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Original Article

Comparison of prevalence of life style risk factors and 10 year risk of CVD event among rural and tribal population of Kollegal Taluk, Chamrajanagar district, South India

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ABSTRACT

Context: Cardiovascular diseases have been recognized as leading cause of death. Three-fourths of CVD deaths occur in low and middle income countries. Surveillance of CVD risk factors is a key strategy for effective CVD prevention. Aims: To identify the extent of CVD risk factors and 10 year risk of developing Cardiovascular Disease events among rural and tribal population. Subjects and methods: This community based cross sectional study was conducted on a total of 482 rural and 415 tribal subjects aged above 30 years from Kollegal taluk, Chamrajanagar, Karnataka, India. Tobacco and alcohol consumption, BMI, blood pressure and capillary blood glucose were estimated. WHO/ISH risk prediction chart was used to predict 10 year risk of MI/stroke.

Results: Tobacco consumption was 15.4% (rural) and 90.8% (tribal). Alcohol consumption was 10.8% (rural) and 21.9% (tribal), Obesity was 40.2% (rural) and 14.0% (tribal). Prevalence of Hypertension was 49.8% (rural) and 32.2% (Tribal) and diabetes 8.3% (rural) and 2.9% (tribal). Nearly one fourth of the population are at moderate risk (10–30%) and one tenth are at high risk (30%) of MI/Stroke within 10 years.

Conclusions: High prevalence of tobacco consumption among tribal and high prevalence of hypertension and diabetes among rural predisposes 10% of population to moderate to high risk of stroke/MI within 10 years.

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1. Introduction

Globally, cardiovascular diseases have been recognized as the leading cause of death. Three-fourths of CVD deaths occur in low and middle income countries. Majority of cardiovascular diseases can be prevented by addressing behavioral risk factors such as tobacco use, unhealthy diet, obesity, physical inactivity and harmful use of alcohol. Using population wide strategies, persons with cardiovascular disease or those with one or more risk factors (at high cardiovascular risk) need appropriate intervention like detection and management using counselling and medicines. Poorest persons in low and middle income countries are affected the maximum and there is sufficient evidence to prove that even at the household level, cardiovascular diseases lead to catastrophic financial crisis and out of pocket expenditure that contribute to poverty and place a heavy burden on the economics of low and middle countries.

Tribal or indigenous people constitute around 8.08% of total population. Around 636 schedule tribe categories live in geographically scattered areas and in areas which are not easily accessible. Even though they have rich culture they are socio-economically disadvantaged and marginalized. Studies carried out worldwide on indigenous tribes who are in process of acculturation whether it may be American Indians, tribes of Malaysia, South-America or Africa, have shown an increasing trends of cardiovascular disease [1–4]. Changing lifestyle and acculturation are leading to the rise in cardiovascular diseases.

One of the important health care interventions is to target those at high total cardiovascular risk or with single risk factor levels above threshold. Hence, this study was planned to identify the extent of CVD risk factors and predict 10 year risk of developing

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CVD among both rural and tribal communities of Kollegal taluk, Chamrajanagar district, Karnataka, India.

2. Subjects and methods

Community based cross sectional study was conducted in Kollegal Taluk, Chamrajnagar District, Karnataka state, South India. Out of 138 villages, 70 villages are predominantly occupied by Girijanaru tribes (Soliga tribes) and remaining are rural population. Taking an average prevalence of 16% of risk factors of CHD with an allowable error of 3.5% on the prevalence of CHD risk factors at 5% level of significance the sample size was estimated to be 438. An additional 10% subjects were included to prevent non responders. Five villages from 70 soliga tribe predominated villages and five villages from other 68 villages are randomly selected and in each village 100 persons above 30 years fulfilling the study criteria were randomly selected after explaining about the study and obtaining consent. The 5 villages that were selected to study the rural population were Ramapura, Gejalantha, Kempaihahutty, Palanimedu, Ajjipura. The 5 tribal (Soliga) population predominant villages that were selected for study are Kombdiki, Gajnuru, Minya, Konankere, Martalli.

