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Prevalence of systemic hypertension among students at Alkindy College of Medicine

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Dedication

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<u>Abstract</u>

Background

Hypertension has been considered the first and most common risk factor for cardiovascular diseases, stroke, and renal diseases, and recently it has been found that the prevalence of hypertension has increased rapidly. The number of patients with hypertension has increased from 600 million cases in 1980 to 1 billion in 2008, and by 2025, about 1.54 billion will suffer from hypertension. Aims of this study To determine the prevalence of hypertension among students at Alkindy College of Medicine.

<u>Methods</u>

The study was conducted at Alkindy College of Medicine / University of Baghdad. A student-based cross-sectional study from October 2022 to February 2023. A simple random sampling procedure was conducted at the college. Two hundred students (108 males and 92 females) participated in this study; all of them are 18 years old or older.

Participants who have a personal history of hypertension were excluded from the study. BMI is a person's weight in kilograms divided by the square of their height in meters. A high BMI can indicate high body fat.

Hypertension is classified as follows: low blood pressure below 90/60, normal below 120/80, elevated 120-129/80, stage one 130-139/80-89, and stage two above 140/90, according to the 2023 American Heart Association classification.Data was collected using an interview questionnaire about their lifestyles and physical blood pressure measurements by an electronic blood pressure monitor.

Results and discussion

The total study samples are 200 (108 males and 92 females), all of them are from 18 to 24 years old, 72% of them are 18–20 years old, 90% of them are non-smokers, 31.5% of them have normal blood pressure, 21% have elevated blood pressure, 23% have elevated blood pressure stage 1, and 24.5% have elevated blood pressure stage 2, 50% of them have a family history of hypertension, 51% of them get enough sleep (7 hours or more), 14.5% eat healthy food (food with little sugar, salt, and red meat), 16% of them eat unhealthy food, and 69.5% eat mixed 56.5% of them have good mental health, 29% are anxious, and 14.5% are angry. 62% of them have a normal body weight (their BMI is 18.5-25), and 22.5% have a BMI of (25-30) 75% of them have no other related diseases, and 15% of them have diabetes mellitus. In this study, there is a significant relationship between hypertension and smoking status, mental health, and caffeine intake and other relations are not significant.



Conclusion

A higher prevalence of hypertension was found with many of the proven risk factors studied among medical students at Alkindy College of Medicine.

Factors found to have a significant relationship with high blood pressure are bad mental health with anger expression or anxiety, heavy smoking, and high caffeine intake, which are also found to be associated with high blood pressure.

Key words

Hypertension, risk factor, smoking



<u>1-Introduction</u>

Hypertension (HTN), also called high blood pressure, is a condition that arises when the body's smaller blood vessels (the arterioles) narrow, causing the blood to exert excessive pressure against the vessel walls and forcing the heart to work harder to maintain the pressure. [1]

Hypertension has been considered the first and most common risk factor for cardiovascular diseases, stroke, and renal diseases; it has been known as a leading modulated disability cause around the world [2-3] so hypertension causes at least 45 percent of mortality due to cardiovascular problems and 51 percent of stroke mortality rate [4], Among the 17 million deaths due to cardiovascular problems in the world [5], 9.4 million occur as a consequence of complications of hypertension. In this regard, in the Eastern Mediterranean Region, where Iraq is located, 26 percent of mortality results from hypertension. [6]

Blood pressure also increases in the acute phase of stroke through unexplained mechanisms, fueling clinical controversy over whether and to what extent it should be treated. Hypertension also worsens stroke outcomes. Patients with pre-existing hypertension have small amounts of salvageable tissue (penumbra) and larger infarctions compared to normotensive patients, although lower blood pressure is also detrimental to stroke. [7-11] The risk of stroke in the setting of hypertension is also far-reaching. Hypertension is a primary driver of cerebral small vessel disease (C.S.V.D.), leading to cognitive decline and lacunar stroke. In addition, recent studies have shown that in women with prior preeclampsia, a common hypertensive disorder of pregnancy, the long-term risk of stroke is increased 4–5-fold. (12–14) The impact of hypertension on cerebral circulation is profoundly significant for the stroke field.

