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Original article

Lifestyle Behaviors, Stress, and Health Indicators Among Female Medical Students: A Cross-Sectional Analysis

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Abstract
Medical students are exposed to high academic stress and lifestyle pressures that may affect their physical and psychological health. A cross-sectional observational study was conducted among 60 female medical students using a structured questionnaire covering demographic characteristics, body mass index (BMI), sleep duration and quality, stress frequency and severity, dietary habits, water and caffeine intake, physical activity, smoking status, blood pressure, blood sugar, migraine frequency, gastrointestinal discomfort, family history of chronic diseases, and self-perceived lifestyle risk. Statistical analysis was performed with PowerDrill AI. Descriptive statistics summarized variables, Spearman correlation assessed associations, and outliers were identified using the interquartile range method. Stress levels varied across weeks, peaking in week two due to maximum stress reports. Sleep duration correlated positively with sleep quality and negatively with stress frequency ($r = -0.25$). Frequent fast-food intake was linked to daily gastrointestinal discomfort, while moderate caffeine consumption was associated with longer sleep. Most participants had normal blood pressure (62.3%) and blood sugar (78.4%), though elevated sugar was more common than low levels. Family history of chronic disease increased perceived lifestyle-related risk. Lifestyle factors among medical students are interrelated, with stress, sleep, diet, and family history shaping both perceptions and health indicators. Holistic interventions are needed to promote resilience and long-term health.
Keywords: Medical Students, Stress, Sleep Quality, Dietary Habits, Caffeine Intake.

Introduction

Medical students represent a unique population exposed to intense academic demands, irregular schedules, and lifestyle pressures that collectively predispose them to stress, poor sleep, and unhealthy dietary habits. These factors not only compromise immediate well-being but also carry long-term implications for professional performance and chronic disease risk (1,2). The global literature consistently highlights that medical training environments contribute to elevated stress prevalence, with downstream effects on sleep quality, dietary choices, and cardiometabolic health (3). Recent investigations have emphasized the interplay between nutrition, physical activity, and sleep in shaping academic success and psychological resilience. Mutlu and colleagues demonstrated that healthier dietary habits and consistent sleep routines were positively associated with improved academic performance among medical students (4). García-Pérez et al. further confirmed that balanced nutrition, regular exercise, and adequate sleep were strongly correlated with psychological well-being in university populations (5).

Stress and sleep quality remain particularly critical. A cross-sectional study in Vietnam revealed that medical students experiencing high stress were more likely to report poor sleep quality, with both factors contributing to reduced academic efficiency and heightened vulnerability to mental health disorders (6). Comparable findings from Saudi Arabia and Egypt reinforce the universality of this association, showing that stress prevalence among medical students is high and consistently linked to poor sleep and unhealthy dietary patterns (7,8). Dietary behaviors, including frequent fast-food consumption and inadequate intake of fruits and vegetables, exacerbate these challenges. High consumption of processed foods has been associated with gastrointestinal discomfort and metabolic disturbances (9), while insufficient intake of nutrient-rich foods undermines immune function and cognitive performance (10). Water intake and caffeine consumption also play nuanced roles, with moderate hydration and caffeine use supporting alertness, but excessive caffeine intake being linked to reduced sleep duration and heightened stress (11,12).

Family history of chronic diseases adds another dimension, influencing risk perception and lifestyle choices among medical students. Those with a positive family history often demonstrate heightened awareness of lifestyle-related disease risks, which may shape their self-perceptions and health behaviors (13). Objective indicators such as blood pressure and blood sugar levels provide further insight into the physiological consequences of these lifestyle patterns (14). In light of these multidimensional influences, a comprehensive evaluation of stress, sleep, diet, physical activity, and health indicators among medical students is warranted. Such evidence is essential to guide institutional strategies that promote healthier lifestyles, enhance resilience, and mitigate long-term disease risk. The present study therefore investigates the interrelationships among lifestyle behaviors, stress, sleep, dietary patterns, and health outcomes in female medical students, contributing to the growing body of literature on student health.

