Physical Activity, Stress and Nutrition-Behaviour among Hypertensive Individuals before Disease Diagnosis

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ABSTRACT

The aim of the current study isto assess physical activity, stress and nutrition behaviour among hypertensive individuals before disease diagnosis by proper medical specialists. Two hundred and fifty seven hypertensive males (56 ± 12 years, 174 ± 8 cm, 91 ± 16 kg, 30.2 ± 5.4 kg/m2) and 257 hypertensive females (58 ± 10 years, 162 ± 7 cm, 83 ± 16 kg, 31.6 ± 5.8 kg/m2) volunteered for the study. Inclusion criteria were; his or her age is ≥ 35 years and diagnosed with hypertension. A questionnaire of three parts was constructed. Content validity was checked before data collection. Intraclass correlation coefficient was used to assess reliability. The BMI results showed that 47% of hypertensive males and 58% of hypertensive females were obese. 64%, 65% and 74% of the study sample reported that they do not use to do high-intensity of physical activity and sport, moderate-intensity of physical activity and sport and strength exercises, respectively. Stress level was moderate among hypertensive males and females (17.9 & 20.9, respectively). 66% of the study sample reported that salt was moderate in their meals. 20% and 23% of the study sample used to eat one or more portion of fresh fruits and vegetables ≥ 7 per week, respectively. Normotensive individuals should do 30-min of moderate PA 5 or more times a week. Normotensive persons should avoid stress. If stress level is moderate or high stress-management strategies should be adopted. Quality and quantity of food should be controlled.

Keywords: Hypertension; Physical activity; Nutrition; Stress.

Introduction

Hypertension is a major health problem globally due to its prevalence, associated risks, difficulty in managing and its high medical and social costs (Chobanian, et al., 2003). It is well established that hypertension is an important risk factor for myocardial infarction, heart failure, stroke, renal failure and kidney disease (Shapiro, 2013). It has been shown that controlling BP with antihypertensive agents can reduce the incidence of stroke by 35-40%, myocardial infarction by 20-25% and heart failure by more than 50% (Chobanian et al., 2003).

Physical activity (PA) is defined as any bodily movement produced by skeletal muscles that require energy expenditure above basal metabolic rate (ACSM, 2013). Regular physical activity, physical fitness and exercise are essentially important for the health and well-being of individuals of all ages (Tsioufis et al., 2010). Physical activity reduces, SBP, DBP, improves lipid metabolism and decreases body weight (Skinner, 2005; Hu et al., 2015). Therefore, many organizations and authors suggested that PA should be considered as an important factor for the prevention and treatment of hypertension in adulthood (e.g., Tsioufis et al., 2010).

Stress is a physical, mental, or emotional factor that causes bodily or mental tension. Stresses can be caused externally (i.e., environment, psychological or social situations) or internally (i.e., illness, or from a medical procedure) (Broome, 2013). Previous studies have classified psychological stress as a risk factor for hypertension (Henry, 1988; Hu et al., 2015). Furthermore, stress can cause elevations in BP and chronic stress prevents an elevated BP from recovering to its normal homeostatic levels (Harrington, 2012).

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Nutrition is defined as the total process of ingestion, digestion, absorption, metabolism of food and the subsequent of assimilation of nutrients material into tissues (Gleeson, & Jeukenbrup, (2004). Nutrition includes both type and amount of food intake (i.e., carbohydrate, fat, protein, water, vitamins and minerals) and eating behavioural science. Nutrition plays a vital role in the morbidity of several diseases. Many studies and associations classify overfeeding as an important causal factor for obesity as a result of a positive energy balance (Skinner, 2005). Kannel et al. (1967) reported that obesity is associated with essential hypertension in 78% of men and 65% of women. Other studies classified excess salt (Henry, 1988) and alcohol (Kaplan, 1995) intake as potential causes of hypertension. Some other studies indicated that excess caffeine intake might cause slight elevation in blood pressure (Nehlig, 2018).

Hypertension treatments include pharmacological and non-pharmacological therapies (Bando et al., 2018). Examples of non-pharmacological therapies for BP control include stress reduction, exercise, weight loss and healthy dietary habits (Dhungana et al., 2018). Therefore, lifestyle modifications may be sufficient to control hypertension in the absence of medications for those persons with stage 1 hypertension (Lin & Svetkey, 2012). Lifestyle modifications might also help to enhance the efficacy of antihypertensive medications for those with higher levels of BP (Lin & Svetkey, 2012).

