PREVALENCE OF OBESITY AND ITS ASSOCIATION WITH SOCIO-ECONOMIC CLASS IN HYPERTENSION

Yoganandan Dayanandan[1], Premkumar Gunaseelan[2]

[1]Senior Resident, Department of General Medicine, Pondicherry Institute of Medical Sciences, Pondicherry.
[2]Assistant Professor, Department of General Medicine, Pondicherry Institute of Medical Sciences, Pondicherry.

ABSTRACT

BACKGROUND

Hypertension exerts a substantial public health burden on cardiovascular health status and healthcare systems in India. It is one of the most important modifiable risk factors for cardiovascular disease[35]. This study was aimed to determine the prevalence of obesity in hypertensive individuals attending the medical OPD or admitted in a tertiary care center and to determine the association of obesity with socio-economic class in hypertensive individuals.

METHODS

From November 2014 to May 2016, a cross sectional study was done among 200 hypertensive patients attending the OPD or admitted in tertiary care center. The following parameters were used; blood pressure, height, weight, BMI as per WHO criteria, socio-economic class based on modified Kuppuswamy scale, nutritional pattern, physical activity, alcohol intake, type of occupation- sedentary/manual and residence (urban/rural).

RESULTS

The significant risk factors by univariate analysis were found to be upper-middle socio-economic class, female sex, family history of hypertension, family history of diabetes, family history of dyslipidaemia, urban residence and sedentary life style. After multivariate analysis, the confounding factors were removed and it was found that female sex, sedentary life style and people from urban areas had significant independent association between hypertension and obesity.

CONCLUSIONS

This research revealed a higher prevalence of obesity in the urban women with hypertension and sedentary life style. The need of the hour is to develop comprehensive and flexible measures to promote adoption of a healthy diet and physical activity for the at-risk population.

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BACKGROUND

A study published in Social Science and Medicine used data for 67 countries representing all the regions of the world to examine how economic development, socioeconomic status, and obesity were related. They found that obesity rose with a nation's economic development. In lower-income countries, people with higher socio-economic status were more likely to be obese. Conversely, in high-income countries, those with higher socio-economic status were less likely to be obese. Those particularly at risk of hypertension, however, are the elderly and overweight people of high socioeconomic class. In India, the overall prevalence of hypertension by the year 2020 will be 159.46/1000 population[1] according to Directorate General of Health Services, Ministry of Health and Family Welfare, Government of India. One of the first studies in India was carried out by Dubey[2] VD which documented 4% prevalence of hypertension amongst industrial workers of Kanpur (with the criteria of BP > 165/95 mmHg). In Delhi, 3% prevalence of hypertension was reported by Wasir HS et al[3] (criteria: >160/95) in 1984. In 1984-87, Gopinath and Chadha et al in their report found the prevalence of hypertension (criteria: >=160/90) to be 11% among males and 12% among females in the urban areas of Delhi and 4% and 3% respectively in rural areas of Delhi. Two more studies carried out in rural areas of Haryana[4] in 1994-95 demonstrated prevalence of hypertension (JNC V criteria) to be 4.5%, while higher prevalence of 45% during 1996-97[5] was found in urban areas of Delhi.

In 1994, the ICMR study[6] which included 5537 individuals (urban residents of 3050 and rural residents of 2487) demonstrated the prevalence of hypertension using Criteria: of 140/90 mm of Hg among males and females respectively to be 25% and 29% in urban areas of Delhi and 13% and 10% in rural areas of Haryana. Gupta R from Jaipur carried out three serial epidemiological studies during 1994,[7] 2001[8] and 2003[9] and he demonstrated an increasing prevalence of hypertension (males - 30%, 36%, and 51% respectively; females - 34%, 38% and 51%) (Criteria: >=140/90 mm of Hg).

