

PREVALENCE OF SYSTEMIC ARTERIAL HYPERTENSION IN POPULATION OF AHMEDABAD CITY

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Background & Objectives: To study the prevalence of hypertension in Ahmedabad city. To assess the association between hypertension and different socio economic classes in the city of Ahmedabad. **Material & Methods:** This cross-sectional study was performed on 602 residents of Ahmedabad city. The study included all the ages and both the genders. They were screened for hypertension by JNC VII criteria using sphygmomanometer. Data was entered in Microsoft Excel and statistical analysis was done. **Results:** In our study, out of total 602 subjects, 509 (84.6%) had normal blood pressure or pre hypertension and 67 had history of hypertension and 26 were newly detected cases of hypertension. So, out of 602 subjects 67+26= 93 subjects had hypertension. **Interpretation:** Prevalence of hypertension is 15.4% in Ahmedabad city. Hypertension is more prevalent in middle socio economic class followed by upper socio economic class and lower socio economic class.

Key Words: Hypertension, Sphygmomanometer, Prevalence

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Introduction:

Hypertension is a chronic condition of concern due to its role in the causation of other non communicable diseases like coronary heart disease, stroke and other vascular complications. In the era of socio-economic and epidemiological transition of population, it is the commonest cardiovascular disorder and emerged as major public health problem. It is one of the major risk factors for cardiovascular mortality. Hypertension alone accounts for 20-50 per cent of all deaths^[1]. High blood pressure is considered both a disease and a risk factor, especially for cardiovascular diseases, and is one of the most serious public health problems. Today, 25% of the world's population suffers from this disease and it has been estimated that this figure will have risen by 60% by 2025, reaching a prevalence of 40%. In addition to deaths due to circulatory system diseases, the socioeconomic burden of hypertension is high, with productive lives cut short through temporary or permanent disability^[4,5]. Overall prevalence for hypertension in India was 29.8% (95% confidence interval: 26.7–33.0). Significant differences in hypertension prevalence were noted between rural and urban parts [27.6% (23.2–32.0) and 33.8% (29.7–37.8); $P=0.05$]^[6]. According to the National Heart

Lung and Blood Institute (NHLBI), the risk factors for high blood pressure are older age, gender, overweight or obesity and unhealthy lifestyle habits, such as lack of physical activity, smoking and eating too much salt. The NHLBI also considers that other risk factors are associated with high blood pressure, such as genetic predisposition and stress. Risk factor identification is an established strategy to apply primordial prevention to reduce the incidence of hypertension in the community. The association between the presence of risk factors and the development of the disease has been well documented^[7,8].

The present study was conducted to evaluate the prevalence of hypertension and to find out the presence of risk factors among the population of Ahmedabad city.

Aims & Objectives:

- To study the prevalence of hypertension in Ahmedabad city.
- To assess the association between hypertension and different socio economic classes in the city of Ahmedabad.
- To find out the mean age of the participants who diagnosed as hypertensive for the first time.
- To find out the association between the prevalence of hypertension and factors like

age, obesity, family history of hypertension and tobacco consumption etc.

- To provide health education to the people.

Material and Methods:

This cross-sectional study was performed on 602 residents of Ahmedabad city. The study included all the ages and both the genders.

Selection criteria:

Inclusion Criteria:

All ages, the genders, newly diagnosed hypertension as well as those already diagnosed and receiving treatment for hypertension.

Exclusion Criteria:

Individuals with secondary hypertension and the temporary candidates of hypertension e.g. Pregnancy in which case hypertension does not persist after pregnancy.

This cross sectional study conducted in the city of Ahmedabad. People living in societies and slum areas of Ahmedabad were selected by stratified random sampling. They were screened for hypertension by JNC VII criteria using sphygmomanometer. After informed consent was obtained, detailed personal, past & family history was taken. Their anthropometric measurements and detailed physical & clinical examination were done. Written and informed consent was taken from the participants. Before conducting the study approval was obtained from Institutional Ethical Committee for human research.

Sample Size:

602 subjects were recruited and sample size was calculated with the following assumptions.