Problem and importance of the study

The use of technology and smart phones has increased dramatically in the last twenty years in Jordan. Fast food restaurants have also increased considerably in the last twenty years in Jordan. These changes might affect physical activity level, stress and nutritional behaviour in Jordan which have not assessed among hypertensive individuals before.

Aims of the study

The purpose of the current study was to assess;

1. Physical activity among hypertensive individuals in Jordan before disease diagnosis.
2. Stress among hypertensive individuals in Jordan before disease diagnosis.
3. Nutrition behaviour among hypertensive individuals in Jordan before disease diagnosis.

Hypotheses of the study

We hypothesized that;

1. Hypertensive individuals would be less physically active.
2. Hypertensive individuals exhibit high stress levels.
3. Hypertensive individuals adopt poor dietary practices.

Methods

Participants:

Two hundred and fifty seven males with hypertension and 257 hypertensive females volunteered to take part in the study. All data were collected from hypertensive individuals in Jordanian capital (Amman), Jordan.Inclusion criteria were; his or her age is ≥ 35 years and diagnosed with hypertension. This study was conducted with institutional ethics approval from the Faculty of Physical Education at the University of Jordan.All characteristics of the study sample are presented in table (1).

Table 1: Descriptive statistics of the study sample

Gender	n	Age (years)	Height (m)	Weight (Kg)	BMI (Kg/m^2)	Age of hypertension diagnosis
Male	257	56 ± 12	1.74 ± 0.08	91 ± 16	30.2 ± 5.4	45.3 ± 11
Female	257	58 ± 10	1.62 ± 0.07	83 ± 16	31.6 ± 5.8	44.4 ± 10

* Values are means ± SD

Procedures:

All participants filled in a physical activity questionnaire which was adapted from Al-Hazzaa et al. (2011), the Perceived Stress Scale (Cohen et al., 1983) and a nutritional-behaviour questionnaire. These three questionnaires were validated in this study. Intraclass correlation coefficient using Cronbach's alpha was used to assess reliability for the three questionnaires in this study.

Measures

Body Mass Index:

Body mass was measured for each person to the nearest 1.0 kg and height was also measured for each person to the nearest 1 cm and body mass index (BMI) was subsequently calculated.

Physical Activity questionnaire:

PA questions were adopted from Al-Hazzaa et al. (2011). Eight questions were included in the PA questionnaire. For example, these questions asked participants how long they completed moderate and high intensity PA and sports. These questions also asked about car use for short distances. Furthermore, these questions asked how long participants engaged in sedentarily behaviours such as watching TV.

Stress: Many scales have been developed to assess stress. In the current study, the Perceived Stress Scale (PSS) (Cohen et al., 1983) comprises 10-items which were translated and employed in the study. The respondents in the current study rated the frequency of their feelings and thoughts related to events and situations that occurred before the diagnosis of hypertension as outlined by Cohen et al. (1983). Six items are negative (1, 2, 3, 6, 9, 10) and the remaining four are positive (4, 5, 7, 8). The response format was the same as the original PSS (Cohen et al., 1983) and each item is rated on a five point Likert-type scale (1 = never to 5 = very often). To produce the score, the four positive items are reverse-scored, and then all the items are summed, with scores ranging from 0 to 40. A higher score indicates greater stress.

Nutrition-Behavioural questionnaire:

Nutrition questions were constructed by the researchers. Although most of these questions are valid, content validity was employed to assess the validity of the questionnaire.

Validity and reliability of the three questionnaires

Content validity revealed that there was ≥ 80% overall agreement between the arbitrators on the questions of PA questionnaire and on the questions of nutritional-behaviour questionnaire. Perceived stress scale was valid and reliable (Cohen et al., 1983). However, as it was translated, content validity revealed that there was ≥ 80% overall agreement between the arbitrators on the questions of PSS questionnaire.Cronbach's alpha was used to assess intraclass correlation coefficient between the items of the three questionnaires. Cronbach's alpha values for three questionnaires are presented in table 2.

