Effect of Lifestyle Modification in Hypertensive Patients in Greater Cairo

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Abstract

Introduction: The World Health Organization has estimated that hypertension causes one in every eight deaths, making it as the third leading killer in the world. In Egypt, 2004, hypertension reached about 26.3% of whole population. Lifestyle modifications have an important role in the management of patients with hypertension; when used effectively.

Objective: to assess efficacy of lifestyle modifications on hypertensive patients, and also assessing their compliance towards lifestyle modifications advice**.**

Subjects and Methods: An intervention study was carried out on 448 hypertensive patients recruited among those attending 5 accredited health centers in greater Cairo from May 2007 to March 2008. Patients were divided into 2 groups: case group (240 patient) & control one (248 patient). Both groups were examined for baseline data: blood pressure, obesity parameters & lipid profile & fulfilled a pre-coded questionnaire containing the relevant variables. Then only intervention group was submitted for 3 months to an educational program about lifestyle modifications, while control group received routine outpatient services & asked to maintain their usual lifestyle including dietary & exercise habits. After 3 months both groups were re-examined for the same baseline data done before 3 months. Administrative and ethical issues were followed in all stages of the study, and appropriate statistical design and tests of significance were performed.

Results: The results of this study showed the following findings: Applying of a Comprehensive lifestyle modifications program including regular physical activity, reducing salt intake, weight reduction …etc. had a direct beneficial effect on lowering both systolic and diastolic blood pressure, weight & lipid profile of the studied cases. Low rate of regular physical exercises practicing by the studied cases was detected before the intervention .There was a good compliance of the studied cases towards practicing regular physical activities, consuming little salty & starchy foods, excess vegetables, fruits, fish & using plant oil in cooking, while they were un-compliant as regards drinking coffee or tea, consuming eggs ,sweets & quitting smoking.

Conclusion & Recommendations: the study concluded that modifying life style lowers level of blood pressure, lipid profile and minimizes the use of Anti-hypertensive, and recommended: increasing the awareness of hypertensive patients about lifestyle modifications program and its importance to control their high blood pressure through health providers or health educators. Ensure more focusing on lifestyle modifications as preventive and curative measures for hypertension in medical curricula. Further research based on evidence based guidelines to improve health related quality of life of hypertensive patients should be encouraged.

Introduction

WHO has estimated that high blood pressure causes one in every eight deaths, making hypertension the third leading killer in the world. Globally, there are one billion hypertensive patients and four million people die annually as a direct result of hypertension.

The estimated prevalence of hypertension in Egypt was (26.3%) of population.[1 & 2].

The Seventh report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure [3] classified blood pressure for adults aged ≥ 18 years as the following table:

Blood pressure classification	SBP (mmHg)	DBP (mmHg)
Normal	< 120	and < 80
Pre-hypertension	$120 - 139$	or $80 - 89$
Stage I hypertension	$140 - 159$	or $90 - 99$
Stage II hypertension	≥ 160	or ≥ 100

SBP: systolic blood pressure   DBP: diastolic blood pressure

Lifestyle can be defined as ways of living based on identifiable patterns of behavior which are determined by interplay between an individual personal characteristic, social interaction, and socio-economic and environmental living conditions [4].

A variety of lifestyle modifications have been shown, mostly in observational studies including reduction of dietary sodium intake, weight loss in the overweight, physical activity & DASH diet with smoking cessation. The last increases the risk of heart attack or stroke at least three-fold in hypertensive patients [5&6]

The DASH diet (Dietary Approaches to Stop Hypertension) is a dietary pattern promoted by the U.S.-based National Heart, Lung, and Blood Institute The DASH diet is rich in fruits, vegetables, whole grains, and low-fat dairy foods; includes meat, fish, poultry, nuts and beans; and is limited in sugar-sweetened foods and beverages, red meat, and added fats. In addition to its effect on blood pressure, it is designed to be a well-balanced approach to eating for the general public. It is now recommended by the United States Department of Agriculture (USDA) as an ideal eating plan for all Americans [7].

Adoption of healthy lifestyle by all individuals is critical in the prevention of high blood pressure and an indispensable part of the management of those with hypertension. Lifestyle modifications decrease blood pressure, enhance antihypertensive drug efficacy and decrease cardiovascular risk. [8 & 9]

National Heart, lung & blood institute, [10] stated that a regular aerobic physical activity (e.g. brisk walking) at least 30 minutes per day, most days of the week will decrease blood pressure by 4 – 9 mmHg.