A pretested semi structured questionnaire was used to collect data on socio demographic factors like age, sex, education, occupation, marital status, socio economic status, religion, caste and behavioral risk factors like consumption of tobacco, alcohol, dietary habits like consumption of fruits and vegetables, details of physical activity level at work, transportation and leisure time were obtained from each participant. Those with severe chronic illness, physical disability, mental disability were excluded.

2.1. Anthropometric measurements

Weight was measured in upright position to the nearest 0.1 kg using calibrated balance beam scale. Height was measured without shoes to the nearest 0.1 cm using calibrated stadiometer. Body mass index (BMI) was calculated by dividing observed weight by height squared (kg/m2). Waist circumference (WC) was measured to the nearest 0.1 cm at the narrowest point between lower end of the rib cage and iliac crest.

Blood pressure was measured after the subject was made to sit for at least 5 min using digital sphygmomanometer.

2.2. Biochemical measurements

Fasting capillary blood glucose estimation was done using glucometers and if they were not in fasting state then Random capillary blood sugar was estimated.

2.3. Current tobacco consumption

A person who consumes tobacco in any form (bidi, cigarette or chewable tobacco etc).

2.4. Current alcohol consumption

A person who consumes alcohol in any form (brandy, whisky, beer, rum, vodka) on most of the days in a week.

2.5. Obesity

Classified according to WHO Asia pacific guidelines (Overweight if BMI $\geq$23, obese if BMI$\geq$25) [5,6].

2.6. Central obesity

Central obesity was defined if waist circumference$\geq$102 cm in men and $\geq$88 cm in women.

2.7. Hypertension

Systolic blood pressure (SBP) of $\geq$140 mmHg and/or diastolic blood pressure (DBP) of $\geq$90 mmHg and/or history of hypertension and on anti-hypertensive medications. Pre-hypertension - SBP 120–139 mmHg and/or DBP 80–89 mmHg [7].

2.8. Diabetes mellitus

Fasting capillary blood glucose is $\geq$ 126 mg/dl Or random capillary blood glucose $\geq$200 mg/dl and/or with previous history of diabetes and on anti-diabetic medications [8].

2.9. Impaired fasting glucose (IFG)

Fasting capillary blood glucose is $\geq$ 110 mg/dl and <126 mg/dl[8].

2.10. Impaired glucose tolerance (IGT)

Random capillary blood glucose is $\geq$ 140 mg/dl and <200 mg/dl[8].

2.11. Year CVD risk prediction

For individuals aged 40 and above, their 10-year risk of a fatal or non-fatal major cardiovascular event (myocardial infarction or stroke) according to age, sex, blood pressure, smoking status and presence or absence of diabetes mellitus, was calculated using SEAR-D specific WHO-ISH Risk prediction charts [9] and classified as low risk ($\leq$10%), moderate risk (10–30%) and higher risk ($\geq$30%).

2.12. Ethical clearance

Ethical clearance for the study was obtained from Institutional ethics committee of the JSS Medical College, Mysuru. Free and informed consent was obtained from each participant.

2.13. Statistical analysis

Data were entered in excel sheet and analyzed using SPSS software version 22 (IBM, USA, Inc). Descriptive statistics like percentages for qualitative data and Mean, standard deviation for quantitative data were calculated. Inferential statistics like chi square for qualitative variables and Independent *t*-test for quantitative variables were used to find statistically significant difference between rural and tribal population and P value of <0.05 was considered to be statistically significant. Multinomial logistic regression was used to predict the factors influencing moderate and high risk of CVD.

