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Effect of Visceral Fat on Blood Pressure Levels

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Abstract. **General Background**: Visceral fat is a key health indicator due to its physiological link to vital body functions, particularly blood pressure regulation. Elevated visceral fat has been associated with an increased risk of cardiovascular diseases and metabolic disorders. **Specific Background**: High blood pressure, a chronic condition characterized by elevated arterial pressure, is influenced by various physiological factors, including body composition. The excessive accumulation of visceral fat can contribute to hypertension by impacting cardiovascular and metabolic functions. **Knowledge Gap**: Despite existing studies on obesity and hypertension, limited research has explored the direct correlation between visceral fat levels and blood pressure among university students in Iraq. **Aims**: This study aims to assess visceral fat levels and blood pressure among students at the Open Educational College – Basra Center and examine the relationship between these two variables. **Results:** Among 85 participants (42% male, 58% female, mean age 40.14 years), 55% had abnormal visceral fat levels, and 52% exhibited elevated blood pressure. Chi-square analysis revealed a significant relationship ($X^2 = 8.125$, $p = 0.028$) between visceral fat and hypertension, indicating that individuals with higher visceral fat percentages were more likely to have elevated blood pressure. **Novelty:** This study provides empirical evidence linking visceral fat accumulation to increased blood pressure in an understudied population, reinforcing the importance of visceral fat as a predictive factor for hypertension**. Implications**: The findings highlight the necessity for targeted health interventions, including lifestyle modifications and public health strategies, to mitigate the risks associated with excessive visceral fat accumulation and hypertension. Future research should further investigate underlying mechanisms and preventive measures tailored to at-risk populations.

Highlights:

1. Visceral fat impacts blood pressure, influencing cardiovascular health.
2. Higher visceral fat correlates with increased blood pressure levels.
3. Managing visceral fat may help regulate blood pressure and prevent complications.

Keywords: Visceral fat, blood pressure, obesity, cardiovascular health, hypertension.

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Introduction

Visceral fat is an important functional indicator of an individual's health and safety because of its physiological connection to many of the body's functions and functional responses, including blood pressure.(1,25)

Therefore, visceral fat is closely linked to health aspects, vital signs, and physiological responses to the functions of the body's organs, such as blood pressure, which is a very common health condition in society. (2,15)

High blood pressure, sometimes called arterial hypertension, is a chronic disease in which the blood pressure in the arteries is high. This increase requires the heart to work harder than usual to be able to push blood through the blood vessels. Blood pressure consists of two numbers, systolic pressure and diastolic pressure, which depends on the pressure obtained and measured during the contraction of the heart muscle (systole) or its relaxation between beats (diastole). (3,16,)

The heart is also considered one of the factors controlling the clinical picture of the body, as a rapid pulse is one of the symptoms that indicate a health problem. When the heart beats excessively quickly, the heart pump works less efficiently and provides the body with a small amount of blood flow, including the heart itself. Therefore, an increase in the heart rate leads to increased work and increased demand for oxygen from the heart, which leads to local anemia. On this basis, we find that the nature of body mass and the percentage of fat and its accumulation are health problems that societies are exposed to at different ages and for both sexes, and this affects the general health of the individual, which may cause complications and other health problems. (4,17,24)

The study aims to:

1. Health assessment of visceral fat ratios for the research sample individuals.
2. Health assessment of high blood pressure for the research sample individuals.
3. -The relationship between fat ratios and high blood pressure.

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The study limits are:

1. Students of the Open Educational College - Basra Center, numbering (85) male and female students.
2. -For the period from 6-1-2024 to 6-10-2024.
3. Biology Laboratory - Open Educational College.

Action Mechanisms

Table 2-1 Devices and tools used

Device	Specifications	Country of origin
Body fat measuring device	The electronic system is equipped with memory and sensors	India
Blood pressure measuring device	Electronic	Germany
Computer hp	hp. fourth generation	U.S.A
Height measuring tape	-	Chaina
Information forms	Papar	-
Gloves	Paws	Chaina

Samples:

The sample included students of the Open College of Education - Basra Center, with (85) male and female students, from various departments, distributed as follows: (36) males, representing (42%), and (49) females, representing (58%). The average age for them was (40.14) years, the lowest age was (24), while the highest age was (62) years.

