

Effect of Lifestyle Intervention Program on Controlling Hypertension among Older Adults

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Abstract

Hypertension is one of the most common health problems in older adults and affects approximately one billion individuals worldwide. Interventions for hypertensive patient should be designed to increase adherence to lifestyle modification and antihypertensive medications. **Aim:** to determine the effect of lifestyle intervention on controlling hypertension among older adults. **Method:** quasi-experimental research design was used. The study carried out on 84 hypertensive elderly patients attending outpatient clinics of the specialized medical hospital, Mansoura university hospital, and New Mansoura general hospital. The subjects were alternatively divided into two equal groups; the first was study group, comprised of 42 patients and they were received the lifestyle intervention regarding control blood pressure. The second was control group, comprised of 42 patients and exposed to routine outpatient care only. Data was collected using 3 tools, socio-demographic and clinical data structured interview sheet, hypertension knowledge, and health promoting lifestyle profile II. **Conclusion:** the lifestyle intervention program was effective in the control of blood pressure via adoption of healthy behaviors.

Keywords: lifestyle intervention, hypertension, older adults

Introduction

Poorly controlled hypertension (HTN) is a significant public health concern all over the world, in term of morbidity, mortality, and economic burden especially among older adults (Ogedegbe et al, 2013). It is the leading and most important modifiable risk factor for heart diseases, stroke, renal diseases and retinopathy (Bani, 2011). HTN is a persistent elevation of the systolic blood pressure (SBP) at a level of 140 mm hg or higher and diastolic blood pressure (DBP) at a level of 90 mm hg or higher based on the average of two or more correct blood pressure measurement taken two or more contact with health care providers (WHO, 2011). Aging is a major risk factor for developing hypertension. The prevalence of the disease increases with age, with a higher rate in men than women (Lewis et al. 2007).

Hypertension affects about 60 million persons in the United States and one billion individuals' worldwide (Park et al, 2011). Blood pressure tends to increase with age in most countries, and the actual prevalence of hypertension in the elderly population is estimated to be as high as 65% in persons aged 65-74 years (Burke & Laramie, 2004). In the United States (2003), it is estimated that, 50% in people aged 60-70years and 75% among those aged 75years have hypertension (Hajjar, Kotchen, 2003). In Europe, the prevalence of hypertension in elders ranges from 53 to 72% (Babatsikou, Zavitsanou, 2010). In Australia, hypertension reported by 11% (2.1 million) (Australian Bureau of Statistics, 2006). In Egypt, a study done by Hassan (1996) revealed that, the prevalence of hypertension is usually high (30.4%) for developing countries and was highest among elderly aged 65-71years (71% in female and 55% for male) (Hassan, 1996).

The goal of hypertension treatment is to prevent death and complications by achieving and maintaining the blood pressure at 140/90 mm hg or lower (Lambert et al, 2006). Lifestyle modification is the first line of intervention for all patients with hypertension, but pharmacological is the cornerstone for the disease treatment to reduce the high blood pressure and prevent complications such as cardiovascular and renal morbidity and mortality (Lemone & Burke, 2008).. Healthcare professionals must not only identify and treat patients with hypertension but also promote a healthy lifestyle and preventive strategies to decrease the prevalence of hypertension in the general population (Margareta et al, 2006). Current recommendations for the prevention and treatment of high blood pressure emphasize lifestyle modification. Lifestyle modifications that effectively lower blood pressure (BP) include weight loss, reduced sodium intake, increased physical activity. In addition, a diet rich in fruit, vegetables, and low-fat dairy products reduced in total and saturated fat, has also proved to lower BP (Onwukwe, Omole, 2012). This goal achieved through supporting and teaching the patients to adhere to treatment regimen, importance of staying on medications even though they do not feel any difference, or perhaps feel worse because of side effects, and by implementing necessary lifestyle changes (Lewis et al, 2007). Therefore, the aim of the study was to determine the effect of lifestyle intervention program on controlling hypertension among older adults.

Materials and Method

Study design: Quasi- Experimental research design was used in this study.

Setting: The study was carried out at outpatient clinics of the specialized medical hospital, Mansoura university hospital, and new Mansoura general hospital.

