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Prevalence and Determinants of Hypertension in Kashmir: A Cross Sectional Study

Dr Zarka Amin Masoodi[1], Dr Riyaz Ahmad Mir [2]
[1]Consultantant Medicine Department of Health & Medical Education Kashmir India
[2]Sr Resident Government Medical College Srinagar Kashmir India

Abstract:
Background: *Increased life expectancy, urbanization, and its attendant life style changes, the overall epidemiological transition and a prolonged political turbulence in Jammu and Kashmir has exposed the population to multiple risk factors. This has given rise to numerous noncommunicable diseases including hypertension resulting in morbidity and mortality of various degrees. Given the complexity of the hypertension among the population both in rural and urban areas, the aim of the present study was to assess the prevalence and the correlates of hypertension in Community Development Block Budgam, Central Kashmir.*
Materials and methods: A community based cross sectional study was undertaken in which 554 subjects participated. WHO STEPS approach was used to collect data on sociodemographic characteristics including age, education, smoking habits, family history of hypertension, physical activity level, anthropometric and biochemical measurements. Data was statistically analysed using statistical package SPSS Windows version 16.0.
Results: *The mean age of the study population was 42.3 years and the age distribution was skewed with majority (75.42%) in 40-49 age range. Among the participants 198 constituting 34.12% were hypertensive with 74.07 % in the age group of 50-69 years. Prevalence of hypertension increased steadily with age and an increase from 6.66 % in the age range of 20-29 years to 54.69% in elderly (>60 years) was observed. The prevalence of hypertension was also related to body mass index and waist hip ratio.. Besides BMI, age and diabetes, family history of high blood pressure and physical activity level were found strongly associated with hypertension with Odds ratio ranging between 1.57-2.19. A linear relationship was found between increase in hypertension and body mass index and waist hip ratio.*
Conclusion: *These findings indicate that hypertension is a significant health problem in the study population. Modifiable factors identified to be associated with prevalence of hypertension such as obesity, overweight, physical activity level; smoking could be used in educational programme aimed at the detection and treatment of the affected population. Therefore, concerted efforts should be made to promote health education with emphasis on associated risk factors.*
Keywords: *Hypertension, Obesity, Overweight, Waist Hip ratio, Odds ratio, Determinants, Prevalence*

I. Introduction

Hypertension is an important public health challenge in both economically developing and developed countries and is one of the most important risk factor for cardiovascular and cerebrovascular morbidity and mortality accounting for an estimated 54% of all strokes and 47% of all ischemic heart disease events globally [1]]. It is also one of the most frequent chronic conditions in medical consultation [2]. In developed world about 330 million people worldwide have hypertension as do around 640 million in the developing world. The WHO rates hypertension as one of the most preventable risk factor of premature deaths worldwide and the problem is growing [3]. In 2025 it is estimated there will be 1.56 billion adults living with high blood pressure [I]. According to the WHO hypertension constitutes an important modifiable risk factor related to 4.5% the world wide disease burden and is associated with an approximately 40% reduction of stroke risk and 15% reduction of myocardial infarction when treated ad controlled [1].

The disease is a silent threat to the health of people all over the world and is rarely accompanied by any symptoms. Usually it is identified through screening or when seeking healthcare for an unrelated problem. The World Hypertension League (WHL) an umbrella organization of 85 national hypertension societies and leagues recognized that more than 50% of the hypertensive population is unaware of their conditions [5]. Worldwide 7.6 million premature deaths (about 13.5% of the global total) were attributed to high blood pressure [6]. As per WHO report about 40% of people aged more than 25 years had hypertension in 2008 [7,8]. Review of the epidemiological studies suggest that the prevalence of hypertension in India has over the last six decades increased in both urban and rural subjects and presently is 25% in urban adults and 15% among the rural adults [9]. According to Director General of Health Services Ministry of Health and Family Welfare, Government of India, the overall prevalence of hypertension in India by 2020 will be 159.46/1000 population [9]. The prevalence of high normal blood pressure also called pre hypertension has been recorded as high as 36 and 44% from south India and Delhi respectively [9]. Various factors might have contributed to this rising trend, attributable to several indicators of' economic progress such as increased life expectancy, urbanization and its attendant lifestyle changes including increasing salt intake and the overall epidemiological transition, India is experiencing currently [10]. These life style modifications have exposed even the adolescents to multiple risk factors and the prevalence of hypertension in younger age groups has assumed alarming proportions [11]. As a result of improved longevity rates hypertension constitutes a major public health problem especially in older adults, affecting half of those aged 60 to 69 years, and around three quarters of those aged older than 70 years [12]. Another factor that may contribute is the increased awareness and detection.

