

## Effect of Aerobic Exercises Training in the Reduction of Blood Pressure for Patients with hypertension

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### Abstract:

**Background:** Hypertension is a very prevalent cardiovascular disease. Medication cannot cure hypertension but it can help to control blood pressure (BP). All current treatment guidelines emphasize the role of non-pharmacological interventions. **Aim:** to evaluate effect of aerobic exercises training in the reduction of blood pressure for patients with hypertension. **Sample & setting:** 80 adult female patients with hypertension. They were allocated randomly into two groups, study and control (40 patients each) who were referred to outpatient clinic of El Minia University hospital with the following criteria; their age ranged between 20-59 year, suffering only from hypertension, which was mild & moderate hypertension. **Tools:** used for data collection were 1) Interview questionnaire data includes a) socio-demographic data. b) Knowledge assessment sheet 2) Patients practice for aerobic exercise training program to monitor blood pressure (BP) for study group. Each patient received three sessions per week for a period of three months. BP was measured at randomized trials during a cycle ergometer exercise for the control group. **Results:** This study revealed that, post aerobic exercise leads to a significant reduction in systolic BP ( $141.0 \pm 7.21$  to  $132.2 \pm 23.4$  mmHg;  $P=.000$ ) and diastolic BP ( $87.7 \pm 7.32$  to  $85.0 \pm 6.5$  mmHg;  $P=.000$ ) Also there were statistically significant differences with patient's knowledge between study and control group. **Conclusion:** aerobic exercise decreases BP in mild and moderate hypertensive patients and patients who received knowledge about disease were improved than patients who did not receive it. **Recommendation:** aerobic exercise training is an important initial or adjunctive step in the reduction of BP for patients with mild to moderate hypertension. Also education of hypertensive patients is necessary to achieve an optimum level of healthy life.

**Key words:** hypertension, aerobic exercise, blood pressure, knowledge, patients

### Introduction:

**World Health Organization (WHO) (2011)** defined hypertension as a health disorder where blood is forced strongly against the blood vessels walls. This condition would increase the work load of the heart causing it to work harder. If the blood vessels are ruptured it cause fatal or other problems to the coronary arteries, kidneys, eye & brain (**Chobanian et al., 2003**). There are two types of hypertension that have been diagnosed, primary & secondary, about 90–95% of cases categorized as primary hypertension, it is closely

related to the life style and the remaining 5–10% of cases considered as secondary hypertension are related to medical condition.

**Carretero and Oparil (2009)** Classified Blood pressure according to systolic and diastolic BP. The normal values for systolic BP are (90-119 mmHg) & diastolic BP (60-79 mmHg). If the systolic or the diastolic blood pressure measurement is higher than the accepted normal values for the individual, it is classified as mild (pre-hypertension), moderate or severe

hypertension. Pre-hypertension or mild hypertension include systolic BP (120-139 mmHg) & diastolic BP(80-89mmHg), moderate hypertension include systolic BP(140-159mmHg) diastolic BP(90-99mmHg)severe hypertension include systolic BP( $\geq$ 160mmHg), and diastolic BP( $\geq$ 100mmHg) these classifications are made after averaging a patient's resting blood pressure readings taken on two or more office visits

The Arab Republic of Egypt, it is rapidly developing country with a change that influenced the lifestyle of the people wards urbanization, particularly over the past 3 decades. Previous surveys from Egypt suggested that hypertension is present in epidemic proportions throughout the country with exceedingly high rates concentrated in urban areas (**Alzaid, 1997**).