Methods

Study Design and Participants

This study employed a cross-sectional observational design and was conducted among sixty female medical students in December 2025. All participants were enrolled in medical studies at the time of data collection and were recruited

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voluntarily. The sample size was calculated using a power analysis based on an expected moderate correlation (r = 0.30) between lifestyle factors and health indicators, with a confidence level of 95% and a statistical power of 80%. The minimum required sample size was estimated at 55 participants; therefore, the inclusion of 60 students ensured adequate statistical power and accounted for potential missing data.

Data Collection

Data were gathered using a structured questionnaire that was carefully designed to capture a wide range of lifestyle and health-related variables. The questionnaire included demographic characteristics, body mass index derived from self-reported height and weight, sleep duration and quality, stress frequency and severity, dietary habits such as fast-food consumption, fruit and vegetable intake, and water consumption, as well as physical activity levels, caffeine intake, and smoking status. In addition, blood pressure and blood sugar measurements were recorded, alongside information on migraine frequency, gastrointestinal discomfort, family history of chronic diseases, and self-perceived lifestyle-related risk. The questionnaire was developed following a review of validated instruments used in similar studies and was subjected to expert evaluation by three faculty members specializing in public health and medical education to ensure content validity. Reliability was assessed through a pilot test involving 5 students not included in the final sample. Internal consistency was measured using Cronbach's alpha, which yielded a value of 0.82, indicating good reliability. Construct validity was further supported by factor analysis, confirming the coherence of items within lifestyle and health domains.

Statistical Analysis

All statistical analyses were performed using SPSS. Descriptive statistics were applied to summarize both continuous and categorical variables. Spearman correlation analysis was chosen to assess associations between lifestyle factors, given the ordinal nature and non-normal distribution of several variables. Outliers were identified using the interquartile range method to ensure data integrity and to highlight potential data entry errors.

Data Visualization

To enhance the clarity and interpretability of the findings, several visualization techniques were employed. Scatter plots were used to examine relationships between continuous variables, particularly height and weight, with BMI encoding. Boxplots were applied to detect outliers in height and weight distributions. Heatmaps were generated to summarize correlations among sleep, stress, and dietary variables. Table and pie charts were used to illustrate categorical distributions such as blood pressure and blood sugar levels, providing a comprehensive visual overview of the dataset.

Results

Stress levels among participants showed marked variability across the three observed weeks. The weekly average stress level increased from 5.87 during the first week to a peak of 10.0 in the second week, followed by a decline to 4.33 in the third week. This peak was driven exclusively by participants reporting the maximum stress level. These trends are illustrated in Figure 1.

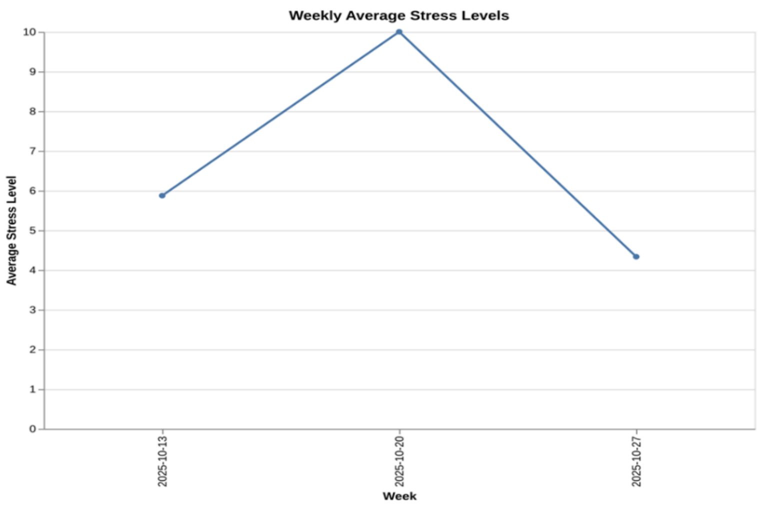

Figure 1. Weekly average stress levels among participants.