Kutty VR[10] from southern India carried out hypertension prevalence study (criteria: >=160/95 mm of Hg) in rural

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Corresponding Author:
Dr. Premkumar,
#19, Cheran Street,
Mullai Nagar, Orleanpet,
Pondicherry- 605005.
E-mail: premkumarguna30@gmail.com
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areas of Kerala during 1991 in the 20 plus age group and found the prevalence to be 18%. Later studies in Kerala (Criteria: JNC VI) reported a prevalence of 37% (among 30-64 age group)[11] in 1998 and 55% (among 40-60 age group)[12] during 2000. During 2000 among elderly populations aged sixty and above in the urban and rural areas, a higher prevalence of 69% and 55% respectively was recorded.[13]

From eastern Indian population few studies were available on prevalence of hypertension. Hazarika et al[14] reported a prevalence of 61% (criteria: =JNC VI) among males and females aged thirty and above in Assam in 2002. The Sentinel Surveillance Project[15], documented 28% overall prevalence of hypertension (criteria: =JNC VI) from 10 regions of the country in the age group 20-69. Another study[16] carried out in 1998 among Industrial population using the same criteria illustrated a prevalence of 30% among men. (in Bharat Electronics Limited, India)

Some studies were also carried out comparing various socio-economic groups. The initial study from urban Chennai was done by Mohan et al[17] who reported a prevalence of 8.4% hypertension among males and females aged 20 and above and belonging to the low socio economic group (based on occupation household income & dietary pattern). Similarly, the middle socio economic group had a higher prevalence (15%) during 1996-97.

In 2000[18] (age group>=40), in a study conducted in the urban Chennai, a higher prevalence of hypertension (54%) was reported among low income group (monthly income less than thirty thousand rupees per annum) and 40% prevalence was reported among high-income group (monthly income of more than sixty thousand rupees per annum). In the slums of Delhi, hypertension prevalence of 12% was reported by Misra et al.[19]

Worldwide data for global burden of Hypertension reported 20.6% of males and 20.9% of females in India suffered from hypertension in 2005.[20] by 2025, the percentages of prevalence are projected to go up to 22.9 and 23.6 for men and women in India, respectively. Recent studies from India have shown the prevalence of HTN to be 25% in urban and 10% in rural people in India.[21,22,23]

According 2008 estimates by WHO, hypertension prevalence in Indians was 32.5% (33.2% in men and 31.7% in women).[24]

Recently, in a meta-analysis conducted by Tanu et al in 2013, the prevalence of hypertension was found to be 40.8% in urban and 17.9% in the rural Indian population.[25] Hypertension is directly responsible for 57% of all stroke deaths and 24% of coronary heart disease deaths in India. This is important because hypertension being a controllable disease, a population-wide decrease of BP of 2 mmHg can prevent 1,53,000 coronary heart disease deaths and 1,51,000 stroke deaths in India.[26]

In developed nations (United States) the awareness of hypertension has improved from fifty one percent in the period 1976–1980[27] to seventy percent in 1999–2000.[28] Thirty one percent of people received treatment for hypertension and it has increased to fifty nine percent in the same period, and the percentage of people with blood pressure controlled to below 140/90 mmHg has increased from 10 percent to 34 percent.[29] These changes have been associated with highly favourable trends in the morbidity and mortality attributed to hypertension. Age-adjusted death rates since 1972 have declined from stroke and coronary heart disease by approximately 60 percent and 50 percent, respectively. In 2009, Pereria et al.,[30] found that the mean awareness of hypertension in men in developed countries is 49.2% as compared to 40.6% in men in developing countries. Similarly, in women the mean awareness if hypertension was 61.7 and 52.7 in developed countries and developing countries respectively.[31] In a systematic analysis in 2012 by Devi et al., awareness of hypertension in India was found to range from 20% to 54% depending upon the type of locality (rural or urban). In 2014, Ragupathy et al., found that for awareness of hypertension in urban India and rural India was 41.9% (35.1-48.9) and 25.1% (21.0-29.1), respectively. The percentage of people treated for hypertension among those diagnosed in urban and rural areas was 37.6 (23.9-51.2) and 24.9 (16.7-33.0), respectively. The percentage of hypertensive patients with their blood pressure under control in urban and rural India was 20.2 (11.6-28.8) and 10.7 (6.4-15.0), respectively. Among urban and rural areas in India significant differences were noted for awareness and control of hypertension (p values of 0.002 and 0.03, respectively)[32]

The study was aimed to determine the prevalence of obesity in hypertensive individuals attending the medical OPD or admitted in a tertiary care center and to determine the association of obesity to various socio-economic class in hypertensive individuals.

