) of Girls Students of Different Educational Board Were Presented Below

Psychological Variables (State Anxiety) among the Girls Students of Different Educational Board.

Table No 6: Descriptive Statistics of State Anxiety of Girls Students of Different Educational Board.

Variables	Different Educational Board	Number	Mean $\pm$ SD
State Anxiety	W.B.C.H.S. E	300	40.24 $\pm$ 8.1
	C.B.S. E		44.59 $\pm$ 10.93
	I.C.S. E		46.22 $\pm$ 11.28

Table no 6 indicate that the mean $\pm$ SD value of state anxiety of girl's students of different educational board (W.B.C.H.S.E, C.B.S.E and I.C.S.E) were 40.24 $\pm$ 8.1, 44.59 $\pm$ 10.93 and 46.22 $\pm$ 11.28 respectively.

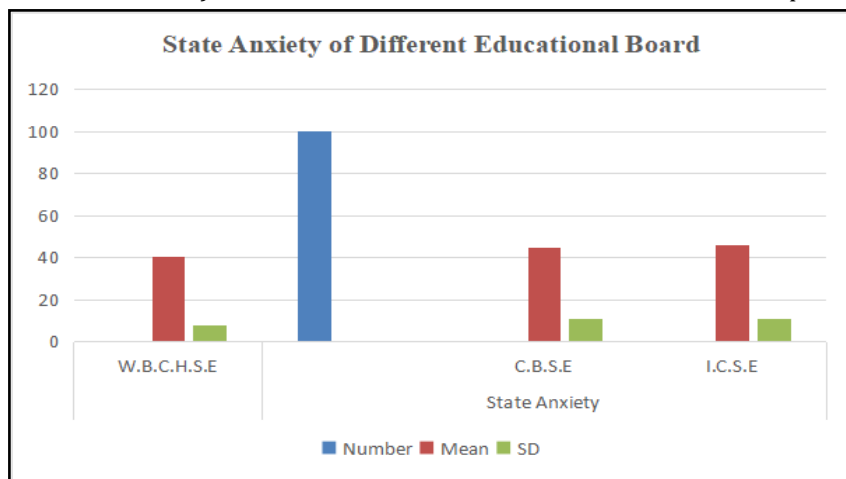


Fig-5: The Mean and SD of State Anxiety of Girls Students of Different Educational Board

Table No 7: ANOVA of State Anxiety among Girls Students of Different Educational (W.B.C.H.S.E, C.B.S.E and I.C.S.E) Boards.

Source of Variation	Sum of Square	df	Mean Square	f-value
Between Groups	1911.327	2	955.663	9.181*s
Within Groups	30913.590	297	104.086	
Total	32824.917	299		

*F_{0.05} 299 = 2.25 s = significant

Table 7 indicate that the mean $\pm$ SD value in respect of state anxiety of different educational board (W.B.C.H.S.E, C.B.S.E and I.C.S.E) were 40.24 ± 8.1 , 44.59 ± 10.93 and 46.22 ± 11.28 respectively.

Table No 14 To observe the mean different of ANOVA was computed and the F value was found 9.181, which was statistically significant at 0.05 level of confidence. But some differences were among the mean values in different board which is significant difference.

For the statistically significant the researcher observe difference between group the least significance difference (LSD) was computed and the values were presented in table

Table No 8: LSD Comparison on State Anxiety Between the Girls Students of Different Boards

Variables	Boards			Mean Difference	t-value
State Anxiety	W.B.C.H.S. E	C.B.S. E	I.C.S. E		
	40.24	44.59		4.35	3.20*s
	40.24		46.22	5.98	4.31*s
		44.59	46.22	1.6	1.04

* $t_{0.05} 198 = 1.97$

LSD assessment was done to find out the significance difference among the boards. It shows in table No 8 that the significant difference were found in state anxiety between W.B.C.H.S. E & C.B.S.E Board the mean difference were 4.35. It also shows that the significant difference was found in State Anxiety between W.B.C.H.S.E & I.C.S.E Board their mean difference was 5.98. While there was no significant difference were found in state anxiety between C.B.S.E & I.C.S.E Board.