Table 2-2-1 Arithmetic mean and standard deviation for the age of the research sample

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Lowest value	Highest value	Standard deviation	mean	Sample number	Statistics
24	62	8.64	40.14	85	Age

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Table 2 - 2 - 2 Number and percentage of gender variable for the research sample individuals

Table 2 - 2 - 2 Number and percentage of gender variable for the research sample individuals		
percentage%	frequency	gender
% 42	36	male
% 58	49	female
% 100	85	total

2 –3 Visceral fat

The electronic system is equipped with memory and sensors

Table 2-3 Visceral fat assessment criteria

Table 2-3 Visceral fat assessment criteria	
Percentage	Visceral fat
1 - 12%	Normal value
Above 12%	High value

Blood presure

All members of the graduation project sample had their blood pressure measured at rest for both systolic and diastolic pressures, and all members of the sample were diagnosed. For most adults, normal resting blood pressure ranges from 100-130 mmHg systolic and 60-80 mmHg diastolic. For most adults, hypertension is present if the resting blood pressure is at or above 130/80 or 140/90 mmHg.

Experiment

On 1/20/2024, the experiment was implemented and measurements and examinations were conducted on the research project sample. The experiment was implemented inside the college's biology laboratory for ten consecutive days to complete the sample number, taking into account the same conditions and location of the laboratory to conduct the examination and measurement.

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Data analysis

The statistical program (SPSS) Statistical Package for Social Sciences, version 26 was used to analyze the data and extract the results, where the following statistical models were used:

Descriptive statistics

Percent, arithmetic mean, and standard deviation.

Inferential statistics

Chi square test (X2) at $P < 0.05$.

Result and Discussion

Table 3-1 Visceral fat assessment

percentage%	frequent	assessment
% 45	38	normal
% 55	47	abnormal
100 %	85	Total

Table 3-1 shows the results of the visceral fat assessment of the study sample individuals. The percentage of abnormal fat among the study sample individuals reached (55%), which is more than half, while the percentage of normal fat reached (45%) among the sample individuals.

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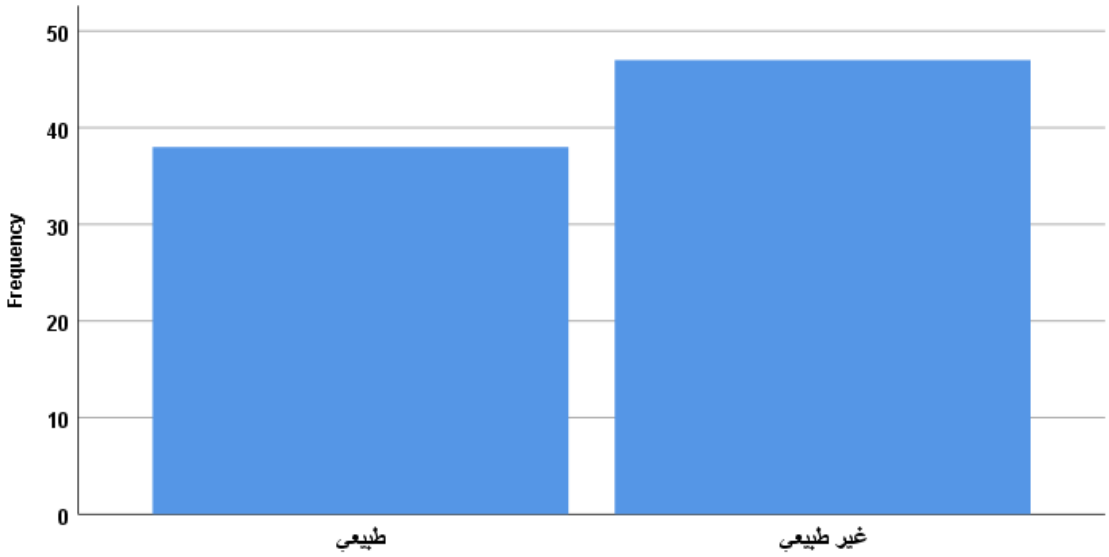

