

CORRELATION BETWEEN PERCEIVED STRESS, RESTING HEART RATE, BODY MASS INDEX, AND BLOOD PRESSURE AMONG MEDICAL FACULTY STUDENTS AT THE UNIVERSITY OF TETOVA. A CROSS-SECTIONAL STUDY.

Rida SALIJA, Esra RAKPI, Vegim ZHAKU

Abstract

Psychological stress is a common issue among medical students and may negatively affect important cardiometabolic parameters such as resting heart rate, blood pressure, and body mass index (BMI). Academic workload, emotional pressure, and lifestyle factors often contribute to increased stress levels in this population. Identifying the relationship between perceived stress and physiological parameters may help promote health and prevent early cardiovascular risk factors among students.

The aim of this study is to evaluate the correlation between perceived stress level, resting heart rate, BMI, and blood pressure among students of the Faculty of Medical Sciences at the University of Tetova.

This study will be observational and cross-sectional and will include 40 General Medicine students, consisting of 21 males and 19 females. Data will be collected anonymously after obtaining informed consent. Stress level will be assessed using the Perceived Stress Scale (PSS-10). Resting heart rate, systolic and diastolic blood pressure, body weight, and height will be measured for BMI calculation. Statistical analysis will be performed using Excel, SPSS, or JASP through descriptive analysis, t-test, ANOVA, and Pearson or Spearman correlation analysis depending on data distribution. Statistical significance will be considered at $p < 0.05$.

Expected results suggest that students with higher levels of perceived stress will present increased resting heart rate and higher blood pressure values. Additionally, a relationship between stress and BMI is expected, as well as possible gender differences.

This study is expected to contribute to a better understanding of the impact of psychological stress on the cardiometabolic health of medical students and to serve as a basis for preventive strategies and the promotion of stress management in the university environment.

Keywords: perceived stress, medical students, BMI, blood pressure, resting heart rate, cardiometabolic health.

Stress can be defined as a state of worry or mental tension caused by a difficult situation. Stress is a natural human response that prompts us to address challenges and threats in our lives. Everyone experiences stress to some degree.³

Physiological responses to stress include the complex changes the human body undergoes when faced with stressors. When the brain perceives a threat, it activates the sympathetic nervous system, initiating a "fight or flight" response characterized by increased heart rate, elevated blood pressure, and accelerated breathing. These changes prepare the body for immediate action by diverting blood flow to vital organs while suppressing non-critical functions such as digestion. Chronic exposure to stress can lead to serious health consequences, including cardiovascular disease, gastrointestinal disorders, and weakened immune function.

Study Objective

To assess the correlation between perceived stress, resting heart rate, BMI, and blood pressure among Medical Faculty students.

³ World Health Organization. Stress [Internet]. World Health Organization. 2023.

Study Hypotheses

Primary Hypothesis

There is a positive correlation between the level of perceived stress and physiological parameters in Medical Faculty students, where students with higher perceived stress levels exhibit higher resting heart rates and higher blood pressure values.

Secondary Hypotheses

- The level of perceived stress differs between genders.
- Female students may exhibit higher levels of perceived stress compared to males.
- There is a relationship between body mass index (BMI) and perceived stress.
- Higher BMI may be associated with higher blood pressure values.

This is a cross-sectional study conducted among students of the Medical Faculty at the University of Tetova.

The study was carried out over a defined period of time and aimed to assess the correlation between perceived stress level, resting heart rate, body mass index (BMI), and blood pressure. Data were collected simultaneously through the PSS-10 questionnaire and physiological measurements of the participants.

Study on Stress and Cardiometabolic Parameters

Faculty of Medicine – University of Tetova | Comparison by Gender

Total Sample:	40	Males:	21	Females:	19
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Parameter	Males — Mean	Males — SD	Females — Mean	Females — SD	Difference (M-F)
Stress PSS-10 (points)	16.9	4	21.1	4	-4.2
BMI (kg/m ²)	24.24	2.68	21.68	4.02	2.56
Resting Heart Rate (bpm)	75.3	8.6	78.8	10.1	-3.5
Systolic Blood Pressure (mmHg)	122.6	8.6	115.7	13.7	6.9
Diastolic Blood Pressure (mmHg)	78.8	7.6	71.9	11.1	6.9

SD = Standard Deviation | Positive difference = Males have higher value | Negative difference = Females have higher value

