ASSOCIATION OF BODY MASS INDEX WITH SOME OF THE RISK FACTORS OF CARDIOVASCULAR DISEASES IN THE AGE GROUP OF 45 YEARS AND ABOVE IN URBAN SLUMS OF DIBRUGARH TOWN

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ABSTRACT

BACKGROUND

Cardiovascular Disease (CVD) is the largest single contributor to global morbidity and mortality in the adult population and will continue to dominate the trends in the future.

The aim of the study is to find out the association of Body Mass Index (BMI) with some of the risk factors of cardiovascular disease.

MATERIALS AND METHODS

A community-based cross-sectional study was conducted in the urban slums of Dibrugarh, to find the association of BMI with some of the risk factors of cardiovascular disease in the adult population of 45 years and above living in the urban slums of Dibrugarh. This study was conducted among 208 subjects from May 2015-October 2015. Each study subject was interviewed on sociodemographic variables with the help of a pretested questionnaire. The blood pressure of participants was measured following the standard operation procedures as laid down by the WHO. Height, weight, waist circumference and hip circumference were measured. Data were analysed by use of percentage and Chi-square tests.

RESULTS

The overall prevalence of hypertension and diabetes from history and medical records was 46.63% and 14.90%, respectively. Hypertension was predominant in females 50 (46.3%) than males 43 (43%), while diabetes was predominant among males 18% (18) than females 12.04% (13). A 33.17% of the study participants had a BMI of 18.5-22.9. Abnormal waist-hip ratio (>0.9 cm in males) was observed in 76% and (>0.85 cm in females) was observed in 75.93%, respectively. A statistical significance exists between WHR and BMI in both males ($p < 0.0172$) and females ($p < 0.0129$). Among the female participants, association between diastolic hypertension and BMI ($p < 0.0131$) was found to be significant.

CONCLUSION

The risk factors of cardiovascular diseases are highly prevalent among urban slum population also which needs measures to control them.

KEYWORDS

Prevalence, BMI, Hypertension, Diabetes, WHR.

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BACKGROUND

Hypertension is a chronic condition of concern due to its role in the causation of coronary heart disease, stroke and other vascular complications. It is the commonest cardiovascular disorder posing a major public health challenge to the population in socioeconomic and epidemiological transition. It is one of the major risk factors for cardiovascular mortality, which accounts for 20-50% of all deaths.[1]

An estimated 17 million people die of CVDs every year, particularly due to heart attacks and strokes. A substantial number of these deaths can be attributed to tobacco smoking, which increases the risk of dying from coronary heart disease and cerebrovascular disease 2-3 fold. WHO review in 2016 stated that CVDs are the number one cause of death globally, more people die annually from CVDs than from any other cause. Inappropriate nutrition, insufficient physical activity, increased tobacco consumption, overweight, central obesity, high blood pressure, dyslipidaemia and diabetes are the factors contributing principally to increased risk of cardiovascular diseases among people above 45 years. Data shows that overall cardiovascular disease is the top killer of Indians accounting

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for 23 percent of all deaths in 2010-13 as compared to 20 percent in 2004-06, 2.6 million. India suffers the highest loss in potentially productive years of life due to deaths from cardiovascular diseases on people aged 35-64 years.[2] Indians experience Coronary Heart Disease (CHD) deaths, a decade earlier than in the developed countries, 52 percent of deaths occur below the age of 70 years in India as compared to 23 percent of similar age groups in the latter.[3] In global comparison, other researchers have also predicted that CHDs are emerging major health problems and will be the leading cause of disability by 2020.[4,5]

Overall, economic growth and globalisation have helped surfacing of CHDs even in the developing countries where they were conventionally labelled as the diseases of affluence.[6] The proportion of urban poor with an increasing trend in the developing world is due to migration of rural population who have to bear the stress of urban lifestyles with the underprivileged economy and poor healthcare delivery services. Health hazards of urban slum dwellers are directly affected by poverty, pollution and stressful environment. With the increase in urban population of India to 31.80 percent, 22.76 percent now dwell in urban slums; urbanisation is expected to rise to 50 percent by 2021 and the proportion of urban poor will double in 5 years.[7,8]

The people of 45 years and above comprise a major part of the population. According to Census 2011 reports people within 45-60 years comprise 12.9% and people above 60 years comprise 8.3% of population in India.[9]

This study was undertaken to get baseline data on the prevalence and association of Body Mass Index (BMI) with some of the risk factors of CVD in the age group of 45 years and above living in the urban slums of Dibrugarh.

