

Obesity and Hypertension: Effect of Weight Gain on Hypertension

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Abstract: Obesity is a major cause of hypertension. Obese individuals exhibit higher levels of blood pressure from childhood to old age. This study focuses on both men and women to assess the prevalence of obesity and hypertension among urban adults in Hyderabad. Four hundred thirteen people aged between 20- 80 years were screened for hypertension. City's leading diagnostic center conducted the tests. Height and weight was recorded and BMI calculated A semi structured questionnaire is prepared to collect information of demographic profile .Educational status indicated that Graduates among men are 91.1 percent and among females 85.8 percent. Employed men constitute 79.4 percent and 12.9 percent women are employed. Nuclear families among Hindus are 61.6 and in Muslims 81.5 percent. BMI among males ranged between 21.6 to 33.6 with one group having BMI above 30, and 3groups the normal category. Among females, BMI ranged between 19.9 to 39.4 with three groups having BMI more than 30 and 3 groups having normal BMI. Systolic pressure above normal level is seen in 55.9 in males and in females, it is 40.1 percent, diastolic pressure is 62.percent in males and 37.1 in females. Conclusion is that among those having above normal BMI Blood Pressure is also high indicating that BMI and Blood Pressure are related.

Keywords: Obesity, overweight, Pre hypertension, Body Mass Index, hypertension

1. Introduction

Obesity is a growing health problem with rapid increase in morbid obesity (1).It is the common disorder that develops from the interaction between the genotype and the environment. (Social, behavioral, cultural, physiological, metabolic and genetic factors.) Obesity is a major cause of Hypertension. Obese individuals exhibit higher levels of BP from childhood to old age. (2) The emerging theories of obesity are that the hormone leptin is a 167 amino acid peptide that promotes reducing appetite and increasing energy expenditure through sympathetic stimulation to thermogenic tissues. (3)After screening 1 million Americans, a direct relationship between blood pressure and BMI was reported. NHANES reports a direct relation between BMI and systolic pressure and diastolic pressure. Initially it was thought to be a disease of high-income countries (HIC), but it is increasing across low and middle-income countries (LMIC). India experiences an ongoing overweight /obesity (4-9).Overweight and obesity is more prevalent among adults aged 35-49 in the urban areas of South India (10,11). Most studies in India are focused on women respondents. It is necessary to examine the changing patterns in men's body in order to understand the impact of modifiable health factors on men (12-14). This study assesses the difference between both sexes and the prevalence of obesity and hypertension among urban adults in Hyderabad.

2. Methodology

Health Camp was conducted in the month of December 2019 in Hyderabad with an objective of screening people with obesity and hypertension and to study the effect of obesity on hypertension. Four hundred and thirteen people took diagnostic tests done by Vijaya Diagnostic center and RV Diabetic center. 258 males and 155 females were tested. Systolic and diastolic pressure was checked by the doctors. Investigator also checked the values.

Demographic profile consisting of age, type of family, type of diet, family size, education and occupation is collected. Data is presented as percentages. Weight was recorded using lever balance; accuracy of the balance was checked regularly. Height was recorded using anthropometric rod. BMI was calculated. The subjects were classified as per standard classifications for hypertension (Table 1) and Body Mass Index (Table2).

Table 1: Hypertension categories

Category	Particulars	Systolic Pressure (mm/Hg)	Diastolic Pressure (mm/Hg)
1.	Normal	<120	<80
2	Pre Hypertension	120-139	80-89
3	Hypertension Stage I	140-159	90-99
4	Hypertension Stage II	>160	>100

Essential Hypertension: (Primary) systolic pressure due to inheritance, kidney problems, hypoxia, drugs, nutritional deficiency, malnutrition, infection, genetic factors.

Secondary Hypertension: less common – mainly due to medical underlying issues Eg. Kidney disease, oral contraceptives, sleep apnea syndrome, etc. Abdominal obesity has a greater risk of developing hypertension.

