

## BEHAVIORAL AND DIETARY FACTORS INVOLVED IN HYPERTENSION

Mamoona Mushtaq<sup>1</sup>, Najma Najam<sup>2</sup>

<sup>1,2</sup> Institute of Applied Psychology,  
University of the Punjab, Lahore,  
Pakistan

**Address for Correspondence:**

**Dr. Mamoona Mushtaq,**

Assistant Professor,

Department of Psychology,  
Government M. A. O College, Lahore,  
Pakistan

E-Mail:

mamoonamushtaq@gmail.com

Date Received: September 28, 2014

Date Revised: November 01, 2014

Date Accepted: November 24, 2014

**Contribution**

All the authors contributed significantly to the research that resulted in the submitted manuscript.

**All authors declare no conflict of interest.**

This article may be cited as: Mushtaq M, Najam N. Behavioral and dietary factors involved in hypertension. Pak Heart J 2015;48(01): 18-23.

### ABSTRACT

**Objective:** To study the relationship of behavioral and dietary factors with hypertension and to study whether these factors predict hypertension disease?

**Methodology:** This cross sectional study was conducted at Public Hospitals of Punjab. Total sample was 350, outdoor hypertensive patients (N= 200, men=100, women=100) between ages 30-65, and control group (N=150, men=75, women= 75), matched with age, gender and monthly income, was recruited from the public hospitals. A comprehensive behavioral and dietary information questionnaire was prepared and used for data collection. Descriptive statistics, chi-square and logistic regression analyses were used.

**Results:** Significant positive correlation of hypertension with sedentary lifestyle ( $\chi^2 = 28.49$ ,  $p < .001$ ), alcohol use ( $\chi^2 = 13.99$ ,  $p < .001$ ), saturated fat foods ( $\chi^2 = 8.78$ ,  $p < .001$ ) and salty foods ( $\chi^2 = 13.45$ ,  $p < .001$ ) was found. Physical inactivity (B = .64, OR = 1.85, 95% CI, 1.18-3.21,  $p < .001$ ), smoking (B = .37, OR = 1.72, 95% CI, 1.14-2.98,  $p < .01$ ), intake of salty food (B = .43, OR = 1.51, 95% CI, 1.12-1.98,  $p < .01$ ), desi-ghee (B = .63, OR = 1.90, 95% CI, 1.34-3.20,  $p < .001$ ) and eggs appeared as significant negative predictors of hypertension.

**Conclusion:** There is significant positive correlation of hypertension with sedentary lifestyle, alcohol use, saturated fat foods and salty foods, while physical inactivity, smoking, intake of salty food, desi-ghee and eggs appeared as significant negative predictors of hypertension.

**Key Words:** Behavioral, Physical Inactivity, Dietary, Hypertension

## INTRODUCTION

Hypertension has been a major topic for research for the last several decades. For many years the psychological and behavioral factors are known to be pertinent to the existing knowledge of hypertension onset and progression. Behavioral pathways are considered main factors that lead to hypertension. It is considered an indirect path in which physiological changes can be brought forth in the framework of unhealthy lifestyles normally termed as behavioral risk factors of hypertension or these factors have turned out to aggravate the risk by indirectly affecting the health.<sup>1</sup>

In developing countries new emerging trends in lifestyle can be held responsible for hypertension and its higher prevalence in urban than in rural areas.<sup>2</sup> People living in rural areas have a strong urge to shift into cities where competition in every walk of life is tough. It is reported that accelerated acculturation to Western lifestyle seems to be associated with hypertension.<sup>3</sup> Consequently, the previous discussion brings us near to behavioral factors which are also recognized as third and modifiable risk factors of hypertension. These factors include obesity, sedentary lifestyle, cigarette smoking and diet. Health damaging behaviors like smoking, poor dietary habits, physical inactivity and excessive use of alcohol can be held responsible for hypertension.<sup>4,5</sup> In Pakistan, 23% to 40% population between ages 45 to 64 years is obese as well as hypertensive.<sup>6,7</sup> In a meta-analysis research which combined results across 25 testing conditions, mean systolic and diastolic BP declined from an average weight reduction of 5.1 kg and were from 3.6 to 4.4 mm Hg.<sup>8</sup>