METHODS

From November 2014 to May 2016, a cross sectional study was done among 200 hypertensive patients attending the OPD or admitted in tertiary care center. The following parameters were used; Blood pressure, Height, weight, BMI as per WHO criteria, Socio economic class based on Modified Kupusamy's scale, Nutritional pattern, Physical activity, Alcohol intake, Type of occupation - sedentary / Manual and Residence (urban / rural). The results were tabulated and analysed using excel and SPSS v16.0.

RESULTS

A total of 200 hypertensive patients attending the out-patient department or admitted in P.I.M.S were enrolled in the study. Tables 1, 2 and 3 shows the Sociodemographic characteristics of the participants. Table 4 shows the association of obesity and socio-economic class in hypertensive patients. The people in upper middle class (category 2) and middle class (category 3) are twice at risk of developing obesity with hypertension as compared to upper socio-economic class people. The lower-class hypertensives are protected against obesity by 47% as compared to upper socio economic class hypertensives but the results are not statistically significant. Table 5 shows the association of age with obesity in hypertensives. Age is not

significantly associated with development of obesity in hypertension. Table 6 shows that females are 1.85 times at risk of developing obesity as compared to the males. This was statistically significant. (p value – 0.03). Table 7 shows that people with people with family history of hypertension have 2.28 times more risk of getting obesity along with hypertension (p-value – 0.005). Table 8 shows that people with family history of diabetes are 2.88 times at risk of getting obesity as compared to people without a family history of diabetes. This is statistically significant (p value – 0.001). Table 9 shows hypertensive people with a family history of dyslipidemia are 3.72 times at risk of getting obesity as compared with hypertensives without a family history of dyslipidemia. This is statistically significant (p value – 0.002). Table 10 shows that in hypertensive patients, people having sedentary physical activity have 2.52 times more chances of getting obesity as compared to moderate and heavy physical activity. This result is statistically significant (p – 0.007). Table 11 shows people living in urban areas have 2.07 times more chances of getting obesity in hypertension as compared to people living in rural areas. This result is statistically significant (p - 0.01). Table 12 shows the multivariate analysis was performed to analyse the association of obesity in hypertensive individuals. After the confounding factors were removed, it was found that male gender (gender), people living in urban areas (residence) and sedentary physical activity (physical activity) have significant association of obesity in hypertensive individuals.

Sl. No.	Age Category	Frequency	Percentage	Confidence Interval (95%)
1.	20-40	28	14.0	9.6% -19.3%
2.	41-60	106	53.0	46% - 59.8%
3.	>60	66	33.0	26.7% - 39.7%
4.	Total	200	100.0	
Sl. No.	**Sex**	**Frequency**	**Percentage**	**Confidence Interval (95%)**
1.	Male	109	54.5	47.56% - 61.31%
2.	Female	91	45.5	38.69% - 52.44%
3.	Total	200	100.0	
Sl. No.	**Literacy**	**Frequency**	**Percentage**	**Confidence Interval (95%)**
1.	Illiterate/Primary School	94	47.0	40.15%53.94%
2.	High School/Intermediae/ Diploma	74	37.0	30.52%-43.86%
3.	Graduate	26	13.0	8.86%-18.21%
4.	Professional	6	3.0	1.22%-6.13%
5.	Total	200	100.0	

