

The Effect of Non-Pharmacological Intervention on Psychological Determinants and Blood Pressure among Hypertensive Patients

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Abstract

Background: New evidence highlights the impact of psychological determinants in somatic diseases. Poorly controlled hypertension was a significant public health concern all over the world. **Aim:** This study aimed to evaluate the effect of non-pharmacological intervention on psychological determinants and blood pressure among hypertensive patients. **Design:** A quasi-experimental pre-test–post-test control group design has been implemented. **Sample:** A purposive sample has been used to select 202 subjects from the Internal Medicine out-patient clinic in El-Shohadaa Central Hospital at El-Shohadaa town, Menoufia governorate, Egypt. **Tools:** Four tools were used to collect the data; 1) Interviewing questionnaire to assess socio-demographic and clinical data of the patients. 2) Bio-physiological measurements to measure the body mass index and systolic and diastolic blood pressure. 3) Health promotion lifestyle profile to assess readiness to change diet and exercise. 4) Beck depression inventory-II and perceived stress scale to assess psychological health determinants. **Results:** The study findings revealed a highly statistically significant reduction in a mean score of depression and, stress post-intervention among the study group compared to the baseline where $P = 0.000$. Also, there was a highly statistically significant improvement in a mean score of readiness to change exercise and, diet post-intervention among the study group compared to the baseline where ($P = 0.000$, $P = 0.01$) respectively. **Conclusion:** It was concluded that non-pharmacological intervention has a positive effect on blood pressure, patients' readiness to change diet, exercise and, psychological health determinants among hypertensive patients. **Recommendations:** Non-pharmacological intervention should be provided to hypertensive patients and other patients who suffer from chronic disease.

Keywords: Hypertension, Psychological Determinants, Body Mass Index, Non-pharmacological Intervention.

Introduction

Hypertension accounts for approximately 7.5 million deaths per year, nearly 12.8% of the total deaths (Kilic, 2016). The highest prevalence of hypertension was found in Africa 46%,

while in the Americas, was 35 % (Kishore, 2014). Adult Egyptians suffered from hypertension were more than 26% and also, more than 50% were individuals older than 60 years (Ibrahim and Albertino, 2012). The researcher indicated that if the same prevalence rates do not change, the researcher predicted

that there will be approximately 15 million will suffer from hypertension and about 7 million will need regular follow-up and lifelong treatment. Low awareness rate is the cause of the complicated problem, only 38% of patients aware of having high blood pressure (**Ibrahim, 2013**). Regarding psychological symptoms; 10% of patients suffer from mild to severe depressive symptoms, 70% from anxiety and, 10% from stress and there was a need for psychiatric evaluation and counseling (**Sharma et al, 2016**).

A survey was conducted in 19 different countries (N = 52,095) illustrated that hypertension was linked to psychiatric conditions such as anxiety, substance abuse, depression, and compulsive eating (Stein et al, 2014). Also, Khatib et al (2014) reported that anxiety, stress, and depression were the most common factors that prevent or delay the adoption of a healthy lifestyle and medication intake. Stress may lead to abnormal activation of the sympathetic nervous system (SNS) triggering hormonal cascades that interfere with blood pressure (BP), increased coagulation and, platelet activity, factors that can act as “triggers” of cerebrovascular events (Jonsson et al, 2015). Depression was considered a significant and independent risk factor for hypertension, especially in young people (**Mermerelis et al, 2016**). The psychological status may worsen the inflammatory response or increase the levels of blood cortisol (**Shah et al, 2011**). Psychological wellbeing was linked to a healthy lifestyle (**Durrani, Irvine, and Nolan, 2012**).

Non-pharmacological intervention was indicated for all patients suffered from hypertension and several types of research proved its beneficial effect and

all most updated guidelines recommended it. There is a realistic chance of delaying or even abolishing the need for non-pharmacological treatment, with results similar or even superior to those achieved with several drugs during pharmacological treatment once the patient adheres and maintains their lifestyle changes (**Paffer Filho et al, 2019**). Interventions that include weight loss, exercise and diet were effective in reducing systolic and diastolic blood pressure by 12.5 mmHg and 7.9 mmHg, respectively (**National Institute for Health and Care Excellence, 2019**).