Diet involves various aspects of health as well as risk for mounting hypertension. Causes of hypertension are associated with different dietary factors like consumption of sodium and spices, diet rich in cholesterol, use of alcohol, saturated fat as well as sweet dishes which determine disease risk factors like increase in BP and rise in total serum cholesterol etc.<sup>9</sup> Hypertension is associated with taking a diet rich in salt intake which results in increasing body sodium content and water retention. High sodium content foods influence blood pressure reactivity, whereas dietary intake of potassium is inversely associated with hypertension.<sup>1,10</sup>

Diet consisting of vegetables, whole grain cereals, fruits, fish, boiled foods and salads has established to work as protective force against the onset of hypertension.<sup>11,12</sup> Variability in lipoproteins and lipids are determined by intake of diet rich in saturated fats.<sup>13</sup> Diet rich in high fat, carbohydrates and sodium is responsible for the activation of sensory nervous system.<sup>14</sup> Investigations have suggested that food rich in sugar starts excretion of catecholamines and BP rise in animals.<sup>15</sup> Physiological activation along with

unhealthy diet exerts an indirect pressure through mounting BP, which is a strong risk factor of hypertension.<sup>16</sup>

One main modifiable behavioral risk factor in hypertension is sedentary lifestyle or physical inactivity.<sup>17</sup> Sedentary lifestyle is documented to be a menace to one's health and negatively influences upon pathogenesis of hypertension. It has a strong relationship with other risk factors of hypertension like BP rise, cholesterol levels and body weight. Researchers have confirmed that increased physical inactivity is associated with the onset of hypertension and high mortality rate. Physical inactivity has reported noteworthy development in endothelial function, increased HDL, lipid profiles and coagulation-related factors. It is documented that reduction in physical activity is significantly related with increased risk of abdominal fat, enhanced weight, blood glucose metabolic problems and metabolic syndrome.<sup>18</sup> Physically active people are relatively less depressed, anxious and have reported increased talent to cope with stress.<sup>19</sup> Empirical research documented that participants with abdominal obesity and a waist circumference of about 102 cm for men and 88 cm for women, were twice as likely to have hypertension.<sup>20</sup>

Smoking has been considered a preventable and the most significant cause of global premature mortality.<sup>20</sup> In Pakistan, highest prevalence rate of cigarette smoking is in the province of Sindh and lowest in the province of Khyber Pukhtunkhwa Province.<sup>21</sup> Moreover, there has been a rapid increase in universal liking towards cigarette smoking which is a recognized risk factor for preventable mortality and morbidity in America.<sup>22</sup> In Pakistan, regular use of cigarette smoking, snuff, cigar, chewing tobacco, pan and birri is common in 1 out of 5 people above the age of 15 years.<sup>21</sup> Bearing in mind the enhanced pervasiveness of smoking and its detrimental effects associated with hypertension, current research along with other dietary and behavioral risk factors, investigated smoking as a risk factor of hypertension.

Hypotheses of this study was 1. Behavioral and dietary factors are associated with hypertension. 2. Behavioral and dietary factors can predict hypertension. The aim of this study was to determine the relationship of behavioral and dietary factors with hypertension and to study whether these factors predict hypertension disease?

## METHODOLOGY

A cross sectional research design was used for the present research. A sample of 350 participants, hypertensive men (n= 100), women (n =100), non-hypertensive men (n =75), and women (n =75), was taken from outdoor departments of public hospitals using a purposive sampling technique.

Inclusion criteria for hypertensive patients was settled as (a)

who were diagnosed as hypertensive patients by medical specialists and had been currently taking antihypertensive medicines (b) participants who were able to read and write Urdu language.