The prevalence rate of hypertension was taken 22.8% from the previous study by Parikh S et al^[9] Sample size was estimated at 5% level of significance with an allowable error of 20%, using the following formula-

$$n = \frac{(Z\alpha)^2 pq}{L^2}$$

Where, n = Sample size

p = Prevalence

q = (1-p)

L=Allowable error

Z α = Z_{0.05} = 1.96

(Z α)² = (Z_{0.05})² = 3.84

So,

$$n = \frac{(3.84)pq}{L^2}$$

p = 22.8% = 0.22

q = (1 - p) = 1 - 0.22 = 0.78

L = 15% of p = 15% of 0.22 = 0.033

So,

$$n = \frac{4(0.22)(0.78)}{(0.033)^2} = 602$$

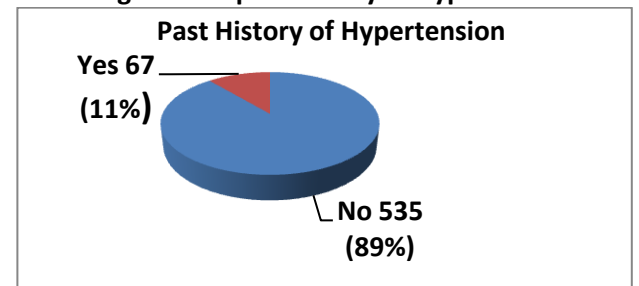
As per above formula minimum 602 sample size was needed.

Data analysis:

Data was entered in Microsoft Excel and analysis was done. To test the significance of the difference among the statistical parameters in different subsets of population, suitable statistical tests were applied. They included chi-square test and Z-test.

Result:

Figure-1 Distribution of the study population according to their past history of hypertension



Out of total 602 subjects, 535 (89%) had no past history of hypertension while 67 (11%) subjects had history of hypertension and currently they were on medication of hypertension.

Table-1 Distribution of the subjects without history of hypertension according to categories of their blood pressure (n=535)

Category	Blood Pressure (mmHg)	Number of persons (n=535)	Percentage
Normal	(<120) (<80)	282	52.7
Pre Hypertension	(120-139) (80-89)	227	42.4
Hypertension Stage-1	(140-159) (90-99)	17	3.2
Hypertension Stage-2	(≥160) (≥100)	9	1.7
Total		535	100

*Here if systolic and diastolic blood pressure fell into different categories, the higher category had been selected to classify the individual's blood pressure.

Out of 535 majorities 282 (52.7%) subjects had normal blood pressure, 227 (42.4%) subjects had pre hypertension followed by 17 (3.2%) and 9 (1.7%) subjects had hypertension stage 1 and hypertension stage-2, respectively. So, total 17+9=26 was hypertensive.

Category Blood Pressure (mmHg) Systolic Diastolic	Number of persons	Percentage
Normal (<120) (<80)	509	84.6
Pre Hypertension (120-139) (80-89)		
Hypertension Stage-1 (140-159) (90-99)	93	15.4
Hypertension Stage-2 (≥160) (≥100)		
Total	602	100

Table-2 Distribution of the study population according to categories of their blood pressure

*Here if systolic and diastolic blood pressure fell into different categories, the higher category had been selected to classify the individual's blood pressure.

Out of 602 subjects, 509 (84.6%) had normal blood pressure or pre hypertension, 67 had history of hypertension and 26 were newly diagnosed. So, in our study, out of 602 subjects 67+26= 93 subjects had hypertension. Prevalence of hypertension in our study was 15.4%.

Table: 3 Distribution of the study population according to gender and categories of blood pressure

Category Blood Pressure (mmHg) Systolic Diastolic	Gender		Total
	Females	Males	
Normal (<120) (<80)			
Pre Hypertension (120-139) (80-89)			
Hypertension Stage-1 (140-159) (90-99)			
Hypertension Stage-2 (≥160) (≥100)			
Total			

Normal or Pre hypertensive (<140) (<90)	270 (84.4)	239 (84.8)	509 (84.6)
Hypertensive (≥140) (≥90)	50 (15.6)	43 (15.2)	93 (15.4)
Total	320 (100)	282 (100)	602 (100)

(Figures given in parentheses are percentages)

Chi square: 0.016 Degree of Freedom: 1 p=0.89

Out of total 320 females, 270 (84.4%) had normal blood pressure or pre hypertension followed by 50 (15.6%) females had hypertension stage -1 or stage-2. Out of total 282 males, 239 (84.8%) had normal blood pressure or pre hypertension followed by 43 (15.2%) males had hypertension stage -1 or stage-2.

