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Original Research Article

Burden of pre-hypertension, hypertension and dyslipidemia and its associated risk factors among adult population of urban slums in South Delhi, India

Prerana Anjan Hanumanthiah[1], Manjunatha Ramu[2]*, Ajantha Rudhra[2]

[1]National Institute of Health and Family Welfare, New Delhi, India
[2]ICMR, National Institute of Nutrition, Hyderabad, India

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***Correspondence:**
Dr. Manjunatha Ramu,
E-mail: r.manjunatha@icmr.gov.in

ABSTRACT

Background: Cardiovascular disease is one of the predominant Global health concerns, the burden of CVD risk factors is increasingly shifting, impacting urban slums population.
Methods: A community based cross sectional study among randomly selected two urban slums of South Delhi was conducted to assess the burden of hypertension and its associated risk factors. 246 randomly selected respondents (Women: 144) aged 40 years & above completed the survey along with Anthropometric and biochemical assessments
Results: Prevalence of hypertension is found to be 50.81% (Men: 43.1% and Women: 56.2%. RR 1.3 (95% CI:1.0-1.7)), female Gender (p=0.05), elderly age (p<0.01) and hypercholesterolemia (p<0.01), were significantly associated with hypertension. Pre-hypertension was found to be high (70.1%) among remaining others. Prevalence of self-reported diabetes is found to be 56.8% (Men: 44 (55%) and Women: 68 (58.1%). RR: 1.403 (95% CI: 0.56-3.46)), Assessment of total cholesterol showed that 6.1% (15) and 16.7% (41) were having high and border line high levels respectively, higher proportion of women were having higher levels of dyslipidemia while compared with men (p<0.01). Observations on NCD risk factors shows that Men were having higher proportions of habits of smoking, smokeless tobacco and alcohol while compared with women (p<0.01), but higher proportions of women (95.8%) had abdominal obesity compared to men (p<0.01).
Conclusions: Prevalence of hypertension, pre-hypertension and self-reported diabetes is high among adults of urban slum dwellers and women have higher burden along with hypercholesterolemia and abdominal obesity.

Keywords: Dyslipidemia, Diabetes mellitus, Hypertension, Pre-hypertension, Urban slum

INTRODUCTION

Cardiovascular disease is one of the predominant Global health concerns, which is one of the leading causes of premature mortality and morbidity.[1] In India, cardiovascular diseases are the major contributing factors behind significant proportion of years of life lost and disability-adjusted life years.[2] As per WHO estimates, NCDs contribute to around 5.87 million deaths annually in India which account for around 60 % of all deaths in the Country.[3] India shares more than two-third of the total deaths due to NCDs in the South-East Asia Region (SEAR).[3] As measured through surveys of NFHS-4 (2015-16) and NFHS–5 (2019-20), data related to risk factors of cardiovascular diseases is showing increase in trends of its risk factors in recent years.[4,5] While historically more prevalent in higher socioeconomic strata and urban centers, the burden of cardiovascular disease risk factors such as hypertension, diabetes, obesity and dyslipidemia is increasingly shifting, impacting vulnerable populations residing in urban slums and rural areas.[6,7] This shift highlights the critical need to

investigate and address these risk factors.[8] Studies have consistently shown a high prevalence of non-communicable diseases, including hypertension and diabetes, within urban slum populations in India.[9] Undiagnosed hypertension and diabetes, its irregular treatment are factors of public health concern than diagnosed.[10]

Delhi it the Capital city of India and about 1.78 million people in Delhi reside in Urban slums.[11] Prevalence of hypertension in Delhi's slum areas was reported to be as high as 23% in 2014, with another study revealing a 25.3% prevalence among adults in West Delhi slums.[8,9] This elevated prevalence underscores the urgent need for focused interventions within these communities, particularly given the higher rates of obesity and dyslipidemia observed among hypertensive individuals in these settings.[9] Existence of multiple cardiovascular risk factors like hypertension and dyslipidemia further exacerbates the overall cardiovascular disease risk among these vulnerable populations.[9] This rise is concerning for populations in slum areas, who are already at a greater risk of cardiovascular disease due to various socio-economic and environmental factors.[12] This necessitates a deeper exploration into the socio-demographic and behavioral characteristics contributing to this existing risk, particularly considering the complex interplay of age, gender and familial predispositions.[13] Therefore, this study was undertaken to identify the CVD risk factors including Hypertension, Diabetes, Obesity, Dyslipidemia and its associated risk factors among the urban slum population in Delhi.