Subjects: The study subjects comprised 84 hypertensive elderly patients attending the study settings. The patients had been selected according to the following criteria: age 60 years and above, both sexes (male and female), diagnosed with hypertension for at least one year, able to communicate, accept to participate in the study, free from any other associated diseases such as diabetes mellitus and renal diseases. The sample size was calculated by DSS research using a two tailed significance test with a power of 80%, and alpha level of 0.05. The subjects were alternatively divided into two equal groups; the first was study group, comprised of 42 patients and they received the lifestyle modification intervention regarding control blood pressure. The second was control group, comprised of 42 patients and exposed to routine outpatient care only.

Study tools: Three tools were used to collect the necessary data.

Tool I: Socio-demographic and clinical data structured interview schedule sheet:

It was developed by the researcher and consisted of two parts: **Part I:** Socio-demographic characteristic of the study sample such as age, sex, marital status, level of education, income and residence area. Medical history included the duration of the disease, and complaints of hypertension. **Part II:** Physiological measurements which include: measurement of blood pressure, calculation of the body mass index (BMI), and lipid profile (total cholesterol, low density lipoprotein, high density lipoprotein and triglyceride level).

Tool II: Hypertension knowledge, structured interview schedule:

This tool was developed by the researcher. It was used to assess baseline knowledge of patients about the disease and to identify patients learning needs as pre-requisites for planning the program. It included a set of questions about: nature of the disease (9 questions), hypertensive medications (9 questions), and healthy behaviors and lifestyle patterns related to blood pressure control namely healthy diet, exercise and its benefits, measures to reduce stress, smoking cessation, and periodic medical follow up (11 questions). Each question had a group of answer points, each correct answer had one grade, while no answer or did not know was scored zero. The scores obtained for each set of questions was summed up to get the total scores for patient's knowledge. The total score was computed out of 114.

Tool III: Health Promoting Lifestyle Profile II (HPLPII):

Health promoting lifestyle profile II (HPLP II) developed by Walker 1995 (Walker et al, 1995), and translated into Arabic and tested for its validity and reliability by Abd El-Hameed (2011). The reliability was assured by Spearman's correlation coefficient $r = 0.886$. It was used to measure respondents' healthy lifestyles through six subscales (8-9 items for each) that measure the dimensions of a health promoting lifestyle; it includes: health responsibility, nutritional habits, physical activity, spiritual growth, interpersonal relations, and stress management. The total number of items is 52. The HPLP II is a summated behavior-rating scale. It uses a 4-point ordinal response format to measure frequency of self-reported health promotion behavior. Each item had four possible responses: 1 (never), 2 (sometimes), 3 (often), and 4 (routinely). A score for overall health promoting lifestyle behaviors was obtained by calculating a mean of the individual's responses to all 52 items: Six subscale scores were obtained similarly by calculating a mean of the responses to each subscale items. Therefore, each of the six subscales score could range from 1 to 4, and the total score ranges from 6 to 24 (Walker et al., 1995).

Method

1. Official letters were issued from the Faculty of Nursing, Mansoura University to the directors of study settings to obtain approval to carry out the study.
2. The study tool I (Socio-demographic and clinical data structured interview sheet), tool II (Hypertension knowledge, structured interview sheet) were developed by the researcher.
3. The Arabic version of the study tool III (Health promoting lifestyle profile II) was used.
4. The lifestyle modification program was developed by the researcher based on review of current literature. A booklet containing the content of the program was designed by the researcher. It was written in a simple Arabic language and supplemented by photos and illustrations to help the patient understanding of the content.
5. Study tools I, II, and III were tested for content validity by a jury of 7 experts in the related fields.
6. A pilot study was conducted on ten hypertensive elderly patients from the outpatient clinic at the Specialized Medical Hospital in order to evaluate the clarity and applicability of the study tools.
7. Verbal consent from the elderly patients to participate in the study was obtained after explanation of the purpose of the study.
8. Privacy of the study sample and confidentiality of the collected data were assured.
9. According to the study criteria. The patients attending the study settings were divided alternatively to

two equal groups; one study or intervention group who submitted to lifestyle modification intervention (42 patients), and the other control group (42 patients). Both studied and control groups were matched as much as possible as regards to age, sex, educational level, to avoid any factors affecting on the results of the study.