Patients suffering from chronic or terminal illness including (a) coronary heart disease (b) liver disease (c) renal disease (d) diabetes (e) malignant disease like cancer were excluded from the study.

Control group was matched to every case of hypertension for age (up to 3 years older and younger), gender, monthly income and working hours. Control group was also taken from the hospitals like hypertensive group and controls were the visitors or non-blood relatives of the cases diagnosed with hypertension, (b) participants with no past, current or family history of hypertension were included in the sample.

A self-structured comprehensive demographic information form was prepared by the researchers regarding the complete dietary schedule and behavioral factors like smoking, exercise, physical activity schedule, weight, use of gymnasium, type of food etc. and participants completed that form. Their schedule in hours spent in exercise etc, daily number of cigarettes smoked and food servings in a week were asked.

Hypertension was considered as criterion or dependent variable and it was dichotomized into 2 groups based upon their being hypertensive and non hypertensive and were coded as: non-hypertensive =0; and hypertensive =1. Smoking (no of cigarettes smoked daily), alcohol/ drug use, walking / exercise / gymnasium use / cycling / jogging / sports / swimming, sleeping, working (all were measured in hours) were taken as independent, predicting and continuous variables in the study.

Type of vegetables (salads, oily cooked, boiled), type of meat (beef, mutton, chicken, fish, shrimps), Type of food (oily, spicy, salty, fried, grilled), Type of sweets (halwajat, kheer, sweets, cakes, other bakery items) and posture (mostly sitting, dealing with chores, laying, watching TV) were taken as independent and categorical variables in the present study.

Official permission was obtained from hospital authorities for data collection from hypertensive patients and healthy controls who were visiting the hospital. Before administration of demographic information form participants were told about the purpose of study. A consent form and demographic information form were administered to all research participants.

Descriptive statistics, chi-square and logistic regression analyses were used.

**RESULTS**

The mean age of study population was 43 ± 8.24 year (30-

65). The range of their number of dependents was from 0 to 11. Their mean weight was 73±8.02 kg (63-98), and mean working hours were 8.80±4.08 hours (4-16).

There was significant differences between hypertensive patients and control group on smoking ( $\chi^2=13.65$ ,  $p<=.001$ ), alcohol use, walk, exercise, cycling, use of gymnasium, sleeping hours and mostly sitting mode (Table 1).

Chi-square test of association was employed to explore the differences between hypertensive group and non-hypertensive controls and significant differences are found on all dietary items between hypertensive patients and non-hypertensive controls (Table 2).

Logistic regression models were employed to examine the behavioral predictors of hypertension and results show that coefficient of cigarette smoking is .37 and OR is 1.72. Therefore as cigarette smoking increases, hypertension in a person would increase by 1.72 times. The coefficient of sleeplessness is .49 and OR is 1.48. So, as sleeplessness is enhanced, chances of hypertension in a person would increase by 1.48 times. The OR for exercise is 1.79 and coefficient is negative. The negative value of the coefficient (-.38) reveals that decrease of one unit scale in exercise is associated with increase in the odds of hypertension development by a factor of 1.79 (95%CI, 1.18-3.21,  $p<.001$ ). Finally the value of the coefficient of mostly sitting (.64) reveals that increase of one unit scale in sitting is associated with increase in the odds of hypertension development by a factor of 1.85 (95%CI, 1.06-3.53,  $p<$

**Table 1: Behavioral Risk Factors Associated With Hypertension (N= 350)**

Factors	Hypertensives (n = 200)		Non Hypertensives (n = 150)		$\chi^2$
	f	%	f	%	
Smoking	123	61.5	74	49	13.65***
Alcohol use/ yes-no	113	56.5	58	38.6	13.99***
Sleeping pills/ yes no	140	70	80	53	12.67***
Walking/hours per day	63	31.5	120	80	11.74***
Exercise/hours per day	54	27	90	60	10.53***
Cycling/hours per day	85	42.5	93	62	12.64***
Gymnasium	67	33.5	115	76.6	13.86***
Jogging/hours per day	66	33	122	81.3	11.76***
Sports/hours per day	41	20.5	64	39	7.85***
Swimming/hours per day	40	20	27	17.9	25.80*
Sleeplessness/day	114	57	50	33.3	18.20***
Sitting posture/hours	116	58	55	36	28.49***