MATERIALS AND METHODS

Study Type and Setting- A community-based cross-sectional study was conducted in urban slums of Dibrugarh town. Dibrugarh town is the headquarters of Dibrugarh district located in the southern bank of river Brahmaputra. Dibrugarh town has a population of 1,38,661 with approximately 28% people living in slums as per the census 2011. There are 10 registered slums. Participants from each slum were enrolled by proportionate allocation.

Timeline- The study was conducted for 6 months starting from May 2015 to October 2015.

Study Subjects- The study subjects included people aged 45 years and above.

Inclusion Criteria- All the people who were aged 45 years or older and residing for more than 6 months in the study area were included.

Exclusion Criteria- Individuals who had not given consent to participate in the study, seriously ill/unable to answer the questions and individuals younger than 45 years.

Sample size calculation- Considering the prevalence of hypertension as 60%,[29] degree of accuracy as 7% and 10% nonresponse rate, a sample size of 206.96 (rounded off to 208) was calculated.

Data Collection Tools and Techniques- Study Tools- A predesigned pretested schedule with socioeconomic variables (occupation, income and socioeconomic status) demographic variables (age, gender, religion, marital status, and type of the family) and anthropometric variables weight (kg), height (m), waist circumference (cm), hip circumference (cm) and blood pressure (mmHg).

Data Collection Procedure- The participants were enrolled in the study by house-to-house visit. Eligible people were explained the purpose of the study and informed consent was obtained from each respondent prior to the interview and physical examination. A predesigned, pretested interview schedule incorporated sociodemographic and anthropometric variables. The female participants were examined in the presence of female attendant or female family members. Medical records available with the participants were asked to know about the health status of the participants. The participants were made aware accordingly about hypertension and lifestyle modification, if required.

Blood pressures were taken by mercury sphygmomanometer using the auscultatory method and was considered hypertensive if the Systolic Blood Pressures (SBP) of 140 mmHg or greater and/or diastolic blood pressure of 90 mmHg or greater (JNC 2007). Weight was recorded using calibrated weighing machine up to 0.10 kg wearing no shoes with light clothing. Height was recorded to the nearest centimetre (0.1 cms) using portable stadiometer. BMI was calculated by the standard formula of weight in kg/height in m^2 and >25 was taken as cutoff for overweight.

Waist Circumference (WC) was measured using flexible nonstretchable measuring tape in standing position. The subjects were asked to stand erect in a relaxed position with both feet together on a flat surface; one layer of clothing was accepted. The WC was measured at the end of a normal respiration, at the approximate midpoint between the lower margin of the last palpable rib and the top of the iliac crest.

Hip circumference was measured around the widest part of the buttocks with a resistant tape with the subject wearing light clothing and stand with hands hanging freely, feet positioned close together and weight distributed evenly across the feet, while taking the reading. Waist-to-Hip Ratio (WHR) was calculated by Waist Circumference (WC) in cm/hip circumference in cm. Cutoffs for high WHR were >0.90 in males and >0.85 in females.

The weight and blood pressure measuring instruments used were standardised for its accuracy from time to time.

Statistical Analysis- The data was analysed by using percentages and appropriate statistical tests of significance (Chi-square test) were employed.

RESULTS

The study population of 208 participants comprised of 48.08% males and 51.92% of females. Highest number of participants were in the age range of 60-69 yrs. (45.67%), most of the participants were Islam by religion (56.73%). A total of 80 participants (38.46%) were illiterate, while

30.77% had high school education and above. Most of the participants (40.38%) belonged to class IV socioeconomic status by Modified Scale of Kuppuswamy's classification (Table 1).