Systemic arterial hypertension is a highly prevalent disease, affecting approximately one billion individuals worldwide (WHO).In Egypt, the prevalence of hypertension is from 24-26 % of all population (**Khoujh, 2007**). In Minia Governorate, the number of hypertensive patients referred to our patients in Minia university hospital is 1233 male and 1471 female (**Information data of statistical office in Minia Univeristy Hospital, 2011**).Systemic arterial hypertension treatments include lifestyle modifications and pharmacological interventions. However, major pharmacological trials have demonstrated that maintaining BP at normal levels is difficult with only 25 to 62% of patients being properly controlled by lifestyle modifications, physical activity especially aerobic exercise is important because it has been associated with a lower incidence of hypertension in different populations (**Chobanian et al., 2003**).

Aerobic exercise is the exercise which increases the body's need for

oxygen, so blood delivers oxygen to the body; aerobic activity challenges the heart & circulatory system to meet this increased need. **Mayo Clinic (2011)**, identified aerobic exercise as a traditional exercise for example, walking, running, dancing, swimming &climbing stairs& jogging.....etc

According to **American heart Association (2011)** the heart functions similar to other muscles in the body; when it is exercised it becomes stronger. A stronger heart will be able to pump more blood to the body with each beat, doing so with less effort. This puts far less strains on the heart & decreases the risk of cardiovascular diseases.

A human body contains a mechanism called baro-reflex carried out by special cells called baroreceptors .These cells are specified to measure & adjust BP for normal body functioning .During exercise these cells get stimulated resulting in their increased efficiency to control BP (**Julius, Kjeldsen & Weber , 2004**).

Exercise is one of the best ways to prevent or control hypertension. Most of researches on high BP & exercise indicate that frequently all types &intensity of aerobic exercise can lower BP. Engaging in 30 minutes of moderate –level exercise can lower high BP by anywhere from 2.5 to 25mmHg (**American College of sports medicine , 2011**). Those individuals who participate in aerobic exercise regularly tend to have reductions in resting BP (**Guimaraes, Carvalho & Bocchi, 2008**).

Moreover **Mancia, Debacker & Dominiczak (2007)** added that such a chronic condition requires life style modification, which can be developed from a thorough understanding of the disease process, and the management challenges by the patient and family members. This pre-supposes a need for some form of hypertensive education

and counselling for the patient and family members. According to **Colpent (2007)** educating and supporting hypertensive patients in changing of their life style are important goals.

#### **Significance of study:**

Hypertension is present in epidemic proportions in adults of most societies and is associated with a markedly increased risk of developing numerous cardiovascular diseases about 60 million individuals suffer from hypertension American only (WHO). In Egypt, the prevalence of hypertension is from 30-35 % of all population (**Ibraheem & Omar 2011**). There is a continuing debate as to the efficacy of aggressive pharmacological therapy in individuals with mild to moderate elevations in blood pressure this has led to a search for nonpharmacological therapies, such as aerobic exercise training, for these individuals (**American Council on exercise , 2011**). So, choice of aerobic exercise effect on hypertensive patient is very essential for the prevention, reduction & control of hypertension.

#### **Aim of study:**

The aim of this study was to evaluate the effect of aerobic exercises training in the reduction of blood pressure for patients with hypertension at EL Minia Governorate.

#### **Research hypothesis:**

- Aerobic exercises causes reduction of blood pressure in study group

#### **Subjects and Methods**

##### **Research Design:**

A Quazi-experimental research design was utilized to fulfill the aim of the study.

##### **Setting:**

The study was conducted in outpatient clinic of El Minia University hospital

##### **Subjects:**

A purposeful sample of eighty volunteers' of hypertensive patients were selected from the hypertension group at outpatient clinic of El Minia

University hospital. Patients included in the study were selected according to the following criteria: free from any disease (hypertension only), been mild & moderate hypertension, ambulatory, level of education, their age ranged between 20-59 years and agree to participate in the study.

#### **Tool for data collection:**

Based on designed questionnaire sheets which were prepared by the researchers to collect data about the following:

1. **Assessment sheet of patients with hypertension practicing exercises:**  
Comprised two parts:

##### **Part I: Socio-demographic**

##### **characteristics of patients including:**

Age, sex, marital status, educational level and occupation, daily activities, antihypertensive medication time....etc.

