

Effects of Obesity on Blood Pressure Among Adult Males and Females in Tikrit City – Sep-Dec, 2008

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Abstract

Obesity is an independent risk factor for cardiovascular disease. Clinical studies have shown that body weight reduction decreases blood pressure. The aim of this study was to illustrate the relationship between obesity and blood pressure among adult males and females in Tikrit city. A case series study among the population aged over 25, (400 individuals, 200 males and 200 females) in Tikrit city. Sample was collected from September till December 2008. The blood pressure of subjects was measured in three occasions one month apart via mercurial sphygmomanometer by well trained personnel to those patients attending to Medicine outpatient of Tikrit Teaching Hospital. Mean systolic blood pressure (SBP) was significantly lower in all groups ($P<0.005$) in non-obese compared with obese patients. This positive relation well indicates the higher the BMI, the more elevated SBP. However, reduction of diastolic blood pressure (DBP) mean was significant only in men and women who were under treatment with antihypertensive drugs ($P<0.05$). In all hypertensive groups and in healthy subjects, there was an increase in body mass index (BMI). This increase was more notable in hypertensive groups, compared with healthy individuals. The prevalence of obesity in hypertensive patients was higher than that of the healthy group.

تأثير السمنة على ضغط الدم بين البالغين من الذكور والإناث في مدينة تكريت

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المستخلص

تعتبر السمنة عامل خطورة على أمراض القلب والأوعية الدموية. بينت الدراسة السريرية أن تقليل الوزن يؤدي إلى انخفاض في ضغط الدم. إن الغرض من هذه الدراسة هو لبيان العلاقة بين السمنة وضغط الدم للبالغين من الذكور والإناث في مدينة تكريت. شملت الدراسة سلسلة الحالات للأعمار فوق ٢٥ سنة (٤٠٠ شخص، ٢٠٠ ذكر و ٢٠٠ أنثى) في مدينة تكريت. جمعت العينة من أيلول وحتى كانون الأول ٢٠٠٨. تم قياس ضغط الدم للأشخاص في ثلاث فترات ومدة الفترة الواحدة شهر باستخدام مقياس ضغط الدم الزئبقي بواسطة كادر متدرب لهؤلاء الوافدين إلى الاستشارية الباطنية في مستشفى تكريت التعليمي. انخفض معدل ضغط الدم الانقباضي معنويا في كل المجموع ($p<0.005$) من غير البدنيين مقارنة بالمرضى البدنيين. وهذه العلاقة الايجابية تشير بوضوح انه كلما ازداد عامل كتلة الجسم ازداد ارتفاع ضغط الدم الانقباضي. وان انخفاض معدل ضغط الدم الانبساطي كان معنويا فقط عند الذكور والإناث الذين يتناولون الأدوية المضادة لارتفاع الضغط ($p<0.05$). في كل مجاميع ارتفاع الضغط وعند الأصحاء كان هناك ارتفاع في عامل كتلة الجسم. إن هذه الزيادة تلاحظ أكثر عند مجاميع ذوي ضغط الدم المرتفع مقارنة بالأصحاء. إن انتشار السمنة هو أكثر عند المرضى ذوي ضغط الدم المرتفع مقارنة بمجموع الأصحاء.

Introduction

Hypertension (HT) is a trait as opposed to a specific disease, and represents a quantitative rather than a qualitative deviation from the norm. any definition of hypertension is therefore arbitrary. Overweight and obesity are terms commonly used to describe individuals with increased body fat. Measuring fat in human requires special instruments and so excess weight is usually defined by measuring the body mass index (BMI) (Christopher *et al*, 1999). Obesity is recognized as an independent risk factors of cardiovascular disease (CVD) (Shaper, 1997). Body weight has the identified role in beginning and progress of CVDs (Kannel, 1993). Blood pressure is controlled by weight reduction (Bmer *et al*, 1995 and Welton *et al*, 1996). Hence, weight reduction in overweight individuals has been recommended as a key principle for control of hypertension (WHO, 1999). Obesity, especially abdominal type, is often accompanied by hypertension, hyperlipidemia, hyperinsulinemia, and diabetes, leading to poor prognosis of Coronary Artery Disease (CAD) in hypertensive obese individuals (Pouliol, 1994 and Modan *et al*, 1991). Some studies have shown that hypertension is an important risk factor for CVD-related mortality, compared to obesity (Stamler *et al*, 1991 and Carman *et al*, 1994). Of great importance is the control and treatment of hypertension, as well as weight reduction and decreasing central obesity (Stamler *et al*, 1991). Given the absence so far of any studies on the trend of body mass index (BMI) and blood pressure levels in large populations in Iraq, some study also conducted to investigate the changes in systolic and diastolic blood pressure and BMI, as well as the trend of changes in BMI in the population of individuals aged 25 years or higher (Alireza *et al*, 1991-2001). A global study known as INTERSALT involv-