Variables		Frequency	Percentage
Age (years)	45-59	56	26.92
	60-69	95	45.67
	70-79	43	20.67
	>80	14	6.73
Sex	Males	100	48.08
	Females	108	51.92
Religion	Hindu	89	42.79
	Islam	118	56.73
	Christian	1	00.48
Socioeconomic status	Class I	4	1.92
	Class II	46	22.12
	Class III	45	21.63
	Class IV	84	40.38
	Class V	29	13.94
Literacy level	Illiterate	80	38.46
	Primary school	41	19.71
	Middle school	23	11.06
	High school	38	18.27
	Higher secondary	13	6.25
	Graduate and above	13	6.25

Table 1. Sociodemographic Profile of Participants

The prevalence of hypertension by history and medical records was 46.63% (97), 43% (43) among males and 50% (50) among females. Study participants never screened for hypertension was 13.94% (29). Among the hypertensives, 75.26% (73) were under antihypertensive medication. Overall prevalence of diabetes by history and medical records was 14.90% (31), 18% (18) among males and 12.04% (13) among females. Among the diabetics, 77.42% (24) were on medication, whereas 45.67% (95) of the subjects were never screened for diabetes (Table 2).

Variables		Number (N=208)	Male (N=100)	Female (N=108)
Hypertension	Yes	97 (46.6)	43 (43)	50 (46.29)
	No	111 (53.4)	57 (57)	58 (53.71)
Diabetes	Yes	31 (14.9)	18 (18)	13 (12.04)
	No	177 (85.09)	82 (82)	95 (87.96)

Table 2. Prevalence of Hypertension and Diabetes as per the History and Medical Records

The frequency distribution of various risk factor shows 33.17% of the study participants had a normal BMI of 18.5-22.9, while 34.62% had a BMI of ≥25. The overall overweight and obesity is 24.0% and 29.0% respectively, among males. Of the female participants, 14.8% had a BMI of more than 23 kg/m^2, while prevalence of obesity (>25 kg/m^2) is higher in females (39.8%) than in males (29%). In our study, 24% males and 12.03% females were underweight (BMI <18.5 kg/m^2).

Abnormal waist-hip ratio (>0.9 cm in males) was observed in 76% and WHR (>0.85 cm) in females was observed in 75.93%, respectively. Out of the 208 participants, 43.75% had a systolic pressure of ≥140 mm of Hg, while 35.58% had a diastolic pressure of ≥90 mmHg (Table 3).

Variables		Frequency	Percentage
BMI (N=208)	<18.5	37	17.79
	18.5-22.9	69	33.17
	23-24.9	30	14.42
	25-29.9	49	23.56
	≥30	23	11.06
WHR of males (N=100)	≤0.9	24	24.00
	>0.9	76	76.00
WHR of females (N=108)	≤0.85	26	24.07
	>0.85	82	75.93
Systolic blood pressure (N=208)	<140 mmHg	117	56.25
	≥140 mmHg	91	43.75
Diastolic blood pressure (N=208)	<90 mmHg	134	64.42
	≥90 mmHg	74	35.58

Table 3. Frequency Distribution of Various Factors

WHR among males (>0.9) was found significantly higher (31.58% in each group) in the BMI group of (18.5-22.9) and (25-29.9) (p=0.0172) and among females WHR (>0.85) was found significantly higher (30.49%) in the BMI group of (18.5-22.9) (p=0.0129). Among the males, systolic hypertension (BP ≥140 mmHg) was found to be higher (34.15%) in the BMI group of (18.5-22.9), and among females, it was more (28% in each group) in the BMI group (18.5-22.9) and (25-29.9) (p=>0.05). A higher percentage (30.30% each) of males with diastolic hypertension (≥90 mmHg) were in the BMI group of (<18.5) and (18.5-22.9) (p=>0.05), and among the females, a higher percentage (39.02%) found in the BMI group (25-29.9) (p=0.0131). BMI group (25-29.9) had a higher percentage (38.89%) males with history of diabetes and it was same for females also (p=>0.05). A higher percentage (32.56%) of males with history of hypertension were in the BMI group of (18.5-22.9), and among females, it was more (27.78%) in the BMI group of (18.5-22.9) and (25-29.9) (p=>0.05) (Table 4).

