

Prevalence and Determinants of Hypertension and Obesity: A Rural-Urban Comparative Study in Telangana, India

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ABSTRACT

Introduction: Non-communicable diseases (NCD) causes 74% of all deaths occurring worldwide. It is common among all age groups. The main behavioural risk factors included inadequate physical activity, tobacco usage, excessive consumption of alcohol and unhealthy diet. This study aimed for the comparison of risk factors for NCD in rural and urban areas and to determine the factors associated with hypertension and obesity. **Methodology:** This cross sectional study was done in the Rural and Urban field practice area of KMC. 300 adults (150 rural and 150 urban) were chosen through systematic sampling technique. WHO Steps questionnaire was used for the data collection. The data collected was analysed using SPSS. Chi square test was used as the statistical tests of significance. **Results:** The proportion of current tobacco users were 24.7% and 16% and current alcohol users were 56% and 46% in rural and urban respectively. Diet were inadequate and poor in both. Physical inactivity was 90.7% in urban, 52% in rural. Prevalence of Hypertension was 14% and 6%, obesity was 37.3% and 48.7% in rural and urban respectively. Diet was significantly associated with Hypertension and alcohol consumption was significantly associated with obesity in both. **Conclusions:** Both the rural and urban areas had high prevalence of risk factors. Smoking, alcohol consumption and hypertension were higher in rural area whereas physically inactivity and obesity were higher in urban area. Hence appropriate health education regarding NCDs and their risk factors are mandatory.

KEYWORDS: Non Communicable Diseases, Risk factors, Rural, Urban, Adults

INTRODUCTION

Over the last two decades, India has experienced a significant shift in its disease burden, transitioning from malnutrition and infectious diseases to a growing prevalence of non-communicable diseases (NCDs).^[1] Globally, NCDs account for 74% of deaths, with a significant proportion of premature deaths occurring in low- and middle-income countries, including India.^[2] These conditions are responsible for approximately 61.8% of all deaths in India, according to a 2017 report by the Indian Council of Medical Research (ICMR) titled Health of the Nation's States.^[3]

The most common NCDs include cardiovascular diseases, diabetes, chronic respiratory diseases, and certain cancers, which are often linked to behavioral risk factors such as tobacco and alcohol use, unhealthy diets, and lack of physical activity. Physical factors like obesity and hypertension further exacerbate these risks. For instance, hypertension remains one of the most preventable causes of cardiovascular diseases globally.^[4] Urbanization and lifestyle changes have increased these risks, with higher consumption of processed foods, sedentary behaviors, and easy access to tobacco and alcohol.^[5, 6]

Global and national initiatives have sought to address these challenges. The United Nations' Sustainable Development Goals (SDGs) aim to reduce premature mortality from NCDs by one-third by 2030.^[7] Similarly, the World Health Organization (WHO) has set the 25x25 target, aiming for a 25% reduction in global NCD mortality by 2025.^[8] Achieving these goals requires targeted, population-specific interventions tailored to the unique challenges of different communities.

The differences in rural and urban environments significantly influence NCD risk factors. Urban areas often pro-

vide better healthcare access but face challenges such as sedentary lifestyles, increased exposure to processed foods, and higher obesity rates. In contrast, rural areas, while less urbanized, struggle with limited awareness and accessibility to preventive measures, leading to higher tobacco and alcohol consumption.^[9] This study aims to compare the prevalence of NCD risk factors between rural and urban areas in Telangana and explore their associations with hypertension and obesity.

MATERIALS AND METHOD

Study Design and Duration: This was a community-based cross-sectional study conducted over a period of four months, from August 2022 to November 2022.

Study Area and Population: The study was carried out in the rural and urban field practice areas of Kakatiya Medical College, Warangal. The selected areas included the rural village of Bollikunta and the urban ward of Ursu. The study population consisted of adults residing in these areas who met the inclusion criteria.

Inclusion Criteria: Adults aged 18 years and above who provided consent and were willing to participate.

Exclusion Criteria: Pregnant women, lactating women, individuals with chronic or mental illnesses, and those unwilling to participate were excluded.

Sample Size Determination: The sample size was calculated using the prevalence of tobacco use among men aged 15 years and above from the NFHS-5 survey (23.2%)^[10], with a precision of 5% and a 10% non-response rate. This yielded a required sample size of 274 participants, which was rounded up to 300, with 150 participants from each rural and urban area.

