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PREVALENCE AND DETERMINANTS OF NON-COMMUNICABLE DISEASE RISK FACTORS AMONG RURAL POPULATION: A HOUSE-TO-HOUSE SURVEY IN CHENNAI, INDIA

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Abstract

INTRODUCTION: Non-communicable diseases (NCDs) are a leading cause of mortality globally, with significant socioeconomic implications, particularly in low and middle-income countries. The burden of NCDs varies across regions in India, with rural areas facing unique challenges. This study aimed to assess the prevalence of NCDs and associated risk factors in a rural community in Tamil Nadu, India.

METHODOLOGY: A community-based cross-sectional survey was conducted for six months in Erayamangalam village, Chennai. A total of 403 individuals aged 18 years and above participated in the study. Data on sociodemographic factors, behavioral risk factors, and NCD prevalence were collected through interviewer-administered questionnaires and clinical screenings for diabetes and hypertension.

RESULTS: The study found that among the rural population, 68 (16.9%) of people had diabetes mellitus and 61 (15.13%) had hypertension and associated risk factors such as age, education level, occupation, socioeconomic status, and family history of NCDs were significantly associated ($p < 0.05$) with the presence of diabetes mellitus and hypertension.

CONCLUSION: The findings underscore the need for comprehensive public health interventions tailored to the rural context to address the growing burden of NCDs. These interventions should focus on preventive measures, health education, early detection, and improving access to quality healthcare services. Addressing the prevalence of NCDs in rural areas requires concerted efforts to implement effective strategies that address the underlying determinants of health and improve overall well-being.

Keywords: Community Healthcare, Rural, Screening, Community Survey, NonCommunicable Disease

INTRODUCTION

Non-communicable diseases (NCDs) account for 74% of all fatalities globally and include diabetes, cancer, heart disease, stroke, and chronic lung disease. About 86% of the 17 million premature fatalities occur before turning 70 and more than three-quarters of all NCD deaths occur in low- and middle-income nations [1]. The majority of NCD deaths (17.9 million annually) are caused by cardiovascular illnesses, followed by cancer (9.3 million), chronic respiratory diseases (4.1 million), and diabetes (2.0 million, including deaths from renal disease induced by diabetes). The risk of mortality from an NCD is increased by tobacco use, air pollution, poor nutrition, harmful alcohol use, and physical inactivity [2]. The NCD epidemic threatens the financial stability of health systems and has devastating health effects on people, families, and communities. The prevention and control of non-communicable diseases (NCDs) constitutes vital developments for the twenty-first century due to the socioeconomic expenses connected with these disorders [1].

In India, the disability-adjusted life year (DALY) rate, a measure of the per-person disease burden, has decreased by 36% between 1990 and 2016. However, there are significant differences between the states, with differences in DALY rates nearly twofold [3]. The prevalence of diabetes in Tamil Nadu has been reported to be 7.8% in rural areas and 23.6% in urban areas [4]. Very little research has been done in rural areas that has thoroughly evaluated the NCD risk variables among the Indian population [5]. The prevalence of NCDs is reported to be higher in urban communities compared to rural areas, emphasizing the urban-rural disparity in NCD burden. In this study, we aimed to understand the prevalence of NCDs and their associated risk factors in rural areas which is crucial for public health interventions, policy development, and healthcare planning to address the increasing burden of these chronic conditions.

METHODOLOGY

Study design, setting, duration and participants:

This community-based cross-sectional survey was done in and among households in Erayamangalam village, Tiruvallur district. The study duration was six months, from February 2023 to July 2023. The study population included all those who were >18 years of age and who gave consent for participation. Ethical approval was obtained from the Saveetha Medical College and Hospital Institutional Ethics Committee before commencing the study (IRB number 008/02/2023/IEC/SMCH).

Sample size and technique:

OpenEpi software version 3.01 was used to determine the sample size for this study. The following assumptions were considered to estimate the required sample size. The expected prevalence of NCD among the rural population was 50% since no house-to-house survey was conducted on the determinants of NCDs in rural India. Using these values with a confidence level of 95%, a sample size of 384 was required [6]. We used the universal sampling method, taking all 250 households in the Erayamangalam village and individuals in each household were surveyed resulting in total sample of 403.

Data collection:

An interviewer-administered questionnaire was used to collect data on sociodemographic and behavioral risk factors for NCD. The socio-demographic questionnaire consists of age, gender, education, occupation, monthly income, BMI and the NCD questionnaire, which consists of smoking history, alcohol history, known cases of NCD and family history of NCD. The population was screened for diabetes by capillary blood glucose testing using a glucometer reading. The population was also screened for hypertension using a sphygmomanometer.

