Original Article

Prevalence and Determinants of Non-communicable Disease Risk Factors using WHO STEPS Approach among Adult Population in Rural and Urban Area of Salem — A Comparative Study

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Abstract

Background : Non-communicable Diseases (NCDs) pose a significant and growing challenge to public health worldwide, given their substantial contribution to morbidity and mortality rates. This trend is particularly pronounced in India, where NCD prevalence is escalating at an alarming rate across both urban and rural regions. Comprehensive findings of the prevalence and determinants of NCD risk factors is imperative to devise and implement effective prevention and control strategies.

Aims and Objectives : (1) To Compare the Prevalence of Non Communicable Disease risk factors among the adult population residing in Rural and Urban field practice area. (2) To determine the factors associated with Non-communicable Disease risk factors among the adult population residing in Rural and Urban field practice area.

Materials and Methods : A cross sectional study was carried out among 400 adults (≥18 years). Semi structured questionnaire was used to collect data and the World Health Organization-STEPS methodology was used to document behavioural risk factors, biochemical risk factors and physical measurements. Continuous and categorical data were represented as mean and proportion respectively. Strength of Association was determined using Odds Ratio and Adjusted Odds Ratio.

Results : Mean age of the participants was 43.8±14.9, about 58.3% of them were females. In our study males exhibit higher rates of tobacco (71.8%) and alcohol (74.4%) use whereas females are more prone to physical inactivity (56.1%), Unhealthy diet (55.7%) and overweight or obesity (61.3%). Binary Logistic Regression analysis reveals that individuals aged over 40 years emerge as a significant predictor of hypertension. Additionally, being male and holding skilled occupations are significantly associated with diabetes.

Conclusions : Identifying risk factors early through screening and embracing healthy lifestyle choices can help alleviate the burden.

Key words : Unhealthy Diet, Dyslipidemia, Hypertension, Diabetes Mellitus.

Non-communicable Diseases (NCDs) claim 41 million lives annually, accounting for 74% of global deaths. Alarmingly, 17 million people die from NCDs before age 70 each year, with 86% of these premature deaths occurring in low- and middle-income countries. Furthermore, an overwhelming 77% of all NCD-related fatalities occur within these same regions[1]. Non-Communicable Diseases (NCDs) are the leading cause of mortality in the South-East Asia Region, resulting in approximately 8.5 million deaths annually. Alarmingly, one-third of these deaths are premature, significantly impacting labor supply and economic productivity in the region[2]. In India, NCDs are estimated to account for 66% of all deaths[2].

Editor's Comment :

- Adults over 40 years are disproportionately affected by NCD risk factors.
- Modifiable risks like tobacco use and unhealthy lifestyles drive obesity, hypertension, diabetes and dyslipidemia.
- Targeted interventions in both urban and rural areas are essential to mitigate the growing NCD burden.

The WHO highlights four key Non-communicable Diseases (NCDs) : diabetes, cardiovascular disease, chronic respiratory disease, and cancer, largely driven by modifiable behavioural and metabolic risk factors. These factors include tobacco use, excessive alcohol consumption, poor diet, physical inactivity, high blood

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pressure, obesity, elevated blood sugar, and abnormal lipid levels. Addressing these risks is critical to curbing the rising prevalence of NCDs globally[3]. When an individual experiences the simultaneous presence of two or more of these factors, it's termed as the clustering of risk factors. This clustering substantially heightens the likelihood of developing Non-communicable Diseases (NCDs)[4].

Currently, a larger proportion of the global population resides in urban areas compared to rural ones, with 55% of the world's population living in urban settings as of 2018. This marks a substantial increase from 1950 when only 30% of the population was urban. Projections indicate that by 2050, urban dwellers will make up 68% of the global population. However, it's important to note that urbanization rates vary significantly across different geographic regions, reflecting diverse levels of urban development worldwide[5]. In the context of Non-communicable Diseases (NCDs), there's a growing concern regarding the impact of urbanization and rural-to-urban migration on population exposure to risk factors. This heightened exposure can be attributed to various factors, including variations in access to motorized transportation and pollution, disparities in occupational physical activity levels, differences in marketing strategies and varying accessibility to tobacco, alcohol and processed food products[6]. Enhancing our comprehension of the determinants of Non-communicable Diseases (NCDs), including disparities between urban and rural areas, is crucial for effective NCD prevention efforts. This understanding enables prioritization of actions and facilitates the customization of strategies based on the resources available[7]. With this background the study was carried out —

- To Compare the Prevalence of Non Communicable Disease risk factors among the adult population residing in Rural and Urban field practice area.
- To determine the factors associated with Non Communicable Disease risk factors among the adult population residing in Rural and Urban field practice area.

Materials and Methods

Study Design : Community based analytical cross sectional study

Study Setting : This study was conducted in the field practice area affiliated with the Rural and Urban Health and Training Centre of VMKV Medical College & Hospital, Salem.

Study Duration : The study was conducted over a period of 6 month period from July, 2023 – December, 2023 following Institutional Ethical Committee approval.