Out of total 93 hypertensive subjects, 50 (53.8%) were females and 43 (46.2%) were males. Prevalence of hypertension stage 1 or 2 was almost equal among males and females. Association between blood pressure category and gender was not statically significant. (p=0.89)

Table: 4 Distribution of the study population according to age and categories of their blood pressure. (n=535)

Category Blood Pressure (mmHg) Systolic Diastolic	No. of the subjects	Age (In years)	
		Mean	SD
Normal (<120) (<80)	282 (52.7)	25.58	16.62
Pre Hypertension (120-139) (80-89)	227 (42.4)	40.30	14.32
Hypertension Stage-1 (140-159) (90-99)	17 (3.2)	45.82	11.48
Hypertension Stage-2 (≥160) (≥100)	9 (1.7)	53.77	16.02
Total	535 (100)		

(Figures given in parentheses are percentages)

Out of total 602 subjects, 535 (89%) had no past history of hypertension. Out of 535, majority 282 (52.7%) had normal blood pressure with mean age

of 25.28±16.62 years.227 (42.4%) had pre-hypertension with mean age of 40.30±14.32 years. 17 (3.2%) had Hypertension stage 1with mean age of 45.82±11.48 years. 9 (1.7%) had hypertension stage 2 with mean age of 53.77±16.02 years.

Table: 5 Distribution of the study population according to socio economic class and categories of their blood pressure

Category Blood Pressure (mmHg) Systolic Diastolic	Socio Economic Class			Total
	Lower	Middle	Upper	
Normal or Pre hypertensive (<140) (<90)	167 (90.2) (32.8)	190 (82.2) (37.3)	152 (81.7) (29.8)	509 (93.6) (100)
Hypertensive (≥140) (≥90)	18 (9.8) (19.4)	41 (17.8) (44.1)	34 (18.3) (36.5)	93 (6.4) (100)
Total	185 (100)	231 (100)	186 (100)	602 (100)

(Figures given in parentheses are percentages)
 Chi square: 6.709 Degree of Freedom: 2 p=0.035
 Out of total 185 subjects from lower socioeconomic class, 167 (90.2%) were nonhypertensive followed by 18 (9.8%) subjects were hypertensive. Out of total 231 subjects from middle socioeconomic class, 190 (82.2%) were nonhypertensive followed by 41 (17.8%) subjects were hypertensive. Out of total 186 subjects from upper socioeconomic class, 152 (81.7%) were nonhypertensive followed by 34 (18.3%) subjects were hypertensive. Out of 93 subjects, who had hypertension, prevalence (80.6%) was more among subjects from middle and upper socio economic class. Association between blood pressure category and socio economic classes was statistically significant. (p<0.05)

Table: 6 Distribution of the study population according to categories of their Body Mass Index (BMI) and categories of their blood pressure

BMI	Category Blood Pressure (mmHg) Systolic Diastolic		Total
	Normal or Pre	Hypertensive (≥140) (≥90)	
Normal (<120) (<80) or Pre Hypertension (120-139) (80-89)	143 (28.1)	366 (71.9)	509 (100)
Hypertension Stage-1 (140-159) (90-99) or	31 (33.3)	62 (66.7)	93 (100)

	hypertensive (<140) (<90)		
<18.5 (Chronic Energy Deficient)	88 (17.3)	3 (3.2)	91 (15.1)
18.5-22.9 (Normal)	161 (31.6)	23 (24.7)	184 (30.6)
23-24.9 (Overweight)	83 (16.3)	13 (14.0)	96 (15.9)
≥25 (Obese)	177 (34.8)	54 (58.1)	231 (38.4)
Total	509 (100)	93 (100)	602 (100)