METHODS

Study with a community based cross-sectional design was conducted among two randomly selected urban slums of South Delhi namely Coolie Camp and Moti Lal Nehru Camp. The study was conducted over a period of 01 year and 06 months from June 2022 to December 2023. Based on an expected 20% prevalence of hypertension,14 a sample of 246 individuals aged > 40 years individuals selected through a multistage random sampling technique participated in the study. All urban slums in South Delhi were listed and these two urban slums were randomly selected and houses were line listed and 246 houses were randomly selected, one eligible individual aged > 40 year was randomly selected among the selected households.

Participants with established coronary heart disease, stroke and Pregnant women were excluded from the study. The study was reviewed and approved by Institutional Ethics Committee (IEC) of National Institute of Health and Family Welfare (NIHFW), New Delhi. The primary data was collected by interviewing the randomly selected household adults living in these slums, who fulfilled the participation criteria. After getting the written informed consent, the participants were interviewed at their houses in the community ensuring audio-visual privacy, with a pretested semi-structured interview schedule. The behavioral risk factors explored were smoking, smokeless tobacco use, alcohol consumption, fruit and vegetable intake and physical activity. Physical measurements included height, weight, waist circumference, hip circumference, pulse rate and blood pressure; measurements were done using standardized techniques. Total Serum Cholesterol levels were tested, with all standard biomedical safety precautions. Data analysis was conducted using SPSS Version 28.0 software and analyzed using descriptive and analytical techniques with the help of appropriate statistical tests, viz, mean, proportion, chi-square, etc.

RESULTS

246 participants (102 (41.5%) men and 144 (58.5%) women) participated in the study. The mean age of the participants was 53.38+9.34 years (Men: 53.93+9.57 years and women 52.99+9.19 years). Sociodemographic profile of the participants is shown in Table 1.

Status of hypertension

Out of 246 respondents, only 219 participants were aware about their status of BP, remaining 27 respondents were not sure about the status; out of 219, prevalence of self-reported hypertension is found to be 46.5% (Men: 35.9% & Women: 53.8%). Among those who believed that they were normotensives and who were not sure about their status (n=117), it was observed that 18 (15.4%) were hypertensives, 82 (70.1%) were in pre-hypertension status. Overall prevalence of hypertension (Self-reported and newly detected) is found to be 50.81% (Men: 43.1% & Women: 56.2%). Female gender (p=0.05), elderly age (P<0.01) and hypercholesterolemia (p<0.01), were significantly associated with hypertension. Multivariate analysis showed that female gender, elderly age and having higher levels of cholesterol were significantly associated with hypertension (Table 2).

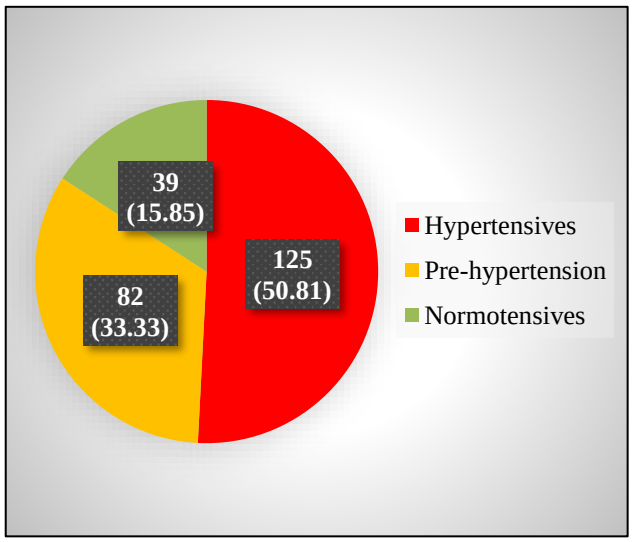

Figure 1: Burden of pre-hypertension and hypertension (n=246).