Table 2: Obesity categories as per BMI

Category	Particulars	BMI
	Severe thinness	<16
1.	Mod. thinness	16-17
2	Mild thinness	17- 18.5
3	Normal	18.5 -25
4	Overweight	25.30
5	Obese- Class I	30-35
6	Obese Class II	35-40
7	Obese Class III	>40
8	Abdominal obesity -Men	102cm (40")
9	Abdominal obesity -Women	88cm (35")

3. Results and Discussion

Improved economic conditions, urbanization, prevalence of sedentary life styles and dietary changes have caused a steady increase in overweight and obesity which is considered the root cause for hypertension (1-3).

Demographic Profile: Most of the families are nuclear (61.6 percent), joint families are 16.7 and extended families or families with one of the in laws constituted 21.7 percent. (Table 3) Non vegetarians formed a major group (85.7 percent) while vegetarians are 14.3 percent. Majority (86.9 percent) are Hindus and Muslims are 13.1 percent. Age of patients ranged between 20-80 years. (Table 2). They are grouped as Males and Females.

Table 3: Type of family

Type of family	Hindus	Muslims	Total
Nuclear	61.6 (221)	81.5 (44)	64.2 (265)
Joint	16.7 (60)	11.1 (6)	15.9 (66)
Extended	7.8 (28)	1.9 (1)	7.1 (29)
One -In law	13.9 (50)	5.5 (3)	12.8 (53)
Total	100 (359)	100 (54)	100 (413)

Figures in parenthesis are actual numbers.

Table 4: Age wise Distribution

Age in Years	Males	Females
<20	24	4
21- 25	28	23
26-30	12	4
31-35	26	20
36-40	32	8
41-45	28	36
46-50	20	16
51-55	32	16
56-60	4	14
61-65	16	4
66-70	20	8
71-75	12	8
>76	4	4
Total	258	155

Both males and females are educated. Among males 91.1 percent are graduates, 8.9 percent are postgraduates/professional degrees. Among females' 85.8 percent are graduates, 6.5 postgraduates and 7.7 percent with high school (Table 5)

Table 5: Educational Level of Subjects

Education	Males		Females	
	%	No	%	No
Upto 10th	0	0	7.7	12
Graduates	91.1	235	85.8	133
PG	8.9	63	6.5	10
Total	100	258	100	155

Occupation wise 82.6 percent of males are employed in government/private sector, retired officers constitute 17.4 percent. Among females employed are 12.9 percent, unemployed/ petty business constituted a major group (79.4 percent) Retired officers are 7.7 percent. (Table 6)

Table 6: Occupation of Subjects

Occupation	Males		Females	
	%	No	%	No
Unemployed	0	0	79.4	123
Employed /business	82.6	213	12.9	20
Retired Officers	8.9	63	7.7	12
Total	100	258	100	155

Systolic and Diastolic Blood Pressure and BMI in Males:

Among Male subjects of 20 years, 50 percent have normal systolic and diastolic pressure, but are overweight (BMI 28.1) In the age groups except 21-25, 71-75 BMI is higher than normal and systolic and diastolic pressure shows 75 and 33 percent are above normal. In the 31-35 age groups, BMI is 33.6, which is obese class I, the corresponding percent of subjects with higher systolic pressure are 19.2 percent and 30.5 percent diastolic pressure. Hypertensive subjects are 100 percent in the age groups of 61-65 (16 people) and least (19.2 percent) in the 31.35 age group. With respect to diastolic pressure most of them are in the normal category, percentage ranging between 50 to 100 percent. Comparing the incidence of hypertension with Body Mass Index indicated that higher the BMI higher is Blood pressure.

Systolic and Diastolic Pressure in Females (Table 7):

Percentage with systolic pressure more than normal ranged between 25 and 100. Diastolic pressure above normal ranged 25-50 percent. Seven groups of the 13 age groups have 100 percent above normal systolic pressure. BMI above normal ranged between 25.4 to 39.3 percent. Studies indicated that obese people are at risk of hypertension (6, 7). Comparison of BMI, systolic and diastolic pressure among males and females (Table 9) indicated that those having higher than normal systolic pressure are more among males than females, percentages being 72.1 and 27.9 respectively. Similar trend is seen even with diastolic pressure, males having higher percentage than females both with respect to normal and higher values. With respect to BMI it is same between males and females sharing 50 percent each in the normal and above normal categories. Among the males, BMI ranged between 21.6 to 33.6 with one group having BMI above 30. Among females BMI ranged between 19.9 to 39.4 and three groups having BMI being above 30. In general, females are more obese than males.

