Psychological Stress, Distress, Anthropometric and Lifestyle as Correlates of Hypertension in a Sample of Pakistani Population

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Byline: Rafia Rafique and Afifa Anjum

Body

This study examines the psychological, lifestyle and anthropometric correlates of hypertension. The objective of the study is to find out whether high level of stress, distress, BMI (greater than = 25 kg/m2) and high WHR (Waist Hip Ratio), lack of useful level of physical activity, smoking cigarettes, presence of family history of hypertension, are likely to predict hypertension. To conduct this study, seventy eight (n = 78) cases with diagnosis of hypertension, aged between 25 to 60 years and (n = 78) community matched controls were recruited through purposive sampling technique. To measure psychological factors; The Perceived Stress Scale by Cohen, Kamarck, and Mermelstein (1983) and Kessler Psychological Distress Scale developed by Kessler, Andrews, and Colpe (2002) were used. Waist Hip Ratio and Body Mass Index were calculated with the help of height, waist, hip circumference and weight measurements.

Information regarding smoking status and frequency and duration of physical activity was ascertained. Information sheet was constructed to gather demographic and medical information. Binary logistic regression analysis model revealed that women, current smokers and those having a family history of hypertension were at a risk for hypertension. High level of distress and absence of four or more hours of physical activity per week were significant predictors for hypertension. In order to circumvent certain temporal confounds we propose prospective longitudinal and interventional studies to be carried out in the future.

Keywords: Psychological stress, distress, anthropometric, lifestyle, hypertension

Hypertension commonly known as high blood pressure continues to be a foremost public health concern for Pakistan. Though the cause may not be known, research endorses that primary hypertension is associated with a number of factors: genetic, behavioral, environmental or a psychological.

In Pakistan there are an estimated 12 million people facing this condition in Pakistan, among them 5.5 million men and 5.3 million are women. Hypertension affects one in three individuals over the age of 45 years (Nishtar et al., 2004) and prevalence of high BP is one in three over the age of 45 years. Prevalence among Pakistani females is lower compared to males, however it exceeds after the age group of 35-44 years (Pakistan Medical Research Council (PMRC) (1998). Prevalence, clinical repercussions, and medical costs linked with hypertension, points towards a clinical emergency that needs prompt attention of researchers and clinical health experts (Siegler, Peterson, Barefoot, and Williams, 1992).

Risk factors associated with hypertension fall in three categories a) physiological eg. Coronary artery disease, diabetes mellitus and kidney disease b) behavioral factors: smoking, diet, sedentary lifestyle and last c) psychosocial factors that are stress, anger, anxiety, burnout, depression and social support and depression (Taylor, 1999; Delaney et al., 2010). A part from the traditional non-modifiable risk factors such as age, gender, family

history etc. there are many modifiable risk predictors associated with hypertension e.g., lack of physical activity , smoking etc. (Yusuf, Hawken, and Ounpuu, 2004).

The fact that hypertension is associated with many psychological, physiological and lifestyle risk factor is well established (Allison et al., 2008; Rahman and Ahmad, 2010). Obesity, physical inactivity, and smoking are other established lifestyle risk factors for hypertension (Hardoon et al., 2008; Siegler et al., 1992). Individuals who are obese have a twofold chance of getting hypertensive as compared to their non- obese counterparts (Sims, 1982; Carroll, Phillips, Gale, and Batty, 2010). The pathogenesis of obesity-related hypertension can be understood in the light of the activation of the sympathetic nervous system. Obesity is associated with increased blood flow, vasodilatation, cardiac output, and hypertension.

The factors that contribute in onset of hypertension due to obesity include enhanced sympathetic tone, activation of the renin- angiotensin system (RAS), hyperinsulinemia, structural changes in the kidney, and elaboration of adipokines (hormones produced in fat itself) such as leptin (Rahman and Ahmad, 2010).

Besides relationship between behavioral risk factors, negative affect has also found to be a risk for hypertension (Allison et al., 2008). Researchers have endorsed that risk of hypertension due to anger, anxiety and depression is comparable to that of obesity and lack of physical activity (Chida and Steptoe, 2009). Studies examining the association of hypertension with psychological distress, such as anxiety and depressive symptoms, have produced mixed findings. Few studies have reported positive associations, (Patten et al., 2009; Carroll et al., 2010) while others have found a weak (Delaney et al., 2010) or no associations (Yan et al., 2003). Studies highlight that stress may not directly cause hypertension, but it can lead to repeated blood pressure elevations, which eventually may lead to hypertension (Mousa, Yousef, Riccardo, Zeidan, and Sabatinelli, 2010).

The terms stress and distress cannot be used interchangeably, there is likely to be a difference in stress and distress that needs to be accentuated. Distress is usually defined as an aversive, negative states/traits resulting in failure of coping and adaptation processes leading to physiological and/or psychological homeostasis (Carstens and Moberg 2000). Stress denotes a real or perceived discomposure to an organism's physiological homeostasis or psychological well-being (NRC, 1992).

Research validates that biological and behavioral pathways link psychological factors to an increased risk of hypertension (Shihab et al., 2012). Psychological factors have found to associate with long term blood pressure, and the evidence dates back to as far as the early 20th century (Alexander, 1939). Theories regarding mechanisms for this probable relationship reveal that psychological factors like prolong stress, anxiety, depression; anger, hostility etc. can directly alter physiological process leading to hypertension. Altered physiological processes that have found to increase the risk of hypertension, include vascular and endothelial changes, increased sympathetic tone, baroreflex sensitivity, vascular stiffness, BP variability and central opiodergic mechanisms (Kaplan, Pettersson, Manuck, and Olsson, 1991).

Cardiovascular reactivity, which is a recurrent pattern of exaggerated sympathetic nervous system activity up-regulates basal blood pressure levels (Matthews, Woodall, and Allen, 1993). Neuro hormonal models point out that psychological factors like stress, distress, anger etc. may precipitate development of hypertension as they modify functioning of the central nervous system (Pickering and Gerin, 1990).