Kashmir valley situated in North Western Himalayan region of India has been experiencing large scale political turbulence since 1990, thus exposing the population to tremendous stress. This has given rise to numerous non communicable diseases, including hypertension, causing various degree of morbidity. Despite high prevalence of hypertension, reliable epidemiological data is scarce and prevention, detection, treatment and control are suboptimal in the state. Given the alarming increase in hypertension rates, the complexity of blood pressure among the Kashmir populations, the aim of the present work was to assess the prevalence and identify the correlates of hypertension among the rural population of Budgam Community Block in central Kashmir.

II. Material and Methods

This community based cross sectional study was conducted in Community Development Block Budgam, a rural area of Central Kashmir, between 2013-2015. The area is within the field practice area of District Hospital Budgam. Written informed consent was obtained from the study participants for the questionnaire based interview and laboratory tests. All volunteer participants above the age of 18 years were recruited. Excluded from the study were pregnant women, disabled and those who were acutely ill. A total of 554 subjects participated in the study. Newly detected patients with hypertension, diabetes and high cholesterol were referred to house physician for further management. The World Health Organization (WHO) step-wise approach was used to determine the prevalence of risk factors associated with hypertension in the study population. [13]. The three components of the study were (1) questionnaire based survey for behavioural risk factors, (2) anthropometric measurements and (3) biochemical measurements.

Socio Demographic Characteristics

Socio demographic data of the participants including age, education, smoking habit, family history of hypertension were recorded using a structured questionnaire. A physical activity questionnaire, validated for middle class Indians, was used [14]. Physical activity level (PAL) was calculated according to WHO Technical Report 1999[15] as 24 hour energy expenditure/basal metabolic rate and grades described as sedentary (<l.4), moderately active (1.55-1.60) and heavily active (>1.75).

Anthropometric Measurements

Body mass index and waist hip ratio was measured in accordance with WHO guidelines [15] and classified according to the Consensus Statement of the Association of Physicians of India [16]. Blood pressure was measured from the right arm after the subject had been sitting for at least five minutes using digital automatic blood pressure apparatus. The average of the two readings taken five minutes apart was recorded. By use of The Seventh Report of the Joint National Committee VII (Indian scenario), 2003 on Prevention, Detection, Evaluation and Treatment of High Blood Pressure [15,16] each subject was classified as Normotensive (blood pressure 90-119/60-79 mmHg); pre hypertensive(120-139/80-89 mmHg) stage I hypertensive(140-159/90-99mmHg); or stage II hypertensive(> 160/> 120mmHg)

Biochemical Measurements

Five ml of blood was collected from ante-cubital vein in two test tubes after 10-hour overnight fasting period, Blood sample for plasma glucose was collected in the test tube containing heparin sodium fluoride. Plasma glucose and total cholesterol were measured using an auto analyser.

Statistical Analysis

Data were analyzed using statistical package SPSS Windows version 16.0. Univariate and multivariate analysis were done to determine the risk factors associated with hypertension. A p – value less than 0.05 were used as the definition of statistical significance.