10. For proper conduction of the study, three phase were utilized:

Assessment phase

- Each hypertensive elderly patient in both control and study groups was interviewed individually before applying the planned program to collect the baseline patient's data using all study tools. This interview took about 25 to 30 minute.
- The body mass index (BMI) was then calculated using the following equation : $BMI = \text{weight (kg)} / (\text{height})^2 \text{ (m)}$.
- At the end of the assessment phase, the researcher measuring the blood pressure using sphygmomanometer for each patient in both groups.

Implementation phase

- The developed lifestyle program was implemented individually for the study group in the outpatient clinics of each previous hospital. It was conducted in 3 sessions. The first session was carried out during the assessment phase and the second session was carried out in the same week while the third in the next week. Each session took about 25 to 30 minutes.
- The researcher conducted the component of the program in the presence of one of the family members of the elderly and asked them to act as patient's reminder, and help the elderly adopting a healthy lifestyle to control the hypertension and prevent any complications.
- The instructional booklet was given to each patient in the study group to attract his/her attention, motivate his/her, and help for reviewing at home and support teaching at home.
- Data collection covered a period of 9 months, started from the first of September 2012 to the end of May 2013.

Evaluation phase

- Immediately after implementation of the lifestyle intervention, each patient in the study group was interviewed to evaluate his/her knowledge using tool II (Hypertension knowledge, structured interview schedule).
- After three months from implementation of the intervention, evaluation of the study and control group was done in the outpatients clinics using the study tool II (Hypertension knowledge, structured interview schedule), and Tool III (Health Promoting Lifestyle Profile II).
- After six months, both study and control group were reevaluated by the researcher using the study Tool III (Health Promoting Lifestyle Profile II), and tool I (part II) physiological measurements.

Statistical analysis

Data was analyzed using PC with statistical package for social science (SPSS) version 16. The 0.05 level was used as the cut off value for statistical significance and the following statistical measures were used: Descriptive statistics: Count, percentage, mean, and SD. Analytical statistics which include Chi square (χ^2), Monte Carlo test, Fisher exact test, Student t-test, and paired sample t-test. In the results, $(p)^1$: comparing pre program and 3 months after in each group. $(p)^2$: comparing pre program and 6 months after in each group. $(p)^a$: comparing study and control group pre the program. $(p)^b$: comparing study and control group 3 months post the program. $(p)^c$: comparing study and control group 6 months post the program.

Results

Table (1): Socio-demographic characteristics of the study and control groups

Items	Study group		Control group		Significance test (p)
	N= (42)	%	N= (42)	%	
<u>Age (in years)</u>					
60-	38	90.5	40	95.2	
75-	4	9.5	2	4.8	
85+	0	0.00	0	0.00	
Mean ± SD	65.64±4.88		65.11±3.97		t=0.718 (0.397)
<u>Sex</u>					
Male	12	28.6	15	35.7	χ ² =0.491 (0.483)
Female	30	71.4	27	64.3	
<u>Social status</u>					
Married	27	64.3	31	73.8	χ ² =0.891 (0.345)
Widow	15	35.7	11	26.2	
<u>Educational level</u>					
Illiterate	16	38.1	19	45.2	χ ² =1.480 (0.857) [^]
Read & write	10	23.8	9	21.4	
Primary	5	11.9	4	9.5	
Secondary	8	19.0	9	21.4	
University	3	7.1	1	2.4	
<u>Residence</u>					
Rural	34	81.0	35	83.3	χ ² =0.081 (0.776)
Urban	8	19.0	7	16.7	
<u>Income</u>					
Enough	17	40.5	12	28.6	χ ² =1.317 (0.251)
Not enough	25	59.5	30	71.4	

[^] P value based on Monte Carlo exact probability

Table 1 shows the socio – demographic characteristics of the study and control groups. The age of the study group ranged from 60 to 79 years, with a mean age of 65.64±4.88 years, while it ranged from 60 to 76 years, with a mean age of 65.11±3.97 years for those in the control group. Females were more prevalent in the studied sample. In study and control groups, (64.3% and 73.8% respectively) were married. Illiteracy was prevailing among 38.1%, and 45.2% of the study and control groups respectively. There was no statistical significant difference between two groups regarding socio-demographic features.