3. Results

Socio-demographic profile of the study participants is presented in Table 1 and it was observed that there was almost equal distribution of rural study participants in all three age groups, whereas in tribal study subjects more than fifty percent were between the ages of 30–45 years. Around 45% were Males and 55% were females in both rural and tribal areas. All tribal subjects were illiterate without any formal education. Among rural subjects also only 12% were literates. Around 94% of the tribal subjects were employed as

Table 1
Comparison of Socio-demographic profile between rural and tribal population.

Variable	Category	Rural (N = 482)		Tribal (N = 415)	
		Frequency	Percentage	Frequency	Percentage
Age (in years)	30–45	157	32.6	216	52.0
	46–60	157	32.6	91	21.9
	61 and above	168	34.8	108	26.0
Sex	Male	221	45.9	185	44.6
	Female	261	54.1	230	55.4
Marital status	Unmarried	5	1.0	–	–
	Married	442	91.7	414	99.8
	Widow/Widower	35	7.3	1	0.2
Literacy	Illiterate	424	88	415	100
	Literate	58	12.0	–	–
Occupation	Profession/Semi-profession	27	5.6	–	–
	Agriculture	57	11.8	2	0.5
	Business	46	9.5	–	–
	Skilled/Unskilled worker/Laborers	102	21.1	390	94.0
	Housewife	205	42.5	21	5.1
	Unemployed	45	9.3	2	0.5
Religion	Hindu	482	100	415	100
Standard of living (SLI)	Low (0–14)	208	43.2	414	99.8
	Medium (15–24)	185	38.4	1	0.2
	High (25–67)	89	18.5	–	–

agriculture labourers with a mere 5% of the women being housewives, however among rural subjects, more than 90% of the women were not engaged in any form of employment and preferred to be housewives and more than 50% of the men were agricultural labourers working in others fields and one fourth of them were agriculturists having their own farms and only 5% of them were either professionals or semi-professionals. All study subjects were Hindus by religion. Almost all tribals lead a low standard of living, whereas among rural subjects, 43.2% were having low and 18.5% were having high standard of living.

Comparison of risk factors among rural and tribal study subjects is presented in Table 2. Tobacco consumption was very high (90.8%) among tribal subjects and it is only 15.4% of the rural subjects. Alcohol consumption is also relatively higher (21.9%) in tribal compared to rural subjects (10.8%). Though many of tribal subjects consume non vegetarian diet (98.8%), frequency of consumption of non-vegetarian food is occasional (not even once a month). Similarly, the frequency of consuming raw fruits and vegetables is occasional i.e. once a month. Among rural subjects, half of them consume non vegetarian food, but most of them consume occasionally. Physical inactivity at work and during transportation is less than 2% of rural subjects. All tribal subjects were engaged in physically active heavy work.

Prevalence of overweight and obesity among rural subjects were 17.8% and 40.2% respectively whereas tribal subjects had significantly lower overweight and obese individuals (11.6 and 14.0%). Even abdominal obesity as assessed by waist circumference was significantly higher among rural subjects (40.7%) and lower among tribal (12.0%). Prevalence of stage 1 and stage 2 hypertension among rural subjects were 30.1% and 19.7%, whereas among tribal subjects it was 20.7% and 12.5%. However, among both rural and tribal subjects one third of the study subjects had pre-hypertension. Comparison of diabetic status, tribal population had lower prevalence of 2.9% whereas rural subjects had 4 times higher prevalence (8.3%). In contrast to diabetic status which is higher in rural subjects, prevalence of prediabetes (IFG & IGT) is

Table 2
Comparison of risk factors for cardiovascular disease between rural and tribal population.

