

Correlation of Blood Pressure and Body Mass Index among Healthy Students in Alrayan Colleges - AL Madinah AL Munawarah - KSA

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Abstract: *The blood pressure may increase when body weight increases. This hypothesis is well established in many researches around the world. The aim of this study is to evaluate the correlation between the body mass index and blood pressure levels among healthy Saudi students in Saudi Arabia. This is a cross - sectional study was conducted during July - September 2023 in Madinah - Saudi Arabia stated on a sample size of 100 students males/females of ages between 18 - 30 years and who were not known to be hypertensive. All the participants were assessed by a questionnaire covering age, gender, physical activity, and smoking history. Blood pressure was measured using the digital sphygmomanometer. Weight and height were measured using the standard scales. BMI was calculated according to the formula $\text{Weight (kg)} / [\text{height (m)}]^2$. Correlations between the variables were estimated and $p < 0.05$ was considered statistically significant. **Results** There is a significant positive relationship between the BMI and the blood pressure ($p = 0.01$), the statistical analysis also showed that there is no significant positive relationship between the BMI and the smoking and physical activity. Prevalence of overweight was 16% and obesity was 8%. **Conclusion:** There is a significant relationship between BMI and blood pressure, confirming previous researches. However, no significant associations were observed between BMI and history of blood pressure abnormalities, smoking, and physical activity.*

Keywords: Obesity, Hypertension, overweight, cross – sectional

1. Introduction

Globally, high Blood Pressure (BP) is responsible for death of 7.1 million, about 13% of the total population. (1) Hypertension is one of the most common disorders and data from observational studies have demonstrated increasing risk of stroke, myocardial infarction, site specific cancer and all - cause mortality associated with elevated blood pressure. (2)

Blood Pressure (BP) is controlled by the activity of the autonomic nervous system. Obesity is associated with sympathetic stimulation which is a leading factor for the development of hypertension. (3) There is a positive association between measures of obesity and blood pressure in both developed and less developed countries. (4)

BMI is defined as body mass index which is a value calculated using the height and weight of the person. BMI ranging from 18 - 25 is considered normal. (4) Obesity and overweight in the age around adolescence are the global problems on the rise, especially very common in developing countries. (5) Obesity is evolving as one of the major burdens as it results in many chronic diseases). Overweight and obesity increase the risks of high BP, coronary heart disease, ischemic stroke, type II diabetes mellitus and certain cancers. (7). Not only physical activity but also other lifestyle factors are associated with hypertension, most notably body weight (8). Studies on general population have demonstrated that the prevalence of hypertension in overweight subjects is more when compared to that in

normal subjects (9). Some studies state that blood pressure does not increase in obese patients, instead high blood pressure was stated in subjects who are underweight (10). The neighborhood environment may also influence on the food habits which leads to increased BP and BMI. (11) Hypertension in Africa is a widespread problem of immense economic importance because of its high prevalence in urban areas; it's frequent under diagnosis, and the severity of its complications (12). It is becoming a public health emergency worldwide, especially in developing countries where studies have projected an increase by 80% in the number of hypertensives by the year 2025. In Africa, >30 million people have hypertension. (12) World health Organization (WHO) predicts that if nothing is done about it, by 2020 three quarters of all deaths in Africa will be attributable to hypertension. (13) About 10 - 20 million people in sub - Saharan Africa may have hypertension and that treatment could prevent around 250000 deaths each year (14). Regional differences in the prevalence of hypertension within countries have been identified. (15)

2. Materials and Methods

This is across - sectional study performed at Alrayan colleges - Almadinah Almunawarah in healthy individuals (males and females) between the 18 - 30 years old who were not known hypertensive (healthy). The study included 100 adults randomly. Questionnaire Interviews with all participants were done covering basic information about age, gender, smoking and physical activity. Blood pressure measured by digital sphygmomanometer, twice at different

times and conditions also height and weight measured using meter and mechanical scale. calculation of body mass index was done for all participants.