It is likely that multiple converging pathways lead to hypertension. Psychological factors link with hypertension through the high-risk; behavioral, environmental pathways. The other pathway is constitutional disposition. These dispositions are associated with psychological characteristics like poor diet, obesity, exercise habits, smoking, age etc. (James, 1987; Krantz and Manuck, 1984). It is important to note the bi-directional association between psychological factors and behavioral, environmental and constitutional factors is present (Roy, Janal, and Roy, 2011).

Even in the light of substantial evidence that is in favor of these theories much of the published literature has received criticism based on methodological grounds (James, 1987). Regardless of rigorous research and evidence at hand into the etiology of hypertension the pathogenesis of the problem is still not fully explained. Empirical

evidence in this regard is limited. Therefore, a well- designed study to explore relationship of psychological, lifestyle and anthropometric factors with hypertension is warranted. The decline in mortality and ailment can be forecasted as most of the psychological and lifestyle risk factors associated with the onset and progression of hypertension are modifiable and can be countered through the use of primary and secondary preventive and interventional strategies (Iqbal, Ridwan, Takari, and Mulyono, 2008; Roy, Janal, and Roy, 2011).

Most risk factors of hypertension are modifiable, controllable as well as preventable by health education and promotion, hence timely identification of these risk factors can help to encounter the disease burden. However evidence in this regard from across the globe cannot be considered ultimate for the native population, as several factors can vary with ethnicity (Kearney, Whelton, Reynolds, Whelton, and He, 2004). There is dire need to conduct studies on risk factors of hypertension for different ethnic groups and across countries.

Even in the presence of substantial evidence, literature is still not conclusive about the comparative features of all the risk factors of hypertension. The knowledge of risk factors for hypertension is largely derived from research conducted in the developed countries, though psychological and behavioural and lifestyle risk factors may vary between populations, and differ due to ethnic diversity. This is one of the reasons that effects of psychological factors on risk of hypertension in the world still remain hotly debated (Kehoe, Wu, Leske, and Chylack, 1994).

Researcher"s irresolution about research findings from the Western and European populations remain questionable in terms of applications to rest of the world. Multifactorial etiology and clustering of factors (comorbidity) explain risk of hypertension (Rozanski, Blumenthal, and Kaplan, 1999). Current research has a methodology designed to examine multiple risk factors simultaneously and in both men and women in a sample of Pakistani Population.

Most of the available literature explaining risk of hypertension comes from either cross-sectional or experimental studies that have mostly been carried out in the west (Delaney et al., 2010; Ramachandruni, Handberg, and Sheps, 2004). Already available literature on psychological risk factors of hypertension has revealed ambivalent results. Among psychological risk factors, anger variables (anger in, anger out, trait anger etc.) were the most studied (13/26 reported associations), followed by anxiety, depression, and others (defensiveness, neuroticism, psychopathology, social networks with one reported association each) (Chida, and Steptoe, 2009). Limited evidence exists regarding the role of stress and distress in onset and progression of hypertension (Ramachandruni et al., 2004).

Prospective studies circumvent certain temporal confounds and could have been the best choice of methodology to infer the proposed psychological, anthropometric and lifestyle risk factors of hypertension but they require sustained funding and follow- up over a period of at least several years. As a result, one of the methodologies best suited to address the impact of psychological factors on hypertension has contributed less than 1% of the empirical work in this area. The time, cost and expenses involved in a prospective longitudinal study were beyond the scope of this research.

Justification and Likely Benefits

This study focuses on multifactorial assessment of risk factors prevalent within the Pakistani population. Identification of these multiple risk factors can help in planning and designing primary and secondary preventive approaches to combat growing epidemic of hypertension within Pakistan. Preventive approaches are cost-effective and can help to reduce the medical cost and disease burden for Pakistan, a country that has limited economic resources and health budget is extremely low.

Objectives

To date, assessment of risk factors for hypertension has hardly been given due attention in Pakistan. Moreover many psychological factors like stress and distress have never been investigated within the native population. The aim of this study is to assess whether perceived psychological stress, distress, anthropometric measurements (Body Mass Index and Waist Hip Ratio) lifestyle factors (history of smoking and physical activity) and non-modifiable factors (age, gender and family history of hypertension) are significantly associated with the risk of

primary hypertension. The aim of our research is to assess multi-factorial risk assessment of hypertension among a sample of Pakistani population.

Hypotheses

- High levels of perceived stress and distress will predict hypertension as compared to low levels of perceived stress and distress.

- Greater BMI (greater than = 25 kg/m2) will predict hypertension as compared to low BMI (less than 25 kg/m2).

- High WHR (abdominal obesity) will predict hypertension as compared to low WHR.

- Physical activity of less than 4 hours per week will predict hypertension as compared to physical activity of (greater than = 4 hours per week).

- Being a smoker will predict hypertension as compared to being an ex-smoker or non-smoker.

- Presence of family history of hypertension (before the age of 60 in blood relatives) as compared to absence of family history of hypertension will predict hypertension.

Research Design

Method

Case control research design was employed for the present study.

Sampling Strategy

A purposive sampling strategy was employed to conduct the study because the sample was selected on the basis of inclusion and exclusion criteria.

Sample

To investigate the association of the aforesaid factors with risk of hypertension and to find whether these factors differ between cases and the controls, we solicited a sample of 78 patients with confirmed diagnosis of hypertension and 78 controls, who were free of hypertension before and at the time of testing. Cases with a confirmed diagnosis of hypertension by doctors on 160/110 mg and currently taking medicines (both male and female), aged between 25 to 60 years were included in this research. Controls selected were community based; they were either visitors or non-blood relatives of the cases diagnosed with hypertension matched for age and gender. One control per case was recruited.

