



URGANCH DAVLAT TIBBIYOT INSTITUTI JANUBIY OROLBO‘YI TIBBIYOT JURNALI

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ASSESSMENT OF BMI CATEGORIES AND HEALTH TRENDS AMONG STUDENTS AT TASHKENT STATE MEDICAL UNIVERSITY: A COMPREHENSIVE STUDY



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Annotation. Obesity and weight-related health issues are increasingly becoming a major public health concern, particularly among university students. This study investigated BMI variations among international students at Tashkent Medical Academy, focusing on factors such as gender, physical activity level, smoking, alcohol consumption, and academic year. A total of 104 participants were surveyed. The findings revealed no significant differences in BMI based on



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gender or academic year. However, physical activity level and alcohol consumption showed significant effects on BMI. Students with low physical activity had lower BMI, possibly due to differences in muscle mass or dietary habits. Regular alcohol consumption was associated with higher BMI levels. These results emphasize the importance of maintaining a healthy lifestyle, including regular exercise and moderation in alcohol intake, among university students.

Keywords: Obesity, body mass index (BMI), student health, physical activity, alcohol consumption, smoking, dietary habits, lifestyle, international students, public health

TOSHKENT DAVLAT TIBBIYOT UNIVERSITETI TALABALARI ORASIDA TANA MASSASI INDEKSI TOIFALARI VA SOG'LIQ HOLATI TENDENSIYALARINI

BAHOLASH: KENG QAMROVLI TADQIQOT

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Annotatsiya. Semizlik va vazn bilan bog'liq sog'liq muammolari, ayniqsa, universitet talabalari orasida dolzarb muammoga aylanib bormoqda. Ushbu tadqiqot Toshkent Tibbiyot Akademiyasida tahsil olayotgan xalqaro talabalar orasida tana massasi indeksi (BMI) o'zgarishlarini o'rganishga qaratilgan. Tadqiqotda 104 nafar ishtirokchi qatnashib, ularning jinsi, sport bilan shug'ullanish darajasi, chekish, alkogol iste'moli va kursi hisobga olindi. Natijalar shuni ko'rsatdiki, jins va kurs BMI ga sezilarli ta'sir ko'rsatmaydi. Biroq jismoniy faollik va alkogol iste'moli muhim omillar ekanligi aniqlandi. Kam jismoniy faollikka ega talabalar BMI ko'rsatkichi pastroq bo'lishi kuzatildi, bu mushak massasi yoki ovqatlanish bilan bog'liq bo'lishi mumkin. Doimiy alkogol iste'mol qiluvchilarda esa BMI yuqoriroq bo'ldi. Tadqiqot talabalarda sog'lom turmush tarzini targ'ib qilish zarurligini ko'rsatadi.

Kalit so'zlar: Semizlik, tana massasi indeksi (BMI), talabalar salomatligi, jismoniy faollik, alkogol iste'moli, chekish, ovqatlanish odatlari, turmush tarzi, xalqaro talabalar, sog'liqni saqlash.

ОЦЕНКА КАТЕГОРИЙ ИНДЕКСА МАССЫ ТЕЛА (BMI) И ТЕНДЕНЦИЙ СОСТОЯНИЯ ЗДОРОВЬЯ СРЕДИ СТУДЕНТОВ ТАШКЕНТСКОГО ГОСУДАРСТВЕННОГО МЕДИЦИНСКОГО УНИВЕРСИТЕТА: КОМПЛЕКСНОЕ ИССЛЕДОВАНИЕ

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Аннотация. Ожирение и связанные с весом проблемы здоровья становятся всё более актуальными, особенно среди студентов университетов. Данное исследование было направлено на изучение вариаций индекса массы тела (BMI) среди иностранных студентов Ташкентской медицинской академии. В исследовании приняли участие 104 студента, и были проанализированы такие факторы, как пол, уровень физической активности, курение, потребление алкоголя и курс обучения. Результаты показали отсутствие значимых различий BMI в зависимости от пола и курса. Однако уровень физической активности и потребление алкоголя оказали значительное влияние. Студенты с низкой физической активностью имели



URGANCH DAVLAT TIBBIYOT INSTITUTI JANUBIY OROLBO‘YI TIBBIYOT JURNALI

2 - TOM, 3/1 - SON. 2026

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более низкий BMI, что может быть связано с различиями в мышечной массе или питании. Регулярное употребление алкоголя ассоциировалось с более высоким BMI. Полученные данные подчёркивают важность здорового образа жизни среди студентов.