##### **Part II: Pre/ post knowledge test:** including the following items:

Meaning of hypertension, clinical manifestation, how to measure BP, measure to minimizing complications.....etc.

##### **Scoring system for nurses' knowledge:**

Total score of nurses knowledge about hypertension was (11) questions. Each right answer was given one score and each wrong answer was given zero with.

##### **2. Observational sheet of patients:**

Consisting of 6 items. This tool was used for study group each patient received to three sessions per week for a period of three months with monitoring (BP). Each session lasts from 15-80minutes median (40m) after exclusion of warm up & cold down on a cycle ergometer exercise and involved mainly walking, running, jogging & climbing stairs. This tool which consists of 6 questions related to number of sessions every week, types of aerobic exercise used, time of

session, and measure of BP and heart rate before , immediately after session& then after 30 minutes of session .But control group was randomized control trials BP during exercise.

Tools were tested for their content validity and clarity by 5 experts in nursing field and doctors specialized in the management of patients with hypertension and appropriate modification was done accordingly

***Ethical and administrative considerations:***

Permission to conduct the study was obtained from the responsible authorities of Minia University Hospital after explanation of its purpose. The volunteers read a detailed description of the protocol and provided written informed consent was obtained from each participating patients to be included in study .Clarification of the nature and purpose of the study was done on initial intervention with each patients. All Participants were informed about their right to withdraw from the study at any time and confidentiality was assured.

***Pilot Study:***

A pilot study was carried out after the development of the tools. It was carried out on 10% of the study sample to test applicability of the tools of the study. The necessary modifications prior to final application of the study tools were done. These patients were not included in the actual study.

***Field work:***

After making the necessary modification to ensure the clarity of the study tools, the actual data collection was started from June to September 2010. The researcher filled the data collection tools within 15-20 minutes before exercise sessions. Then subjects were divided randomly into two groups study & control (40 patients).

***The Study Group:***

Forty hypertensive patients were divided into 2 small groups (20

patients) in each group according to age, gender and educational level. Each group divided into 3 sub group (6-7 Pts). Each group had 3 sessions per week for a period of 3 months (36 sessions). Each subgroups practice their training in morning, mid day and night time for one month for each time, then alternation for the times between subgroups. So, blood pressure was monitored all the day time for every patient in rehabilitation centers and garden of hospitals.

Each session's lasts form 15-80 minutes after the exclusion of warm – up & cold –down activities involve mainly walking, running, jogging and climbing stairs. Before beginning any sessions usually started by measuring of blood pressure (before exercise), immediately after a session and then after 30 minutes (post-exercise). Before beginning of the sessions, discussion of the booklet was done for each patient .The studied and control group members were assessed two times, through the first interview and in the termination of three months later for knowledge. The educational booklet was developed by the researcher based on identifications of patients needs. During sessions patients were informed about hypertension as a disease and how to do aerobic exercise, in a simple way using colored photos & simple diagrams.

***Statistical design:***

Collected data were verified prior to computerized data entry. Descriptive statistics were calculated (e.g., frequency, percentage, mean and standard deviation). Testing hypotheses was applied to check the significance of differences between levels (scores) before and after application of the protocol. Chi square, NOVA test and P-value (probability to reject a correct null hypothesis or type I Error) was considered if P-value is less than 0.05.

## Results:

**Table (1):** Shows that most of study & control patients aged more than 40 years old, married (97.5%), educated; either read & write till highly educated (32.5%, 45%) (35%, 22.5%) respectively. And (50%, 57.5%) are working.

No statistically significant difference was found as regards the socio-demographic variables between the two groups examine.

**Table (2)** shows that: majority of both study & control groups were (72.5%, 65%) of the patients suffering from elevated blood pressure since 1-5 years, (60%, 65%) of them are not taking any antihypertensive medications and (32.5%, 30%) are taking beta blocker once daily.