Table 1 Demographic Characteristics of Study Sample Depicted as Frequency and Percentages

Variables	Men Cases	Men Controls	Women Cases	Women Controls
	f (%)	f (%)	f (%)	f (%)
Age				
Mean age	40	44	36	38
Education				
Primary	-	1 (2.6)	1 (2.6)	2 (5.6)
Middle	-	-	-	1 (2.8)
Matric	3 (7.7)	6 (15.4)	6 (15.4)	3 (8.3)
FA	4 (10.3)	9 (23.1)	9 (23.1)	7 (19.4)
BA	20 (51.3)	12 (30.8)	12 (30.8)	13 (36.1)
MA/MSc	12 (30.8)	11 (28.2)	11 (28.2)	10 (27.8)
Occupation				
Student		1 (2.6)	1 (2.6)	1 (2.8)
Business	14 (35.9)	14 (35.9)	14 (35.9)	10 (27.8)
Private job	7 (17.9)	9 (23.1)	9 (23.1)	16 (44.4)
Government	16 (41.0)	13 (33.3)	13 (33.3)	6 (16.7)

Housewife				
Mean and Median	(214126.88)	(18625.00)	(25881.08)	(34230.00)
monthly income	(18600.11)	(12000.00)	(14,061.50)	(26500.00)
Property (House)				
Yes	23 (59)	22 (30.8)	22 (56.4)	24 (66.7)
No	16 (41)	17 (69.2)	17 (43.6)	12 (33.3)
Marital status				
Married	18 (46.2)	22 (56.4)	22 (56.4)	20 (55.6)
Not married	11 (28.2)	11 (28.2)	11 (28.2)	4 (11.1)
Engaged	8 (20.5)	4 (10.3)	4 (10.3)	5 (13.9)
Divorced	1 (2.6)	1 (2.6)	1 (2.6)	3 (8.3)
Widowed	1 (2.6)	1 (2.6)	1 (2.6)	4 (11.1)
Family system				
Nuclear	16 (41)	12 (30.8)	12 (30.8)	15 (41.7)
Joint	23 (59)	27 (69.2)	27 (69.2)	21 (58.3)
Living				
Rural	11 (28.2)	13 (33.3)	13 (33.3)	14 (38.9)
Urban	28 (71.8)	26 (66.7)	26 (66.7)	22 (61.1)
Family size				
5 or less	9 (23.1)	5 (12.8)	5 (12.8)	5 (13.9)
Between 6 and 9	19 (48.7)	12 (30.8)	12 (30.8)	11 (30.6)
10 or more	11 (28.2)	22 (56.4)	22 (56.4)	18 (50)

Exclusion Criteria for Cases Diagnosed with Hypertension.

Patients having chronic or terminal medical illness including: Coronary heart disease, liver disease and cancer. Certain chronic conditions may increase risk of hypertension and were also excluded like high cholesterol, diabetes, kidney disease and sleep apnea. Patients with asthma, gout and pregnant females were excluded from the study. Patients with history of any psychiatric diagnosis or psychiatric medication and patients having blood pressure less than 160/110 were excluded. Moreover participants failing to provide a written consent and those unable to read and write Urdu language were excluded.

Community Controls were drawn from the community, matched to every case of hypertension for age (up to 5 years older and younger) and gender. Community controls were visitor's or non-blood relatives of the cases diagnosed with hypertension. Only participants with no prior history of hypertension were included as controls.

Exclusion Criteria for Matched Controls. A similar exclusion criterion as that employed for the cases was used for the selection of the controls.

Assessment Measures

Medical and Demographic Information Sheet. Demographic information was gathered on variables like age, gender, education, marital status, duration since hypertension was diagnosed, family history of hypertension, information regarding smoking status (current, ex- smoker, non- smoker).

The Perceived Stress Scale (PSS). Cohen, Kamarck, and Mermelstein (1983) developed PSS that computes magnitude of stressful situations in one's life and the present level of experienced stress, on a 10 item scale. Each item is measured on a 5-point Likert type scale (0 = Never, 1 = Almost never, 2 = Sometimes, 3 = Fairly often, 4 = Very often). The PSS has four positively worded items (4, 5, 7 and 8) that are reversed scored. A total score on the scale is obtained by adding all scores across the 10 items. Internal reliability of the scale has found to be 0.78 (Cohen and Williamson, 1988). Cronbach's alpha coefficient for our sample came out to be 0.72.

Kessler Psychological Distress Scale (K10). Kessler Psychological Distress Scale (K10) developed by Kessler, Andrews, and Colpe (2002), intended to yield a global measure of distress based on questions about anxiety and depressive symptoms that a person has experienced in the most recent 4 week period. (K10) is a 10-item questionnaire for patients to complete. Items on form use a five-point Likert-type scale (from "none of the time" = 1 to "all of the time" = 5). Response choices include none of the time= 1, a little of the time= 2, some of the time= 3,

most of the time= 4, and All of the time= 5. Scores range from 10 to 50. Score under 20 are likely to be well, score 20-24 are likely to have a mild mental disorder, and score 25-29 are likely to have moderate mental disorder and score 30 and over are likely to have a severe mental disorder. Internal reliability of the scale has found to be 0.79 (Kessler, Andrews, and Colpe, 2002). Cronbach's alpha coefficient for our sample came out to be 0.76.

Anthropometric Measurements. Height, waist and hip circumference were measured in centimeters, (by using a non-stretchable standard tape with a metal buckle at one end over the light clothing), weight was assessed in kilograms. Waist and hip circumferences of every study participant was used to calculate WHR. Height and weight readings were used to calculate BMI (with the help of an online calculator). Cutoffs for WHR and BMI were based on the control data of men and women cases.

Physical Activity. Physical activity is defined as regular involvement in moderate to strenuous activities (walking, cycling, jogging, gymnasium exercise, gardening and sports), criteria for being identified as having a useful level of physically activity is "four or more hours of physical activity per week". Frequency and duration of physical activity was ascertained. This criterion for useful level of physical activity has previously been adopted by many studies conducted to unearth lifestyle risk factors for hypertension (Patten et al., 2009, Rosengren et al., 2004) Smoking.

The information regarding smoking was obtained that included smoking status (current, ex-smoker and non-smoker), for smokers who reported smoking cigarettes, further information regarding age at which smoking was started and number of cigarettes smoked per day was obtained. Current smokers were defined as individuals who smoked cigarettes or beedis (homemade traditional cigarette) in the past year (12 months). Ex-smokers were defined as individuals who had given up smoking more than a year ago; non-smokers were defined as those who do not smoke at present and have never smoked in the past.

