

## Association Between Hypertension and Obesity: A Prospective Study at a Tertiary Care Hospital

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### ABSTRACT

**Background:** It has been seen that subjects with hypertension have two folds higher risk of developing coronary artery disease and four times higher risk of congestive heart failure when compared to subjects with normal blood pressure. When obesity is associated with abnormal lipid levels, hypertension or glucose intolerance it leads to a metabolic syndrome and the risk of cardiovascular disease rises several times. The present study was aimed to evaluate the association between obesity and hypertension.

**Materials and Methods:** The cross sectional prospective survey was conducted in the Department of General Medicine, Rama Medical College Hospital & Research Centre, Pilkhuwa, Hapur, Uttar Pradesh, India. The study was conducted for duration of 6 months. The amount of physical activity of every subject was also recorded. Waist and hip measurements of all the subjects were obtained by a measuring tape having width of 1.0 cm. Individuals were made to stand upright and wear minimal clothing as possible for recording of measurements. All the data was arranged in a tabulated form and analysed using SPSS software. Chi square test or fisher exact test were used for analysis. Probability value of less than 0.05 was regarded significant.

**Results:** The study consisted of 200 subjects, out of these 50% (100) were males and 50% (100) were females.

The mean age of the subjects was 39.25 +/- 19.51 years. The average waist-hip ratio was 0.99 ± 0.06 for men and 0.97 ± 0.07 for women. Waist circumference average was 98.7 cm ± 10.5 and 98.8 cm ± 10.4 for men and women, respectively.

**Conclusion:** From the above study we can conclude that obesity acts as a significant risk factor for hypertension. The risk of obesity differs with the type of work, lifestyle habits, socioeconomic class and alcohol and smoking. Obese people tend to be hypertensive more frequently than non-obese subjects.

**Keywords:** Hypertension, Obesity, Risk, Waist.

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### INTRODUCTION

One of the most common cardiovascular disease is hypertension and its prevalence differs between 10 to 20% amongst adult subjects.<sup>1</sup> It has been seen that subjects with hypertension have two folds higher risk of developing coronary artery disease and four times higher risk of congestive heart failure when compared to subjects with normal blood pressure.<sup>2,3</sup> According to a survey by Global Burden of Disease study by the year 2020, coronary artery disease and cerebrovascular disease will be the predominant cause of death around the world.<sup>4</sup>

Patients with increased blood pressure are required control of certain risk factors like obesity, diabetes, smoking and sedentary lifestyle.<sup>5</sup> Amongst the mentioned factors obesity is a crucial risk factor and is harmful to health as it is very commonly associated with cardiovascular diseases.<sup>6</sup> When obesity is associated with abnormal lipid levels, hypertension or glucose intolerance it leads to a metabolic syndrome and the risk of cardiovascular disease

rises several times.<sup>7</sup> The incidence of obesity and obesity-related disorders is increasing around the globe.

According to the Center for Disease Control and Prevention, it was estimated that obesity would cost at least \$147 billion in the year 2008 in the United States. Therefore, there has been a shift in the policies and strategies to prevent obesity. Cardiovascular mortality and obesity are increasing at a parallel rate in the developing countries.<sup>8</sup>

Various cross-sectional and longitudinal surveys have shown an association of hypertension with body weight and found that this association increases as the body weight increases.<sup>9-12</sup> This fact holds true for lean individuals also.<sup>13</sup> However, there have been few studies regarding this association amongst hypertensive subjects, as it is more frequently performed on general population.<sup>14</sup> The present study was aimed to evaluate the association between obesity and hypertension.