Study Participants : The research focused on adults ≥18 years residing in the field practice areas of the Rural and Urban Health Training Centre of Medical College & Hospital.

Inclusion criteria : Adults aged over 18 years who provided written informed consent were included in the study.

Exclusion criteria : The study did not include adults with intellectual disabilities, cognitive impairments or serious illnesses, as well as pregnant or lactating women.

Sample size calculation : The sample size was calculated using the formula Z^2PQ / L^2, based on a prevalence of 36% from a study by Rawal, *et al*. With Z = 1.96, P = 36, Q = 64, and L = 5% (absolute precision), the calculation yielded a sample size that was further adjusted for a 10% non-response rate. The final sample size was determined to be 400, with an equal distribution of 200 participants from rural and urban areas.

Sampling technique : Adults were listed from family folders at our health centers and serially numbered. Simple random sampling was used to select study participants.

Informed Consent : Informed consent was prepared in the local language and written consent was obtained from each participant before data collection, ensuring their voluntary participation in the study.

Ethical clearance : Ethical clearance was obtained from the institution and proceeded with the data collection.

Data Collection : Face-to-Face interviews were conducted to gather information on socio-demographic characteristics and behavioral risk factors including tobacco and alcohol use, physical activity, diet and family history. Standardized instruments like portable stadiometer, electronic weighing scale and non stretchable measuring tape were used to measure Height, Weight, Waist and hip

circumference. Participants were instructed to remove footwear and bulky items to ensure accuracy. Blood pressure was measured using an automated monitor. Following an overnight fasting period, a 5-mL venous blood sample was drawn by a skilled phlebotomist from the anterior cubital vein for the assessment of lipid profile and blood sugar levels, including fasting plasma glucose, triglycerides, total cholesterol and high-density lipoprotein, using a chemical autoanalyzer. All instruments were regularly calibrated for accuracy during the data collection period.

Statistical Analysis : Data collected was entered into Microsoft Excel and analyzed using SPSS software. Descriptive statistics included frequencies and percentages for categorical data, and mean with standard deviation for numerical data. Chi-square test was used to determine the significance of findings ($p<0.05$ considered significant). Binary logistic regression assessed the strength of association, with adjusted prevalence ratios and corresponding 95% confidence intervals computed after adjusting for confounding variables, identifying independent associations with risk factors.

Operational Definitions :

Tobacco Usage : Current tobacco smokers are those who have smoked tobacco products at least once in the last 30 days[9].

Alcohol consumption : Current episodic heavy drinking defined as consuming six or more drinks on any day in the past 30 days[9].

Insufficient Fruit and Vegetable Intake : Participants consuming less than 5 servings of fruits and vegetables per day will be considered to have insufficient fruit and vegetable intake[9].

Physical activity : World Health Organization recommends a minimum of 150 minutes of moderate-intensity or 75 minutes of vigorous-intensity aerobic physical activity for adults.[10]

Obesity : Participants were classified based on BMI[10] as: Obese : ≥30.0 kg/m²
Overweight : 25.0-29.9 kg/m²

Raised blood pressure - Blood pressure is considered raised if Systolic BP≥140 mmHg and or Diastolic BP≥90 mmHg or being previously treated for hypertension[10].

Hyperglycemia will be defined as a plasma glucose level ≥7.0 mmol/L (> 126 mg/dL), and also recorded if the participant is currently on medication for DM. The prediabetes stage will be defined as a plasma glucose level between 5.5 and 7.0 mmol/L (100-125 mg/dL)[11].

Dyslipidemia will be defined as any of the followings: elevated TC (≥200 mg/dL), high LDL (≥160 mg/dL), low HDL (<40 mg/dL in men and <50 mg/dL in women), or elevated TG (≥150 mg/dL)[11].

Results

Table 1 shows the distribution of socio-demographic variables among individuals residing in rural and urban areas. The mean age of the study participants was 43.8 years and standard deviation of 14.9.

The analysis reveals notable gender differences in health behaviours and risk factors. Males have higher tobacco and alcohol use, hypertension and triglyceride levels, while females are more prone to inactivity and obesity. Hypertension is linked to age >40, higher socio-economic status, unhealthy diets and tobacco use. Diabetes, obesity and dyslipidemia are more common among males, skilled/unskilled workers and tobacco users.

