ORIGINAL ARTICLE

Ten Years Risk Prediction of Cardiovascular Disease among Adults in Rural Area of Dakshina Kannada, Karnataka

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ABSTRACT

Background: Cardiovascular disease (CVD), one of the non-communicable diseases, has become a major public health problem and it is a leading cause of morbidity and mortality in both developing and developed countries. The important CVD risk factors are obesity, hypertension, diabetes, hyperlipidaemia, unhealthy diet, physical inactivity and tobacco use. Cardiovascular risk approach is feasible and cost-effective tool, which helps to identify those at high risk for developing CVDs, so that immediate preventive measures or action can be taken to reduce the risk. **Objectives**: estimate the ten-year risk of developing cardiovascular disease using Framingham heart risk assessment score. **Materials and Methods:** A community-based, cross-sectional study was conducted among adults residing in a rural area of Dakshina Kannada District for a period of 6 months from July 2013 to December 2013. The data was collected using pretested semi structured questionnaire through interview methods. Anthropometric measurement and blood investigation (fasting blood sugar and lipid profile) was done. The Framingham Risk Score is a gender-specific algorithm used to estimate the 10-year cardiovascular risk of an individual **Results:** Among 712 study participants, 95 (13.3%) and 20 (2.8%) participants had intermediate and high risk of developing cardiovascular disease in 10 years respectively. The proportion of intermediate CVD risk prediction and high-risk predication was more in males as compared to females. **Conclusion:** The cardiovascular risk factors like obesity, physical inactivity, diabetes and hypertension are widely prevalent among adults in rural areas. The high-risk prediction for developing CVD among study participants in next 10 years was 2.8%.

KEY WORDS: Cardiovascular risk factors, Framingham risk score, 10 years CVD risk prediction, Prevalence.

Introduction

Cardiovascular disease (CVD), one of the non-communicable diseases, has become a major public health problem and it is a leading cause of morbidity and mortality in both developing and developed countries.[1,2] Globally, CVD are one of leading cause of death and an estimated 17.9 million people died from cardiovascular disease in 2019, representing 32% of all global deaths.[2] It has been predicted that approximately 23.6 million people will die from cardiovascular diseases by 2030.[3]

The important CVD risk factors are obesity, hypertension, diabetes, hyperlipidaemia, unhealthy diet, physical inactivity and tobacco use.[4] Most of the factors like unhealthy diet, tobacco use, physical

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inactivity and obesity can be prevented by behavioural changes and thus decreased the rise of CVD. There is a need for creating awareness among the population regarding adoption of behavioral changes & healthy lifestyle, and screening for risk factors for early detection of CVD.

Even, estimation of risk of developing cardiovascular event in the next 10 years will also help and aware the individuals regarding the measures they need to take for prevention of any untoward cardiovascular events in the future.

Cardiovascular risk approach is feasible and cost-effective tool, which helps to identify those at high risk for developing CVDs, so that immediate preventive measures or action can be taken to reduce the risk.[5] The Framingham risk score (FRS) is well-established and widely used method to measure cardiovascular disease risk in general population.[6] As there was very few studies done 10 year risk estimation of CVD among rural population, so this was study was conducted with the aim to estimate the ten-year risk of developing cardiovascular disease using Framingham heart risk assessment score.

Methodology

A community-based, cross-sectional study was conducted among adults residing in a rural area of Dakshina Kannada District for a period of 6 months from July 2013 to December 2013. The sample size was calculated to 712, by considering the prevalence of hypertension (which is one of the established risk factors of cardiovascular disease) as 36.1% in rural Kerala with an allowable error of 10%.[7] Ethical clearance was taken from the institutional ethics committee before starting the study. Informed written consent was taken from all participants and data was collected using pretested semi-structured questionnaire by interview method. The questionnaire consisted socio-demographic details, dietary habits, smoking, family history of cardiovascular disease/diabetes/ hypertension. Anthropometric measurements (weight, height) and general physical examination were done. Blood pressure (BP) was measured using standard mercury sphygmomanometer in the sitting position and it was classified as per JNC 7 guidelines.[8]

