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ASSOCIATION BETWEEN BODY MASS INDEX, BLOOD PRESSURE, AND BLOOD GLUCOSE LEVELS WITH GENDER AMONG FACULTY OF SPORTS SCIENCE AND RECREATION STAFF AT UITM

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Abstract

High body mass index (BMI), blood pressure, and glucose levels lead to many diseases such as hypertension, diabetes, and cardiovascular disease (CVD). This study aimed to compare BMI on blood pressure and glucose levels among genders of the Faculty of Sports Science and Recreation (FSR), UiTM Shah Alam staff. The study involved 26 males, and 19 females aged between 24 and 60 years old who then participated in the health screening processes. Then the data was analyzed by using SPSS version 29. The significant level for male, and female BMI and systolic blood pressure is smaller than the p-value ($p<0.05$) indicating significance between BMI and systolic blood pressure (SBP) against male and female staff in FSR with a weak positive correlation. Meanwhile, the p-value for male and female BMI and blood glucose level is higher than 0.05 indicating no significance between BMI and blood glucose level against either male or female staff in FSR. The correlation of male BMI is a very weak negative correlation indicating an inversely proportional relationship between BMI and blood glucose level among the male staff. The study reveals that the association between BMI and blood pressure among male and female FSR employees is substantial, with a slight positive correlation. However, there is no significant relation between BMI and blood glucose levels among male and female FSR staff, with a mild negative correlation for males and a weak positive correlation for females.

Keywords: body mass index (BMI), blood pressure, blood glucose, UiTM

INTRODUCTION

The prevalence of non-communicable diseases (NCDs) such as hypertension, diabetes, and obesity has been steadily rising worldwide, prompting increased interest in understanding their risk factors and associations with demographic variables, particularly gender (World Health Organization, 2021). Among key health indicators, Body Mass Index (BMI), blood pressure (BP), and blood glucose levels

(BGL) serve as critical markers for assessing an individual's risk of developing cardiovascular diseases and metabolic disorders (Ng et al., 2014). Variations in these health indicators across genders have been widely studied, as men and women often exhibit distinct physiological, hormonal, and lifestyle-related differences that influence their health status (Regitz-Zagrosek, 2012). Understanding these variations is crucial for designing targeted interventions and promoting public health initiatives.

In academic settings, faculty members, particularly those within the field of Sports Science and Recreation, are expected to maintain a relatively active lifestyle due to their professional engagement with physical education, sports, and wellness programs. However, the sedentary nature of teaching, research, and administrative responsibilities may contribute to health concerns, despite their professional association with physical activity and fitness (Buckworth & Dishman, 2002). Studies have suggested that even among individuals engaged in sports science, disparities in BMI, BP, and BGL exist, influenced by dietary habits, stress levels, physical activity patterns, and genetic predispositions (Warburton et al., 2006). Therefore, assessing these health indicators among faculty members of the Sports Science and Recreation Faculty at Universiti Teknologi MARA (UiTM) provides valuable insights into their overall health status and the potential gender-based disparities that may exist.

This study aims to examine the relationship between gender and three key health indicators that are BMI, blood pressure, and blood glucose levels among UiTM's Sports Science and Recreation faculty members. Specifically, this research seeks to determine whether significant gender differences exist in these health parameters and identify potential contributing factors. By addressing these associations, the study will contribute to the development of targeted interventions and health promotion programs tailored to the specific needs of male and female staff members. Findings from this research can inform institutional policies to enhance faculty well-being, promote a healthier academic workforce, and encourage sustainable health practices within the educational environment.

METHODOLOGY

Participants

A total of 43 staff members (n = 43; 24 males and 19 females) from the Faculty of Sports Science and Recreation (FSR), Universiti Teknologi MARA (UiTM), Shah Alam, aged between 24 and 60 years old, were recruited for this study. Participants were selected through purposive sampling, with random sampling applied among those who agreed to participate in the health screening. Exclusion criteria included pregnancy (n = 2 females), medication use (n = 1 male, 2 females), and incomplete data (n = 1 male). After applying the exclusion criteria, the final sample consisted of 43 participants (24 males and 19 females). All participants were briefed on the study objectives, procedures, and potential risks, and written informed consent was obtained prior to data collection. Ethical approval was secured from the university's ethics committee.