Table 2: Cronbach's alpha values for the three questionnaires

	Cronbach's alpha	**Sig. level**
PA questionnaire	**0.679**	**0.000**
Perceived stress scale	**0.720**	**0.000**
Nutritional-behaviour questionnaire	**0.507**	**0.000**

Data analysis

Data were checked for normality using Shapiro-Wilk test. A series of independent sample t-test were used to assess whether there was a significant difference between male and female in the values of Perceived Stress Scale questions. A series of Chi-Square for single classification (i.e., the choices of PA and nutrition-behaviour) were used to assess whether there was a significant difference in the frequencies of the study sample on the choices of PA and nutrition-behaviour. These statistical techniques were analysed using the SPSS version 16. A series of Chi-Square for two

classifications (i.e., gender and the choices of PA questions and nutrition-behaviour questions) were used to assess whether there was a significant difference in the frequencies of male and females on the choices of PA. These series of Chi-Square for two classifications were analyzed manually using Microsoft Office Excel 2007 as described by Vincent& Weir, (2012).

Results

The Chi-Square results of physical activity and nutritional habits are presented in table 2 and table 4, respectively. The independent sample t-test results for Perceived Stress Scale are presented in table 3.

Part 1: Physical activity

Table 3: Chi-Square results for physical activity questions. Values are frequencies (n).

Question	Gender	Choices						
		Always	**Sometimes**	**Never**	**-**	**-**	**-**	**Total**
Q1: I used to use the stairs instead of elevator	Male	78	122	57	-	-	-	**257**
	Female	111	85	61	-	-	-	**257**
	Total	**189**	**207**	**118**	-	-	-	**514**
		Always	Sometimes	Never	-	-	-	Total
Q2: I used to walk instead of ride a car in short distance that doesn't exceed a kilometre	Male	94	86	77	-	-	-	**257**
	Female	96	103	58	-	-	-	**257**
	Total	**190**	**189**	**135**	-	-	-	**514**
		Daily	4-6 times per week	2-3 times per week	Once a week	1-2 times monthly	never	Total
Q3: I used to perform high- intensity physical activity or sport, that made my breathing level and heart rate increased, and lasts for continuous or intermittent 20-min	Male	14	15	34	26	22	146	**257**
	Female	16	20	14	10	14	183	**257**
	Total	**30**	**35**	**48**	**36**	**36**	**329**	**514**
Q4: I used to perform moderate-intensity physical activity or sport, that made my breathing level and heart rate increased above the rest values, and lasts for continuous or intermittent 30-min	Male	13	14	32	19	35	144	**257**
	Female	15	14	17	11	10	190	**257**
	Total	**28**	**28**	**49**	**30**	**45**	**334**	**514**
Q5: I used to perform strength exercises (free weight or body weight exercises) to strengthen my muscles, or I used to do weary hand work in house or garden	Male	14	17	20	20	14	172	**257**
	Female	13	8	8	10	8	210	**257**
	Total	**27**	**25**	**28**	**30**	**22**	**382**	**514**
		Very active	Moderately active	Rarely active	Office work	-	-	Total
Q6: I used to describe my physical activity at my job	Male	54	76	58	41	-	-	229
	Female	33	24	12	6	-	-	75
	Total	87	100	70	47	-	-	304
Q7: I used to describe my physical activity at home	Male	37	97	66	57	-	-	257
	Female	132	76	29	20	-	-	257
	Total	169	173	95	77	-	-	514
		None	≤ 2 hours	3-5 hours	> 5 hours	-	-	Total
Q8: I used to spend….per day watching	Male	8	110	91	48	-	-	257

Question	Gender	Choices						
		Always	Sometimes	Never	-	-	-	Total
TV or using computer or Smartphone	Female	24	121	78	34	-	-	257
	Total	32	231	169	82	-	-	514

Chi square results showed that hypertensive individuals were not equally distributed on the three choices of the first question $\chi^2_{(2)} = 26$, P <0.01, on three choices of the second question $\chi^2_{(2)} = 12$, P <0.01, on the six choices of the third question $\chi^2_{(5)} = 831$, P <0.01, on the six choices of the fourth question $\chi^2_{(5)} = 869$, P <0.01, on the six choices of the fifth question $\chi^2_{(5)} = 1231$, P <0.01, on the four choices of the sixth question $\chi^2_{(3)} = 21$, P <0.01, on the four choices of the seventh question $\chi^2_{(3)} = 58$, P <0.01 and on the four choices of the eighth question $\chi^2_{(3)} = 184$, P <0.01.