Significance of The Study

Hypertension management was based on a combination of pharmacological treatments and non-pharmacological interventions (**Keates et al, 2017**). The main factor contributing to the failure of keeping blood pressure within the ideal limits was the non-adherence to pharmacological and non-pharmacological treatments (**Grezzana, Stein, & Pellenda, 2017**). **Akonobi & Khan (2019)** confirmed that sodium restriction, physical exercise, weight loss, and alcohol use reduction were effective non-pharmacological interventions to control hypertension. Also, **Korhonen et al (2020)** illustrated that after the beginning of medications, patients were less likely to adhere to lifestyle modifications, as evidence of a decreased level of physical activity and increased body weight.

Moreover, **The National Center for Chronic Disease Prevention and Health Promotion (2019)** illustrated that the behavioral risk factors that lead to chronic diseases, include: poor nutrition marked by diets low in fruits and vegetables while it high in saturated fats and sodium, obesity, physical inactivity,

tobacco use, exposure to secondhand smoke, and excessive alcohol intake. Obesity was a particular contributor to type 2 diabetes, stroke, renal disease, cardiovascular disease, and different types of cancer (Centers for Disease Control and Prevention, 2020a). In addition, Gillis (2019) showed that moderate weight loss from five to ten percent of initial body weight along with a decreased abdominal fat can lower blood pressure and blood glucose levels.

Health training stresses motivating patients to develop a healthy lifestyle. Diet, exercise and, self-care behaviors in combination with medication are pivotal for hypertension's treatment (Metelska et al, 2011). Nurses play an important role in assisting patients to control their illness by helping them and their families to obtain knowledge and skills necessary to engage in self-care; social support to assist in resolving identified barriers; develop self-efficacy and increase their motivation to perform self-care (Rujawatthanakorn et al, 2011). Moreover, there was a need for more research studies to reduce complications that resulted from hypertension through adherence to pharmacological treatments and application of nursing intervention programs that include uses of a healthy diet, physical activity and, stress management for improving the healthy lifestyle and psychological status (Ebrahim, El Gahsh, & Abd-Elalem, 2017). This study aimed to evaluate the effect of non-pharmacological intervention on psychological determinants and blood pressure among hypertensive patients.

The aim of the study

Evaluate the effect of non-pharmacological intervention on psychological determinants and blood pressure among hypertensive patients.

Subjects and Methods

Research hypothesis:

1- Participants who will receive a non-pharmacological intervention (study group) will have greater readiness for change diet and exercise post-intervention than participants who will not receive a non-pharmacological intervention (control group).

2- Participants who will receive non-pharmacological intervention (study group) will have a lower score of depression and stress post-intervention than participants who will not receive non-pharmacological intervention (control group).

3- Participants who will receive non-pharmacological intervention (study group) will have a lower mean score of weight, body mass index and, blood pressure post-intervention than participants who will not receive a non-pharmacological intervention (control group).

Research design:

A quasi - Experimental pre-test – post-test control group design has been used to achieve the purpose of the study
Setting: This study was conducted at the Internal Medicine Clinic in El-Shohadaa Central Hospital at El-Shohadaa town that serves El-Shohadaa town and surrounding villages, Menoufia governorate, Egypt.

Study participants

A purposive sample of 202 patients from the above-mentioned setting who fit the inclusion criteria; diagnosed with hypertension of both sexes, adult, free from cardiac disease, does not take treatment for depression or anxiety and agree to participate in the research study. They were randomly divided equally into two groups through the writing of the participants' names in papers, put them in a container, mixed well, then select one at a time and alternatively put in one of the groups (control group and intervention group). Eleven participants were withdrawn from the intervention group and ten participants from the control group due to lack of time.