Table (2): Medical history of hypertension in the study and control groups

Items	Study group		Control group		Significance test (P)
	N= (42)	%	N= (42)	%	
<u>Disease symptoms</u>					
Yes	34	81.0	36	85.7	0.343 (0.558)
No	8	19.0	6	14.3	
<u>Complaints #</u>					
Headache	31	73.8	33	78.6	0.262(0.608)
Dizziness	19	45.2	16	38.1	0.441(0.507)
Palpitation	13	31.0	12	28.6	0.057(0.811)
Fatigue	11	26.2	7	16.7	1.131(0.287)
Blurred vision	9	21.4	10	23.8	0.068(0.794)
Tinnitus	6	14.3	5	11.9	0.105(0.746)
Confusion	4	9.5	1	2.4	FET (0.360)
Nausea & Vomiting	3	7.1	1	2.4	FET (0.616)
Tremors	3	7.1	1	2.4	FET (0.616)
<u>Duration of disease (in years)</u>					
Mean ± SD	6.12±4.36		5.14±3.87		
Median (Min-Max)	5.0 (1.0-20.0)		4.0 (1.0-20.0)		
Mann-Whitney U test (P)	759.50 (0.268)				

Not mutually exclusive

Table 2 illustrates history of hypertension among the study and control groups. Headache was the main presenting symptoms for hypertensive elderly patients in the both groups. It was constituted 73.8% of the study group and 78.6% of the control group. In relation to the duration of disease of the study and control groups. The median duration of the disease was 5.0 (1.0-20.0) and 4.0 (1.0-20.0) years for the study and control group respectively. There was no statistical significant difference between two groups.

Table (3): Effect of lifestyle sessions on knowledge scores of the study and control groups

Knowledge	Study group			Control group		t-test (p) ^a	t-test (p) ^b
	Before sessions	Immediately	After 3 months	Before sessions	After 3 months		
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD		
Nature of the disease	9.80±4.21	25.92±5.73	22.02±6.81	9.83±4.64	10.02±4.63	0.025 (0.980)	9.438 (0.000)*
t-test (p) ¹	36.578 (0.000)*			-			
t-test (p) ²	22.247 (0.000)*			1.667 (0.103)			
Hypertensive medications	5.92±2.98	15.14±2.40	11.78±2.73	5.26±2.72	5.33±2.50	1.070 (0.288)	11.27 (0.000)*
t-test (p) ¹	35.959 (0.000)*			-			
t-test (p) ²	17.223 (0.000)*			0.903 (0.372)			
Healthy behaviors	12.95±5.76	30.31±5.39	25.76±6.33	13.50±5.73	13.59±5.75	0.436 (0.664)	9.212 (0.000)*
t-test (p) ¹	24.62 (0.000)*			-			
t-test (p) ²	15.39 (0.000)*			0.850 (0.400)			
Total knowledge	28.69±12.39	71.38±13.11	59.57±14.68	28.59±12.72	28.95±12.48	0.035 (0.972)	10.22 (0.000)*
t-test (p) ¹	38.57 (0.000)*			-			
t-test (p) ²	23.87 (0.000)*			1.91 (0.062)			

Table 3 illustrates the effect of lifestyle modification sessions on knowledge of the study and control groups. The table reveals that the scores for total and all items of knowledge of the study group increased significantly immediately after applying sessions where P values were found to be (0.000), and the improvement was slightly decreased in all items of knowledge after 3 months but remain differ significantly as in before sessions p= 0.000.

Table (4): Mean scores of Lifestyle patterns of the study and control groups before and after the intervention