A similar criterion has been employed in other studies carried out on the Pakistan population (Nishtar et al., 2006).

Translation of assessment scales. Permission for translation and use of instruments for conducting present study was appropriately sought from authors of all the scales. To ensure a rigorous process of translation as well as to achieve equivalence between the original version and translated versions of scales, Vallerand"s (1989) steps for instrument translation with slight modification were employed (Wongsri, Cantwell, and Archer, 2003). These steps have found to decreased risks of errors and improved the precision of translation. The first step involved forward translation from (English version into Urdu). Each and every one amongst the three translators had prior experience of translating questionnaires and were knowledgeable about content of the questionnaire and had substantial experience in using Likert-type scales. During the second step, rating of translated scale items by native experts was carried out.

All translations obtained after the forward translation procedure were rated by two bilingual native speakers. Step 3 involved an item by item review of the three translations in a panel discussion comprising of three members. The final target version of the translation was produced after comprehensive discussion by the members of the panel. Problematic items, for which a mutual consensus was not reached by the members of previous panel discussion, were taken up by another voluntary panel that comprised of three new members. After the second panel discussion, a final draft of comprehensive target translation: the forward translation based on mutual agreement on item wise review was produced. This final draft was given to an expert in Urdu language. The proof-read draft, thus finalized, was then backward translated by three (blind translators) who were known language experts with established competence in English as well as Urdu Language.

A panel of three bilingual experts was formulated to review similarities and differences between the original English version of the scales and the back translated version. Final draft of the consensus translation was produced following 100% agreement by all the members of the designated panel on all items.

Procedure

An institutionalized consent was sought from regulatory and ethics committee of the hospitals before starting the research. Sample was gathered from six hospitals all over Pakistan. After explaining the purpose of the study to the

participants, cases and controls were asked to give a written consent. Permission of the authors was sought for use and translation of measures in Urdu language namely Perceived Stress Scale and Kessler Distress Scale. Demographic/medical information sheet was developed to assess demographic information and gather information regarding smoking status and family history of hypertension. Researcher translated all the original scales into Urdu language and determined their psychometric properties, through the process of validation. Vallerand's (1989) steps for instrument translation with slight modification were employed (Wongsri et al., 2003).

All participants (both cases and controls) were briefed about the purpose of the study as well as assured about the confidentiality and privacy of their responses. For every case at least one age and gender matched community control was recruited either that very day or at the maximum within a week. Once the participants had filled out the questionnaire the researcher thanked and debriefed the participants about the nature of the study. Psychometric properties of the tools were determined with the help of pilot study and reliability coefficients for continuous variables were calculated separately.

Results

Descriptive and inferential statistics were run to infer the proposed hypotheses. Unconditional binary logistic regression analysis was conducted by using the forward conditional method to verify the proposed hypotheses. Multivariate odds ratios (ORs) and 95% confidence intervals (CIs) for psychological, anthropometric, lifestyle and traditional risk factors were calculated. Odds ratios were calculated to represent the excess risk of exposure to a factor in cases compared with controls, without exposure.

Table 2 Gender Wise Description of the Study Sample on Anthropometric Measurements

Variables	Men Cases		Women Cases		Men Controls		Women Controls	
	M(SD)	Range	M(SD)	Range	M(SD)	Range	M(SD)	Range
Waist	37.13(3.18)	33-46	36.72(4.85)	27-46	37.56(3.81)	30-44	36.17(4.58)	28-46
Hip	40.79(3.59)	35-49	41.22(5.74)	31-50	41.72(4.37)	33-50	41.08(4.81)	32-50
WHR	.89(.06)	.68-.09	.89(.07)	.69-.19	.90(.08)	.63.20	.88(.06)	.68-1.09
Weight	77.21(8.36)	60-92	72.81(10.85)	45-92	82.13(8.22)	60-97	73.83(9.69)	55-92
Height	5.61(.26)	5.0-6.4	5.30(.26)	4.7-5.9	5.64(.244)	5.1-6.1	5.42(.20)	5.1-6.0
BMI	26.53(2.97)	21-34	29.24(10.59)	14-86	29.46(3.51)	24-38	28.17(3.90)	19-35

Table 3 Gender Wise Description of the Study Sample on Self-reported Physical Health

Variables	Men Cases	Men Controls	Women Cases	Women Control
	n (%)	n (%)	n (%)	n (%)
M(SD)				
Age at diagnosis	38	45	35	38
Family history				
Present	21(53.8)	9(23.1)	19(52.8)	13(36.1)
Absent	16(41)	26(66.7)	17(47.2)	21(58.3)
Smoking				
Present	19(48.7)	19(48.7)	2(5.6)	1(2.8)
Absent	20(51.3)	20(51.3)	34(94.4)	35(97.2)
No of cigarettes Smoked per day				
20 or less	14(35.9)	13(33.3)	1(2.8)	1(2.8)
More than 20	4(10.9)	3(7.7)	-	-

Factors and Family History of IHD.

A Binary logistic regression analysis was performed to ascertain factors associated with hypertension by using forward conditional method, with hypertension as the outcome variable and variables (WHR, BMI, family history of hypertension, smoking, no. of cigarettes smoked, non-useful level of physical activity, stress and distress) as predictor variables. The model was controlled for age and gender. A total of 130 cases and controls were analyzed and the full model significantly predicted presence of IHD (Omnibus Chi-square = 95.25, df = 7, p= .001). The model accounted for between 49% and 65 % of variance in hypertension. Overall 86.5 % of the predictions were accurate. Gender (being a women), smoking, family history, distress and non-useful level of physical activity (= 4 hours per week) were found to be significant predictors of hypertension.

