

**BJMHR**

British Journal of Medical and Health Research

Journal home page: [www.bjmhr.com](http://www.bjmhr.com)

## **A Study of Prevalence of High Blood Pressure Among Young Adults in Goa: Uncovering a Silent Epidemic**

**Premanandh K<sup>1</sup>, AM Ferreira<sup>1\*</sup>, F S Vaz<sup>1</sup>, MS Kulkarni<sup>1</sup>, SG Perni<sup>1</sup>, US Kamat<sup>1</sup>, NR Pinto<sup>1</sup>**

*1. Department of Preventive and Social Medicine, Goa Medical College, Bambolim, Goa, India, 403202.*

### **ABSTRACT**

The prevalence of hypertension is rapidly increasing in India, both in urban and rural areas. The increase in incidence in hypertension at a younger age is essentially due to lifestyle factors. Given the rising prevalence of hypertension among young adults in developing countries early detection and treatment of high blood pressure is essential to the reduction of cardiovascular disease and prevention of associated burden of illness. The cross sectional study was conducted in a rural area in Goa among young adults in the age group 20-39 years. The study participants were interviewed with a structured pretested questionnaire. The three sections of the questionnaire included demographic variables, behavioural risk factors and physical measurements and examination. The data was entered and analysed using the SPSS software package. Bivariate analysis was performed to establish the association between the various factors and hypertension. Odds ratio was calculated with 95% confidence interval. Stepwise logistic regression analysis was used to identify independent predictors of hypertension. The prevalence of hypertension was found to be 13.7% among young adults in the study area. The prevalence was higher among males (16.5%) compared to females (10.8%). On bivariate analysis; smoking, alcohol use, physical inactivity, obesity, family history of hypertension were identified as significant risk factors of hypertension. Multiple logistic regression identified alcohol consumption, insufficient physical activity and abdominal obesity as the most significantly associated factors for hypertension. Hypertension to a great extent is a preventable disease hence appropriate preventive action can alter environments, protect against risk factors and change life expectations. On a population scale, relatively modest behavioural changes affecting several of the risk factors simultaneously can make dramatic changes in population health.

**Keywords:** Hypertension, prevalence, risk factors, young adults.

\*Corresponding Author Email: [ferreira2409@gmail.com](mailto:ferreira2409@gmail.com)

Received 12 April 2015, Accepted 26 April 2015

Please cite this article as: Ferreira AM *et al.*, A Study of Prevalence of High Blood Pressure Among Young Adults in Goa: Uncovering a Silent Epidemic. British Journal of Medical and Health Research 2014.

## INTRODUCTION

Worldwide raised blood pressure is estimated to cause 7.5 million deaths, about 12.8% of all deaths. This account for 57 million disability adjusted life years or 3.7% of total DALYs<sup>1</sup>. Globally, one in three adults, according to the world health statistics 2012 report, have raised blood pressure<sup>2</sup>. Hypertension is caused, to a large extent, by four behavioural risk factors that are pervasive aspects of economic transition, rapid urbanization and sedentary life styles: tobacco use, unhealthy diet, insufficient physical activity and harmful use of alcohol<sup>3</sup>. A large percentage of hypertension is preventable through reduction of these four main behavioural risk factors. Not addressing hypertension in a timely fashion will have significant economic and social impact. Gaps in the provision of essential services for hypertension often results in high rates of complications such as heart attack, strokes, renal disease and peripheral vascular disease. The prevalence of hypertension is rapidly increasing in India, both in urban and rural areas<sup>2</sup>. The increase in incidence in hypertension at a younger age is due to lifestyle factors including smoking, obesity, low physical activity and excessive intake of alcohol and salt<sup>3</sup>. Another concern, adults who experience elevated blood pressure at a younger age are at increased risk of morbidity and mortality from cardiac, vascular and renal disease. Premature death, disability, personal and family disruption, loss of income and health care expenditure due to hypertension, take a toll on families, communities and national finances<sup>3</sup>. Given the rising prevalence of hypertension among young adults in developing countries undergoing epidemiologic transition like India, early detection and treatment of high blood pressure is essential to the reduction of cardiovascular disease and prevention of associated burden of illness. This cross sectional study was undertaken with the objective to gather epidemiological data on hypertension among young adults.