Sampling Technique: A household census listing survey identified the population and households in the selected areas. Bollikunta had 1,025 households and a population of 4,184, while Ursu had 909 households and a population of 3,498. Systematic random sampling was used as follow 1. Sampling Interval: 7 for rural areas and 6 for urban areas. 2. Starting from a randomly selected household, every nth household was approached based on the sampling interval. 3. One adult member from each selected household was randomly chosen for the survey. 4. Non-cooperative households or locked houses were skipped, and the next household was selected.

Data Collection: Data were collected using a pre-tested semi-structured questionnaire adapted from the WHO STEPS questionnaire.^[11] Measurements included: Blood Pressure: Assessed using a sphygmomanometer and Anthropometric Data: Collected using an inch tape and weighing machine.

Outcome and Exposure Variables: **Outcome Variables:** Stages of hypertension and BMI classification. **Exposure Variables:** Tobacco usage, alcohol consumption, dietary

intake, and physical activity.

Definitions and Measurements:

- **Behavioral Risk Factors (STEP 1):** Included alcohol consumption, tobacco use (daily or less frequent), and physical activity measured using the International Physical Activity Questionnaire.^[12]
- **Physical Measurements (STEP 2):**
- **Blood Pressure:** Classified using the Joint National Committee 7 guidelines.^[13] : • Normal: <120/80 mmHg. • Pre-hypertension: 120–139/80–89 mmHg. • Stage I Hypertension: 140–159/90–99 mmHg. • Stage II Hypertension: >160/100 mmHg
- **BMI: Categorized based on WHO Asian BMI classification.**^[14] : • Underweight: ≤ 18.5 kg/m². • Normal: 18.5–22.9 kg/m². • Overweight: 23–24.9 kg/m². • Obese I: 25–29.9 kg/m². • Obese II: ≥ 30 kg/m²
- **Abdominal Obesity:** • Waist Circumference: Risky if ≥ 88 cm for women and ≥ 102 cm for men.^[15] • Waist-Hip Ratio: Risky if >1.0 in men and >0.85 in women.
- **Diet Adequacy:** Defined as a daily intake of at least 400 grams of vegetables and fruits.^[16]

Statistical Analysis: The data collected were entered into MS Excel and analyzed using SPSS Statistics for Windows, Version 20.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize the socio-demographic details and key risk factors.

Since systematic sampling was used, adjustments were made to account for potential clustering and sampling design effects. A complex survey design was set up in SPSS to ensure the analysis reflected the study's sampling method. Rural and urban areas were treated as strata, and households were treated as clusters to account for similarities within selected households. Sampling intervals of 7 in rural areas and 6 in urban areas were used, and equal probabilities of selection were assumed.

A design effect (DEFF) of 1.2 was applied to adjust variance estimates. This adjustment accounted for clustering and the possibility that participants within the same sampling interval might share similar characteristics. The design effect ensured that the confidence intervals and standard errors represented the actual population variance more accurately.

Weighted analysis was performed to account for differences in population sizes between rural and urban areas. This ensured that the findings proportionately represented both groups. Adjusted confidence intervals and standard errors were calculated for all prevalence estimates, such as tobacco use, alcohol use, physical inactivity, and hypertension.

Chi-square tests were used to study associations between categorical variables, such as risk factors and health outcomes. These tests were adjusted for the survey design

to provide accurate p-values. Prevalence rates for key outcomes were reported with 95% confidence intervals, adjusted for the sampling design.

RESULTS

In this study, a total of 300 participants were selected, with 150 each from rural and urban areas. The systematic sampling method used may have introduced clustering effects due to potential similarities within households or geographic proximity. Thus, statistical adjustments were made using survey-specific methods to account for the sampling design.

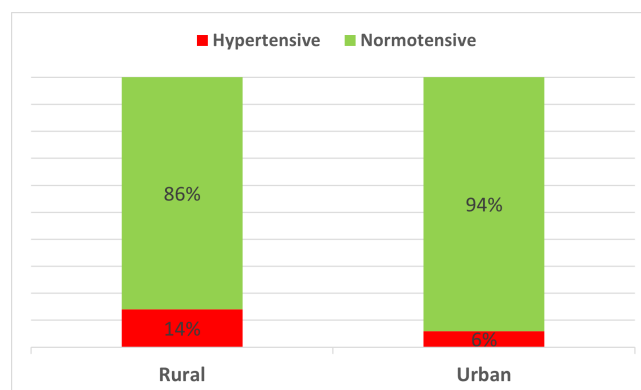
The mean age of participants was approximately 45 years. Rural areas had an equal gender distribution, whereas urban areas had more male participants (66.7%). Literacy rates were higher in urban areas (89.3%), while employment rates were higher in rural areas (91.3%). Socio-economic status classification according to the Modified BG Prasad scale is summarized in Table 1.