Lifestyle items	Study group			Control group			t-test (p) ^a	t-test (p) ^b	t-test (p) ^c
	Before sessions	After 3mon.	After 6mon.	Before sessions	After 3mon.	After 6mon.			
	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD			
Health response.	1.98±0.23	2.49±0.26	2.45±0.29	2.005±0.3	2.02±0.34	2.02±0.34	0.270 (0.788)	6.978 (0.000)*	6.677 (0.000)*
t-test (p) ¹	14.094 (0.000)*			1.262 (0.214)					
t-test (p) ²	11.094 (0.000)*			1.262 (0.214)					
Physical activity	1.68±0.46	2.21±0.42	2.24±0.36	1.73±0.46	1.77±0.49	1.76±0.49	0.502 (0.617)	4.403 (0.000)*	4.995 (0.000)*
t-test (p) ¹	12.611 (0.000)*			2.449 (0.069)					
t-test (p) ²	12.969 (0.000)*			2.138 (0.078)					
Nutritional habits	2.17±0.27	2.61±0.23	2.58±0.22	2.27±0.35	2.33±0.31	2.31±0.35	1.482 (0.142)	4.708 (0.000)*	4.425 (0.000)*
t-test (p) ¹	17.059 (0.000)*			3.240 (0.002)*					
t-test (p) ²	13.715 (0.000)*			2.202 (0.033)*					
Spiritual growth	2.71±0.30	3.003±0.25	2.94±0.26	2.77±0.22	2.78±0.21	2.79±0.22	1.002 (0.319)	4.242 (0.000)*	2.858 (0.005)*
t-test (p) ¹	10.038 (0.000)*			2.077 (0.107)					
t-test (p) ²	8.235 (0.000)*			2.354 (0.081)					
Personal relations	2.76±0.31	2.94±0.24	2.91±0.25	2.81±0.23	2.83±0.22	2.80±0.24	0.799 (0.427)	2.076 (0.041)*	1.973 (0.052)*
t-test (p) ¹	6.773 (0.000)*			1.704 (0.096)					
t-test (p) ²	5.877 (0.000)*			0.650 (0.519)					
Stress management	2.12±0.35	2.47±0.24	2.50±0.21	2.22±0.30	2.26±.29	2.25±0.29	1.456 (0.149)	3.550 (0.001)*	4.316 (0.000)*
t-test (p) ¹	11.343 (0.000)*			3.812 (0.063)					
t-test (p) ²	11.720 (0.000)*			3.716 (0.071)					
Total lifestyle score	13.45±1.5	15.75±1.24	15.64±1.1	13.84±1.5	14.01±1.6	13.97±1.5	1.134 (0.260)	5.560 (0.000)*	5.521 (0.000)*
t-test (p) ¹	24.633 (0.000)*			5.050 (0.933)					
t-test (p) ²	19.875 (0.000)*			3.374 (0.882)					

Table 4 reveals the results of applying lifestyle program to assess the lifestyle of the study and control group before and after the programs. Mean scores for total and all dimensions of lifestyle patterns such as health

responsibility, physical activity, nutritional habits, spiritual growth, interpersonal relations, and stress management were increased (improved) significantly in the study group at 3 months post sessions and the improvement maintained at 6 month evaluation ($P=0.000$), where as patients in the control group had significant improved score and higher mean score only for nutritional habits dimension in both evaluation ($P=0.002$ and $P=0.033$) respectively.

Table (5): Mean scores of systolic and diastolic blood pressure of the study and control groups pre and post the program

Blood pressure	Study group		Control group		t- test (p) ^a	t- test (p) ^b
	Before session	After 6 months	Before sessions	After 6 months		
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD		
Systolic blood pressure (SBP)	152.86±12.1	143.4±12.3	151.43±13.9	149.29±13.59	0.500 (0.619)	3.110 (0.003)*
t- test (p) ¹	9.776 (0.000)*		2.735 (0.069)			
Diastolic blood pressure (DBP)	97.85±8.05	89.28±6.76	97.38±8.13	95.71±8.87	0.270 (0.788)	3.733 (0.000)*
t- test (p) ¹	9.140 (0.000)*		2.864 (0.077)			

Table 5 describes the changes in blood pressure measurements of the study and control groups before and after the program. In the study group, systolic and diastolic blood pressure measurements decreased significantly post 6 months of session implementation ($P=0.000$ and 0.000 respectively).

Table (6): Lipid profile & BMI of the study and control groups' pre and post the program

Items	Study group		Control group		t- test (p) ^a	t- test (p) ^b
	Before sessions	After 6 months	Before sessions	After 6 months		
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD		
Cholesterol	250.50±46.99	232.6±38.8	258.71±56.64	254.36±52.27	0.723 (0.472)	2.159 (0.034)*
t- test (p) ¹	6.032 (0.000)*		3.109 (0.603)			
Triglyceride	210.9±46.9	192.74±32.01	213.9±59.17	209.31±50.73	0.275 (0.798)	1.790 (0.077)
t- test (p) ¹	5.826 (0.000)*		2.093 (0.083)			
LDL	174.5±47.3	156.24±38.42	177.98±55.39	175.11±47.05	0.309 (0.758)	2.014 (0.047)*
t- test (p) ¹	5.402 (0.000)*		1.196 (0.239)			
HDL	33.66±11.1	37.54±10.25	36.92±15.06	39.78±14.04	1.128 (0.262)	0.834 (0.407)
t- test (p) ¹	4.584 (0.000)*		4.270 (0.000)*			
BMI	30.63±4.51	29.88±4.02	30.41±3.97	30.28±3.74	0.244 (0.808)	0.362 (0.718)
t- test (p) ¹	4.822 (0.023)*		3.296 (0.192)			