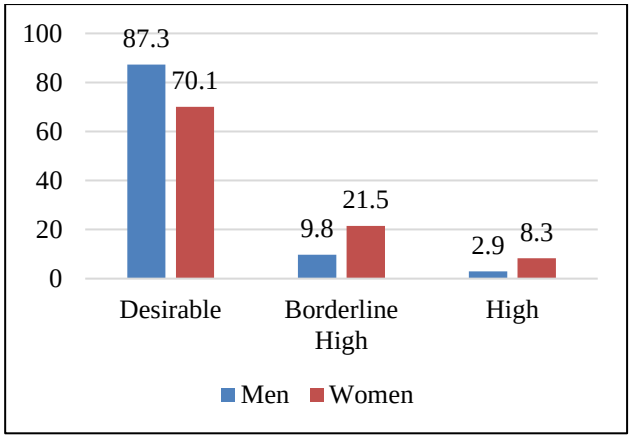

Figure 2: Distribution of total cholesterol levels by gender (n=246).

Status of self-reported diabetes

Regarding the status of diabetes, only 197 were aware about their status and 49 individuals were not sure about their status and out of 197, prevalence of self-reported diabetes is found to be 56.8% (Men: 44 (55%) & Women: 68 (58.1%)).

Status of dyslipidemia

Analysis of distribution of total cholesterol levels shows that 15 (6.1%) and 41 (16.7%) participants were having high and border line high levels of dyslipidemia. Higher proportion of women were having higher levels of dyslipidemia while compared with men ($p<0.01$) (Figure 2).

Observations on NCD risk factors among men and women shows that Men were having higher proportions of habits of smoking, smokeless tobacco and alcohol while compared with women ($p<0.001$), but higher proportions of women had abdominal obesity (95.8%) while compared with men ($p<0.01$). This shows that women have higher burden of dyslipidemia, higher BMI, abdominal obesity and higher burden of hypertension and diabetes.

Table 1: Socio-demographic profile of the study participants (n=246).

Socio-demographic variables	Sub-groups	Number (N)	(%)
Age group (in years)	<50	95	38.6
	50 to 59	75	30.5
	60 to 69	56	22.8
	70 and above	20	8.1
Gender	Male	102	41.5
	Female	144	58.5
Religion	Hindu	206	83.8
	Muslim	22	8.9
	Sikh	1	0.4
	Christian	17	6.9
Caste	General	73	29.7
	OBC	55	22.4
	SC	31	12.6
	ST	3	1.2
	Refused	84	34.1
Marital status	Never married	2	0.8
	Currently married	194	78.9
	Separated	9	3.7
	Divorced	3	1.2
	Widowed	38	15.4
Occupation	Government employee	4	1.6
	Non-government employee	43	17.5
	Self-employed	42	17.1
	Labourer	22	8.9
	Homemaker	105	42.7
	Retired	10	4.1
	Unemployed	20	8.1
Education	No formal schooling	82	33.3
	Less than primary school	13	5.3
	Primary school completed	37	15.1
	Secondary school completed	49	19.9

Continued.

Socio-demographic variables	Sub-groups	Number (N)	(%)
	High school completed	47	19.1
	College /University completed	15	6.1
	Postgraduate degree	3	1.2
Socio economic class (per capita income per month) (as per updated BG Prasad classification (April 2023)			
Upper class (I)	8822 and above	28	11.4
Upper middle Class (II)	4411 – 8821	90	36.6
Middle class (III)	2647 – 4410	67	27.2
Lower middle Class (IV)	1323–2646	45	18.3
Lower class (V)	<1323	16	6.5

Table 2: Association of hypertension with predictor variables (n=246).