(Figures given in parentheses are percentages)
 Chi square: 22.895 Degree of freedom: 3 p<0.0001
 Out of total 509 subjects with normal blood pressure, majority 177 (34.8%) were obese (≥25BMI), 161 (31.6%) subjects had normal BMI followed by 88 (17.3%) and 83 (16.3%) subjects had BMI of <18.5 (Chronic Energy Deficient) and 23 to 24.9 BMI (Overweight) respectively. Out of total 93 hypertensive subjects, 54 (58.1%) subjects were (≥25 BMI), 23 (24.7%) subjects had normal BMI followed by 13 (14.0%) and 83 3 (3.2%) subjects had 23 to 24.9 BMI and BMI of <18.5 respectively. Association between categories of BMI and Hypertension was strongly significant. (p<0.0001)

Table: 7 Distribution of the study population according to family history of hypertension and categories of their blood pressure

Category Blood Pressure (mmHg) Systolic Diastolic	Family history of hypertension		Total
	Yes	No	
Normal (<120) (<80) or Pre Hypertension (120-139) (80-89)	143 (28.1)	366 (71.9)	509 (100)
Hypertension Stage-1 (140-159) (90-99) or	31 (33.3)	62 (66.7)	93 (100)

Hypertension Stage-2 (≥ 160) (≥ 100)			
Total	174 (28.9)	428 (66.7)	602 (100)

(Figures given in parentheses are percentages)
Chi square: 1.05 Degree of Freedom: 1 $p=0.305$
*Here if systolic and diastolic blood pressure fell into different categories, the higher category had been selected to classify the individual's blood pressure.

Out of 509 subjects with normal blood pressure or pre hypertension majority 366 (71.9%) subjects had negative family history of hypertension while 143 (28.1%) had positive family history of hypertension. Out of 93 hypertensive subjects majority 62 (66.7%) had negative family history of hypertension while only 31 (33.3%) had positive family history of hypertension. The association between family history of hypertension and blood pressure category were not statistically significant. ($p=0.305$)

Table: 8 Distribution of the study population according to Tobacco consumption and categories of their blood pressure

Category Blood Pressure (mmHg) Systolic Diastolic	Tobacco Consumption		Total
	Yes	No	
Normal (<120) (<80) or Pre Hypertension (120-139) (80-89)	27 (5.3)	482 (94.7)	509 (100)
Hypertension Stage-1 (140-159) (90-99) or Hypertension Stage-2 (≥ 160) (≥ 100)	8 (8.6)	85 (91.4)	93 (100)
Total	35 (5.8)	567 (94.2)	602 (100)

(Figures given in parentheses are percentages)
Chi square: 1.56 Degree of Freedom: 1 $p=0.211$
*Here if systolic and diastolic blood pressure fell into different categories, the higher category had been selected to classify the individual's blood pressure.
Out of 509 subjects with normal blood pressure or pre hypertension majority 482 (94.7%) subjects

had negative tobacco history while 27 (5.3%) consumed tobacco in some form. Out of 93 hypertensive subjects majority 85 (91.4%) had negative tobacco history while only 8 (8.6%) consumed tobacco in some form. The association between tobacco consumption and blood pressure category was not statistically significant. ($p=0.211$)

Discussion:

Prevalence of Hypertension

In our study, out of 535 subjects who had not history of hypertension, majorities 282 (52.7%) subjects had normal blood pressure. Out of total 535 subjects, 227 (42.4%) subjects had pre hypertension followed by 17 (3.2%) and 9 (1.7%) subjects had hypertension stage 1 and hypertension stage-2. Out of total 602 subjects, 509 (84.6%) had normal blood pressure or pre hypertension and 67 had history of hypertension. So, out of 602 subjects $67+26=93$ subjects had hypertension. Prevalence of hypertension in our study was 15.4%.

The prevalence of hypertension in India is reported as ranging from 10 to 30.9%^[10]. Recently, a study conducted among labour population of Gujarat reported prevalence of hypertension to be 16.9% as per WHO criteria^[11]. The prevalence will increase even further unless broad and effective preventive measures are implemented.