Chi-Square results revealed that there was a significant difference in the frequencies of male and female with hypertension on the choices of the first question $\chi^2_{(2)} = 12.51$, P <0.01, the third question $\chi^2_{(5)} = 22.23$, P <0.01, the fourth question $\chi^2_{(5)} = 27.1$, P <0.01, the fifth question $\chi^2_{(5)} = 17.17$, P <0.01, the sixth question $\chi^2_{(3)} = 43.83$, P <0.01, the seventh question $\chi^2_{(3)} = 88.14$, P <0.01 and the eighth question $\chi^2_{(3)} = 11.91$, P <0.01. However, Chi-Square results revealed that there was no significant difference in the frequencies of male and female with hypertension on the choices of the second question $\chi^2_{(2)} = 4.22$, > 0.05.

Part 2: Stress

Table 4: Means (m), standard deviation (sd), t-test (t), degrees of freedom (df) and level of confidence (sig) results for stress questions

Question (Stress)	Gender	n	m	sd	t	df	Sig
Q1:I used to feel upset because of something happened unexpectedly	Male	257	2.42	1.12	-5.296	512	0.000
	Female	257	2.92	1.04			
Q2: I used to feel that I'm unable to control the important things in my life	Male	257	1.23	1.02	-3.052	512	0.002
	Female	257	1.53	1.20			
Q3:I used to feel nervous and stressed	Male	257	1.75	1.19	-5.647	512	0.000
	Female	257	2.37	1.28			
Q4:I used to feel confident about my ability to handle my personal problems	Male	257	1.51	1.05	-2.659	512	0.008
	Female	257	1.76	1.12			
Q5:I used to feel that things were going my way	Male	257	2.02	1.06	-2.392	512	0.017
	Female	257	2.23	1.00			
Q6:I used to feel that I couldn't cope with all things that I had to do	Male	257	1.36	1.04	-0.943	512	0.346
	Female	257	1.45	1.11			
Q7:I used to feel that I am able to control irritations in my life	Male	257	1.92	1.04	-1.094	512	0.275
	Female	257	2.02	1.14			
Q8:I used to feel that I am on top of things	Male	257	1.71	1.03	-1.817	512	0.070
	Female	257	1.88	1.11			
Q9:I used to feel angry because of things that were outside of my control	Male	257	2.46	1.15	-3.196	512	0.001
	Female	257	2.78	1.14			
Q10:I used to feel that difficulties were piling up so high that I couldn't overcome them	Male	257	1.48	1.04	-4.584	512	0.000
	Female	257	1.95	1.25			
Total of Perceived Stress Scale	Male	257	17.9	5.6	-5.968	512	0.000
	female	257	20.9	6.0			

A series of independent sample t-test showed that hypertensive female have significantly higher stress level in questions 1, 2, 3, 4, 5, 9and 10than hypertensive males (P < 0.05). A series of independent sample t-test showed that hypertensive female have higher, but not significant, stress level in question 6, 7 and 8 than hypertensive male (P >

0.05). Independent sample t-test showed that hypertensive female have significantly higher stress level in the Perceived Stress Scale than hypertensive male (P = < 0.05). Cohen, et al. (1983) reported that if PSS scores were 0-13, 14-26 and 27-40 these classify as low stress level, moderate stress level and high stress level, respectively. Based on Perceived Stress Scale aforementioned classifications hypertensive males and females have moderate stress level (17.9 & 20.9, respectively).

Part 3: Nutrition

Table 5: Chi-Square results for nutrition questions. Values are frequencies (n).

