The Effect of Exercise on the Blood Pressure and Heart Rate in Obese and Patient with Hypertension: Case-Control-Study

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Abstract

Background: Obesity is considered in daily clinical practice as one of the main health problems widely distributed over the world and it signifies a actual task to both community and individual health (1-3). Furthermore, hypertension is main cause of (ischemic heart disease) and cerebrovascular accidents.it has been improved in literatures which established on long term follow up the importance of regular exercise for treatment of obesity and hypertension though short term complications have established little consideration.

Aim of Study: to assess the effect of exercise on hemodynamic response in a patient sample with hypertension and hypertensive obese patients.

Patients and Methods: A Selected patients from those visiting the outpatient of medicine at AL-Diwaniyah Teaching Hospital and who suffer from primary hypertension and randomly distributed to two groups: obese hypertensive and hypertensive without obesity . A third group who are non-hypertensive obesity patients also randomly select from a group of patients who are visiting outpatient of medicine for viral diseases acute self-limiting illness. A control group of seemingly healthy individuals involved doctors in the hospital and a health staff.

Results: a highly significant of the mean systolic blood pressure of patient with hypertension and obese hypertensive patients than of both the obese and control "groups [$p< 0.05$]. A highly significant mean diastolic-blood pressure of patient with hypertension and obese hypertensive-patients than that of both the obese and control groups [$P < 0.05$], highly significant mean-heart/rate of patients with hypertension and obese patients with hypertension than that of both obese and control groups [$P < 0.05$]". Also, after extreme workout and 15 min. following rest there was significantly different in hemo-dynamic reaction after extreme workout and 15 minutes following rest between groups.

Conclusion: After extreme workout and 15 minutes after rest a significant difference was found among the groups.

Introduction

obesity is considered in the daily clinical practice a major health- problems widely distributed over the world and it signifies a actual challenge to both community and individual wellbeing [1-3]. Obesity, overweight considerably associated with major health problems like ischemic heart disease, diabetes mellitus and many of malignant disease [4-6]. one of most frequent cause of the high mortality and morbidity correlated with obesity is insufficient function of cardiorespiratory system, muscle weakness and a defect in autonomic nervous system [7-9]. The obese patients as compared with normal subjects shown in many studies to have lower variability of the heart rate and reduction in sensitivity of baroreflex [10, 11]. The standard graded exercise test is the most easier and costly effective method to evaluate the connections between the auto-nomic nervuos system and

cardiovascular system during the phase of rest, exercise and the phase of improvement. [12]. Also, the reaction of body to this test in tern of the heart rate changes regarded as an important pointer for risk of mortality and morbidity combining cardiovascular system [13]. The reaction of obese and overweight people to standard graded exercise test is not completely understood [1].

In contrast, the best way to treat obesity and its associated problems is regular exercise. Decreasing the weight is a chief consequence intended by the overweight individuals who are performing it; though, number of health related enhancements have recorded with performing exercise even with no significant weight loss [14, 15]. Some of the benefits which are observed, enhancement in cardio-respiratory capability and strength of muscle are the primary high-lighted results in available studies [1, 16].

Primary-hypertensiion is considered as the highly frequent cardiovascular complaints and a main worldwide risk-factor for cerebrovascular accidents and IHD [17-19]. The effect of regular exercise in hypertensive patient is studied by a number of unplanned controlled trails [20]. Furthermore, the consequences of these unplanned controlled trails are studied by a number of meta-analysis to make the picture more clear [21, 22]. A conclusion of these meta-analyses approaches that the blood pressure reduced by 5 to 7 mmHg with aerobic exercise training, and by 2 to 3 mmHg of blood pressure reduced by dynamic resistance exercise among hypertensive patients [23, 24]. However, the accessible literatures not recognized well the exact response of hypertensive patients accompanied with obesity, thus, the current study purposes to compare the response of hypertensive and or obese patients to standard graded exercise test in relation to the alterations in SBP, DBP and heart rate.