Modification of life style of life is an important area for prevention and control of high blood pressure

Subjects and Methods:

An intervention study was carried out in 5 accredited health centers in greater Cairo: three health centers in Cairo (Elhay Elsadis, Elmahkamah and Eldarasa), one in Giza (El-Monib), and one in Qalubia (Kablat). 488 hypertensive patients were recruited according to selection criteria and divided randomly into intervention and control groups (240 cases and 248 controls) (first patient was taken in intervention group and the next was taken in control group and so on).

Selection criteria: patients who are 25 – 65 years, hypertensive, able to walk for recommended periods [30 minutes /day] and not suffering from heart diseases interfering with activities. The patients were excluded if they regularly used drugs that affect lipids.

At the beginning of the study, baseline data were taken for both groups which were: blood pressure, BMI, waist circumference and fasting lipids levels, in addition to fulfilling a pre-coded questionnaire containing the relevant variables: socio-demographic data, regular physical activities, dietary & smoking habits.

Then, only intervention group: was submitted for 3 months to an educational program about lifestyle modifications (weight reduction, dietary sodium reduction, regular physical activity, smoking cessation…etc), until re-examined after 3 months with the control group which was not given this program but, asked to receive the routine outpatient services and maintain their usual lifestyle including dietary and exercise habits until they reexamined. Program of lifestyle modification consists of 4 health education classes and monthly individual counseling sessions for all intervention group patients .The measurements and investigations of control group were the same as intervention ones.

Interviewing patients using the questionnaire and measurements of blood pressure, weight, height and waist circumference were carried out for every patient (5 minutes). Then the patient was counseled for 7 minutes about lifestyle modifications. At the end of the counseling, the researcher gave the patient the preset brochure to be read and set an appointment for testing fasting lipid levels instructing him to fast for 12 – 14 hours.

Fasting lipid profile levels were done for only 50 patients in each group (chosen randomly) & carried out in Al-Hussein hospital lab. Administrative and ethical issues were done before beginning from MOHP. Descriptive and analytic statistics were done. The lowest accepted level of significance was 0.05 or less.

Aim of the work:
Ultimate objective: To improve the health status of Egyptian hypertensive patients.
Immediate objectives**:** To assess the efficacy of lifestyle modifications on hypertensive patients and to assess their compliance towards lifestyle modifications advice.

Results
Table (1): showed the demographic characteristics of the studied sample.
The most prominent findings were: Mean age was 52.95± 6.76 years and 53.10 ± 6.62 for case and control group respectively. Females represented the larger proportion of both case & control groups (nearly 65%). Illiterates constituted the greater proportion of persons (about 43%) of both groups. None working represented (54.2 %) of cases & (49.2%) of controls while (3.3%) and (3.6%) respectively were employed .All these results were statistically insignificant between both groups.
Table (2): demonstrated comparison between cases & controls as regards physical activity habits at the baseline of the study: minority of case (4.6%) & control group (6%) showed regular physical activity as (walking/ running). Majority of cases (67%) & controls (70%) agreed to change their physical activity habits. About(70%) of both groups spent 5 hours or more daily in sitting or watching T.V. Concerning knowledge about benefits of practicing regular physical activity :only (about 27%) of both case & control groups thought that regular physical exercises helps reduction of blood pressure, with no significant differences between cases and controls at the baseline level.
Table (3): After 6 months: Percentage of those practicing regular physical exercise rose among cases to be (12.5%) versus (6%) of controls after intervention, also (60.8%) of cases agreed to change their physical activity habits Compared to (69.4%) of controls .Also (70%) of cases used to spend 5 or more hours per day in sitting or watching T.V. compared to (68.9%) of controls. About benefits of practicing regular physical exercises, percentage of those who stated that it decreases blood pressure rose to (82%) of cases versus (29%) of controls with highly significant differences between cases and controls.

Table (4): showed comparison between cases & controls as regards dietary habits at the baseline of the study: Majority of cases (91%) and control (89%) groups used to consume plant oils in their cooking. Majority of cases (63%) and controls (62%) used to consume 3 cups or more of tea /coffee per day. It was noticed that about (15%) of both case and control groups used to add little amounts of salt to their foods, while those added excess amount were about (11%) of both groups. About (70%) of both case & control groups were consuming starchy foods 5 times or more per week. Vegetables and fruits: were ingested by majority of studied cases and controls (about 70%) 5 times or less weekly. Ingesting sweets 3 times or more per week was recorded by about one third of both cases and control groups. Most of cases & controls (92%) used to eat eggs 5 times or less per week. Regarding eating fish, the prominent finding is that about three quarters of both case & control group never eat fish at all. All the above mentioned results showed insignificant differences between cases and controls at the baseline level.
Table (5): showed Percentages of change of dietary habits after 6 months:
- Fat consumption: majority of cases (93.8%) used to consume plant oils in cooking and only (6.3%) of cases used cream or butter in cooking, while controls figures still the same as before intervention, with no statistically significant difference between cases and controls after 6 months.
- Consumption of tea & coffee cups per day: Still (64.2 %) of cases versus (62.9%) of controls used to consume 3 cups or more of tea/coffee per day. no significant statistically differences between cases and controls.
- Among cases (7.9%) were found to add excess amount of salt to their foods versus (12.1%) of controls with a highly significant statistical difference between cases and controls.
- As regards starchy foods consumption: (35 %) of cases were consuming it 5 times or more compared to (59.7%) of controls. Statistically, there is highly significant difference between cases and controls after 6 months.
- Concerning fresh vegetables & fruits, (61.7 %) of cases were eating them 5 times or more/weekly, compared to (28.2%) of