Figure 3-1 Visceral fat assessment level of the sample

Table 3-2 Arithmetic means and standard deviations of blood pressure

Table 3-2 Arithmetic means and standard deviations of blood pressure					
min	max	Sample size	S.D	mean	Pressure Type
101	176	85	16.971	130.68	mm.h
66	115	85	11.204	85.36	Systolic

Table 3-3 Blood pressure assessment

Table 3-3 Blood pressure assessment		
percentage%	frequent	Rating
% 48	41	Normal
% 25	21	High Normal
% 19	16	High Class 1
% 8	7	High Class 2
% 100	85	Total

Table 3-3 shows the blood pressure level assessment for the study sample, where the normal blood pressure rate was (48%), while the high normal assessment rate was

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(21%), and the high blood pressure category 1 and category 2 were (19%) and (8%) respectively.

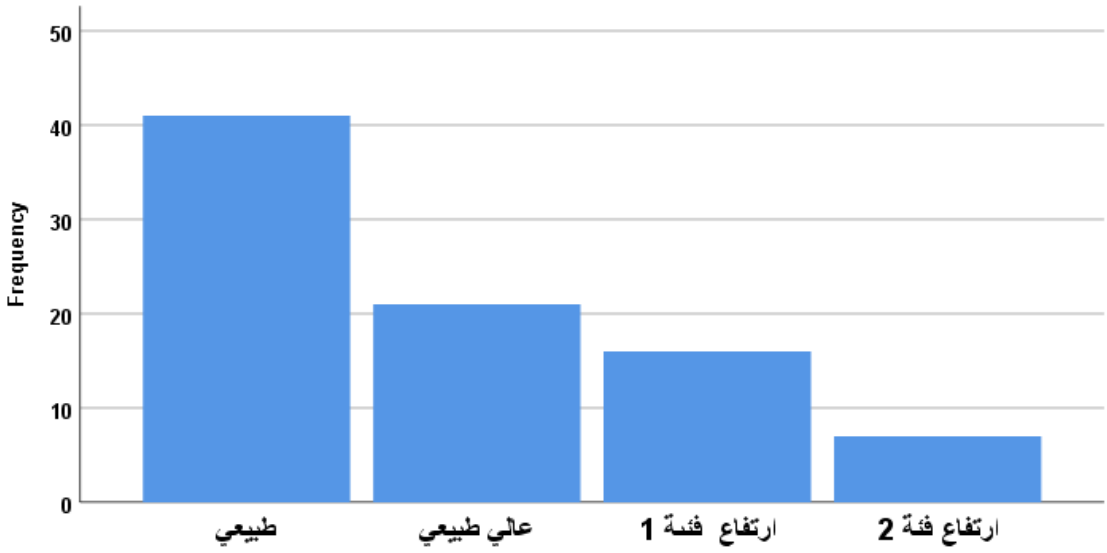

Figure 3-4 Blood pressure level of the sample

Table 3-4 Relationship of visceral fat to blood pressure level using chi-square

Table 3-4 Relationship of visceral fat to blood pressure level using chi-square						
Chi square model						
Blood pressure	Visceral fat		Total	Significant		
	Normal	Abnormal		X^2	p- value 0.05	Sig.
Normal	25	16	41			
High Normal	6	15	21	8.125	0.028	Sig
High Class 1	4	12	16			
High Class 2	3	4	7			
Total	38	47	85			

Table 3-4 shows the results of the relationship between visceral fat and blood pressure level for the study sample, as the chi-square value reached (8.125) and the P-value reached (0.028), which is less than (0.05), which means that there are no

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significant differences in the relationship between visceral fat and pulse rate for the study sample.