## MATERIALS AND METHODS

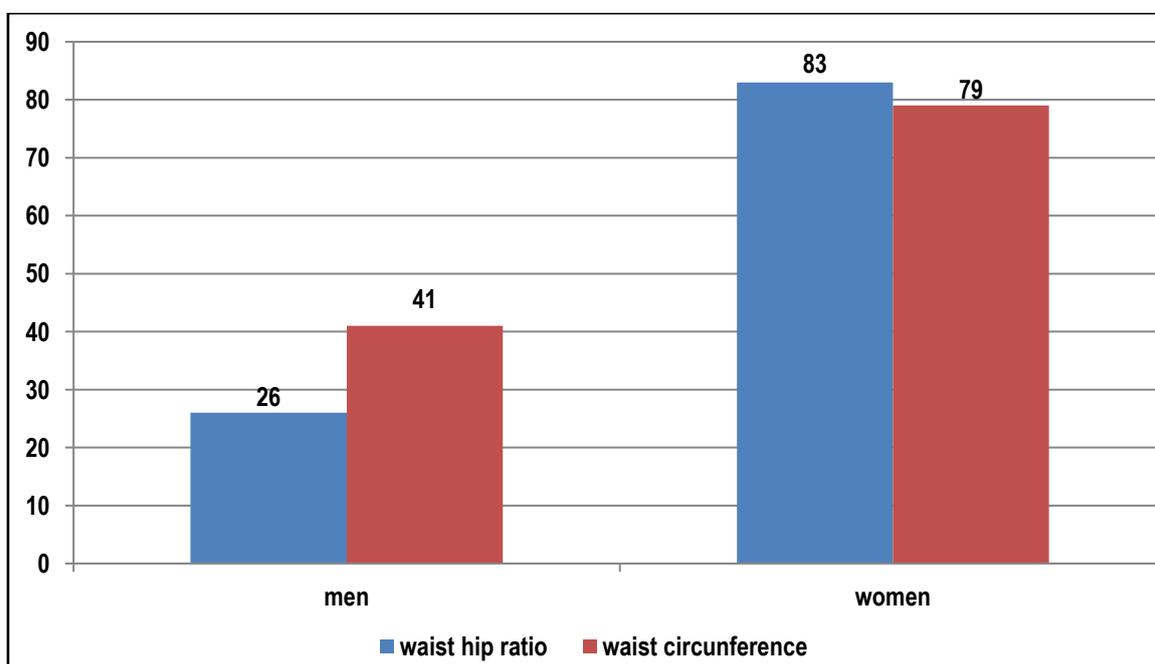
The cross sectional prospective survey was conducted in the Department of General Medicine, Rama Medical College Hospital & Research Centre, Pilkhuwa, Hapur, Uttar Pradesh, India. The study was conducted for duration of 6 months. Ethical committee clearance was obtained from the institutional ethical board. A written consent was obtained from all the subjects after explaining them the protocol of the study. In this study a total of 200 hypertensive subjects were involved. Data was obtained from all the subjects in a predesigned and pretested proforma. The details included demographic data, information about their habits, socioeconomic class etc. Various blood tests were performed to establish the total cholesterol levels. The amount of physical activity of every subject was also recorded. Waist and hip measurements of all the subjects were obtained by a measuring tape having width of 1.0 cm. Individuals were made to stand upright and wear minimal clothing as possible for recording of measurements. For recording waist circumference, distance between the iliac crest and the last rib at the level of the umbilicus was noted. The largest extension of the buttocks was recorded for measurement of. No soft tissues were pressed during measurement. Calculation of WHR was done by dividing the waist circumference from the hip circumference. Individuals with WHR  $\geq 1.0$  for men and  $\geq 0.85$  for women were regarded obese. For the waist circumference, cut off point taken were  $\geq 102$  cm amongst men and  $\geq 88$  cm amongst women. All the data was arranged in a tabulated form and analysed using SPSS software. Chi square test or Fischer exact test were used for analysis. Probability value of less than 0.05 was regarded significant.

## RESULTS

The study consisted of 200 subjects, out of these 50% (100) were males and 50% (100) were females. The mean age of the subjects was  $39.25 \pm 19.51$  years. The average waist-hip ratio was  $0.99 \pm 0.06$  for men and  $0.97 \pm 0.07$  for women. Waist circumference average was  $98.7 \text{ cm} \pm 10.5$  and  $98.8 \text{ cm} \pm 10.4$  for men and women, respectively.

Graph 1 shows the prevalence of obesity amongst males and females that was denoted by the waist hip ratio and waist circumference. Amongst males, 26% and 41% were obese based on waist hip ratio and waist circumference respectively. Amongst females, 83% and 79% were obese based on waist hip ratio and waist circumference respectively. There was a significant difference in the prevalence of obesity amongst males and females.

Table 1 denotes the demographic details of the subjects. There were 79 males and 53 females who were married. 21 males and 47 females were unmarried. There was a significant difference amongst the males and females. Majority of the hypertensive males were more than 40 years of age and females were less than 40 years of age. There were 53% males and 48% females who were more than 40 years of age. There were 47% males and 52% females who were less than 40 years of age. There was no difference in age amongst both the groups. 54% males and 34% females were employed and 46% males and 66% females were unemployed. There was significant difference in employment amongst males and females. There were 40% males and 26% females who belonged to upper class, 23% males and 32% females belonged to lower class. There was a significant difference in socioeconomic status amongst males and females. There were 17% males and 11% females who were smokers. Rest of the subjects were non-smokers. There was no significant difference amongst male and female smokers. There were 23% males who consumed alcohol and 77% males didn't consume alcohol. Amongst females 5% consumed alcohol and 95% didn't consume alcohol. There was a significant difference amongst male and female alcohol consumers. Total cholesterol was normal amongst 75% males and 69% females. It was raised in 25% males and 31% females. There was no significant difference in the level of cholesterol amongst the group. There were 27 males and 16 females who opted for regular physical activity. Rest 73% males and 84% females were not involved in regular physical activity. There was a significant difference in the proportion of males and females who opted for regular physical activity.