Operational definition:

Diabetes: symptoms of diabetes plus casual or random plasma glucose ≥ 200 mg/dl (casual means without regarding the time of last meal) [7].

Hypertension: Hypertension was defined as SBP/DBP $\geq 140/90$ mmHg in participants younger than 60 years and SBP/DBP $\geq 150/90$ mmHg in those aged 60 years or above [8].

BMI: Asian-Pacific cut-off points underweight (<18.5 kg/m²), normal weight (18.5-22.9 kg/m²), overweight (23-24.9 kg/m²) and obese (≥ 25 kg/m²) [9].

RESULTS

Table 1 provides a comprehensive overview of various demographic and health-related variables among a sample population. The sample population consists of individuals predominantly above 46 years 204 (50.6%). Female representation was slightly higher 216 (53.6%) than male 187 (46.4%). Most individuals were married 371 (92.1%). Higher education was the most common educational attainment 143 (35.5%). Class III (Middle) is the most prevalent socioeconomic class 206 (51.1%). Nuclear families were the most common family type 306 (74.9%). Obesity was the most prevalent BMI category 138 (34.2%). The individuals with diabetes mellitus 68 (16.9%) and hypertension 61 (15.13%) were recorded. Family history of NCDs present in 147 (36.5%) and recent NCD-related deaths in the family 41 (10.2%).

Table 1: Socio demographic and health related characteristics of study participants (N=403)

S.NO	Variables		Frequency (N)	Percentage (%)
1	Age	≤ 46	199	49.4
		> 46	204	50.6
2	Gender	Male	187	46.4
		Female	216	53.6
3	Marital status	Married	371	92.1
		Unmarried	32	7.9

4	Education	Illiterate	131	32.5
		Primary	45	11.2
		Secondary	84	20.8
		Higher	143	35.5
5	Occupation	Unemployed	158	39.2
		Unskilled	97	24.1
		Semi-skilled	64	15.9
		Skilled	84	20.8
6	Socio economic status*	Class I (Upper)	7	1.7
		Class II (Upper Middle)	86	21.3
		Class III (Middle)	206	51.1
		Class IV (Lower Middle)	96	23.8
		Class V (Lower)	8	2.0
7	Type of family	Joint	42	10.4
		Nuclear	306	74.9
		Three generation	55	13.6
8	BMI	Underweight	35	8.7
		Normal	110	27.3
		Overweight	120	29.8
		Obese	138	34.2
9	Diabetes Mellitus	No	335	83.1
		Yes	68	16.9
10	Hypertension	No	342	84.9
		Yes	61	15.1
11	Family H/O NCD	No	256	63.5

		Yes	147	36.5
12	H/O NCD related deaths in the family in last 5 years	No	362	89.8
		Yes	41	10.2

*Modified BG Prasad classification Jan 2024

Table 2 unveils significant insights into the correlation between diabetes mellitus and various demographic and health-related factors. Firstly, a substantial association is detected between age and diabetes mellitus ($\chi^2 = 46.304$, $p < 0.001$), with individuals aged over 46 years exhibiting a notably higher prevalence of the condition. While no statistically significant association is evident between gender and diabetes mellitus ($\chi^2 = 2.194$, $p = 0.139$), a trend suggests a potential slightly higher likelihood among males. Marital status does not demonstrate a statistically significant association with diabetes mellitus ($\chi^2 = 7.056$, $p = 0.080$), albeit a noteworthy trend is observed. Education level emerges as a significant determinant ($\chi^2 = 5.732$, $p = 0.001$), indicating that higher education levels are associated with a reduced likelihood of diabetes mellitus. Similarly, occupation exhibits a significant association ($\chi^2 = 16.790$, $p = 0.001$), revealing that unemployment and lower-skilled occupations correlate with a higher prevalence of diabetes mellitus. While no statistically significant association is established between socioeconomic status and diabetes mellitus ($\chi^2 = 7.865$, $p = 0.097$), a trend suggests a potential linkage. Type of family, BMI, and history of NCD-related deaths in the family do not display statistically significant associations with diabetes mellitus. Conversely, a substantial association is unveiled between family history of NCD and diabetes mellitus ($\chi^2 = 84.135$, $p < 0.001$), indicating a genetic predisposition to the condition. In summary, age, education level, occupation, and family history of NCDs show significant associations with diabetes mellitus within the sample population, highlighting potential areas for targeted interventions and further research.

