International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064

Prevalence of Hypertension and its Risk Factors among Urban Sikh Population of Amritsar

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Abstract: ***Hypertension is a major risk factor for cardiovascular disorders, stroke and myocardial infarction, and its burden is increasing disproportionately in developing countries as they undergo demographic transition. Hypertension is responsible for 57% of stroke deaths and 24% of coronary heart disease deaths in India. The sample size of 1089 subjects was calculated. This study focused on Urban Sikhs living in the Amritsar, Punjab, India as they constitute 70% of the total population of Amritsar according to 2011 census report. The prevalence of hypertension has increased during the last decade. The high prevalence of hypertension (35.9%) in this study, confirms this increasing trend. It is necessary to adopt appropriate preventive strategies and interventions in high risk individuals to curb the growing epidemic of hypertension.***

Keywords: Hypertension, Sikh, Urban, Cardiovascular, lifestyle, prevalence

1. Introduction

Hypertension is the most common cardiovascular disease and is assuming epidemic proportions in developing countries as well [1]. It affects nearly 26% of the population worldwide [2]. Hypertension exhibits an iceberg phenomenon where unknown morbidity exceeds the known morbidity. Hypertension is a major risk factor for cardiovascular disorders, stroke and myocardial infarction, and its burden are increasing disproportionately in developing countries as they undergo demographic transition [3, 4, 5, 6]. It is estimated that by 2020, CVDs will be the largest cause of mortality and morbidity in India [7]. The prevalence of hypertension is rapidly increasing in developing countries and is said to be one of the leading causes of death and disability among the elderly [8].Hypertension is responsible for 57% of stroke deaths and 24% of coronary heart disease deaths in India. [9]

Using a cut-off of 140 mmHg or greater systolic blood pressure (BP), or 90 mmHg or greater diastolic BP, the age-standardized prevalence of hypertension worldwide in the year 2000 was estimated to be 26.6% in men (95% confidence interval, CI 26.0 to 27.2) and 26.1% in women (95% CI 25.5 to 26.6). This is estimated to rise to 29.0% in men (95% CI 28.6 to 29.4) and 29.5% in women (95% CI 29.1 to 29.9) by 2025 [10]

India, the world's largest democracy, is undergoing a rapid economic growth. This growth has been accompanied by demographic, lifestyle and cultural changes which have had a large impact on the health profile of India's citizens and placed a significant strain on the country's healthcare system [11, 12, 13]

It was estimated that around two-thirds of those with people with hypertension worldwide were living in developing countries (639 million) in 2000, and that this would rise to three-quarters living in developing countries (1.15 billion) by 2025. Previous authors have suggested prevalence rates for hypertension in urban Indian population to be 29-45% in men and 25-38% in women [14, 15, 16, 17]

Indian studies have revealed that the prevalence of hypertension has increased by 30 times among the urban population over a period of 55 years and about ten times among the rural population over a period of 36 years.(18). Management of hypertension requires life-long medication with some lifestyle modifications. The only way to curb the problem of hypertension is by its prevention.

Several risk factors have been implicated in the etiology of hypertension. This includes geographic considerations, genetic socio-economic, socio-cultural and dietary, nutritional status etc. While the risk factors and their impact on hypertension is documented by well designed studies in the Western countries, systematically conducted studies using rigorous epidemiological techniques are lacking in India. Epidemiological studies to assess the prevalence of Hypertension are urgently needed in developing countries like India to determine the baseline against which future trends in risk factor levels can be assessed and preventive strategies planned to promote health. The urban population is very prone to development of cardiovascular diseases with Sidhu et al putting to figure at 20.15 % [19]. Inspite of the prediction of this population to the development of CVD, there has been no Epidemiological in this population.

Thus the primary aim of this study was to identify the prevalence of hypertension in the Urban Sikh Population of Amritsar by means of a door-to-door survey. A secondary aim was to identify the risk factors for hypertension.