ing 52 world nations has shown that every 10 kg increase in body weight is associated with an increase of 3 mmHg in SBP, and an increase of 2.2 mmHg in DBP (Dyer *et al*, 1989). A 1990 prospective study known as TAIM (Trial of Antihypertensive Interventions and Management) found that overweight and obesity were associated with an increased risk of hypertension (Wasserstein *et al*, 1992). A decrease in BMI leads to a more notable reduction of SBP and DBP in hypertensive patients and even healthy individuals (Alireza *et al*, 1991-2001). A study of hypertensive patients in 1993 showed a significantly better blood pressure control in patients who combined drug treatment with weight reduction, compared to patients who only received antihypertensive medications (Neato *et al*, 1993), and increased BMI leads to a higher CVD-related mortality in hypertensive individuals.

Materials and Methods

This study consisted of hypertensive patients attending to medical outpatient of Tikrit Teaching Hospital aged ≥ 25 year old in Tikrit city and nearby areas. A total of 400 individuals (200 males and 200 females) were studied. Random method was used for sampling. Blood pressure of subjects was checked three times one month apart. Upon their every attendance, the person's blood pressure was taken in the right hand in sitting position after 5 minutes of rest. Blood pressure was measured twice and the mean of the two measurements was recorded as the person's blood pressure. The measuring device was a mercurial sphygmomanometer with a cuff matching the subject's arm size (width: 13 cm, length: 42 cm). Blood pressure measurements depend on auscultation of the first sound was SBP and the forth Krotokoff sound was considered as the DBP. In all three occasions, well trained indi-

viduals were used to collect and record data. They were examined twice to ensure all measurements were performed correctly. To eliminate distorting data in weight and height measurement, the subject's heights and weights were measured in centimeters for BMI calculation. For analysis purposes, 4 distinct BMI ranges were considered as follows: (Christopher *et al*, 1999)

BMI 18.5 - 24.9 (kg/m²) was acceptable

BMI 25.0 - 29.9 was overweight

BMI 30.0 - 39.9 was obese

BMI ≥ 40.0 was morbidly obese

People with a minimum SBP and DBP of 140 and 90 mmHg, respectively, and those who had begun receiving anti-hypertensive medications at least 7 days before entering the study were considered as hypertensive. Hypertensive subjects were divided into four groups according to their history:

1. Individuals unaware of their hypertension.
2. Individuals aware of their hypertension, but take no antihypertensive treatment.
3. Individuals taking antihypertensive drugs but hypertension is not controlled.
4. Individuals taking antihypertensive drugs and their blood pressure is controlled.

Statistical analysis

Data were entered into computer via EPI5 software and statistically analyzed with SPSS v7.5.1 (Saflol, 2003 and Gardner, 1991). Variant analytic tests was used to determine significant difference between parameters. P-value less than 0.05 to gain best balance between specificity and sensitivity of the relationships. P<0.05 is considered significant throughout the present study.

Results

The study show that mean SBP of patients aged 25-39 years was 152±15 mmHg while mean SBP of nonhypertensive individuals was 120±11 mmHg. Mean SBP of hypertensive patients aged 40-54 years was 160±18 mmHg while that of healthy subjects of the same age group was 117±21 mmHg. Mean SPB of hypertensive patients aged 55-69 years was 153.6±11 mmHg opposed to 119.7±9 mmHg for healthy subjects of the same age group. And mean SBP of hypertensive patients aged 70 years and older was 159.4±18 mmHg while it was 130±19 mmHg for healthy individuals(Table 1).

Table (1):- Systolic blood pressure (mmHg) of hypertensive individuals according to age groups.