	Yes	No	Risk ratio	95% CI	P value
Age group (in years)					
<50	37 (38.9)	58 (61.1)			
50 to 59	39 (52)	36 (48)	1.33	0.95 - 1.86	0.009
60 to 69	35 (62.5)	21 (37.5)	1.6	1.16 - 2.21	
70 and above	14 (70)	6 (30)	1.79	1.22 - 2.63	
Gender					
Male	44 (43.1)	58 (56.9)			
Female	81 (56.2)	63 (43.8)	1.3	1.0 - 1.7	0.05
Religion					
Hindu	102 (49.5)	104 (50.5)			
Christian	8 (47.1)	9 (52.9)	0.95	0.56 - 1.60	
Muslim	14 (63.6)	8 (36.4)	1.28	0.91 1.81	0.4
Sikh	1 (100)	0 (0)	2.01	1.75 2.31	
Socio economic status (per capita income in rupees per month)					
Class I (8822 and above)	14 (50)	14 (50)			
Class II (4411–8821)	46 (51.1)	44 (48.9)	1.02	0.67-1.55	
Class III (2647–4410)	34 (50.7)	33 (49.3)	1.01	0.65-1.57	0.2
Class IV (1323–2646)	19 (42.2)	26 (57.8)	0.84	0.51-1.39	
Class V (<1323)	12 (75)	4 (25)	1.5	0.94-2.39	
Smoking status					
Never smoker	92 (50.8)	89 (49.2)			
Smoker	33 (50.8)	32 (49.2)	0.99	0.75-1.32	1
Smokeless tobacco use					
Never used	96 (48)	104 (52)			
Used	29 (63)	17 (37)	1.31	1.00-1.71	0.09
Alcohol					
Drinker	35 (52.2)	32 (47.8)			
Never used	90 (50.3)	89 (49.7)	0.96	0.73-1.26	0.8
Cholesterol					
Desirable	87 (45.8)	103 (54.2)			
Borderline high	29 (70.7)	12 (29.3)	1.54	1.20-1.98	
High	9 (60)	6 (40)	1.31	0.84-2.03	0.01
Fruits consumption					
Sufficient	38 (45.8)	45 (54.2)			
Insufficient	87 (53.4)	76 (46.6)	1.16	0.88-1.53	0.3
Vegetable consumption					
Sufficient	117 (49.8)	118 (50.2)			
Insufficient	8 (72.7)	3 (27.3)	1.46	0.99-2.14	0.2
BMI					
Normal weight	23 (44.2)	29 (55.8)			
Obese	75 (54)	64 (46)	1.21	0.86-1.71	0.6

Continued.

	Yes	No	Risk ratio	95% CI	P value
Over weight	22 (47.8)	24 (52.2)	1.08	0.70-1.66	
Under weight	5 (55.6)	4 (44.4)	1.25	0.64-2.42	
Abdominal obesity					
No	14 (40)	21 (60)			
Yes	111 (52.6)	100 (47.4)	1.31	0.85-2.01	0.2
Caste					
General	38 (52.1)	35 (47.9)			
Other backward class (OBC)	26 (47.3)	29 (52.7)	0.9	0.63-1.29	0.4
Refused	47 (56)	37 (44)	1.07	0.80-1.43	
Scheduled Caste (SC) / Scheduled Tribe (ST)	14 (41.2)	20 (58.8)	0.79	0.50-1.25	

Table 3: Association of diabetes with predictor variables (n=197).