Ключевые слова: Ожирение, индекс массы тела (BMI), здоровье студентов, физическая активность, потребление алкоголя, курение, пищевые привычки, образ жизни, иностранные студенты, здравоохранение

Methodology This study was conducted among international students at Tashkent State Medical University to evaluate health trends, the prevalence of obesity, and the severity and progression of different obesity categories. The primary objective was to analyze the overall health conditions of international students. A total of 104 participants voluntarily took part in the study, with no interventions applied. The data collection process involved a structured Google Form specifically designed for this research, which participants were required to complete. To ensure a focused analysis, specific inclusion and exclusion criteria were established. The inclusion criteria required participants to be international students currently enrolled at Tashkent State Medical University. The collected data focused on BMI categories, which were analyzed to assess weight classifications among participants. **Introduction:** In recent decades, the prevalence of obesity and weight-related health issues has been rising at an alarming rate, making it a significant public health concern worldwide. Among young adults, particularly university students, lifestyle changes associated with higher education, such as altered dietary habits, irregular sleep schedules, increased academic stress, and fluctuating levels of physical activity, can contribute to unhealthy weight gain. The impact of these changes is especially pronounced among international students, who must navigate the additional challenges of adapting to new cultural and dietary environments, often resulting in drastic variations in their BMI. BMI, a widely used indicator of body weight status, plays a crucial role in assessing the health and nutritional well-being of individuals. A higher BMI is associated with increased risks of obesity-related health conditions, including cardiovascular diseases, diabetes, and metabolic disorders, while a lower BMI may indicate malnutrition or other underlying health concerns. Given the growing concern about the health and well-being of university students, understanding BMI trends and the factors influencing weight regulation within this demographic is essential. This study aims to assess BMI differences based on gender, physical activity levels, smoking habits, alcohol consumption, and living arrangements among international students at Tashkent State Medical University. Additionally, it examines how BMI trends evolve across different academic years and whether senior students experience distinct weight-related trends compared to their junior counterparts. By addressing these objectives, the study seeks to provide valuable insights into the health and lifestyle behaviours of university students, thereby contributing to the broader discourse on weight management and preventive healthcare strategies.

The relationship between BMI and various lifestyle factors has been extensively studied in public health research. Several studies have demonstrated that university students undergo significant lifestyle changes that impact their weight and overall health. According to Deliens et al. (2015), eating behavior among university students is influenced by a combination of personal, environmental, and socio-economic factors, all of which contribute to BMI variations. Similarly, Mikolajczyk et al. (2009) found that stress and dietary habits play a critical role in shaping students'



URGANCH DAVLAT TIBBIYOT INSTITUTI JANUBIY OROLBO‘YI TIBBIYOT JURNALI

2 - TOM, 3/1 - SON. 2026

14.00.00 - TIBBIYOT FANLARI ISSN: 3093-8740

weight trends, with high-stress levels often leading to increased consumption of high-calorie foods and reduced physical activity.

Gender-based differences in BMI have also been widely documented. Research by Papadaki et al. (2010) suggests that female university students tend to have higher BMI levels than their male counterparts, primarily due to metabolic and lifestyle factors. Women often have a higher percentage of body fat than men, which contributes to differences in BMI values. Additionally, variations in dietary habits and physical activity levels between genders further influence weight trends. The role of physical activity in BMI regulation is well-established in scientific literature. Studies by Gonçalves et al. (2021) and El-Gilany et al. (2017) indicate that students who engage in regular exercise have lower BMI levels and a reduced risk of obesity-related health issues. However, despite the known benefits of physical activity, many university students fail to maintain consistent exercise routines due to academic pressures and lifestyle constraints. The impact of living arrangements on BMI has also been explored in several studies. Research by Alzahrani et al. (2018) found that students living in hostels tend to have higher BMI levels compared to those living independently, as communal dining environments often promote unhealthy eating habits. This finding is consistent with the results of the current study, which highlights the importance of promoting nutritional awareness among students residing in shared accommodations.

The influence of alcohol consumption and smoking on BMI has been a subject of debate in health research. While some studies suggest that alcohol intake contributes to weight gain due to its high caloric content (Deliens et al., 2015), others argue that the relationship between smoking and BMI is complex and may depend on other behavioral factors (Mikolajczyk et al., 2009). The current study builds upon these findings by exploring the impact of these lifestyle factors on BMI trends among international students at TMA.