Risk factors	Rural (N = 482)	Tribal (N = 415)	P-value[b]
Tobacco consumption	75 (15.4)	377 (90.8)	<0.001
Alcohol consumption	52 (10.8)	91 (21.9)	<0.001
Non veg consumption	245 (50.8)	410 (98.8)	<0.001
Weight (kg)[a]	57.48 (12.09)	48.41 (10.52)	<0.001
BMI[a]	24.56 (5.4)	21.06 (4.1)	<0.001
Overweight	86 (17.8)	48 (11.6)	<0.001
Obesity	194 (40.2)	58 (14.0)	<0.001
Waist circumference (cm)[a]	92.08 (12.8)	77.74 (12.3)	<0.001
Central obesity	196 (40.7)	50 (12.0)	<0.001
Systolic BP (mmHg)[a]	139.32 (21.65)	132.05 (21.07)	<0.001
Diastolic BP (mmHg)[a]	88.82 (12.17)	88.59 (16.94)	0.81
Hypertension-1	145 (30.1)	86 (20.7)	<0.001
Hypertension-2	95 (19.7)	52 (12.5)	<0.001
Fasting blood glucose (mg/dl)[a] (rural n = 156) (tribal n = 30)	111.61 (28.82)	109.40 (16.0)	0.55
Impaired Fasting Glucose (rural n = 156) (tribal n = 30)	33 (22.29)	15 (50)	
Random blood glucose (mg/dl)[a] (rural n = 326) (tribal n = 377[c])	119.17 (41.83)	121.73 (35.51)	0.38
Impaired Glucose Tolerance (rural n = 326) (tribal n = 377[c])	33 (10.18)	67 (17.77)	
Diabetes status	40 (8.3)	12 (2.9)	<0.001

[a] Results are reported as mean (SD), Other results are reported in n (%).
[b] Chi square test and was used to compare proportions and Independent student standard *t*-test was used to compare the means.
[c] 8 participants didn't consent for capillary blood collection.

higher among tribal subjects.

It was evident that tobacco (96.7%) and alcohol (27.5%) consumption were highest among 45–60 years age group tribal subjects. Overweight was highest (18.5%) in 46–60 years age group rural subjects and it is around 11–12% across all the age groups of tribal subjects. Obesity was highest among 46 to 60 age group rural participants. It was also evident that elderly (≥61 years) study participants from both rural and tribal area had lower prevalence (34.7% and 8.3% respectively) than the younger age group individuals. Prevalence of stage 1 hypertension increased with age in middle aged (34.2%) and elderly (33.1%) rural study subjects but for tribal study subjects it was 31.9% for 46–60 year age group study subjects and 19.4% for the elderly. Stage 2 hypertension was increasing with age and prevalence was 25.8% in rural study subjects above 60 years and 18.5% in tribal subjects above 60 years. Diabetes prevalence was highest in 46–60 year old middle aged individuals for both rural (10.8%) and tribal (4.4%) areas.

It was also observed that tobacco and alcohol consumption were highest among tribal males, overweight (15.5%) and obesity (36.4%) were high among rural males compared to tribal males. Overweight (19.9%) and obesity (43.7%) were highest in rural females. Hypertension (stage 1 and stage 2) was higher in rural males and females compared to tribal counterparts.

Mean weight, body mass index, waist circumference, systolic blood pressure was significantly higher among rural study subjects. It was observed that clustering of risk factors in tribal population is higher compared to rural and the difference is statistically significant (0.001). Fig. 1 describes about the 10 year CVD risk in rural and tribal population and it was observed that in tribal population moderate and high risk of CVD is relatively higher than rural study population ($P = 0.043$).

Clustering of risk factors among rural and tribal are described in Fig. 2 and it is observed that clustering in tribal population is higher compared to rural and the difference is statistically significant ($p = 0.000$).

Multinomial Regression risk prediction model for moderate and high risk (10–30%) found a statistically significant association with age, SBP, gender, smoking, diabetes with the highest odds ratio for smoking and diabetes.

4. Discussion

Ongoing demographic transition in the world has changed health care needs of the people. Non communicable diseases are rapidly replacing infectious diseases as the leading causes of disability and pre mature deaths. Cardiovascular diseases are becoming a serious concern accounting for 38% of disease in WHO South East Asia Region. Rural and tribal populations are also experiencing such demographic transition and are at increased risk of suffering from non-communicable diseases.