Table 4 Factors Independently Associated with Hypertension in Cases and Controls

Variable	B (SE)	Exp (B) OR (95% CI)
Step 1 Constant		
Age	-.04 (.02)	.95
Gender	-.00 (.41)	.99
Non useful level of activity	2.78 (.44)	16.19
Step 2 Constant		
Age	-.05 (.03)	.95
Gender	1.03 (.55)	2.82
Smoking	2.50 (.56)	12.21
Non useful level of activity	2.63 (.49)	13.90
Step 3 Constant		
Age	-.051 (.03)	.95
Gender	1.30 (.59)	3.67
Smoking	2.80 (.61)	16.58
Distress	.17 (.05)	1.18
Non useful level of activity	2.36 (.50)	10.62
Step 4 Constant		
Age	-.06 (.03)	.94
Gender	1.20 (.59)	3.33
Smoking	2.91 (.63)	18.35
Family history	1.32 (.53)	3.74
Distress	.17 (.05)	1.19
Non useful level of activity	2.50 (.53)	12.27

Discussion

Distress was found to be a significant predictor of hypertension. Similar evidence has been endorsed by other researches. Chronic raise in negative affect elevates blood pressure. Many psychological factors: stress, anger, anxiety, hostility, depression, lack of social support, and Type A behavior pattern have been associated with risk of hypertension (Jonas and Lando, 2002; Kamarck, Polk, Sutton-Tyrrell, and Muldoon, 2002). Studies have endorsed a hypertension risk difference of almost 8% between high psychological distress and low psychological distress groups (Rutledge, Brenda, and Hogan, 2002). Our study findings seem to be in line with the evidence gained from 52 countries (the INTERHEART study), these researchers found a significant relationship between distress and hypertension (Rosengren et al., 2004).

Distress through behavioural pathway can lead to hypertension. Distress directly affects dietary habits and health seeking behaviours both in humans and animals (Greeno and Wing, 1994). Studies have found that distress hinders performance of global health behaviours (Wiebe and McCallum, 1986) and decreases the use of positive health behaviours such as exercise, and proper diet (Lindquist, Beilin, and Knuiman, 1997). Consequently, it increases use of maladaptive health behaviours like consumption of food rich in fats, smoking, and excessive use of alcohol. It has been understood that distress can result in priority change in health promoting behaviours as other matters may become the center of attention (Griffin, Friend, Eitel, and Lobel, 1993).

Explored was stress. There is likely to be difference in stress and distress that needs to be emphasized, as scientific community many a times uses the term interchangeably. Distress is usually defined as an aversive, negative states/traits resulting in failure of coping and adaptation processes leading to physiological and/or psychological homeostasis (Carstens and Moberg 2000; NRC 1992). Stress denotes a real or perceived discomposure to an organism's physiological homeostasis or psychological well-being.

Stress did not turn out to be a significant risk factor of hypertension within the Pakistani sample. Several studies have emphasized stress to be a significant predictor of hypertension (Nishtar et al., 2004). Evidence accrued that cardiovascular reactivity to stress is characterized by recurrent pattern of exaggerated sympathetic nervous system activity that is likely to up-regulate basal blood pressure levels over time. Laboratory research suggests that during periods of mental stress, nerve firing increases (Ramachandruni et al., 2004) and raises levels of catecholamine's, serotonin, HR (heart rate) and BP (blood pressure) (Schwartz et al., 2003). Changes like raised levels of circulatory

plasma adrenaline and noradrenaline termed as the "adrenaline hypotheses" play a significant role in onset and progression of hypertension (Floras, 1992).

Major reason for the disparity in the study results can be attributed to the fact that evidence of stress as a risk factor of hypertension mostly exists from prospective cohort studies (greater than 1 year follow-up) (Everson et al., 1997). Likewise methodological protocols; sample size and sampling strategy, use of instruments to assess study variables employed by these researchers are quite dissimilar to that adopted in our study.

Prospective studies of psychological factors on blood pressure can offer a means of evading certain temporal confounds, and need unrelenting funding and follow-up over a period of at least a number of years. Critical flaw in the argument that psychological factors play a role in the development of hypertension is the relative absence of prospective data (Pickering and Gerin, 1990).

Differences in definition of hypertension (eg,140/90 vs 165/90 mm Hg), use of clinic-based vs ambulatory blood pressure measurement methods, appropriate control for covariates (ie, multivariate vs univariate leads to differences in identification of risk factors (Jonas and Lando, results.

Studies that have investigated psychological risk factors have not tried to explain the potential mechanisms involved in onset of hypertension (Everson et al., 199 7). Scales previously used to infer psychological factors of hypertension are mostly whose psychometric properties are often not established; they contain few items that often lacking independent validation (James, 1987).

Mostly studies conducted on risk factors of hypertension have taken psychological factors as secondary to the already host of non- modifiable traditional factors like age, gender and family history of hypertension. However in our study both: scales to measure distresses as well as stress have well established psychometric properties, these original scales were translated into Urdu language and there psychometric properties were determined through the process of validation.

Among traditional/ non-modifiable risk factors, gender was found to be a significant risk factor of hypertension in our sample. Females compared to males were found to be at a greater risk for hypertension. More women are found to be hypertensive and earlier than men (Jafary, Levey, and Jafar, 2007; PMRC, 1998).The differences in gender for the prevalence of hypertension and other cardiovascular diseases remain large in countries across the globe (Zhang, Sasaki, and Kesteloot, 1995).

Some differences in risk factors for hypertension between women and men in rural Bihar (Ghosh, Sarkar, Mukherji, and Pal, 2013) and Assam, India have been identified (Hazarika, Biswas, Narain, Kalita, and Mahanta, 2002). Differences in hypertension prevalence by region and income (in some places men have higher prevalence, while in others women do) have been identified. In a cross sectional survey, conducted on low income settlement in the city of Karachi, Lahore; the overall prevalence of hypertension was 26%, the prevalence among males (34%) was higher than females (24%) (Safdar, Omair, Faisal, and Hasan, 2004).

