

Research Article

Cardiovascular risk assessment in population from urban and sub urban areas of Eastern part of Odisha, India

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ABSTRACT

Background: Cardiovascular disease (CVD) is a leading cause of death in the world. The aim of the study was to assess cardiovascular risk factors in population from urban and sub urban areas of eastern part of Odisha, India.

Methods: We conducted an observational study; total 67 individuals (21 women, 46 men) were recruited from the population, aged 30 to 59 years, to evaluate their cardiovascular risk factors by pre-designed structured questionnaire and clinical and laboratory data were collected over a period of 6 months.

Results: The prevalence of major CVD risk factors was: hypertension 28.3%, diabetes 38.8%, elevated total cholesterol/HDL ratio 38.8 %, obesity 62.6 % and current smoking 28.3%. The score of ≥ 4 was obtained more among the 40–49 year old age group than the 30-39 and 50-59 year old age groups (≥ 2) and the risk factor score of ≥ 3 was significantly more in the higher income group as compared with the lower income group (74% vs. 26%). A high-risk dietary pattern was found to be significantly more in the literate group as compared with the illiterate group (32.2% vs. 25%).

Conclusions: This study concludes that the high prevalence of CVD and its risk factors is due to lack of awareness and special attention should be given to changing life style and dietary control among a comparatively young male population from urban and sub urban areas of eastern part of Odisha.

Keywords: CVD, Diet, Life style, Risk factors, Score

INTRODUCTION

Cardiovascular disease (CVD) is the major cause of morbidity and mortality in the world and it is the number one cause of death globally.¹ According to WHO report, 17.5 million people died from CVDs in 2012 and three quarters of CVD deaths were in low and middle-income countries. There are several behavioural risk factors such as tobacco use, unhealthy diet, obesity, physical inactivity and harmful use of alcohol and incidence of CVD can be controlled by addressing these factors.² Cardiovascular disease (CVD) is rapidly increasing in the world particularly in Asian countries and about half of the CVD

cases worldwide are living in these countries.^{3,4} Therefore, it is an important issue to control CVD in Asia for the world health.⁵

Hypertension and diabetes are common comorbid conditions that affect the majority of CVD patients, with the prevalence depending on type of diabetes, age, obesity, and ethnicity. Type 2 diabetes with hypertension and dyslipidemia are strong risk factors for cardiovascular disease (CVD), and diabetes itself confers independent risk.¹ The American Heart Association (AHA) has designated two major risk factors-obesity and physical inactivity for CVD risk.^{6,7} The quantitative

relationship between these risk factors and CVD risk has been elucidated by the Framingham Heart Study and other studies.⁸

The risk of cardiovascular diseases has increased across age groups and was significantly higher in men than in women. Another important issue is that the cardiovascular morbidity, mortality, and risk burden have shifted toward younger age, especially in men. Besides, a study reported that the risk of cardiovascular mortality is higher among black women than white women.^{9,10}

Exercise also plays an important role in CVD and it lowers diabetes, hypertension, and CVD risk in hypercholesterolemia patients.¹¹ It has been observed that high dietary sodium intake is associated with elevated incidence of CVD in patients with type 2 diabetes and it shows a synergistic effect between HbA_{1c} values and dietary sodium intake for the development of CVD.¹²

A higher-quality diet was associated with a lower risk of recurrent or new CVD events among people ≥55 years of age with CVD or diabetes mellitus. It can be suggested that dietary modification may have benefits in addition to those seen with aspirin, angiotensin modulators, lipid-lowering agents, and β-blockers. Health professional's advice to individuals to improve their diet quality would substantially reduce CVD recurrence beyond drug therapy alone and save lives globally.¹³

A study revealed that additional support in modifying lifestyles is useful in the reduction of cardiovascular disease risk. Change in individual risk factors: blood pressure, lipid profile, weight, body mass index, waist circumference, smoking, diabetes has been measured in the study.

Many of the risk factors like smoking, obesity, dietary pattern, physical inactivity etc. need special attention. Cardiovascular disease risk factor was highly prevalent in the study population, the most striking being obesity (56%) and hypertension (46%) as per WHO criteria. The physical activity score was significantly more in the older age group and higher income group. A high-risk dietary pattern was seen to be significantly more in the younger age group and the literate group.^{13,14}

It has been demonstrated that physical activity reduces risk of CVD.¹⁵ Most of the (80%) of global deaths related to CVD occur in low-and middle-income nations, which cover most countries in Asia.¹⁴ Herein, we have conducted an observational study to evaluate the cardiovascular risk factors in population from urban and suburban areas of eastern part of Odisha, India.