Hypertension and different socio economic classes

In our study, out of total 602 subjects, majority 231 (38.4%) subjects were from middle socio economic class followed by 186 (30.9%) and 185 (30.7%) subjects were from upper and lower socio economic class respectively. Out of total 185 subjects from lower socio economic class, 167 (90.2%) were nonhypertensive followed by 18 (9.8%) subjects were hypertensive. Out of total 231 subjects from middle socio economic class, 190 (82.2%) were nonhypertensive followed by 41 (17.8%) subjects were hypertensive. Out of total 186 subjects from upper socio economic class, 152 (81.7%) were nonhypertensive followed by 34 (18.3%) subjects were hypertensive.

44% of the hypertensive subjects ($n=93$) belonged to middle socio economic class followed by 36.5% from upper socio economic class and only 19.4% belonged to lower socio economic class.

In our study, association between blood pressure category and socio economic classes was statistically significant. ($p < 0.05$)

In Singh R.B. et al^[12] the prevalence of hypertension ($>140/90$) and its risk factors were significantly associated with level of socio economic class in a cohort of rural population in North India. This relation persisted after adjustment of age but declined after the addition of other lifestyle characteristics in a multivariate analysis. Over weight and obesity and sedentary lifestyle were also prevalent among upper and middle social classes subjects However, physical activity was greater among subjects of lower socio economic class.

Hypertension and Age

In our study, out of total 320 females, 119 (37.2%) females were in the age group of 20-39 years followed by 95 (29.7%) and 65 (20.3%) females were in the 40-59 years and <20 years age groups respectively. Only 41 (12.8%) females were in ≥ 60 years age group. Out of total 282 males, 82 (29.1%) males were in the age group of 20-39 years followed by 89 (31.6%) and 78 (27.7%) males were in the 40-59 years and <20 years age groups respectively. Only 33 (11.7%) males were in ≥ 60 years age group. Association between age and gender was not statistically significant. ($p = 0.188$)

In our study, out of total 509 subjects with normal blood pressure, majority 195 (38.3%) were in the age group of 20-39 years, 143 (28.1%) subjects were in the age group of <20 years followed by 139 (27.3%) and 32 (6.3%) subjects were in the age groups of <40 -59 years and ≥ 60 years respectively.

Out of total 93 hypertensive subjects, 42 (45.2%) subjects were in the age group of ≥ 60 years followed by 38 (40.9%) and 13 (14.0%) subjects were in the age groups of 40-59 years and 20-39 years respectively. The association between age and blood pressure category was statistically significant. ($p < 0.0001$)

In our study, out of total 602 subjects, 535 (89%) had no past history of hypertension.

Out of 535, majority 282 (52.7%) had normal blood pressure with mean age of 25.28 ± 16.62 years. 227 (42.4%) had pre hypertension with mean age of 40.30 ± 14.32 years. 17 (3.2%) had Hypertension stage 1 with mean age of 45.82 ± 11.48 years. 9

(1.7%) had hypertension stage 2 with mean age of 53.77 ± 16.02 years.

In Parikh S. et al^[9] mean age of population surveyed was 37.2 years in nonhypertensive while in hypertensive it was 49.8 years, which was significantly higher.

In our study, the proportion of hypertension was found to increase steadily with the increase in age. These findings are coherent with study carried in rural Wardha^[14]. Such changes of blood pressure with age might be due to changes in vascular system i.e. atherosclerotic changes in blood vessels.

Awareness about hypertension and Mean age of first detection

In present study, out of total 602 subjects, 535 (89%) had no past history of hypertension while 67 (11%) subjects had history of hypertension and currently they were on medication of hypertension and out of 535 majorities 282 (52.7%) subjects had normal blood pressure. Out of total 535 subjects, 227 (42.4%) subjects had pre hypertension followed by 17 (3.2%) and 9 (1.7%) subjects had hypertension stage 1 and hypertension stage-2.

These 26 subjects were not aware about their hypertensive status. They were newly detected. The mean age of first detection of subjects who had hypertension stage 1 was 45.82 ± 11.48 years and hypertension stage 2 was 53.77 ± 16.02 years.