No significant differences has put into evidence between the two groups in relation to medical data.

**Table (3):** show that an improvement in mean before & rest systolic BP ( $141.0 \pm 7.21$  to  $132.2 \pm 23.4$ ), pre & rest diastolic BP ( $87.7 \pm 7.32$  to  $85.0 \pm 6.51$ ) Moreover, a highly statistically significant difference was found between before & rest exercise BP ( $P=0.000$ ). Also there was improvement in mean heart rate before & rest heart rate ( $75.2 \pm 9.2$  to  $70.7 \pm 9.5$ ). Moreover, Statistically significant difference was found ( $p=0.000$ ) for mean systolic and diastolic and heart rate measurements before starting exercises and after 30 minutes rest post exercises

**Table (4):** shows that: an improvement in mean & stander deviation pre & rest systolic and diastolic blood pressure for patients taking antihypertensive medication ( $140.7 \pm 7.93$ ,  $87.3 \pm 6.53$  to  $134.8 \pm 8.04$ ,  $84.08 \pm 6.67$ ) respectively, and before & rest systolic and diastolic BP for patients not taking antihypertensive

medication ( $142.4 \pm 8.06$ ,  $89.3 \pm 8.57$  to  $136.7 \pm 9.13$ ,  $87.5 \pm 7.34$ ) respectively.

There was no Statistically significant difference between systolic and diastolic blood pressure for patients taking or not taking antihypertensive medication at pre session ( $p=0.798$ ) & after 30 minutes rest post session ( $p=0.260$ )

**Figure (1):** illustrated that, a highly statistically significant relation in BP. Before session & after 30 minutes of sessions (Rest) in study group. But in control group, no changes were observed before and after 30 minutes from measuring BP.

**Table (5):** shows that: an improvement in mean knowledge scores of study group Subjects throughout the post knowledge ( $9.725 \pm 1.44$ ). Moreover, highly statistically Significant differences were found among the study group compared with control group ( $P = 0.000$ ), in the post knowledge.

## Discussion:

Findings of this study revealed that the highest percent of the sample were between 40- <50 years of age. Which supported by **Vasan et al., (2001)** who stated that although hypertension can occur at any age, the greatest incidence is among those aging 35 to 55 years.

As regards the marital status in this study, most of the female patients in the study & control group were married. The incidence of hypertension disease was found higher in married patients than singles. These results may be related to increased age of married patients. The same results were found in married patients more than single (83.3%, 16.7%) respectively by **Carvalho et al., (2008)**.

In relation to occupational status the results of the present study revealed

that more than half of patients in control group have work and half of the study group have work & This finding was supported by Taylor- Tolbert et al., (2001) was found that mild & moderate hypertension affect all population.

The present finding revealed that decreased systolic BP 5-9 mmHg ,diastolic BP3-5 while **Hagber and Brown (2010)** reported that aerobic exercise reduction of BP averaging approximately 8 and 11 mmHg in systolic & 2-5 mmHg in diastolic respectively .

The average of BP reduction observed after exercise was similar to the post-exercise BP reduction described by **Park, Jastremaki and Wallace (2005)** and **Santos-Silva et al., (2007)**who have shown that a single set of aerobic exercise can decrease rest BP to below basal level in mild and moderate hypertensive patients & that hypotensive effect remains for several hours after exercise. This result disagreement with **Pikkujamsa et al., (2007)** who reported that no reduction of BP post exercise; these discrepancies may be caused by the different intensities of the exercise performed.

Concerning patients take and don't take anti hypertensive medication. This study finding showed that ,there was no statistically significant observed Post-aerobic exercise BP reduction occurs in patients taking and don't take anti hypertensive medication, Our results agree with **Thiele, Pohlink and Schuler (2011)** who showed that no difference between, mild or moderate hypertensive patients treated or untreated in BP post aerobic exercise .This finding is incongruent with that of **Alessi et al., (2005)** who mentioned that post-aerobic exercise BP reduction is only significant in untreated hypertensive patients only. While **Julius et al. (2004)** opposed current study result who reporting that BP levels of treated hypertensive patients

were lower than the BP levels of untreated hypertensive.