Table 2: Association between Socio Demographic variable and Diabetes Mellitus (N=403)

S.NO	Variable	Diabetes Mellitus		Chi square χ^2	P-value
		No	Yes		
1	Age (years)				
	≤ 46	191 (47.4)	8 (2.0)	46.304	0.000*
	> 46	144 (35.7)	60 (14.9)		
2	Gender				
	Male	161 (40)	26 (6.5)	2.194	0.139

	Female	174 (43.2)	42 (10.4)		
3	Marital status				
	Married	303 (75.2)	68 (16.9)	7.056	0.08
	Unmarried	32 (7.9)	0 (0)		
4	Education				
	Illiterate	103 (25.6)	28 (6.9)		
	Primary	31 (7.7)	14 (3.5)	5.732	0.001*
	Secondary	70 (17.4)	14 (3.5)		
	Higher	131 (32.5)	12 (3.0)		
5	Occupation				
	Unemployed	118 (29.3)	40 (9.9)		
	Unskilled	81 (20.1)	16 (4.0)	16.790	0.001*
	Semi-skilled	57 (14.1)	7 (1.7)		
	Skilled	79 (19.6)	5 (1.2)		
6	Socio economic status*				
	Class I (Upper)	7 (1.7)	0 (0)		
	Class II (Upper Middle)	78 (19.4)	8 (2.0)	7.865	0.097
	Class III (Middle)	170 (42.2)	36 (8.9)		
	Class IV (Lower Middle)	74 (18.4)	22 (5.5)		
	Class V (Lower)	6 (1.5)	2 (0.5)		
7	Type of family				
	Joint	33 (8.2)	9 (2.2)	3.127	0.209
	Nuclear	252 (62.5)	54 (13.4)		
	Three generation	50 (12.4)	5 (1.2)		
8	BMI				

	Underweight	32 (7.9)	3 (0.7)		
	Normal	87 (21.6)	23 (5.7)	6.465	0.091
	Overweight	106 (26.3)	14 (3.5)		
	Obese	110 (27.3)	28 (6.9)		
9	Family H/O NCD				
	No	246 (61)	10 (2.5)	84.135	0.000*
	Yes	89 (22.1)	58 (14.4)		
10	H/O NCD related deaths in the family in last 5 years				
	No	303 (75.2)	59 (14.6)	0.839	0.360
	Yes	32 (83.1)	9 (2.2)		

*P-value <0.05- Significant (Pearson's chi square)

The analysis of the Table 3 reveals significant associations between hypertension and several demographic and health-related variables. Firstly, age emerges as a pivotal factor, demonstrating a profound correlation with hypertension ($\chi^2 = 37.819$, $p < 0.001$). Individuals aged over 46 years exhibit a notably higher prevalence of hypertension compared to their younger counterparts. Gender also emerges as a significant determinant, with males showing a greater propensity for hypertension than females ($\chi^2 = 5.358$, $p = 0.021$). Moreover, marital status exhibits a noteworthy association with hypertension ($\chi^2 = 6.200$, $p = 0.013$), indicating that married individuals are more susceptible to hypertension compared to unmarried counterparts. Education level proves to be another influential factor, with higher education levels associated with a decreased likelihood of hypertension ($\chi^2 = 18.677$, $p < 0.001$). Occupational status ($\chi^2 = 15.194$, $p = 0.002$) and socioeconomic status ($\chi^2 = 11.919$, $p = 0.018$) also demonstrate significant associations, with unemployment and lower socioeconomic status correlating positively with hypertension. Additionally, a family history of non-communicable diseases (NCD) emerges as a substantial risk factor for hypertension ($\chi^2 = 84.037$, $p < 0.001$), suggesting a genetic predisposition to the condition. Conversely, while there appears to be a trend, no statistically significant association is observed between the history of NCD-related deaths in the family and hypertension ($\chi^2 = 3.043$, $p = 0.081$). In summary, age, gender, marital status, education level, occupation, socioeconomic status, and family history of NCDs show significant associations with hypertension within the sample population, indicating the potential risk factors. Overall, these findings underscore the multifactorial nature of hypertension, influenced by a complex interplay of demographic, socioeconomic, and genetic factors.

Table 3: Association between Socio Demographic variable and Hypertension (N=403)

S.NO	Variable	Hypertension		Chi square χ^2	P-value
		No	Yes		
1	Age (years)				
	≤ 46	191 (47.4)	8 (2.0)	37.819	0.000*
	> 46	151 (37.5)	53 (13.2)		
2	Gender				
	Male	175 (43.4)	41 (10.2)	5.358	0.021*
	Female	167 (41.4)	20 (5.0)		
3	Marital status				
	Married	310 (76.9)	61 (15.1)	6.200	0.013*
	Unmarried	32 (7.9)	0 (0)		
4	Education				
	Illiterate	105 (26.1)	26 (6.5)	18.677	0.000*
	Primary	34 (8.4)	11 (2.7)		
	Secondary	67 (16.6)	17 (4.2)		
	Higher	136 (33.7)	7 (1.7)		
5	Occupation				
	Unemployed	125 (31)	33 (8.2)	15.194	0.002*
	Unskilled	80 (19.9)	17 (4.2)		
	Semi-skilled	55 (13.6)	9 (2.2)		
	Skilled	82 (20.3)	2 (0.5)		
6	Socio economic status*				
	Class I (Upper)	6 (1.5)	1 (0.2)	11.919	0.018*
	Class II (Upper Middle)	79 (19.6)			