*significant at $p \leq 0.05$

Table 6 describes the lipid profile and body mass index of the study and control groups before and after the lifestyle intervention. All results in this table shows that, in the study group total cholesterol TC, triglycerides TG, and LDL levels decreased after 6 months from the program. The differences were statistically significant ($P=0.000$ for each), while HDL levels increased (improved) and the difference was significant at 6 month evaluation ($P=0.000$). On the other hand, total cholesterol TC, triglycerides TG, and LDL levels of patients in the control group decreased at 6 months after the program but the differences were not statistically significant as shown in the table, while HDL level increased significantly at 6 month evaluation ($P=0.000$). Regarding BMI, the mean of body mass index was decreased significantly among patients in the study group. While, the mean score of body mass index of patients in the study group slightly decreased but the differences were not statistically significant ($P=0.192$).

Figure 1: Correlation between total knowledge score and total lifestyle score of the study group at 3 months after sessions.

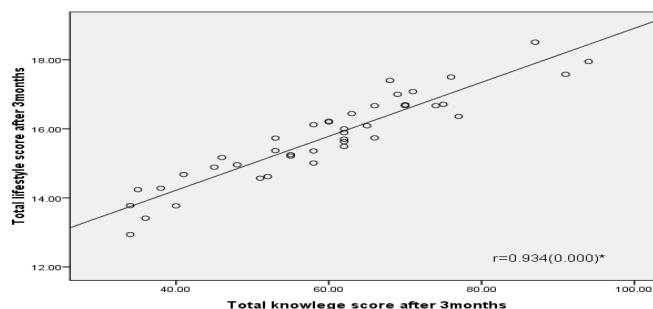


Figure 1 shows significant strong positive correlation between total knowledge score and total lifestyle mean score after 3 months of program implementation.

Discussion

Hypertension is one of the most common worldwide diseases affecting elderly population. Because of the associated morbidity and mortality and the cost to society. Therefore, healthcare professionals must not only identify and treat patients with hypertension but also promote a healthy lifestyle and preventive strategies to decrease the prevalence of hypertension in the general population. Current recommendations for the prevention and treatment of high blood pressure emphasize lifestyle modification. Lifestyle modifications that effectively lower blood pressure (BP) include weight loss, reduced sodium intake, increased physical activity, and limited alcohol consumption. In addition, a diet rich in fruit, vegetables, and low-fat dairy products reduced in total and saturated fat, has also proved to lower blood pressure (Onwukwe, Omole, 2012).

Age is the most powerful risk factor for developing hypertension. The world increase in the elderly population (age ≥ 65 years) is associated with concurrent increase in prevalence of hypertension and morbidity and mortality from vascular complications of the disease (Jones et al, 2010). This is in accordance with the results of the present study where the mean age of the studied subjects more than 65 years. This is attributed to the age related changes in arterial stiffness and decreased elasticity. The same findings were reported in other studies carried out in Egypt by Hassan (2009) and Dawood (2012). On the same line, studies carried out by Tam et al (2005) and Wright et al (2011) in USA, which investigated the prevalence of hypertension by age group and gender, found a high prevalence among older adults.

The present study showed that hypertension was encountered more among females than males. This may be attributed to the effect of premenopausal hormones in protection against cardiovascular diseases. Also, it may be related to the presence of modifiable risk factors as obesity, stressful life situation which have more influence females rather than males. The same findings were reported in study carried out in Egypt by Hassan (2009).

