

Original Research Article

Blood Pressure Assessment in Undergraduate Medical Students: Impact of Gender, Body Mass Index and Family History of Hypertension

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Abstract

Increase blood pressure is considered to be a silent killer which lead to increase in morbidity and mortality, so it is necessary to determine the subjects with high risk at an early stage in order to inhibit the disease progression and its co-morbid conditions. This study aimed to measure the blood pressure of undergraduate medical students and its relation to specific risk factors (gender, body mass index and family history of hypertension).

The study was performed in College of Medicine in Babylon University in the period from December 2014 to April 2015 and included 330 students. Some variables were taken from the history in addition to measurement of weight, height, systolic and diastolic blood pressure. The results revealed that regarding systolic blood pressure, 15% of students had prehypertension and 8% of students were hypertensive while for diastolic blood pressure, 32% had prehypertension and 4% were hypertensive. There was significant correlation between systolic and diastolic blood pressure with male gender, body mass index and family history of hypertension ($P \leq 0.05$). This study revealed high prevalence of prehypertension and in less extent hypertension among college students and this problem represented a neglected issue.

Key words: gender; students; body mass index; prehypertension; hypertension; systolic blood pressure; diastolic blood pressure.

الخلاصة

إن الزيادة في ضغط الدم تعتبر بمثابة القاتل الصامت الذي يؤدي إلى زيادة في الاعتلالات الصحية والوفيات لذلك فإن من الضروري إن نحدد الأشخاص المعرضين للإصابة في عمر مبكر لتلافي التقدم في المرض والحالات المصاحبة له. تهدف هذه الدراسة إلى قياس ضغط الدم لدى طلبة كلية الطب ومعرفة العلاقة بينه وبين عوامل الخطورة (الجنس، مؤشر كتلة الجسم، والتاريخ العائلي لضغط الدم).

تم إجراء الدراسة في كلية الطب / جامعة بابل للفترة من شهر كانون الأول 2014 إلى شهر نيسان 2015 وشملت 330 طالباً. تم اخذ بعض المتغيرات من خلال الاستبيان بالإضافة إلى قياس الوزن، الطول، ضغط الدم الانقباضي والانقباضي. تبين من الدراسة أنه بالنسبة لضغط الدم الانقباضي، 15% من الطلبة كان لديهم الحالة المسماة ما قبل ارتفاع ضغط الدم و 8% منهم كان لديه ارتفاع بضغط الدم، بينما في حالة ضغط الدم الانقباضي، كان هناك 32% لديهم حالة ما قبل ارتفاع ضغط الدم و 4% منهم كانوا مصابين بارتفاع ضغط الدم. كان هناك ارتباط معنوي بين ضغط الدم الانقباضي والانقباضي مع الجنس الذكري، مؤشر كتلة الجسم والتاريخ العائلي لضغط الدم. أثبتت هذه الدراسة وجود نسبة كبيرة من طلبة كلية الطب لديهم الحالة المسماة ما قبل ارتفاع ضغط الدم ونسبة قليلة لديهم ارتفاع ضغط الدم وهذه تمثل حالة لم يسلط الضوء عليها.

الكلمات المفتاحية: الجنس، الطلاب، مؤشر كتلة الجسم، ما قبل ارتفاع ضغط الدم، ارتفاع ضغط الدم، ضغط الدم الانقباضي، ضغط الدم الانقباضي.

Introduction

Hypertension is considered as a chronic condition causing a major public health problem producing a challenge to population in socioeconomic

and demographic transition. Prehypertension in young age group is an important risk for developing hypertension in later years of life[1,2]. The hypertension was

common in both developed (333 million) and developing (639 million) countries[3]. There was a strong relation between the increase in blood pressure (BP) in young adults with the increase in mortality from cardiovascular disease in later life, so decrease in blood pressure in young age group could underlie declines in mortality from cardiovascular disease[4]. The examination of blood pressure patterns in young age group (that is not caused by diseases, used of drugs, or behavioral changes) will be helpful in explanation of population determinants of blood pressure[5].