The sample size was calculated by the Epi website. The assumptions were; a two-sided confidence level of 95% = $(1 - \alpha)$, A power $(1 - \beta)$ or (% chance of detecting) of 80%. Ratio of sample size, unexposed (pre-intervention)/ exposed (post-intervention) = 1, % controls with exposure = 38%. Fleiss method was used with 101 patients with hypertension as a sample size pre-intervention and the same 101 patients as post-intervention sample size. So the total sample size would be 202 (Fleiss, 2016).

Tools of the Study

Four tools were utilized to accomplish the purpose of the study.

Tool 1: A constructed interview questionnaire: To assess socio-demographic characteristics and clinical data of the patients. It included patients' age, education, income, residence, occupation, marital status, medical history, medication use and, family history.

Tool 2: Bio-physiological Measurements:

a) Measuring the Body Mass Index (BMI). Obesity was assessed based on the equation of $BMI = \text{Weight (kg)} / \text{Height (m)}^2$ (Centers for Disease Control and Prevention, 2011). Participants were considered obese when BMI is ≥ 32.3 kg/m² (Lewis et al., 2009).

b) Measuring the Systolic and Diastolic blood pressure: Blood pressure (BP) was measured according to American Heart Association guidelines for in-clinic blood pressure measurement using a mercury column sphygmomanometer and suitable cuff. Two blood pressure readings were taken with a 2–3 min rest period between readings (Agidigbo & Pickering, 2010).

Tool 3: Health promotion lifestyle profile (HPLP):

It was developed by Nolan, Upshur & Lynn, (2011) to assess readiness to change diet and exercise by using the self-reported stages of readiness to change the following behaviors: dietary restriction of fat and sodium, daily dietary intake of vegetables and fruits, daily physical activity and, weekly planned exercise. It measured stage of readiness to change on a 4-point continuous scale; 1) the pre-contemplation stage (in the next 6 months; participants having little or no intention of changing behavior), 2) the contemplation stage (beginning to acknowledge that they have a problem related to their behavior, and thinking seriously about solving it; intention to change within 6 months), 3) the preparation stage (participants make plans about how they will change their behavior within the next month), and 4) the action/maintenance stage (participants make overt changes in their behavior and

their surroundings in the last 6 months and/or maintaining behavior change, often with relapses; can last from 6 months to about 5 years). It was translated into Arabic by the researchers and tested for its validity by a panel of experts. The reliability of the tool was done using test - retest reliability and proved to be strongly reliable = 0.70).

Tool 4: Psychological determinants

a) Beck Depression Inventory-II (Beck, Steer & Brown, 1996): The Arabic version was adopted from Ghareeb (2000). It was a 21-items self-report multiple-choice inventory designed to measure cognitive-affective and somatic-behavioral symptoms of depression present in the last two weeks and rated on a 4-point scale ranging from 0 to 3 based on the severity of each item. The range total score was 0- 63, a low level of depression (0-13)., mild (14-19)., moderate (20-28) sever (29-63). The instrument was tested for reliability and validity by (Ghareeb, 2000) using the alpha coefficient and seemed to be strongly reliable ($r = 0.89$).

b) The Perceived Stress Scale (PSS): This scale was originally developed by (Cohen, Kamarck, Mermelstein, 1983). It was adopted and translated into Arabic and tested for content validity and reliability by the researchers. It was ten items and rated on a 5-point scale ranging from (0 - 4) zero means often to 4 means very often. PSS scores were obtained by reversing responses (e.g., 0 = 4, 1 = 3, 2 = 2, 3 = 1 & 4 = 0) to the four positively stated items (items 4, 5, 7, & 8) and then summing across all scale items). Reliability was tested by administration of the same tool to the same subjects under similar conditions on more occasions. Answers from repeated testing

were compared (Test-re-test reliability = 0.92).