Experimental Design

This cross-sectional study was conducted at the Faculty of Sports Science and Recreation (FSR), Universiti Teknologi MARA (UiTM), Shah Alam, in 2023. Data collection involved health screening sessions where participants underwent measurements of body mass index (BMI), blood pressure (BP), and blood glucose levels (BGL). Participants were instructed to wear lightweight clothing, remove footwear, and avoid heavy meals prior to the screening. Measurements were conducted in a controlled indoor environment during working hours to minimize variability.

BMI was calculated from height and weight measurements taken using calibrated equipment by trained research assistants. Blood pressure was measured using a digital sphygmomanometer following standard protocols, while blood glucose (HbA1c) levels were obtained from capillary blood samples using point-of-care devices. Each participant's data was recorded in a standardized form, ensuring consistency and accuracy across all measurements. The study aimed to assess the relationship between BMI, BP, and BGL, with gender as a moderating variable.

Table 1. Subject characteristics

Variable	***Mean ± SD***
Number of Subjects	43
Male	24
Female	19
Age (years)	24 to 60
BMI (kg/m²) Male	27.61 ± 6.10
BMI (kg/m²) Female	28.82 ± 6.44
SBP Male	128 ± 18.95
DBP Male	82 ± 11.55
SBP Female	108 ± 9.15
DBP Female	81 ± 9.51
Blood Glucose Level (%) Male	5.92 ± 0.95
Blood Glucose Level (%) Female	5.59 ± 0.49

BMI: Body mass index; **SBP**: Systolic blood pressure; **DBP**: Diastolic blood pressure

MEASUREMENTS

Body Mass Index (BMI)

Staff are required to wear lightweight, loose-fitting clothing and remove jewelry, metals, and shoes during the physical examination. The measurement process for body weight and height was taken by trained research assistants, who monitored it to ensure the quality of data collected.

Blood Pressure

The category of blood pressure was recorded, which consists of systolic blood pressure (SBP) and diastolic blood pressure (DBP).

Blood Glucose (HbA1c)

The blood glucose levels of both genders were obtained and recorded for each participant. The collected data were examined with SPSS version 29 software

Statistical Analysis

All data were analyzed using IBM SPSS Statistics (version 29.0). Descriptive statistics, including mean and standard deviation (SD), were computed for all variables (BMI, systolic blood pressure [SBP], diastolic blood pressure [DBP], and blood glucose levels [HbA1c]). Pearson correlation coefficients were used to examine the relationships between BMI and SBP, DBP, and blood glucose levels for both male and female participants. A significance level was set at $p < 0.05$.

RESULTS

Table 2 shows data on BMI category classification for both genders. 11 males are categorized as overweight, 8 males are obese I, 2 males are normal and obese III each, and 1 male is underweighted. The mean male BMI in the overweight category is 25.54 ± 0.99, and 29.55 ± 1.38 for the obese I category. The average BMI of male staff in FSR is 27.61 ± 6.10, categorized as obese I. 8 females are categorized as overweight, 3 females are normal, obese I, and obese II each, and 2 females are categorized as obese III. The mean female BMI in the overweight category is 25.79 ± 1.62 followed by 21.37 ± 0.93 in the normal category. The average BMI of female staff in FSR is 28.82 ± 6.44, which is categorized as obese I.

Table 2. BMI categories for each gender

Characteristics	***n (%)***	***Mean ± SD***
BMI (kg/m^2)		28.14 (6.21)
Male	24 (100.0)	27.61 (6.10)
Underweight	1 (4.2)	
Normal	2 (8.3)	20.15 ± 0.07
Overweight	11 (45.8)	25.54 ± 0.99
Obese I	8 (33.3)	29.55 ± 1.38
Obese II		
Obese III	2 (8.3)	43.45 ± 7.28
Female	19 (100.0)	28.82 ± 6.44
Underweight		
Normal	3 (15.8)	21.37 ± 0.93
Overweight	8 (42.1)	25.79 ± 1.62
Obese I	3 (15.8)	29.00 ± 0.98
Obese II	3 (15.8)	35.43 ± 1.69
Obese III	2 (10.5)	41.95 ± 1.63

The results in Table 3 show data on blood pressure classification for both genders. The blood pressure of 7 males is optimum, followed by 5 males for normal, high-normal, and hypertension 1 each and 1 male for hypertension 2 and hypertension 3, respectively. The average blood pressure of male staff in FSR is 128/82, categorized as normal blood pressure. The blood pressure of 9 females is optimum, followed by 4 females for high-normal, and 3 females for normal and hypertension 1, respectively. The average blood pressure of female staff in FSR is 108/81, categorized as normal blood pressure.

