

The Effect of Obesity on Blood Pressure.

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الخلاصة

الهدف من هذه الدراسة لمعرفة مدى تأثير السمنة على ضغط الدم. أجريت هذه الدراسة على 80 متبرعاً أصحاء سريرياً تم اختيارهم وتقسيمهم إلى فئتين عمريتين الفئة العمرية الأولى تحت سن الأربعين التي تم تقسيمهم أيضاً إلى مجموعة A 20 شخص وأوزانهم ضمن الحد الطبيعي ومجموعة C 20 شخص وأوزانهم عالية. أما الفئة العمرية الثانية فهي فوق سن الأربعين وتم تقسيمهم إلى مجموعتين، مجموعة B 20 شخص وأوزانهم ضمن الطبيعي ومجموعة D 20 شخص وأوزانهم عالية. تم قياس ضغط الدم العالي SBP وضغط الدم الواصل DBP ومعدل ضغط الدم MBP في كل مجموعة ومقارنتها بالمجاميع الباقية والنتائج أظهرت ان السمنة لها أثر واضح في زيادة ضغط الدم في كلا الفئتين العمريتين كما تبين ان تأثير السمنة على الضغط يزداد بازدياد العمر.

Abstract

The aim of this study to quantify the effect of obesity on blood pressure. We study 80 persons (clinically normal), divided in two groups according to the age, the first group under 40 years which is subdivided into two groups, group A 20 persons with normal weight and group C also 20 persons with over weight and the second group, above 40 years also subdivided into two groups, group B 20 persons with a normal weight and group D 20 persons, with over weight and we have found the effect of obesity on, systolic, diastolic, and mean blood pressure on the first group and on the second group. And the results indicate that the effect of obesity on the age group over 40 years more than the effect of obesity on the age group, below the 40 years. So the effect of obesity on SBP, DBP and MBP is increase with the increasing of the age.

Introduction

Obesity is an increasing problem in the developed word and has substantial health effects. In United Kingdom, 50% of the adult population are over weight (BMI) 25-29.9 and 20% are obese (BMI \geq 30)⁽¹⁾. A small excess consumption of only 50-200 kcal daily will lead to a weight gain of 2-20 kg over a period of 4-10 years. Excess weight gain usually start when individual are aged between 20 and 40.⁽¹⁾

The Aetiology of Obesity: The aetiology of obesity arises from a complex interplay of behavioural and genetic factors.

Specific Causes of Weight Gain :⁽¹⁾

1. **Endocrine Factors:** Hypothyroidism, Cushing's syndrome, Hypothalamic Tumour or injury, insulinoma.
2. **Drug Treatments:** Tricyclic antidepressants, sulphonyl urea drug, oral contraceptive pills, corticosteroids, sodium valproate.
3. **Genetic:** Prader-Willi Syndrome, a few rare single gene disorders have been identified which lead to a symptom complex including obesity, these include mutations of the melanocortin-4 receptor (MC₄ R).
4. **Behavioural Factors:** The major factors leading to obesity in the population therefore seem to be an overall decrease in activity levels. Thus, public health measures to reduce obesity in the population might be to increase the physical activity and exercise, rather than simply on a reduction of food intake an important behavioral factor predisposing to obesity:
 - * High-fat diets.
 - * Snacking and the loss of formalized meal patterns which reduce the conscious recognition of food eaten.
 - * Consumption of energy dense foods (often high in bulk).
 - * Alcohol consumption.

Complication of Weight Gain

Obesity has effects on both mortality and morbidity. It is clear that the lower mortality rates are seen in individuals with a BMI of 18.6-24. Data from population studies, such as that in Framingham, USA, show a clearly increased risk of death with increasing weight. For individuals aged between 30 and 42 the risk of death increases by 1% for each 0.5 kg weight rise. For individuals between the ages of 50 and 62 this figure becomes 2% for each 0.5 kg weight rise. Coronary heart disease is the major cause of death but cancer rates are also increased in overweight⁽²⁾ especially colorectal cancer in males and cancer of the gall bladder, biliary tract, breast, endometrium and cervix in females. Problems of morbidity increase steadily as the BMI increases above 25 kg/m² such as, type 2 diabetes mellitus, hypertension, stroke, hyperlipidaemia, coronary heart disease.⁽³⁾

Obesity and High Blood Pressure

Many population studies have proved a direct correlation between obesity and significant rise in blood pressure⁽⁴⁾.