III. Results

Five hundred fifty four subjects participated in the screening exercise out of which 289 were males and 265 female constituting 52.25% and 47.83% percent of the study population respectively. The age distribution of the respondents was skewed with majority (75. 42%) in the 40-69 years age range (Table 1). The elderly (above 70 years of age) constituted 7.40% of the respondents. The mean age did not differ among male and female participants. Mean age was 42.32 years; 42.45 for males and 43.12 for females. Among the participants 189, constituting 34.12% of the participants, were hypertensive with majority(74.07%) in the age group of 50-69 years. Prevalence of hypertension was calculated as the rate of cases divided by the study population. Prevalence of hypertension increased steadily with age. From 6.66% in the age group of 20-29 years it reached 54.69% in elderly (> 60 years). The results indicated increased prevalence of hypertension during the most productive years between 40- 60 years putting the population at risk of cardiovascular morbidity and mortality at relatively younger age. The prevalence of hypertension was also found related to body mass index. With the increase in age and body weight the number of hypertensive subjects increased accordingly. Amongst 147 subjects in the age group of 50-59 years 92 were obese or overweight and the prevalence of hypertensive subjects was 70. Similarly trend was observed in the age group of 60-69 years where among 128 subjects, 81 were overweight or obese out of which 70 were hypertensive.

Table 1 Distribution and prevalence of hypertension in age groups in relation to obesity /overweight

Age group (years)	No of Respondents (%)	Hypertensive (%)	Age specific prevalence of obesity (=n) (%)	Age specific prevalence of overweight (=n) (%)
20-29	15 (2.70)	1 (6.66)	-	5 (33.33)
30-39	81 (14.62)	7 (8.64)	6 (7.41)	25 (30.86)
40-49	142 (25.63)	23 (16.20)	24 (16.90)	60 (42.25)
50-59	147 (26.53)	70 (47.62)	31 (21.09)	61 (41.50)
60-69	128 (23.10)	70 (54.69)	29 (22.66)	52 (40.63)
>70	41 (7.40)	18 (43.90)	3 (7.31)	25 (60.80)
Total	554	189 (34.12)	93 (16.79)	228 (41.16)

Sociodemographic and clinical characteristics of the study population are reflected in table 2. The studied population showed various educational levels with only 17.15% having graduate or postgraduate level of education. While 170 had passed higher secondary examination, 285 had received education 10th standard and below. Amongst the participants only 31 were illiterate. Prevalence of overweight and obesity using WHO definition for Asians was 41.16 and 16.79% respectively. Central obesity as determined by Waist Hip Ratio (WHR>. 90) was present in 38.81% of the study population out of which 49.79% were hypertensive. Among the 97 subjects (17.51%) found diabetic, 45 (46.39%) were hypertensive. While only 26 were newly detected, 21 (44.68%) were self reported. Based on physical activity level 60 subjects were sedentary while, majority of the study population (32%) were moderately active. Out of 60 subjects who were sedentary, 27(45%) were hypertensives. Family history of hypertension was found strongly associated with hypertension. Out of 91 with family history of hypertension 51 (56.04%) were hypertensive. Smoking was prevalent in 134 (24.15%) of the subjects. Out of 189 cases of hypertension 32(16.93%) were newly detected. Among known hypertensives, 44 (23%) had blood pressure under control (SBP <140 mmHg and DBP<90 mmHg).

Table 2 Sociodemographic and clinical characteristics of study population

Variable	n	Normotensive	Hypertensive	P – value
Gender				<.001
Male	228	190	98	
Female	265	174	91	
Age (years)				0.12
20-40	96	88	8	
41-60	189	96	93	
>61	169	81	88	
Educational status				<.001
Illiterate	31	18	13	
≤ 10th	258	168	90	
10+2	170	107	63	
Graduate / PG	95	60	35	
Physical activity level				0.03
Sedentary	60	33	27	
Active	329	226	103	
Most Active	165	130	35	
Smoker				<.001
Yes	134	92	52	
No	420	273	174	
Family history of HT				<.001
Yes	91	40	51	
No	463	302	161	

BMI				<.001
≤ normal weight	233	208	25	
Over weight	228	92	107	
Obese	93	23	70	
Waist hip ratio (>0.9)	215	108	107	<.001
Diabetes mellitus	97	42	45	<.001
Self reported	21	13	8	
Newly detected	26	15	11	
Cholesterolemia	71	46	25	<.001