## MATERIALS AND METHODS

The cross sectional study was conducted in a rural area in Goa during the period from March 2012 to February 2013 among young adults in the age group of 20-39 years. Using a prevalence of 12% with an acceptable error of 2 percent with 95% confidence, the required sample size was 965. Data was collected through house to house visits. The study participants were interviewed with the help of a structured pretested questionnaire. The three sections of the questionnaire included demographic variables, behavioural risk factors and physical measurements and examination. The behavioural risk factors explored were tobacco use, alcohol consumption, diet and physical activity. Physical measurements which included weight, height, and waist circumference were obtained using standardized techniques. Blood pressure measurement was done in the right arm using a mercury sphygmomanometer by auscultatory technique. The average of two readings taken five minutes apart was recorded.

Hypertension was defined as blood pressure measurement more or equal to 140 mmHg systolic and/ or 90 mmHg diastolic, or a known hypertensive on medication as per the Joint National Committee (JNC) VII criteria<sup>4</sup>. The data was entered and analysed using the SPSS software package version 18.0. Bivariate analysis was performed to find the association between the various factors and hypertension. Odds ratio was calculated with 95% confidence interval. A 'p' value of less than 0.05 was considered statistically significant. Stepwise logistic regression analysis was used to identify independent predictors of hypertension. The study was approved by the institutional ethics committee. Informed consent was obtained from the study participants. Confidentiality was maintained in the process of data collection and analysis.

## RESULTS AND DISCUSSIONS

A total of 968 young adults constituted the study sample. The prevalence of hypertension was found to be 13.7% among young adults in the study area. The prevalence was higher among males (16.5%) compared to females (10.8%). The prevalence of pre-hypertension among the respondents was 38.8%. The prevalence of pre-hypertension was higher in males (48%) compared to females (29%). Around 10.5% had isolated systolic hypertension while only 3% had isolated diastolic hypertension. Among the 133 hypertensive study participants, 77(57.9%) were unaware of their hypertensive status and were detected for the first time during the study. Out of the 56 participants diagnosed prior to the study 18 (32.2%) were untreated while out of the 38 (67.8%) participants who were already on treatment only 20(52.6%) were adequately treated. As far as socio-demographic variables were concerned, the prevalence of hypertension among participants aged 20-29 years was 8.9% compared a prevalence of 17.5% in those aged 30-39 years. This rising trend was found to be statistically significant ( $p=0.0001$ ). Highest prevalence of hypertension (32.3%) was found in upper socio-economic group followed by upper lower class (19.8%). The lowest prevalence was in the lower socio economic group (8.4%) as per the BG Prasad socio economic classification. This difference was statistically significant ( $p=0.0001$ ). As regards occupational activities, the highest prevalence of hypertension was found in those involved in sedentary occupational activities (27.3%), followed by unemployed individuals (11.4%) while, the lowest prevalence of hypertension (5.7%) was found in those involved in heavy work. The difference between occupational activities was found to be statistically significant ( $p=0.000001$ ). The risk factors analysed for their association with hypertension were smoking, alcohol use, physical inactivity, obesity, family history of hypertension and low intake of fruits and vegetables (table 2). Prevalence of hypertension among smokers was higher (23.0%) compared to non smokers (12.4%). Conversely smokers were found to 2.12 were more likely to have