We gathered our study sample from the city of Lahore, Punjab and risk of hypertension was found to be greater in women compared to men. Women in Punjab, compared to men are more obese, overweight, less physical activity, being overweight and physically inactive (Ghosh et al., 2013; Zhang, Sasaki, and Kesteloot, 1995). This could be a reason why women were found to be more hypertensive in our sample recruited from Lahore, situated in the province of Punjab. Obesity and lack of physical activity are independent predictors of hypertension (Sims, 1982). Body mass index, as a combined result from total calorie intake, physical activity and genetic factors, play an important role in determining the level of blood pressure individually and between populations (Hardoon et al., 2008)

Smoking, family history of hypertension and lack of useful level of physical activity of less than four hours were found to be other significant risk factors of hypertension. Obesity, physical inactivity, and smoking are established risk factors for hypertension (Ahmad, Ahmad, Zulfiqar, Jan, and Rehman, 2007; Hardoon et al., 2008). Smoking,

obesity and physical inactivity are higher in people with elevated psychological stress and in those diagnosed with hypertension (Everson et al., 1997).

Individuals who are obese have a twofold chance of getting hypertensive as compared to their non-obese counterparts. Increased prevalence of hypertension itself is related to weight gain (Cordon, Clark, Mueller, and Hovis, 1980). However neither increased BMI nor WHR turned out to be significant risk factors of hypertension in our research. Research evidence exists from a long-term prospective study; men who were overweight or obese in early adulthood or middle age were at higher risk of hypertension later in life. Overweight or obese men were consistently at higher risk of hypertension across the entire period of follow-up. Obesity in young adulthood conferred a 3-fold risk of hypertension (Shihab et al., 2012). BMI does not distinguish between weight associated with muscle and weight associated with fat, and the relationship between BMI and body fat content varies according to body build and proportion (Garrow, 1981).

Furthermore, BMI cannot make a discrepancy between fat and muscle mass (Ashwell, (2009). In contrast, the measure of intra-abdominal or central fat accumulation to reflect changes in hypertension and risk factors for cardiovascular diseases and other forms of chronic diseases is better than BMI. WHR as a measure of risk of hypertension and other diseases has been recently challenged to due to several reasons. First, hip circumference cannot be obtained routinely and the measure is more difficult to perform and less reliable. Second, WHR is not useful in practical risk management as the ratio could remain constant when the weight of individual increases or decreases (Ashwell, 2009; Wang, 2009).

In future studies need to be designed by considering measure of intra-abdominal or central fat accumulation to reflect a precise association with hypertension. Moreover intervention trials, in which participants are selected on the basis of high standing on one or more factors, epitomize an additional avenue for likely future research (Delaney et al., 2010). The need is to conduct prospective studies for improved reliability and a better understanding of the temporal relationship of obesity (BMI and WHR) with blood pressure.

To sum up, the results of our study provide statistical support for the proposed relationship between psychological, non- modifiable factors and risk of hypertension. The status of psychological factors as a clinically important risk factor for high blood pressure appears promising, but additional research, potentially including prospective longitudinal and intervention trials will be necessary to further infer this prediction.

Mechanisms explaining this potential relationship remain speculative and should continue to be a focus of research among behavioral medicine investigators. The inclusion of multiple samplings adds yet another layer of difficulty to prospective studies, but the probable benefits of improved reliability and a better understanding of the temporal relationship between psychological factors and blood pressure may be important enough to motivate us to overcome this obstacle.

Research must go further by actively proposing and testing meditational relationships that will better allow us to assess potential mechanisms in these relationships. Nearly all studies to date derived their estimates of psychological effects on hypertension from a single point estimate of psychological functioning. There is evidence to indicate that many personality characteristics are relatively stable over long intervals, other psychological characteristics such as depression are known to fluctuate.

Limitations. The findings of our study are susceptible to an inability to control for competing explanations. For example, the possibility that alternative mechanisms (genetic or environmental) could dispose both psychological characteristics and hypertension risk, that blood pressure increases may precede (rather than follow). Psychological factors may similarly serve as a non-causal marker for disease onset and progression and are among the most frequently cited shortcomings by other researchers too (Krantz, and Manuck, 1984; Pickering and Gerin, 1990).

In spite of certain limitations the study highlights a need to move beyond the conventional approaches to assess traditional factors associated with the risk of primary hypertension. Moreover this study draws attention towards call for assessment of psychological risk factors like distress along with assessment of traditional modifiable (anthropometric and lifestyle) and non-modifiable factors (age, gender and family history of hypertension). This

study also provides direction for designing primary and secondary preventive approaches based on identified psychological, anthropometric, lifestyle and traditional risk factors present within the Pakistani population. Preventive approaches to counter the growing epidemic of hypertension need to focus on creating awareness regarding smoking as a risk factor for hypertension. Preventive strategies should target at creating awareness towards increasing the level of physical activity to four or more hours per week.

Timely psychological management of distress needs to be highlighted, as distress has found to predict hypertension. Public should be made aware of the fact that women as well as families who have a blood relative with hypertension before the age of 60 are at a greater risk for hypertension. Last but not the least the study endorses directions for prospective longitudinal research. Research -potentially including intervention trials- will be necessary to further shed light on this issue.

Conclusion. To prevent an epidemic of cardiovascular disease in Pakistan, hypertension control by screening, treatment and primary prevention of identified risk factors will be an important task for physicians, public health professionals, psychologists and health policy makers in Pakistan.

References

Ahmad, R., Ahmad, A., Zulfiqar, S., Jan, S., and Rehman, I. (2007). Assessment of waist-hip ratio and its relationship with coronary heart disease in community hospital of district Swat. Pakistan Journal of Medical Science, 23(4), 585-588.

Alexander, F. (1939). Emotional factors in essential hypertension. PsychosomaticMedicine, 1, 175-179.

Allison, M. A., Manson, J. E., Langer, R. D., Aragaki, A., Smoller, S., Lewis, C. E., and Robinson, J. (2008). Association between different measures of blood pressure and coronary artery calcium in postmenopausal women. Hypertension, 52(5), 833-840.