An important component in the treatment guideline for hypertension is the recommendation for patients' education. Patients' education is an important strategy in improving adherence and can be seen as foundation of most patients – focused intervention (Busari et al, 2010). Effective management of hypertension depends on patients' understanding of their condition, treatment regimen, and adherence to lifestyle and /or pharmacological treatment. Increasing patients' knowledge about the disease can achieve the goal of treatment, empower patients to make decision about their treatment, and can empower their motivation and intention to adhere with the treatment regimen (Sanne et al, 2008 & Zhang et al, 2009). In cross sectional survey on 296 adults with hypertension in USA by Sanne et al (2008) showed that insufficient hypertension knowledge is the main cause of uncontrolled hypertension among the study subjects. In this respect, the lifestyle modification program implemented in the present study included educational component implies hypertension in nature, antihypertensive medications, and healthy behaviors and lifestyle patterns related to blood pressure control namely healthy diet, physical activity, measures to reduce stress, smoking cessation, weight reduction, and periodic medical follow up. Regarding knowledge of the study and control groups, the findings of the present study showed that, the total mean score of knowledge before sessions were 28.69 ± 12.39 for study group and 28.59 ± 12.48 for control group with no statistical significant differences between groups. This is supported by a study done in Egypt by Hassan (2009) who revealed that lack of knowledge among the causes of non compliance with the treatment regimen among hypertensive elderly patients. Studies done in India by Kusuma et al (2009) , Nigeria by Iyalomhe (2010) to determine knowledge and perception about hypertension concluded that, despite the higher prevalence of hypertension, knowledge about hypertension was low and comprehensive knowledge was lacking. The present study revealed a significant improvement in the knowledge of the study group after implementation of the sessions. This is in accordance with a study carried out in Egypt by Soliman (2007) which concludes a significant increase in knowledge level post program and in follow up after 3 months compared to

pre program. Tobe et al (2007) and Dawes et al (2010) in Canada stated that most patients who received education booklet about hypertension have a good baseline about hypertension. On the same line, a study done in China by Yang et al (2011) which conducted 25 day health education about hypertension, revealed that the overall knowledge of all elderly received the educational program were significantly improved after the program. Providing information about the disease and treatment regimen appears to be sufficient for adherence, and non adherence is often attributed to inadequate knowledge (Busari et al, 2010). This is in accordance with the findings of the present study which proven a significant strong correlation between acquiring knowledge and adopting a healthy lifestyle, indicating that individuals have better knowledge are more likely to have higher cognitive function so that they may understand the necessity of lifestyle changes and more motivated to adopt healthy lifestyle and adhering with the treatment regimen. The same findings were reported in another study conducted in Egypt by Solimn (2007). Other studies conducted in Pakistan by Hashmi et al (2007) and Saleem et al (2011) revealed that educating the patients about the disease and clarifying doubts regarding treatment directly connected with better control of hypertension. In contrast, other studies conducted in Egypt by Hassan (2009), and in Spain by Guirado et al (2011) revealed no relation between knowledge about hypertension and compliance with therapeutic treatment to control blood pressure. This is may be justified by knowledge was not enough to achieve compliance and changing in lifestyle because knowledge is not the only component to achieve the goal, but also positive attitude and behaviors.

Lifestyle modification is considered the current challenge to control blood pressure. The results of the current study showed that the total and all dimensions of lifestyle patterns show significant improvement in the study group compared with the control group, which shows significant improvement in only one dimension 'nutritional habits. This improvement among those in the control group may be justified by obtaining information about healthy diet from their health care providers or from the mass media such as magazines, television, and newspapers. Clearly mechanism that explain improved lifestyle after the program including eating healthy diet, physical activity as walking, and proper stress management may be related to the fact that the knowledge acquisition during the sessions play an essential role in motivating the older adults to adopting healthy lifestyle. Similar findings were reported by Weheida et al (2009) and Soliman (2007) in Egypt, who found marked improvement in adopting healthy behaviors after implementing educational program among studied hypertensive patients. In the same context, studies done in Germany by Osterbrink, Munzinger (2005) and in Canada by Padwal et al (2005) confirmed the successful implementation of hypertension treatment and education program (HTEP). A randomized control trial study in Korea (2011) which investigated the effect of integrated health education program in community dwelling older adults with hypertension reported the significant increase in health related behaviors among the intervention group (Park et al, 2011). In Australia (2007), Burke et al observed the benefits of the lifestyle modification program provided to hypertensive patients and found 89% of the studied subjects after 4 months follow up reported healthy behaviors as decrease dietary fat, increased physical activity, decrease weight, and increase fish and vegetable in diet.