The risk factors for hypertension are increasing in rural and urban populations [15]. These risk factors include smoking, alcohol intake, and sedentary lifestyles. Among the 17 million deaths due to cardiovascular problems in the world. [16] On the other hand, statistics showed an increase in the prevalence of hypertension. The number of patients with hypertension has increased from 600 million cases in 1980 to 1 billion in 2008. [17] Also, it was suggested that, by 2025, 1.54 billion adults will suffer from hypertension. [18] Adjusted for age, the 2017–2018 hypertension prevalence among adults aged 18 and over was 45.4% and was higher among men (51.0%) than women (39.7%) (figure 1). The prevalence of hypertension increases with age.

The prevalence was 22.4% among adults aged 18–39 and increased to 54.5% among those aged 40–59, and 74.5% among those aged 60 and over. For both men and women, a similar pattern of increasing prevalence of hypertension by age was observed. Hypertension prevalence was higher among men than women aged 18–39 (31.2% compared with 13.0%) and 40–59 (59.4% compared with 49.9%), but the prevalence was not significantly different between men and women aged 60 and over (75.2% compared with 73.9%).



Figure 1. Prevalence of hypertension among adults aged 18 and over, by sex and age: United States, 2017–2018.

For all adults aged 18 and over, the level of education was associated with the prevalence of hypertension. College graduates had a significantly lower prevalence of hypertension (38.5%) than adults with high school education or less (47.0%) or more than high school or some college (50.5%) (Figure 2).

Among men, the prevalence of hypertension was highest among adults with more than high school or some college education (57.6%), compared with adults with a high school education or less (50.0%) or college graduates (46.7%). The observed difference between men with a high school education or less and those with a college degree was not statistically significant. Among women, hypertension prevalence was significantly lower among college graduates (31.3%) than among those with a high school education or less (42.9%) or more than high school or some college (43.9%).

Men had a significantly higher prevalence of hypertension than women across all categories of education.



Figure 2. Age-adjusted prevalence of hypertension among adults aged 18 and over, by sex and education: United States, 2017–2018

Overall, the age-adjusted prevalence of hypertension decreased from 47.0% in 1999–2000 to 41.7% in 2013–2014, and then increased to 45.4% in 2017–2018 (Figure 3).

Men followed a similar pattern, with age-adjusted prevalence decreasing from 51.7% in 1999–2000 to 45.2% in 2013–2014, and then increasing to 51.0% in 2017–2018. However, age-adjusted hypertension prevalence for women did not significantly change from 1999–2000 (42.0%) to 2017–2018 (39.7%).

Figure 3. Age-adjusted trend in hypertension prevalence among adults aged 18 and over, by sex: United States, 1999-2018. [19]





2-Aims of the study

To determine the prevalence of hypertension among students at Alkindy College of Medicine.

3-Patients and Methods

A student-based cross-sectional study from October 2022 to February 2023. A simple random sampling procedure was conducted at the college. Two hundred students (108 males / 92 females) participated in this study all of them are 18 vears old or older. Participants who have a personal history of hypertension were excluded from the study. BMI is a person's weight in kilograms divided by the square of their height in meters. A high BMI can indicate high body fat.

Blood pressure for adults aged 18 years or older can be classified as follows: Blood pressure categories:-The five blood pressure (BP) ranges recognized by the American Heart Association are:

1-Normal: Blood pressure readings of less than 120/80 mm Hg are considered within the normal range.

2-Elevated: Elevated blood pressure is when readings consistently range from 120–129 systolic and less than 80 mm Hg diastolic. People with elevated blood pressure are likely to develop high blood pressure unless steps are taken to control the condition.