Question	Gender	Choices						
		Never	**1-2 per month**	**1-2 per week**	**3-4 per week**	**5-6 per week**	**≥ 7 per week**	**Total**
Q1: I used to eat fast food (e.g., hamburger and hotdog)	Male	105	80	55	10	5	2	257
	Female	127	90	39	1	0	0	257
	Total	**232**	**170**	**94**	**11**	**5**	**2**	**514**
Q2: I used to drink drinks that contain caffeine (e.g., coffee, Pepsi and energy drinks)	Male	27	31	37	17	35	110	257
	Female	33	26	46	18	27	107	257
	Total	**60**	**57**	**83**	**35**	**62**	**217**	**514**
Q3: I used to eat a portion or more of fresh fruits (e.g.: banana and apple):	Male	12	27	78	59	35	46	257
	Female	13	37	77	55	19	56	257
	Total	**25**	**64**	**155**	**114**	**54**	**102**	**514**
Q4: I used to eat a portion or more of fresh vegetables (e.g.: tomato and cucumber):	Male	11	17	87	54	46	42	257
	Female	10	21	66	48	38	74	257
	Total	**21**	**38**	**153**	**102**	**84**	**116**	**514**
Q5: I used to eat meals that contain cooked vegetables:	Male	5	19	79	91	33	30	257
	Female	4	12	83	72	33	53	257
	Total	**9**	**31**	**162**	**163**	**66**	**83**	**514**
Q6: I used to eat desserts and sweets (e.g.: biscuits, cake and donuts):	Male	22	71	80	45	16	23	257
	Female	28	58	83	35	13	40	257
	Total	**50**	**129**	**163**	**80**	**29**	**63**	**514**
		Too much	**Much**	**Moderate**	**little**	**Very little**	**Total**	-
Q7: The salt in my food was	Male	7	36	160	32	22	257	-
	Female	15	25	178	29	10	257	-
	Total	**22**	**61**	**338**	**61**	**32**	**514**	-
		Always	**Often**	**Rarely**	**Total**	-	-	-
Q8:I used to monitor the quality and quantity of my food	Male	32	114	111	257	-	-	-
	Female	48	92	117	257	-	-	-
	Total	**80**	**206**	**228**	**514**	-	-	-
		None	**1**	**2**	**3**	**4**	**≥ 5**	**Total**
Q9: If you used to drink drinks that contain caffeine, how many cups did you drink during a day?	Male	17	86	68	48	21	17	257
	Female	30	85	63	45	19	15	257
	Total	47	171	131	93	40	32	514
		> 1 hour	**1 hour**	**half an hour**	**immediately**	**Total**	-	-
Q10: I used to eat the last meal before sleeping:	Male	103	93	39	22	257	-	-
	Female	135	88	16	18	257	-	-
	Total	238	181	55	40	514	-	-
		Never	**Rarely**	**Often**	**Always**	**Total**	-	-

Question	Gender	Choices						
		Never	1-2 per month	1-2 per week	3-4 per week	5-6 per week	≥ 7 per week	Total
Q11: I used to eat meals that contain a high amount of fats:	Male	21	113	102	21	257	-	-
	Female	55	97	88	17	257	-	-
	Total	76	210	190	38	514	-	-

Chi square results showed that hypertensive individuals were not equally distributed on the six choices of the first question $\chi^2_{(5)} = 557$, P <0.01, the second question $\chi^2_{(5)} = 255$, P <0.01, the third question $\chi^2_{(5)} = 129$, P <0.01, the fourth question $\chi^2_{(5)} = 142$, P <0.01, the fifth question $\chi^2_{(5)} = 246$, P <0.01, the sixth question $\chi^2_{(5)} = 150$, P <0.01 and the ninth question $\chi^2_{(5)} = 151$, P <0.01. Chi-Square results showed that hypertensive individuals were not equally distributed on the four choices of the tenth question $\chi^2_{(3)} = 218$, P <0.01 and the eleventh question $\chi^2_{(3)} = 166$, P <0.01. Chi square results showed that hypertensive individuals were not equally distributed on the five choices of the seventh question $\chi^2_{(4)} = 684$, P <0.01 and on the three choices of the eighth question $\chi^2_{(2)} = 74$, P <0.01, the

Chi-Square results revealed that there was no significant difference in the frequencies of male and female with hypertension on the choices of the second question $\chi^2_{(5)} = 3.12$, P > 0.05, the third question $\chi^2_{(5)} = 7.47$, P > 0.05, the fifth question $\chi^2_{(5)} = 10.38$, P > 0.05, the sixth question $\chi^2_{(5)} = 8.23$, P > 0.05, the eighth question $\chi^2_{(2)} = 5.71$, P > 0.05and the ninth question $\chi^2_{(5)} = 4.11$, P > 0.05. Chi-Square results revealed that there was a significant difference in the frequencies of male and female with hypertension on the choices of the first question $\chi^2_{(5)} = 19.76$, P <0.01, the fourth question $\chi^2_{(5)} = 13.29$, P < 0.05, seventh question $\chi^2_{(4)} = 10.499$, P < 0.05, the tenth question $\chi^2_{(3)} = 14.46$, P <0.01 and the eleventh question $\chi^2_{(3)} = 17.88$, P <0.01.