In a study performed in Basrah in Iraq, it revealed that the mortality rate due to cardiovascular disease was elevated in the last four decades, which may be related to many risk factors like hypertension so this require information about BP distribution in young people[6].

The present study focuses on the distribution of systolic and diastolic BP in young age group in addition to study the effect of some risk factors on it and this depended upon the hypothesis that early identification of individuals at risk can help in promoting preventive measures as early as possible, so the aim of this study was to assess the pattern of blood pressure distribution among students of medical college of Babylon University in Iraq and its relation to specific risk factors (gender, body mass index and family history of hypertension).

Materials and Methods

The study was performed in College of Medicine in Babylon University, it included students from first to six stages, data collected through questionnaires. Field part of the study extended from December 2014 to April 2015.

Data collected included age, gender, family history of hypertension, height, weight, and blood pressure. The body mass index (BMI) was calculated by dividing weight in kilograms by square of height in meters (kg/m^2). It is classified as follows:

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under-weight $< 18.5 \text{ kg/m}^2$, normal weight $= 18.5-24.9 \text{ kg/m}^2$, overweight $= 25-29.9 \text{ kg/m}^2$, obesity $\geq 30 \text{ kg/m}^2$ [7].

The measurement of blood pressure was performed by mercurial sphygmomanometer. The measurement were taken after rest for 5 minutes in a sitting position. The heard of the first sound (Korotkoff phase 1) was considered as the systolic BP, while the disappearance of the sound (Korotkoff phase 5) was regarded as the diastolic BP. Blood pressure was classified into four classes: normal BP if the measured systolic BP was $< 120 \text{ mmHg}$ and/or diastolic BP was $< 80 \text{ mmHg}$; pre-hypertension if the measured systolic BP was $120-139 \text{ mmHg}$ and/ or diastolic BP was $80-89 \text{ mmHg}$; stage (1) hypertension if the systolic BP was $140-159 \text{ mmHg}$ and/or diastolic BP was $90-99 \text{ mmHg}$; and stage (2) hypertension if the measured systolic blood pressure was $\geq 160 \text{ mmHg}$ and/or diastolic blood pressure was $\geq 100 \text{ mmHg}$ [8].

Statistical Analysis

The collected data were statistically analyzed using SPSS programme [Statistical Package for Social Sciences version 18] . Descriptive statistics were presented by percentage, mean and standard deviation (SD). Groups were compared by using t-test and Chi-square test, a P-value ≤ 0.05 was regarded statistically significant.

Results

The study included 330 students (145 males and 185 females), the age ranged from 18-24 years old with mean $(20.52 \pm 1.2 \text{ years})$. Regarding family history of hypertension there was 146 students with positive family history while there was 184 with negative family history.

1. Distribution of body mass index

The predominant percentage of students had normal body mass index as illustrated in figure(1).

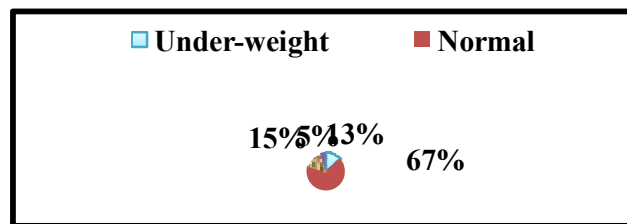


Figure 1 : Distribution of body mass index

2. Distribution of systolic blood pressure

The percentage of students with normal systolic B Prepresented the highest

percentage(77%), 15% prehypertension and only 8% had hypertension as shown in figure (2).

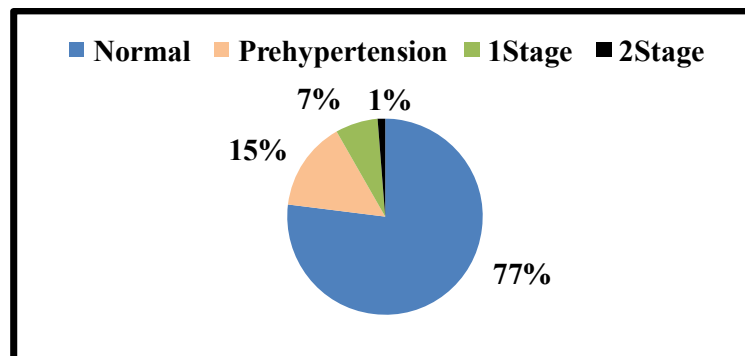


Figure 2: Distribution of systolic blood pressure

3. Distribution of diastolic blood pressure

Figure (3) shows that normal diastolic blood pressure (64%), prehypertension (32%) and only 4% had hypertension.