Table 1. Age, Sex and Literacy of The Participants

Sl. No.	Occupation	Frequency (N)	Percentage (%)	Confidence Interval (95%)
1.	Unemployed	49	24.5	18.92%-30.67%
2.	Unskilled Labourer	62	31.0	24.88%-37.67%
3.	Plant and Machine Operators	10	5.0	2.57%-8.73%
4.	Skilled Agriculture and Fishery	14	7.0	4.04%-11.20%
5.	Service Workers & Shop & Market Sales Workers	19	9.5	5.99%-14.18%
6.	Clerks	14	7.0	4.04%-11.20%
7.	Technicians	13	6.5	3.67%-10.60%
8.	Professional	13	6.5	3.67%-10.60%
9.	Legislators/Managers	6	3.0	1.22%-6.13%
10.	Total	200	100.0	
Sl. No.	**Socio Economic Status**	**Frequency (N)**	**Percentage**	**Confidence Interval (95%)**
1.	Upper	11	5.5	2.93%-9.36%
2.	Upper Middle	24	12.0	8.02%-17.07%
3.	Middle / Lower Mid	58	29.0	23.03%-35.58%
4.	Upper Lower	90	45.0	38.2%-51.94%
5.	Lower	17	8.5	5.20%-13.0%
6.	Total	200	100.0	

Table 2. Occupation and Socioeconomic Status of The Participants

Sl. No.	Body Mass Index (BMI)	Frequency	Percentage	Confidence Interval (95%)
1.	Under Weight	14	7	4.04% - 11.2%
2.	Normal Weight	97	48.5	41.62%-55.42%
3.	Overweight	71	35.5	29.1%-42.32%
4.	Obesity Class 1	17	8.5	5.20%-13.0%
5.	Obesity Class 2	1	0.5	0.025% - 2.44%
6.	Obesity Class 3	0	0	0.0% - 1.48%
	Total	200	100.0	
Sl. No.	**Residence**	**Frequency**	**Percentage**	**Confidence Interval (95%)**
1.	Urban	106	53	46.06% - 59.85%
2.	Rural	94	47	40.15% - 53.94%
3.	Total	200	100.0	

Table 3. BMI and Residence of The Participants

Sl. No.	Socio Economic Class	Obesity		Risk Ratio	95% Confidence Interval (Lower Limit-Upper Limit)		p Value
		No n(%)	Yes n(%)				
1.	Upper	4 (36.4)	7 (63.6)	REF			
2.	Upper Middle	14 (58.3)	10 (41.7)	2.450	.562	10.680	0.046
3.	Middle/Low Middle	32 (57.1)	24 (42.9)	2.154	.568	8.168	
4.	Lower/Upper Lower	35 (39.3)	54 (60.7)	1.114	.304	4.084	
5.	Lower	4 (23.5)	13 (76.5)	.538	.102	2.840	
6.	Total	89 (45.2)	108 (54.8)				

Table 4. Association Between Obesity and Various Socio-Economic Classes in Hypertensive Individuals

Chi Square, DF – 4

Sl. No.	Age (Years)	Obesity		Total	Risk Ratio (Lower Limit-Upper Limit)	p Value
		No n (%)	Yes n (%)			
1.	1(20-40)	14 (50)	14 (50)	28 (100)	REF	
2.	2(41-60)	59 (55.7)	47 (44.3)	106 (100)	1.351 (0.6 – 3.3)	.8
3.	3(>60)	38 (57.6)	28 (42.4)	66 (100)	1.081 (0.6 – 2.0)	
4.	Total	111 (55.5)	89 (44.5)	200 (100)		

Table 5. Association Between Age and Obesity in Hypertensive Individuals

Chi Square, DF – 2

Sl. No.	Sex	Obesity		Total	Risk Ratio (Lower Limit-Upper Limit)	p Value
		No n (%)	Yes n (%)			
1.	Male	68 (62.4)	41 (37.6)	109 (100)	REF	
2.	Female	43 (47.3)	48 (52.7)	91 (100)	1.85 (1.05-3.26)	.03
3.	Total	111 (55.5)	89 (44.5)	200 (100)		

Table 6. Association of Gender and Obesity in Hypertensive Patients

Chi Square, DF – 1

Sl. No.	Family History of Hypertension	Obesity		Total	Risk Ratio (Lower Limit-Upper Limit)	p Value
		No n (%)	Yes n (%)			
1.	Yes	50 (46.3)	58 (53.7)	108 (100)	2.28 (1.28-4.05)	0.005
2.	No	61 (66.3)	31 (33.7)	92 (100)	REF	
3.	Total	111 (55.5)	89 (44.5)	200 (100)		