Results The analysis of age distribution among male and female participants revealed slight variations in their mean ages. The mean age for males was 21.31 years ($SD = 1.94$), while females had a slightly lower mean age of 20.56 years ($SD = 1.62$). The age range for males spanned from 18 to 26 years, whereas for females, it ranged from 18 to 25 years. No missing data were recorded for either gender, ensuring completeness in the dataset. These results indicate a relatively homogeneous age distribution between male and female participants, with only a minor difference in their average ages.

The distribution of BMI classifications among the participants shows that the majority, 64.76%, fall into the normal BMI category, indicating a generally healthy weight range for most individuals. However, a significant portion, 20.95%, are classified as overweight, suggesting that a considerable number of participants have BMI values above the normal range. Additionally, 7.62% of individuals are underweight, which may indicate potential nutritional concerns. A small percentage, 1.91%, falls into the obese category, representing the least common classification in the dataset. These findings highlight that while most participants maintain a healthy BMI, there are notable proportions of both underweight and overweight individuals, emphasizing the need for awareness and potential health interventions.

BMI Class	Frequency	Percentage (%)
Normal	68	64.76

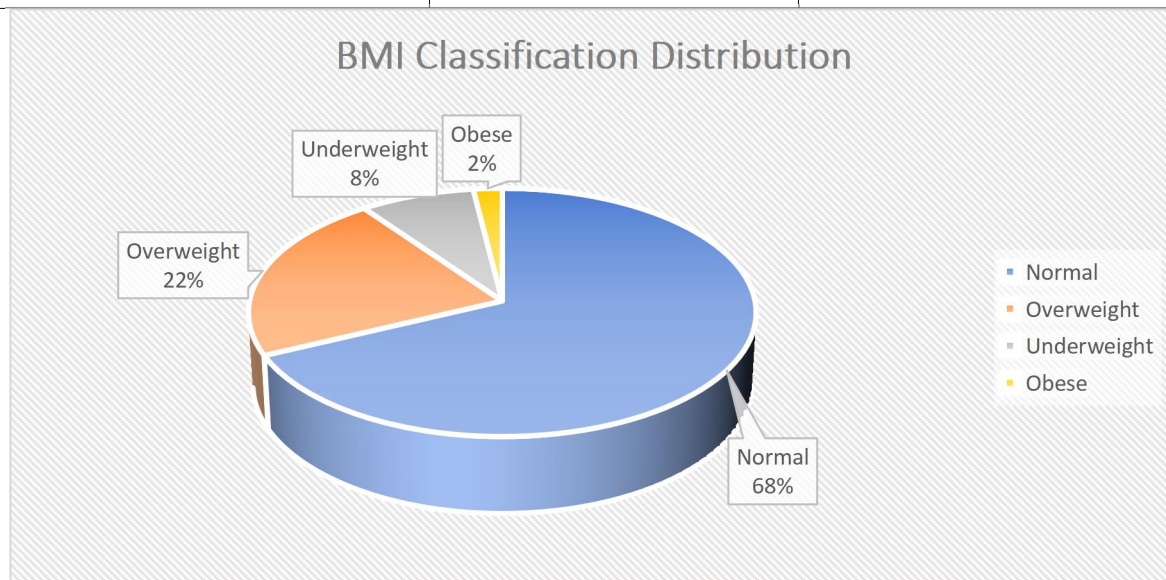


URGANCH DAVLAT TIBBIYOT INSTITUTI JANUBIY OROLBO‘YI TIBBIYOT JURNALI

2 - TOM, 3/1 - SON. 2026

14.00.00 - TIBBIYOT FANLARI ISSN: 3093-8740

Overweight	22	20.95
Underweight	8	7.62
Obese	2	1.91



The descriptive statistics for BMI reveal that there is a slight difference between males and females, but this difference is not statistically significant. The mean BMI for males is 22.731 (SD = 3.685), whereas for females, it is 22.139 (SD = 3.756). The standard errors for males (0.457) and females (0.601) indicate minor variations in the data distribution. Additionally, the coefficient of variation is nearly identical for both groups (0.162 for males and 0.170 for females), suggesting similar levels of relative dispersion. Given these findings, while there is a numerical difference in BMI between genders, it does not appear to be statistically significant.