Variables			BMI					P-value
			<18.5	18.5-22.9	23-24.9	25-29.9	≥30	
WHR	Male (n=100)	≤0.9 (n=24)	10 (41.67%)	9 (37.5%)	2 (8.33%)	1 (4.17%)	2 (8.33%)	0.0172
		>0.9 (n=76)	14 (18.42%)	24 (31.58%)	12 (15.79%)	24 (31.58%)	2 (2.63%)	
	Female (n=108)	≤0.85 (n=26)	7 (26.92%)	11 (42.31%)	3 (11.54%)	1 (3.85%)	4 (15.38%)	0.0129
		>0.85 (n=82)	6 (7.32%)	25 (30.49%)	13 (15.85%)	23 (28.05%)	15 (18.29%)	
Systolic Hypertension	Male (n=100)	<140 mmHg (n=59)	15 (25.42%)	19 (32.20%)	10 (16.95%)	12 (20.34%)	3 (5.08%)	0.5999
		≥140 mmHg (n=41)	9 (21.95%)	14 (34.15%)	4 (9.76%)	13 (31.71%)	1 (2.44%)	
	Female (n=108)	<140 mmHg (n=58)	9 (15.52%)	22 (37.93%)	8 (13.79%)	10 (17.24%)	9 (15.52%)	0.4262
		≥140 mmHg (n=50)	4 (8.00%)	14 (28.00%)	8 (16.00%)	14 (28.00%)	10 (20.00%)	
Diastolic Hypertension	Male (n=100)	<90 mmHg (n=67)	14 (20.90%)	23 (34.33%)	9 (13.43%)	18 (26.87%)	3 (4.48%)	0.8502
		≥90 mmHg (n=33)	10 (30.30%)	10 (30.30%)	5 (15.15%)	7 (21.21%)	1 (3.03%)	
	Female (n=108)	<90 mmHg (n=67)	10 (14.93%)	27 (40.30%)	11 (16.42%)	8 (11.94%)	11 (16.42%)	0.0131
		≥90 mmHg (n=41)	3 (7.32%)	9 (21.95%)	5 (12.20%)	16 (39.02%)	8 (19.51%)	
Diabetes	Males (n=100)	Yes (n=18)	1 (5.56%)	6 (33.33%)	4 (22.22%)	7 (38.89%)	0	0.1370
		No (n=92)	23 (25.00%)	27 (29.35%)	10 (10.87%)	18 (19.57%)	4 (4.35%)	
	Females (n=108)	Yes (n=13)	0	2 (15.38%)	2 (15.38%)	5 (38.46%)	4 (30.77%)	0.3039
		No (n=95)	13 (13.68%)	34 (35.79%)	14 (14.74%)	19 (20.00%)	15 (15.79%)	
Hypertension	Males (n=100)	Yes (n=43)	11 (25.58%)	14 (32.56%)	6 (13.95%)	11 (25.58%)	1 (2.33%)	0.9607
		No (n=57)	13 (22.81%)	19 (33.33%)	8 (14.04%)	14 (24.56%)	3 (5.26%)	
	Females (n=108)	Yes (n=54)	3 (5.56%)	15 (27.78%)	8 (14.81%)	15 (27.78%)	13 (24.07%)	0.0650
		No (n=54)	10 (18.52%)	21 (38.89%)	8 (14.81%)	9 (16.67%)	6 (11.11%)	

Table 4. Association of Various Factors with BMI

Above table shows a statistical significant exists between WHR and BMI in both males and females.

DISCUSSION

We conducted a community-based cross-sectional study in the urban slum population of Dibrugarh town. We found prevalence of hypertension from history was 46.63% (97), while the prevalence of hypertension in various studies varied from 7% to 70%.[10] A low prevalence in hypertension was reported by studies in urban slum of Tirupati (8.6%), slum-resettlement in Delhi (16.36%), slums of Tirupati (22.5%), urban Nellore (29.3%), urban Kolkata (28%), urban slums of Patna (16.36%) and urban Shimoga (25.83%).[11-17] A comparable study was reported by Chainnakali and Mohan and Manandhar et al as 40.5% and 44.9%.[18,19] However, a higher prevalence were reported in geriatric slum population of Kolkata (64%), slums of Surat city (73.3%), tea gardens of Assam (60.8%) and elderly population in Assam (63.63%).[20,21,22,23] In the present study, a higher prevalence of hypertension was found in females (46.3%) than males (43%). Similar studies were reported in geriatric slum population of Kolkata (64.9% vs. 62.9%), rural Puducherry (40.8% vs. 39.2%) tea gardens of Assam (62.2% vs. 59.4%).[20,18,22] However in contrast, a higher prevalence of hypertension was reported in males in studies from slums of Tirupati (30.1% vs. 19.4%), urban Nellore (30.9% vs. 27.7%), urban slums of Patna (18.79% vs. 14.48%), urban Shimoga (27.3% vs. 24.36%) urban slums of Faridabad (17.2% vs. 15.8%) and elderly population of Assam (64.2% vs. 62.89%).[11,14,16-17,24,23]

In most of the studies, the prevalence of hypertension varied. The differences in the prevalence rates are probably related to the definitions adopted, age groups selected as study participants, difference in sociocultural factors, urban-rural variation, differences in slums-tea garden as well as studies done at various time of the year.