Ethical Consideration

The ethics committee approval was taken from Faculty of Nursing, Menoufia University, Egypt on the subject of research. Also, formal consent was obtained from subjects to participate in the study after explaining the purpose of the study. The subjects were assured that all information would be confidential and participation in the study was voluntary and that they could withdraw from the study at any time.

Procedure of data Collection:

(1) The researchers obtained official permission from El-Shohadaa Central Hospital's director, Menoufia governorate, Egypt. The agreements and the aim of the study were explained to the internal medicine clinic's physician and clinic nurse in El-Shohadaa Central Hospital, Menoufia governorate, Egypt to gain their cooperation.

(2) A pilot study was conducted to test the clarity of the questionnaire items. All patients included in the pilot study met the inclusion criteria and were excluded from the main study sample.

(3) The researchers collected data from the first of April 2019 to the end of November 2019.

- The researchers introduced themselves to the participants and then explained the aim of the study using client-centered language and their consent to participate was obtained.

- A baseline assessment was done through interviewing questionnaires, bio-physiological measurements (the systolic

and diastolic blood pressure, body weight and the Body mass index), health promotion lifestyle profile, and psychological determinants which include a) Beck depression inventory-II and b) the perceived stress scale. The period of a baseline assessment was two months.

- Following assessment, subjects were randomized into two groups: Intervention group that received a non-pharmacological intervention and the control group.

- The internal medicine clinic's physician and clinic nurse were asked to determine three days to the intervention group which are different from follow-up days of the control group to prevent the contamination.

- Subjects in non-pharmacological intervention group were divided into six groups each group consisted of 17 subjects and they attend eight consecutive weekly sessions; two groups per day three days a week, the session about 60 minutes (the first group at 9 to 10 Am then the second group at 11to noon) in the waiting room.

- A non-pharmacological intervention aimed at helping the participants to live a healthy lifestyle and increase their abilities to avoid physical and psychological complications. It was achieved through many teaching methods such as lectures, discussions, brainstorming, and demonstration, re-demonstration, giving examples & modeling.

- The researchers used video, pictures and, booklet to facilitate explanation and to be a reference for them. At the end of each session, summary, feedback, further clarifications were done for ambiguous things.

The sessions of non-pharmacological intervention were:

Session one: This session aimed to help the participants to gain knowledge about hypertension disease. It included health education about normal blood pressure, high blood pressure, causes of hypertension, signs, symptoms and, complications of uncontrolled blood pressure.

Session two and three: This session aimed to help the participants to gain knowledge about the broad lines of management; change their lifestyle, take a healthy diet, decreasing their weight, making physical exercise in addition to decreasing stressors and, coping with stress. The researchers tried to help the participants to identify the causes, risks of unhealthy behaviors and determine the benefits of changing it.

Session four: This session aimed at regulating the physical activities of the participants. It included health education about how to incorporate a daily routine of physical activity, such as waking, marketing, home responsibilities, light regular physical activities 30 minutes and recommended at least walking 30 minutes each day or (10,000 steps) at least 5 days a week.

Session five and six: This session aimed at helping the participants identify the link between blood pressure and psychological status. It included health education about stress and depression (definition, causes, signs and symptoms and, its effect on the health status and blood pressure). Health education about internal or external stressors, how the body responds to stress, coping process, resources that assist in effective coping (problem-solving ability, prior experience with the stressor, adequate knowledge

about the cause of the stressor, adequate sleep, nutrition, and physical hygiene, available support system such as family, friends, money)

Session seven: This session aimed at helping the participants learn and practice deep breathing exercises and meditation. It included explanation and demonstration of deep breathing exercises; the researcher asked the participant to sit comfortably with straight back, put one hand on the chest and the other on the stomach, breathe in through the nose until the hand on the stomach raised then exhale through the mouth, pushing out the air until the hand on stomach move in.