3-Hypertension Stage 1: Hypertension Stage 1 is when blood pressure consistently ranges from 130–139 systolic or 80–89 mm Hg diastolic. At this stage of high blood pressure, doctors are likely to prescribe lifestyle changes and may consider adding blood pressure medication based on your risk of atherosclerotic cardiovascular disease (ASCVD), such as a heart attack or stroke. 4-Hypertension Stage 2: Hypertension Stage 2 is when blood pressure consistently ranges at 140/90 mm Hg or higher. At this stage of high blood pressure, doctors are likely to prescribe a combination of blood pressure medications and lifestyle changes.

5-Hypertensive crisis, higher than 180, and/or higher than 120.

Low blood pressure is a reading of less than 90/60mmHg.

Controlled hypertension: systolic blood pressure less than 140 mmHg and diastolic blood pressure less than 90 mmHg among those with hypertension Estimates are age-adjusted to the subpopulation of persons with hypertension in the 2007–2008 National Health and Nutrition Examination Survey.

The classification of BMI according to the Centers for Disease Control and Prevention (CDC) is 1-Below 18.5 is the underweight range.

2-from 18.5 to 25 is a healthy weight range.

3-from 25 to 30 is the overweight range.

4-If 30 or higher, it falls within the obesity range. Which is classified into (class 1: 30-35/class 2: 35-40/class 3: 40 or higher).

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The heart rate (HR) at rest is 60 to 100 bpm in normal conditions; above that is higher HR (tachycardia), and below 60 is determined as low HR (bradycardia). According to the American Heart Association,

Data was collected using an interview questionnaire and physical blood pressure measurements by an electronic blood pressure monitor (Smith) Model AZ-86. The participant rested for at least 5 minutes in a sitting position. The same digital device for blood pressure measured the heart rate. It was ensured that the participant had not consumed hot beverages, such as tea or coffee, smoked or chewed tobacco, or undertaken vigorous physical activity within the 30 minutes preceding the interview. If they had, then the measurements were postponed by 30 minutes.

The participant's results are classified.

First, the participants were interviewed about their personal history of hypertension, family history of hypertension, and smoking history. The participants were interviewed about sleep quality, mental health, lifestyle, type of food, and caffeine intake.

The collected data were tabulated and analyzed using the S.P.S.S. (Statistical Package for Social Sciences). A chi-square test was carried out to test the differences between proportions. A p-value of less than 0.05 was considered statistically significant.



<u>4-Results</u>

As shown in Table 1 and the following charts, the total number of subjects who participated in this study is 200. The mean age of the participants is 19.82, ranging from 18 to 25 years, 144 of them (72%) are in the age group (18-20), 55 of them (27.5%) are in the age group (20-24) and 0.5% are in the age group (24-26). 108 of them are male (54%), and 92 of them are female (46%). The majority of them are non-smokers (90%), and only 10% are smokers.

Three participants have a personal history of hypertension.

About half of them (51.5%) get enough sleep (more than 7 hours per day), half of them have a family history of hypertension, 16% get unhealthy food (salty, sugary, fast-food, and red meat), 14.5% get healthy foods, and 69.5% get mixed. About half of them (56.5%) have good mental health, 29% have anxiety, and 14.5% are angry.15% of them have DM, 8% have thyroid diseases, and just 0.5% have kidney diseases. 8.5% of them are underweight (their BMI is less than 18.5), 62% of them are in the healthy range of weight (BMI 18.5-25), 22.5% of them are overweight (BMI 25-30), 6.5% of them are in class 1 of obesity (BMI 30-35), and only 0.5% are in class 2 of obesity. 14% have a high caffeine intake, 29% have a moderate intake, 34% have a low intake, and the rest have none.