The distribution of students across different course years reveals a concentration in the initial years, with a gradual decline in higher years. The 2nd Course has the highest proportion of students at 31.3% (41 students), followed by the 1st Course with 29.0% (38 students). The number of students drops significantly in the later years, with the 3rd Course accounting for 6.1% (8 students), the 4th Course at 4.6% (6 students), and the 5th Course at 6.9% (9 students). The 6th Course has the lowest enrollment, making up only 1.5% (2 students) of the total. This trend suggests a potential decrease in student retention or progression to higher levels, possibly due to academic challenges, dropout rates, or program structure. If needed, further investigation can help identify the factors contributing to this pattern.

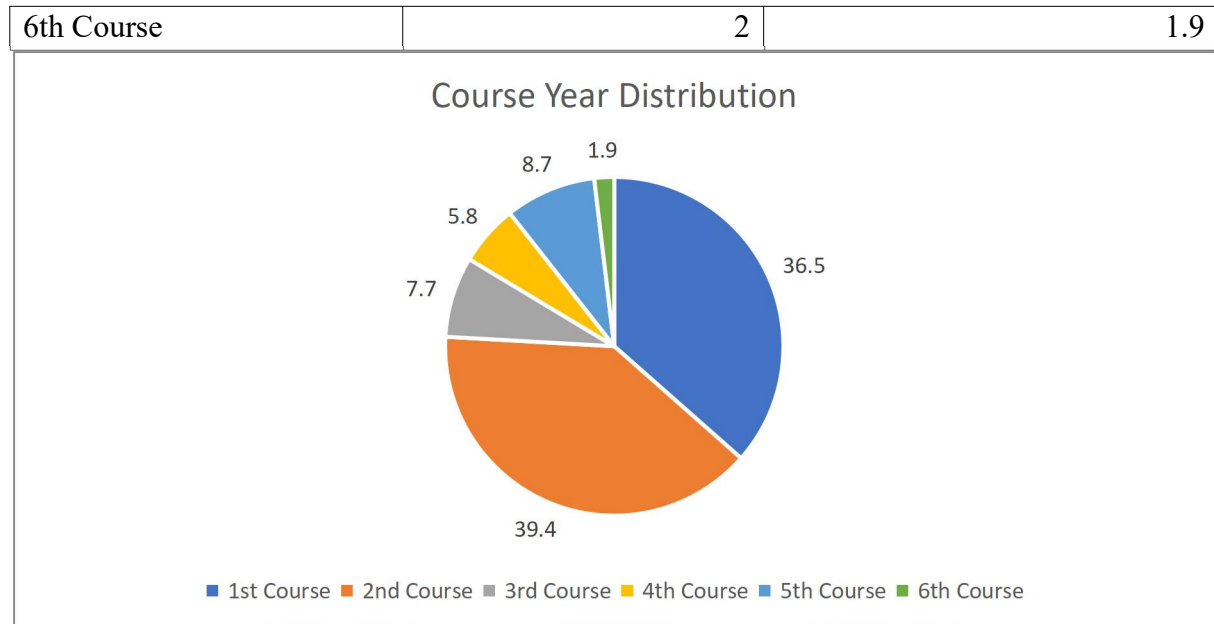
Course Year	Number of students	Percentage
1st Course	38	36.5
2nd Course	41	39.4
3rd Course	8	7.7
4th Course	6	5.8
5th Course	9	8.7



URGANCH DAVLAT TIBBIYOT INSTITUTI JANUBIY OROLBO‘YI TIBBIYOT JURNALI

2 - TOM, 3/1 - SON. 2026

14.00.00 - TIBBIYOT FANLARI ISSN: 3093-8740



A one-way ANOVA was conducted to examine differences in BMI across different course years. The results indicated no statistically significant difference, $F(5, 98) = 0.534$, $p = 0.750$, $\omega^2 = 0.000$, suggesting that BMI does not significantly vary by course year.

Descriptive statistics for BMI across different courses are presented in Table 1. The mean BMI values ranged from 21.96 ± 3.14 (4th Course) to 26.28 ± 3.92 (6th Course).** The 2nd Course had the largest sample size ($N = 41$) with a mean BMI of 22.76 ± 3.99 , whereas the 6th Course had the smallest sample size ($N = 2$), making its mean less reliable.

Table 1: Descriptive Statistics for BMI Across Courses

Course Year	N	Mean $\pm$ SD (BMI)
1st Course	38	22.19 ± 3.57
2nd Course	41	22.76 ± 3.99
3rd Course	8	22.53 ± 3.96
4th Course	6	21.96 ± 3.14
5th Course	9	22.24 ± 3.45
6th Course	2	26.28 ± 3.92

Overall, BMI showed slight variations across course years, but the differences were not statistically significant.