control, with highly significant statistical differences between cases and controls.

- As regards ingesting sweets, figures did not differ much after intervention where also about one third of case and control groups were eating sweets 3 times or more per week, with insignificant statistical difference between cases and controls.

- The same findings after intervention were obtained as regards eating eggs 5 or less times per week by (92%) of both cases and controls. There is insignificant statistical difference between cases and controls.

- Regarding fish consumption: percentage of those didn't eat fish at all has declined to (40.8%) of cases versus (78.2%) of controls with highly significant difference between cases and controls after 6 months.

Table (6): Smoking habit: at the baseline of study, the percentage of those who were regularly smoking was (18.4%) versus (19.7%) of controls. Most smokers (more than 83%) of both groups were smoking at least 10 years. There are no statistical significant differences between cases and controls at the baseline level.

Table (7): The findings were more or less similar to that of base line, where (15.4%) of cases were still regularly smoking versus (19.7%) of controls, with no significant differences between cases and controls after 6 months.

Table (8): the mean systolic blood pressure at the beginning of the study was 143.99 ±9.8 mmHg of cases versus 142.86 +8.7 mmHg of controls. Mean diastolic blood pressure was 92.8 ±7.69 mmHg for cases and 91.7 ±9.1mmHg for control groups with insignificant statistical difference between cases and controls at the baseline level.

Table (9): As regards blood pressure after 6 months: the mean systolic blood pressure of the cases was 137.02 ± 9.95 mmHg compared to 143.10±9.3 mmHg of controls. The mean diastolic blood pressure of the cases was 89.42 ± 7.16mmHg compared to 91.9 ± 9.2 mmHg of controls. There is a highly significant statistical difference between cases and controls.

Table (10): At the beginning of the study: the mean total cholesterol, HDL, LDL and triglycerides of cases (50 cases) were 214.2 ± 32.8, 40.7 ± 8.9, 137.7 ± 33.6 and 152.1 ± 47.2 respectively compared to 218.6 ± 38.6, 40.5 ± 9.7, 143.2 ±27.2 and 153.1 ± 47.9 of

controls respectively. There are insignificant statistical differences between cases and controls at the baseline level.

Table (11): demonstrated the comparison between cases & controls as regards lipid profile after the intervention, the mean total cholesterol, LDL and triglycerides of cases (50 cases) were 196.4 ± 20.3, 115.3 ± 18.3 and 137.6 ± 39.8 respectively compared to 221.3 ± 31.4, 142.3 ± 27.0 and 154.1 ± 48.4 of controls respectively. Statistically, there are highly significant differences between cases and controls after the intervention.

Table (12): At the baseline level, the mean BMI and waist circumference of cases were 29.1 ± 3.52 degree and 110.2 ± 12.7 cm respectively compared to 28.6 ± 3.41 degree and 109.8 ± 11.8 cm respectively of controls with no significant differences between cases and controls.

Table (13): After 6 months of the intervention, the mean BMI and waist circumference of cases were 27.9 ± 3.11 degree and 107.1 ± 10.8 cm respectively compared to 28.9 ± 3.43 degree and 110.6 ± 12.3 cm respectively of controls with highly significant differences between cases and controls.

Discussion

In this study, the sample included 240 cases and 248 controls attending 5 accredited health centers in greater Cairo. The mean age ± S.D was about 53 ± 7 years for both groups. Females represented about two thirds of study sample (65.8 % of cases & 64.9% for controls) and this was in agreement with Cakir & Pinar [11] who conducted a study for testing lifestyle modifications on hypertensive patients in Turkey with a sample of 60 patients, where (61.2 %) of them were females. About half of both cases and controls were not working while only, about (3%) of both cases and controls were employed. This may be attributed to high percentage of females in the sample. Regarding education level of the studied persons, the greater percentage (43%) of cases & (42%) of controls were illiterate while those who had secondary or higher levels were about one fifth of cases & one quarter of controls. This was more or less similar to what concluded by Rozanski et al. [12] who carried out a study about relationship between education level and incidence of hypertension revealed that hypertension

tended to be higher among persons with lower education levels. Majority of both cases & controls (85%) had less than 500 L.E. monthly incomes and this may be attributed to high attendance of poor patients for receiving free medications for hypertension.