Session eight: This session aimed at helping the participants learn and practice progressive muscle relaxation. It included alternately tensing and relaxing of muscle groups over the legs, abdomen, chest, arms, and face. In a sequential pattern, with eyes closed, the individual places tension in a given muscle group purposefully for approximately 10 seconds and then releases it for 20 seconds before continuing with the next muscle group. The mental component requires that the individual focuses on the distinction between the feelings of tension and relaxation. With practice, the patient learns how to effectively relax in a short time.

-The researchers interviewed all participants in the control and the intervention groups again after 4 months from baseline assessment and re-administered the tool three and four then repeated Bio-physiological measurements (the body mass index, body weight and measuring the systolic and diastolic blood pressure) to evaluate the effect of non-pharmacological intervention on psychological determinants and blood pressure among hypertension patients.

Statistical Analysis:

The data were coded, tabulated, and analyzed by personal computer and statistical package SPSS version 22. Quantitative data were presented by mean (X), standard deviation (SD), frequency, number, percentage and t-test for comparison between two means, chi-square (χ^2), and Fisher Exact test were used for qualitative data. The correlation coefficient (r) was used to assess the association. $P < 0.05$ was considered statistically significant and P value < 0.001 was highly significant while $P > 0.05$ indicated non-significant

Results

Table (2): Revealed no statistically significant difference between intervention and control groups regarding mean age, marital status, residence, education while a statistically significant difference between intervention and control groups regarding gender and occupation where $P = (0.001, 0.05)$ respectively.

Table (3): Illustrated a highly statistically significant reduction in mean weight and body mass index of intervention group after the intervention (76.5 ± 1.1 , 29.2 ± 0.5) compared with (80.0 ± 1.0 , 30.5 ± 0.5) at baseline where $P_3 = 0.000$, $P_3 = 0.04$ respectively and a statistically significant difference between intervention and control groups post-intervention where $P_2 = 0.004$. Regarding blood pressure, there was a highly statistically significant reduction in mean systolic and diastolic blood pressure of intervention group after the intervention (130.9 ± 1.1 , 80.6 ± 8.5) compared with (154.2 ± 1.2 , 97.9 ± 0.6) at baseline where ($P_3 = 0.000$, 0.03) respectively. Also, a highly statistically significant difference between

intervention and control groups regarding systolic and diastolic blood pressure post-intervention where $P2 = 0.000$. Regarding systolic and diastolic blood pressure of the control group, there was a statistically significant difference between pre-test and post-test where ($P4 = 0.02$., 0.000) respectively.

Moreover; a highly statistically significant reduction in the mean score of depression and stress of intervention group post-intervention (8.9 ± 0.6 , 13.3 ± 0.7) compared with (11.8 ± 0.8 , 17.2 ± 0.7) at baseline where ($P3 = 0.000$) and a highly statistically significant difference between intervention and control groups regarding depression and stress score post-intervention where ($P2 = 0.000$).

Regarding participants' readiness to change their behavior related to diet and exercise; regarding readiness to change diet, there was a statistical significant improvement in a mean score of readiness to change diet post-intervention (3.8 ± 0.07) compared with (2.9 ± 0.06) at baseline where $P3 = 0.01$.

Also, a highly statistically significant difference between intervention and control groups regarding readiness to change diet post-intervention where $P2 = 0.000$. Regarding participants' readiness to change their behavior related to exercise; there was a highly statistically significant improvement in a mean score of readiness to change exercise post-intervention (3.6 ± 0.07) compared with (2.7 ± 0.07) at baseline where $P3 = 0.000$. Also, a highly statistically significant difference between intervention and control groups regarding readiness to change exercise post-intervention where $P2 = 0.000$.

Table (4): Illustrated the correlation of psychological determinants and participants' readiness to change their behavior related to diet and exercise at baseline and post-intervention. There was a negative statistically significant correlation between participants' readiness to change their behavior regarding diet and exercise and psychological health determinants (depression and stress).

Table (1): Conceptual and Operational Definitions.