Fasting intravenous blood was taken on the next day morning of visit, for blood sugar and lipid profile under universal safety precautions from all study participants. As per standard guidelines, the cut off value was taken for considering diabetes and dyslipidemia.[9,10]

The Framingham Risk Score is a gender-specific algorithm used to estimate the 10-year cardiovascular risk of an individual.[11] It was calculated on the basis of risk score that includes five parameters namely age, total cholesterol, HDL cholesterol, smoking and systolic blood pressure (SBP), which were different for males and females.For every parameter, specific points were given and ten-year risk for CVD in percentage was calculated by total points. Absolute CVD risk percentages over 10 years were classified as low risk (< 10%), intermediate risk (10–20%), and high risk (> 20%).[12]

The data was entered and tabulated in Microsoft Excel sheet and it was analyzed using Statistical Package for Social Sciences (SPSS) software Trial version 21. Tests of significance such as Pearson's chi square test was used, and the statistical significance level was fixed at $p < 0.05$.

Operational definitions

The following operational definitions were used in this study:

1. Hypertension was defined according to the 7th report of Joint National Committee for the detection and evaluation of BP or of already those diagnosed and taking anti-hypertensive medication.[8]
2. Obesity was defined as body mass index (BMI $\geq$ 25 kg/m2[13]
3. Current tobacco users are those who used any tobacco products like cigarettes, bidis, chewing tobacco, snuff on a regular basis for at least the previous one year before the assessment.[14]
4. Physical Exercise[8]
    (a) Regular exercise: engagement in regular aerobic physical activity such as brisk walking at least 30 min/day, at least 5 days/week.
    (b) Some exercise: engagement in regular aerobic physical activity such as brisk walking only on some days of the week.
    (c) No exercise: no engagement in aerobic physical activity at all.

Results

The study population consisted of 433 (60.8%) females and 279 (39.2%) males. Maximum partic-

ipants (38.2%) were in age groups of 50-59 years. (Table 1)

Table 1: Sociodemographic characteristics of study population (n=712)

Variable	Categories	Total	
		No.	%
Age (in years)	18-29	104	14.6
	30-39	160	22.5
	40-49	176	24.7
	50-59	272	38.2
Gender	Male	279	39.2
	Female	433	60.8
Education*	Illiterate	173	24.3
	Primary	230	32.3
	Secondary	154	21.6
	High School	109	15.3
	PUC & above	46	6.5
Occupation	Unemployed	176	24.7
	Employed	536	75.3
Diet	Mixed	467	65.6
	Vegetarian	245	34.4

*According to Indian standards of educational qualifications

The prevalence of family history of CVD was 52 (7.3%), tobacco consumption was 86 (12.1%). The prevalence of obesity, hypertension and diabetes were 267 (37.50%), 308 (43.2%) and 146 (20.5%) respectively (Table 2).

Among 712 study participants, 95 (13.3%) and 20 (2.8%) participants had intermediate and high risk of developing cardiovascular disease respectively. The proportion of intermediate CVD risk prediction and high-risk predication was more in males as compared to females. (Table 3)

In this study, all study participants among 18-29 years had low CVD risk. The study participants had intermediate CVD risk predication were 3.1%, 8.5% and 27.6% in the age group 30-39 years, 40-49 years and 50-59 years respectively. In the age group of 50-59 years, 27.6% participants had high CVD risk prediction, which was higher than other age group participants. (Figure 1)

Gender, age groups, physical inactivity, tobacco consumption, obesity and hypertension status were found to have a statistically significant association with CVD risk categories. Among 351 participants, who are physically inactive, 56 (15.9%) and 15 (4.3%) had moderate and high 10-year CVD risk predication respectively (Table 4)