Table 3. Blood pressure classifications for each gender

Characteristics	***n (%)***	***Mean ± SD***	
		Systolic Blood Pressure (SBP)	**Diastolic Blood Pressure (DBP)**
Blood pressure (mm Hg)		120 ± 18.29	81 ± 10.58
Blood pressure classification			
Male	24 (100.0)	128 ± 18.95	82 ± 11.55
Optimum	7 (29.2)	111 ± 6.71	72 ± 4.80
Normal	5 (20.8)	125 ± 3.67	82 ± 1.82
High-normal	5 (20.8)	134 ± 4.03	88 ± 0.71
Hypertension 1	5 (20.8)	147 ± 6.19	94 ± 3.56
Hypertension 2	1 (4.2)		105 ± 6.36
Hypertension 3	1 (4.2)	185 ± 0.00	
Female	19 (100.0)	108 ± 9.15	81 ± 9.51
Optimum	9 (47.4)	108 ± 8.88	72 ± 3.54
Normal	3 (15.8)	121 ± 0.00	84 ± 0.58
High-normal	4 (21.1)		86 ± 1.41
Hypertension 1	3 (15.8)		97 ± 1.53
Hypertension 2			
Hypertension 3			

The results in Table 4 show data on blood glucose (HbA1c) levels for both genders. 13 male staff in FSR have pre-diabetic HbA1c, 9 males are normal, and 2 males have diabetes. The average blood glucose value of male staff in FSR is 5.92, which is a pre-diabetic level. Meanwhile, 11 female staff in FSR have normal HbA1c, followed by 7 females who have pre-diabetic blood glucose, and a female with diabetes. The average blood glucose value of female staff in FSR is 5.59, a pre-diabetic level.

Table 4. Blood glucose (HbA1c) levels for each gender

Characteristics	***n (%)***	***Mean ± SD***
Blood glucose level (%)		5.77 ± 0.79
Blood glucose classification		
Male	24 (100.0)	5.92 ± 0.95
Normal	9 (37.5)	5.43 ± 0.26
Pre-diabetic	13 (54.2)	5.92 ± 0.18
Diabetes	2 (8.3)	8.45 ± 2.05
Female	19 (100.0)	5.59 ± 0.49
Normal	11 (57.9)	5.25 ± 0.23
Pre-diabetic	7 (36.8)	5.99 ± 0.30
Diabetes	1 (5.3)	6.50 ± 0.00

The scatter plots in Figures 1 to 4 show a relationship between BMI and SBP among male and female staff in FSR respectively. The BMI of male and female staff is proportional to systolic blood pressure. In addition, the BMI of male and female staff is proportional to diastolic blood pressure. Table 5 shows the details of the correlation between BMI and SBP / DBP (mm Hg) among males.