Methodology

study design: A case control study conducted in Al-Diwanyiah Teaching/ Hospital, Al-Diwanyiah-province; Iraq in period between August 2018 to December 2019.

Patients: A selected patient with primary hypertension were randomly allocated in two groups from those who are regularly visiting the outpatient of medicine in Al-Diwaniyah Teaching Hospital, patients with obesity and hypertension and patient with hypertension but without obesity . The patient with number one was selected randomly according to a number randomly created by the computer and every other 5 patients the other patients selected. The third group who are obese not hypertensive patients was also randomly selected from those patients who are visiting the outpatient of medicine for a self-limiting acute viral illnesses. from seemingly healthy subjects including the doctors and health staffs in the hospital, the control group were included.

Our sample at last were categorized into subsequent groups: the control healthy subjects (n = 70), the patients with hypertension (n = 50) , the obese patients (n = 54) and those obese with hypertension patients (n =42)

Exercise test

"The test was held out at room-temperature (about 25-°C) and a treadmill was used to complete the practical work of this study". The systolic and DBP was determined by using the arm-cuff sphygmomanometer were as heart rate recorded by using ECG monitoring. The phases which are included in the study are: a standard readings of heart -rate and diastolic and SBP, readings of extreme workout and finally the read out were repetitive 15 min following the rest.

Ethical Consideration

After detailed and full clarification of the procedures and the objective of the research, a oral agreement was taken from all individuals and the study was accepted by the committee of institutional ethical approval

Statistical-Analysis

Using Statistical Package for Social Sciences SPSS /23 and the [Microsoft Excel software]-2010, the statistical evaluation and analysis of the data obtained were made. Discrete-variables were stated as a "number and percentage, while continuous-variables were stated on mean and SD. One-way analysis of variance and (post hoc LSD)-tests were done to study difference of mean between groups". A P- value ≤ 0.05 was considered. Significant.

Results

Table-1. demonstrations the demographic features of the study and control-groups. There was not significantly different in mean age for control and hypertension group (P > 0.05); also, no difference in mean of age between obese and obese /hypertensive groups (*P* > 0.05), but the maen age of obese and obese/ patients with hypertension was significantly- higher than of both control and patient with hypertension groups (P < 0.05). Regarding mean BMI of control and hypertensive patients (P > 0.05), no significant difference, "also no significant difference in mean BMI between obese and obese /hypertensive groups (P > 0.05), but the mean BMI of obese and hypertensive/ obese patients was significantly higher (P < 0.05) than the mean BMI of both control-and hypertensive groups. No difference in mean body-fat % among control and patient with hypertension (*P* > 0.05); also there was no significant difference in mean body fat % among obese group and obese/ hypertensive group as *P*-value> 0.05. The mean body/ fat percent of obese/hypertensive and obese patients was significantly higher (*P* < 0.05) than the mean body fat percent of both control group and hypertensive groups. There was no significant difference in mean waist circumference between control and hypertensive groups (*P* > 0.05); also there was no significantly different in mean waist circumference among obese and obese// hypertensive groups (*P*-value > 0.05). the mean Waist Circumference of obese and hypertensive/obese patients was statistically, significantly high [P-<0.05] than mean Waist-Circumference of both control and hypertensive groups".

There was no important different in mean baseline SBP between obese patients and control-group (P > 0.05); "also significantly no difference in the mean SBP between hypertensive patients and obese/ hypertensive-patients (P- value > 0.05); but the mean SBP of hypertensive and hypertensive /obese patients was higher than that of both control and obese groups (P < 0.05). No significant-difference in mean baseline DBP between obese patients and control group (*P* > 0.05); also no significant difference in mean DBP between the hypertensive patients and obese/hypertensive patients (P > 0.05); but a the mean diastolic blood pressure of hypertensive and hypertensive obese patients was significantly higher than that of both control and obese groups (*P* < 0.05). no significant difference in the mean baseline heart rate between obese patients and the control group (*P* > 0.05); also the mean heart rate of not significantly different in hypertensive patients as of that of obese/hypertensive patients (*P* > 0.05); but the mean HR was significantly higher in hypertensive and hypertensive obese patients ssthan that of both control and obese groups (P < 0.05), as shown in table-1".