In the present study, it was observed that, there were three different time of day in value of BP that reduced after aerobic exercise. This was supported by **Pierdomenico (2007)**who stated that the different times didn't affect the reduction of BP post exercise but any exercise that affect on decreased BP even little reduction in BP.

Another important point of our study is the tested group are exposed to session period (exercise vs. nonexercise) this interval varied from 1-2 days ,to allow regulation of BP. by the effect of exercise ,this finding is in agreement with **Taylor-Tolbert , Dengel and Bocchi (2001)** who reported that post exercise hypotension may persist for up to 22 hours after exercise.

Exercise causes a natural rise in BP as the oxygen demands of the body increase in response to the stress of training, and decreases in resting BP by physical exercise may be related to reduced peripheral resistance rather than cardiac output. Two mechanisms have been proposed to explain this decrease in peripheral resistance: sympathetic inhibition and altered vascular responsiveness after exercise. Also Blunted vascular responsiveness to  $\alpha$ -adrenergic stimulation as well as increased local release of nitric oxide, prostaglandins, , and ATP, are also factors associated with changes in vascular responsiveness after acute exercise and may have also contributed to the post-exercise BP reduction observed in this study (**Mayo Clinic, 2011**).

The present study findings reported that, there was a statistically significant difference among the study group pre/post educational regarding to disease; differentiate between systolic &diastolic BP, risk factors that increase

BP, effect of aerobic exercise in decreasing BP. This is similar to **Borlaug et al., (2007)** who reported that, patients who received continuous education had increased patients knowledge. This was parallel with **Montgomery and Bratton (2009)** who stated that participation in educational & practical session of aerobic exercise significantly helped improvement of knowledge.

#### Conclusion:

Based on the results of the present study, the following had been concluded:

- Aerobic exercise sessions reduced blood pressure for mild & moderate hypertensive patients.
- There were insignificant relationships between age, time of

doing exercise & taken or not taken anti hypertensive medication and reduction post exercise BP. Moreover, the result revealed that, there were significant differences among those who participate compared to those who didn't participate as regards knowledge related to the disease

#### Recommendations:

- Health education plan must be available for the patients and their families to explain the importance of aerobic exercise in reduction of BP for hypertensive patients.
- Studies on similar context but with wider scope and larger sample size are recommended to confirm finding of this study

**Table (1): patient's characteristics of study and control group**

Groups Variable	Study group (n = 40)		Control group (n = 40)		X <sup>2</sup> p. value
	No.	%	No.	%	
<b>Age group :</b>					
25 - < 40	4	10.01	3	7.5	X <sup>2</sup> = 1.477 P < .402
40-< 50	25	62.5	21	52.5	
50 : 59	11	27.5	16	40.0	
<b>Marital status :</b>					
Married	39	97.5	39	97.5	X <sup>2</sup> = .000 P < 1.000
Single	1	2.5	1	2.5	
<b>Level of education :</b>					
University	14	35.0	9	22.5	X <sup>2</sup> = 2.270 P < .518
Secondary	11	27.5	12	30.0	
read & write	13	32.5	18	45.0	
Illiterate	2	5.0	1	2.5	
<b>Occupational status:</b>					
Work	20	50.0	17	42.5	X <sup>2</sup> = .453 P < .501
Not work	20	50.0	23	57.5	