Variable	Rural (n=150) No. (%)	Urban (n=150) No. (%)
Age (Mean±SD)	47.02±13.25	42.63±17.34
Gender		
Male	62 (41.3)	100 (66.7)
Female	88 (58.7)	50 (33.3)
Education		
Literate	16 (10.7)	134 (89.3)
Illiterate	134 (89.3)	16 (10.7)
Occupation		
Employed	137 (91.3)	114 (76)
Unemployed	13 (8.7)	36 (24)
Socioeconomic Status		
Upper class	12 (8.0)	72 (48)
Upper middle class	8 (5.3)	42 (28)
Middle class	54 (36)	28 (18.7)
Lower middle class	38 (25.3)	6 (4)
Lower class	38 (25.3)	2 (1.3)

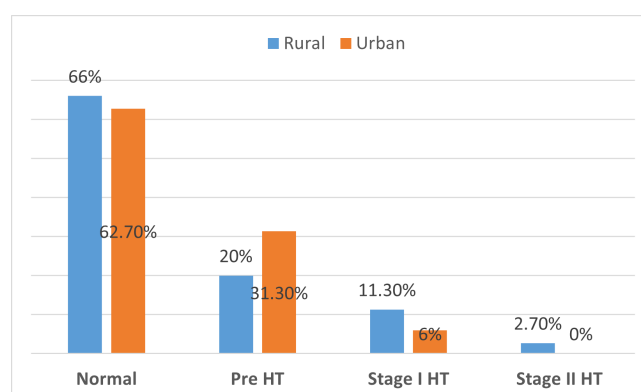
Table 1: Distribution of the study participants according to socio demographic details (N=300)

The main behaviour risk factors were assessed and the usage extent were studied. Alcohol usage was higher than the tobacco usage in both rural and urban areas. Majority (94.7%) of the people's dietary intake was inadequate in the rural village. Almost half (46%) of the urban participants

were taking adequate dietary intake. Majority (90.7%) of urban participants were physically inactive. Graph 1 shows the hypertension prevalence in the rural and urban areas. The prevalence was higher in rural (14%) when compared to urban (6%). But almost 31.3% of the people (Graph 2) were in the pre hypertension stage in the urban areas. Graph 3 represents the bar graph explaining the classification of BMI in the study participants. Majority of the study participants in the urban ward were either overweight (32%) or obese (48.7%).



Graph 1: The prevalence of hypertension in the study participants (N=300)



Graph 2: The comparison of stages of hypertension in the Rural and Urban study participants (N=300)

Table 2 is showing the anthropometric findings in the study participants. Urban participants had higher mean weight, mean BMI, mean hip circumference compared to the rural participants. But the risk calculated based on the waist hip ratio was higher in the rural participants.

Hypertension was significantly associated with the alcohol usage and the physical activity in the rural village, whereas in the urban ward it is associated with tobacco usage and the adequacy of diet intake (Table 3). Similarly, obesity was associated with all the risk factors except tobacco usage in the rural village, whereas obesity is associated with all the risk factors except physical activity in the urban ward as depicted in Table 4.

Variable	Categories	Rural		Urban	
		HT (%)	χ^2 value P value	HT (%)	χ^2 value P Value
Tobacco Use	Current	8 (5.3%)	5.656, p=0.463	2 (1.3%)	7.901 p=0.019*
	Never	13 (8.6%)		7 (4.7%)	
Alcohol Use	Current	16 (10.6%)	20.411, p=0.002*	4 (2.7%)	1.950 p=0.745
	Never	5 (3.3%)		5 (3.3%)	
Diet consumption	Adequate	0 (0%)	6.878 p=0.076	2 (1.3%)	16.472 p<0.001*
	Inadequate	21 (14%)		7 (4.7%)	
Physical activity	Adequate	12 (8%)	11.683 p=0.009*	0 (0%)	2.434 p=0.296
	Inadequate	9 (6%)		9 (6%)	