Among the factors associated with the hypertension obesity, overweight, diabetics, physical activity level, age, gender, education and smoking were some of the major risk factors (table3).The multivariate analysis of risk factors of hypertension showed that compared with normotensive, the hypertensive participants were less physically active, less educated and had a higher prevalence of obesity, diabetes and hypercholesterolemia and higher levels of BMI. After adjusting for various determinants, it was revealed that diabetic, overweight, obese and older people were more likely to have hypertension. Diabetes, age, family history and obesity were found as the most important risk factor for developing hypertension with odds ratio varying between 2.03 to 2.19. After age and obesity, family history was found to be strongly associated with hypertension. Diabetic were found to have 2.03 odds of developing hypertension In this study obese subjects had 2.13 odds of developing hypertension compared with non obese subjects and being overweight was associated with 1.65 of developing hypertension.

Table3. Multivariate analysis of risk factors associated with hypertension

Determinant	Odds Ratio	95% CI
Age	2.19	2.05 – 2.80
Diabetes	2.03	1.30 – 3.25
Gender (male vs female)	1.06	1.02 – 1.08
Obesity	2.13	1.87 – 3.16
Overweight	1.65	1.19 – 1.97
Waist hip ratio	1.57	1.38 – 1.80
Physical activity level	1.53	1.03 – 1.86
Smoking	0.85	0.69 – 1.23
Education	1.04	1.02 – 1.19
Family history	2.11	1.42 – 2.76

The proportion of study subjects with hypertension across the body mass index range is shown in figure 1. Prevalence of hypertension increased across the BMI range and the linear trend was statistically significant (p<0,05). Hypertension increased from 21% among patients with normal weight to 47-60% among overweight and 71% among obese subjects. Similarly the prevalence of hypertension across WHR range (figure 2) showed an increasing trend and the linear trend was statistically significant (<0.05). The prevalence of hypertension began to increase at BMI of 22-23 kg/m^2 and WHR of 0.85-0.86.