hypertension compared to non smokers (OR=2.12; 95% CI: 1.33-3.37). As far as alcohol use was concerned, highest prevalence was among binge drinkers (30.2%) followed by current drinkers (17.6%) while, the prevalence among life time abstainers was only 10.5%. This difference was found to be statistically significant ( $p=0.0001$ ). Significantly higher prevalence of hypertension was found among those who reported insufficient physical activity (21.7%) compared to those who had sufficient physical activity (6.4%). Also those with insufficient physical activity were almost four times more likely to have hypertension compared to those having sufficient physical activity (OR= 4.08; 95% CI: 2.68-6.21). Overweight persons had a very high prevalence of hypertension (42.5%) compared normal weight (7.7%) and underweight (3.5%). Overweight persons were eight times more likely to have hypertension compared to normal weight individuals (OR=8.87; 95% CI: 5.88-13.39). Individuals with abdominal obesity were 17 times more likely to have hypertension compared to those without abdominal obesity (OR=17.09; 95% CI: 9.09-32.19). The prevalence of hypertension among those who had family history of hypertension was 26.3% compared to 17.7% prevalence among those who had no family history of hypertension. This difference was found to be statistically significant ( $p=0.001$ ). Individuals with family history of hypertension were 1.65 times more likely to have hypertension compared to those without such history. Individuals who had sufficient fruit and vegetable intake had lower prevalence of hypertension (9.3%) compared to those with low intake (14.1%). However this difference was statistically not significant. A stepwise multiple logistic regression analysis was conducted testing variables which were significant on bivariate analysis. Prediction success overall was 88.6%. Multiple logistic regression identified only alcohol consumption, insufficient physical activity and abdominal obesity as the most significantly associated factors for hypertension (table 3). The prevalence of hypertension was found to be 13.7% among the young adults, while the prevalence of pre-hypertension among the study participants was 38.8%. The IDSP non-communicable disease risk factor survey phase I conducted across seven states in India reported prevalence of hypertension as low as 10.7% in Uttarakhand and as high as 18.5% in Mizoram<sup>5</sup>. In a survey conducted by National Nutrition Monitoring Bureau across nine states in India<sup>6</sup>, the pooled estimate of hypertension in rural men (30-40 years) was found to be 19.5%. Yadav S et al<sup>7</sup> reported a hypertension prevalence of 13.7% among young adults (30-39 years) in their study in North India, while the prevalence of pre-hypertension in this age group was 36%. The prevalence of hypertension was found to be higher among males compared to females. Other studies<sup>5,6,7</sup> have also reported higher prevalence among males compared to females. Doumas M et al have reported that cardiovascular events occur at a lower rate and at a later age in females

than males<sup>8</sup>. As far as socio-demographic factors were concerned higher hypertension prevalence was found in higher socio-economic class, sedentary occupation and higher age. Similar findings have been reported by other studies<sup>9,10</sup>. On bivariate analysis; smoking, alcohol use, physical inactivity, obesity, family history of hypertension were identified as significant risk factors of hypertension. Gupta R et al in their study among rural males reported relative risk for hypertension due to smoking of 1.30 (95% CI: 1.00-1.69) among mild smokers, 1.39 (95% CI: 1.16-1.66) among moderate smokers and relative risk of 1.55 (95% CI: 1.03-2.33) among heavy smokers<sup>11</sup>. Considerable evidence supports an association between excessive alcohol intake and an increased risk of hypertension<sup>12,13</sup>. However conflicting studies have reported beneficial<sup>14</sup>, unassociated<sup>15</sup> and deleterious effects<sup>16,17</sup> of light to moderate alcohol intake on the risk of hypertension. As far as physical activity is concerned, currently available evidence indicates physical activity decreases cardiovascular disease risk including hypertension<sup>18</sup>. Physical activity is known to improve endothelial function, which enhances vasodilatation and vasomotor function in the blood vessels<sup>19</sup>. Individuals with family history of hypertension were more likely to have hypertension compared to those with no such history. Corvol P et al estimated that the risk of becoming hypertensive for an individual with a family history of hypertension was four times higher than average<sup>20</sup>. Obese individuals were more likely to have hypertension compared to non obese individuals. Hsieh SD et al<sup>21</sup> have reported significant positive correlation between body mass index and systolic and diastolic blood pressure. In our study insufficient intake of fruits and vegetables was not identified as a significant associated factor for hypertension. Dietary modifications have long been known to aid in the control of hypertension, and fruits and vegetables intake in particular has been shown to reduce blood pressure in a variety of settings, including randomised controlled trials<sup>22</sup>. Final model by Multiple logistic regression analysis identified only alcohol consumption, insufficient physical activity and abdominal obesity as the most significant predictors factors of hypertension.

**Table 1: Socio demographic factors associated with hypertension among young adults.**

Variable	Hypertension		Total No. (%)	p value
	Present No. (%)	Absent No. (%)		
Gender				
Male	82 (16.5)	415 (83.5)	497 (51.3)	p=0.0001
Female	51 (10.8)	420 (89.2)	471 (48.7)	
Age group				
20-29 years	38 (8.9)	387 (91.1)	425 (43.9)	p=0.01
30-39 years	95 (17.5)	448 (82.5)	543 (56.1)	
Socio economic status*				
Upper	10 (32.3)	21 (67.7)	31 (3.2)	