Results. A one-way ANOVA was conducted to examine the differences in BMI across different gym activity levels. The results revealed a statistically significant effect, $F(4, 99) = 2.950$, $p = 0.024$, indicating that BMI differs based on gym activity level.

Descriptive Statistics. Descriptive statistics for BMI across gym activity levels are summarized in Table 1. The Very Low gym activity group had the lowest BMI (18.31 ± 2.26), whereas the Very High gym activity group had the highest BMI (24.13 ± 3.44). This suggests a trend where



URGANCH DAVLAT TIBBIYOT INSTITUTI JANUBIY OROLBO‘YI TIBBIYOT JURNALI

2 - TOM, 3/1 - SON. 2026

14.00.00 - TIBBIYOT FANLARI ISSN: 3093-8740

individuals with very low activity levels tend to have a significantly lower BMI compared to those with higher activity levels.

Table 1: Descriptive Statistics for BMI Across Gym Activity Levels

Gym Activity Level N Mean $\pm$ SD (BMI)

Very Low ★	7	18.31 $\pm$ 2.26
Low	20	23.13 $\pm$ 3.54
Moderate	47	22.52 $\pm$ 3.93
High	23	22.73 $\pm$ 3.11
Very High ★	7	24.13 $\pm$ 3.44

Post Hoc Comparisons (Tukey's HSD). To determine specific group differences, Tukey's post hoc tests were conducted. Significant pairwise differences ($p < 0.05$) are presented in Table 2.

Table 2: Significant Pairwise Comparisons Between Gym Activity Levels

Comparison	Mean Difference	p-value
Very Low ★ vs. Moderate	-4.21	0.035 ★
Very Low ★ vs. Very High ★	-5.82	0.024 ★
Very Low ★ vs. Low	-4.42	0.040 ★

The Very Low gym activity group (★) had a significantly lower BMI than the Moderate, Low, and Very High activity groups (★), as indicated by the post hoc comparisons. No significant differences were observed among the Low, Moderate, High, and Very High groups, implying that once a moderate level of gym activity is reached, further increases in activity level do not result in significant BMI differences. These findings suggest that Very Low gym activity is associated with a significantly lower BMI, but beyond moderate activity, the impact on BMI differences becomes negligible.

BMI does not differentiate between muscle mass and body fat, which can lead to misclassification of individuals. Those with high muscle mass may have a higher BMI despite being healthy, while individuals with low muscle mass and higher fat composition may have a normal BMI but still face health risks. In this study, the higher BMI in active groups could reflect muscle development rather than excess fat, while the lower BMI in inactive groups may indicate reduced muscle mass. Therefore, BMI should be complemented with other measures like body fat percentage or waist-to-hip ratio for a more accurate health assessment.

A one-way ANOVA was conducted to evaluate whether BMI significantly differs based on alcohol consumption habits (Occasionally, No, and Yes). The analysis revealed a statistically significant effect of alcohol consumption on BMI, $F(2, 101) = 3.541$, $p = 0.033$, suggesting that at least one group differs significantly from another.

Descriptive Statistics

- Occasionally (N=8): Mean BMI = 24.124, SD = 2.689
- No (N=91): Mean BMI = 22.174, SD = 3.722
- Yes (N=5): Mean BMI = 26.018, SD = 2.428

Individuals who consume alcohol regularly ("Yes") had the highest mean BMI (26.018), followed by occasional drinkers (24.124), while non-drinkers exhibited the lowest mean BMI (22.174).



URGANCH DAVLAT TIBBIYOT INSTITUTI JANUBIY OROLBO'YI TIBBIYOT JURNALI

2 - TOM, 3/1 - SON. 2026

14.00.00 - TIBBIYOT FANLARI ISSN: 3093-8740

Post Hoc Tukey HSD Test

To determine which groups differ significantly, a post hoc Tukey HSD test was conducted.

Group Comparison	Mean Difference	Standard Error	t-value	p-value
Occasionally vs. No	1.950	1.334	1.462	0.313 (NS)
Occasionally vs. Yes	-1.894	2.062	-0.919	0.630 (NS)
No vs. Yes	-3.844	1.661	-2.314	0.058 (Marginally Significant)

- The comparison between No vs. Yes was marginally significant ($p = 0.058$), indicating that non-drinkers may have a lower BMI than regular alcohol consumers.
- No significant difference was observed between Occasionally vs. No ($p = 0.313$) and Occasionally vs. Yes ($p = 0.630$).