Ashwell, M. (2009). Obesity risk: importance of the waist-to-height ratio Nurs Stand. PubMed. Inelmen, E.M., Sergi, G., Coin, A., Miotto, F., Peruzza, S., and Enzi, G. Can obesity be a risk factor in elderly people Obesity Review, 4(3), 147-55.

Carroll, D., Phillips, A. C., Gale, C. R., and Batty, G. D. (2010). Generalized anxiety and major depressive disorders, their comorbidity and hypertension in middle-aged men. Psychosomatic Medicine, 72, 16-19.

Carstens, E., and Moberg, G. P. (2000). Recognizing pain and distress in laboratory animals. Institute for Laboratory and Animal Research Journal, 41(2), 62-71.

Chida, Y., and Steptoe, A. (2009). The association of anger and hostility with future coronary heart disease: A meta-analytic review of prospective evidence. Journal of American College of Cardiology, 53, 936-946.

Cohen, S., Kamarck, T., and Mermelstein, R. (1983). A global measure of perceived stress. Journal of Health and Social Behavior, 24(4), 386-396.

Cohen, S., and Williamson, G. (1988). Perceived stress in a probability sample of the United States. Spacapan, S. and Oskamp, S. (Eds.) The Social Psychology of Health. Newbury Park, CA: Sage.

Cordon, H. R., Clark, D. K., Mueller, J. L., and Hovis, W. A. (1980). Phytoplankton pigments from the N~mbus-7 Coastal Zone Color Scanner: Comparison with surface measurements. Science News, 210, 63-66. doi: 0645/3535.647463.363.

Delaney, J. A., Oddson, B. E., Kramer, H., Shea, S., Psaty, B. M., and McClelland, R. L. (2010). Baseline depressive symptoms are not associated with clinically important levels of incident hypertension during two years of follow-up: the multi-ethnic study of atherosclerosis. Hypertension, 55, 408-414.

Everson, S. A., Kauhanen, J., Kaplan, G. A., Goldberg, D. E., Julkunen, J., Tuomilehto, J., and Salonen, J. T. (1997). Hostility and increased risk of mortality and acute myocardial infarction: The mediating role of behavioral risk factors. American Journal of Epidemiology, 146, 142-152.

Floras, J. S. (1992). Epinephrine and the genesis of hypertension. Hypertension, 19, 1-18. doi: 0329449.354o953/345.346

Garrow, J. S. (1981). Treat obesity seriously. A Clinical Manual. Harcourt Brace/Churchill Livingstone.

Ghosh, A., Sarkar, D., Mukherji, B., and Pal, R. (2013). Prevalence and risk correlates of hypertension among adult rural population in Bihar. Annals Tropical Medicine and Public Health, 6(1), 71-75.

Greeno, C. G., and Wing, R. R. (1994). Stress-induced eating. Psychological Bulletin, 115, 444-464.

Griffin, K. W., Friend, R., Eitel, P., and Lobel, M. (1993). Effects of environmental demands stress, and mood on health practices. Journal of Behavioral Medicine, 16, 643-661.

Hardoon, S. L., Whincup, P. H., Lennon, L. T., Wannamethee, S. G., Capewell, S., and Morris, R. W. (2008). How much of the recent decline in the incidence of myocardial infarction in British men can be explained by changes in cardiovascular risk factors Circulation, 117, 598-604.

Hazarika, N.C., Biswas, D., Narain, K., Kalita, H. C., and Mahanta, J. (2002). Hypertension and its risk factors in tea garden workers of Assam. National Medical Journal of India, 15, 63-68.

Iqbal, M., Ridwan, A., Takari, F., and Mulyono, H. (2008). Rediscovery of a Milky Stork, Mycteria cinerea breeding colony in South Sumatra province, Indonesia. Birding ASIA, 15, 62-66. doi: 0932/3246.95445.433.

Jafary, T. H., Levey, A. S., and Jafar, F. H. (2007). Ethnic subgroup differences in hypertension in Pakistan. Journal of Hypertension, 21(5), 905-912. doi: 0932909/4525.52456.

James, S. A. (1987). Psychosocial precursors of hypertension: Review of the epidemiologic evidence. Circulation, 76(1), 60-66. doi: 0932094/425/54.633.

Jonas, B. S., and Lando, J. F. (2002). Negative affect as a prospective risk factor for hypertension. Psychosomatic Medicine, 62, 188-196. doi: 09832/245.2424/52.

Kamarck, T. W., Polk, D. E., Sutton-Tyrrell, K., and Muldoon, M. F. (2002). The incremental value of ambulatory BP persists after controlling for methodological confounds: Associations with carotid atherosclerosis in a healthy sample. Journal of Hypertension, 20, 1-7. doi: 09942.25235/5.35./2.

Kaplan, J. R., Pettersson, K., Manuck, S. B., and Olsson, G. (1991). Role of sympathoadrenal medullary activation in the initiation and progression of atherosclerosis. Circulation, 84(1), 23-32.

Kearney, P. M., Whelton, M., Reynolds, K., Whelton, P. K., and He, J. (2004). Worldwide prevalence of hypertension: a systematic review. Journal of Hypertension, 22(1), 11-19.

Kehoe, R., Wu, S. Y., Leske, M. C., and Chylack, L. T. (1994). Comparing self- reported and physician reported medical history. American Journal of Epidemiology, 139(8), 813-818.

Kessler, R. C., Andrews, G., and Colpe, (2002). Short screening scales to monitor population prevalences and trends in non-specific psychological distress. Psychological Medicine, 32, 959-956.

Krantz, D. S., and Manuck, S. B. (1984). Acute psychophysiological reactivity and the risk of cardiovascular disease: A review and methodological critique. Psychological Bulletin, 96, 435-464.

Lindquist, T. L., Beilin, L. J., and Knuiman, M. W. (1997). Influence of lifestyle, coping, and job stress on blood pressure in men and women. Hypertension, 29, 1-7.

Matthews, K. A., Woodall, K.L., and Allen, M. T. (1993). Cardiovascular reactivity to stress predicts future blood pressure status. Hypertension, 22, 479-485.