Regarding regular physical exercises,

Only 11 (4.6%) of cases and 15 (6%) of controls were regularly practicing physical exercises at base line. These figures have significantly changed to become 30 (12.5%) of cases and 15(6%) of controls after 6 months. These findings coincided with Whelton et al. [13] & Stewart et al. [14], who conducted studies to reveal the effect of aerobic exercise on hypertensive patients. They detected a low compliance of performing regular exercise in spite of a decline in blood pressure as 3.84 mmHg in systolic pressure and 2.58 mmHg in diastolic pressure. They attributed that to many obstacles that usually face regular physical activity practices as limited places for practicing, poverty, long time of work and laziness while, the remarkable change in physical activity practicing of cases in our study may be due to simplifying the practicing to be applied as a normal daily activity such as catching a bus from farther point, climbing the stairs instead of using elevators, walking to the markets instead of using transportation and walking to pray in a farther mosque.

Majority of studied cases and controls showed low level of knowledge towards benefits of practicing regular physical exercise for blood pressure, but favorable attitude towards changing physical activity habits. Siebenhofer et al. [15] & Sever & Messerli [16] ,obtained similar results & enumerated the benefits of regular physical activity as it decreases high blood pressure, helps weight reduction, improves lipid profile, reduces tension, helps control of DM, and enhance good sleep.

Generally, the compliance of cases in our study towards regular physical activity habits was good. Smith et al., [17] stated that patients should be advised to raise their compliance by taking up modest levels of aerobic exercise on a regular basis.

Dietary habits:

In the current study, about two thirds of cases & controls used to drink 3 or more cups of tea/coffee per day before and after the

intervention. This goes in line with Kasim et al. [18] who conducted a study to identify some lifestyle factors associated with hypertension in El-Hussein & Bab El-Shaeria hospitals, & concluded that drinking more than 3 cups of tea/ coffee per day was considered as a risk factor for hypertension .In our study, these findings may be attributed to difficulty of changing the habit of intake of tea because of its physical effect on mood of individuals and its association with social aspects as mentioned bySudano et al.[19].

Regarding sweet and starchy food consumption, it is noticed that, rate of eating sweets did not differ between cases and controls either before or after the intervention while starchy foods were consumed by about 70% of case and control groups at least 5 times weekly and these figures have been changed significantly after 6 months to be about 35% and 59% of case & control groups respectively. This is in accordance with Winkelmayer et al. [20] & Pereira et al [21] who conducted a study titled **"Effects of a low–glycemic load diet on resting energy expenditure and heart disease risk factors during weight loss"** and the study revealed that blood pressure improved more with the low–glycemic load diet. In our study, these results may be attributed to high consumption of starchy foods in the Egyptian community and the significant decline of its consumption may be attributed to focusing of intervention on decreasing these items that play an important factor of gaining weight which considered as an indirect factor of incidence of hypertension as stated by Yasser et al. [22].

Findings of eggs consumption per week showed that figures didn't differ either before or after the intervention for both case and control groups. Low compliance emphasizes the importance of educating hypertensive patients in special towards the presence of cholesterol in eggs and its consumption should be restricted as possible**.**

Regarding fish consumption, Base-line data showed that about three quarter of cases and control groups have never eaten fish before .This situation has been changed significantly after 6 months for only cases ,where the figure declined to (40.8%) for those who didn't eat fish. These changes may be attributed to relative low cost of fish compared to meat, also the beneficial effect of fish consumption on hypertension and lipid

profile which had been shown by many studies as Vaidya & Forman [23], Mori et al.[24] ,who stated that substituting fish for meat will help reduce total and saturated fat consumption and, by virtue of specific effects of omega 3 long chain polyunsaturated fatty acids in fish, may further reduce blood pressure and the risk of sudden cardiac death. Also, this is in accordance with (Daniels & Gidding [25] who conducted a study showed a reduction in blood pressure with fish intake plus weight loss approach.

Concerning salt intake, it was found that the percentage of those used to add excess salt to their food among cases only has declined significantly from (11.3%) to (7.9%). This in agreement with (He & Mac Gregor[26] & He et al.[27] who stated that all patients whose BP is greater than optimal (120/ 80 mmHg) could benefit from lower sodium intake. Also, Mancia et al. [28,])concluded that Sodium restriction alone can reduce BP in normotensive, prehypertensive, and hypertensive individuals, including the elderly.