Regular alcohol consumers (Yes) tend to have a higher BMI compared to non-drinkers (No) and occasional drinkers. While the overall ANOVA was significant ($p = 0.033$), only the No vs. Yes comparison showed a marginally significant difference ($p = 0.058$). More data may be required to confirm a strong relationship between alcohol consumption and BMI.

Discussion: The analysis explored the relationships between BMI and various factors, including age, gym activity level, alcohol consumption, and course year, providing insights into potential trends and differences within the study population. Age and BMI Distribution The findings indicate a relatively homogeneous age distribution between male and female participants, with males having a slightly higher mean age than females. Similarly, BMI differences between genders were minimal and not statistically significant, suggesting that gender does not play a significant role in BMI variation within this sample. However, the distribution of BMI classifications highlights potential health concerns. While most participants (64.76%) fall within the normal BMI category, a notable proportion (20.95%) are overweight, and 7.62% are underweight. These figures suggest that while the majority maintain a healthy BMI, targeted health interventions may be necessary to address weight-related issues at both ends of the spectrum.

BMI and Course Year The analysis of BMI across different course years revealed no statistically significant differences. While BMI values varied slightly, ranging from 21.96 in the 4th Course to 26.28 in the 6th Course, the results suggest that academic progression does not strongly influence BMI. However, the distribution of students across course years showed a clear decline in enrollment numbers in later years, potentially indicating issues related to retention, academic challenges, or other structural factors. Further investigation into the reasons behind this trend may be necessary.

Impact of Gym Activity on BMI. A significant effect of gym activity on BMI was observed ($p = 0.024$), highlighting the role of physical activity in weight management. Individuals with very low gym activity had a significantly lower BMI compared to those with moderate and higher activity levels. This counterintuitive finding may be influenced by factors such as muscle mass, body composition, or dietary habits. Notably, no significant differences were found between low, moderate, high, and very high gym activity groups, suggesting that once a certain level of activity is achieved, additional exercise may not drastically impact BMI. These findings emphasize the importance of incorporating a balanced fitness routine while considering other lifestyle factors that contribute to BMI regulation. BMI has limitations as it does not distinguish between muscle mass and body fat. Individuals with high muscle mass may have an elevated BMI despite being healthy,



URGANCH DAVLAT TIBBIYOT INSTITUTI JANUBIY OROLBO'YI TIBBIYOT JURNALI

2 - TOM, 3/1 - SON. 2026

14.00.00 - TIBBIYOT FANLARI ISSN: 3093-8740

while those with low muscle mass but higher fat may appear normal. This can lead to misinterpretation, especially in physically active individuals. Therefore, additional measures like body fat percentage should complement BMI for accurate health assessment.

Alcohol Consumption and BMI: Alcohol consumption also showed a significant effect on BMI ($p = 0.033$), with regular alcohol consumers exhibiting the highest mean BMI. While post hoc comparisons did not reveal strong statistical significance between groups, the comparison between non-drinkers and regular drinkers was marginally significant ($p = 0.058$), suggesting that frequent alcohol consumption may be associated with higher BMI. The lack of significant differences between occasional drinkers and the other groups suggests that moderate alcohol intake may not have a pronounced effect on BMI. These results align with existing research linking alcohol consumption to weight gain due to its caloric content and potential effects on metabolism and appetite.

Conclusion: Overall, the study highlights several key trends related to BMI. While age and course year do not appear to significantly influence BMI, gym activity level and alcohol consumption play more prominent roles. The findings suggest that maintaining moderate to high levels of physical activity and being mindful of alcohol intake could help in managing BMI. However, the study also reveals counterintuitive patterns, such as the lower BMI among individuals with very low gym activity, which may warrant further exploration into factors like diet, body composition, and metabolic differences.

These insights provide a foundation for health awareness initiatives, particularly in university settings, where students may face challenges in maintaining a balanced lifestyle. Encouraging healthy eating habits, promoting regular exercise, and raising awareness about alcohol-related weight implications could be beneficial in supporting overall well-being among students. Future research could further investigate additional lifestyle factors, dietary habits, and metabolic differences to develop a more comprehensive understanding of BMI variations in young adults.

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URGANCH DAVLAT TIBBIYOT INSTITUTI JANUBIY OROLBO‘YI TIBBIYOT JURNALI

2 - TOM, 3/1 - SON. 2026

14.00.00 - TIBBIYOT FANLARI ISSN: 3093-8740

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