Table 9: Comparison of Males and females

	Males		Females		Total	
	%	No	%	No	%	No
Systolic Pr. Normal	72.1	121	27.9	47	100	168
Systolic high	55.9	137	40.1	108	100	245
Diastolic N	62.3	207	37.7	125	100	332
Diastolic H	62.9	51	37.1	30	100	81
BMI N	50.0	3	50.0	3	100	6
BMI > High	50.0	10	76.9	50.0	100	20
TOTAL	100	258	100	258	100	26

The continuing discovery of the mechanism regulating appetite and metabolism mechanism of selective leptin resistance and with the signals of ghrelin and Peptide YY are newer strategies for treatment of obesity and hypertension (6).

4. Conclusion

The study revealed that obesity and blood pressure are related, it is percolating down in to younger ages, a situation that needs to be taken as a national issue. Majority males and females are overweight clubbed with higher than normal systolic and diastolic pressures. A direct relationship between BMI, systolic and diastolic pressure is reported (5). There is a need to conduct education sessions to do exercise (walking, yoga or brisk gym exercises) proper diet and strive to maintain normal healthy weight.

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Table 7: Systolic, Diastolic Blood pressure of Males with BMI

Age group	Males								BMI
	Systolic				Diastolic				
	Normal		High		Normal		High		
%	No.	%	No.	%	No.	%	No.		
15-20	50	12	50	12	100	24	0	0	28.1
21-25	25	7	75	21	75	21	25	7	23
26-30	100	12	0	0	100	12	0	0	27.1
31-35	80.8	21	19.2	5	61.5	16	38.5	10	33.6
36-40	50	16	50	16	100	32	0	0	28.8
41-45	100	28	0	0	71.4	20	28.6	8	28.9
46-50	20	4	80	16	40	8	60	12	26.6
51-55	14.3	4	85.7	28	87.5	28	12.5	4	29.3
56-60	100	4	0	0	100	4	0	0	22.2
61-65	0	0	100	16	75	12	25	4	26.9
66-70	20	4	80	16	75	16	25	4	27.6
71-75	66.7	8	33.3	4	100	12	0	0	21.6
>76	25	1	75	3	50	2	50	2	26.5
	46.9	121	53.1	137	80.2	207	19.8	51	

Table 8: Systolic and Diastolic Pressure in Females with BMI

Age Group	Systolic Normal Range <120						Diastolic Normal Range <80						BMI
	Normal		High		Total		Normal		High		Total		
Years	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	
<20	75	3	25	1	100	4	100	4	0	0	100	4	39.4
21-25	0	0	100	23	100	23	100	23	0	0	100	23	25.5
26-30	0	0	100	4	100	4	100	4	0	0	100	4	25.4
31-35	60	12	40	8	100	20	100	20	0	0	100	20	27.4
36-40	50	4	50	4	100	8	100	8	0	0	100	8	19.9
41-45	44.4	16	55.6	20	100	36	63.9	23	36.1	13	100	36	27.5
46-50	50	8	50	8	100	16	100	16	0	0	100	16	29.6
51-55	0	0	100	16	100	16	50	8	50	8	100	16	26.6
56-60	100	4	0	0	100	4	100	4	0	0	100	4	29.6
61-65	0	0	100	4	100	4	75	3	25	1	100	4	30.4
66-70	0	0	100	8	100	8	50	4	50	4	100	8	31.6
71-75	0	0	100	8	100	8	50	4	50	4	100	8	22.6
>76	0	0	100	4	100	4	100	4	0	0	100	4	24.7
	30.3	47	69.7	108	100	155	80.6	125	19.4	30	100	155	