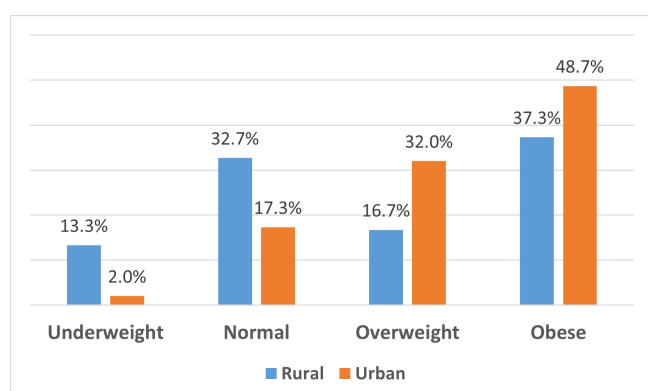
*P value ≤ 0.05 is considered significant.

Table 3: Association between the hypertension and the risk factors (N=300)

Variable	Categories	Rural		Urban	
		Obese (%)	χ^2 value P value	Obese (%)	χ^2 value, P Value
Tobacco Use	Current	15 (10%)	7.76, p=0.26	24 (16%)	39.44 p<0.001*
	Never	65 (43.3%)		97 (64.6%)	
Alcohol Use	Current	39 (26%)	25.74 p<0.001*	60 (40%)	15.53 p=0.017*
	Never	35 (23.3%)		57 (38%)	
Diet consumption	Adequate	6 (4%)	11.33 p=0.010*	52 (34.6%)	13.82 p=0.003*
	Inadequate	75 (80%)		69 (46%)	
Physical activity	Adequate	34 (22.6)	7.17 p=0.067*	11 (7.3%)	0.90 p=0.825
	Inadequate	47 (31.3%)		110 (73.3%)	

*P value ≤ 0.05 is considered significant.

Table 4: Association between the obesity and the risk factors (N=300)



Graph 3: The comparison of BMI classification in the Rural and Urban study participants (N=300)

DISCUSSION

A greater understanding of all the underlying mechanisms and the related pathways which links the social determinants with the preventable NCD deaths is essential to challenge the root causes of health inequities and inequalities. [17, 18] The understanding is essential for fulfilling an important Goal 3, (UN SDG, Target 3.4) by 2030 in addition to the WHO's "25 by 25" target by 2025. [7, 8]

The prevalence of hypertension in the current study was 14% from rural and 6% from urban. Hypertension is the most common and the preventable risk factor of CVDs. In recent days, urbanisation encroached even the tribal neighbourhoods. In a study done by Kandpal et al. [19] among tribes, the prevalence was 40% which is quite higher when

Anthropometry	Rural (N=150)	Urban (N=150)
Weight*	58.08±10.26 kg	65.73±11.42 kg
BMI*	24.03±4.67	25.37±3.52
Waist circumference		
Risk	12 (8%)	15 (10%)
No risk	138 (92%)	135 (90%)
Hip Circumference*	90.77±11.96cm	95.64±7.90cm
Waist hip ratio		
Risk	37 (24.7%)	32 (21.3%)
No risk	113 (75.3)	118 (78.7)

*presented as Mean±SD.

Table 2: Anthropometric measurement in rural and urban study participants (N=300)

compared to our study. In a study done by Sabale et al. [20] the prevalence of HT was 19.6% higher than the present study. The higher prevalence of HT was also reported by Geldsetzer et al in his study in India, which was 25.3% (95% CI: 25.0–25.6) among adults. [21] The reason the current study's prevalence is lower, may be the majority around 30% were in the pre hypertension stage which doesn't get covered under the prevalence of HT. But the findings of the current study were similar to the report of NFHS 5 India fact sheet [22] where the prevalence of HT was 15.7%.

Though metabolic syndrome was more common in rural than urban participants, merging of both the behavioural and physical risk factors (3 out of 5 as defined in the WHO-STEPS analysis guide: low physical activity, BMI ≥ 23 kg/m², risky waist circumference and risky WHR) was seen less frequently in rural and more frequently in urban participants. Raza et al got the similar finding in the comparative analysis of risk factors among rural and urban communities across the world. [23] Tobacco use and alcohol use were more common in rural (24.7%, 56%) when compared to the urban (16%, 46%). This finding is similar to the national report released in 2021 where tobacco and alcohol usage were higher in the rural villages comparing to the urban wards. [22] But the prevalence of tobacco usage was higher when compared to the alcohol usage in NFHS 5 - India which is contradictory to our study. According to NFHS 5, Telangana fact sheet [24] the prevalence of tobacco usage (22.3%) was lesser compared to the alcohol usage (43.3%) similar to the present study.