**Table (2): Percentage distribution of the sample according to medical data**

Groups variables	Study group (n =40)		Control group (n = 40)		X <sup>2</sup> p. value
	No.	%	No.	%	
Disease duration					
1 - <5	29	72.5	26	65.0	X <sup>2</sup> = .764 P < .858
5-10	6	15	9	22.5	
>10 years	5	12.5	5	12.5	
Anti-hypertensive Medication					
Taken					X <sup>2</sup> = .213 P < .644
Not taken	16	40.0	14	35.0	
	24	60.0	26	65.0	
Type of antihypertensive					
B- blocker	13	32.5	12	30.0	X <sup>2</sup> = 4.933 P < .294
Ca channel blocker	3	7.5	2	5.0	
Frequency of antihypertensive					
One time	14	35.0	12	30.0	X <sup>2</sup> = .482 P<.786
Two time	2	5.0	2	5.0	

*Peak BP: means measuring BP immediately after sessions*

*Rest BP: means measuring BP after 30 minutes of sessions*

**Table (3): Mean systolic and diastolic Bp, HR measurement before and after exercises for 3 minutes of aerobic exercise**

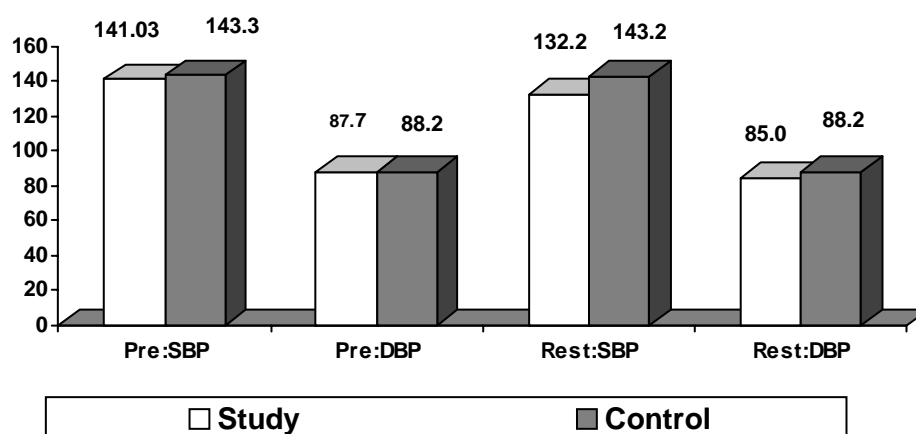
Monitoring BP (mmHg) & Heart rate (b/min)	Study		
	Mean	S.D	P. Value
<b>Measuring Systolic of B.P:</b>			
Pre session	141.03	7.21	0.000*
Peak BP	214.0	26.7	
Rest BP	132.2	23.41	
<b>Measuring diastolic of B.P</b>			
Pre session	87.7	7.32	0.000*
Peak BP	106.0	11.1	
Rest BP	85.0	6.51	
<b>Heart rate (b/min)</b>			
Pre session	75.2	9.2	0.000*
Peak BP	160	9.0	
Rest BP	70.7	9.5	

(\*) Statistically significant at  $p < 0.05$



**Table (4): Differences between patients post exercise BP and patients taken and not taken antihypertensive medication:**

Medication & Monitoring BP	Taken anti hypertensive medication		Not Taken anti hypertensive medication		Sign.
	Mean	S.D	Mean	S.D	
Monitoring B.P pre session:					
Systolic	140.7	7.93	142.4	8.06	P=.798
Diastolic	87.3	6.53	89.3	8.57	
Monitoring Rest B.P after session:					
Systolic	134.8	8.14	136.7	9.13	p=.260
Diastolic	84.08	6.67	87.5	7.34	

**Figure (1): Differences between study & control group related BP****Table (5): Differences between study and control group subjects in relation to the mean knowledge scores through the study period**

Group stages	Study group (n = 40)		Control group (n = 40)		Sign.
	Mean	S.D	Mean	S.D	
Pre knowledge	3.125	2.311	2.92	1.73	P = 0.000*
Post knowledge	9.725	1.44	2.92	1.73	

(\*) Statistically significant at  $p < 0.05$

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