	Yes	No	Risk ratio	95% CI	Sig.
Gender					
Male	44 (55)	36 (45)			
Female	68 (58.1)	49 (41.9)	1.403	0.56-3.46	0.770
Age group (in years)					
<50	37 (51.4)	35 (48.6)			
50 to 59	42 (65.6)	22 (34.4)	0.940	0.32-2.79	
60 to 69	25 (55.6)	20 (44.4)	0.520	0.17-1.58	
70 & Above	8 (50)	8 (50)	0.800	0.25-2.5	0.350
Religion					
Hindu	92 (56.4)	71 (43.6)			
Muslim	12 (60)	8 (40)	1.550	0.27-8.84	
Sikh	1 (100)	0	0.811	0.15-4.31	
Christian	7 (53.8)	6 (46.2)	0.000	0	0.820
Socioeconomic status (per capita income in rupees per month)					
Class I (8822 and above)	7 (58.3)	5 (41.7)			
Class II (4411–8821)	20 (57.1)	15 (42.9)	0.397	0.079-2.00	
Class III (2647–4410)	34 (61.8)	21 (38.2)	0.456	0.12-1.64	
Class IV (1323–2646)	42 (59.2)	29 (40.8)	0.388	0.11-1.29	
Class V (<1323)	9 (37.5)	15 (62.5)	0.459	0.14-1.43	0.350
Smoking status					
Current smoker	22 (75.9)	7 (24.1)			
Past smoker	9 (45)	11 (55)	0.289	0.09-0.86	
Never smoked	81 (54.7)	67 (45.3)	1.189	0.35-3.98	0.058
Smokeless tobacco use					
Current user	12 (44.4)	15 (55.6)			
Used in the past	4 (44.4)	5 (55.6)	1.836	0.66-5.06	
Never used	96 (59.6)	65 (40.4)	2.536	0.49-12.98	0.251
Alcohol use					
Current drinker	21 (58.3)	15 (41.7)			
Past drinker	13 (72.2)	5 (27.8)	0.467	1.15-1.38	
Life time abstainer	78 (54.5)	65 (45.5)	0.280	0.06-1.16	0.350
Cholesterol classification					
Desirable	86 (56.2)	67 (43.8)			
Borderline high	18 (56.3)	14 (43.8)	2.785	0.69-11.23	
High	8 (66.7)	4 (33.3)	2.936	0.63-13.66	0.778
Fruits consumption					
Insufficient	72 (55.4)	58 (44.6)			
Sufficient	40 (59.7)	27 (40.3)	1.338	0.65-2.72	0.560
Vegetable consumption					
Insufficient	6 (85.7)	1 (14.3)			

Continued.

	Yes	No	Risk ratio	95% CI	Sig.
Sufficient	106 (55.8)	84 (44.2)	0.247	0.02-2.42	0.116
BMI (Kg/m^2)[19]					
Underweight (<18.5)	5 (83.3)	1 (16.7)			
Normal weight (18.5-22.9)	16 (42.1)	22 (57.9)	0.178	0.01-2.36	
Overweight (23-24.9)	22 (61.1)	14 (38.9)	1.606	0.61-4.23	
Obese (> 25)	69 (59)	48 (41)	0.749	0.31-1.80	0.135
Abdominal obesity					
No	14 (58.3)	10 (41.7)			
Yes	98 (56.6)	75 (43.4)	1.287	0.34-4.84	0.709

Table 4: Comparison of mean values of SBP, DBP, Waist circumference, BMI and cholesterol by gender.

Parameter	Men	Women	P value
SBP	136.25±16.37	135.18±16.00	0.6
DBP	84.34±9.52	83.46±8.84	0.46
Waist circumference	95.5±13.10	98.90±11.55	0.03
BMI (Kg/m2)	24.78±4.43	27.25±4.96	<0.01
Total cholesterol (mg/L)	169.70±31.65	188.25±35.50	<0.01

Table 5: Distribution of NCD risk factors by gender.