Table 7. Association of Family History of Hypertension to Obesity in Hypertensive Individuals

Chi Square, DF - 1

Sl. No.	Family History of Diabetes	Obesity		Total	Risk Ratio (Lower Limit-Upper Limit)	p Value
		No n (%)	Yes n (%)			
1.	Yes	31 (39.7)	47 (60.3)	78 (100)	2.88 (1.6-5.19)	0.001
2.	No	80 (65.6)	42 (34.4)	122 (100)	REF	
3.	Total	111 (55.5)	89 (45.5)	200 (100)		

Table 8. Association Between Family History of Diabetes and Obesity in Hypertensive Patients

Chi Square, DF-1

Sl. No.	Family History of Dyslipidaemia	Obesity		Total	Risk Ratio (Lower Limit-Upper Limit)	p Value
		No n (%)	Yes n (%)			
1.	Yes	102 (60.4%)	67 (39.6%)	169 (100%)	3.72 (1.6-8.57)	0.002
2.	No	9 (29.0%)	22 (71%)	31 (100%)	REF	
3.	Total	111 (55.5%)	89 (44.5%)	200 (100%)		

Table 9. Association Between Family History of Dyslipidaemia and Obesity in Hypertensive Patients

Chi Square, DF-1

Sl. No.	Physical Activity	Obesity		Total	Risk ratio (Lower Limit-Upper Limit)	p Value
		No n (%)	Yes n (%)			
1.	Sedentary	33 (41.8)	46 (58.2)	79 (100)	2.52 (1.3-4.8)	0.007
2.	Moderate	31 (64.6)	17 (35.4)	48 (100)	0.99 (0.46 – 2.12)	
3.	Heavy	47 (64.4)	26 (35.6)	73 (100)	REF	
4.	Total	111 (55.5)	89 (44.5)	200 (100)		

Table 10. Association of Physical Activity with Obesity in Hypertensive Individuals

Chi Square, DF-2

Sl. No.	Residence	Obesity		Total	Risk Ratio (Lower Limit-Upper Limit)	p Value
		No n (%)	Yes n (%)			
1.	Urban	50 (47.2)	56 (52.8)	106 (100)	2.07 (1.17 – 3.66)	0.01
2.	Rural	61 (64.9)	33 (35.1)	94 (100)	REF	
3.	Total	111 (55.5)	89 (44.5)	200 (100)		

Table 11. Association of Residence with Obesity in Hypertensive Individuals

Chi Square, DF- 1

Sl. No.	Variables	Univariate P Value	Risk Ratio	CI (Lower Limit-Upper Limit)		Adjusted p Value
1.	Socio Economic Status	0.05	2.09	0.42	10.43	0.37
2.	Gender	0.03	0.45	0.23	0.88	0.02
3.	Family History - Hypertension	0.005	0.67	0.30	1.45	0.3
4.	Family History – Diabetes	0.001	0.67	0.28	1.59	0.37
5.	Family History – Dyslipidaemia	0.002	0.49	0.17	1.4	0.18
6.	Residence	0.01	2.23	1.18	4.19	0.01
7.	Sedentary Physical Activity	0.007	1.65	1.01	5.70	0.04

Table 12. Multivariate Analysis of Various Factors for Assessing the Association of Obesity in Hypertensive Individuals

DISCUSSION

Hypertension is the most common chronic metabolic disease in India. High blood pressure is ranked as the third most important risk factor for attributable burden of disease in south Asia (2010).[33] Hypertension exerts a substantial public health burden on cardiovascular health status and healthcare systems in India. Hypertension is one of the most important modifiable risk factors for cardiovascular disease.[34] Hypertension is directly responsible for 57% of all stroke deaths and 24% of all coronary heart disease (CHD) deaths in India. This cross-sectional study was done by recruiting 200 hypertensive individuals to determine its association with socio economic class.