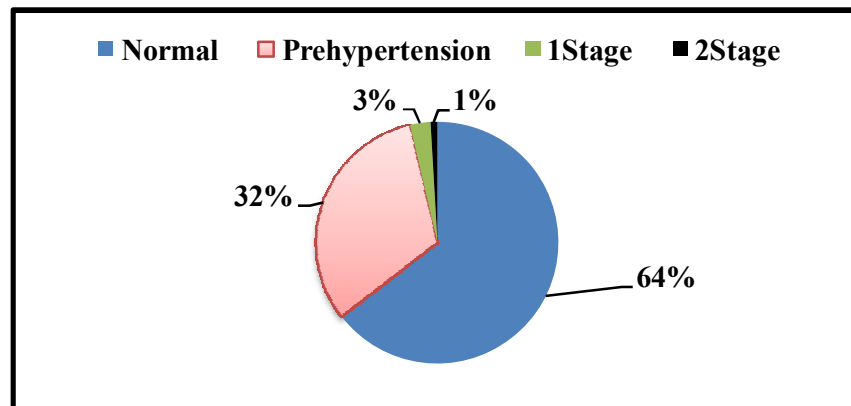


Figure 3: Distribution of diastolic blood pressure

4. Frequency distribution of study groups by gender according to body mass index

This study revealed that there was significant relation between gender and

body mass index (P value<0.05), the percentage of overweight and obesity was higher in males than females as shown in table (1)

Table 1:Frequency distribution of study groups by gender according to body mass index

Gender	Body mass index No.(%)				Total No.(%)
	Under-weight	Normal	Overweight	Obesity	
Males	17 (11.7%)	71 (49%)	39 (26.9%)	18 (12.4%)	145 (100%)
Females	26 (14%)	142 (76.8%)	11 (6%)	6 (3.2%)	185 (100%)
Total	43 (13%)	213 (64.5%)	50 (15.2%)	24 (7.3%)	330 (100%)
P value	0.001				

*P value ≤ 0.05 is significant

5. Frequency distribution of study groups by gender according to systolic and diastolic blood pressure

The study also showed a significant relation between gender with systolic and diastolic

blood pressure as shown in tables (2) and (3). The percentages of students with prehypertension and hypertension was more in males than females.

Table 2: Frequency distribution of study groups by gender according to systolic blood pressure

Gender	Systolic blood pressure N0.(%)			Total N0.(%)
	Normal	Prehypertension	Hypertension	
Males	102 (70.3%)	28 (19.3%)	15 (10.4%)	145 (100%)
Females	152 (82.2%)	22 (11.9%)	11 (5.9%)	185 (100%)
Total	254 (77%)	50 (15.2%)	26 (7.8%)	330 (100%)
P value	0.03			

*P value ≤ 0.05 is significant

Table 3 :Frequency distribution of study groups by gender according to diastolic blood pressure

Gender	Diastolic blood pressure N0.(%)			Total N0.(%)
	Normal	Prehypertension	Hypertension	
Males	77 (53.1%)	60 (41.3%)	8 (5.6%)	145 (100%)
Females	133 (71.8%)	47 (25.4%)	5 (2.8%)	185 (100%)
Total	210 (63.6%)	107 (32.4%)	13 (4%)	330 (100%)
P value	0.04			

*P value ≤ 0.05 is significant

6. Frequency distribution of study groups by body mass index according to systolic and diastolic blood pressure

Tables (4) and (5) show significant relation between body mass index with systolic and

diastolic blood pressure, the percentage of prehypertension was higher in overweight and obese students than students with normal body weight.