In Parikh S. et al^[9] 33.3% were aware about their status, 22.9% of those aware had controlled blood pressure which was lower than Chandigarh, where 57.7% were aware about their status, 59.6% of those aware were on treatment & 66% of those on treatment had controlled blood pressure^[17]. In India and its surrounding countries, awareness level is $< 45\%$. Adequacy of control of blood pressure is abysmal and has been achieved in $< 10\%$ of hypertensive. The control rate in India is less than half of that in the west.

Hypertension and Physical activity and BMI

In our study, out of total 602 subjects, majority 231 (38.4%) subjects were obese (≥ 25 BMI) followed by 184 (30.6%) and 96 (15.9%) subjects had normal BMI (18.5-22.) and overweight category BMI (23.0-24.9) respectively. Only 91 subjects (15.1%) had BMI < 18.5 (Chronic energy deficient category). Out of total 509 subjects with normal blood pressure, majority 177 (34.8%) were obese (≥ 25 BMI), 161 (31.6%) subjects had normal BMI followed by 88

(17.3%) and 83 (16.3%) subjects had BMI of <18.5 and 23 to 24.9 BMI respectively. Out of total 93 hypertensive subjects, 54 (58.1%) subjects were (≥ 25 BMI), 23 (24.7%) subjects had normal BMI followed by 13 (14.0%) and 83 (3.2%) subjects had 23 to 24.9 BMI and BMI of <18.5 respectively. Association between categories of BMI and Hypertension was strongly significant. ($p < 0.0001$) In Parikh S. et al^[9], no heavy worker was hypertensive. While 4 (3.4%) moderate workers had hypertension which is significantly lower (z value=8.27, $P < 0.001$) than 31.1% prevalence amongst sedentary worker. Somewhat same findings were reported in urban areas of Chandigarh^[15], there 86.8% of hypertensive was in sedentary activity group & risk of developing hypertension was 35% in person who did not engage in vigorous exercise.

Hypertension and Gender

In our study, out of total 602 subjects, 320 (53.2%) were female while 282 (46.8%) were male. Out of total 320 females, 270 (84.4%) were nonhypertensive followed by 50 (15.6%) females were hypertensive. Out of total 282 males, 239 (84.8%) were nonhypertensive followed by 43 (15.2%) males were hypertensive. Out of total 93 hypertensive subjects, 50 (53.8%) were females and 43 (46.2%) were males. Prevalence of hypertension stage 1 or 2 was almost equal among males and females. Association between blood pressure category and gender was not statistically significant. ($p=0.89$)

In Parikh S. et al^[9] there was no significant difference between prevalence among the male (23.2%) was higher than females (22.5%) (Z value 0.06, $p > 0.05$). Prevalence of hypertension among males (23.2%) & females (22.5%) was lower than as reported by Gupta et al (males-30%; Females-33%) in the same age group^[13].

Hypertension and Tobacco consumption

In present study, out of 509 nonhypertensive subjects, majority 482 (94.7%) subjects had negative tobacco history while 27 (5.3%) consumed tobacco in some form. Out of 93 hypertensive subjects majority 85 (91.4%) had negative tobacco history while only 8 (8.6%) consumed tobacco in some form. Association between tobacco history and blood pressure category was not statistically significant. ($p=0.211$)

In Parikh S. et al^[9], 85 (40.2%) of males had habit of tobacco consumer which was lower than 51.3% in men and 10.3% in women among individuals >15 years of age according to the National Sample Survey (NSS) and 46.5% in men and 13.8% in women based on the National Family Health Survey-2 (NFHS-2)^[3]. Prevalence of tobacco consumption in hypertensive was 43.4% which was significantly higher than 14.5% prevalence rate amongst normotensives (Z value=5.1, $P < 0.001$). Prevalence of tobacco consumption in hypertensive was (43.4%) 40 out of 49 hypertensive males (81.6%) had habit of tobacco either in chewing or smoking form. As none of the female was tobacco consumer, tobacco consumption was found to be one of the major risk factor for hypertension in males.

CONCLUSIONS

We made following conclusions from our study:-

- Prevalence of hypertension is 15.4% in Ahmedabad city.
- Hypertension is more prevalent in middle socio economic class followed by upper socio economic class and lower socio economic class.
- Incidence of hypertension increase above the age of 40.
- Hypertension is more prevalent in obese people.