Analysis of body measurements revealed a positive correlation between height and weight within the normal data range, with higher BMI values corresponding to greater body weight. However, extreme outliers were detected in height and weight measurements using the interquartile range method, suggesting data entry errors that may affect BMI interpretation. These findings are shown in Figures 2, 3, and 4.

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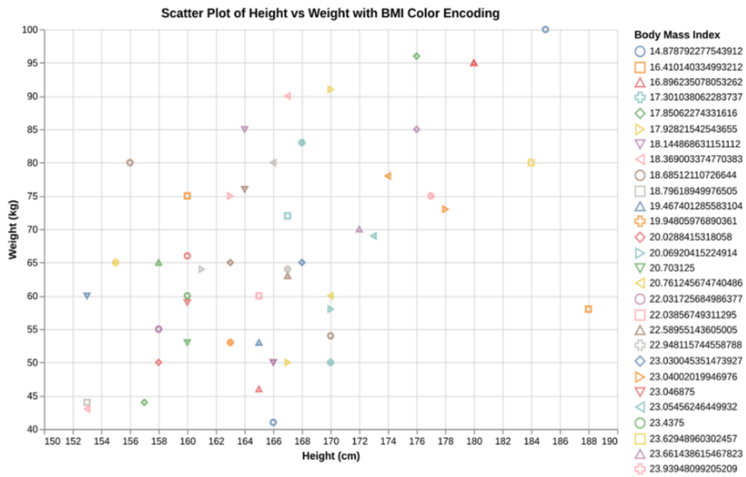

Figure 2. Scatter plot of height versus weight with BMI color encoding.

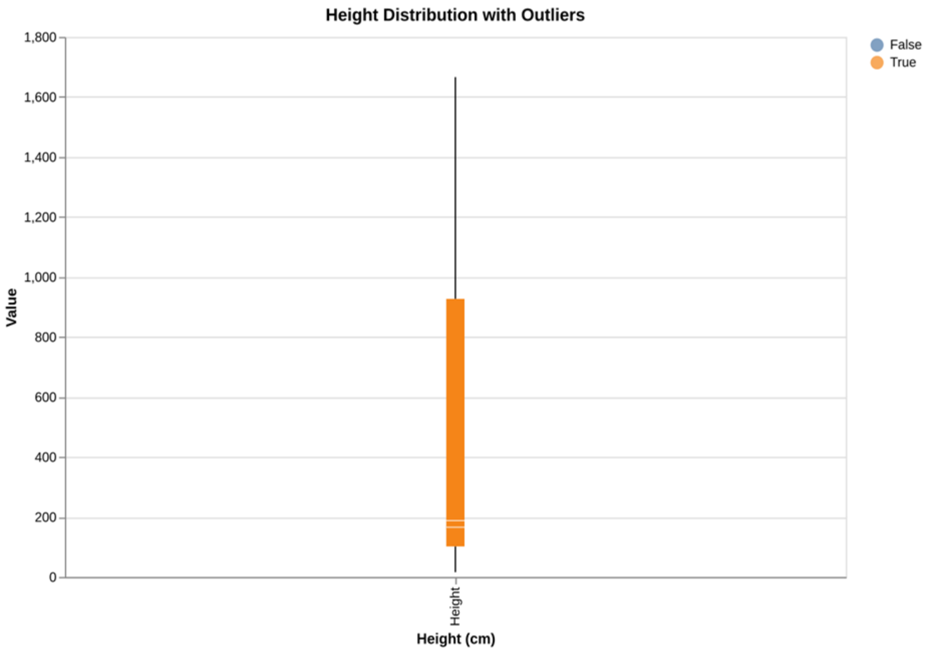

Figure 3. Boxplot of height distribution showing outliers.

