CPQ Nutrition (2019) 3:2
Research Article

Impact of Stress Status on Hypertension

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Received: 25 October 2018
Published: 03 January 2019

Keywords: *Systolic Blood Pressure; Diastolic Blood Pressure; Hypertension; Stress; Cardiovascular Diseases*

Abstract

Hypertension is one of the most common causes of various diseases in the World and major risk factor for cardiovascular diseases, leading cause of morbidity and mortality. Mental or psychosocial stress is one of the leading risk factor for hypertension which itself is main causative factor for several cardiovascular diseases. The present study has been undertaken on the 130 clinically diagnosed hypertensive patients visiting multispecialty Hospitals in Ludhiana, Punjab. Systolic and diastolic blood pressures (BP) of the subjects were determined using a mercury sphygmomanometer and the stethoscope. A significant ($P<0.01$) difference was found with respect to male and female systolic blood pressure, however, non significant for diastolic blood pressure of the subjects. Majority of the male subjects were found to be at Stage I (50.70 per cent) degree of Hypertension (BP 140-159 or/90-99mm Hg), whereas, majority of the female subjects were Pre hypertensive (54.24 per cent) i.e. BP 120-139 or / 80-89mmHg. Moreover, a significant ($P<0.01$) association was found between age and degree of Hypertension of the subjects. 67.60 per cent of male and 45.76 per cent of female subjects were found to live a stressful life. A non significant association was found between various risk factors like stress and sleeping pattern with the degree of hypertension of the subjects.

Introduction

Hypertension (HTN) has become a mainly responsible for global disease burden. It has been considered as one of the major preventable causes of premature death worldwide especially in developing countries [1]. Studies have reported up to 60% increase in the numbers of hypertensive adults by the year 2025. In India, it has assumed epidemic proportions by the year 2015 [2]. WHO predicts that 100 million or 60 per cent of the world's heart patient will be Indians by the year 2210. Without widespread dietary improvement Indian heart disease toll has doubled by 2015 [3]. Hypertension is not only an important risk factor for non-communicable diseases, but also is a major cause of mortality and morbidity all over the world [4,5]. The prevalence and incidence of hypertension as well as isolated systolic and diastolic blood pressure is still increasing in most regions [6-8]. Developing countries, especially Asian countries, are expected to experience the highest increase in hypertension; reports show that about two thirds of hypertensive patients live in developing countries [9]. About 6.6 million Iranians aged 25 to 65 years old are suffering from hypertension. Findings show that about 54% of cases of stroke and 47% of cases of coronary artery disease are attributed to hypertension. The risk of developing coronary heart disease in hypertensive people was 96% in those without diabetes and 3.23 fold in those with diabetes; the same increasing risk was observed in case of developing stroke (2.24 and 3.73 fold increase, respectively) [5]. Since, hypertension is considered asymptomatic; nearly half of the patients are unaware of their disease [10]. Many researchers believe that major changes in lifestyle behaviors play an important role in the prevalence of hypertension [11]. Several studies showed that low level of physical activity, being overweight and malnutrition and being smoker could be associated with increased risk for hypertension even in early adulthood prediction of hypertension during adolescence [12,13]. Researchers believe that taking antihypertensive medication as well as lifestyle modification will result in the best therapeutic effect. However, some studies have shown that when hypertensive patients are informed about their disease, they did not change their lifestyle behavior [14,15]. So far, a little number of studies has compared the lifestyle behavior among aware and not aware hypertensive patients, which could be an important step for further treatments [16].

Age

It was reported Hypertension to be present in 29 and 45 per cent myocardial infarction patients of < 40 years and > 40 years of age, respectively [17]. Whereas in another study [3] found 33 per cent of myocardial patients to be hypertensive and significantly lower prevalence in patients below 40 years of age. Moreover, it was found 23 per cent of myocardial patients to be hypertensive who were below 40 years of age and 35 per cent of the subjects were above 40 years of age [18].

Stress

A linear association was observed between level of stress and development of hypertension. Persons having higher mental stress (stress group) were definitely having maximum number of cases of hypertension (59.6 per cent) whereas among No stress group only 12.2 per cent were found hypertensive. It is proven fact that stress results in immediate sympathetic stimulation with a vasomotor response that result in high-output state and elevated blood pressure. In another review study 'Emerging Risk Factors for Atherosclerosis' observed that five out of 13 studies showed that stress was strongly related with hypertension [19].

Similar observations were made by another investigation in which emotional, sociocultural and occupational stress has been studied in relation with prevalence of hypertension. A number of studies have demonstrated that psychological stress is associated with increases in BP and the development of hypertension [20]. The present study intends to observe the occurrence of stress among the patients of hypertension.