As regards minerals & vitamins consumption which represented by fresh vegetables and fruits, only about (29.2%) of cases were consuming fresh vegetables and fruits 6 or more times weekly to be changed after intervention to become about two thirds of cases. This goes in line with the results stated by CDC [29] about the benefits of consumption of fresh fruits and vegetables, where they contain essential vitamins, minerals, and fiber that may protect from chronic diseases; including hypertension, DM and cancers. Also, this agreed with (Streppel et al. [30] & (Dickinson et al. [31] who carried out a study titled "Potassium supplementation for the management of primary hypertension in adults" which concluded that potassium supplementation (fresh fruits are rich source of potassium) appears to modestly lower the blood pressure in some normotensive and hypertensive humans.

Compliance of cases towards some dietary habits was unsatisfactory regarding consumption of tea or coffee, sweets and eggs, while it was satisfactory regarding salt added to foods, type of fat used in cooking, consumption of starchy foods, fish, fresh vegetables & fruits. Wetzels et al. [32] stated that poor or un-compliance of patients for any

disease usually constitutes a major cause of inadequate management.

Regarding smoking habit, data obtained from baseline study didn't differ much after 6 months, where about one fifth of cases and controls were regularly smoking before and after the intervention. Most of them (more than 80%) were smoking at least 10 years. This was stated by Kasim et al.[18] who conducted a study revealed that smoking was a risk factor of hypertension. In our study, compliance of cases towards quitting smoking was unsatisfactory. Smoking habit in many circumstances may convert to addiction especially after a long period.

In the concern of change of blood pressure , both systolic and diastolic blood pressure of control group didn't show any difference before & after the intervention in contrast to case group which showed a highly significant decline after the intervention either for mean systolic (by 6.97+0.13 mmHg)or mean diastolic blood pressure (by 3.38 +0.53 mmHg). Similar findings were recognized by Cakir & Pinar [11] who showed that the mean systolic & diastolic blood pressure of cases lowered by (8.8 $\pm$ 5.2 & 6.9+5.3 mmHg). While the mean systolic and diastolic blood pressure of controls were not lowered after the intervention, but elevated by about (1.2 $\pm$ 5.3mmHg & 1.6 $\pm$ 4.6mmHg) respectively.

As regards lipid profile of the cases group: total cholesterol, LDL and triglycerides had been decreased after the intervention by 17.8 $\pm$ 12.5, 22.4 $\pm$ 15.3 & 14.5 $\pm$ 7.4 respectively. For controls, only total cholesterol and triglycerides had been increased after the intervention, while LDL had been decreased and HDL are increased. These figures agreed with Mori et al. [24] who conducted a similar study showed that total cholesterol, LDL and triglycerides of cases had been decreased after the intervention by 27.7 $\pm$ 35.3, 28.9 $\pm$ 38.2 & 14.0 $\pm$ 25.9 respectively while HDL has been increased by 1.5 $\pm$ 5.2. For controls, total cholesterol had been increased after the intervention by 1.8 $\pm$ 19.3 while HDL, LDL and triglycerides had been decreased by 0.2 $\pm$ 3.9, 5.1 $\pm$ 15.6 & 11.2 $\pm$ 35.0 respectively.

Regarding the change of obesity parameters after the intervention, BMI and waist circumference of cases were decreased by1.20 $\pm$ 0.41 degree and 3.1 $\pm$ 1.9cm respectively without similar results in controls. Similar findings were recognized by Siebenhofer et al. [15] who conducted a study, showed that mean BMI & waist circumstances of cases were lowered by 1.5 $\pm$ 0.84 degree and 3.83+2.32 cm respectively, while mean BMI and waist circumference of controls didn't show remarkable change after 6 months.

CONCLUSION

According to the findings of the study and the interpretation of these results, the following has been concluded:

1. Applying of a comprehensive lifestyle modifications program including regular physical activity, reducing weight & salt intake besides, consuming excess vegetables, fruits & fish had a direct beneficial effect on lowering both systolic and diastolic blood pressure.

2. The program had a direct effect on BMI, waist circumference & lipid profile of the studied cases.

3. Low level of knowledge of the studied cases towards the relationship between regular physical exercises and control of high blood pressure was detected.

4. Good compliance of the studied cases towards practicing regular physical activity habits, consumption of starchy foods ,fish ,fruits & vegetables ,added salts to food & type of fat used in cooking.

5. Poor compliance of the studied sample towards quitting smoking, drinking tea / coffee & eating sweets and eggs.

Recommendations

Based on the results of this study and the conclusions, one can recommend the following:

1. Increasing the awareness of hypertensive patients about lifestyle modifications program and its importance to control their high blood pressure. This awareness can be carried out through health providers or health educators.