Table 2 Binary Logistic Regression analysis reveals significant associations between factors and health conditions. Age over 40 predicts hypertension, while male gender and skilled occupations associate with

Table 1 — *Socio-demographic Characteristics*

Variable	Rural (n=200)		Urban (n=200)	
	Male	Female	Male	Female
Age :				
>40 years	52(44.8)	64(55.2)	51(48.6)	54(51.4)
≤40 years	31(36.9)	53(63.1)	46(48.4)	49(51.6)
Religion :				
Hindu	78(43.3)	102(56.7)	91(50.3)	90(49.7)
Christian / Muslim	5(25)	15(75)	6(31.6)	13(68.4)
Education :				
≥Higher Secondary	25(58.1)	18(41.9)	20(55.6)	16(44.4)
<Higher Secondary	58(36.9)	99(63.1)	77(47)	87(53)
Occupation :				
Skilled worker & above	46(64.8)	25(35.2)	46(64.8)	25(35.2)
Below skilled worker	37(28.7)	92(71.3)	51(39.5)	78(60.5)
Marital Status :				
Married	63(46.3)	73(53.7)	71(51.1)	68(48.9)
Others[#]	20(31.3)	44(68.8)	26(42.6)	35(57.4)
Type of Family :				
Nuclear	53(38.1)	86(61.9)	69(45.7)	82(54.3)
Joint	30(49.2)	31(50.8)	28(57.1)	21(42.9)
SES :				
Upper / Middle	43(43.4)	43(56.6)	37(51.4)	35(48.6)
Lower	50(40.7)	73(59.3)	60(46.9)	68(53.1)

#Others – Single, Widow, Divorced

Table 2 — *Binary Logistic Regression findings*

Variable	HTN	
	P value	APR (CI)
Age	<0.001**	1.227(1.014 - 3.836)
	DM	
Sex	0.014*	1.634(1.411-1.993)
Occupation	0.011*	1.551(1.348-1.871)
	Overweight	
Tobacco	0.034*	1.641(1.039-2.592)
	Dyslipidemia -High Cholesterol	
Age	0.002*	1.984(1.293-3.044)
Occupation	<0.001**	2.654(1.576-4.467)
SES	<0.001**	3.092(1.238-3.647)
	Dyslipidemia – Low HDL	
SES	0.012*	1.561(1.357-3.883)
Tobacco usage	0.015*	1.568(1.361-2.895)

Only the significant association has been presented in the Table
**p value < 0.05, **p value <0.01*

diabetes. Tobacco use is linked to overweight, and dyslipidemia predictors include age over 40, male gender, higher socio-economic status, and tobacco consumption.

Discussion

A cross-sectional survey conducted in South India, using the WHO-STEPS methodology, has provided insights into the risk factors associated with Non-communicable Diseases (NCDs) in the region. One significant finding of the survey is the notable differences in tobacco use prevalence between urban and rural areas. In our study, the prevalence is higher in urban areas at 34.5% compared to rural areas at 22%. This contrasts with findings from other regions such as Kerala[12], where tobacco use prevalence is higher in rural areas (45%) compared to urban areas (43%) and Chennai,[13] where rural areas (23.7%) exhibit higher prevalence than urban areas (19.4%).

Moreover, the survey shows that alcohol consumption in rural areas is 17.5% and 22% in urban areas, contrasting with the Tamil Nadu IDSP survey[14], where the rates were higher - 39.7% in rural areas and 31.7% in urban areas. These variations highlight the complex interplay of different factors influencing alcohol and tobacco use.

In both rural and urban areas of our study the prevalence of overweight and obesity stands significantly high at 62% and 60%, respectively. These rates markedly exceed those reported by Oomen, *et al*[15]. Furthermore, consistent with findings from Venkatrao, *et al*[16] our research demonstrates a higher prevalence of overweight and obesity among females compared to males. Specifically, in rural areas, the prevalence is higher in females at 69.3% compared to males at 30.7%, while in urban areas, the prevalence is 53.3% in females versus 46.7% in males. These results highlight the critical need for targeted interventions to address the burgeoning issue of overweight and obesity, particularly among females, in Tamil Nadu.

This study confirms that people in Tamil Nadu don't eat enough fruits and vegetables like in other states[17]. Particularly rural women seem to eat the least amount of fruits and vegetables in line with findings from Geetha, *et al*[18]. This demonstrates a significant difference from urban settings and emphasizes the need to inform and inspire rural women about the advantages of eating a balanced diet[19]. Moreover, the prevalence of diabetes (51% rural, 39% urban) exceeds the figures reported for Tamil Nadu in the multi-centric ICMRINDIAB study[20]. (7.8% rural, 13.7% urban). The increase in unhealthy habits among Indians, coupled with the higher chance of pre-diabetes turning into diabetes, could be the reason for the significant rise in high fasting blood sugar levels[17].

The prevalence of hypertension among adults is high among urban when compared to that of rural areas, with rates standing at 49% in urban areas and 41.5% in rural areas which is similar to that of Bhagyalaxmi, *et al*[19].The high number of tobacco users in urban areas may be the cause of the high risk of hypertension[21]. These figures complement the estimates for India (33% urban, 25% rural) and South India (32% urban, 21% rural)[22] among adults aged 18 years and above.

Conclusion

The study uncovered a significant prevalence of behavioural and metabolic risk factors, showcasing variations among adults in both rural and urban areas. These findings underscore the necessity for robust public health strategies aimed at fostering healthier lifestyles and preventing the emergence of NCDs in the community. Future research endeavours and longitudinal studies are imperative to track trends over time and evaluate the efficacy of intervention initiatives in addressing NCD risk factors in Salem and comparable locales.

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