Lifestyle Factors

Category	Males (n)	Males (%)	Females (n)	Females (%)
Physical Activity — Never	2	9.5%	2	10.5%
Physical Activity — 1–2 times/week	11	52.4%	11	57.9%

Physical Activity — 3–4 times/week	6	28.6%	4	21.1%
Physical Activity — 5+ times/week	2	9.5%	2	10.5%
Smoking — No	16	76.2%	13	68.4%
Smoking — Occasionally	1	4.8%	4	21.1%
Smoking — Regularly	4	19.0%	2	10.5%
Sleep — < 5 hours	1	4.8%	2	10.5%
Sleep — 5–6 hours	6	28.6%	3	15.8%
Sleep — 7–8 hours	12	57.1%	13	68.4%
Sleep — > 8 hours	2	9.5%	1	5.3%

PSS-10 — Perceived Stress Scale — Analysis Per Question

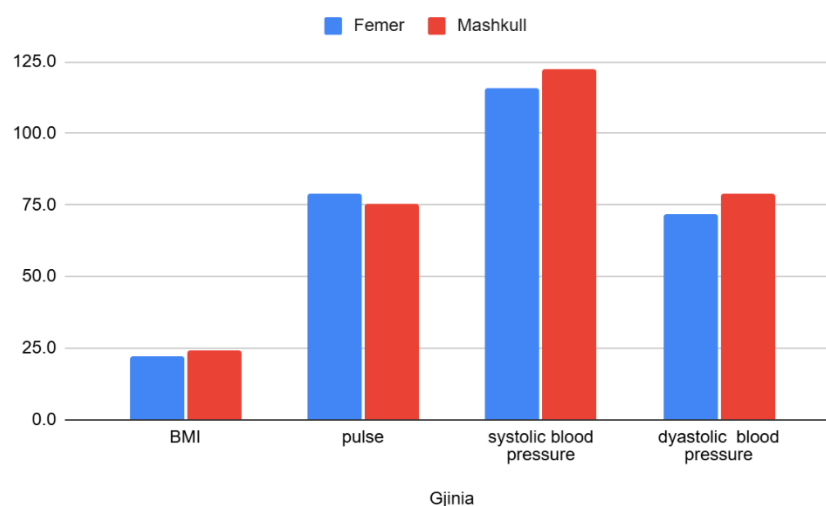
Question (PSS-10)	Males Mean	Males SD	Females Mean	Females SD	Difference	Direction
Q1. How often have you felt upset about something unexpected?	2.81	1.17	3.74	0.81	-0.93	Females ↑
Q2. How often have you felt nervous and stressed?	3.33	0.86	3.95	0.85	-0.62	Females ↑
Q3. How often have you felt confident in your ability? [R]*	3.9	1.0	3.68	0.67	0.22	Males ↑
Q4. How often have you felt that things were going according to plan? [R]*	3.29	1.15	2.84	0.83	0.45	Males ↑
Q5. How often have you felt unable to cope with your tasks?	2.38	0.92	3.11	0.81	-0.73	Females ↑
Q6. How often have you been able to control irritations? [R]*	3.43	0.87	3.32	0.95	0.11	Males ↑
Q7. How often have you felt "on top of things"? [R]*	3.48	1.03	3.0	0.94	0.48	Males ↑
Q8. How often have you felt angered by things outside your control?	3.52	1.17	3.63	1.01	-0.11	Females ↑
Q9. How often have you felt that difficulties were piling up?	2.9	1.14	3.47	0.9	-0.57	Females ↑
TOTAL PSS-10 (0–40 points)	16.9	4	21.1	4	-4.2	Females ↑

[R] = Reverse-scored question (4 minus original value). Total score: 0 = no stress, 40 = maximum stress.

PSS-10 Scores Per Question by Gender

Gender	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Female	3.5	3.7	3.7	3.7	2.8	3.1	3.3	3.0	3.6	3.5
Male	2.8	2.8	3.9	3.9	3.3	2.4	3.4	3.5	3.5	2.9