	Class III (Middle)	170 (42.2)	7 (1.7)		
	Class IV (Lower Middle)	83 (20.6)	36 (8.9)		
	Class V (Lower)	4 (1.0)	13 (3.2)		
			4 (1.0)		
7	Type of family				
	Joint	34 (8.4)	8 (2.0)		
	Nuclear	256 (63.5)	50 (12.4)	4.859	0.088
	Three generation	52 (12.9)	3 (0.7)		
8	BMI				
	Underweight	34 (8.4)	1 (0.2)		
	Normal	92 (22.8)	18 (4.5)	4.760	0.190
	Overweight	99 (24.6)	21 (5.2)		
	Obese	117 (29)	21 (5.2)		
9	Family H/O NCD				
	No	249 (61.8)	7 (1.7)	84.037	0.000*
	Yes	93 (23.1)	54 (13.4)		
10	H/O NCD related deaths in the family in last 5 years				
	No	311 (77.2)	51 (12.7)	3.043	0.081
	Yes	31 (7.7)	10 (2.5)		

*P-value <0.05- Significant (Pearson's chi square)

DISCUSSION

This cross-sectional study conducted as a part of a house-to-house survey to assess the prevalence and determinants of NCD risk factors among the rural population in Chennai reveals a significant burden of NCDs in the rural community, with a considerable portion of the population affected by diabetes mellitus and hypertension. The prevalence of non-communicable diseases

(NCDs) in rural India is a significant health concern, as highlighted by various studies. Research indicates a high burden of NCD risk factors in rural areas, emphasizing the need for preventive measures [10]. Additionally, the older demographic in rural areas has led to a higher prevalence of NCDs than previously reported, necessitating a wider age range in future health surveys to accurately reflect the changing disease profile and inform healthcare planning [11].

The epidemiological transition in India, driven by rapid economic growth and urbanization, has led to lifestyle changes that increase exposure to NCD risk factors, such as unhealthy food habits and lack of physical exercise. Globalization has also played a role in increasing NCD risk factors through the open markets for food, alcohol, and tobacco products, contributing to the overall burden of NCDs in India [12].

Studies emphasize the importance of estimating the prevalence of NCD risk factors through surveys like the Tamil Nadu STEPS Survey-2, which aims to provide valuable insights into the burden of NCD risk factors and guide interventions to reduce their impact on public health [9]. The study emphasizes the significance of family history of chronic diseases as a strong predictor of NCD prevalence among adults. Additionally, age plays a crucial role, with younger adults being less likely to have NCDs compared to older age groups. These findings underscore the importance of considering genetic predispositions and age-related factors in assessing NCD risk [13].

The study delves into the prevalence of multiple NCD risk factors globally, emphasizing the high burden of risk factors like insufficient fruit and vegetable consumption, physical inactivity, and sedentary behavior. The research underscores the need for comprehensive strategies to address these modifiable risk factors and reduce the overall burden of NCDs worldwide [14]. Studies have shown variations in the prevalence of these risk factors between rural and urban areas, with higher rates of diabetes, hypertension, and other NCD risk factors observed in urban settings compared to rural regions [4]. The findings indicated significant associations between obesity, hypertension, diabetes, alcohol use, and tobacco use, emphasizing the need for lifestyle modifications and early interventions to address the growing burden of noncommunicable diseases in rural Tamil Nadu [15].

Overall, addressing the prevalence of NCDs in rural India necessitates a comprehensive approach that considers behavioral risk factors, social determinants, and the need for community engagement to combat this growing health challenge effectively.

Limitations

The study focuses specifically on Erayamangalam village, Chennai, India. As a result, the findings may not be representative of NCD prevalence and risk factors in other rural regions of India. The study adopts a cross-sectional design, which captures data at a single point in time. As a result, it cannot establish causal relationships between variables or account for changes in NCD prevalence over time. While the study examines several demographic and health-related variables, there may be other factors influencing NCD prevalence that were not included in the analysis.

CONCLUSION

The study conducted in Erayamangalam village, Chennai, sheds light on the prevalence of non-communicable diseases (NCDs) and their associated risk factors among the rural population. The study reveals a significant burden of NCDs in the rural community, with a considerable portion

of the population affected by diabetes mellitus and hypertension. The study identifies several demographic and health-related factors associated with the prevalence of diabetes mellitus and hypertension. These findings highlight the need for increased attention to NCDs in rural health programs and policies.

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