Concept	Variable	Conceptual Definition	Operational Definition
Non-pharmacological interventions (health education about healthy diet, physical exercise, decreased body composition and, effective coping with stress.	Healthy diet	A healthy diet provides the body with essential nutrition: fluid, micronutrients, macronutrients, and adequate calories. Also, it helps to maintain or improve overall health. (Lean Michael, 2015).	Consume the DASH Diet (Dietary Approaches to Stop Hypertension) that include more intakes of vegetables and fruits, milk products with a lower proportion of fat, reduction of cholesterol, salt and, saturated fat in meals.
	Physical exercise	Movement of the body that uses energy and burns calories. For health benefits, it must be moderate to vigorous in intensity (Pittman, 2018).	Participant's response to questions regarding daily physical activity and weekly planned exercise in Health Promotion Lifestyle Profile (HPLP).
	Body composition	An indicator of the proportion of fat, muscle, and bone in an individual's body (Pittman, 2018).	Measurement of body fat percentage
	Coping strategies	Are psychological patterns that individuals use to manage thoughts, feelings, and actions encountered during various stages of ill health and treatments (Franklin, 2014).	Participants learn to use problem-focused coping and emotion-focused coping; practice deep breathing exercises, meditation and, progressive muscle relaxation.
Psychological determinants (stress and depression	Stress	Is a process in which environmental demands exceed an organism's adaptive capacity. This can result in biological and psychological changes that may place persons at risk of disease (Cohen, Kessler & Underwood-Gordon, 1995).	In the current study, stress refers to the patient's feelings aroused when they are involved in a certain situational demanding or change in their life and it will be measured by using the perceived stress scale (Cohen, Kamarck, Mermelstein, 1983).
	Depression	Is a common mental disorder that presents with depressed mood, decreased energy, loss of interest or pleasure, disturbed sleep or appetite, feelings of guilt or low self-worth, and poor concentration (WHO, 2012).	It is the total score of depressive symptoms measured by using Beck Depression Inventory-II (BDI-II) which is specially designed for assessing cognitive-affective and somatic-behavioral symptoms of depression (Beck, Steer & Brown, 1996 ; Ghareeb, 2000)

Table (2): Distribution of Socio-demographic Characteristics of The Studied groups (N = 202).

	Studied groups				Test of sig.	P-value
	Intervention group (n=101)		Control group (n=101)			
	No	%	No	%		
Age (years)					t –test	0.8(NS)
<i>M</i>		58.5		58.1	0.2	
<i>SD</i>		1.1		1.0		
Gender					χ²	0.001(Sig)
Male			41	40.6	10.4	
Female	20	19.8		59.4		
			60			
	81	80.2				
Marital status					χ²	0.3 (NS)
Single*	46	45.5	40	39.6	0.72	
Married	55	54.5	61	60.4		
Residence					χ²	0.23(NS)
Rural	82	81.2	75	74.3	1.4	
Urban	19	18.8	26	25.7		
Education					χ²	0.5 (NS)
Illiterate./R&W	69	68.3	65	64.4	1.33	
Technical Education	24	23.8	23	22.8		
University/Postgraduate	8	7.9	13	12.9		
					χ²	0.72 (NS)
Living alone	20	19.8	22	21.8	0.12	
Living With a family	81	80.2	79	78.2		
Occupation					χ²	0.05 (Sig)
Housewives	66	65.3	47	46.4	7.7.	
Workers	8	7.9	13	12.9		
Employees	20	19.8	27	26.7		
Others	7	6.9	14	13.9		
Total	101	100	101	100		

Table (3): Comparison between Baseline and Post-Intervention Values for Anthropometric Measures, Blood Pressure, Depression, Stress and Readiness to Change among the Intervention Group and The Control Group.