The prevalence of hypertension is as follows:

31% of them have normal blood pressure (below 120/80), 21% have elevated blood pressure (120-129/80), 23% have elevated blood pressure stage 1 (130-139/80-89), and 24.5% have elevated blood pressure stage 2 (above 140/90). 81.5% of the cases have a normal heart rate (60–100), 17.5% of them above 100 bpm, and only 1% below 60 bpm. (Table1)



Table 1		Frequency	Percent %
Gender	Male	108	54
	Female	92	46
Cage	<=20	144	72
	20-22	55	27.5
	24-26	1	0.5
Smoking Status	Smoker	20	10
	Non-Smoker	180	90
Personal history of HTN	Yes	3	1.5
	No	197	98.5
Blood Pressure Status	Normal	63	31.5
	Elevated	42	21
	HTN stage 1	46	23
	HTN stage 2	49	24.5
Sleep Quality	Get Enough Sleep	103	51.5
	Insufficient Sleep	97	48.5
Family History of HTN	Yes	100	50
	No	100	50
Type of Food	Healthy food	29	14.5
	Mixed	139	69.5
	Unhealthy food	32	16
Caffeine intake	No Caffeine intake	38	19
	Low	68	34
	Moderate	58	29
	High	36	18
Mental Health	Good Mental Health	113	56.5
	Anxiety	58	29
	Anger Expression	29	14.5
CHR	<=59	2	1
	60-100	163	81.5
	>101	35	17.5
СВМІ	<-18.5	17	8.5
	18.5-25	124	62
	25-30	45	22.5
	30-35	13	6.5
	35-40	1	0.5
Other Related Diseases	DM	30	15
	Adrenal Diseases	2	1
	Kidney Diseases	1	0.5
	Thyroid Gland Diseases	16	8
	No	151	75.5



Figure 4: Percentage of patients according to their gender



Figure 5: Percentage of patients according to their age

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Figure 6: Percentage of patients according to their smoking status



Figure 7: Percentage of patients according to their stage of HTN





Figure 8: Percentage of patients according to their sleep quality



Figure 9: Percentage of patients according to their personal history of HTN





Figure 10: Percentage of patients according to their mental health



Figure 11: Percentage of patients according to their caffeine intake





Figure 12: Percentage of patients according to type of food



Figure 13: Percentage of patients according to their family history of HTN



Table 2 shows there that there is significant relation between hypertension and smoking status, caffeine intake, and mental health. While there is no significant association among other variables.

Table 2		Normal	Elevated	Elevated	Elevated	P
	1	BB		stage 1	stage 2	Value
Cage	<=20	45	27	32	40	0.275
	20-22	18	15	14	8	
	24-26	0	0	0	1	
Smoking	Smoker	2	3	5	10	0.023
Status	Non-smoker	61	39	41	39	
Sleep Quality	Get Enough Sleep	36	22	21	24	0.666
	Insufficient Sleep	27	20	25	25	
Family	No	37	19	24	20	0.257
history of HTN	Yes	26	23	22	29	
Type of Food	Healthy	8	3	11	7	0.170
	Unhealthy	11	10	7	4	
	Mixed	44	29	28	38	
Caffeine	High	5	15	8	8	0.018
intake	Moderate	20	6	17	15	
	Low	27	10	13	18	
	No intake	11	11	8	8	
Mental	Angry	11	10	3	5	0.043
health	Anxiety	17	13	19	9	
	Good	35	19	24	35	
CBMI	<=18.5	9	2	5	1	0.360
	18.5-25	38	26	27	33	
	25-30	10	11	11	13	
	30-35	6	3	2	2	
	35-40	0	0	1	0	





Figure 14: relation between HTN and smoking status



Figure 15: relation between HTN and caffeine intake





Figure 16: relation between HTN and mental health

Table 3	Normal	Elevated	Elevated stage 1	Elevated stage 2	P Value
DM	11	11	3	5	0.086
Kidney diseases	1	0	0	0	0.692
Thyroid diseases	7	1	7	1	0.077
Adrenal Diseases	0	0	0	2	0.183

Table 3 shows no significant association between hypertension and comorbidities

5-Discussion

Hypertension is a global epidemic and has become an increasingly important medical problem in children and adolescents. More and more research on hypertension in adolescents remind us to strengthen the prevention and control of hypertension in a particular population. However, information on the risk factors of hypertension in youth around 18 years was limited. This study included 200 medical students from Alkindy College of the Medicine /University of Baghdad, with a mean age of 19.82 years.