Mousa, H. S. A., Yousef, S., Riccardo, F., Zeidan, W., and Sabatinelli, G. (2010). Hyperglycaemia, hypertension and their risk factors among Palestine refugees served by UNRWA. Eastern Mediterranean Health Journal, 16 (6), 460-465.

National Research Council (NRC). (1992). recognition and alleviation of pain and distress in laboratory animals. Washington, DC: National Academy Press.

Nishtar, S., Mirza, Y. A., Jehan, S., Hadi, Y., Badar, A., Yusuf, S., and Shahab, S. (2004). Newspaper articles as a tool for cardiovascular prevention programs in a developing country. Journal of Health Communication, 9(4), 355-369. doi: 093048/5935.432509.

Nishtar, S., Wierzbicki, A. S., Lumb, P. J., Lambert-Hammill, M., Turner, N. C., Crook, A. M., and Gill, J. (2006). Waist-hip ratio and low HDL predict the risk of coronary artery disease in Pakistanis. Current Medical Research Opinion, 20, 55-62.

Pakistan Medical Research Council (PMRC). (1998). National health survey of Pakistan (1990-1994). Retrieved from: http:// www. aiou.edu.pk/FoodSite/ National%20Health%20Survey%20 of%20Pakistan%201990%201994.doc

Patten, S. B., Williams, J. V., Lavorato, D. H., Campbell, N. R., Eliasziw, M., and Campbell, T. S. (2009). Major depression as a risk factor for high blood pressure: epidemiologic evidence from a national longitudinal study. Psychosomatic Medicine, 71, 273-279.

Pickering, T. G., and Gerin, W. (1990). Cardiovascular reactivity in the laboratory and the role of behavioral factors in hypertension: A critical review. American Behavior Medicine, 12, 3-16. doi: 0932904/4353.63469056.3

Rahman, S., and Ahmad, R. (2010). Prevalence of orthostatic hypotension among diabetic patients in a community hospital of Peshawar. Pakistan Journal of Physiology, 6(2), 98-103.

Ramachandruni, S., Handberg, E., and Sheps, D. S. (2004). Acute and chronic psychological stress in coronary disease. Current Opinion in Cardiology, 19(5), 494-499. doi: 0923402.5/345 ./3534534508.

Rosengren, A., Hawken, S., Ounpuu, S., Sliwa, K., Zubaid, M., Almahmeed, W. A., Blackett, K. N., Sitthi-Amorn, C., Sato, H., and Yusuf, S. (2004). Association of psychosocial risk factors with risk of acute myocardial infarction in 11119 cases and 13648 controls from 52 countries (The INTERHEART study): Case- control study. Lancet, 11(17), 953-962. doi: 094035.3450094453.4.

Roy, M., Janal, M., and Roy, A. (2011). Medical and psychological risk factors associated with incident hypertension in type 1 diabetic African Americans. International Journal of Hypertension, 118(1), 105-115.

Rozanski, A., Blumenthal, J. A., and Kaplan, J. (1999). Impact of psychological factors on the pathogenesis of cardiovascular disease and implications for therapy. Circulation, 99(16), 2192-2217.

Rutledge, T., Brenda, E., and Hogan, A. (2002). A quantitative review of prospective evidence linking psychological factors with hypertension development. Psychosomatic Medicine, 64, 758-766. doi:10.1097/01.PSY.0000031578.42041.1C

Safdar, S., Omair, A., Faisal, U., Hasan, H. (2004). Prevalence of Hypertension in a low income settlement of Karachi, Pakistan. Journal of Pakistan Medical Association, 54(10), 506-509.

Schwartz, A. R., Gerin, W., Davidson, W. K., Pickering, G. T., Brosschot, F. J., Thayer, F. J., and Linden, W. (2003). Toward a causal model of cardiovascular responses to stress and the development of cardiovascular disease. Psychosomatic Medicine, 65, 22-35. doi: 902943 5/46.46/.46/353.

Siegler, I. C., Peterson, B. L., Barefoot, J. C., and Williams, R. B. (1992). Hostility during late adolescence predicts coronary risk factors at midlife. American Journal of Epidemiology, 136, 146-154. doi: 0934490/5/.65953.34.

Sims, E. A. H. (1982). Mechanisms of hypertension in the overweight. Hypertension, 4(Suppl.), 1114.1-1114.9.

Shihab, H. M., Meoni, L. A., Chu, A. Y., Wang, N., Ford, D. E., Liang, K., Gallo, J. J., and Klag, M. J., (2012). Body mass index and risk of incident hypertension over the life course. Journal of the American Heart Association, 126, 2983-2989. doi: 10.1161/ CIRCULATIONAHA.112.117333

Taylor, S. E. (1999). Health Psychology (4th ed.). USA: McGraw-Hill Companies, Inc.

Vallerand, R. J. (1989). Toward a methodology of cross-cultural validation of psychological questionnaires: Implications for research in French. Psychologies Canadians, 30, 662-680.

Wang, J. W. (2009). Obesity criteria for identifying metabolic risks. Asia Pacific Journal of Clinical Nutrition, 18, 105-113.

Wiebe, D. J., and McCallum, D. M. (1986). Health practices and hardiness as mediators in the stress-illness relationship. Health Psychology, 5, 425-438.

Wongsri, N., Cantwell, R., and Archer, J. (2003). The Strategic Flexibility Questionnaire-A survey in Thai tertiary students. Paper presented at the 10th Conference of the European Association for Research on Learning and Instruction, Padova, Italy.

Yan, L. L., Liu, K., Matthews, K. A., Daviglus, M. L., Ferguson, T. F., and Kiefe, C. I. (2003). Psychosocial factors and risk of hypertension: The ***coronary artery risk development in young adults*** (***CARDIA) Study***. JAMA, 290, 2138-2148.

Yusuf, S., Hawken, S., and Ounpuu, S. (2004). Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): Case-control study. Lancet, 36(4), 937-952. doi: 0923498/53562.6.75.

Zhang, X., Sasaki, S., and Kesteloot, H. (1995). The sex ratio of mortality and its secular trends. International Journal of Epidemiology, 24, 720-729.

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