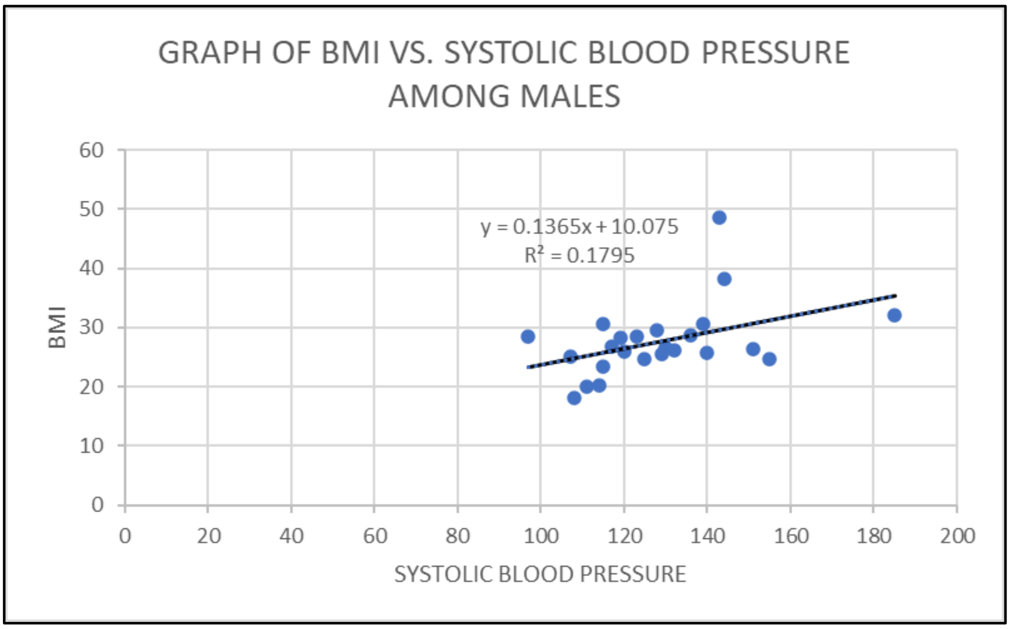

Figure 1: Scatter plot graph of BMI vs. systolic blood pressure among males

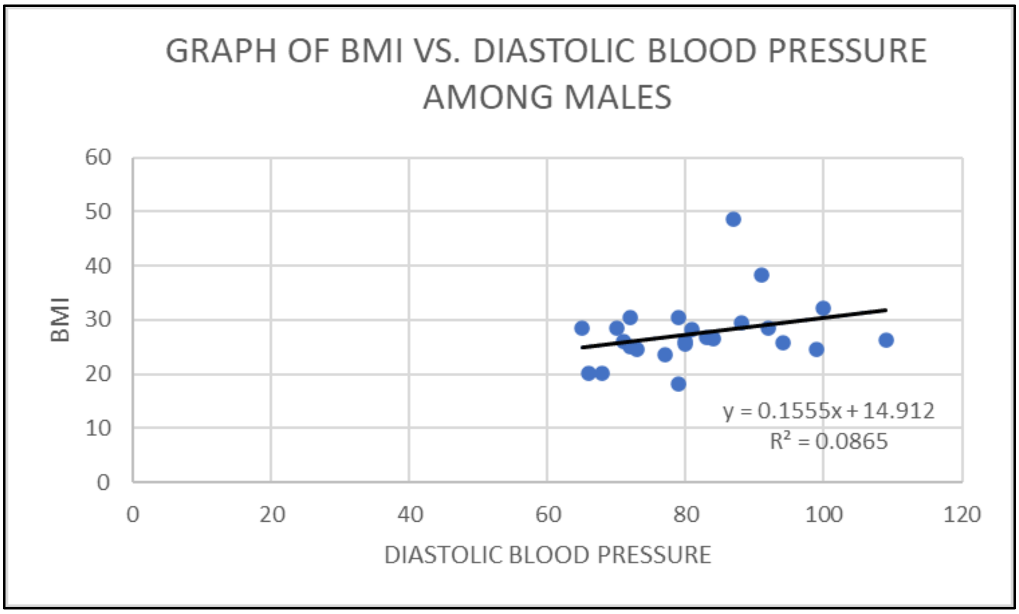

Figure 2. Scatter plot graph of BMI vs. diastolic blood pressure among males

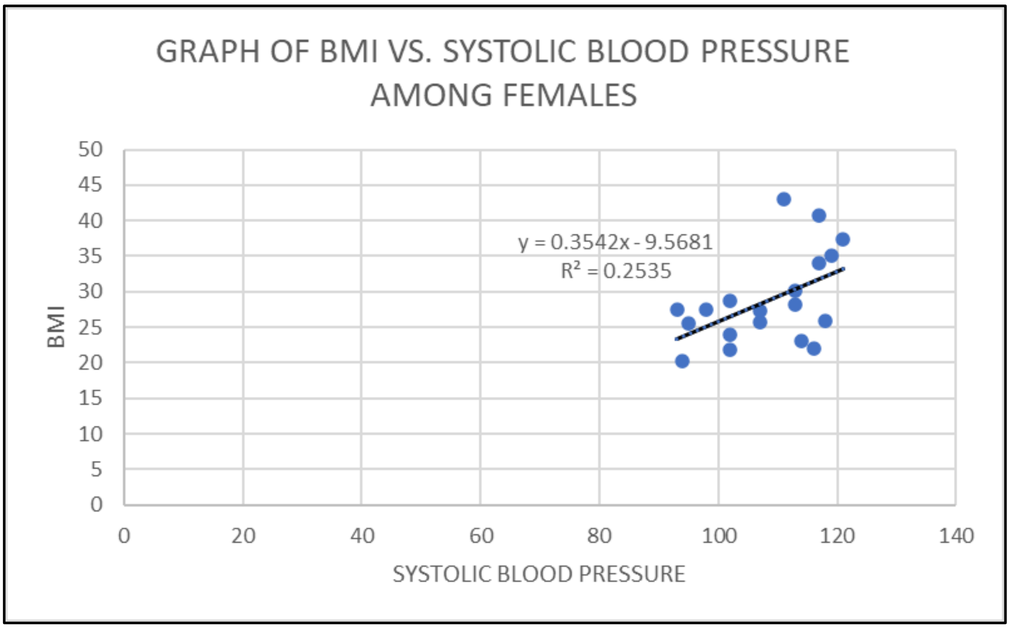

Figure 3. Scatter plot graph of BMI vs. systolic blood pressure among females

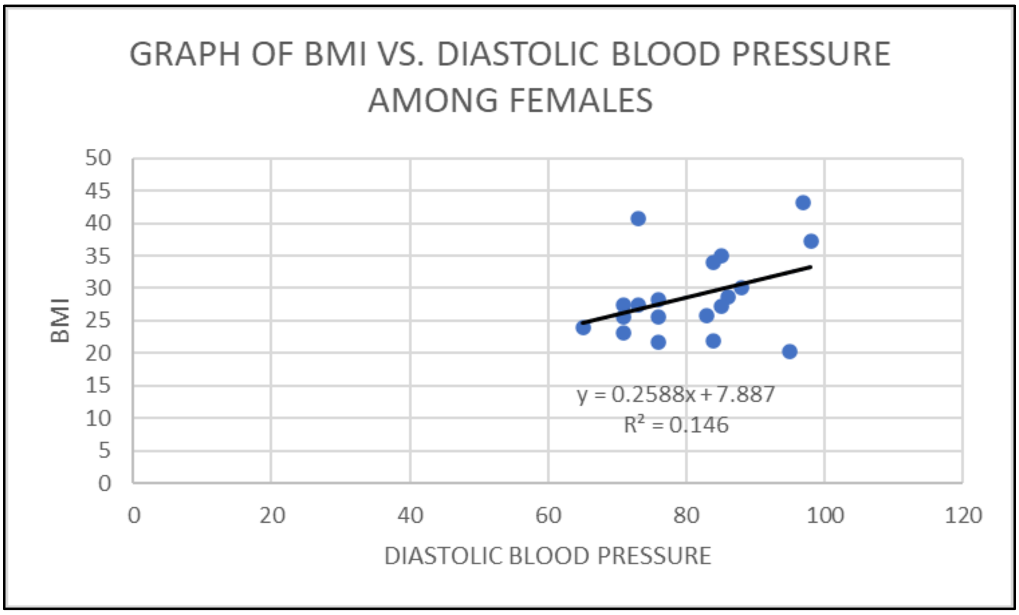

Figure 4. Scatter plot graph of BMI vs. diastolic blood pressure among females

Table 5. Details on the correlation between BMI, SBP and DBP (mm Hg) among males

BMI	*SBP (Mean ± SD)*	*DBP (Mean ± SD)*
Underweight	108 ± 0.0	79 ± 0.0
Normal	113 ± 2.1	67 ± 1.4
Overweight	124 ± 14.9	84 ± 12.1
Obese I	130 ± 25.7	81 ± 11.9
Obese II		
Obese III	144 ± 0.7	89 ± 2.8
p-value	<0.05	>0.05

BMI: Body mass index; **SBP:** Systolic blood pressure; **DBP:** Diastolic blood pressure

In Figure 5, the BMI of male staff decreases with blood glucose level, meanwhile in Figure 6, when the BMI of female staff increases, the blood glucose level also increases. Table 6 shows the details of the correlation between BMI and SBP / DBP (mm Hg) among females. Additionally, Table 7 shows the details of the correlation between BMI and blood glucose level (%) among males and females.