Findings of present study strongly indicate that we need to raise awareness among the people particularly of middle class about hypertension and its complications. They should be taught preventive measures like healthy life style and importance of physical fitness. They should be motivated for regular health checkups after the age of 40 for early diagnoses and treatment of hypertension. Controlling blood pressure should be the national priority. Strategies for prevention and treatment of hypertension should be planned at all levels right from government program to personal care.

ANNEXURE

Some criteria and definitions used in the study

Age: Completed age in years on the last birth days was calculated from the valid id proof.

Socio – Economic Classification: For this Modified Prasad's classification was adopted.

Modified Prasad's Classification (AICPI Rs. 876 for August 2016)

Social Class	Income Per month Per capita Rs.
I	Rs. 4318 and above
II	Rs. 2159 to Rs. 4317
III	Rs. 1296 to Rs. 2158
IV	Rs. 648 to Rs. 1295
V	Less than Rs. 648

Social Class -I Upper Socio Economic Class
Social Class II and III – Middle Socio Economic Class
Social Class IV and V – Lower Socio Economic Class

BMI Category ^[2]
<18.5 Chronic Energy Deficient
18.5-22.9- Normal
23-24.9 –Overweight
≥ 25 –Obese

REFERENCES

1. K.Park, Epidemiology of chronic non-communicable diseases and conditions. In, Textbook of Preventive and Social Medicine, 20th edition, Jabalpur, Bhanot Publishers, 2009;335-336
2. National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Disease and Stroke (NPCDCS): Developed under the Government of India – WHO Collaborative Programme 2008-2009
3. Reddy KS, Gupta PC: *Report on tobacco control in India—Executive summary*. New Delhi: Ministry of Health and Family Welfare, Government of India; 2005:4-10
4. Gupta R. Trends in hypertension epidemiology in India. *J Hum Hypertens* 2004; 18:73–78
5. Noncommunicable diseases country profiles 2011. http://www.who.int/nmh/countries/ind_en.pdf [Accessed 10 May 2013]
6. Raghupathy Anchala *et al.* Hypertension in India: a systematic review and meta-analysis of prevalence, awareness, and control of hypertension 2014 Jun; 32(6): 1170–1177.
7. Lopez AD, Mathers CD, Ezzati M, Jamison DT, Murray CJ. Global and regional burden of disease and risk factors, 2001: systematic analysis of population health data. *Lancet* 2006; 367:1747–1757
8. Kearney PM, Whelton M, Reynolds K, Muntner P, Whelton PK, He J. Global burden of hypertension: analysis of worldwide data. *Lancet* 2005; 365:217–223
9. S. Parikh, J. Choksi, D.V. Bala. The study of epidemiology and determinants of hypertension in urban health training center (UHTC). *Gujarat Medical Journal* 2011; 66: 22-27
10. Padmavati S. A meta-analysis-National Heart Institute, New Delhi. *Ind Heart J* 2002; 54:99-102
11. Tiwari RR. Hypertension and epidemiological factors among tribal labour population in Gujarat. *Indian Journal of Public Health* 2008; 52(3):144-146
12. Singh RB, Sharma JP, Rastogi V, Niaz MA, Singh NK. Prevalence and determinants of hypertension in the Indian social class and heart survey. *Journal of Human Hypertension* (1997) 11, 51–56
13. Gupta R., Gupta S., Gupta V. P., Hariprakash – Prevalence and Determinants of Hypertension in the urban population of North India. *Journal of Hypertension* 1995; 13:1193-2000.
14. Deshmukh PR, Gupta SS, Dongre AR, Barambe MS, Maliye C, Kaur S, Garg BS. Relationship of anthropometric indicators with blood pressure levels in rural Wardha. *Indian J Med Res* 2006; 123: 657-664.
15. Sushil K. Ahlawat, MMC Singh, R.Kumar, S.Kumari, B.K.Sharma Time trend in the prevalence of Hypertension & associated risk factors in Chandigarh. *Journal Of Indian Medical Association* Sep.2002; Vol.100(9):547-555

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