The Blood pressure status of the participants in this study is 31.5% of them have normal blood pressure ,68.5% have not normal blood pressure,21% have elevated blood pressure ,23% have elevated stage 1 blood pressure ,and 24.5% have elevated blood pressure stage 2 .In comparison , the prevalence of Hypertension in Iraq is 30% of the population .[20] Perhaps the reasons are the bad lifestyle that the medical students have ,such as getting insufficient sleep and inadequate mental health and anxiety.[21] Another study revealed that the prevalence of HTN was 23.8% in Iranian college students.[22] A local study in Kuwait showed that the proportion of hypertensive patients was 11.8%.[23]

In this study there is a relation between smoking and developing hypertension and the P value of this relation is 0.023 which is statistically significant, the total number of smokers in this study is 20 subjects only 2 subjects have normal blood pressure and 3 have elevated Blood pressure and 5 have elevated blood pressure stage 1 and 10 have elevated blood pressure stage 2, while the non-smokers was 180, and 61 of them (33.9%) have normal blood pressure and 39 of them (21.66%) have elevated blood pressure and 41 of them (22.77%) have elevated blood pressure stage 1 and only 39 (21.66%) have elevated blood pressure stage 2.

Several epidemiological studies including healthy subjects, hypertensive subjects, diabetic, and renal patients have clearly documented that smokers have higher BPs than non-smokers, Importantly, the prevalence of hypertension was higher in former smokers than in never smokers , and the risk of hypertension was associated with the number of cigarettes smoked daily and the duration of smoking.[24]

A study by Günes et al has shown that hypertension is more common in the subjects who smoke 40 and more cigarettes a day than in those who smoke fewer, with a statistically significant difference. [25] But A causal relationship between exposure to smoking and increase in blood pressure (BP) is not yet clearly demonstrated. Some observations suggest a transient increase while smoking a cigarette or when exposed to passive smoking. Late stable hypertension may also occur as a consequence of smoking. This could be attributed to the progression of atherogenesis triggered by smoking (e.g. endothelial dysfunction). Endothelial dysfunction is strongly associated with hypertension. Impaired nitric oxide (NO) availability attributable to oxidative stress production, which causes NO breakdown, has also been considered as another mechanism.



Smoking and hypertension seem to have an additive effect as risk factors for cardiovascular disease. A study by Sung Hoon Kim et al. has shown no relation between smoking and higher blood pressure in the overall population, but, when gender was considered, female smokers were more likely to demonstrate hypertension. [26] Another study by Thomas S. Bowman et al. demonstrates that hypertension has a strong relationship with smoking in women, especially heavy smokers (at least 15 cigarettes per day). [27]

In this study, the prevalence of high blood pressure among participants who are taking caffeine is statistically significant with a P value (0.018) Participants with higher caffeine intake are 36 only 5 of them (13.88%) have normal blood pressure, 15 of them (41.16%) have elevated blood pressure, and 8 of them (22.22%) have elevated stage 1 blood pressure. The result is the same with participants who have elevated stage 2 blood pressure. Participants with moderate caffeine intake are 58, 20 of them (34.48%) have normal blood pressure, and only 10% of them have elevated blood pressure and 29% of them have elevated blood pressure stage 1 and 25% of them have elevated blood pressure stage 2 Participants with low caffeine intake are 68, (39.7%) of them have normal blood pressure stage 2 Participants with no caffeine intake are 38, (28.94%) of them have normal blood pressure, and the same percent have elevated blood pressure stage 2.

As we see, the numbers begin to improve when the intake of caffeine decreases.