Discussion

This is a baseline study to assess PA, stress and nutrition behaviour among hypertensive persons before the diagnosis of hypertension. This study is going to be followed by longitudinal study to assess PA, stress, nutrition-behaviour and other habits such as smoking among hypertensive persons in Jordan after one, two, three, four and five years of the diagnosis of the hypertension.

Hypothesis 1: Hypertensive individuals would be less physically active.

It is well established that less physical activity and a sedentary lifestyle leads to diseases such as cardiovascular diseases, obesity, type 2 diabetes, osteoporosis and hypertension (ACSM, 2013; Willumsen, & Bull, (2020). Therefore, in the current study we assessed the prevalence of sedentary lifestyle or low PA level among hypertensive individuals in Jordan before disease diagnosis. For the PA questionnaire we will not interpret all questions, instead we will interpret the most important questions. Therefore, we will analyze and interpret question 3, 4 and 5. In Q3 "I used to perform high- intensity physical activity or sport, that made my breathing level and heart rate increase, and lasts for continuous or intermittent 20-min" 64% of the study sample reported that they did not used complete high-intensity physical activity or sport for 20 minutes. In Q4 "I used to perform moderate-intensity physical activity or sport, that made my breathing level and heart rate increased above the rest values, and lasts for continuous or intermittent 30-min" 65% of the study sample reported that they do not used to complete moderate-intensity of physical activity or sport for 30 minutes. In Q5 **"**I used to perform strength exercises (free weight or body weight exercises) to strengthen my muscles, or I used to do weary hand work in house or garden" 74% of the study sample reported that they do not used to do strength exercises. All these findings indicated that sedentary lifestyle is related to hypertension incidence. These findings are in agreement with Sohn et al. (2014). These authors indicated that there is a strong association between sedentary behaviour and increased SBP and elevated BP. In addition, Malhotra et al. (1999) indicated that sedentary lifestyle and higher BMI are risk factors for hypertension. On the other hand, moderate to vigorous physical activity or exercise-related physical activity may reduce the risk of developing hypertension (Díaz-Jáures and Suarez, (2017);

Slattery and Jacobs, 1988). It has been suggested that middle-aged men with lower levels of physical fitness are at greater risk of mortality from coronary heart and cardiovascular diseases (Díaz-Jáures and Suarez (2017); Slattery and Jacobs, (1988)). This greater risk is largely due to higher BP levels. Therefore, different organizations, including the ACSM and WHO have suggested that every adult should undertake at least 30 minutes of moderate-intensity physical activity (such as brisk walking, cycling, swimming, house work, or gardening) on most, preferably all, days of the week (ACSM, 2013). These recommendations are based on increasing epidemiological evidence that regular physical activity reduces the risk of cardiovascular disease.

The mean BMI in our study indicated that the hypertensive males and females were obese (30.2 kg/m^2& 31.6 kg/m^2, respectively). More specifically, 120 (47%) and 150 (58%) of hypertensive males and females had a BMI ≥ 30 kg/m^2, respectively. The higher percentage of obesity among our sample might be interpreted by low PA. This association between high BMI and low PA among our sample is not surprising. Many studies have indicated that low exercise and PA activity level is associated with obesity (ACSM, 2013; Costill et al., 2008).

Chi-Square results indicated that the frequencies of hypertensive females who did not undertake moderate-intensity PA (Q3:71% & 57%, respectively), high-intensity PA (Q4: 74% & 56%, respectively) or strength exercises (Q5: 82% & 67%, respectively) were significantly higher than hypertensive males. Our findings are in agreement with Al-Nozha et al. (2007) who reported that 98.1% of Saudi females and 93.9% of Saudi males were inactive. Al-Nakeeb, et al. (2012) also reported that male youths in the UK and Saudi Arabia were more active than female youths as indicated by the lower total METS/min per week for female youths than male youths. All these findings support the notion that females are less active than males. In Q6: "I used to describe my physical activity at my job" only 29% of the hypertensive females answered this question compared to 89% of hypertensive males. This indicated that 71% of hypertensive female were unemployed this in turn might decrease physical activity even more.

Hypothesis 2: hypertensive individuals exhibit high stress levels.