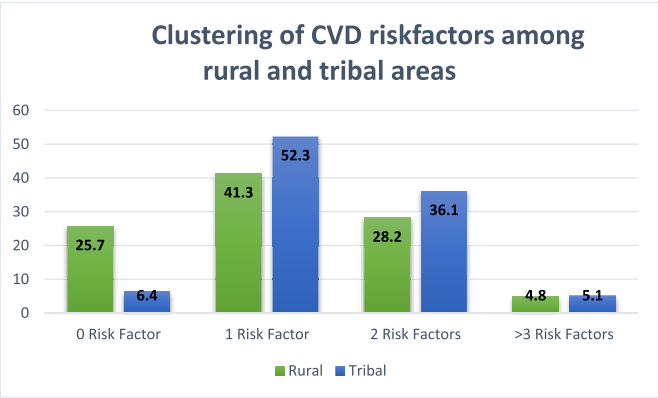

Fig. 1. Clustering of CVD riskfactors among rylar and tribal areas.

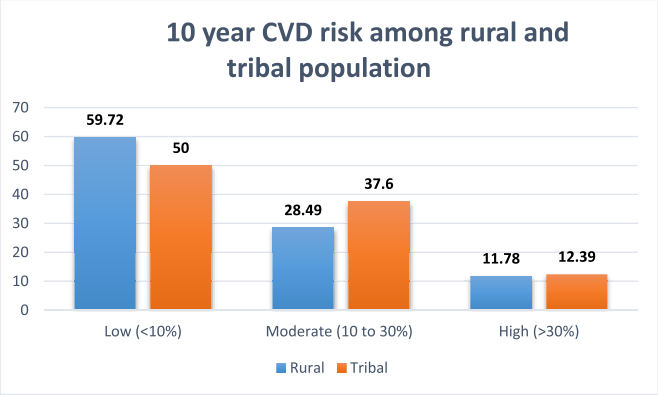

Fig. 2. 10 year CVD risk among rural and tribal population.

Present study documents diabetes prevalence of 8.3% in rural and 2.9% in tribal population. In a review article on burden of non-communicable diseases in South Asia, the prevalence of diabetes ranges from 2.1% to 7.1% and it was projected that by the year 2025 it would increase to 2.3% to 8.7% [10]. Although diabetes prevalence is more in rural area, pre-diabetes (IFG & IGT) are more in tribal compared to rural which can be attributed to changing lifestyles even in tribal population and the need for screening is important in these populations also. In tribal population eight subjects were not willing to undergo screening with a simple test like capillary blood glucose which shows there is increased need of awareness about screening for diabetes and focus on preventive measures of diabetes.

Prevalence of hypertension in this study was 49.8% (rural) and 33.2% (tribal) and most of the individuals were not aware of their hypertensive status and among those who were aware also most of them were not on regular medications. Among various studies the hypertension prevalence in rural and tribal areas ranges between 27.4% and 46.3% [11–14]. The increasing prevalence of hypertension is attributable to rapid transition of life style practices as well as increased elderly population due to an increase in life expectancy. Relatively higher prevalence of hypertension could be due to use of digital sphygmomanometer and single time recording of the blood pressure.

Present study documents smoking prevalence of 15% (rural) and very high prevalence of tobacco consumption in tribal areas (90.8%). The national prevalence of regular use of smoking tobacco is estimated to be 16.2% and chewing tobacco 14.0%. Respondents belonging to recognized disadvantaged groups were significantly more likely to report regular use of alcohol as well as smoking and chewing tobacco. People from rural areas had higher rates compared to urban dwellers. Individuals below poverty line had higher odds for chewing tobacco and alcohol use compared to those above poverty line [15]. In The Global Adult Tobacco Survey (GATS), India found that the rural areas of the country exhibit comparatively higher prevalence rates (38.4%) in comparison to urban areas (25.3%) [16]. The study among Kerala tribes revealed high prevalence of tobacco use in any form (76% among men and 47% women) [14]. Relatively lesser prevalence in rural areas in the present study might be due to reporting bias i.e subjects not willing to reveal their smoking habits. Very high prevalence (90.8%) of tobacco consumption in tribal area even among females (88.3%) can be attributed to easy availability of tobacco as most of the tribal study subjects working in tobacco fields, illiteracy, cultural acceptability

and lack of awareness about the harmful effects of tobacco on health.