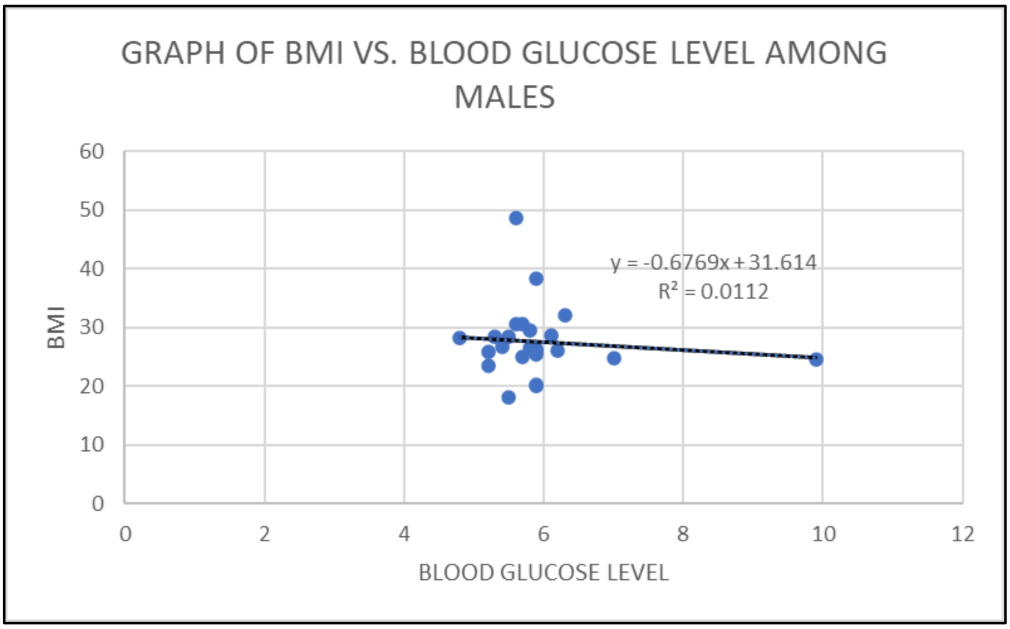

Figure 5. Scatter plot graph of BMI vs. blood glucose level among males

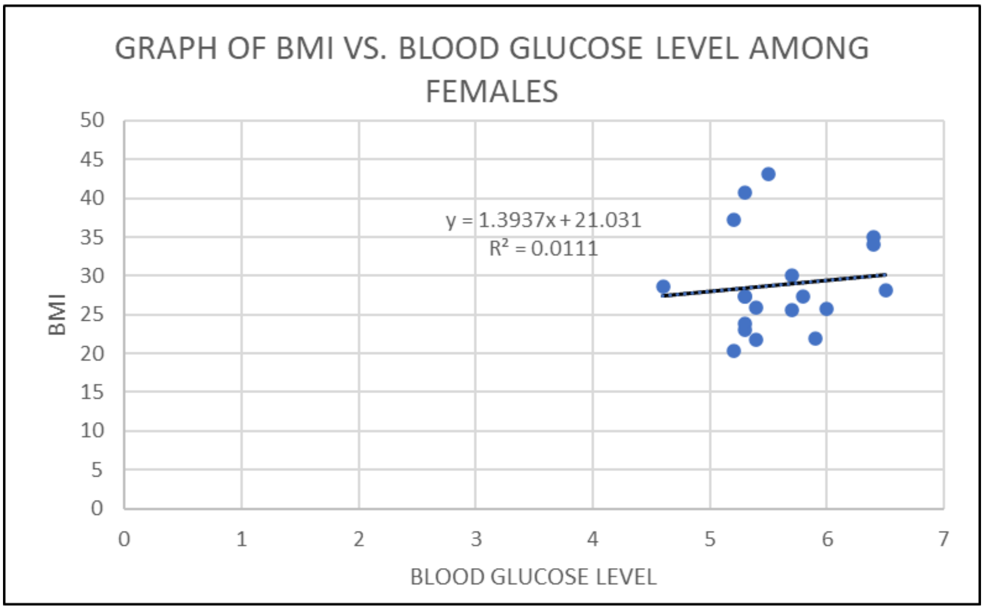

Figure 6. Scatter plot graph of BMI vs. blood glucose level among females

Table 6. Details on the correlation between BMI, SBP and DBP (mm Hg) among females