In recent years, technological revolution in industrial and agricultural sectors has dramatically changed our lifestyle behaviours and increased stress levels. Therefore, one of the aims of the current study was to assess stress levels among hypertensive males and females in Jordan before hypertension diagnosis. PSS values indicated that males and females with hypertension have moderate stress levels (17.9 & 20.9, respectively). These findings are in agreement with Hu et al. (2015). These authors reported that 38.45% of their sample had general stress. These authors also reported that SBP, DBP and rates of hypertension were higher in a group with, compared to a group without, general stress. Shapiro (2013) indicated that individuals who are exposed to prolonged and repeated stress in their emotional life, occupational and interpersonal relationships are most likely to develop hypertension. Matthews et al. (2004) observed that large BP changes in response to acute stressors predict incidence of hypertension. Kulkarni et al. (1998) indicated that stress can cause hypertension through repeated BP elevations as well as by stimulation of the nervous system to produce large amounts of vasoconstriction hormones (i.e., epinephrine and norepinephrine) that increase BP.

The results of a series of independent sample t-test showed that females with hypertension have significantly higher values on the PSS questions and on the total of PSS than hypertensive males ($P < 0.05$). These, findings are in agreement with Hu et al. (2015). These authors observed that Chinese middle-aged women appeared to be more susceptible to psychological stress than men. Our findings are in disagreement with öhlin et al. (2007) who reported that the effect of occupational stress was higher on blood pressure among men than women. Allen et al. (1993) also indicated that, when men and women were exposed to stress, men have greater blood pressure increase than women. In our study, the frequencies of hypertensive females who did not used to undertake moderate-intensity and high-intensity PA or strength exercise were significantly higher than hypertensive men. Low PA in females might have contributed to increased stress levels compared to males.

Hypothesis 3: hypertensive individuals adopt poor dietary practices.

One of the aims of the current study was to assess nutrition behavior among hypertensive individuals in Jordan before the diagnosis of hypertension. 338 (66%) of our sample reported that the salt in their meals was moderate.

Moderate to high dietary salt intake is has adverse effects on vascular health. Suppa et al. (1988) reported that diet low in salt decreased SBP by 4 mmHg and 2 mmHg in DBP among 356 hypertensive persons. It is recommended to eat food with a low salt content such as fruits and vegetables to avoid excessive dietary salt intake in hypertensive as well as and normotensive individuals (Fodor et al., 1999). However, a low percentage of our sample used to eat fresh fruits and vegetables. Specifically, 102 (20%) and 116 (23%) reported that they used to eat one portion or more of fruits and vegetables ≥ 7 times per week, respectively. Some countries such the UK, Australia, and New Zealand recommend 5 to 7 daily portions of fruits and vegetables. Pienovi et al. (2015) indicated that consuming fruits and vegetables in amounts larger than 400 g per day, provides a protective effect against increases in both systolic and diastolic BP. Moreover, Borgi et al. (2016) suggested that greater long-term intake and increased consumption of whole fruits may reduce the risk of developing hypertension.

Two hundred and twenty eight (44%) of our sample reported that they rarely control the quality and quantity of their diet. Since one hundred and eighty nine (37%) of our sample had a low level of education (i.e., no secondary school degree), this might have lead to low awareness of dietary recommendations. In support of this postulate, Kesteloot et al., (1980) indicated that hypertension was significantly less common in men with higher education compared to men with lesser education. These authors also indicated that hypercholesterolemia, smoking and overweight were also less frequent. This may be interpreted as persons with higher education are generally better informed such that they more readily adopt primary preventive methods (Kesteloot et al., 1980). Two hundred and seventeen (42%) of the study sample reported that they used to drink drinks containing caffeine. Excessive consumption of drinks that contain caffeine is associated with hypertension (Nehlig, 2018). Weinberg & Bealer's (2004) indicated that coffee and caffeine intake considered an important factor in hypertension's causes. In a study by Mutnick et al. (2004), an equivalent of two to three cups of coffee was given to subjects whose BP is classified normotensive. It was determined that the higher the baseline BP, the more increase was seen up to an hour after caffeine intake.

One hundred and ninety (37%) of the study sample reported that they used to eat food that is high in fat. A fat-rich diet might alongside a low PA contribute to the high prevalence of obesity among hypertensive males and females (30.2 kg/m^2& 31.6 kg/m^2, respectively). Also, a diet rich in fruits, vegetables, and low-fat dairy foods and with reduced saturated and total fat can substantially lower BP, independent of PA (Appel et al. 2003).