High blood pressure, or hypertension, is more common in overweight or obese teens.⁽⁵⁾

Half Americans aged 55-64 years have high blood pressure-a major risk for heart disease and stroke- and two in five are obese. According to health, united states 2005⁽⁶⁾, and the first steps in treating essential hypertension usually losing weight if you are over weight.⁽⁷⁾

Many different factors are associated with high blood pressure; hereditary, sex, age, race, stress, smoking a diet high in salt, heavy use alcohol and especially obesity⁽⁸⁾.

It is well established that there is a strong clinical association between obesity and hypertension.⁽⁹⁾

Weight or BMI in association with age is the strongest indicator of increasing blood pressure.⁽¹⁰⁾

Treatment of the higher blood pressure recommends nonpharmacologic therapies such as weight loss-increase physical activity and sodium restriction.⁽¹¹⁾

Material and methods

This study carried out on 80 persons at age group below 40 years and second group above 40 years in order to know the effect of obesity on the Blood Pressure with the increasing of age and the first group (below 40 years) subdivided into two groups, group A, is normal group (normal BMI) and group C is an obese group (BMI more than 30 Kg/m²). And the second age group above 40 years, also subdivided into two groups, group B is a control group (BMI normal, less than 25 Kg/m²) and group D is an obese group (BMI more than 30 Kg/m²). I have measured the BP (SBP, DBP, and MBP) of all these groups, and I have measured the weight height and BMI.

Measurement of Blood Pressure

Korotkoff Sounds: The Korotkoff sound may be heard by placing astethoscope over the brachial artery, while the pressure in an occlusion around the upper arm is gradually reduced and depend on phase I (SBP) and phase V (DBP). Phase I. is the first sound that occur indicate the peak systolic pressure.

Phase V: Occur when they disappear.

In this study the blood pressure of all the patients has been recorded in supine positions.

MBP (Mean Blood Pressure): Calculated as diastolic blood pressure (DBP) plus one third of pulse pressure (difference between SBP and DBP).⁽¹³⁾

BMI (Body Mass Index): Is calculated by measuring a persons weight in kilograms and then dividing by that person's height in meters squared [Kg/m²]⁽¹⁾

Normal BMI = 18.5 – 24.9

Under weight < 18.5
 Over weight 25 – 29.9
 Obese 30 – 39.9
 Extremely obese > 40

Results

In this study when we have comparison between group A (young age group control) and group C (also young age group but obese) and we have found that there are significantly increase in SBP, DBP and MBP in group C as in table (1) and figure (1).

Table (1)

	A	C	p-value
	Mean±SD	Mean±SD	
SBP	119.5±10.37456	139.5238±11.36708	<0.01
DBP	71.75±7.656267	93.80952±11.36708	<0.01
MBP	87.63±7.438386	108.3667±10.54046	<0.01

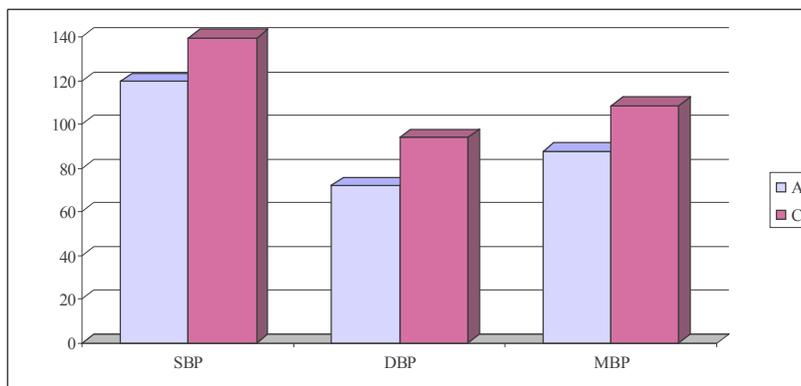
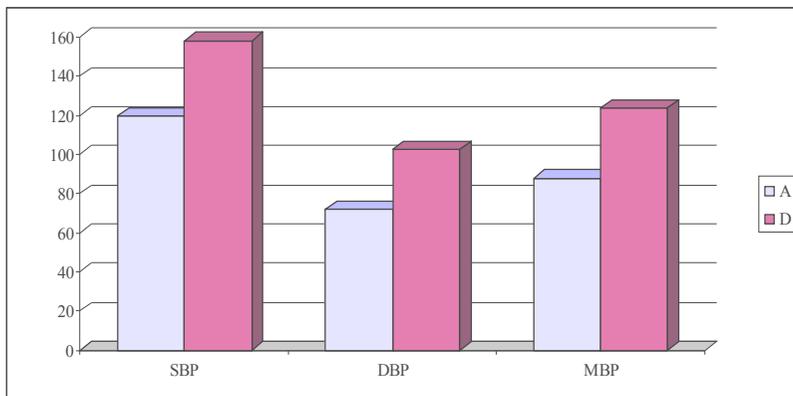