Table 4 :Frequency distribution of study groups by body mass index according to systolic blood pressure

Body mass index	Systolic blood pressure N0.(%)				Total No.(%)
	Normal	Prehypertension	Hypertension		
			Stage 1	Stage 2	
Underweight	38 (88.4%)	4 (9.3%)	1 (2.3%)	0 (0%)	43 (100%)
Normal	189 (85.9%)	24 (10.9%)	7 (3.2%)	0 (0%)	220 (100%)
Overweight	20 (40%)	17 (34%)	13 (26%)	0 (0%)	50 (100%)
Obesity	7 (41.2%)	5 (29.4%)	2 (11.8%)	3 (17.6%)	17 (100%)
Total	254 (77%)	50 (15.2%)	23 (7%)	3 (0.8%)	330 (100%)
P value	0.000				

*P value ≤ 0.05 is significant

Table 5 : Frequency distribution of study groups by body mass index according to diastolic blood pressure

Body mass index	Diastolic blood pressure N0.(%)				Total
	Normal	Prehypertension	Hypertension		
			Stage 1	Stage 2	No.(%)
Underweight	38 (88.4%)	5 (9.3%)	0 (2.3%)	0 (0%)	43 (100%)
Normal	172 (85.9%)	48 (10.9%)	0 (3.2%)	0 (0%)	220 (100%)
Overweight	0 (40%)	38 (34%)	10 (26%)	2 (0%)	50 (100%)
Obesity	0 (41.2%)	16 (29.4%)	0 (11.8%)	1 (17.6%)	17 (100%)
Total	210 (77%)	107 (15.2%)	10 (7%)	3 (0.8%)	330 (100%)
P value	0.000				

*P value ≤ 0.05 is significant

7. Frequency distribution of study groups by family history of hypertension according to systolic and diastolic blood pressure

The study illustrated that there was significant relation between family history

of hypertension with systolic and diastolic blood pressure as shown in tables (6) and (7).

Table 6 : Frequency distribution of study groups by family history of hypertension according to systolic blood pressure

Family history of hypertension	Systolic blood pressure No. (%)				Total No. (%)
	Normal	Prehypertension	Hypertension		
			Stage 1	Stage 2	
Positive	93 (63.7%)	36 (24.7%)	15 (10.3%)	2 (1.3%)	146 (100%)
Negative	161 (87.5%)	14 (7.6%)	8 (4.3%)	1 (0.5%)	184 (100%)
Total	254 (76.9%)	50 (15.2%)	23 (7%)	3 (0.9%)	330 (100%)
P value	0.01				

*P value ≤ 0.05 is significant

Table 7: Frequency distribution of study groups by family history of hypertension according to diastolic blood pressure

Family history of hypertension	Diastolic blood pressure No. (%)				Total No. (%)
	Normal	Prehypertension	Hypertension		
			Stage 1	Stage 2	
Positive	65 (44.6%)	72 (49%)	7 (4.9%)	2 (1.5%)	146 (100%)
Negative	145 (78.8%)	35 (19.1%)	3 (1.6%)	1 (0.5%)	184 (100%)
Total	210 (63.6%)	107 (32.4%)	10 (3.1%)	3 (0.9%)	330 (100%)
P value	0.04				

*P value ≤ 0.05 is significant

8. Frequency distribution of study groups by body mass index and family history of hypertension according to systolic and diastolic blood pressure

We classified the students according to body mass index and family history of hypertension in association with genders to four groups: group1(normal body weight and negative family history), group2 (increased body weight and negative

family history), group3 (normal body weight and positive family history) and group4 (increased body weight and positive family history). The percentage of prehypertension and hypertension in group 4 is more than other groups. In all groups the percentage of prehypertension and hypertension was more in males than females as illustrated in tables (8) and (9).