Daily consumption of fruits and vegetables plays a role against NCD. [25] Adequate diet is considered as intake of at least 400 grams of fruits and vegetables per person daily divided into 5 servings with each serving of 80g. [16] In the present study, 5.3% in rural and 46% in urban were having adequate diet. Rural participants being poorer were unable to afford regularly for fruits and vegetables. In Telangana,

people got used to eating rice with only pickles which doesn't meet the proper dietary requirements. Another reason observed was during particular days (especially Wednesday and Sunday) people opt for non vegetarian food. Those days people have the habit of skipping the fruits and vegetables, because it might hinder the digestion process. Based on the above findings it is evident that, the intake of fruits and vegetables can be increased by awareness generation.

Physical inactivity is one of the risk factors for NCD as well as one among the ten risk factors for increase in mortality globally. Those who were physically inactive has 20% to 30% increased risk of all-cause mortality when comparing to those who were physically active (according to WHO - minimum 150 minutes of any kind of physical activity with moderate intensity per week or its equivalent). [26] In the current study, 52% of rural and 90.7% of urban participants were physically inactive. This tells that only 10% were physically active which is similar to the findings of the study done by Sabale et al among employees in Maharashtra. [20]

The prevalence of obesity in the current study was 37.3% in rural and 48.7% in urban area. It is almost similar to the Telangana State Fact Sheet [24] where the prevalence was 40.2%. In the study by Sabale et al. [20] the prevalence was little higher (56.7%) compared to the present study. In contradictory to the prevalence of higher obesity, the prevalence of risky WHR was 24.7% in rural and 21.3% in urban areas which is lower when compared to NFHS-5 survey report. [22, 24] This could be because generalised obesity may be higher than the abdominal obesity in the current study which was not studied.

In the current study, alcohol usage and physical activity were significantly associated with hypertension in the rural village & tobacco usage and dietary intake were significantly associated with hypertension in the urban wards. Similar association was seen in the study done by Raza et al. [21] across the world where alcohol intake and physical activity were significantly associated with the hypertension. Alcohol usage, dietary intake and physical activity were significantly associated with obesity in rural village whereas, tobacco usage, alcohol usage and dietary intake were significantly associated with obesity in urban wards. In the study done by Raza et al. [21] and Kandpal et al. [19] physical activity was significantly associated with the obesity similar to the present study. Association of physical inactivity with hypertension and obesity implies the importance of the physical activity as a risk factor for NCD. Hence awareness about the regular physical activity and its importance in the prevention of many lifestyle diseases needs to be generated among the population.

LIMITATIONS AND STRENGTHS

The current study has some limitations. Firstly, there may a chance for social desirability bias as it as a self-reporting questionnaire and there are chances that the

study participants doesn't reveal the exact details of tobacco and alcohol usage. Secondly, Step 3 of the WHO STEPS questionnaire (biochemical profile) was not taken into the study due to the financial and time constraints. Thirdly, the study doesn't take into consideration other dietary measures apart from fruit and vegetable intake. Coming to the strengths of the current study. The study was a comparative study done in rural and urban areas which makes it unique among other studies. Also the study being done in the community is another strength of the study. The sample size has been calculated based on statistical formula and the study followed a proper sampling method (Systematic random sampling) which ensures representativeness, which therefore can be generalized to the whole population. The questionnaire used was validated, accurate anthropometric measurements and the blood pressure were recorded using the calibrated instruments adds more strength which reduced the chance of interviewer bias in the study.

CONCLUSION

The prevalence of hypertension and the main risk factors such as tobacco usage and alcohol intake was higher in the rural area compared to the urban. But overweight and obesity and the risk factor physical inactivity were highly prevalent among urban participants compared to rural participants. Majority of the rural people had inadequate diet. Alcohol use and physical inactivity were significantly associated with hypertension in rural, whereas use of tobacco and inadequate diet consumption were significantly associated with hypertension in urban area. Alcohol use and diet consumption were significantly associated with obesity in both rural as well as urban.

RECOMMENDATIONS:

Rehabilitation programs for quitting of smoking and alcohol should be conducted by health workers. Awareness regarding the importance of physical activity and diet consumption should be made via health education targeting mainly on younger age groups. Health workers in community should do regular screening for obesity and advise about exercises.

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