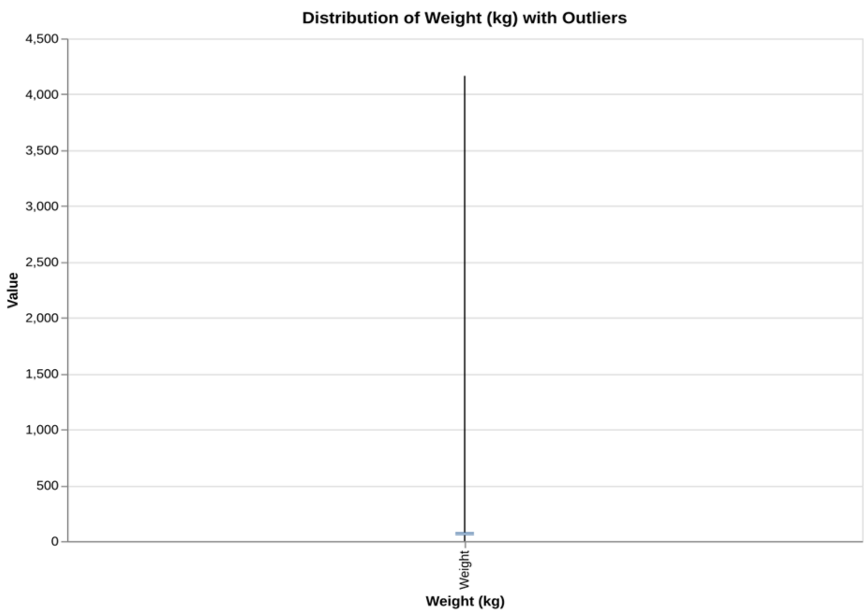

Figure 4. Boxplot of weight distribution showing outliers.

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The prevalence of a family history of chronic diseases varied across age groups, with a lower proportion reported among younger participants compared to older age groups. This distribution is presented in Figure 5.

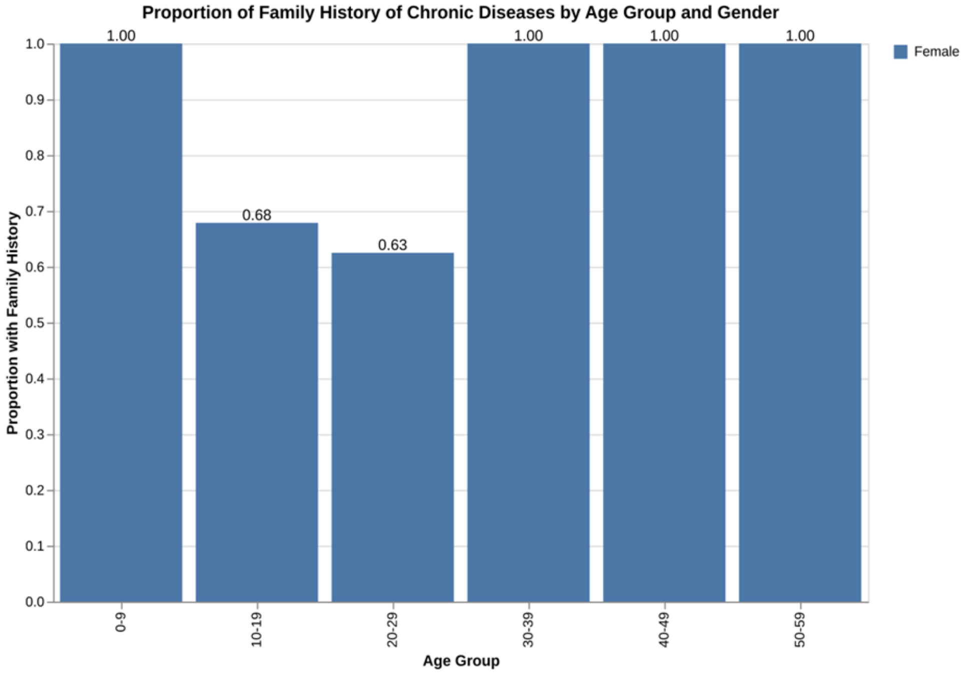

Figure 5. Proportion of family history of chronic diseases by age group

Correlation analysis demonstrated a strong positive association between sleep duration and sleep quality, while sleep duration showed a moderate negative correlation with stress frequency (r = −0.25). Stress frequency was moderately associated with stress severity and weakly correlated with fast-food consumption. Water intake was positively correlated with fruit and vegetable consumption. Figure 6 summarizes these relationships.