Materials and Methods

The present study has been undertaken on the 130 clinically diagnosed hypertensive patients visiting multispecialty Hospitals in Ludhiana, Punjab. The selected hypertensive subjects were of age 30 years and above. Systolic and diastolic blood pressures (BP) of the subjects were determined using a mercury sphygmomanometer and the stethoscope. Blood pressure was reported as systolic / diastolic mm of Hg. A set of two readings were recorded each time with help of sphygmomanometer to reduce any type of errors. Mean of both the readings was taken as the final blood pressure of the subjects. Furthermore, the degree of Hypertension was assessed as per WHO, 2003 and JNC VII, 2003 classification. Information regarding stress status, type of stress and its impact was also recorded for each subject on the pre-printed questionnaire.

Table 1: *Classification of degree of hypertension as per WHO, 2003 and JNC VII, 2003.*

Degree of Hypertension	Blood Pressure (mm Hg)	
	SBP	DBP
Pre-Hypertension	120-139	80-89
Stage – I Hypertension	140-159	90-99
Stage – II Hypertension	>/= 160	>/= 100

Results and Discussion

Blood Pressure Levels and Degree of Hypertension

Blood pressure of the subjects was measured by a mercury sphygmomanometer and a stethoscope. The blood pressure levels depicted in Table 2 is mean ± standard error values. On an average mean ± standard error systolic blood pressure of the subjects was recorded as 141.31± 0.54 mm Hg of male and 138.00±0.45 mm Hg of female subjects. A significant (P<0.01) difference was found between mean systolic blood pressures of male and female subjects.

Table 2: *Age wise distribution of blood pressure (BP) of hypertensive subjects.*

Age Groups	30-40 Years	40-50 Years	≥50 Years	Mean
BP /Sex				
Systolic BP				
Male	136.37±3.21	146.35±2.59	142.23±2.15	141.31±0.54
Female	134.00±1.83	140.80±1.28	140.00±1.39	138.00±0.45
t-value	**0.617**	**2.048***	**0.696**	**4.591****

Diastolic BP				
Male	86.50±1.67	87.80±1.50	92.28±1.33	88.19±0.23
Female	86.60±1.84	90.00±1.53	88.40±1.03	88.33±0.22
t-value	**0.040**	**0.968**	**0.996**	**0.436**

* Significant at P<0.05
** Significant at P<0.01

The mean ± standard error SBP of male subjects at different age groups was recorded as 136.37±3.21, 146.35 ±2.59 and 142.23±2.15mm Hg at age groups 30-40, 40-50 and ≥50 years, respectively. The SBP of female subjects was recorded as 134.00±1.83, 140.80±1.28 and 140.00±1.39mm Hg at age groups 30-40, 40-50 and ≥50 years respectively. Systolic blood pressure of male subjects was found to be higher than that of female subjects at all the age groups. A statistically significant difference has been found between SBP of males and females of 40-50 years of age group. Mean ± standard error diastolic blood pressures of male subjects was recorded as 86.50±1.67, 87.80±1.50 and 92.28±1.33mm Hg, whereas, 86.60±1.84, 90.00±1.53 and 88.40±1.03mm Hg that of female subjects at age group I, II and III, respectively. Moreover, a non significant difference was found between male and female diastolic BP at all the age groups.

Range of Blood Pressure

The distribution of subjects according to range of blood pressure (Table 3) revealed that majority (48.46 per cent) of the total subjects had systolic blood pressure between 140-159mm Hg, followed by 35.38 per cent between 120-139mm Hg. 8.46 per cent of the subjects had SBP ≥160 and 7.69 per cent had SBP considered as normal (SBP ≤ 120mm Hg).

Table 3: *Distribution of subjects on the basis of range of Blood Pressure.*

Sex	Male	Female	Total
Category of BP			
Systolic BP			
SBP≤120	2 (2.82)	8 (13.56)	10 (7.69)
120-139	25 (35.21)	25 (35.21)	46 (35.38)
140-159	40 (56.34)	23 (38.98)	63 (48.46)
≥160	4 (5.63)	7 (11.86)	11 (8.46)
$\chi 2 = 8.51$*			
Diastolic BP			
DBP≤80	12 (16.90)	9 (15.25)	21 (16.15)
80-89	31 (43.66)	29 (49.15)	60 (46.15)
90-99	21 (29.58)	15 (25.42)	36 (27.69)
≥100	7 (9.86)	6 (10.17)	13 (10.00)
$\chi 2 = 11.15$*			*** Significant at P<0.05**

The data on diastolic blood pressure revealed that the maximum (46.15 per cent) per cent of hypertensive subjects had DBP between 80-89mm Hg, followed by 27.69 per cent between 90-99, 16.15 per cent of total subjects had DBP considered as normal (DBP ≤ 80mm Hg) and 10.00 per cent of subjects had DBP ≥100mm Hg. Moreover, a significant (P<0.05) difference was found between male and female with respect to range of blood pressure (SBP and DBP).