Age	High Blood Pressure Individuals				Total HT	Non-HT
	Unaware	Aware but Uncontrolled	Treated but Uncontrolled	Controlled		
25-	145.6±16	150.2±13	153.1±10	138±12	152±15	120±11
40-	144±31	152±11	166±20	144.6±6	160±18	117±21
55-	148.4±14	150.8±17	159±30	129.2±11	153.6±11	119.7±9
70-	141±8	160±9	160.1±23	144.6±29	159.4±18	130±19

(age group differences are not significant P<0.05 Chi=1.00613)

The study show that mean DBP of hypertensive patients aged 25-39 years was 95.3±8 mmHg, while it was 77.2±8 mmHg for nonhypertensive individuals of the same age group.

Mean DBP of hypertensive patients aged 40-54 years was 98.2±10 mmHg compared with 80.2±5 mmHg for nonhypertensive subjects of the same ages. Mean DBP of 55-69 years old hyper-

tensive patients was 103.1±9 mmHg while that of the nonhypertensive subjects was 87.1±9 mmHg. Mean DBP of hypertensive patients aged 70 years or

elder was 110.9±10 mmHg while 100±12 mmHg was the DBP of non-hypertensive persons of the same age group (Table 2).

Table (2):- Diastolic blood pressure (mmHg) of hypertensive individuals according to age groups.

Age	High Blood Pressure Individuals				Total HT	Non-HT
	Unaware	Aware but Uncontrolled	Treated but Uncontrolled	Controlled		
25-	89.2±11	94.6±8	102.2±6	98.2±5	95.3±8	77.2±8
40-	97.2±9	94.6±6	110.3±9	106.3±6	98.2±10	80.2±5
55-	97.0±10	100.1±10	111.2±10	109±9	103.1±9	87.1±9
70-	103.5±5	112±6	120.1±8	111.8±10	110.9±10	100±12

(age group differences are significant $P < 0.05$ Chi=9.60273)

The study also show that mean SBP of male hypertensive patients was 144.2±13 mmHg whom unaware of their hypertension, 149.7±14 mmHg of whom aware but uncontrolled, 160.3±16 mmHg of those treat but uncontrolled their hypertension, and 130.4±10 mmHg for those whom did control their hypertension. Mean SBP of hypertensive males was 153.3±9 mmHg opposed to 120±9 mmHg for nonhypertensive males. Regarding female hypertensive patients, the study

show that mean SBP was 144.8±21 mmHg for those whom unaware of their hypertension, 150.2±12 mmHg of whom aware but uncontrolled their hypertension, 166.7±20 mmHg of those whom treat but uncontrolled their hypertension, and 130.8±9 mmHg for those whom control their hypertension. Mean SBP of total hypertensive female patients was 160.2±8 mmHg while mean SBP of nonhypertensive females was 110±6 mmHg (Table 3).

Table (3):- Systolic blood pressure (mmHg) of hypertensive males and females.

Gender	High Blood Pressure Individuals				Total HT	Non-HT
	Unaware	Aware but Uncontrolled	Treated but Uncontrolled	Controlled		
Male	144.2±13	149.7±14	160.3±16	130.4±10	153.3±9	120±9
Female	144.8±21	150.2±12	166.7±20	130.8±9	160.2±8	110±6

(male to female differences are significant $P < 0.05$ Chi=13.40223)

The study show that mean DBP of male hypertensive patients was 91.1±10 mmHg for those whom unaware of their hypertension, 94.2±8 mmHg for those aware but uncontrolled their hypertension, 97.1±10 mmHg for those whom treat but uncontrolled their hypertension, and 85±6 for those whom control their hypertension. Mean DBP of total hypertensive males was 94.2±7 mmHg while non-hypertensive DBP of males mean was 73±7 mmHg. For hypertensive fe-

males, the mean DBP was 92.7±15 mmHg for those whom unaware of their hypertension, 92.9±11 mmHg for those aware but uncontrolled their hypertension, 100.3±12 mmHg for those whom treat but uncontrolled their hypertension, and 91.7±3 mmHg for those control their hypertension. Mean DBP of total hypertensive females was 95.7±10 mmHg while it was 72±8 mmHg for nonhypertensive females (Table 4).

Table (4):- Diastolic blood pressure (mmHg) of hypertensive males and females.