Fig. (1)

- comparison between group A (young age group and group D (old age group-obese persons) we have found that there are significantly increase in SBP, DBP and MBP in group D as in table (2) and figure (2).

Table (2)

	A	D	p-value
	Mean±SD	Mean±SD	
SBP	119.5±10.37456	158±19.35812	<0.01
DBP	71.75±7.656267	102.5±10.19546	<0.01
MBP	87.63±7.438386	123.805±20.67377	<0.01



- comparison between group B (control old age group) and group C (obese young age group) we found that there are significantly increase in SBP, DBP and MBP on comparison with group C as in table (3) and figure (3).

Table (3)

	B	C	p-value
	Mean±SD	Mean±SD	
SBP	126.5±8.4448	139.5238±11.3671	<0.01
DBP	77±7.3269	93.80952±11.3671	<0.01
MBP	93.3605±7.1043	108.3667±10.5405	<0.01

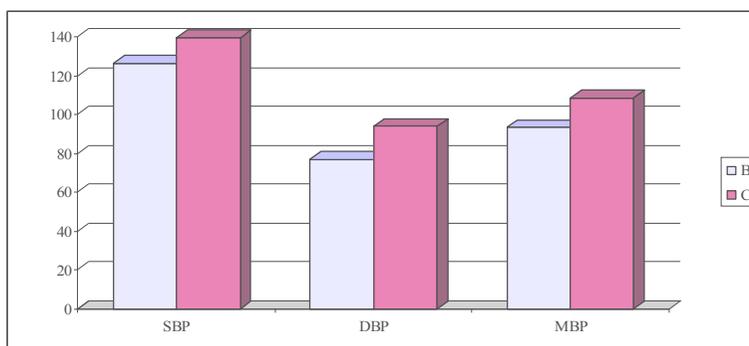


Fig. (3)

- comparison between group B (control old age group) and group D (obese old age group) we have found that there are significantly increase in SBP, DBP and MBP in group D as in table (4) and figure (4).

Table (4)

	B	D	p-value
	Mean±SD	Mean±SD	
SBP	126.5±8.4448	158±19.3581	<0.01
DBP	77±7.326951	102.5±10.1954	<0.01
MBP	93.3605±7.1043	123.805±20.6737	<0.01

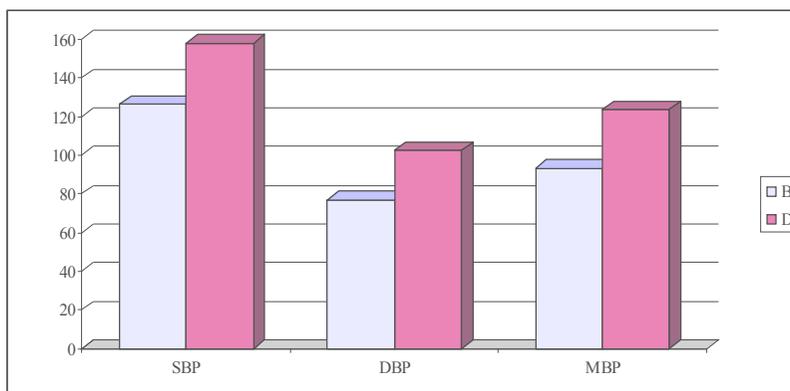


Fig. (4)

- comparison between group C and group D we found that there are significantly increase in SBP, DBP and MBP in group D as in table (5) and figure (5).