Degree of Hypertension

More precise distribution of hypertensive subjects on the basis of degree of Hypertension is given in Table 4. The data revealed that half of the total male subjects (50.70 per cent) were at I stage degree of Hypertension (140-159 and /or 90-99mm Hg), 11.27 per cent at II stage Hypertension (BP≥160 and / or ≥100mm Hg) and the remaining 38.03 per cent were found at pre Hypertension (BP120-139 and /or 80-89mm Hg) stage.

Table 4: *Age wise distribution of degree of Hypertension (HTN).*

Age Groups Degree of HTN	30-40 Years	40-50 Years	≥50 Years	Total
Male				
Pre HTN	5 (62.50)	8 (42.10)	14(31.82)	27 (38.03)
Stage I	3 (37.50)	9 (47.37)	24(54.54)	36 (50.70)
Stage II	-	2 (10.53)	6 (13.64)	8 (11.27)
$\chi 2 = 188.02^{**}$				
Female				
Pre HTN	4 (57.14)	15 (50.00)	13(59.09)	32 (54.24)
Stage I	3 (42.86)	11 (36.67)	7 (31.82)	21 (35.59)
Stage II	-	4 (13.33)	2(9.09)	6 (10.17)
$\chi 2 = 17.45^{**}$				**** Significant at P<0.01**

Moreover, degree of Hypertension was found to increase significantly (P<0.01) with the age of male subjects. On the other hand, among female subjects, 54.24 per cent were at pre Hypertension stage, 35.59 per cent at stage I and the remaining 10.17 per cent at stage II degree of Hypertension.

Stress and Degree of Hypertension

In modern times stress level of human being is increasing continuously and it is responsible directly or indirectly in the occurrence of the various health related complications. Therefore an attempt has been made to get information about living status (stress and sleeping pattern) of the subjects.

Table 5: *Distribution of subjects on the basis of stress status in relation to degree of Hypertension.*

Degree of Hypertension	Living stressful		Type of stresses			If stress affects food consumption		If yes, how	
	No	Yes	Family	Occupational	Any other	No	Yes	Eat less	Eat more
Male									
Pre HTN	10 (43.48)	17 (35.42)	7 (26.92)	11 (45.83)	1 (25.00)	8 (30.77)	9 (40.91)	6 (35.29)	3 (60.00)
Stage I	11 (47.83)	25 (52.08)	15 (57.69)	10 (41.67)	2 (50.00)	15 (57.69)	10 (45.45)	8 (47.06)	2 (40.00)
Stage II	2 (8.69)	6 (12.50)	4 (15.38)	3 (12.50)	1 (25.00)	3 (11.54)	3 (13.64)	3 (17.65)	-
Total	23 (32.39)	48 (67.60)	26 (54.17)	24 (50.00)	4 (8.33)	26 (54.17)	22 (45.83)	17 (72.27)	5 (22.73)
χ2 value	**χ2 =0.52**		**χ2 =1.18**			**χ2 =7.10**		**χ2 =1.50**	
Female									
Pre HTN	19 (59.37)	13 (48.15)	10 (47.62)	4 (50.00)	-	7 (50.00)	6 (46.15)	4 (50.00)	2 (40.00)
Stage I	10 (31.25)	11 (40.74)	9 (42.86)	2 (25.00)	-	5 (35.71)	6 (46.15)	3 (37.50)	3 (60.00)
Stage II	3 (9.37)	3 (11.11)	2 (9.52)	2 (25.00)	-	2 (14.28)	1 (7.69)	1 (12.50)	-
Total	32 (54.24)	27 (45.76)	21 (77.78)	8 (29.63)	-	14 (51.85)	13 (48.15)	8 (61.54)	5 (38.46)
χ2 value	**χ2=0.75**		**χ2=0.40**			**χ2 =0.46**		**χ2=0.35**	

Stress

Perusal of the data showed (table 5) that 67.60 per cent of the total male subjects were found to live a stressful life, out of which, the maximum (52.08 per cent) had stage I degree of Hypertension, followed by 35.42 per cent at pre Hypertension and 12.50 per cent at stage II degree of Hypertension.

