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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 TamilNadu, India.

METHODOLOGY:A community-basedcross-sectional survey was conducted for six months in Erayamangalam village, Chennai. A total of 403 individuals aged18 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 under score 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 health care 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, Non-Communicable Disease

INTRODUCTION

Non-communicablediseases(NCDs)accountfor74%ofallfatalitiesgloballyandincluded iabetes,cancer, heartdisease,stroke,andchroniclungdisease.About86%ofthe17millionprematuref atalitiesoccur beforeturning70andmorethanthree-quartersofallNCDdeathsoccurinlow-andmiddle-incomenations [1].ThemajorityofNCDdeaths(17.9millionannually)arecausedbycardiovascularil lnesses,followedby cancer(9.3million),chronicrespiratorydiseases(4.1million),anddiabetes(2.0millio n,includingdeaths fromrenaldiseaseinducedbydiabetes).TheriskofmortalityfromanNCDisincreased bytobaccouse,air pollution,poornutrition,harmfulalcoholuse,andphysicalinactivity [2].TheNCDepidemicthreatensthe 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].

InIndia,thedisability-adjustedlifeyear(DALY)rate,ameasureoftheper-persondiseaseburden,has decreasedby36%between1990and2016.However,therearesignificantdifferences betweenthestates, withdifferencesinDALYratesnearlytwofold[3].TheprevalenceofdiabetesinTamil Naduhasbeen reportedtobe7.8%inruralareasand23.6%inurbanareas[4].Verylittleresearchhasbe endoneinrural areas that has thoroughly evaluated the NCD risk variables among the Indian population [5].

TheprevalenceofNCDsisreportedtobehigherinurbancommunitiescompare dtoruralareas, emphasizingtheurban-ruraldisparityinNCDburden.Inthisstudy,weaimedtounderstandtheprevalence ofNCDsandtheirassociatedriskfactorsinruralareaswhichiscrucialforpublichealthi nterventions, policy development, and healthcare planning to address the increasing burden of these chronic conditions.

METHODOLOGY

Studydesign,setting,durationandparticipants:

This community-based cross-sectional survey was done in and among households in Erayamangalam village,Tiruvallurdistrict.Thestudydurationwassixmonths,fromFebruary2023toJuly2 023.Thestudypopulation included all those who were >18 years of age and who gave consent for participation. EthicalapprovalwasobtainedfromtheSaveethaMedicalCollegeandHospitalInstitution alEthicsCommitteebefore commencing the study (IRB number 008/02/2023/IEC/SMCH).

Samplesizeandtechnique:

OpenEpisoftwareversion3.01wasusedtodeterminethesamplesizeforthisstudy.Thefollowing assumptionswereconsideredtoestimatetherequiredsamplesize.TheexpectedprevalenceofNCDamong theruralpopulationwas50%sincenohouse-to-housesurveywasconductedonthedeterminantsofNCDs inruralIndia.Usingthesevalueswithaconfidencelevelof95%,asamplesizeof384wasrequired[6].We used theuniversal samplingmethod, takingall 250households inthe Erayamangalamvillage and individuals in each household were surveyed resulting in total sample of 403.

Datacollection:

An interviewer-administered questionnaire was used to collect data on sociodemographic and behavioral riskfactorsforNCD.Thesocio-demographicquestionnaireconsistsofage,gender,education,occupation, monthlyincome,BMIandtheNCDquestionnaire,whichconsistsofsmokinghistory, alcoholhistory, knowncasesofNCDandfamilyhistoryofNCD.Thepopulationwasscreenedfordiabetesbycapillaryblood glucose testing using a glucometer reading. The population was also screened for hypertension using a sphygmomanometer.

Operationaldefinition:

Diabetes:symptomsofdiabetespluscasualorrandomplasmaglucose≥200mg/dl(casualmeanswithout regarding the time of last meal) [7].

Hypertension: Hypertension was defined as SBP/DBP ≥140/90 mmHg in participants younger than 60 years andSBP/DBP≥150/90mmHginthoseaged60yearsorabove[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

Table1providesacomprehensiveoverviewofvariousdemographicandhealth-relatedvariablesamonga samplepopulation.Thesamplepopulationconsistsofindividualspredominantlyabove46years204 (50.6%). Female representation was slightly higher 216 (53.6%) than male 187 (46.4%). Most individuals were married371(92.1%).Highereducationwasthemostcommoneducationalattainment 143(35.5%).ClassIII (Middle)isthemostprevalentsocioeconomicclass206(51.1%).Nuclearfamilieswerethemostcommon family type 306 (74.9%). Obesity was the most prevalent BMI category 138 (34.2%). The individuals with diabetesmellitus68(16.9%)andhypertension61(15.13%)wererecorded.FamilyhistoryofNCDspresentin 147(36.5%)andrecentNCD-relateddeathsinthefamily41(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 (χ^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 > 46	 191 (47.4) 144 (35.7)	 8 (2.0) 60 (14.9)	46.304	**0.000***
2	**Gender** Male Female	 161 (40) 174 (43.2)	 26 (6.5) 42 (10.4)	2.194	0.139
3	**Marital status** Married Unmarried	 303 (75.2) 32 (7.9)	 68 (16.9) 0 (0)	7.056	0.08
4	**Education** Illiterate Primary Secondary Higher	 103 (25.6) 31 (7.7) 70 (17.4) 131 (32.5)	 28 (6.9) 14 (3.5) 14 (3.5) 12 (3.0)	5.732	**0.001***
5	**Occupation** Unemployed Unskilled Semi-skilled Skilled	 118 (29.3) 81 (20.1) 57 (14.1) 79 (19.6)	 40 (9.9) 16 (4.0) 7 (1.7) 5 (1.2)	16.790	**0.001***
6	**Socio economic status*** Class I (Upper) Class II (Upper Middle) Class III (Middle) Class IV (Lower Middle) Class V (Lower)	7 (1.7) 78 (19.4) 170 (42.2) 74 (18.4) 6 (1.5)	0 (0) 8 (2.0) 36 (8.9) 22 (5.5) 2 (0.5)	7.865	0.097
7	**Type of family** Joint Nuclear Three generation	 33 (8.2) 252 (62.5) 50 (12.4)	 9 (2.2) 54 (13.4) 5 (1.2)	3.127	0.209
8	**BMI** Underweight Normal Overweight Obese	 32 (7.9) 87 (21.6) 106 (26.3) 110 (27.3)	 3 (0.7) 23 (5.7) 14 (3.5) 28 (6.9)	6.465	0.091
9	**Family H/O NCD** No Yes	 246 (61) 89 (22.1)	 10 (2.5) 58 (14.4)	84.135	**0.000***