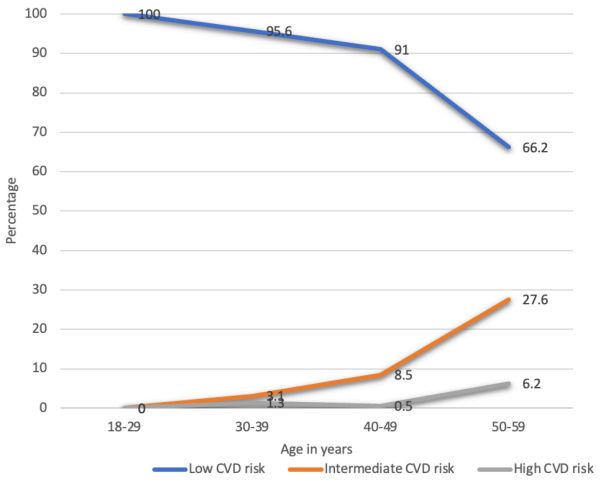

Figure 1: Distribution of study participants with relation to the Framingham 10 years risk prediction (n=712)

Discussion

In this study, majority of the participants were females (60.8%) and in the age group of 50-59 years (38.2%). Among CVD risk factors, hypertension (43.2%) and obesity (37.5%) were more prevalent among study participants. In a study done by Bartwal et al in rural Haldwani stated that the prevalence of hypertension as 41.7%, which was similar to our study finding.[15] Whereas in a study done by Chow C.K et al in rural population of Andhra Pradesh, revealed that 36.8% were obese (BMI>25).[16] The prevalence of diabetes was 20.5% in this study, which was similar to the prevalence of diabetes as 22.8% reported by Muthunarayanan L et al in rural block of Tamil Nadu.[17] As compared to females, males had higher chances of intermediate and high CVD risk prediction. In a study done by Deori T J et al in rural Lucknow, 14.8 % males had high risk of CVD, which was more than the females, ant it was comparable to our study findings.[17] Maximum participants (83.8%) in this study had low (<10%) risk for developing CVD in next 10 years. Similar findings were observed in the study done by Deori T J et al in rural population of Lucknow and Balaji B V et al in rural population of India.[18,19]

The risk of developing CVD increases as age progress, which was found in this study. The intermediate and high CVD risk was more among study participants who were above 40 years irrespective of genders.

Table 2: Prevalence of cardiovascular risk factors among study population (n=712)

Risk factors	Male (n=279)	Female (n=433)	Total (n=712)	p Value
	No. (%)	No. (%)	No. (%)	
Family history of CVDs	19 (6.8)	33 (7.6)	52 (7.3)	0.748
Tobacco consumption (chewing/smoking)	62 (22.2)	24 (5.5)	86 (12.1)	0.000*
Obesity (BMI >25)	97 (34.8)	170 (39.3)	267 (37.5)	0.154
Hypertension (BP>140/90 mm Hg)	119 (42.6)	189 (43.6)	308 (43.2)	0.810
Diabetes	56 (20.1)	90 (20.8)	146 (20.5)	0.502
High total Cholesterol (> 240 mg/dl)	43 (15.4)	78 (18.0)	121 (17.0)	0.623
Low HDL (< 40 mg/dl)	71 (25.4)	74 (17.1)	145 (20.4)	0.001*

*Statistically significant

Table 3: Distribution of study participants with relation to the Framingham 10 years risk prediction (n=712)

Gender	Age group (in years)	Framingham 10-year risk prediction			Total No. (%)
		Low risk No. (%)	Intermediate risk No. (%)	High risk No. (%)	
Male	18 – 29	40 (100)	0	0	40
	30 – 39	48 (88.9)	4 (7.4)	2 (3.7)	54
	40 – 49	56 (84.9)	9 (13.6)	1 (1.5)	66
	50 – 59	37 (31.1)	66 (55.5)	16 (13.4)	119
	Total	181 (64.9)	79 (28.3)	19 (6.8)	279
Female	18 – 29	64 (100)	0	0	64
	30 – 39	105 (99.1)	1 (0.9)	0	106
	40 – 49	104 (94.5)	6 (5.5)	0	110
	50 – 59	143 (93.5)	9 (5.9)	1 (0.6)	153
	Total	416 (96.1)	16 (3.7)	1 (0.2)	433