BMI	*SBP (Mean ± SD)*	*DBP (Mean ± SD)*
Underweight		
Normal	104 ± 11.1	85 ± 9.5
Overweight	104 ± 8.9	74 ± 6.7
Obese I	109 ± 6.4	83 ± 6.4
Obese II	119 ± 2.0	89 ± 7.8
Obese III	114 ± 4.2	85 ± 17.0
p-value	<0.05	>0.05

BMI: body mass index; **SBP:** systolic blood pressure; **DBP:** diastolic blood pressure

Table 7. Details on the correlation between BMI and blood glucose level (%) among males and females

BMI	*Male (Mean ± SD)*	*Female (Mean ± SD)*
Underweight	5.5 ± 0.0	
Normal	5.9 ± 0.0	5.5 ± 0.4
Overweight	6.3 ± 1.3	5.5 ± 0.3
Obese I	5.6 ± 1.0	5.6 ± 1.0
Obese II		6.0 ± 1.7
Obese III	5.4 ± 0.1	5.4 ± 0.1
p-value	>0.05	>0.05

BMI: Body mass index; **M**: male; **F**: female

Based on Table 8 below, the significant level for male, and female BMI and SBP is smaller than the p-value ($p<0.05$) indicating significance between BMI and SBP against male and female staff in FSR. The weak positive correlation between BMI and SBP for males ($r=0.424$) and females ($r=0.503$) indicates BMI is proportional to SBP, where when the BMI increases, the SBP also increases. However, the mean of females' BMI is slightly higher than males' meanwhile the mean of males' SBP is higher than females' (Table 4 and Table 5), which shows that females tend to be moderately obese (obese I) and males tend to have normal systolic blood pressure.

The p-values for male and female BMI and DBP are greater than 0.05, indicating no significance between BMI and DBP against male and female staff in FSR. The weak positive correlation between BMI and DBP for males and females shows that BMI is proportional to SBP. From Table 4, the mean BMI of females is higher than males, meanwhile in Table 5, the DBP of males is slightly higher than females, which also shows that females tend to be moderately obese, and males tend to have normal diastolic blood pressure. In both SBP and DBP, the mean blood pressure levels show that females have optimum systolic and diastolic blood pressure.

The p-value for male and female staff BMI and blood glucose level is higher than 0.05; p=0.623 > 0.05, and p=0.668 > 0.05, respectively indicating no significance between BMI and blood glucose level. The correlation of male BMI is a very weak negative correlation (-0.106) indicating an inversely proportional relationship between BMI and blood glucose level among male staff (Figure 6). The correlation between female BMI and blood glucose level is a very weak positive correlation (r=0.105). However, the mean blood glucose level is highest among overweight males and obese II females.

Table 8. Correlation between BMI and SBP, BMI and DBP, and BMI and blood glucose level for males and females

Characteristic	***Correlation***	***p-value***
BMI and SBP	0.294	0.056
Male	0.424	0.039
Female	0.503	0.028
BMI and DBP	0.322	0.035
Male	0.294	0.163
Female	0.382	0.106
BMI and blood glucose level	-0.060	0.701
Male	-0.106	0.623
Female	0.105	0.668

BMI: Body mass index; **SBP;** Systolic blood pressure; **DBP;** Diastolic blood pressure

DISCUSSION

The findings indicate a significant yet complex relationship between BMI and blood pressure among faculty members, with variations observed between genders. A weak positive correlation between BMI and SBP among both males and females suggests that increased BMI levels are associated with higher SBP (p-value < 0.001) and DBP (p-value < 0.001). However, gender alone is not a sufficient determinant of this outcome, as multiple studies have highlighted the influence of additional factors such as age, education level, and geographical location (Bernabe-Ortiz et al., 2021). This underscores the importance of considering broader socio-demographic and environmental variables in assessing cardiovascular health.