Out of the total male subjects living stressful life, 54.17 per cent had family stresses, 50.00 per cent had occupational stress and 8.33 per cent reported some psychological disturbances as the cause of stresses. 45.83 per cent of subjects also reported the effect of stress on food consumption. They were either eating less (72.27 per cent) or more (22.73 per cent) under stressful conditions.

On the other hand, the data about female responses revealed that 45.76 per cent of total subjects were living stressful life, out of which the majority (48.15 per cent) had pre Hypertension, followed by stage I (40.74 per cent) and stage II (11.11 per cent) degree of Hypertension.

Females had more of family stresses (77.78 per cent) than occupational (29.63 per cent) stresses and no one reported any psychological disturbances. Stress had an effect on food consumption of 48.15 per cent of the female subjects too and majority of the females were eating less (61.45 per cent) under stressful conditions.

Thus, 67.60 per cent of the male and 45.76 per cent of female subjects were found to live a stressful life. In male subjects, family (54.17 per cent) and occupational (50.00 per cent) stresses were most common; however, 8.33 per cent also reported some psychological disturbances as the cause of stresses. Females had more of family stresses (77.78 per cent) than occupational (29.63 per cent) stresses and no one reported any psychological disturbances. Stress had an effect on food consumption of both male (45.83 per cent) and female (48.15 per cent) subjects. Majority of the subjects (72.27 per cent of male; 61.54 per cent of female) were eating less under stressful conditions. The subjects at Stage II degree of Hypertension were found to eat less. Moreover, a non significant association was found between living status and degree of Hypertension.

Sleeping Pattern

The data on sleeping pattern revealed that 46.48 per cent of the male subjects had sound sleep and 53.52 per cent were experiencing some sleeping disorders mostly insomnia. 15.79 per cent of the male subjects were using sleeping pills were (alp salt, tranquillizers etc). On the other hand, out of female subjects, 62.71 per cent had no sound sleep and 18.92 per cent were taking sleeping pills (meloprax etc).

Table 6: *Distribution of subjects on the basis of sleeping pattern in relation to degree of Hypertension.*

Sleeping pattern / Degree of HTN	Enjoy sleeping		Taking sleeping pills	
	No	Yes	No	Yes
Male				
Pre HTN	11 (28.95)	16(48.49)	8 (25.00)	3 (50.00)
Stage I	23 (60.53)	13(39.39)	21(65.62)	2 (33.33)
Stage II	4 (10.53)	4 (12.12)	3(9.37)	1 (16.67)
Total	38 (53.52)	33(46.48)	32(84.21)	6 (15.79)
χ2value	χ2=2.37			
Female				
Pre HTN	20 (54.05)	12(54.55)	15(50.00)	5 (71.43)
Stage I	13 (35.13)	8 (36.36)	11(36.67)	2 (28.57)
Stage II	4 (10.81)	2(9.09)	4 (13.33)	-
Total	37 (62.71)	22(37.29)	30(81.08)	7 (18.92)
χ2 value	χ2=0.0			

Thus, sleeping pattern revealed that 53.52 per cent of the male and 62.71 per cent of female subjects experienced some sleeping disorders mostly insomnia. Majority of the subjects (84.21 per cent of male; 81.08 per cent of female) were not using sleeping pills. A non significant association was found between degree of Hypertension and sleeping pattern of the hypertensive subjects.

Conclusions

The mean systolic BP of male subjects was found to be 141.31±0.54 and 138.00±0.45mm Hg of female subjects and moreover the highest SBP was recorded of subjects in the age group 40-50 years. The mean diastolic BP of male subjects was found to be 88.19±0.23 and 88.33±0.22mm Hg of female subjects. Moreover, a significant ($P<0.01$) difference was found with respect to male and female systolic BP, however, non significant for DBP of the subjects. Majority of the male subjects were found to be at Stage I (50.70 per cent) degree of Hypertension (BP 140-159 or/90-99mm Hg), whereas, majority of the female subjects were Pre hypertensive (54.24 per cent) i.e. BP 120-139 or / 80-89mmHg. Moreover, a significant ($P<0.01$) association was found between age and degree of Hypertension of the subjects. 67.60 per cent of male and 45.76 per cent of female subjects were found to live a stressful life. Among male subjects, family (54.17 per cent) and occupational stresses (50.00 per cent) were common; however, female subjects had more of family stresses (77.78 per cent). Moreover, majority of the subjects were found to eat less (72.27 per cent of male; 61.54 per cent of female) under stressful conditions. A non significant association was found between various risk factors like stress and sleeping pattern with the degree of Hypertension of the subjects.

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