Upper middle	26 (8.6)	278 (91.4)	304 (31.4)	p=0.0001
Lower middle	63 (15.5)	344 (84.5)	407 (42.0)	
Upper lower	26 (19.8)	105 (80.2)	131 (13.5)	
Lower	8 (8.4)	87 (91.6)	95 (9.9)	
<b>Occupational activities</b>				
Sedentary	72 (27.3)	192 (72.7)	264 (27.3)	p=0.000001
Moderate	45 (8.8)	467 (91.2)	512 (52.9)	
Heavy	2 (5.7)	33 (94.3)	35 (3.6)	
Student	5 (6.4)	73 (93.6)	78 (8.1)	
Unemployed	9 (11.4)	70 (88.6)	79 (8.2)	

\*BG Prasad socioeconomic classification

All the above factors are statistically significant

**Table 2: Risk variables associated with hypertension among young adults.**

Variable	Hypertension		OR (95% CI)	p value
	Present No. (%)	Absent No. (%)		
Smoking				
Smoker	29 (23.0)	97 (77.0)	2.12 (1.33-3.37)	0.001
Non-smoker	104 (12.4)	738 (87.6)	Ref	
Alcohol use				
Life time abstainer	79 (10.5)	670 (89.5)	Ref	
Current drinker	14 (17.6)	71 (82.4)	1.67 (0.90-3.10)	0.0001
High risk drinker	40 (30.2)	89 (69.8)	3.81 (2.45-5.91)	
Physical activity				
Sufficient	32 (6.4)	471 (93.6)	Ref	0.0001
Insufficient	101 (21.7)	364 (78.3)	4.08 (2.68-6.21)	
BMI				
Normal weight	49 (7.7)	589 (92.3)	Ref	
Under weight	5 (3.5)	139 (96.5)	0.43 (0.16-1.05)	0.0001
Overweight	79 (42.5)	107 (57.5)	8.87 (5.88-13.39)	
Abdominal obesity				
Present	118 (22.3)	322 (77.7)	17.09 (9.09-32.19)	0.0001
Absent	15 (3.40)	513 (96.6)	Ref	
Family History				
Present	35 (26.3)	148 (73.7)	1.65 (1.08-2.55)	0.01
Absent	98 (17.7)	687 (82.3)	Ref	
Fruit and vegetable intake				
Sufficient	7 (9.3)	68 (90.70)	Ref	0.2
Insufficient	126 (14.1)	767 (85.9)	1.59 (0.71-3.55)	

**p value: Probability value**

**OR (95% CI): Odds Ratio at 95 % Confidence interval**

**Table 3: Multiple Logistic Regression analysis of risk factors for hypertension.**

<b>Risk Factor</b>	<b><math>\beta</math> coefficient</b>	<b>SE</b>	<b>p value</b>	<b>OR (95% CI)</b>
<b>Alcohol use</b>				
Current drinker	1.175	0.379	0.002	3.32 (1.54-6.81)
High risk drinker	1.936	0.289	0.0001	6.93 (3.93-12.21)
<b>Insufficient physical activity</b>	0.759	0.249	0.002	2.13 (1.31-3.48)
<b>Overweight</b>	0.918	0.612	0.134	2.50 (0.75-8.31)
<b>Abdominal obesity</b>	2.045	0.369	0.0001	7.73 (3.74-15.93)

**$\beta$  coefficient:** Beta coefficient

**SE:** Standard Error

**p value:** Probability value

**OR (95% CI):** Odds Ratio at 95 % Confidence interval

## CONCLUSION

High prevalence of behavioural risk factors, obesity and hypertension was found among the young adults indicating higher risk of cardiovascular morbidity and mortality at younger age. The high prevalence of pre-hypertension among the young adults was also alarming as they are likely to develop hypertension in the near future. Unless effective preventive measures are implemented, the prevalence of hypertension is likely to increase substantially. Hypertension to a great extent is a preventable disease hence appropriate preventive action can alter environments, protect against risk factors and change life expectations. On a population scale, relatively modest behavioural changes affecting several of the risk factors simultaneously can make dramatic changes in population health.

## REFERENCES

1. Mendis S, Puska P, Norrving B (eds). Global Atlas on cardiovascular disease prevention and control. World Health Organisation, Geneva 2011: 38-39.
2. World Health Organisation. World Health Statistics Report 2012. World Health Organisation, Geneva 2012:119
3. World Health Organisation. A global brief on hypertension; World Health Day 2013. World Health Organisation, Geneva 2012: 13-14.
4. Seventh report of the Joint National Committee on prevention, detection, evaluation and treatment of high blood pressure. Hypertension 2003; 42: 1206-1252.
5. National Institute of Medical Statistics, Indian Council of Medical Research, IDSP non-communicable disease risk factors survey, phase I states of India, 2007-08. National Institute of Medical Statistics and division of Non-communicable Diseases, Indian Council of Medical Research, New Delhi, 2009.