Consistent with prior research, males exhibited higher SBP and DBP levels compared to females (128/82 mmHg vs. 108/81 mmHg, respectively), whereas females demonstrated a higher average BMI (28.82 vs. 27.61) (Bernabe-Ortiz et al., 2021). Kang (2021) found a significant association between obesity and blood pressure in the Korean population. Furthermore, BMI and waist-to-height ratio were found to be strong predictors of blood pressure and cardiovascular risks, particularly in females, suggesting the need for gender-specific health interventions.

Research by Ji et al. (2021) provided additional insights into gender-based differences in cardiovascular risks, suggesting that women's lower basal SBP levels make them more susceptible to CVD when BP increases beyond their normal range. These differences may stem from variations in vascular anatomy, such as smaller artery diameters in women, which contribute to increased vascular resistance. Furthermore, hormonal fluctuations during the menstrual cycle have been linked to diurnal

SBP variations and nocturnal hypertension, which could partially explain the observed disparities in blood pressure regulation between genders.

Gender-based disparities in obesity were also evident in this study, where females demonstrated a higher BMI despite consuming slightly healthier diets than males. One plausible explanation is that women tend to engage in less physical activity, coupled with the physiological effects of pregnancy, childbirth, and menopause, which contribute to weight gain (Mohd-Sidik et al., 2021). Psychological factors, including societal pressures related to body image and emotional stress, also influence weight-related behaviors, further reinforcing the gender gap in obesity prevalence.

The relationship between BMI and diabetes risk is another crucial aspect. A study conducted in Japan found that diabetes prevalence was significantly associated with BMI, educational attainment, and socioeconomic status (Omura et al., 2025). Interestingly, higher education levels were linked to an increased risk of diabetes, independent of BMI, indicating that lifestyle factors beyond obesity contribute to disease progression. Similarly, Zhang et al. (2021) concluded that waist circumference and waist-to-height ratio were more closely related to diabetes than BMI, particularly among individuals aged 40 and above. Given that Malaysian adults exhibit high rates of undiagnosed diabetes, hypertension, and hypercholesterolemia (Koo et al., 2023), targeted screening and preventive measures should be implemented to mitigate these risks.

Obesity's role in the pathogenesis of type 2 diabetes mellitus (T2DM) is well established, as it contributes to insulin resistance and β-cell dysfunction. However, emerging research suggests that in certain individuals, innate insulin resistance precedes obesity, leading to excessive hepatic glucose production and hyperinsulinemia, which subsequently drive weight gain (Ruze et al., 2023). This alternative disease pathway highlights the complexity of metabolic disorders and underscores the need for a holistic approach to managing diabetes risk factors beyond BMI alone.

Overall, this study underscores the intricate interplay between gender, BMI, blood pressure, and diabetes risk. While gender-based physiological differences contribute to variations in these health parameters, socio-demographic and lifestyle factors also play a pivotal role. The findings emphasize the importance of gender-specific interventions, including targeted lifestyle modifications, early screening programs, and workplace wellness initiatives to promote long-term health among faculty members. Future research should explore longitudinal trends to better understand the evolving impact of these health indicators across different population groups.

CONCLUSION

The rising prevalence of non-communicable diseases such as obesity, hypertension, and diabetes among Malaysians presents a significant public health challenge, placing a considerable burden on individuals, communities, and healthcare systems. This study provides valuable insights into the interrelated factors influencing obesity, hypertension, and diabetes among male and female faculty members at UiTM's Faculty of Sports Science and Recreation. Our findings reveal a notable association between BMI and blood pressure among both male and female staff members, with a slight positive correlation. However, no significant association was observed between BMI and blood glucose levels, as evidenced by a mild negative correlation for males and a slight positive correlation for females. Given these findings, gender-specific strategies should be considered when developing targeted weight management programs and intervention strategies for obesity, hypertension, and diabetes among faculty members. Recognizing physiological and lifestyle differences between males and females will enhance the effectiveness of preventive measures and health initiatives.

Future research should focus on socio-demographic variables to further explore the underlying risk factors of NCDs across different age groups. Additionally, efforts should emphasize early detection, prevention, and management of NCDs while addressing social determinants of health and disparities in healthcare access. A comprehensive approach incorporating lifestyle modifications, health education, and workplace wellness programs will be essential in mitigating the risks associated with obesity, hypertension, and diabetes, ultimately improving the overall health and well-being of university staff.

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