2. Organizing lectures, symposia, meetings and workshops for health providers about importance of lifestyle modifications in hypertension management.

3. Focusing on lifestyle modifications as a preventive and curative measure for hypertension in medical curricula.

4. Further research based on evidence based guidelines to improve Health Related Quality Of Life of hypertensive patients should be encouraged.

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Tables of the study:

Table (1): Socio-demographic characteristics of the studied sample:

Variables	Cases (n = 240)		Controls (n = 248)	
	No	%	No	%
Mean Age	52.95± 6.76		53.10 ± 6.62	
t test: 0.11 P > 0.05				
Sex				
Males	82	34.2 %	87	35.1 %
Females	158	65.8 %	161	64.9 %
χ^2 : 0.05 P > 0.05				
Occupation				
Not working	130	54.2%	122	49.2%
Unskilled worker	51	21.3%	51	20.6%
Skilled worker	51	21.3%	66	26.6%
Employed	8	3.3%	9	3.6%
χ^2 : 2.11 P > 0.05				
Education				
Illiterate	104	43.3 %	105	42.3 %
Read & write only	84	35.0 %	83	33.5 %
- secondary level	29	12.1 %	30	12.1 %
High+	23	9.6 %	30	12.1 %
χ^2 : 0.82 P > 0.05				
Marital status:				
Married	222	92.5%	230	92.7%
Widow	18	7.5%	18	7.3%
χ^2 : 0.1 P > 0.05				
Family income (L.E. / month):				
↓ 500	207	86.2%	213	85.9%
500 – 1000	33	13.8%	35	14.1%
χ^2 : 0.01 P > 0.05				

L.E.: Egyptian Pound

Table (2): Comparison between cases & controls by baseline physical activity habits:

Physical activity habits of cases & controls	Baseline			
	ases (n= 240)		ontrols (n= 248)	
	No	%	No	%
Pattern and Regularity of physical exercises				
Irregular/little /never	229	95.4 %	233	94.0 %
Regular walking	8	3.3 %	10	4.0 %
Regular running(football)	3	1.3 %	5	2.0 %
		χ^2: 0.63		P > 0.05
requency of physical exercises per week (cases, n =11) (controls, n =15)				
1 – 2 days	3	27.3 %	11	73.3 %
3 – 5 days	8	72.7 %	4	26.7 %
Odds ratio: 0.14 χ^2: 5.42 P = 0.05*				
Time spent sitting or watching TV per day				
-2 hours	11	4.6 %	11	4.5 %
3 – 5 hours	61	25.4 %	68	27.4 %
More than 5 hours	68	70.0 %	169	68.1 %
χ^2: 0.25 P > 0.05				
Agreement of change his physical activity habits				
Agreed	62	67.5 %	176	71.0 %
Disagreed	78	32.5 %	72	29.0 %
Odds ratio: 0.85 χ^2: 0.69 P > 0.05				
Opinion towards benefits of regular physical exercises*				
Helps weight reduction	35	97.9%	244	98.4 %
Decreases BP	67	27.9%	68	27.4 %
Decreases blood lipids	91	79.6 %	187	75.4 %
ecreases stress, anxiety & depression	25	10.4%	30	12.1 %
Helps DM control	74	30.8 %	78	31.5 %
χ^2: 1.14 P > 0.05				

*There were multiple question answers by studied cases & controls

Table (3): Comparison between cases & controls as regards physical activity habits after 6 months:

Physical activity habits of cases & controls	After 6 months			
	Cases (n= 240)		Controls (n= 248)	
	No	%	No	%
Pattern and Regularity of physical exercises				
Irregular/little/never	210	87.5 %	33	4.0 %
Regular Walking	27	11.2 %	0	4.0 %
Regular Running(football)	3	1.3 %	5	2.0 %
χ^2: 16.38 P <0.05*				
Frequency of physical exercises per week (cases, n =30) (controls, n =15)				
1 – 2 days	22	73.3 %	1	3.3 %
3 – 5 days	8	26.7 %	4	6.7 %
Odds ratio: 1.00 χ^2: 0.00 P > 0.05				
Time spent sitting or watching TV per day				
-2 hours	11	4.6 %	1	.5 %
3 – 5 hours	61	25.4 %	6	6.6 %
More than 5 hours	168	70.0 %	71	8.9 %
χ^2: 0.09 P > 0.05				
Agreement of change his physical activity habits				
Agreed	146	60.8 %	72	9.4 %
Disagreed	94	39.2 %	6	0.6 %
Odds ratio: 0.69 χ^2: 3.90 P < 0.05*				
Opinion towards benefits of regular physical exercises*				
Helps weight reduction	240	100.0%	43	7.9 %
Decreases BP	198	82.4%	4	9.8 %
Decreases blood lipids	217	90.4 %	90	6.6 %
Decreases stress, anxiety & depression	39	16.3%	1	2.5 %
Helps DM control	116	48.3 %	8	1.5 %
χ^2: 47.60 P < 0.01**				