6. National Nutritional Monitoring Bureau. Diet and nutritional status of population and prevalence of hypertension among adults in rural areas; National Nutritional Monitoring Bureau rural survey 2005-06. National Nutritional Monitoring Bureau, New Delhi, 2008.
7. Yadav S, Boddula R, Genitta G, Bhatia V, Bansal B, Kongara S et al. Prevalence and risk factors of pre-hypertension and hypertension in an affluent North Indian population. *Indian Journal of Medical Research* 2008; 128: 712-20.
8. Doulas M, Papademetriou V, Faselis C, Kokkinos P, Gender differences in hypertension: myths and reality. *Current Hypertension Reports* 2013; 15: 321-330.
9. Chadha SL, Gopinath N, Shekhawat S. Urban-rural differences in the prevalence of coronary heart disease and its risk factors in Delhi. *Bull World Health Org* 1997; 75:31-8.
10. Gupta R, Sharma AK, Prakash H. High Prevalence of Hypertension in rural and urban populations. *Transplant Proc* 2000; 32: 1840.
11. Gupta R, Agarwal VS, Gupta VP, Soangra MR. Correlation of smoking, blood pressure levels and hypertension prevalence in urban and rural subjects. *J Association Physicians India* 1997; 45:919-22.
12. Tsuruta M, Adachi H, Hirai Y, Fujiura Y, Imaizumi T. Association between alcohol intake and development of hypertension in Japanese normotensive men: 12-year follow-up study. *Am Journal Hypertension* 2000; 13:482-7.
13. Fuchs FD, Chambless LE, Whelton PK, Nieto FJ, Heiss G. Alcohol consumption and the incidence of hypertension: the atherosclerosis risk in communities study. *Hypertension* 2001; 37:1242-50.
14. Thadhani R, Camargo CA jr, Stampfer MJ, Curhan GC, Willett WC, Rimm EB. Prospective study of moderate alcohol consumption and risk of hypertension in young women. *Arch Internal Medicine* 2002; 162:569-574.
15. Stranges S, Wu T, Dorn JM, Freudenheim JL, Muti P, Farinero E, Nochajski TH, Trevisan M. Relationship of alcohol drinking pattern to risk of hypertension: a population based study. *Hypertension* 2004; 44: 813-9.
16. Ohomori S, Kiyohara Y, Kato I, Kubo M, Tanizaki Y, Iwamoto H, Nakayama K, Abe I, Fujishima M. Alcohol intake and future incidence of hypertension in general Japanese population: the Hisayama study. *Alcohol Clinical Exp Res* 2002; 26:1010-6.
17. Nakanishi N, Makino K, Nishina K, Suzuki K, Tatara K. Relationship of light to moderate alcohol consumption and the risk of hypertension in Japanese male office workers. *Alcohol Clinical Exp Res* 2002; 26:988-94.
18. Oguma Y, Shinoda-Tagawa T. Physical activity decreases cardiovascular disease risk in women: Review and meta-analysis. *Am Journal Preventive medicine* 2004; 26: 407-18.

19. Lee CD, Folsom AR, Blair SN. Physical activity and stroke risk: a meta-analysis. *Stroke* 2003; 34: 2475-2481.
20. Corvol P. Can the genetic factors influence the treatment of systemic hypertension? The case of the rennin-angiotensin-aldosterone system. *American Journal of Cardiology* 1992; 70: 14D-20D
21. Hseih SD, Yoshinaga H, Muto T, Sakurai Y, Kosaka K. Health risks among Japanese men with moderate body mass index. *Internal Journal of Obesity Related Metabolic Disorders* 2000; 24: 358-62.
22. Appel LJ, Moore TJ, Obarzanek E, Vollmer WM, Svetkey LP, Sacks FM et al. A clinical trial of the effects of dietary patterns on blood pressure. DASH collaborative research group. *New England Journal of Medicine* 1997; 336: 1117-24.

**BJMHR is**

- **Peer reviewed**
- **Monthly**
- **Rapid publication**
- **Submit your next manuscript at**

**[bjmhronline@gmail.com](mailto:bjmhronline@gmail.com)**