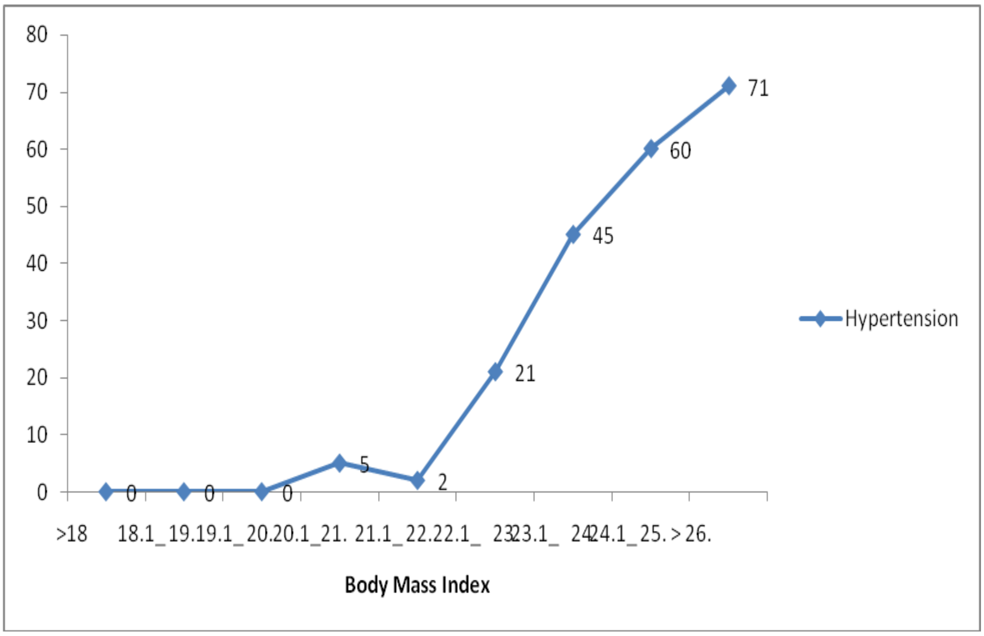

Figure1. Proportion of study subjects with hypertension across body mass index

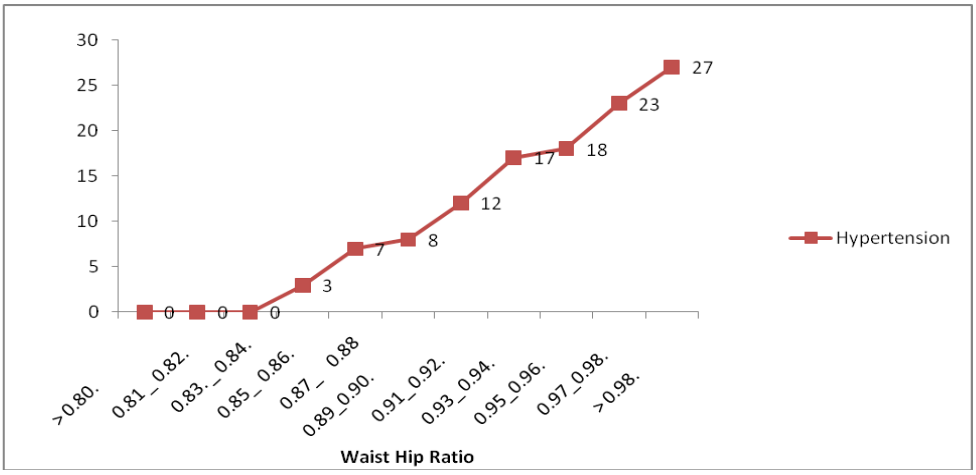

Figure2. Proportion of study subjects with hypertension across waist hip ratio

IV. Discussion

Hypertension is quantitatively the most important determinant of premature cardiovascular diseases including ischemic heart disease and stroke causing high mortality and morbidity. The risk of both coronary disease and stroke increases progressively with incremental increase in blood pressure above 115/75 mmHg as shown in numerous epidemiological studies [17, 18]. The increase in cardiovascular risk has primarily been described in terms of elevated systolic pressure in those over age 60 years [19] and elevation in diastolic pressure in younger individuals. Pulse pressure, which is the difference between the systolic and diastolic blood pressure, determined primarily by large artery stiffness, is also a strong predictor of risk [19]. Projections have been made for the expected decrease in morbidity and mortality resulting from a 10-12 mmHg reduction in systolic pressure and 5-6 mmHg reduction in diastolic pressure using data from multiple trials performed over past 30 years. Although not proving cause-and-effect, the estimated benefit from this degree of blood pressure lowering is a 38% reduction in risk of stroke and 16% reduction in risk of coronary disease [20]. Given the asymptomatic nature of hypertension, its detection is usually incidental, and at times after significant complications have arisen [21]. As a result, the real burden of hypertension in most societies, particularly in developing world, is underreported [22]. Self awareness as well as the treatment and control of hypertension are very Iow in both lower [22,23] and high income countries [24]. This might be contributing to the increasing burden of stroke and myocardial infarction. Valid and reliable information on the prevalence of hypertension is crucial in the development of health policies for prevention, control and early diagnosis of this condition. The current study conducted in Central Kashmir describes the prevalence and identifies correlates of hypertension in a rural setting. The prevalence of hypertension was as high as 34.12% which is significantly higher than that of previous reports [23,9] and high income countries [24,25].