*: significant   **: highly significant

***There were multiple question answers by studied cases & controls

Table (4): Comparison between cases & controls as regards dietary habits at the baseline of the study:

Dietary habits of cases & controls	Baseline			
	Cases (n= 240)		Controls (n= 248)	
	No	%	No	%
Type of fats used for cooking				
Plant oils	220	91.7 %	223	89.9 %
Cream / Butter	20	8.3 %	25	10.1 %
Odds ratio : 1.23 χ^2: 0.44 P > 0.05				
Number of stimulant beverages (tea, coffee,..)cups per day				
-2	87	36.2 %	22	37.1%
3+	153	63.8 %	156	62.9 %
χ^2: 0.09 P > 0.05				
Amount of salt in food				
little salt	38	15.8 %	38	15.3 %
normal salt	175	72.9 %	181	73.0 %
Salty	27	11.3 %	29	11.7 %
χ^2: 0.04 P > 0.05				
Consumption of starchy foods (potatoes, rice,..)(time / week)				
– 4	71	29.6 %	75	30.2 %
5+	169	70.4 %	173	69.8 %
χ^2: 0.03 P > 0.05				
Consumption of Fresh vegetables and fruits per week (time / week)				
-5	170	70.8 %	178	71.9 %
6+	70	29.2 %	70	28.2 %
χ^2: 0.77 P > 0.05				
Consumption of Sweets per week (time / week)				
-2	153	63.8 %	158	63.7 %
3+	87	36.3 %	90	36.3 %
χ^2: 1.81 P > 0.05				
Consumption of Eggs per week (time / week)				
Never	3	1.3 %	3	1.2 %
-5	221	92.1 %	229	92.3 %
6+	16	6.7%	16	6.5%
χ^2: 0.02 P > 0.05				
Consumption of fish (time/week)				
Never	178	74.2%	191	77.0%
Once/more	62	25.8	57	23.0%
X^2=0.56 P >0.05				

(5): Comparison Table between cases & controls as regards dietary habits after 6 months:

Dietary habits of cases & controls	After 6 months			
	Cases (n= 240)		Controls (n= 248)	
	No	%	No	%
Type of fats used for cooking				
Plant oils	225	93.8 %	223	89.9 %
Cream / Butter	15	6.3 %	25	10.1 %
Odds ratio : 1.68 χ^2: 2.38 P > 0.05				
Number of stimulant beverages (tea, coffee,..) cups per day				
-2 cups	86	35.8 %	92	37.1 %
3+ cups	154	64.2 %	156	62.9 %
χ^2: 0.37 P > 0.05				
amount of salt in food				
little salt	65	27.1 %	37	14.9 %
normal salt	156	65.0 %	181	73.0 %
Salty	19	7.9 %	30	12.1 %
χ^2: 11.88 P < 0.01**				
Consumption of starchy foods (potatoes, rice,..) (time / week)				
–4	156	65.0 %	100	40.3 %
5+	84	35.0 %	148	59.7 %
χ^2: 14.50 P < 0.01**				
Consumption of Fresh vegetables and fruits per week (time / week)				
-5	92	38.3 %	178	71.8 %
6+	148	61.7 %	70	28.2 %
χ^2: 56.47 P < 0.01**				
Consumption of Sweets per week (time / week)				
-2	168	70.1 %	158	63.7 %
3+	72	29.9 %	90	36.3 %
χ^2: 4.98 P > 0.05				
Consumption of Eggs per week (time / week)				
never	3	1.3 %	2	0.8 %
-5	223	92.9 %	229	92.7 %
6+	14	6.8%	16	6.5%
χ^2: 3.13 P > 0.05				
Consumption of fish (time/week)				
Never	98	40.8%	194	78.2%
Once/more	142	59.2%	54	21.8%
X^2=72.62 P <o.o1				

Table (6): Comparison between cases & controls as regards smoking habits at the baseline of the study:

Smoking habits of cases & controls	Baseline			
	Cases (n= 240)		Controls (n= 248)	
	No	%	No	%
Regularity and type of smoking				
Never /little/irregular smoke	196	81.7 %	199	80.3%
Regular Cigarettes smokers	27	11.3 %	37	14.9 %
Regular Shisha smokers	17	7.1 %	12	4.8 %
χ^2: 2.32 P > 0.05				
Duration of smoking				
< 10 years	5	11.4 %	8	16.3 %
≥ 10 years	39	88.6 %	41	83.7 %
Odds ratio: 0.66 χ^2: 0.47 P > 0.05				