Psychological Variables (Trait Anxiety) among the Girls Students of Different Educational Board.

Table No 9: Descriptive Statistics of Trait Anxiety of Girls Students of Different Educational Board.

Variables	Different Educational Board	Number	Mean $\pm$ SD
Trait Anxiety	W.B.C.H.S. E	300	44.78 ± 7.76
	C.B.S. E		49.64 ± 11.64
	I.C.S. E		51.76 ± 11.2

Table no 9 indicate that the mean $\pm$ SD value of Trait anxiety of girl's students of different educational board (W.B.C.H.S.E, C.B.S.E and I.C.S.E) were 44.78 ± 7.76 , 49.64 ± 11.64 and 51.76 ± 11.2 respectively.

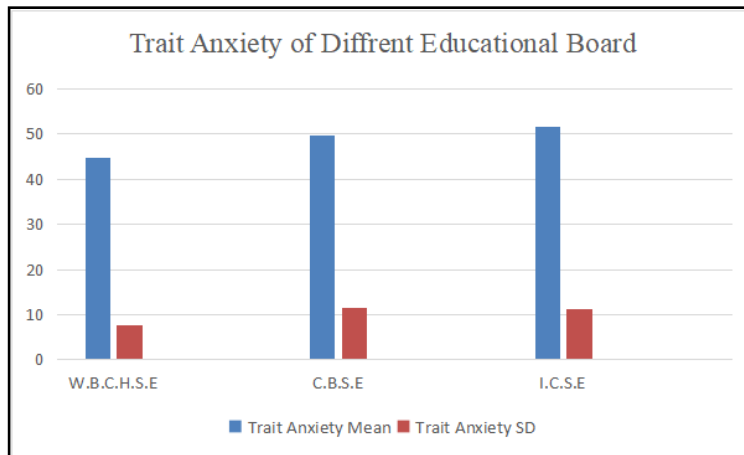


Fig-6: The Mean and SD of Trait Anxiety Girls Students of Different Educational Board

Table No 17: ANOVA of Trait Anxiety among the Girls Students of Different Educational (W.B.C.H.S.E, C.B.S.E and I.C.S.E) Board.

Source of Variation	Sum of Square	df	Mean Square	f-value
Between Groups	2561.147	2	1280.573	11.967*s
Within Groups	31780.440	297	107.005	
Total	34341.587	299		

* $F_{0.05, 299} = 2.25$. s = significant

Table no 17 indicate that the mean value in respect of Trait Anxiety of different educational board (W.B.C.H.S.E, C.B.S.E and I.C.S.E) were 44.78 ± 7.76 , 49.64 ± 11.64 and 51.76 ± 11.2 respectively.

To observe the mean different of ANOVA was computed and the F value was found 11.967, which was statistically significant at 0.05 level of confidence. But some differences were among the mean values in different board which is significant difference.

Table No 10: LSD Comparison on Trait Anxiety Between the Girls Students of Different Boards

Variables	Boards			Mean Difference	t-value
	W.B.C.H.S. E	C.B.S. E	I.C.S. E		

Trait Anxiety	44.78	49.64		4.86	3.47*s
	44.78		51.76	6.98	5.12*s
		49.64	51.76	2.12	1.31

* $t_{0.05 \ 198} = 1.97$

LSD assessment was done to find out the significance difference among the boards. It shows in table No 10 that the in table no 18 that the significant difference were found in trait anxiety between W.B.C.H.S. E & C.B.S. E Board their mean difference were 4.86. It also shows that the significant difference was found in trait anxiety between W.B.C.H.S.E & I.C.S.E Board their mean difference was 6.98. While there was no significant difference were found in trait anxiety between C.B.S.E & I.C.S.E Board.

Conclusion

This study explored the relationship between psychological and physical health among female students from three different educational boards: WBCHSE, CBSE, and ICSE. The primary focus was on understanding the impact of Body Mass Index (BMI) and anxiety levels (both state and trait anxiety) across these educational systems. The findings provided valuable insights into the physical and psychological well-being of adolescent girls in varying academic environments.