An increase in the prevalence of hypertension associated with age has been detected in this study, which is consistent with the global trend [26]. The prevalence of hypertension increased significantly from age group of 30-49 to 60-69 years. The present study also showed that the prevalence of hypertension was significantly higher in individuals of more than 40 years as compared to those less than this age. Subjects in the age group of 40-60 registered prevalence rate of 70%. Vasan et al in their study found significant association of hypertension with age [27]. There was significant difference in prevalence of hypertension in different educational classes in the present study. Wang et al [28] and Jugal Kishore et al [29] also found that both systolic and diastolic blood pressure were inversely associated with the level of education, independent of all other risk factors. Education makes the people aware of the disease and what precautions can be undertaken by the healthy individual. Stefanos Tyrovolas et al [30] in their multinational study on risk factors of hypertension reported that compared to normotensive, hypertensive participants were less educated. Common risk factors for hypertension, such as diabetes, being overweight or obese, family history of hypertension, physical activity level, and smoking have been found to be strongly associated with hypertension in the current study. On multivariate analysis, increasing age, body mass index, waist hip ratio, and presence of diabetes or cholesterolemia independently contributed to hypertension. The prevalence of hypertension and diabetes increased with increasing body mass index and waist hip ratio.. Similar observations were made in different work environments [31]. The prevalence of hypertension in the present study consistently increased with increasing body mass index. This is in concordance with the findings of other authors [27]. Being overweight or obese increased the odds for having hypertension by 2.13. Among subjects in the present study who were centrally obese, nearly 49.77% were hypertensive. The link between obesity and hypertension is through neuroendocrine mechanisms and most recently, factors derive from adipose tissue are thought to play a major role, [32]. The National Health and Nutrition Examination survey reported linear association between increase in body mass index and systolic, diastolic and pulse pressure in the American population [33] .It is reported that an increase of body mass index of 1.75 kg/m ^{2} in men and 1.25 kg/m ^{2} in women will cause 1 mm Hg rise in systolic blood pressure. [33]. Obese patients are more prone to hypertension and hypertensive patients also appear prone to weight gain [34,35]. Findings from the Framingham and Tecumseh studies revealed that future weight gain is significantly higher in hypertensive than in normotensive subjects, which thus suggests that even hypertensive patients with normal weight are at increased risk of developing obesity. [34]. The reports suggest that the relationship between obesity and hypertension can be considered a- two-way street [34] Obesity with hypertension but not obesity alone is associated with an increased risk of cardio vascular disease. In overweight and obese subjects the cardiovascular risk is not significantly increased unless hypertension is present [35]. This emphasizes the influence of hypertension as a mediator of cardiovascular disease in obesity.

Besides obesity, sedentary life style and smoking are important modifiable risk factors for hypertension. In addition, a family history of hypertension was also a strong contributor to hypertension. In previous studies family history has been shown to be an important predisposing to hypertension [36,37]. Among modifiable factors significant association was shown with tobacco intake. This is consistent with the findings of other studies where tobacco has been shown associated with hypertension [36, 38]. However, Jugal Kishore et al did not observe any significant association of tobacco with the prevalence of hypertension [29]. Similarly hypertension was more prevalent among those with raised cholesterol level. Similar results were shown by some previously studies [39]. We also found an increased risk of hypertension among subjects with sedentary life style. Association of physical activity level with hypertension has previously been shown in different populations [40]. As was recently outlined by the American Heart Association Professional Education Committee of the Council for Blood Pressure Research, old 'age and obesity are the two of the most powerful risk factors for control of, hypertension in general but also a risk factor for uncontrolled treated hypertension,[30,41].

The present study has several strengths. It is one of the few to evaluate the effects of various socio demographic and bio clinical characteristics of hypertension in a large population under field conditions. All the interviews were conducted by a single person, which provided uniformity in data gathering. Amongst the limitations of the study, the fact that it used a cross sectional design limits the possibility of etiological conclusion. In addition there is always a bias in self reported questionnaires to the extent that the information is either under reported or over reported. The findings emerging out of current study cannot be extrapolated to the populations of all the rural areas in Kashmir in view of varied socio demographic and other characteristics.

V. Conclusion

The prevalence of hypertension in the study population was found high which clearly shows that it is becoming a serious public health concern in the area. Certain factors like overweight, obesity, family history, smoking habit, physical activity level, diabetes were found associated with high blood pressure . Taking into account that treatment of hypertension constitutes a complex process, which includes many life style changes, as well as special medication, promotion of health dietary habits constitute an effective non pharmacological means for management of hypertension as well as weight control. Modifiable risk factors identified to be associated with the prevalence could be used in health education programme aimed at the management of this problem.

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