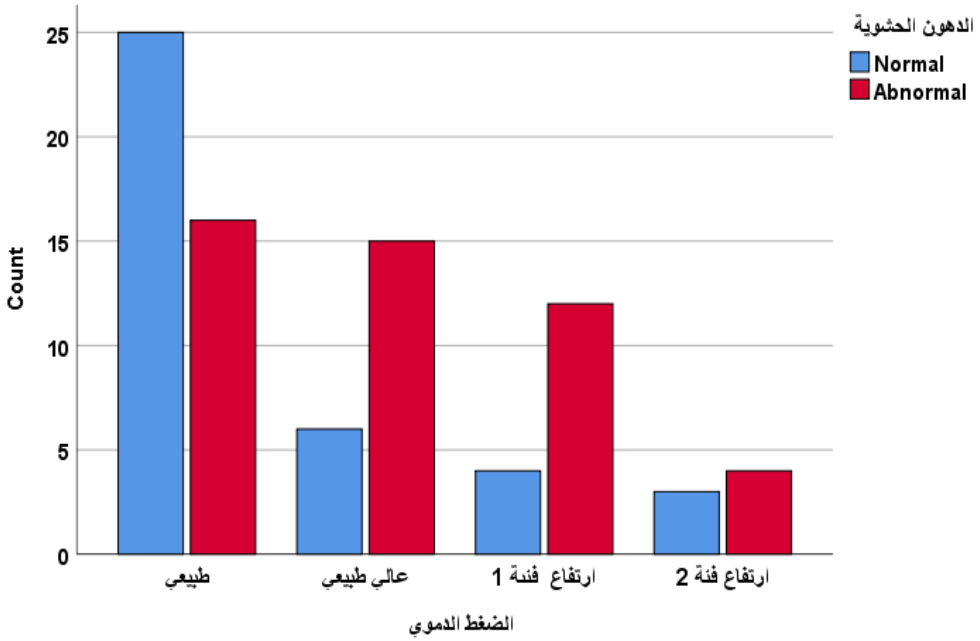

Figure 3-5 Relationship between visceral fat and blood pressure level

Discussion of the results

It is clear from Table 3-1 that the level of visceral fat in the sample individuals was high compared to the normal level, as the largest percentage of the sample was the increased level of visceral fat, as the percentage (55%) of the sample was abnormal, meaning that there is a higher percentage of fat in the sample individuals, and the researcher attributes it to the frequent consumption of foods rich in fats and sugars with lack of exercise and little movement, which causes an increase in visceral fat in the body. Tables (3-3) show the results of the clinical signs of blood pressure for the study sample, and it is clear that a large percentage of the sample had high blood pressure higher than the normal rate, which explains the direct effect of visceral fat on blood pressure.

Table 3-4 The relationship between visceral fat and blood pressure levels was significant and influential, as the higher the percentage of visceral fat, the higher the blood pressure level, because visceral fat accumulates on the internal organs of the human body such as the heart, arteries, liver and kidneys, which affects high blood pressure, especially in the arteries that carry blood.(5, 13,18,19)

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Thus, the results of the study show that the effect of the accumulation and increase of visceral fat has a direct and significant effect on raising blood pressure levels above their normal rates. While. One of the main causes of high blood pressure is the accumulation of fat in the walls of blood vessels, the liver and various parts of the body such as the abdomen, buttocks, waist and others, which causes many health problems such as high blood pressure.(6, 12,21,)

High blood pressure, which is sometimes called arterial hypertension, is a chronic disease in which the blood pressure in the arteries is high. This increase forces the heart to perform its function with greater effort than normal in order to be able to pump blood into the blood vessels. Obesity is a medical condition in which excess body fat accumulates to the point that it causes negative health effects, leading to a reduced life expectancy and increased health problems. Researchers say that increased visceral fat increases a person's risk of developing heart disease, high blood pressure, blood vessels, osteoporosis, depression, and certain types of cancer. (7, 11,22)

Depending on the degree of obesity, increased visceral fat is a sign of obesity, overweight, and the risk of diseases caused by diet and physical activity, which negatively affect body functions such as blood pressure, heart function, and arteries. (8,9,20,23).

Conclusions

1. There is an increase in the percentage of visceral fat in the study sample individuals.
2. There is an increase in the blood pressure rate in most of the sample individuals.
3. There is a significant relationship between the percentage of visceral fat and the level of blood pressure in the study sample.

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Recommendations

1. Relying on the results of the study to determine the relationship between the percentage of visceral fat and high blood pressure.
2. Following healthy diets and physical activities to avoid obesity and the accumulation of visceral fat in the body.
3. Conducting a study that addresses other physiological functions and responses and the extent of the impact of obesity and fat accumulation on these functions.
4. Conducting a study that addresses the impact of obesity and fat accumulation on psychological factors.
5. Conducting a study that addresses the impact of visceral fat on the spread of cancer.

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