Height and Weight:

The average height and weight of students from the three educational boards were found to fall within the expected range, with students from CBSE and ICSE showing slightly higher averages in both height and weight compared to those from WBCHSE. These physical measures provide essential context for analyzing BMI and understanding the relationship between body composition and anxiety levels.

Body Mass Index (BMI):

The study found that the BMI values of all students from the three educational boards fell within the "normal" weight category (18.5-24.5 kg/m²), indicating that BMI did not significantly differ across the boards. Despite the differences in academic pressures and environments, BMI was not a significant differentiator among the groups. This suggests that while BMI is an important physical health indicator, it does not appear to play a major role in shaping anxiety levels across different educational systems.

State Anxiety:

State anxiety levels were found to be highest among students from ICSE, followed by CBSE, with the lowest levels reported by WBCHSE students. The significant differences in state anxiety between the boards suggest that the academic pressure and environment in more competitive boards like CBSE and ICSE contribute to higher levels of immediate anxiety. These findings highlight the critical need for addressing anxiety in students from these educational systems.

Trait Anxiety:

Similar trends were observed for trait anxiety, with ICSE students showing the highest levels, followed by CBSE, and WBCHSE students exhibiting the lowest. This indicates that the long-term psychological effects of academic stress may be more pronounced in students from more competitive educational systems. The significant differences between the groups underscore the influence of educational environment on students' persistent anxiety levels.

Hypothesis Testing:

The hypothesis testing conducted as part of this study revealed the following:

The null hypothesis regarding no difference in anxiety levels among the three educational boards was rejected, as significant differences were found in both state anxiety ($F = 9.181, p < 0.05$) and trait anxiety ($F = 11.967, p < 0.05$). These results affirm that educational environments have a significant impact on students' anxiety levels.

The null hypothesis regarding no difference in BMI among the groups was accepted, as no statistically significant difference was found in the BMI values across the boards ($F = 1.440, p > 0.05$). This suggests that while BMI is a relevant measure of physical health, it does not differ notably across the three educational systems in this study.

Implications

The findings of this study have significant implications for educational policies, student support programs, and mental health initiatives in schools.

Mental Health Support in Schools:

The significant differences in anxiety levels across the educational boards, particularly in state and trait anxiety, emphasize the need for tailored mental health support. Students from CBSE and ICSE, who reported higher anxiety levels, may benefit from interventions that address academic pressures, time management skills, and coping strategies for stress. Schools should prioritize mental health resources, including counseling services, workshops, and stress-relief activities to help students manage anxiety.

Educational Policy:

The study suggests that academic pressure plays a crucial role in shaping students' mental health. Educational policies should focus on creating balanced curricula that reduce undue stress and competition, particularly in high-pressure environments like CBSE and ICSE. Strategies to alleviate pressure, such as mindfulness training, flexible learning schedules, and extracurricular activities focused on well-being, should be implemented across educational systems.

BMI and Physical Health:

Although no significant differences in BMI were found, the study highlights the importance of maintaining healthy body weight as part of overall well-being. Schools should continue to promote healthy eating habits,

physical activity, and education about body image to ensure that students maintain an ideal BMI that supports both physical and psychological health.

Targeted Interventions:

The results underscore the need for targeted interventions based on the educational system a student is in. Since anxiety levels differ significantly between the boards, personalized support systems, such as peer groups, mentorship, and tailored counseling, could be effective in managing anxiety. Additionally, promoting awareness about the relationship between psychological health and physical health (such as BMI) could help in creating more holistic support structures.

In conclusion, this study underscores the importance of addressing both physical and psychological health in students, particularly in high-pressure educational environments. While BMI was not a differentiator in the study, anxiety levels were significantly impacted by the educational board, signaling the need for comprehensive mental health strategies and policies. By focusing on reducing academic stress and promoting overall well-being, educational institutions can play a key role in fostering healthier, more balanced development for students.

Declaration of Conflicting Interests

The authors declare no potential conflicts of interest with respect to the research, authorship and publication of this article.

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