Characteristics	Baseline				P1	p	Post- intervention				P2	P3	P4	
	Interv entio n g r o u p (n=101)		Control g r o u p (n=101)				Interv entio n g r o u p (n=90)		Control g r o u p (n=91)					
	M	S D	M	S D			M	S D	M	S D				
Height (Cm)	162.3	0.7	162.2	0.6	t=0.11	0.9	162.1	0.8	162.3	0.6	0.8	0.9	0.72	
Weight (Kg)	79.0	1.1	79.5	1.4	t=0.2	0.7	76.5	1.1	79.4	1.8	0.1	0.0	0.9	
BMI	30.5	0.5	30.3	0.6	t=0.17	0.86	29.2	0.5	30.1	0.5	0.2	0.0	0.8	
Systolic BP	115.4	12.2	115.4	11.1	t=1.6	0.09	113.9	11.1	114.7	13.0	0.00	0.0	0.02	
Diastolic BP	79.6	0.6	79.6	0.7	t=1.3	0.17	80.6	0.5	81.5	1.0	0.0	0.0	0.0	
Depression	11.8	0.8	12.6	0.8	t=0.65	0.51	8.9	0.6	13.2	0.6	0.0	0.0	0.0	
Stress	17.2	0.7	19.4	0.6	t=2.3	0.02	13.3	0.7	20.3	0.7	0.0	0.0	0.6	
Readiness to change	Exercise	2.7	0.07	1.7	0.08	t=8.6	0.00	3.6	0.07	1.8	0.09	0.0	0.0	0.8
		Diet	2.9	0.06	1.8	0.09	t=9.8	0.00	3.8	0.07	1.9	0.1	0.0	0.0
			No	%	No	%	χ^2		No	%	No	%	χ^2	p2
Normal Over wt						0.03							0.0	0.1
Obesity		5	5	13	12	= 6.8	.	6	6.	12	13.	04	4	
		59	58	43	49			63	7	40	42	5		
		37	36	45	44			21	23	39	44	04		
		.6		.6				.3		.9				

P1= comparison between each baseline character of intervention and control groups.

P2= comparison between each post-intervention character of intervention and control groups.

P3= comparison between each baseline and post-intervention character of the intervention group.

P4= comparison between each baseline and post-intervention character of the control group.

Table (4): Correlation between Depression, Stress, and readiness for change Diet and Exercise at baseline and post-intervention.

Readiness for change:	Psychological determinants	r	P-value
Baseline diet	Depression	- 0.209	0.003
	Stress	- 0.288	0.000
Baseline exercise	Depression	- 0.235	0.001
	Stress	- 0.267	0.000
Post- intervention diet	Depression	- 0.321	0.000
	Stress	- 0.476	0.000
Post-intervention exercise	Depression	- 0.354	0.000
	Stress	- 0.490	0.000

Discussion

Control of chronic diseases need long term management programs to be followed by either patients or health systems. Regarding the comparison between baseline and post-intervention values for anthropometric measures; the present study's finding confirmed that a highly statistically significant reduction in mean weight and body mass index of intervention group after the intervention compared with baseline and a statistically significant difference between intervention and control groups post-intervention (Table 3). The finding of the present study was in the same line with **Nakade et al (2012)** reported that all the anthropometric data were significantly improved among the intervention group, while the control group showed little change in these variables after 12 months. Also, **Torres et al (2011)** reported that the change from the baseline body weight was significant in the first six months 2.80 ± 0.47 kg (-3.2%), $p < 0.0001$, this group continued to lose weight, and this change compared with baseline was 3.50 ± 0.69 kg (- 4.0%) at twelve months of follow-up, and 3.50 ± 0.69 kg (- 4.0%) at 24 months, the patient still losing weight: -3.83 ± 0.80 kg (- 4.3%). It may be related to the content of the counseling intervention (health education about healthy, low salt diet, fat-restricted, and low calories and the flexible plane of three healthy meals).