Sonal Parikh et al reported that, the low CVD risk was present among younger age group and 61.5% had combined intermediate and high CVD risk among 50-59 years study participants.[20] In this study, it was observed that estimated intermediate and high CVD risk was statistically higher among those participants who were physically inactive, tobacco users, obese (BMI>25), hypertensive and diabetic. Similar findings of higher CVD risk prediction with physical inactivity, hypertension, obesity and diabetes were observed in the study done by Prathyusha Kadiyala et al in rural Mysuru and Gift Norman et in rural population of South India.[21,22]Urban population are always at high risk of developing cardiovascular disease because of their lifestyle. Our study findings can be comparable with the findings of the study done among urban population by Sonal Parikh in Ahmedabad city and M N Alam in Farukhabad, Uttar Pradesh.[20,23]

The strengths of this study were clinical examination, laboratory investigation (Lipid profile & fasting blood sugar) and good sample size. Assessment of various risk factors for CVD and 10-year risk prediction for CVD among rural population were also the strengths of this study.

The limitation of this study was that majority of the population was female, so its generalizability is limited, but it will provide more insight information regarding risk factors among women. Information bias regarding tobacco consumption and physical activity cannot be ruled out. Framingham risk assessment tool does not include family history of CVDs and diabetes, which are one of the important risk factors for cardiovascular disease.

Conclusion

The cardiovascular disease burden of India is expected to be double in the next two decades,

Table 4: Association of various variables and Framingham 10 years risk prediction (n=712)

Variables		CVD risk category			Total	p value
		Low	Intermediate	High		
		No. (%)	No. (%)	No. (%)		
Gender	Male	181 (64.9)	79 (28.3)	19 (6.8)	279	< 0.00001*
	Female	416 (96.1)	16 (3.7)	1 (0.2)	433	
Age (in years)	< 40	257 (97.3)	5 (1.9)	2 (0.8)	264	< 0.00001*
	> 40	340 (75.9)	90 (20.1)	18 (4.0)	448	
Physical activity	Yes	317 (87.8)	38 (10.5)	6 (1.7)	361	0.048*
	No	280 (79.8)	56 (15.9)	15 (4.3)	351	
Diet	Vegetarian	170 (69.4)	65 (26.5)	10 (4.1)	245	0.000*
	Mixed	409 (87.6)	41 (8.8)	17 (3.6)	467	
Tobacco consumption	Yes	22 (25.6)	51 (59.3)	13 (15.1)	86	< 0.00001*
	No	583 (93.1)	36 (5.8)	7 (1.1)	626	
BMI	< 25	242 (90.6)	21 (7.9)	4 (1.5)	267	0.000*
	> 25	353 (79.3)	75 (16.9)	17 (3.8)	445	
Hypertension	Yes	250 (80.7)	49 (15.8)	11 (3.5)	310	0.004*
	No	359 (89.3)	35 (8.7)	8 (2.0)	402	
Diabetes	Yes	22 (15.1)	41 (28.1)	83 (56.8)	146	< 0.00001*
	No	389 (68.7)	143 (25.3)	34 (6.0)	566	

*Statistically significant

making it leading cause of mortality and morbidity. Around, 69% of population of India residing in rural areas, and they are also adopting the urban life style which can lead to develop cardiovascular disease. From this study, it is inferred that modifiable cardiovascular risk factors like obesity, physical inactivity, diabetes and hypertension are widely prevalent among adults in rural areas. The intermediate and high-risk prediction for developing CVD among study participants in next 10 years was 13.3% and 2.8% respectively, and it was statistically associated with tobacco consumption, obesity, hypertension and diabetes.

Conflict of interest

Authors declare no conflict of interest.

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