Table (5)

	C	D	P-value
	Mean±SD	Mean±SD	
SBP	139.52±11.367 1	158±19.3581	
DBP	93.809±11.367 1	102.5±10.1954	
MBP	108.36±10.540 5	123.805±20.6737	

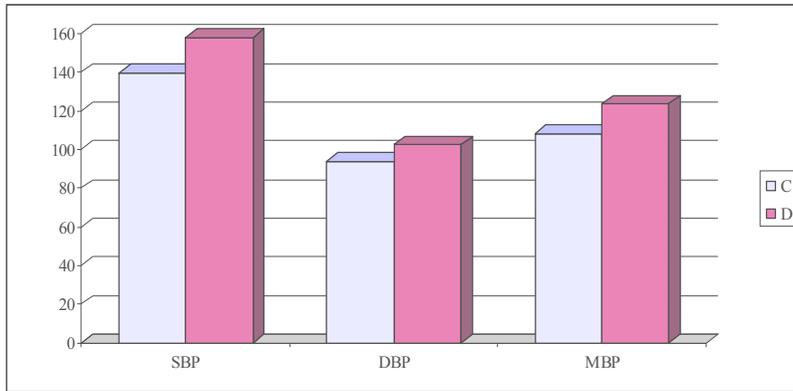


Fig. (5)

- comparison between group A and group B we found that there are significantly increase in SBP, DBP and MBP in group B as in table (6) and figure (6).

Table (6)

	A	B	p-value
	Mean±SD	Mean±SD	
SBP	119.5±10.37456	126.5±8.4448	<0.01
DBP	71.75±7.656267	77±7.326951	<0.01
MBP	87.63±7.438386	93.3605±7.1043	<0.01

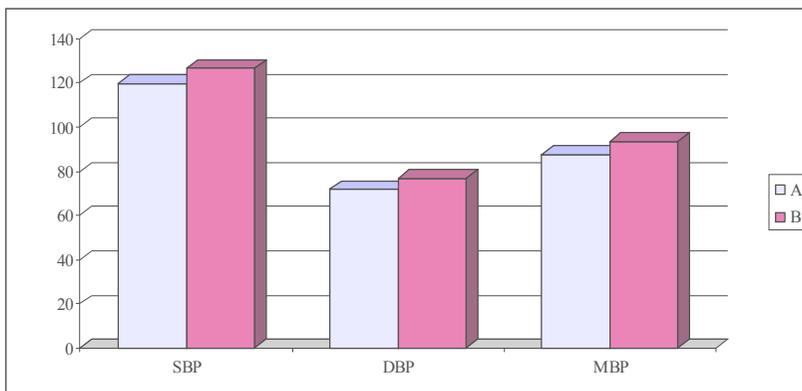


Fig. (6)

Discussion

- 1) In group I, SBP, DBP and MBP in subgroup C are significantly higher than that of subgroup A and the same different was found between subgroup B and D due to BMI higher in obese.⁽¹⁾
- 2) Comparison between subgroups C and D indicate that the SBP, DBP and MBP were significantly higher in subgroup D than subgroup C. And this is most likely due to age and increasing of BMI.
- 3) In this study in both young and old age groups, the increasing in SBP, DBP, and MBP due to increasing in BMI (more than 30Kg/m²).

References

- Davidsen, Principles and Practice of Medicine 19th Edition, 2006.
- Smith, A.D., Brand, M.W, Wang, M. H., Dorrance, A.M. (2006). Obesity-induced hypertension develops in young rats. *Exp. Biol. Med.* 231: 282-287.
- Obesity and High Blood Pressure. www.greathighbloodpress.com. The effect of weight reduction on blood pressure, Plasma.
- Renin Activity-The New England Journal of Medicine is Owned, Published and Copyrighted © 2007.
- When Being Overweight is a health Problem <file:///H:/obesity8.htm>, 2007.
- Obesity, High Blood Pressure Impacting Many U.S. Adults Ages 55-64. <file:///H:/hus05.htm>.
- Objective Medical Information on Obesity, Weight Management, Eating Disorders, and Related Topics, Health united States, 2005. number 017-022-01592-7.
- Effects of the Glucocorticoid II Receptor Antagonist Mifepristone on Hypertension in the obese zucker rat. Department of Vascular Biology, Hertfordshire AL6 9AR UK.
- American obesity Association copyright © 2002. <file:///H:/Health-effects.htm>.
- Treatment of Obesity Hypertension. <File:/H:/treatment of obesity hypertension.htm>.
- Up to Date Patient information: High Blood Pressure, Diet, and Weight (www.americanheart.org).
- The New England Journal of Medicine – The Effect of weight reduction on blood pressure.
- Smith JJ. Hughes CV, Patcin MJ et al. 1987, the effect of age on hemodynamic response to graded postural stress in normal men.