The prevalence of hypertension was higher in the 41 to 60 age group in this study (53%, CI - 46% - 59.8%) when compared to age groups 20 to 40 (33%, CI - 26.9% - 39.9%) and age group. Similarly, in Burden and predictors of hypertension in India: results of SEEK study conducted by Youssef MK Farag et al., in 2014, the prevalence of hypertension was found to be more in people who are more than 40 years.[32] Similar results were seen in a study conducted by Clara K. Chow et al in 2013 (Prevalence, Awareness, Treatment, and Control of Hypertension in Rural and Urban Communities in High-, Middle-, and Low-Income Countries) which showed that the prevalence of hypertension was more in people more than 50 years as compared to people less than 50 years or age.[34]

In this study the prevalence of hypertension among males (54.5%, CI - 47.56% - 61.31%) was higher as compared to females (45.5%, CI - 38.69% - 52.44%). Similar results were seen in the SEEK study conducted by Youssef MK Farag et al (2014).[32] Higher prevalence of hypertension among men (28% as compared to 21%) was also seen in a study conducted in Puducherry by Shrivastava et al in 2015 (Burden and Determinants of Hypertension in Rural Pondicherry, India).[34]

But in the study 'Prevalence, Awareness, Treatment, and Control of Hypertension in Rural and Urban Communities in High-, Middle-, and Low-Income Countries' by Clara et al, the prevalence of hypertension in women (38.7%) was higher than that of men (36.5%).[33] The prevalence of hypertension was found to be more in people living in urban areas (53%) as compared to people living in rural areas (47%) in our study. Similar results were seen in 'Burden and predictors of hypertension in India: results of SEEK study' conducted by Youssef MK Farag et al (2014) which showed a prevalence of 58.3% and 41.7% in urban and rural population respectively.[32] Clara et al (2013) showed prevalence in hypertension of 44.4% in urban population and 31.5% in rural population.[33] In a meta-analysis by Tanu Mida et al in 2013 (Prevalence of hypertension in India: A meta-analysis), the prevalence of hypertension among urban population was 40.8% as compared to 17.9% in rural population.

People of upper lower socio-economic class (Class 4 as per modified Kuppuswamy scale classification) had high prevalence of hypertension in our study. Similar results were seen in studies done by Gupta R et al and Kaplan GA et al.[35] A study done by Shrivastava et al in 2015 showed a higher prevalence of hypertension among people with a lower per capita income.[34] In contrary to our study finding, a study done by Singh RB et al showed a higher prevalence of hypertension among people in higher socio economic class.

Family history of hypertension was significantly associated with hypertension in our study. In a study conducted by Shrivastava et al in 2015, family history of hypertension has been shown to be a strong predictor of development of hypertension.[32]

Normal BMI category (BMI – 18.5–24.9) included most of the study population (48.5%). People belonging to overweight category (BMI – 25.0-29.9) were 35.5% in our study which is similar to study done by RB Singh (1997)[36] Similar results were reported by Shrivastava et al in 2015.[34] The prevalence of obesity and overweight in this study is 44%. Similar results were seen in a study conducted by Rajendra Pradeepa et al in 2015 (Prevalence of generalized & abdominal obesity in urban & rural India- the ICMR - INDIAB Study (Phase-I) (ICMR - INDIAB-3)).[37]

The prevalence of overweight and obesity was higher among people belonging to the upper middle socio-economic class (58.3%) (class- 2 of modified Kuppuswamy scale). Likewise, similar results were seen in study conducted by Dinsa et al (2012) which found that within low-income countries, obesity is more prevalent among the higher-SES groups.

Developing countries are witnessing this increasing prevalence of hypertension and obesity due to acculturation. Rapid and often uncontrolled urbanization leads to exposure to many health risks, including poor sanitation and environmental risk factors. However, it also leads to changes in dietary and lifestyle changes leading to decreased physical activity and increased risk of obesity and greater risk of hypertension. Further large-scale studies are required to validate the findings from the study.

CONCLUSIONS

This research revealed a higher prevalence of obesity in the urban women with hypertension and sedentary life style. The need of the hour is to develop comprehensive and flexible measures to promote adoption of a healthy diet and physical activity for the at-risk population.

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