Blood pressure control is the main finding in the present study which revealed significant decline in systolic and diastolic blood pressure among patients in the study group at 6 months evaluation. This may be justified by the fact proven in this study that lifestyle patterns correlated significantly with control of systolic and diastolic blood pressure which means that high adoption of healthy lifestyle associated with better blood pressure control. Moreover, patients in the control group reported slight reduction in systolic and diastolic blood pressure. This is probably due to patients' adoption of healthy lifestyle as a result of response to the instructions of their health care providers/or contamination between patients in the study group and those in the control. For example, patients in the study group share some of the information they received during the program with those in the control group regarding how to control their blood pressure. The previous findings are consistent with the findings of Weheida et al (2009) in Egypt, who reported reduction in blood pressure measurement in the study group after walking and breathing exercise intervention at 4 and 8 weeks follow up. These also confirmed by a study conducted in USA by Appel et al (2003) who concluded that, individuals with high blood pressure can make multiple lifestyle changes that lower blood pressure and reduce their cardiovascular risk. Similarly, Park et al (2011) reported greater reduction in blood pressure among community dwelling older adults with hypertension in the study group than control group at 12 weeks after the program in Korea. Lee et al (2007) in Taiwan added that, the mean change in systolic blood pressure was a decrease of 15.4 mmHg and 8.4 mmHg in the intervention and control group respectively after 6 months evaluation of community based intervention for hypertensive older people. Furthermore, another study done in South Africa by Onwukwe and Omole (2012) revealed achieving of blood pressure control among majority of patients attending the primary health care settings. Ogedegbe et al (2013) in USA, Burke et al (2007) in Australia reported the effectiveness of the intervention to control blood pressure among older adults.

Concerning lipid profile, the current study reported a significant improvement in lipid profile (TC, TG, HDLc, LDLc) among patients in the study group compared with those in the control group who showed significant improvement in HDLc only. The change among patients in the control group may be related to their adoption of

healthy lifestyle especially walking which proven its benefits in improving HDLc as a result of acquisition of knowledge regarding healthy behaviors from mass media or from health care providers. These results are in harmony with a study conducted in Egypt by Weheida et al (2009), who revealed significant improvement in lipid profile among hypertensive patients at 8 weeks follow walking program for 45minutes/ 3 days weekly, and justified this improvement by the benefits of walking which increase sense of wellbeing, relieve emotional tension, and raise the level of HDLc. Other studies conducted in Australia by Burke et al (2007) and in Germany by Osterbrink and Munzinger (2005) supported the findings of this study. Finally, the main guidelines recommendation in hypertensive older adults are to maintain the systolic blood pressure not surpass 140 mm Hg and diastolic blood pressure not over 90 mm Hg. Interventions for hypertensive patients should be designed to increase adherence to lifestyle modification and antihypertensive medications (Lewis et al., 2007). Healthcare professionals must not only identify and treat patients with hypertension but also promote a healthy lifestyle and preventive strategies to decrease the prevalence of hypertension in the general population (Margareta et al, 2006).

Conclusion

According the results of the present study, it can be concluded that, hypertension is an important public health challenge and its main risk factors are increasing age, female sex, smoking, obesity, and hyperlipedemia. Moreover, knowledge score, lifestyle score of the study group improved significantly after applying the intervention. As well as, the lifestyle interventions were an effective non pharmacological intervention in the management of hypertension and lead to a significant improvement in blood pressure measurements and lipid profile among elderly patients in the study group.

Recommendations

Based on the results of the study, the following recommendations are suggested:

1. Increase awareness of elders about risk factors of hypertension is essential to empower and motivate elders to adopt healthy lifestyle to prevent the disease. This can be achieved through mass media and health education programs to elders about the disease process and the importance of adopting healthy lifestyle such as consumption of healthy diet, maintaining physical activity, and proper stress management.
2. All health care providers should always update themselves with current information and development in the health profession regarding hypertension knowledge.
3. A comprehensive treatment plan is to be instituted before the patient is discharged from the clinics to help the patient and his caregiver to understand and follow accurately the required therapeutic regimen.
4. Follow up visits either to the clinic or through home visits is important in order to evaluate the progress of patient's condition and motivate them to adhere with preventive measures through promoting healthy lifestyle to prevent complications.

Acknowledgement

We would like to extend our deep thanks to all health personnel in the out patients clinics of Mansoura university hospital as well as the patients who agreed to participate in the study for their cooperation in the fulfillment of this work.

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