At the period of extreme exercise, the evaluation of mean SBP, DBP and the HR between study and control groups is shown in table-2 . a significantly higher mean-systolic blood pressure was in hypertensive obese patients followed by obese /hypertensive patients and that of control patients at last. A significantly higher mean DBP was in hypertensive obese patients then obese and hypertensive patients and at the last the control subjects. A significantly lower mean heart rate in all groups of the study in contrast with that of control group (P-value <0.05); though, no significant difference was in mean HR among study-groups (P > 0.05), as shown in table-2.

15 minutes after rest , the comparison of the mean SBP, DBP and the heart rate between control and the groups of study shown in table 3 . a significantly higher "mean systolic blood pressure was in hypertensive / obese patients then followed by obese and hypertensive patients and control subjects at last , also significantly higher mean DBP in hypertensive obese patients then followed by both obese and hypertensive patients and by control subjects at the last . significantly lowest mean heart rate among all study groups in contrast with that of control group (P <0.05); though, no significant difference in mean HR between study groups (P more than 0.05), as shown in table 3".

Table 1: Demo-graphic features of the study groups

Featur	**Control (*n*= 70)**	**Hypertensive (*n*=50)**	**Obese (*n*=54)**	**Hypertensive & Obese (*n*=42)**
Age (years)	21.01± 3.25 B	23.21 ± 3.02 B	30.21 ± 4.73 A	29 .29± 4.11 A
BMI (kg/m2)	23.02 ± 1.63 B	24.41 ± 2.24 B	34.29 ± 3.40 A	34.41 ± 3.21 A
Body fat percentage (%)	18.8 ± 3.9 B	21.9 ± 3.9 B	33.8 ± 7.2 A	36.8 ± 4.9 A
Waist circumference (cm)	85.21 ± 5.73 B	85.80 ± 7.2 B	112.21 ± 9.13 A	111.40 ± 8.04 A
SBP baseline (mm Hg)	123.81 ± 14.81 B	142.69 ± 10.81 A	128.46 ± 9.19 B	145.81 ± 11.94 A
DBP baseline (mm Hg)	73.51 ± 7.99 B	82.25 ± 11.12 A	77.93 ± 12.86 B	85 ± 10.2 A
Heart rate baseline (Beat/min)	70.80 ± 15.05 B	76.06 ± 11.01 A	70.87 ± 11.87 B	78.84 ± 11.89 A

N;number of cases; "BMI: body mass index; SBP; systolic blood pressure; DBP; diastolic blood pressure; capital letters were used for explanation of the results of (post hoc LSD) multiple comparison test consequently similar letters, direct no significant-difference at $P > 0.05$, while different letters designate significant difference at $P \leq 0.05$; letter (A) being the highest value".

Table-2: Heart rate and blood pressure during extreme exercise

Featur	**Control (n =70)**	**Hypertensive (n =50)**	**Obese (n =54)**	**Hypertensive & Obese (n =42)**
SBP (mm Hg)	165.84 ± 25.87 C	175.89± 22.96 B	173.92 ± 23.94 B	181.87± 21.98 A
DBP (mm Hg)	76.42± 10.26 C	84.21± 15.12 A	80.98 ±16.11 B	88.10 ± 10.07 A
Heart rate (beat/min)	161.92 ± 20.21 A	155.86 ± 18.65 B	154.02± 20.08 B	154.04 ± 11.94 B

n: *number of cases*; "SBP: *systolic blood pressure*; DBP: *diastolic blood pressure*; Capital letters were used to explain the results of (post hoc LSD), multiple comparison test so that similar letters indicate no significant difference at $P > 0.05$, whereas different letters indicate significant difference at $P \leq 0.05$; letter (A) being the highest value"