On the other hand, 232 (45%) of the study sample reported that they never ate fast food. This is good nutrition behaviour. Smith, (2011) indicated that fast food, such as French fries, chicken, pizzas and hamburgers are high in sodium content. This might be attributed to the fact that most (79%) of the females with hypertension are unemployed. Higher percentage of unemployment females will in turn lead to more home-prepared food instead of fast and cooked food from outside home. 238 (46%) of the study sample reported that they used to eat the last meal one hour or more before going to sleep. This represents good nutrition behaviour as a later dinner time is associated with a higher chance to increase fat storage (Costill et al., 2008).

Conclusion

Body mass index means indicated that Jordanian hypertensive males and females were obese (30.2 kg/m^2& 31.6 kg/m^2, respectively). More than 50% of Jordanian males and females with hypertension did not undertake sufficient moderate- and high-intensity PA or perform strength exercise, with females less active than males. Jordanian males and females with hypertension had moderate stress levels, but females had higher stress levels than males. 56% of our sample reported that they controlled and monitored the quality and quantity of their diet. Therefore, in order to avoid hypertensionwe recommend that;

1. Individuals should lose weight.
2. Increase their physical activity.
3. Monitor and control stress.

4. Individuals should also monitor and control the quality and quantity of food intake.

Implications

This study enhances awareness levels of the importance of increasing PA, adopting good nutritionbehaviour and avoiding and controlling stress in preventing hypertension in normotensive individuals.Moreover, this study has important implicationsfor managing and attenuating hypertension among individuals with hypertension by adopting positive lifestyle behaviours.

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Authors' contribution: Ismail and Al-Rahamneh conceptualized the study design and protocol, and determined the study institutions. Ismail collected and assembled the data. Al-Rahamneh carried out the analysis and interpretation of data. Ismail drafted the manuscript. All authors have critically reviewed, revised and approved the manuscript.

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النشاط البدني والضغط النفسي والسلوك الغذائي لدى المصابين بارتفاع ضغط الدم قبل الإصابة بالمرض

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ملخص

هدفت هذه الدراسة الى تقييم النشاط البدني والضغط النفسي والسلوك الغذائي لدى المصابين بارتفاع ضغط الدم قبل الإصابة بالمرض**257** . رجل و**257** سيدة من المصابين بارتفاع ضغط الدم تطوعوا للاشتراك في الدراسة، شروط الانضمام لعينة الدراسة ان يكون الشخص مصاب بارتفاع ضغط الدم وان يكون عمره **35** سنة فاكثر**K** لتقييم النشاط البدني والضغط والسلوك الغذائي تم استخدام ثلاث استبانات مختلفة بعد حساب صدقها بطريقة صدق المحتوى وثباتها بطريقة الاتساق الداخلي)كرونباخ ألفا.(أظهرت نتائج الدراسة ما يلي**47%** : من الرجال و**58%** من السيدات المصابون بارتفاع ضغط الدم لديهم سمنة بناء على مقياس مؤشر كتلة الجسم، و**64%** من عينة الدراسة لم يمارسوا أنشطة بدنية أو رياضات ذات شدة عالية و **65%** من عينة الدراسة لم يمارسوا أنشطة بدنية أو رياضات ذات شدة متوسطة و**74%** من عينة الدراسة لم يمارسوا تمارين قوة. وأظهرت نتائج الدراسة كذلك أن مستوى الضغط النفسي لدى الرجال المصابين بارتفاع ضغط الدم كان متوسط **(17.9)** ومستوى الضغط النفسي لدى السيدات المصابات بارتفاع ضغط الدم كان متوسط **(20.9)** وأن **66%** من أفراد عينة الدراسة كانوا يتناولون وجبات نسبة الملوحة فيها متوسطة و**23%** - **20%** فقط من أفراد عينة الدراسة كانوا يتناولون فواكهة أو خضروات طازجة **7** مرات فأكثر أسبوعي. يوصي الباحثان الأفراد غير المصابين بارتفاع ضغط الدم بضرورة ممارسة النشاط البدني **5** مرات في الأسبوع وأن تكون مدة الممارسة **30** دقيقة في كل مرة للوقاية من الإصابة بارتفاع ضغط الدم وكذلك تجنب الضغط النفسي. في حالة الضغط النفسي المتوسط او المرتفع يجب اتباع استراتيجيات لخفضه. وأخيراً يجب الانتباه الى نوعية وكمية الطعام المتناول.

الكلمات الدالة: ارتفاع ضغط الدم، النشاط البدني، التغذية، الضغط النفسي.

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