Table (7): Comparison between cases & controls as regards smoking habits after 6 months:

Smoking habits of cases & controls	After 6 months			
	Cases (n= 240)		Controls (n= 248)	
	No	%	No	%
Regularity and type of smoking				
Never/ little / irregular smokers	203	84.6 %	199	80.3%
Regular Cigarettes smokers	23	9.6 %	37	14.9 %
Regular Shisha smokers	14	5.8 %	12	4.8 %
χ^2: 3.33 P > 0.05				
Duration of smoking				
< 10 years	5	13.5 %	8	16.3 %
≥ 10 years	32	86.5 %	41	83.7 %
Odds ratio: 0.80 χ^2: 0.13 P > 0.05				

Table (8): Comparison between cases & controls as regards blood pressure at the baseline of the study:

Blood pressure	Baseline		Difference	
	Cases (n=240)	Controls (n=248)		
	M ± SD	M ± SD	M ± SD	
Systolic blood Pressure	143.99 ± 9.8	142.86 ± 8.7	1.13 ± 1.1	
t test: 0.6		P > 0.05		
Diastolic blood pressure	92.8 ± 7.69	91.7 ± 9.1	1.1 ± 1.4	
t test: 0.8		P > 0.05		

Table (9): Comparison between cases & controls as regards blood pressure after 6 months:

Blood pressure	After 6 months		Difference	
	Cases (n=240)	Controls (n=248)		
	M ± SD	M ± SD	M ± SD	
Systolic blood Pressure	137.02 ± 9.95	143.10 ± 9.3	6.08 ± 0.65	
t test: 4.2		P <0.01**		
Diastolic blood pressure	89.42 ± 7.16	91.9 ± 9.2	2.28 ± 2.04	
t test: 4.2		P <0.01**		

** = highly significant

Table (10): Comparison between cases & controls as regards lipid profile at the baseline of the study:

Lipid profile	Baseline		Difference	
	Cases (n=50)	Controls (n=50)		
	M ± SD	M ± SD	M ± SD	
Total cholesterol	214.2 ± 32.8	218.6 ± 38.6	4.4 ± 5.8	
t test: 0.38		P > 0.05		
HDL cholesterol	40.7 ± 8.9	40.5 ± 9.7	0.2 ± 0.8	
t test: 0.01		P > 0.05		
LDL cholesterol	137.7 ± 33.6	143.2 ± 27.2	5.5 ± 6.4	
t test: 0.81		P > 0.05		
Triglycerides	152.1 ± 47.2	153.1 ± 47.9	1.0 ± 0.7	
t test: 0.02		P > 0.05		

Lipid profile	After 6 months		Difference
	Cases (n=50)	Controls (n=50)	

	M ± SD	M ± SD	M ± SD
Total cholesterol	196.4 ± 20.3	221.3 ± 31.4	24.9 ± 11.1
t test: 12.17		P < 0.01**	
HDL cholesterol	42.1 ± 9.6	40.3 ± 9.7	1.8 ± 0.1
t test: 0.88		P > 0.05	
LDL cholesterol	115.3 ± 18.3	142.3 ± 27.0	27 ± 8.7
t test: 14.26		P < 0.01**	
Triglycerides	137.6 ± 39.8	154.1 ± 48.4	16.5 ± 8.6
t test: 7.49		P < 0.01**	

Tables (12): Comparison between cases & controls as regards obesity parameters at the baseline of the study:

| Obesity parameters | Baseline | | Difference | |
| | Cases (n=240) | Controls (n=248) | | |
	M ± SD	M ± SD	M ± SD	
BMI	29.1 ± 3.52	28.6 ± 3.41	0.5 ± 0.11	
t test: 1.2		P > 0.05		
Waist circumference	110.2 ± 12.7	109.8 ± 11.8	0.4 ± 0.9	
t test: 0.9		P > 0.05		

Tables (13): Comparison between cases & controls as regards obesity parameters after 6 months:

| Obesity parameters | After 6 months | | Difference | |
| | Cases (n=240) | Controls (n=248) | | |
	M ± SD	M ± SD	M ± SD	
BMI	27.9 ± 3.11	28.9 ± 3.43	1.00 ± 0.32	
t test: 2.5		P <0.01**		
Waist circumference	107.1 ± 10.8	110.6 ± 12.3	3.5 ± 1.5	
t test: 3.0		P <0.01**		

** = highly significant