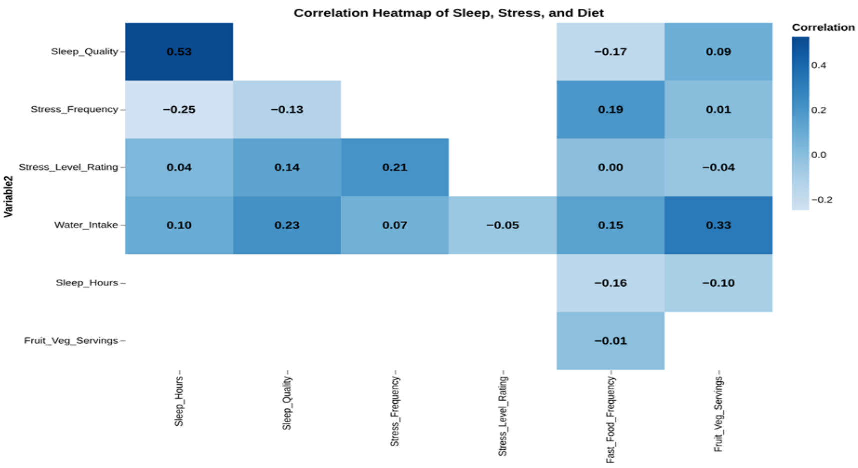

Figure 6. Correlation heatmap of sleep, stress, and dietary variables.

Blood health indicators revealed that the majority of participants had normal blood pressure (62.3%) and normal blood sugar levels (78.4%). Elevated blood sugar levels were more prevalent than low levels, while low blood pressure was slightly more common than high blood pressure. These distributions are illustrated in Table 1.

Table 1. Distribution of blood sugar and blood pressure levels among participants

Indicator	Category	Value
Blood Sugar Level Distribution	High	15.69%
	Low	5.88%
	Normal	78.43%
Blood Pressure Status	High	16.98%
	Low	20.75%
	Normal	62.26%

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Participants with a positive family history of chronic diseases were more likely to perceive their lifestyle as increasing their disease risk compared to those without a family history. This relationship is shown in Figure 7.

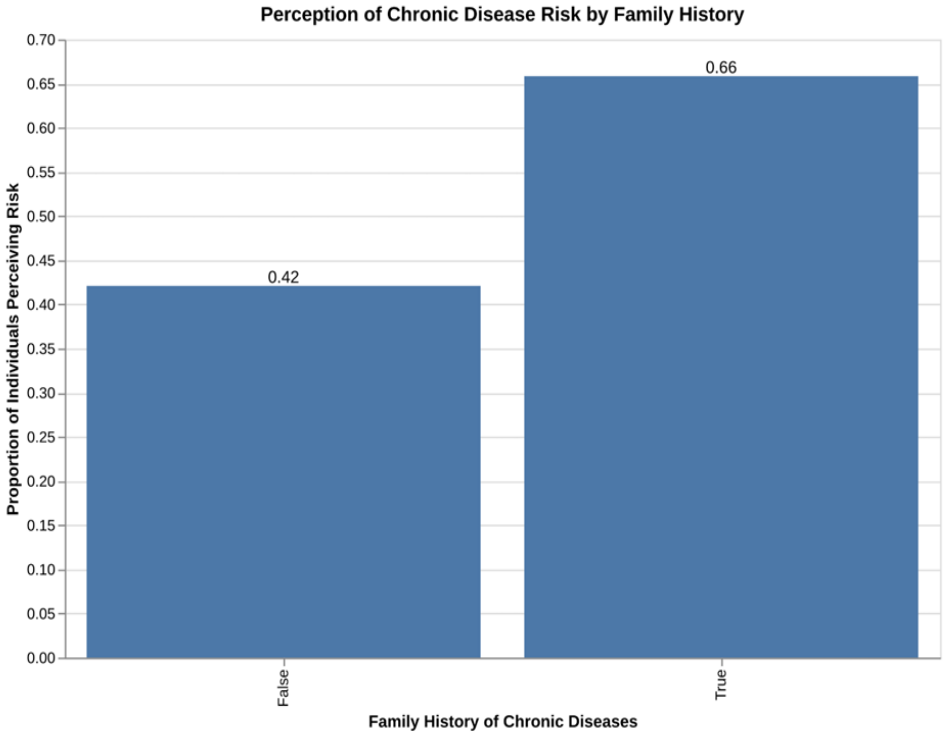

Figure 7. Perception of chronic disease risk by family history.