Note: f = frequencies; % = percentages;  $\chi^2$ = chi-square; \* $p < .05$ , \*\*\* $p < .001$

**Table 2: Dietary Items (Per Week at least 1 Serving) Associated with Hypertension (N= 350)**

Variable	Hypertensives (n = 200)		Non Hypertensives (n = 150)		X <sup>2</sup> (df=3)	Variable	Hypertensives (n = 200)		Non Hypertensives (n = 150)		X <sup>2</sup> (df=6)
	f	%	f	%			f	%	f	%	
Beef	70	35	46	31	11.98***	Type of oil					
Mutton	36	18	24	16		Desi-ghee/day	74	37	26	24	8.78***
Chicken	80	40	55	36		Dalda-ghee	75	32.5	48	24	
Fish	14	7	25	17		Cooking-oil	51	25	59	39	
<b>Type of food / weekly 2 servings</b>											
Vegetables	46	23	101	71	64.84***	Salty	58	29	34	22	13.45***
Salads	34	17	69	46		Spicy	95	44.5	45	30	
Deserts	69	39	26	17		Fried	58	29	13	8.6	
Bakery item	51	49	36	23		Grilled	35	17.5	40	27	
						Boiled	20	10	5	3.3	

.001) (Table 3).

The prediction value of R<sup>2</sup> =66.23 indicates that model is adequately fit and dietary items are contributing 66.23% in the odds of hypertension. The coefficients of consumption of salty foods, sweets, desi-ghee and eggs show that chances of hypertension would also increase with the increase in their use. The negative value of the coefficient of vegetables (-.45) indicates that reducing the consumption of vegetables is associated with increase in the odds of hypertension development (Table 4).

**DISCUSSION**

Behavioral and dietary variables associated with hypertension have been given less importance in Pakistan. The current study established that behavioral and dietary items are significantly associated with hypertension. Increased smoking frequency was significantly associated

with the risk of hypertension. The present finding holds the same footings to that of the previous studies.<sup>20</sup> In the current study smoking 12 or more cigarettes daily was explored to be associated with the odds of hypertension by a factor of 1.72 (95% CI, 1.14-2.98). Research has documented that in Pakistan, 56% men and 32% women use several types of tobacco (NHSP, 1990-1994).<sup>7</sup> It is possible that if all types of smoking would be measured; reported proportion of tobacco use would go up.

Another important variable gaining impetuous is physical activity which is widely studied with respect to hypertension. The advantages of walking in reducing hypertension are well established. Present study explored walking of two to four hours per day to be a protective factor for hypertension. Protective effects of physical activity and bad effect of less physical activity have already been well discussed in many researches.<sup>17,22</sup>

**Table 3: Lifestyle Factors Predicting Hypertension (N = 350)**

Variable	B	S.E	LL	OR	UL
Constant	-13.56**	4.80			
Cigarette smoking	.37**	.14	1.14	1.72	2.98
Sleeplessness	.49***	.23	1.27	1.48	2.75
Exercise/daily	-.38**	.21	1.18	1.79	3.21
Mostly sitting position	.64***	.29	1.06	1.85	3.53

Note: R<sup>2</sup> = 61.54 (Hosmer & Lemeshow); .56 (Cox & Snell); .69 (Nagelkerke); Model x<sup>2</sup> (8)= 24.80; OR= odds ratio;