Alcohol consumption in the present study was reported to be 10.8% in rural and 21.9% in tribal population. Prevalence of current use of alcohol ranged from as low as 7% in the western state of Gujarat (officially under Prohibition) to 75% in the North-eastern state of Arunachal Pradesh. There is also an extreme gender difference. Significantly higher use has been recorded among tribal, rural and lower socio-economic urban sections [17]. Alcohol consumption is seen in 37.5% among tribal population of Uttarakhand [12]. The study among Kerala tribes revealed alcohol consumption in 53% men and 1% among women [14].

Obesity was noted in 40.2% of rural and 14% of tribal population. Central obesity with waist circumference ≥102 cm in male and >88 cm in female was found in 40.7% of rural and 12% in tribal population. It was obvious that obesity is not only seen in affluent and urban population but its prevalence is increasing in rural areas and even to tribal populations. There is need for creating awareness about the harmful effects of obesity and its association with many non-communicable diseases among these population. In a review on epidemic of obesity, prevalence in developed countries ranges from 23% (Japan) to 66.3% (USA) whereas in developing countries the range varies between 13.4 (Indonesia) to 72.5 (Saudi Arabia) [18]. Traditionally known for malnutrition, Indians now report more and more frequently with overweight, obesity, and their consequences. Obesity is a major driver for the widely prevalent metabolic syndrome and type-2 diabetes mellitus (T2DM). While the problem of under nutrition still exists in many parts of India, the additional burden of obesity due to change in lifestyles is alarming situation. A better understanding of the numbers and causes can help overcome barriers to the primary prevention of obesity for youth and adults in communities, medical care and workplaces [19].

Among rural study participants, 11.78% of participants had high risk and 28.49% had moderate risk of developing CVD in 10 years by using WHO/ISH risk charts. Study done in Bangladesh rural population and rural Pondicherry of South India showed 7.9%, 10.8% with high risk and 12.3%, 39% having moderate risk of developing CVD in ten years respectively [11,20]. Difference in the percentage of moderate risk between present study and other studies can be explained by difference in the categorization of risk as moderate and high i.e in present study moderate risk is taken as 10–30% where as in other studies it is taken as 10–20% and the utilization of WHO/ISH risk prediction charts with cholesterol in rural Pondicherry study. Among rural study population, 28.2% had 2 CVD risk factors, 4.8% had ≥3 CVD risk factors clustering which is similar to findings in a study done in rural central India of 25.4% having 2 risk factors and 8.2% having ≥3 CVD risk factors [13].

5. Limitations

As the study was for a short period, logistics of sample collection and biochemical analysis and paucity of funds, blood cholesterol estimation was not possible for all the study participants. Blood pressure was measured only once and a follow up to confirm the raised blood pressure was not done.

6. Strengths

In spite of these limitations, this study is first of its kind in screening for conventional risk factors for CVD and estimation of 10 year CVD risk among rural and tribal population of Kollegal taluk, South India. Study was done with an adequate sample size representing the population. Study was able to detect diabetes and hypertension in many study subjects who were unaware of their disease status.

7. Conclusion

Surveillance of CVD risk factors by a population based study has documented nearly one-fourth of rural and tribal population at moderate risk and almost one tenth have high risk of developing cardiovascular event within next ten years.

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Presentation at a meeting

Nil.

Conflicting interest

Nil.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.dsx.2019.07.056.

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