No clear linear association was observed between exercise frequency and BMI due to extreme BMI outliers and limited data at higher exercise frequencies, as illustrated in Figure 8.

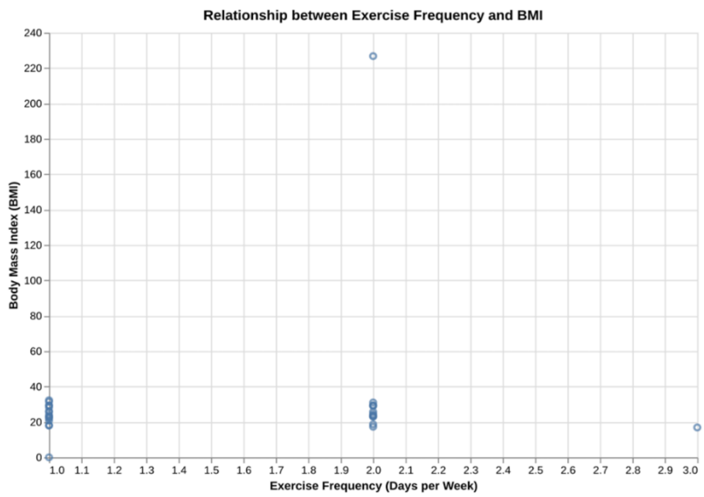

Figure 8. Relationship between exercise frequency and BMI.

Frequent fast-food consumption was associated with a higher prevalence of daily gastrointestinal discomfort, with the highest proportion observed among participants consuming fast food almost daily. Conversely, those who rarely or never consumed fast food reported mostly occasional discomfort. The relationship between caffeine intake and sleep duration demonstrated that moderate caffeine consumption was associated with longer sleep duration, while higher intake was linked to reduced sleep hours, as shown in Figure 9.

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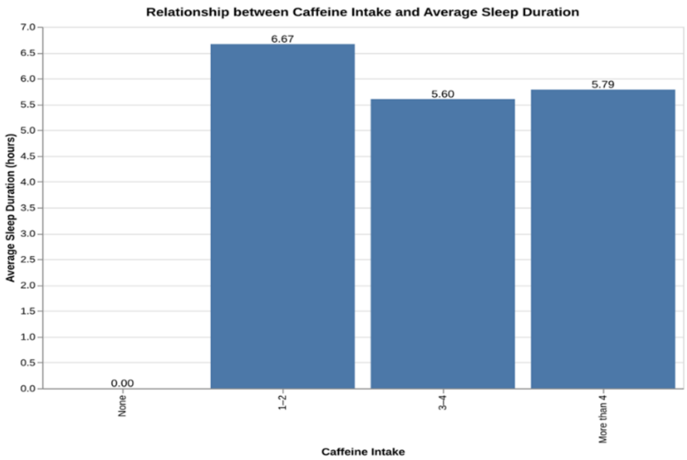

Figure 9. Relationship between caffeine intake and average sleep duration.

Discussion

The present study provides a multidimensional view of lifestyle behaviors, stress, sleep, dietary patterns, and health indicators among female medical students. The variability in stress levels observed across weeks, with a peak driven by maximum stress reports, reflects the episodic nature of stress in academic settings. Previous studies have consistently documented high stress prevalence among medical students, often linked to examination periods and workload intensity (15). Our finding of a moderate negative correlation between sleep duration and stress frequency aligns with evidence from Almojali et al., who reported that stress was a significant predictor of poor sleep quality in Saudi medical students (7). Similarly, Tran et al. demonstrated that stress and sleep disturbances were interdependent, contributing to reduced academic efficiency (6). These results reinforce the need for interventions that target both stress management and sleep hygiene simultaneously.