2. Materials and Methods

The sample size of 1089 subjects was calculated. The multi stage cluster randomized sampling was done using the probabilities proportional size (PPS) method. This study focused on Urban Sikhs living in the Amritsar, Punjab, India as they constitute 70% of the total population of Amritsar

according to 2011 census report. The area was arbitrarily divided into five equal zones namely (Z_1, Z_2, Z_3, Z_4, Z_5). Each zone constituted of 13 Censes wards .The list provided the name, age and address of those eligible for voting (>18 years). The fieldwork was completed in a period of 20 months, starting in Jan 2012. The totals of 215 subjects from each zone were randomly selected. In the selection of the family in a particular ward the WHO method of sampling was followed to prevent any non uniformity in selection of the subjects. A model consent form was constructed to ensure compliance with ICMR guidelines regarding the use of human subjects in research. All protocols and consent documents were reviewed and approved by the Institutional Ethics Committee of Faculty of Sports Medicine & Physiotherapy, Guru Nanak Dev University, Amritsar. The complete detailed Performa of all the family members was filled by the investigator which included number of members in the family, age, educational status etc. From the list provided one male and one female member were randomly selected. These two family members were requested to fill in the self designed, professionally validated questionnaire Blood pressure was measured using a standard auscultatory method with the help of a pneumatically operated mercurial type random-zero sphygmomanometer in the sitting position with the back supported and the arm was kept at the level of fourth interspaced at sternum. Blood pressure was measured after the questionnaire was filled in i.e. nearly 5 min after the visit, by which time the emotional reaction of the subject had stabilized. Three casual readings were taken. Average of these readings was taken as the final reading.

Hypertension was defined on the basis of Joint National Committee (JNC) VII criteria. If blood pressure was > 120/80, the BP was checked again after minimum of 5 min. and only if BP was >140/90, was the person labeled to have HTN. Persons having systolic blood pressure (SBP) between 120-139 and / or diastolic blood pressure (DBP) between 80 - 89 were labeled to have pre-hypertension. Stage1 hypertension was taken as systolic BP between140-159 and/ or diastolic BP between 90-99 mmHg. Stage 2 hypertension was taken as systolic BP > 160 and/ or diastolic BP > 100 mmHg. The fasting blood sample was taken for the analysis of biochemical variables. The blood was analyzed for serum cholesterol, (CHO), serum trigylerides (TG), (High density lipoprotein (HDL),(Low density lipoprotein (LDL), very low density lipoprotein (VLDL).The anthropometric readings were taken namely height, weight, waist (WC)and hip circumference(HC).

Results: All the Statistical analysis was done using Stata 11.2. The association of the categorical variables with outcomes was seen by the Chi Square test. p values less than 0.05 were taken as significant. Unadjusted odds ratio of relationship of each factor with outcomes was found using binary logistic regression test. Factors, which are significant in univaraite analysis, were included in multivariate analysis using multi variable logistic regression test.

Table 1: Prevalence of hypertension in the urban sikh population with 95% CI

Lifestyle disorder	*Total Subject population*	*Frequency*	*Prevalence in %age (95% CI)*
Hypertension	1089	359	35.9(33.0,38.7)

Table 2: Gender wise distribution of the biochemical parameters in hypertensive and non hypertensive individuals (Mean ± SD)

Age	Male	Female
Non hypertensive	45.6 ± 14.3	46.1 ± 14.7
hypertensive	55.1 ± 13.5	54.3 ±13.1
CHO		
Non hypertensive	199.3 ±46.9	193.2 ±42.1
hypertensive	205.2 ±44.0	209.7 ±50.5
TG		
Non hypertensive	156.4 ±65.3	154.2 ±61.0
hypertensive	167.9 ± 55.3	165.2 ± 60.9
HDL		
Non hypertensive	44.2 ± 10.3	44.0 ±9.7
hypertensive	47.9 ± 8.5	44.2 ±11.0
LDL		
Non hypertensive	147.2 ±49.4	140.4 ±42.1
hypertensive	154.0 ± 46.2	154.9 ±43.4
VLDL		
Non hypertensive	33.0 ± 23.8	31.3 ± 18.1
hypertensive	33.4 ± 11.1	33.0 ± 12.3
SBP		
Non hypertensive	120.0 ±8.4	119.7 ±7.9
hypertensive	136.4 ±11.6	139.4 ±13.0
DBP		
Non hypertensive	80.0 ±5.5	78.8 ± 5.3
hypertensive	93.2 ± 5.8	94.1 ± 6.8
BMI		
Non hypertensive	26.1 ± 5.0	26.1 ± 5.2
hypertensive	25.4 ± 5.0	26.1 ± 5.4
WC		
Non hypertensive	84.9 ± 13.0	84.4 ± 13.5
hypertensive	80.8 ± 12.4	84.0 ± 13.5
HC		
Non hypertensive	97.6 ± 14.4	98.1 ± 13.0
hypertensive	98.1 ± 13.4	97.4 ± 13.9
WHR		
Non hypertensive	0.89 ± 0.21	0.87 ± 0.19
hypertensive	0.83 ± 0.18	0.87 ± 0.20