Table-3: measurements of heart rate and blood pressure 15 minutes after rest

Feature	Control (n= 35)	Hypertensive (n=25)	Obese (n=27)	Hypertensive & Obese (n=21)
SBP (mm Hg)	165.99 ± 25.88 C	175.94± 22.89 B	173.89 ± 24.18 B	182.25± 22.01 A
DBP (mm Hg)	77.09 ± 10.08 C	85.21± 13.99 A	81.26 ±16.20 B	87.83 ± 10.06 A
Heart rate (beat/min)	162.10 ± 20.24 A	156.20± 18.07 B	153.78 ± 20.19 B	154.03 ± 12.30s B

n: *number of cases*; "SBP: systolic-blood/pressure; DBP: *diastolic-blood pressure*; Capital-letters were used to explain the results of (post hoc LSD multiple comparison-test) so that similar letters indicate no significant difference at $P > 0.05$, whereas different letters indicate/significant difference at $P \leq 0.05$; letter (A) being the highest value"

Discussion

The mean standard SBP of patient with hypertension and hypertensive/ obese patients in the present study was statistically significantly higher than that of control group and within the hypertensive range of more than 140 mm Hg, which indicate that the control of blood pressure of those patients was poor in spite of they have being managed for many years for hypertension . Mean DBP of the patient with hypertension and hypertensive obese patients on the other hand was also highly significant than that of control-group ,but the mean DBP was in normal usual range less than 90 mm Hg. Also baseline-mean HR was of all groups was in normal usual limit (60 to100 beat/minute) in spite of some significant difference between groups.

Under-controlled BP in patients with hypertension joined in this study can be explained by insufficient compliance with drug treatment, in-adequate dietary salt intake or, to a lesser scope, due to compassionate flooding in this medical situation. In fact strict blood-pressure is compulsory for those patients so to avert life/threatening cardio-vascular and cerebro-vascular problems.

In extreme exercise, systolic and DBP mean from hypertension patients have got the highest levels compared to the control and obese patients groups; the later also experienced more than usual mean diastolic and SBP but the level was lower than high blood pressure patients. In terms of HR, it was lower in patients with hypertension and obese patients compared to the control groups, where the lowest level in hypertension group. Though, after 15 min., it was noted that high blood pressure and obese patients unable to return to baseline readings. This was also the case for the control group; yet the BP readings were higher in patient with hypertension /obesity than in control group while meaning of HR was lower in patients than in control group.

Systolic and DBP shown to reduced following regular exercise in patients with high BP [25] and is usually suggested by inter-national guidelines [26, 27]. However, guide-lines do not reveal anything about exercise counsels for patients with resistant hypertension and high BP/ obese patients. Continued physical action is associated with lower risk of mortality and cardio-vascular problems in high BP patients who are shown to be impervious to the usual guidelines of the management [28]. Though still no proof for the benefits of frequent physical activity for resistant hypertensive

patients, a number of studies have been conducted that have yielded promising results. A 8- 12 weeks program with an aerobic exercise [29], which contained of routine walking established with an interval training pattern, three times per week, will reduce 24hrs SBP by about (5.4±12.2) mmHg and 24-hour DBP by about "(2.8±5.9) mmHg. Furthermore, reduction of systolic and diastolic blood pressure at daytime by (5.9±11.6) mmHg and {3.3±6.5} mmHg and reduction of systolic and DBP at nighttime by 3.8±17.1 mmHg and 1.9±8.2 mmHg, respectively (29). This reduction in BP was also seen in succeeding researches with training exercise based on heated water [30-32]".

Even with these suggestions regarding the advantage of do exercises, we saw in the present study, temporary improvement of peaks in BP which may be convoluted by life threatening conditions like dissection of aorta and thrombo-embolism. so, we are recommended that exercise in obese and patients with high blood pressure should started regularly with continuous ambulatory monitoring in order that unnecessary rapid elevation of BP levels is prevented.

Ethical Clearance: The Research Ethical Committee at scientific research by ethical approval of both MOH and MOHSER in Iraq

Conflict of Interest: None

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