**Table 4: Dietary Items Predicting Hypertension (N = 350)**

Items	B	S.E	LL	OR	UL
Constant	-13.45**	4.90			
Salty food	.43**	.14	1.12	1.51	1.98
Sweets	.35*	.10	1.01	1.69	2.91
Vegetables	-.45**	-.14	1.02	1.43	2.82
Butter, desi-ghee	.63***	.20	1.34	1.90	3.20
Eggs	.57***	.18	1.30	1.89	3.02

Note: R<sup>2</sup> =66.23, Hosmer & Lemeshow), .74 (Cox & Snell), .67 (Nagelkerke). Model x<sup>2</sup> (21)= 51.60; LL= lower limit; UP= upper limit;

Research evidence has established that the choice of dietary items enhances or reduces risk of hypertension. Findings of existing study indicate that people who were consuming diet rich in eggs, beef, and desserts were at the greater risk of hypertension. Conversely, participants who consumed vegetables, fish and fruits were less vulnerable to hypertension.

The present study explored more weekly consumption of eggs in their routine life to be associated with the risk of hypertension.<sup>12</sup> In addition, intake of other animal products like desi-ghee and butter were found to be great risk of hypertension as well. This finding is similar with previous findings that suggest diet rich in sodium, sugar, total fat, saturated fat, animal products, whole cream milk, eggs and meat result in weight gain, elevated level of serum cholesterol and ultimately enhances the risk of hypertension.<sup>12</sup> In the present study saturated fats like butter, desi-ghee and consumption of sweets made from sugar have found to be strongly correlated with the risk of hypertension. The findings of the present study indicate that food items made from milk, cream, sweets and desserts are associated with risk of hypertension. In Pakistan, commonly used desserts are different halwajat, kheer, custard, rus-malai, sweets and cakes contain high fat contents. Cholesterol and fat present in commonly used products with milk carbohydrates and animal proteins are correlated with hypertension development because they tend to clog the arteries which are supplying blood to heart.

Research evidence establishes that the intake of desi-ghee is associated with the progression of atherogenic process that enhances the odds of premature expiry due to hypertension in south Asians.<sup>23</sup> Protective effect of vegetables, raw cereals, fish and fruits were strongly associated with hypertension in native population.<sup>23,13</sup> It is observed that one or two servings of fish per week has established to decrease hypertension mortality by greater than 50% among those who eat 30 grams or less of fish daily than those who do not consume fish at all.<sup>24</sup> One another strong risk factor of hypertension explored in indigenous population was salty food. It is globally established that added salt to foodstuff is associated with acceleration in odds of hypertension.<sup>12</sup>

Finally it is essential to note that intake of dietary items in a country like Pakistan is dependent upon household size and the level of income. Some dietary items are expensive e.g. fruits and fish are not in the easy reach of common man. Additionally, some nutritious food items accessible seasonally or are accessible variably from area to area. In Pakistan, fish and eggs are eaten in a large quantity during the winter season and particularly in coastal regions.

## CONCLUSION

There is significant positive correlation of hypertension with

sedentary lifestyle, alcohol use, saturated fat foods and salty foods, while physical inactivity, smoking, intake of salty food, desi-ghee and eggs appeared as significant negative predictors of hypertension