Table 3: Age Specific &Age Standardized Prevalence of Hypertension gender- wise in % age with 95% CI

Age Group (in years)	*Prevalence of Hypertension in % age with 95% CI*					
	Male		*Female*		*Total*	
	n	Prevalence in % age with 95% CI	n	Prevalence in % age with 95% CI	n	Prevalence in % age with 95% CI
20-29	30	10.0 (-1.4,21.4)	45	11.1 (1.6,20.6)	75	10.7 (3.5,17.8)
30-39	96	25.0 (16.2,33.9)	96	14.6 (7.4,21.8)	192	19.8 (14.1,25.5)
40-49	136	39.0 (31.5,47.3)	127	25.9 (18.2,33.7)	263	32.7 (27.0,38.4)
50-59	147	39.4 (31.5,47.4)	104	43.3 (33.6,52.9)	251	41.0 (34.9,47.2)
60+	178	54.5 (47.1,61.9)	130	45.4 (36.8,54.0)	308	50.6 (45.0,56.3)
Total	587	40.0 (36.0,44.0)	502	31.0 (27.0,35.1)	1089	35.9 (33.0,38.7)

Table 3: Risk factors for Hypertension

Variables	Hypertension		p-value	Unadjusted Odds Ratio with 95% CI	Adjusted Odds Ratio with 95% CI
	Non hypertensive n (%age)	hypertensive n (%age)			
Age (in years)					
20-29	67 (9.6)	8.0 (2.0)	<0.00	1	1
30-39	154 (22.0)	38 (9.7)		2.0 (0.9,4.7)	1.9 (0.8,4.4)
40-49	177 (25.3)	86 (21.9)		4.0 (1.9,8.9)	3.5 (1.6,7.7)
50-59	148 (21.2)	103 (26.3)		5.8 (2.7,12.7)	4.7 (2.1,10.4)
60+	152 (21.7)	156 (39.9)		8.6 (4.0,18.5)	6.9 (3.1,15.2)
Gender					
Female	346(49.5)	156 (39.9)	<0.00	1	1
Male	352 (50.4)	235 (60.1)		1.5 (1.1,1.9)	1.0 (0.8.1.5)
BMI					
Underweight	46 (6.5)	27 (6.9)	0.48	1.2 (0.7,2.0)	-------
Normal	239 (34.2)	116 (29.6)		1	-------
Pre Obese	251 (35.9)	149 (38.1)		1.2 (0.9,1.6)	-------
Obese	162 (23.2)	99 (25.3)		1.2 (0.9,1.7)	-------
Waist Circumference					
< 102 cm in males < 88 cm in females	505(72.3)	293(74.9)	0.35	1	-------
≥ 102 cm in males ≥ 88 cm in females	193 (27.6)	98 (25.0)		0.8 (0.6,1.2)	-------
Physical Activity					
Mild	29 (4.1)	16 (4.0)	0.7	1	-------
Moderate	83 (11.8)	40 (10.2)		0.9 (0.4,1.8)	-------
Heavy	586 (83.9)	335 (85.6)		1.0 (0.5,2.0)	-------
Diet					
Vegetarian	378 (54.1)	198 (50.6)	0.26	1	-------
Non Vegetarian	320 (45.8)	193 (49.3)		1.1 (0.9,1.5)	-------
Alcohol Intake					
Non Alcoholic	567 (81.2)	293 (74.9)	0.01	1	1
Alcoholic	131 (18.7)	98 (25.0)		1.4 (1.0,1.9)	1.3 (0.9,1.8)
Family History					
No family history	396 (56.7)	209 (53.4)	0.46	1	-------
Family history of T2DM	162 (23.2)	92 (23.5)		1.0 (0.8,1.5)	-------
Family history of hypertension	140 (20.0)	90 (23.0)		1.2 (0.9,1.7)	-------
Type of oil used					
Refined	494 (70.7)	267 (68.2)	0.22	1	-------
Desi Ghee	124 (17.7)	65 (16.6)		1.0 (0.7,1.3)	-------
Dalda	80 (11.4)	59 (15.0)		1.3 (1.0,2.0)	-------
Triglycerides					
<150 mg/dl	341 (48.8)	144 (36.8)	<0.00	1	1
≥ 150 mg/dl	357 (51.1)	247 (63.1)		1.6 (1.3,2.1)	1.2 (0.9,1.6)
HDL					
< 40 mg/dl for males < 50 mg/dl for females	401 (57.4)	199(50.9)	0.03	1	1
≥ 40 mg/dl for males ≥50 mg/dl for females	297 (42.5)	192 (49.1)		0.8 (0.6,1.0)	0.8 (0.6,1.0)
Cholesterol					
< 200 mg/dl	402 (57.5)	173 (44.2)	<0.00	1	1
≥ 200 mg/dl	296 (42.4)	218 (55.7)		1.7 (1.3,2.1)	1.2 (0.9,1.7)
LDL					
<130 mg/dl	251 (35.9)	108 (27.6)	<0.00	1	1
≥ 130 mg/dl	447 (64.0)	283 (72.3)		1.5 (1.1,1.9)	0.9 (0.7,1.3)
Diabetes					
Not present	563 (80.6)	273 (69.8)	<0.00	1	1
Present	135 (19.3)	118 (30.21)		1.8 (1.3,2.4)	1.4 (1.0,1.9)
Metabolic Syndrome					
Not present	549 (78.6)	166 (42.4)	<0.00	1	-------
Present	149 (21.3)	225(57.5)		5.0 (3.8,6.5)	-------