We found overall prevalence of diabetes by history was 14.9% (31), 18% (18) among males and 12.04% (13) among females. Pinto VG et al (2004) observed prevalence of diabetes as 15.90% in an urban community of Goa,[25] which is consistent with the present study finding. Similar studies were reported in urban Kolkata with history of diabetes as 13%, while in urban slums of Faridabad, the prevalence of diabetes mellitus reported was 1.4% in men and 1.3% in women.[15,24] Sekhri et al in urban Indian population reported that the overall prevalence of diabetes

was 16% in the study population with no significant difference between men (16.6%) and women (12.7%).[26]

In the present study, the prevalence of obesity (BMI >25 kg/m2) was 39.8% in females and 29% in males, which was much higher than the percentage of overweight men and women (16% vs. 21.9%) in urban slums, Faridabad.[24] Deekala et al reported the proportion of overweight and obesity together as around 49.3% with central obesity based on waist circumference was 35.3%, while in urban slums of Patna, the prevalence of overweight and obese was 31.94%.[11,16] Kandpal V et al in a tribal population of India reported high BMI (57.6%) followed by abdominal obesity (36.4%) and hypertension (35.3%) as the major risk factors among females, while on the other hand, hypertension (57.8%) followed by high BMI levels (54.8%) and abdominal obesity (28.8%) were found to be higher among males.[27] In a study of urban Indian population, it was reported that (47.6%) had a BMI ≥25 kg/m^2 with 46.1% men and 55.5% women being overweight or obese.[26] Todkar et al found that 70.39% study participants were in the range of normal BMI (18.6-24.9), which is much higher than the present study finding of 47.6% (in the range of 18.6-24.9).[28]

The present study revealed that 24% males and 12.03% females were underweight (BMI <18.5 kg/m^2), which is much less than the prevalence of underweight found in urban slums of Faridabad (29% men vs. 21.2% women with (BMI <18.5 kg/m^2).[24] While another study done in tea gardens of Assam reported that majority of the subjects (86.1%) were underweight (BMI <20). More women were underweight as compared to men.[22]

In the present study, waist-hip ratio (>0.9 in males) was observed in 71.8% and (>0.85 in females) was observed in 78.83%, respectively. WHR was found to be more in the BMI class (18.5-22.9) and (25-29.9) in males and BMI class (18.5-22.9) in females, which was statistically significant. So, central obesity is prevalent in the normal BMI group also. Gupta R et al in Jaipur found significant positive correlation between BMI and WHR in both males and females.[29] In the urban slums of Patna, it was seen that the prevalence of central obesity indicators was higher in females as compared to males. The WHR was ~0.88 in 75.2% of the tea garden subjects.[22] The proportion of women having waist-hip ratio >0.85 was higher as compared to men having waist-hip ratio >1 indicating higher risk of developing cardiovascular disease among females.[21]

Out of the 208 participants, 43.75% had a systolic pressure of ≥140 mm of Hg, while 35.58% had a diastolic pressure of ≥90 mm of Hg. However, 4.3% had isolated systolic hypertension (2.3% males and 5.6% females), while prevalence of isolated diastolic hypertension was low, i.e. 0.9% (0.9% males and 1.04% females).

In contrast to the present finding, Kannan reported that 20.4% had only systolic and 19.2% had only diastolic hypertension, which was quite high (18.37%).[30]

CONCLUSION

The study revealed that obesity (general and central) and hypertension, which are the risk factors for CVD are highly prevalent among the slum population also and is a matter of concern in the urban slum population. This burden calls for a sound public health approach to stem the epidemic. Emphasis should be given on measures based on primordial and primary prevention especially from the school level to modify the lifestyle and behaviour of the people of the slum community. There is a need to strengthen the existing surveillance system, so as to monitor, evaluate and guide policies and programmes. With little or no social and health systems to support the urban slum population, this group (especially the females) needs urgent intervention.

Limitations of the Study- The present study did not assess the other risk factors of cardiovascular diseases like physical activity, consumption of alcohol and tobacco, salt intake, etc.

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