All the data collected in this study was analyzed using the SPSS (Statistical Package for Social Sciences) computer program Version 16, (Chi - square for mean and p value for significance). $P < 0.05$ was considered statistically significant. Ethical Approval of this study was obtained from Ethical committee at Alrayan colleges.

3. Results

In this study blood pressure and BMI were measured in 100 participants. The age of the individuals ranged 18 and 30 years, 30.5% of the participants were males; most of the

participants (69.5%) were female. the range of the old was (21+_4).20% were smokers, 80% have no physical activity.

The BMI was found to be within the normal range (74%) of individual BMI about (18.5 - 25). About 2% the participants were under weight (BMI<18). About 16% were overweight (BMI = 25 - 29.9) and 8% were obese (BMI>29.9). 8% of the participants were prehypertensive.

The individuals were considered hypertensive when the pressure was equal or >140/90 mm Hg, Prehypertension when Systolic 120 - 139 mm Hg, diastolic 80 - 89 mm Hg.

50% of the obese have a risk of hypertension (prehypertension). there is 16% were overweight, 37% of them have a risk of hypertension.

Table 1: Correlation between blood pressure and different parameters

		Classification of blood pressure				Chi - Square test	
		Normal (N= 92)		Prehypertensive (N= 8)		Test value (X2)	P - value
		No.	%	No.	%		
History of blood pressure abnormality	No	72	78.3%	4	50.0%	X2= 0.802	0.092FET (NS)
	Yes	28	21.7%	4	50.0%		
Smoking	No	72	78.3%	4	50.0%	X2= 5.64	0.092FET (NS)
	Yes	20	21.7%	4	50.0%		
Physical activity	No	80	87.0%	1	10.5%	0.002	0.965 (NS)
	Yes	12	13.0%	1	12.5%		
body mass index	Normal	73	79.3%	1	12.5%	26.61	0.001MC (HS)
	Obese	4	4.3%	4	50.0%		
	Overweight	13	14.1%	3	37.5%		
	Underweight	2	2.2%	0	0.0%		

$p \leq 0.05$ is statistically significant, $p \leq 0.01$ is high statistically significant, SD: standard deviation, X2: Chi - Square test, FET: Fischer exact test, MC: Monte - Carlo Correction

There was a statistically significant relation between blood pressure and body mass index ($p=0.001$). There was no statistically significant relation between blood pressure and

history of blood pressure abnormalities, smoking, and physical activity ($p > 0.05$).

Table 2: Correlation between body mass index and different parameters

		Classification of body mass index								Chi - Square test	
		Normal (N= 74%)		Obese (N= 8%)		Overweight (N= 16%)		Underweight (N= 2%)		Test value (X2)	P - value
		No.	%	No.	%	No.	%	No.	%		
History of blood pressure abnormality	No	56	75.7%	7	87.5%	12	75.0%	1	50.0%	X2= 1.334	0.816MC (NS)
	Yes	18	24.3%	1	12.5%	4	25.0%	1	50.0%		
Smoking	No	57	77.0%	7	87.5%	10	62.5%	2	100.0%	X2= 2.853	0.408MC (NS)
	Yes	17	23.0%	1	12.5%	6	37.5%	0	0.0%		
Physical activity	No	67	90.5%	8	100.0%	11	68.8%	1	50.0%	X2= 9.148	0.035MC (S)
	Yes	7	9.5%	0	0.0%	5	31.3%	1	50.0%		
Blood pressure	Normal	73	98.6%	4	50.0%	13	81.3%	2	100.0%	26.61	0.001MC (HS)
	Prehypertensive	1	1.4%	4	50.0%	3	18.8%	0	0.0%		

$p \leq 0.05$ is statistically significant, $p \leq 0.01$ is high statistically significant, SD: standard deviation, X2: Chi - Square test, MC: Monte - Carlo Correction

There was a statistically significant relation between body mass index and physical activity ($p=0.035$). In addition, there was a statistically significant relation between body mass index and blood pressure ($p=0.001$). There was no

statistically significant relation between body mass index and history of blood pressure abnormalities, and smoking ($p > 0.05$).