## REFERENCES

1. Covelli MM. Prevalence of behavioral and physiological risk factors of hypertension in African American adolescents. *Pediatr Nurs* 2007;33:327-32.
2. Gupta R, Prakash H, Kaul V. Cholesterol, lipoproteins, triglycerids, rural-urban differences and prevalence of dyslipidaemia among males in Rajasthan. *J Assoc Physicians India* 1997;45:275-9.
3. Steffen PR, Smith TB, Larson M, Butler L. Acculturation to Western society as a risk factor for high blood pressure: a meta-analytic review. *Psychosom Med* 2006;68:386-97.
4. Harris KF, Matthews KA. Interactions between autonomous nervous system activity and endothelial function: a model for the development of cardiovascular disease. *Psychosom Med* 2004;66:153-64.
5. Oparil S, Zaman A, Calhoun DA. Physiology in medicine: a series of articles linking medicine with science. *Ann Inter Med* 2003;139:761-76.
6. Jafar TH, Chaturvedi N, Pappas G. Prevalence of overweight and obesity and their association with hypertension and diabetes mellitus in an Indo-Asian population. *CMAJ* 2006;175:1071-7.
7. Pakistan Medical Research Council. National health survey 1990-94: health profile of people of Pakistan. Islamabad: 1998.
8. Neter JE, Stam BE, Kok FJ, Grobbee DE, Geleijnse JM. Influence of weight reduction on blood pressure: a meta-analysis of randomized controlled trials. *Hypertension* 2003;42:878-84.
9. Dyer AR, Elliot P, Stamler J, Chan Q, Ueshima H, Zou BF. Dietary intake in male and female smokers, ex-smokers, and never-smokers: The INTERMAP study. *J Hum Hypertes* 2003;17:641-54.
10. Appel L, Brands MW, Daniel SR, Karanja N, Elmer, PJ, Sacks FM. Dietary approaches to prevent and treat hypertension: a scientific statement from the American Heart Association. *Hypertension* 2006;47:296-308.
11. Iqbal R, Anand S, Onupuu S, Islam S, Zhang X, Rangarajan S, et al. Dietary patterns and the risk of acute myocardial infarction in 52 countries; results of INTERHEART Study. *Circulation* 2008;118:129-37.
12. Mozaffarian D, Longstrech WT, Lemaiture RN, Monolio

- TA, Kuller LH, Burke GL, et al. Fish consumption and stroke risk in elderly individuals: the cardiovascular health study. *Arch Internal Med* 2005;165:200-6.
13. Arntzenius AC, Kromhout D, Barth JD, Reider JHC, Brusckhe AV. Atherosclerosis. *N Engl J Med* 1985;312:805-11.
  14. Landsberg L, Young JB. Insulin-mediated glucose metabolism in the relationship between dietary intake and sympathetic nervous system activity. *Intern J Obesity* 1985;9:63-8.
  15. Fournier RD, Chiueh CC, Kopin IJ. Refined carbohydrate increases blood pressure and catecholamine excretion in SHR & WKY. *Am J Physiology* 1986;250:E381-5.
  16. Calle EE, Rodriguez C, Walker-Thurmond K, Thun MJ. Overview of obesity and mortality from cancer in a prospectively studied cohort of U. S. adults. *N Engl J Med* 2003;348:1625-38.
  17. Pi-Sunyer FX. The obesity epidemic: pathophysiology and consequences of obesity. *Obesity Res* 2002;10:97-104.
  18. Ekeland E, Heian E, Hagan KB, Abbot J, Nordheim L. Exercise to improve self-esteem in children and young people. *Cochrane Database Syst Rev* 2005;(1):CD003683.
  19. Biddle SJH, Mutrie N. *Psychology of physical activity*. London: Routledge; 2005.
  20. Ezzati M, Lopez AD. Estimates of global mortality attributable to smoking in 2000. *Lancet* 2003;362:847-52.
  21. Nasir K, Rehan N. Epidemiology of cigarette smoking in Pakistan. *Addiction* 2001;96:1847-54.
  22. Kelley GA, Kelley KS, Tran Z. Aerobic exercise, lipids and lipoproteins in overweight and obese adults: a meta-analysis of randomized controlled trials. *Int J Obes (Lond)* 2005;29:881-93.
  23. Hamidah S, Behzad M, Ebrahim G, Mojtaba S. Diet, hypertension, hypercholesterolemia and diabetes in ischemic heart diseases. *Pak J Med Sci* 2006;23:596-601.
  24. Kromhout D, Bosschieter EB, de Lezenne, Coulander C. The inverse relation between fish consumption and 20 year mortality from coronary heart disease. *N Engl J Med* 1985;312:1205-9.