Smoking	Current smoker	Past smoker	Never smoked	P value
Male	34 (33.3%)	18 (17.6%)	50 (49%)	<0.01
Female	8 (5.6%)	5 (3.5%)	131 (91%)	
Smokeless tobacco	Currently using	Used in the past	Never used	
Male	25 (24.5%)	9 (8.8%)	68 (66.7%)	<0.01
Female	8 (5.6%)	4 (2.8%)	132 (91.7%)	
Alcohol use	Current drinker	Former drinker	Life time abstainer	
Male	39 (38.2%)	19 (18.6%)	44 (43.1%)	<0.01
Female	6 (4.2%)	3 (2.1%)	135 (93.8%)	
Abdominal obesity	Yes	No		
Men	73 (71.6%)	29 (28.4%)		<0.01
Women	138 (95.8%)	6 (4.2%)		

DISCUSSION

Through this study we are reporting that half of the study population from urban slums of Delhi aged 40 years and above are suffering from Hypertension, more than half are self-reporting that they were already diagnosed with diabetes and nearly 1/4th is having hypercholesterolemia; which indicates a higher burden of NCDs among urban slum dwellers in Delhi. A study published in Lancet Diabetes Endocrinol 2023 on Metabolic non-communicable disease health report of India by R M Anjana and group reported a prevalence 17.8% of diabetes, 45% of hypertension, 60.3% of abdominal obesity in general population of Delhi among adults aged 20 years and older, our study included adult populations aged above 40 years, but our study reveals a slightly higher burden of hypertension of 50.81% among adults above 40 years and older the change is almost marginal, important observation is that in their study burden of hypertension was higher among men compared with women; whereas we are reporting that hypertension is significantly high among women compared to men, which indicates that as age advances chances of hypertension among men and women becomes equally high.[20] It's important to note that even though we assessed a self-reported diabetes prevalence which showed that 56.8% reported that they were already diagnosed with diabetes by a healthcare practitioner. Previous study among adults aged 40 years and above among Nicobarese tribes has showed that self-reported diabetes prevalence was only 7.1%, compared to this a very high prevalence of self-reported diabetes prevalence is observed in this study at 56.8% which calls for an immediate action.[21] Study among Nicobarese population had showed that men had lower prevalence of hypertension compared to women and similar findings are found in current study among Delhi urban slum dwellers. Compared to reports by RM Anjana and group, abdominal obesity was high among women; hypercholesterolemia was high among women compared to men, similar findings were observed in our study. Higher burden of dyslipidemia among urban slum

dwellers is noted in our study and these findings are aligning with prior research that highlights disproportionately high prevalence rates were observed comparable urban slum settings, this exacerbates the overall cardiovascular disease risk within these communities, necessitating targeted interventions to mitigate adverse health outcomes.[22,23] The findings challenge the historical perception of these conditions as "diseases of affluence," demonstrating their pervasive presence across diverse socioeconomic strata.[24] Specifically, our findings indicate higher prevalence rates for hypertension, dyslipidemia and diabetes compared to prior studies like the Jaipur Heart Watch-6, suggesting an escalating burden of cardiometabolic risk factors in urban slum populations.[25]

This escalation is further supported by studies indicating that as many as 70% of individuals in general populations within the National Capital Region exhibit metabolic syndrome, a cluster of these risk factors.[25] The substantial evidence linking metabolic syndrome to urban residence and socioeconomic vulnerability further emphasizes the critical need for more research examining its prevalence in India's slum populations.[26,27] Presence of higher burden of hypertension, diabetes, dyslipidemia, obesity among women indicates that they are at risk of cardiovascular events even though habits of smoking, smokeless tobacco, alcoholism is less among them. Such findings highlight the necessity of an anthropological examination of health priorities to ensure that interventions are culturally sensitive and aligned with community realities.[27]

CONCLUSION

Prevalence of hypertension, pre-hypertension and self-reported diabetes is high among adults of urban slum dwellers and women have higher burden along with hypercholesterolemia and abdominal obesity even though they have lesser habits of NCD risk factors compared with men, which calls for immediate actions by conducting regular screening activities for early diagnosis and initiation of treatment for Hypertension, Diabetes, Dyslipidemia with a higher focus on women. Immediate efforts to mitigate NCD risk factors through regular sensitization and awareness activities should to be undertaken to reduce the burden of NCD risk factors in these urban slums.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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