Gender	High Blood Pressure Individuals				Total HT	Non-HT
	Unaware	Aware but Uncontrolled	Treated but Uncontrolled	Controlled		
Male	91.1±10	94.2±8	97.1±10	85±6	94.2±7	73±7
Female	92.7±15	92.9±11	100.3±12	91.7±3	95.7±10	72±8

(All differences are significant $P < 0.05$ Chi=16.21122)

The mean BMI of hypertensive males was 26.1 ± 3 Kg/m² for those whom unaware of their hypertension, 25.3 ± 3 Kg/m² for those aware but uncontrolled their hypertension, 21.3 ± 2 Kg/m² for those treat but uncontrolled their hypertension, and 21.2 ± 1 Kg/m² for those control their hypertension. Mean BMI of total hypertensive males was 25.7 ± 3 Kg/m² while it was 23 ± 3 Kg/m² for nonhypertensive males. Mean BMI of hypertensive females

was 28.7 ± 4 Kg/m² for those whom unaware of their hypertension, 28.4 ± 8 Kg/m² for those aware but uncontrolled their hypertension, 30.9 ± 3 for those treat but uncontrolled their hypertension, and 24 ± 2 Kg/m² for those whom control their hypertension. Mean BMI of total hypertensive females was 28.1 ± 5 Kg/m² while mean BMI of nonhypertensive females was 26.2 ± 4 Kg/m² (Table 5).

Table (5):- BMI (Kg/m²) of hypertensive and normotensive males and females.

Gender	High Blood Pressure Individuals				Total HT	Non-HT
	Unaware	Aware but Uncontrolled	Treated but Uncontrolled	Controlled		
Male	26.1±3	25.3±3	21.3±2	21.2±1	25.7±3	23±3
Female	28.7±4	28.4±8	30.9±3	24±2	28.1±5	26.2±4

(All differences are significant $P < 0.05$ Chi=7.41102)

Discussion

Mean SBP of subjects was higher in hypertensive groups compared with healthy individuals, and mean SBP of hypertensive patients significantly differs among the four groups of HT. However, there is no significant relationship between mean SBP in both hypertensive and healthy individuals and age group. Hence age did not affect the severity of hypertension as an interventional factor and this result was agreed with what found by Alireza *et al*, 1991-2001. Other studies, however, have shown that blood pressure increases with age (Kannel *et al*, 1993) DBP increased significantly with advancing age, and this agreed with what was found by Kannel *et al*, 1993. It was also observed that SBP had a significant lower trend in all hypertensive groups and healthy subjects (both male

and female), except in those who were unaware of their hypertension. A similar trend has been reported in a study by Mika *et al*, 1997; which is probably due to more frequent and timely patient referral to physician, continuity of treatment, reduced salt intake, and the use of new and more effective anti-hypertensive medications. The same picture resulted regarding DBP. Mean BMI increased in both sexes in all hypertensive and healthy groups. This BMI increase was significantly affecting hypertension. The unfavorable trend of changes in BMI may be due to reduced physical activity, increased consumption of grains and fat (especially of the hydrogenated type). Insignificant reduction of DBP in men may be due to increased BMI.

The decreasing trend of SBP may be stopped or reversed if BMI increase is not curbed. Thus, there is a positive relationship between SBP and BMI. A study conducted in Finland between 1982 and 1997 showed a significant BMI increase in all hypertensive groups, compared to healthy individuals, and in all hypertensive groups, BMI increased only in women who were unaware of their hypertension and hence did not seek treatment (Mika, 1997). In this study just less than half (47% of men and 49% of women) were receive antihypertensive treatment were obese (Mika, 1997). Hypertension is 1.6-3 times more prevalent in obese or over-weight people compared with individuals with normal BMI (Hament *et al*, 1998). In this study it was observed that men with uncontrolled hypertension in the two groups with BMI \leq 30 and BMI $>$ 30 had a significant increase in their mean SBP. In women, there was a significant difference between the two groups with BMI \leq 30 and BMI $>$ 30, in terms of mean SBP. Almost similar results have been obtained by other studies (Kannel *et al*, 1993, Wasserstein *et al*, 1992, Seidel *et al*, 1996, and Welton *et al*, 1996)

Conclusions

1. Obesity affects hypertensive patients that the higher the BMI the more elevated both systolic and diastolic blood pressure.
2. Both genders are equally affected concerning added increment of BP due to their raised BMI.
3. Though BP increased with advancing age, obesity affects BP of adults as much as older age groups.

Recommendations

- Health education to hypertensive patients is of prime importance in the direction of maintaining a healthy body weight to minimize risks of their elevated blood pressure.

- Regular checking of BP is an important follow-up to protect the hypertensive patient from unwanted sequel.

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