Table 5: BMI: WHR distribution in the sample population

BMI	*WHR*	*N*
Normal	0.79 ± 0.15	355
Underweight	0.71 ± 0.2	73
Pre Obese	0.91 ± 0.18	400
Obese	1.01 ±0.2	261

Table 6: Mean & SD values of the anthropometric physiological and biochemical parameters accordingly to age group

Age (in years)	*BMI*	*Waist*	*WHR*	*TG*	*CHO*
0-40	26.4 ± 5.3	85.7 ±13.5	0.89 ±0.19	150.7 ± 66.1	188.8 ± 46.2
>40	26.3 ± 5.3	84.9 ±13.7	0.88 ± 0.20	173.3 ±66.5	210.8±47.8

Age (in years)	*HDL*	*LDL*	*VLDL*	*SBP*	*DBP*
0-40	44.4 ± 10.3	135.4 ± 42.6	31.1 ±11.5	121.3 ±11.5	80.5 ±8.1
>40	43.4 ±9.3	156.8 ±14.6	34.8 ±14.6	129.2 ±13.2	85.7 ±9.0

Table 7: Blood pressure classification in the subject population

Blood pressure	*N*	*% age*
Normal (SBP ≤119, DBP ≤79 mm of Hg)	133	12.2
Pre Hypertensive (SBP 120-139 DBP 80-89 mm of Hg)	565	51.8
Hypertension Stage 1 (SBP 140-159, DBP 90-99mm of Hg)	276	25.3
Hypertension Stage 2 (SBP ≥160, DBP ≥100mm of Hg)	115	10.6

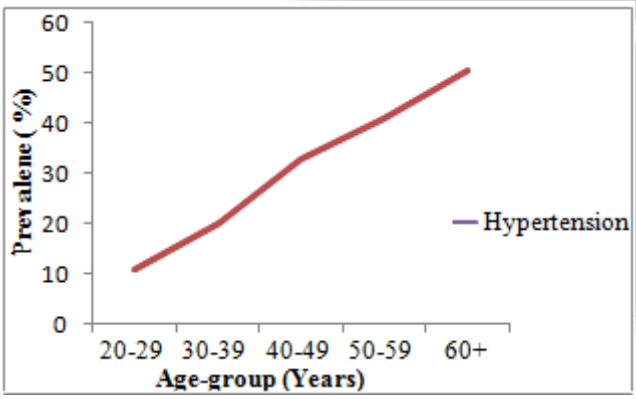

Figure 1: Age wise Trend of Hypertension

Demographic & Clinical profile of subjects with and without T2DM. Table 3 shows the gender wise prevalence of hypertension across different age groups. The study also shows significantly higher rates of hypertension in the older age groups. The hypertension prevalence rates increase from 10 % in the age group of 20-29 years peaking to 50.6% in the age group of 60 + years.

Chi Square outputs of significant proportions with several clinical, demographic and biochemical parameters available to the present study comparing the subjects with and without hypertension are shown in Table 4. Proportionately more subjects with hypertension had diabetes (30.2%). Likewise proportionately more subjects, 63.1 % had hypertrigylerdemia, 50.9 % had low HDL levels, 55.7 % had hypercholesterolemia and 57.5% suffered from metabolic syndrome.Gender wise comparison shows that out of total hypertensive's 60 % are male's patients.23% hypertensive's had a positive family history of hypertension. 63.4 % of the hypertensive's fall in category of pre-obese and obese category.