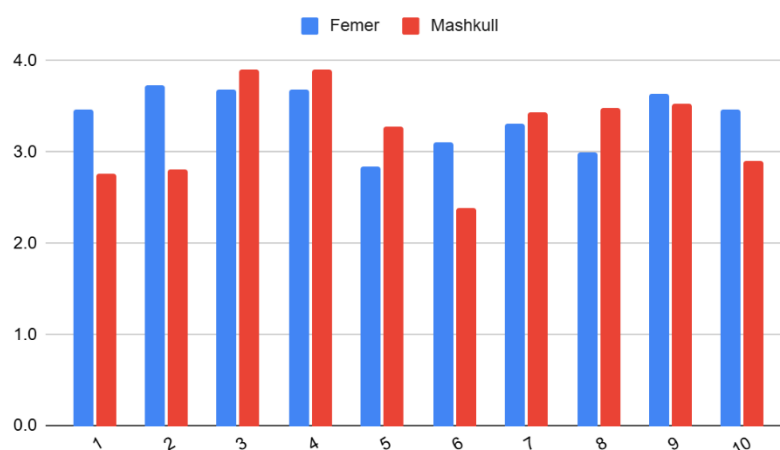
Gender	BMI	Resting Rate	Heart	Systolic BP	Diastolic BP
Female	22.0	78.8		115.7	71.9
Male	24.2	75.3		122.6	78.8



PSS-10 — Perceived Stress Scale

The PSS-10 is a scale measuring perceived stress over the past month, consisting of 10 questions:

1. How often have you felt upset about something unexpected?
2. How often have you felt that you were unable to control the important things in your life?
3. How often have you felt nervous and stressed?
4. How often have you felt confident about your ability to handle your personal problems? (reverse)
5. How often have you felt that things were going your way? (reverse)
6. How often have you felt that you were unable to cope with all the things you had to do?
7. How often have you been able to control irritations in your life? (reverse)
8. How often have you felt that you were on top of things? (reverse)
9. How often have you been angered because of things that were outside of your control?
10. How often have you felt difficulties were piling up so high that you could not overcome them?



Physiological Parameters by Gender

Analysis of physiological parameters revealed differences between genders.

Males had:

- Higher BMI
- Higher systolic blood pressure
- Higher diastolic blood pressure

Females exhibited:

- Higher resting heart rate⁴

Mean values were:

- BMI: 24.2 in males vs. 22.0 in females
- Resting heart rate: 78.8 bpm in females vs. 75.3 bpm in males
- Systolic BP: 122.6 mmHg in males vs. 115.7 mmHg in females
- Diastolic BP: 78.8 mmHg in males vs. 71.9 mmHg in females

Results

Perceived Stress Level by Gender

Analysis of the PSS-10 scale showed that female students had a higher level of perceived stress compared to males.

The mean total PSS-10 score was:

- Females: 21.1 ± 4
- Males: 16.9 ± 4

A difference of 4.2 points suggests a higher perception of stress among the female gender.

In questions related to:

- worry
- nervousness
- emotional overload
- accumulating difficulties females reported higher mean values.

Meanwhile, males showed higher scores on reverse-scored questions, which reflect:

- emotional control
- self-confidence

⁴ Physiological responses to stress | EBSCO [Internet]. EBSCO Information Services, Inc. | www.ebsco.com. 2024

- better coping with stressful situations

Conclusion

This cross-sectional study analyzed the relationship between perceived stress, resting heart rate, body mass index (BMI), and blood pressure among Medical Faculty students at the University of Tetova.

Results showed that female students exhibited higher levels of perceived stress compared to males, while males had higher BMI and blood pressure values. Females also showed a higher resting heart rate.

The findings suggest that perceived stress may be associated with physiological changes in the cardiovascular system and metabolic parameters. These results highlight the importance of identifying and managing stress among medical students, with the aim of preserving both physical and psychological health.⁵

Further studies with larger samples and more advanced statistical analyses are needed to more accurately assess the relationship between stress and physiological parameters.

References

- [1]. World Health Organization. Stress [Internet]. World Health Organization. 2023. Available from: <https://www.who.int/news-room/questions-and-answers/item/stress>
- [2]. Physiological responses to stress | EBSCO [Internet]. EBSCO Information Services, Inc. | www.ebsco.com. 2024. Available from: <https://www.ebsco.com/research-starters/health-and-medicine/physiological-responses-stress>
- [3]. Chu B, Marwaha K, Ayers D, Sanvictores T. Physiology, Stress Reaction [Internet]. PubMed. Treasure Island (FL): StatPearls Publishing; 2024. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK541120/>

⁵ Chu B, Marwaha K, Ayers D, Sanvictores T. Physiology, Stress Reaction [Internet]. PubMed. Treasure Island (FL): StatPearls Publishing; 2024