Regarding blood pressure; the present study's finding illustrated as a highly statistically significant reduction in mean systolic and diastolic blood pressure of the intervention group after the intervention compared with baseline. Also, a highly statistically significant difference between intervention and control groups regarding systolic and diastolic blood pressure post-intervention. The current study's finding was supported by **Hasandokht et al (2015)** documented a significant improvement in the blood pressure of the patients throughout the study phases ($p < .001$). Also, **Ali & Taha (2015)** verified a significant difference between pre and post-treatment diastolic blood pressure where diastolic blood pressure at pre-treatment was $(85.35 \pm 2.96$ mmHg) and at post-treatment was $(81.0 \pm 2.88$ mmHg). Moreover, **Nouh et al (2015)** reported that a highly statistically significant difference between the participants' percentage who had a reduction in both systolic and diastolic blood pressure in the study group and the participants' percentage in the control group. These may be due to participants' adherence to low salt diet and applying deep breathing exercises, meditation, and progressive muscle relaxation.

Concerning depression, stress; the current study's finding illustrated a highly statistically significant reduction in the mean score of depression and stress post-intervention compared with baseline. Also, a highly statistically significant

difference between intervention and control groups regarding depression and stress score post-intervention. The current study's finding was consistent with **Durrani, Irvine & Nolan (2012)** who confirmed that participants' stress and depression symptoms decreased, which in turn facilitated an increase in motivation to adhere to healthy behaviors. Also, **Ali et al (2015)** added that increased adherence to healthy behaviors may have facilitated a reduction in symptoms of stress and depression. Moreover **Quintana-Zavala et al (2018)**, who found that nursing interventions and counseling have a beneficial effect on stress and cortisol, and were effective for managing stress, stress reactivity index decreased from 1.68 to 0.8824 also, a decrease in cortisol level's mean after the nursing interventions from 12,78 (SD=5.29) $\mu\text{g/dL}$ to 11,85 (SD=4.75) $\mu\text{g/dL}$.

Regarding participants' readiness to change their behavior related to exercise and diet, there was a highly statistically significant improvement in the mean score of participants' readiness to change their behavior related to exercise and readiness to change their behavior related to diet among intervention group post-intervention compared with a baseline. Also, a highly statistically significant difference between intervention and control groups regarding participants' readiness to change their behavior related to exercise and readiness to change their behavior related to diet post-intervention (Table 3). The finding of the current study was supported by **Quintana-Zavala et al (2018)** who reported that a significant increase in walking between baseline and 6-months ($p = 0.006$, $d = 0.24$) and between baseline and 18-months ($p = 0.032$, $d = 0.20$) in the motivational interviewing intervention group. It may be related to

increasing participants' awareness of their stressors, causes of depressive symptoms, resources that assist them to cope effectively which increased their adherence to healthy behaviors.

Regarding the correlation of depression, stress, and participants' readiness to change their behavior related to diet and exercise, the present study's finding documented a negative statistically significant correlation between participants' readiness to change their behavior related to diet and exercise and psychological health determinants (depression and stress) (Table 4). The current study's finding was congruent with **Moore & Cunningham (2012)** they found a statistically significant negative correlation between exercise and stress. Also, the study by **Nouh et al (2015)** who indicated that there was a significant association between fiber intake and stress levels; individuals with high levels of stress consumed less than 20g or between 20 - 30 g/day, whereas individuals categorized with low stress, or moderate stress consumed more than 30g of fiber/day. Also, **Roohafza et al (2016)** clarified that hypertensive or diabetic patients in the high-stress group had a significantly lower percentage of medication usage ($P = 0.018$ and $P < 0.001$, respectively) and were less likely to follow recommended exercise regimen ($P = 0.039$ and $P = 0.032$, respectively). These may be attributed to the link between psychological distress and the use of unhealthy coping strategies (as consumption of sugary foods, overeating, spending extra hours in front of the TV or computer or sleeping too much, therefore their readiness to change exercise and diet decreased.

Conclusion:

The implementation of a non-pharmacological intervention has a positive effect on the reduction of systolic, diastolic blood pressure, weight, depression, and stress among hypertensive patients. Moreover, it has succeeded in increasing hypertensive patients' readiness to change exercise and diet.

Recommendation:

The implementation of non-pharmacological intervention for hypertensive patients and other patients who suffer from chronic disease.

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