Detailed correlates of hypertension in univariate analysis and multivariate logistic regression method showing significant predictors of hypertension are summarized in Table 4. Advancing age, gender, alcohol intake,T2DM, hypercholesterolemia, hypertrigylerdemia and low serum HDL levels significantly contributed to the increased hypertension risk. The increased serum cholesterol and serum triglycerides increased the risk of developing hypertension one and half times more.

3. Discussion

The prevalence of hypertension has increased during the last decade [20] . The high prevalence of hypertension (35.9%) in this study, confirms this increasing trend. Rapid urbanization, lifestyle changes are dietary changes are the factors attributable to this rising trend. Increased prevalence of hypertension observed in this study was similar to that reported in Himachal Pradesh with an overall prevalence of 35.89 % with 34.8% in males and 33.1 % in females. [21], in Central India, overall prevalence of hypertension is 19.04%, with 23.4% males and 14.4 %.in females. (22) Similarly in Kerala overall prevalence was 36.7% with 36 % in males and 37.2 % in females [23].

Further we also observed that the findings of the current study are coherent with those reported in the study conducted among urban and rural adults of Lucknow [24**]**. Cross-sectional surveys, as well as prospective observational cohort studies, have consistently demonstrated a positive relation between age and blood pressure in most populations with diverse geographical, cultural and socioeconomic characteristics. Such changes of blood pressure with age might be due to changes in vascular system [25]

When the age- and sex-specific prevalence of hypertension was compared, The proportion of hypertension was higher among males (60.1%) compared to that in females (39.9 %). It is also seen that in each age group, the prevalence of hypertension was higher among males as compared to females except in 20-29 and 50-59 years of age group. This concurs with the observation made by a previous study that males (42.9%) had high risk of hypertension when compared to females (34.2%) among rural population of Davanagere [26]. This fact also confirm with the current study that women have lower systolic blood pressure (SBP) levels than men during early adulthood, while the opposite is true after the sixth decade of life [27]. Diastolic blood pressure (DBP) tends to be just marginally lower in women than men regardless of age. Similarly, in early adulthood, hypertension is less common among women than men. However, the incidence of hypertension increases more rapidly in women older than 60 years. The highest prevalence rates of hypertension were observed in elderly black women (>75%), aged > 75 years [27].

In the present study, significant positive association was found between age and prevalence of hypertension. In the target population of 20 years and above, the prevalence of T2DM increased with age from 10.7% in 20-29 years old age group through 19.8% in those aged 30-39 years, 32.7 % in age group 40 -49 years, 41 % in 50-59 year old age group and 50.6 % in those aged ≥ 60 years. Desai *et al* [28] also reported an increase in the prevalence of hypertension with the increasing age.

In this study we inferred that 30.2 % of the hypertensive's suffered from Type 2 Diabetes Mellitus. Type 2 Diabetes mellitus is considered as an important risk factor in the development of hypertension, i.e. subjects who suffer from diabetes had 1.4 times more risk of developing hypertension. The prevalence of coexistent hypertension and diabetes varies across different ethnic, racial, and social groups. Importantly, hypertension in patients with type 2 diabetes causes a significant increase in the risk of vascular complications in this population, and together both conditions predispose to chronic kidney disease. [29,30]. The overlap between hypertension and diabetes substantially increases the risk of ischemic cerebrovascular disease, retinopathy, and sexual dysfunction. [31]. Diabetes mellitus is an independent risk factor for coronary artery disease, and the risk is markedly increased when hypertension is present.

Another risk factor in development of hypertension is obesity. Very few subjects in this study were in the category of healthy BMI. Only 32.6 % (n= 355) of the subjects presented with a healthy BMI as per the WHO guidelines. 6.7% (n= 73) were reported underweight, whereas 36.7% (n= 400) were reported as pre obese and 24% (n=261) presented as obese. The subject population presented a picture of general obesity as central obesity was not significantly present in this population. General obesity is related to the abnormal lipid profile values i.e increased serum cholesterol, serum triglyride, LDL and decreased HDL values.

While observing the life style pattern of Sikh population in current study we found that 25 % of the hypertensive's in this population were alcoholics. Alcohol intake also presents as independent risk factor in the development of hypertension. A person who consumes alcohol has 1.3 times more risk of having hypertension in some part of his lifetime than the non alcoholic. The alcohol intake raises the risk of hypertension and the cardiovascular disorders and stroke.

Our study also clearly indicates that the Young Sikh adults < 40 years of age have similar high BMI, WC and WHR to that of the older adults >40 years of age (Table 6). It is necessary to adopt appropriate preventive strategies and interventions in high risk individuals to curb the growing epidemic of hypertension.

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