Table 8 : Frequency distribution of study groups by body mass index and family history of hypertension according to systolic blood pressure

Groups		Systolic blood pressure No. (%)			Total No. (%)
		Normal	Prehypertension	Hypertension	
Normal body weight & -ve family history of hypertension	males	100 (99%)	1 (1%)	0 (0%)	101 (100%)
	females	123 (100%)	0 (0%)	0 (0%)	123 (100%)
Increased body weight & -ve family history of hypertension	males	3 (23.1%)	6* (46.1%)	4* (30.8%)	13 (100%)
	females	4 (40%)	4* (40%)	2* (20%)	10 (100%)
Normal body weight & +ve family history of hypertension	males	2 (20%)	5* (50%)	3* (30%)	10 (100%)
	females	4 (50%)	3* (37.5%)	1* (12.5%)	8 (100%)
Increased body weight & +ve family history of hypertension	males	7 (19.4%)	19* (52.8%)	10* (27.8%)	36 (100%)
	females	11 (37.9%)	12* (41.4%)	6* (20.7%)	29 (100%)
Total		254 (77%)	50 (15.2%)	26 (7.8%)	330 (100%)

*P value ≤ 0.05 is significant

Table 9 : Frequency distribution of study groups by body mass index and family history of hypertension according to diastolic blood pressure

Groups		Diastolic blood pressure No. (%)			Total No. (%)
		Normal	Prehypertension	Hypertension	
Normal body weight & -ve family history of hypertension	males	70 (98.6%)	1 (1.4%)	0 (0%)	71 (100%)
	females	97 (99%)	1 (1%)	0 (0%)	98 (100%)
Increasing body weight & -ve family history of hypertension	males	3 (16.7%)	13* (72.2%)	2* (11.1%)	18 (100%)
	females	5 (35.7%)	8* (57.1%)	1* (7.2%)	14 (100%)
Normal body weight & +ve family history of hypertension	males	3 (18.8%)	11* (68.8%)	2* (12.4%)	16 (100%)
	females	4 (36.4%)	6* (54.5%)	1* (9.1%)	11 (100%)
Increasing body weight & +ve family history of hypertension	males	12* (20%)	43* (71.7%)	5* (8.3%)	60 (100%)
	females	16* (38.1%)	24* (57.1%)	2* (4.8%)	42 (100%)
Total		210 (63.6%)	107 (32.5%)	13 (3.9%)	330 (100%)

*P value ≤ 0.05 is significant

Discussion

The problem of hypertension affects about 20-30% of the population. The prevalence is less in young than older population [7].

In our study, the percentage of students with hypertension was 8% for systolic and 4% for diastolic blood pressure. This rate of prevalence was in agreement with the prevalence found in the China [8] and in Korea[9]. The percentage of systolic pre-hypertension was 15% while it was 32% for diastolic pre-hypertension and this may give a clue that in the future, many of those subjects might develop overt hypertension. The underweight was more prevalent in females than males were while overweight and obesity were more in males than females and this was consistent with other studies like Silva, *et al*, [10] and Rahmanian and Shojaie [11]. Gender differences in dietary habits and lifestyles could be the causes for the observed differences between male and female subjects. The high incidence of underweight in the female subjects may be attributed to the 'slim-fit' syndrome among

young modern women. Most women in this age range are excessively concerned about their shape and make purposeful efforts to maintain a trim shape, as a result of poor eating habits, the women end up being malnourished[12].

In this study the prehypertension and hypertension (systolic and diastolic) increased significantly with BMI and family history of hypertension with higher values in males than in females and this was consistent with other studies as in a study performed by [13]. The classification of body weight according to BMI was due to the fact that it represents an index that has an important explanatory power concerning the occurrence of arterial hypertension[14]. The percentage of prehypertension and hypertension was more in group of students with multiple risk factors (male gender, increased body weight and positive family history of hypertension) than other groups. This finding was consistent with Weil, *et al*, who referred to impaired nitric oxide-mediated-endothelium-dependent vasodilation, this

will lead to vasoconstriction and this make possible elevation of BP[15].

Conclusion

Prehypertension and hypertension were regarded as an important public-health problem among college students. Systolic and diastolic BP was higher in male students than in female students. The results also showed that gender, BMI and positive family history of hypertension were important effectors in case of increase in blood pressure.

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