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

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)		
	Primary	34 (8.4)	11 (2.7)	18.677	**0.000***
	Secondary	67 (16.6)	17 (4.2)		
	Higher	136 (33.7)	7 (1.7)		
5	**Occupation**				
	Unemployed	125 (31)	33 (8.2)		
	Unskilled	80 (19.9)	17 (4.2)	15.194	**0.002***
	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)		
	Class II (Upper Middle)	79 (19.6)		11.919	**0.018***
	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

Discussion

This cross-sectional study conducted as a part of a house-to-house survey to assess the prevalence and determinantsofNCDriskfactorsamongtheruralpopulationinChennairevealsasignificantburdenof NCDsintheruralcommunity,withaconsiderableportionofthepopulationaffectedby diabetesmellitus andhypertension.Theprevalenceofnon-communicablediseases(NCDs)inruralIndiaisasignificant healthconcern,ashighlightedbyvariousstudies.ResearchindicatesahighburdenofNCDriskfactorsin ruralareas,emphasizingtheneedforpreventivemeasures[10].Additionally,theolder demographicinrural areashasledtoahigherprevalenceofNCDsthanpreviouslyreported,necessitatingawideragerangein futurehealthsurveystoaccuratelyreflectthechangingdiseaseprofileandinformhealthcareplanning[11].

The epidemiological transition in India, driven by rapid economic growth and urbanization, has led to lifestylechangesthatincreaseexposuretoNCDriskfactors,suchasunhealthyfoodhabitsandlackof physicalexercise.GlobalizationhasalsoplayedaroleinincreasingNCDriskfactorsthroughtheopen marketsforfood,alcohol,andtobaccoproducts,contributingtotheoverallburdenofN

CDsinIndia[12].

Studiesemphasizetheimportanceofestimatingtheprevalenceof NCDriskfactorsthroughsurveyslikethe TamilNaduSTEPSSurvey-2,whichaimstoprovidevaluableinsightsintotheburdenofNCDriskfactorsand guide interventions to reduce their impact on public health [9]. The study emphasizes the significance of familyhistoryofchronicdiseasesasastrongpredictorofNCDprevalenceamongadults .Additionally,age playsacrucialrole,withyoungeradultsbeinglesslikelytohaveNCDscomparedtoolderagegroups.These findings underscore the importance of considering genetic predispositions and age-related factors in assessing NCD risk [13].

Thestudydelvesintotheprevalenceof multipleNCDriskfactorsglobally,emphasizingthehighburdenof riskfactorslikeinsufficientfruitandvegetableconsumption,physicalinactivity,andsedentarybehavior. Theresearchunderscorestheneedforcomprehensivestrategiestoaddressthesemodifiableriskfactorsand reducetheoverallburdenofNCDsworldwide[14].Studieshaveshownvariationsintheprevalenceofthese riskfactorsbetweenruralandurbanareas,withhigherratesofdiabetes,hypertension,andotherNCDrisk factorsobservedinurbansettingscomparedtoruralregions [4].Thefindingsindicatedsignificant 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 non-communicable diseases in rural Tamil Nadu [15].

Overall,addressingtheprevalenceofNCDsinruralIndianecessitatesacomprehensiveapproachthat considersbehavioralriskfactors,socialdeterminants,andtheneedforcommunityengagementtocombat this growing health challenge effectively.

Limitations:

Thestudyfocusesspecificallyon Erayamangalamvillage,Chennai,India.Asaresult,thefindingsmaynotbe representativeofNCDprevalenceandriskfactorsinotherruralregionsofIndia.Thestudyadoptsacross- sectional design, which captures data at a single point in time. As a result, it cannot establish causal relationshipsbetweenvariablesoraccountforchangesinNCDprevalenceovertime.While thestudy examinesseveraldemographicandhealth-relatedvariables,theremaybeotherfactorsinfluencingNCD prevalence that were not included in the analysis.

Conclusions

Thestudyconducted in Erayamangalamvillage,Chennai,shedslightonthepre valenceofnon-communicablediseases(NCDs)andtheirassociatedriskfactorsamongtheruralpopulation.Thestudy revealsasignificantburdenofNCDsintheruralcommunity,withaconsiderableportio

nofthepopulation affectedbydiabetesmellitusandhypertension.Thestudyidentifiesseveraldemographicandhealth-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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