The positive correlation between height and weight within the normal range, alongside extreme outliers detected by the interquartile range method, highlights the importance of data validation in student health research. Outliers may reflect data entry errors or rare physiological conditions. Comparable methodological challenges have been noted in studies assessing BMI among university populations, where misreporting of height and weight can distort associations with lifestyle factors (16). Ensuring accurate anthropometric data collection remains critical for reliable interpretation of BMI-related outcomes.

Our findings that participants with a positive family history of chronic diseases were more likely to perceive their lifestyle as increasing disease risk are consistent with prior evidence. A study by Al-Dubai et al. found that medical students with a family history of diabetes or hypertension demonstrated heightened awareness of lifestyle-related risks and were more motivated to adopt preventive behaviors (17). This suggests that family history may serve as a catalyst for health-conscious attitudes, although whether this translates into sustained behavioral change remains uncertain.

Frequent fast-food consumption was associated with daily gastrointestinal discomfort, echoing findings from Kant and Graubard, who linked processed food intake to metabolic and digestive disturbances (9). More recent evidence from Nguyen et al. confirmed that high fast-food consumption among students was associated with increased gastrointestinal symptoms and poorer overall diet quality (18). Conversely, higher fruit and vegetable intake correlated positively with water consumption, supporting the notion that healthier dietary patterns cluster together, as observed in large-scale dietary surveys (19).

The relationship between caffeine intake and sleep duration in our study, where moderate consumption was linked to longer sleep and higher intake to reduced sleep, reflects the dual role of caffeine as both a cognitive enhancer and a sleep disruptor. Clark and Landolt's systematic review highlighted that moderate caffeine use may improve alertness without severely impairing sleep, whereas excessive intake consistently shortened sleep duration (11). Similar findings were reported by Richards and Smith, who noted that high caffeine consumption was associated with increased stress and reduced sleep among adolescents (12). Our results extend these observations to medical students, underscoring the importance of moderating caffeine intake in this population.

The majority of participants demonstrated normal blood pressure and blood sugar levels, though elevated blood sugar was more prevalent than low levels, and low blood pressure was slightly more common than high blood pressure. These findings are consistent with global epidemiological data showing that hypertension and diabetes are rising among young adults, but remain less prevalent in student populations compared to older cohorts (20). Mills et al. emphasized that early detection of abnormal blood pressure and glucose levels is critical, as these markers often precede chronic disease development (14). Our results suggest that while most medical students maintain normal values, a subset may already exhibit early risk indicators.

No clear linear association was observed between exercise frequency and BMI, largely due to extreme outliers and limited data at higher exercise frequencies. This finding contrasts with studies that have demonstrated consistent inverse associations between physical activity and BMI in student populations (21). The discrepancy may be explained by

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methodological limitations, including small sample size and self-reported exercise data, which are prone to recall bias. Future studies with larger cohorts and objective activity measures are needed to clarify this relationship.

Conclusion

This study highlights the complex interrelationships between lifestyle behaviors, stress, sleep, diet, and health indicators among female medical students. Stress variability across weeks, its negative association with sleep duration, and its link to dietary habits underscore the need for integrated approaches to student well-being. The observed correlations between fast-food consumption and gastrointestinal discomfort, caffeine intake and sleep duration, and family history with perceived disease risk emphasize that lifestyle choices and genetic predispositions jointly shape health outcomes. While most participants maintained normal blood pressure and blood sugar levels, the presence of elevated values in a subset suggests early markers of cardiometabolic risk.

Human Ethics

The study was reviewed and approved by the Maaref Institutional Review Board, approval number 2025-10002. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Consent to Participate

Informed consent was obtained from all individual participants included in the study. Participation was voluntary, and participants were informed of their right to withdraw at any time without consequence. For participants under the age of 18, consent was obtained from a parent or legal guardian in addition to the participant's assent.

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Data Availability

The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

Conflict of interest. Nil

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