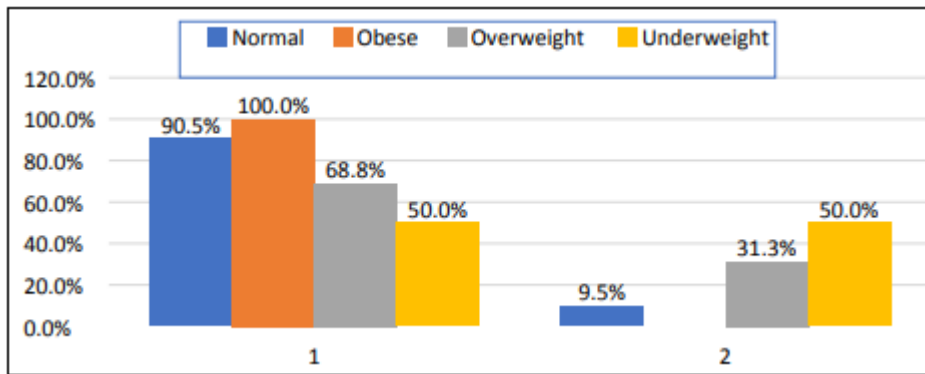


Figure 1: Relation between blood pressure and body mass index and physical activity

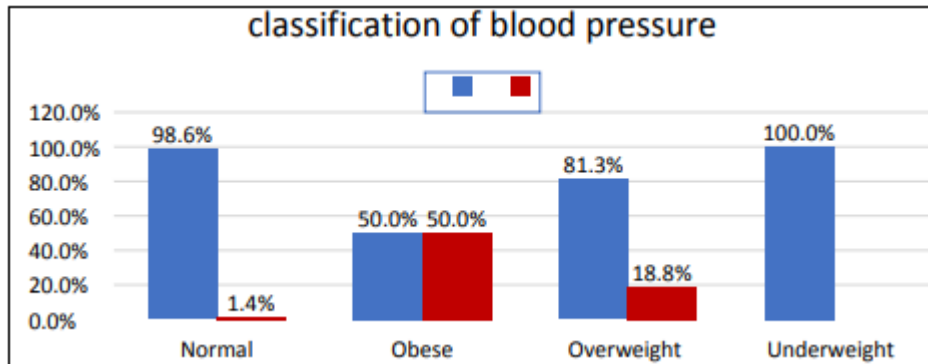


Figure 2: Relation between blood pressure and body mass index.

4. Discussion

Prevalence of obesity among this study population is low when compared to similar study conducted in KSA 2022 which reported the 33% as a prevalence of obesity in Saudi population. (16) variations in sample size and demographic characteristics of the study population, such as age, also the participants on this study were medical students may be more aware about risk of obesity.

In the study the results revealed a statistically significant relationship between BMI and blood pressure ($p=0.001$), indicating that as BMI increases, blood pressure tends to rise. This finding similar to many studies (17), (18). (19)

However, no significant associations were found between BMI and history of blood pressure abnormalities, smoking ($p>0.05$), this result similar to a study done by Shaikih and etal2020 - concluded no significant association between smoking and hypertension. (20)

Which varied from study conducted by Herath, etal 2022 reported there is a significant correlation between smoking and high blood pressure. (21)

5. Conclusions

Our study provides evidence of a significant relationship between BMI and blood pressure, confirming previous research. However, no significant associations were observed between BMI and history of blood pressure abnormalities, smoking, and physical activity.

6. Recommendations

These findings underscore the importance of managing BMI as a potential risk factor for elevated blood pressure. Further research is warranted to uncover the underlying mechanisms and explore interventions to mitigate the adverse effects of increased BMI on blood pressure regulation.

Competing of interests

All the authors declare no conflicts of interest.

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