Caffeine raises blood pressure by elevating vascular resistance, and this effect is larger and more prolonged in hypertensive patients than in normotensive patients. The pressor response to caffeine occurs equally in people at rest and under stress. The elevated baseline pressures of the hypertensive patient are therefore increased by both caffeine and stress, potentially leading to undesirably high pressures. Such combined effects on blood pressure may potentially confound the evaluation of hypertension, and possibly reduce the effectiveness of antihypertensive therapy. [28]

It was recently shown in a cross-sectional study by Yang YC et al. and another study by Dyer AR et al. that higher habitual tea intake was associated with a lower risk of hypertension because it may indicate a central role of serum potassium concentrations. [29-30]

Overall, a study by Cuno S P M Uiterwall et al. shows that higher baseline coffee intake was associated with lower later blood pressure only from middle age onwards, while there was no such relation in younger persons. [31]



High blood pressure among participants who are mental health issues was statistically significant with P value is (0.043), Only 37.93% of participants who show anger have normal blood pressure while 62.07% have abnormal blood pressure as follows (34.44%) have elevated blood pressure,(10.34%) have elevated blood pressure stage 1 and (17.24%) have elevated blood pressure stage 2,the numbers become bad considering the anxiety among participants because only (29.31%) of them have normal blood pressure and (70.69%) of them have abnormal blood pressure as follows (22.41%) of them have elevated blood pressure,(32.75%) of them have elevated blood pressure stage 1 and (15.51%) of them have elevated blood pressure stage 2.And about Participants with good mental health (31%) have normal blood pressure while 69% of them have abnormal blood pressure as follows (16.18%) of them have elevated blood pressure stage 2. Studies by Kaplan MS et al. and by Rutledge T. et al. found that psychosocial factors, in particular depression, anxiety, and anger, contribute to the etiology of hypertension. [32-33]

Good mental health is necessary not only to prevent hypertension alone but also to treat it, as a study by Hameed, E. K.et al says in their study. [34]

Psychological trauma has been hypothesized to be an especially important contributor to hypertension.[35] A study by Anna Grimsrud et al. Demonstrates the relations between mental health problem such as anxiety and anger expression and developing hypertension.[36]

Study by Gupta R, et al , and another study by Chockalingam A, et al. and study by Goldstein IB et al showed that family history of HTN was an important contributor to HTN and pre-HTN.[37-39]

In this region, a significant linear relationship has been shown between increasing overweight and the prevalence of hypertension in the Saudi population in a study by Al-Nozha MM et al. [40] Sabra et al. have demonstrated a relationship between an increased level of blood pressure and overweight in male students (aged 18–26 years) at King Faisal University (KFU) in Dammam, Saudi Arabia. [41] In contrast to our study, we found no significant relationship between BMI and hypertension.

Some studies prove there is a significant relationship between hypertension in adults and gender, family history of hypertension, type of food, sleep quality, DM, kidney diseases, thyroid diseases, and adrenal diseases [42] but our study does not.

This difference in results between our study and these studies may be due to the low number of subjects who participated in this study.



6-Conclusion

A higher prevalence of hypertension was found with many of the proven risk factors studied among medical students at Alkindy College of Medicine.

The study found that only 31.5% of the subjects had normal blood pressure, and 21% of them had elevated blood pressure (120-129/80) as they were classified as pre-hypertensive, (23%) had high blood pressure stage 1, and 24.5% had high blood pressure stage 2.

Factors found to have a significant relationship with high blood pressure are bad mental health with anger expression or anxiety, heavy smoking, and high caffeine intake, which are also found to be associated with high blood pressure.

These results provided preliminary data on the high proportion of both hypertension and prehypertension and its related risk factors among college students, in Iraq.



7- Recommendations

The levels of awareness, treatment, and control remain relatively low, especially for the young and middle-aged population. Faced with the epidemiological transition, we need innovative strategies to control and prevent hypertension, so we recommend:

The design and implementation of community-based screening programs for hypertension in this section of the community is due to the high incidence of hypertension and its modifiable risk factor among them and to modifying their lifestyles, such as getting rid of heavy smoking, leaving anger expression and anxiety, and getting a small amount of caffeine in coffee and tea.



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