Graph 1: Prevalence of abdominal obesity amongst the study subjects

Table 1: Demographic details of the subjects

Variable	Subgroup	Male		Female		P Value
		N = 100	%	N=100	%	
Marital Status	Married	79	79	53	53	<0.05
	Unmarried	21	21	47	47	
Age	Less than 40 Yrs	47	47	52	52	>0.05
	More than 40 Yrs	53	53	48	48	
Paid Work	Yes	54	54	34	34	<0.05
	No	46	46	66	66	
Socioeconomic Status	Upper class	40	40	26	26	<0.05
	Middle class	37	37	43	43	
	Lower class	23	23	32	32	
Smoking	Yes	17	17	11	11	>0.05
	No	83	83	89	89	
Alcohol Use	Yes	23	23	5	5	<0.05
	No	77	77	95	95	
Total Cholesterol	Normal	75	75	69	69	>0.05
	Raised	25	25	31	31	
Regular Physical Activity	Yes	27	27	16	16	<0.05
	No	73	73	84	84	

## DISCUSSION

As per the studies conducted obesity increases the incidence of hypertension amongst both children and adults. There is 2.1 fold and 7.2 fold, more risk of developing hypertension amongst overweight and obese children respectively.<sup>15</sup> According to a study conducted in the 2004 amongst the school children at Texas, it was seen that the burden of hypertension was 4.5%, which is strongly associated with obesity.<sup>16</sup> According to World Health Organization, there are about 7.5 million deaths due to hypertension and 57 million disability adjusted life years are lost due of hypertension.<sup>17</sup> In a study conducted amongst children in the Western world indicate the prevalence of hypertension was between 7% and 19%.<sup>18</sup> As per a study conducted in New Delhi amongst subjects aged between 12–18 years adolescents, the prevalence of systolic and diastolic hypertension was 7.84% and 2.15% and that of overweight/obesity was 18.6% and 16.5% amongst males and females, respectively.<sup>19</sup> Hypertension is directly proportional to overweight/obesity. In our present study, there were 79 males and 53 females who were married. 21 males and 47 females were unmarried. There was a significant difference amongst the males and females. Majority of the hypertensive males were more than 40 years of age and females were less than 40 years of age. There were 53% males and 48% females who were more than 40 years of age. There were 47% males and 52% females who were less than 40 years of age. There was no difference in age amongst both the groups. 54% males and 34% females were employed and 46% males and 66% females were unemployed. There was significant difference in employment amongst males and females. There were 40% males and 26% females who belonged to upper class, 23% males and 32% females belonged to lower class. There was a significant difference in socioeconomic status amongst males and females. There were 17% males and 11% females who were smokers. Rest of the subjects were non-smokers. There was no significant

difference amongst male and female smokers. There were 23% males who consumed alcohol and 77% males didn't consume alcohol. Amongst females 5% consumed alcohol and 95% didn't consume alcohol. There was a significant difference amongst male and female alcohol consumers. Total cholesterol was normal amongst 75% males and 69% females. It was raised in 25% males and 31% females. There was no significant difference in the level of cholesterol amongst the group. There were 27 males and 16 females who opted for regular physical activity. Rest 73% males and 84% females were not involved in regular physical activity. There was a significant difference in the proportion of males and females who opted for regular physical activity.

The cause of increased blood pressure amongst overweight/obese adolescents might be due to excess action of sympathetic nervous system action, insulin resistance, and abnormal structure and function of the blood vessels.<sup>20</sup> In a study by conducted by Abolfotouh MA et al amongst Egyptian children and AK Singh et al amongst adolescents residing in India show that obesity carries an increased risk of both high systolic and diastolic blood pressure.<sup>18,19</sup> In a study conducted by AK Singh, extra salt and smoking are associated with significant risk of hypertension.<sup>19</sup> However they are not significant risk factors in our study. Family history of hypertension was significantly associated with hypertension in studies conducted by Abolfotouh et al.<sup>18</sup> and Sunder et al.<sup>21</sup> According to study conducted by Sunder et al, physical inactivity was not significantly associated with risk of hypertension whereas in our study, physical inactivity was significantly associated with hypertension.<sup>21</sup>

## CONCLUSION

From the above study we can conclude that obesity acts as a significant risk factor for hypertension. The risk of obesity differs with the type of work, lifestyle habits, socioeconomic class and

alcohol and smoking. Obese people tend to be hypertensive more frequently than non-obese subjects. Awareness about obesity and hypertension is important to bring a change in lifestyle habits.

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