METHODS

The aim of the study was to assess the cardiovascular risk in population from urban and sub urban areas of eastern part of Odisha with family history of diabetes and

hypertension. Overall, total 67 individuals (21 women, 46 men) were recruited from urban and suburban population attending our hospital from time to time for health check-up over a duration of six months with age interval of 30 to 59 years and a history of at least one risk factor for cardiovascular diseases (e.g., smoking, increased blood cholesterol, and increased blood glucose level).

We performed a detailed cardiovascular risk factor assessment and estimated a total cardiovascular risk for each individual at a regular preventive check-up visit. Information was obtained by standardized questionnaire at baseline on biological parameters [age, sex, height, weight, body mass index (BMI), blood pressure, waist circumference, serum lipids, blood glucose, family predisposition]; habits (diet, physical activity, extra salt intake, chewable tobacco, smoking, daily alcohol intake); socio-demographic characteristics (education, profession, family status); and clinical data including age at diagnosis, duration and treatment of diabetes (current and initial) and history of hypertension and its treatment.

Serum was analyzed for total cholesterol, HDL, LDL, triglycerides (mg/dl), and fasting and 2 hour postprandial glucose (mg/dl) and HbA_{1c} (%). The cardiovascular screening (risk factor measurement) was carried out according to a standardized protocol based on the international standards (Table 1).^{15,16}

Table 1: Scoring for general risk factors.

Risk factor	Score
History of hypertension	1
History of diabetes	1
Family history of hypertension	1
Family history of diabetes	1
Total cholesterol in mg/dL	
200-239	1
240-279	2
≥280	3
HDL cholesterol in mg/dL	
35-44	1
<35	2
Regular smoker	1
Chewable tobacco	1
Alcoholic	1
BMI>23	1
HTN in mmHg (systolic 140-159 / diastolic 90-99)	1
HTN in mmHg (systolic 160-179 /diastolic 100-109)	2
HTN in mmHg (systolic ≥180 / diastolic ≥110)	3

Maximum attainable score = 16; minimum attainable score = 0; BMI = Body mass index; HTN = Hypertension.

Informed consent was collected from each respondent prior to the interview and physical examination. Obesity, measured with waist circumference (in cm) and body

mass index (BMI, kg/m²), was determined. The risk factors for physical activity and dietary pattern were taken from the Standard Integrated Disease Surveillance Program questionnaire (Table 2 and Table 3) while the scoring for these risk factors were calculated as per Framingham Risk Score.

Table 2: Scoring for physical activity.

Physical activity score	Score
Nature of work	
Sedentary	2
Moderate	1
Heavy	0
Average number of hours spent at work/day	
<5 hours	2
5-10 hours	1
>10 hours	0
Mode of traveling for going to workplace	
No travel	3
Sitting in vehicle/standing	2
Walking	1
Cycling	0
Physical activity not related to work	
No such physical activity	5
Slow walking	4
Brisk walking	3
Yoga	2
Cycling	1
Physically active games	0

Maximum attainable score = 12; minimum attainable score = 0.

The prevalence of these risk factors and their association with different sociodemographic variables like age, sex, literacy status, and per capita monthly income were analyzed as per proven risk factors.¹⁵⁻¹⁹

Table 3: Scoring for dietary pattern.

Dietary pattern score	Score
Number of days of vegetable intake/week	
<4	1
≥4	0
Number of days of fruit intake/week	
<4	1
≥4	0
Daily oil consumption/adult consumption unit	
≥20 ml/day	1
<20 ml/day	0
Extra salt intake with cooked food	
Yes	1
No	0

RESULTS

The study population comprised of 21 female and 46 male participants. Among the participants, 68.6% were male. Most participants were in the age group of 50-59 (47.76 %) and more than 88.06% were educated (middle, high school, intermediate and graduated) while 11.94 % were illiterate.

Table 4: Baseline characteristics and cardiovascular risk factors with SCORE (n=67).

Age in years	30-39	40-49	50-59	Total
Gender				
Male	11 (61.1 %)	15 (88.2 %)	20 (62.5 %)	46 (68.6%)
Female	7 (38.8 %)	2 (11.7 %)	12 (7.3 %)	21 (31.3 %)
Obesity ^a	9.5(52.7 %)	12 (70.5 %)	20.5 (64 %)	42 (62.6 %)
BMI in kg/m ²	11(61.1 %)	13 (76.4 %)	19 (59.3 %)	42(64.1 %)
Waist circumference in cm	16 (88.8 %)	15 (88.2 %)	28 (87.5 %)	59 (88 %)
Hypertension ^b	3 (16.6 %)	7 (41.1 %)	9 (28.1 %)	19 (28.3 %)
FPS in mg% ^c	10 (55.5 %)	10 (58.8 %)	11 (34.3 %)	31 (46.2 %)
HbA _{1C} % ^d	13 (72.2 %)	11 (64.7 %)	15 (46.8 %)	39 (58.2 %)
Diabetes mellitus (DM) type 2	4 (22.2 %)	9 (52.9 %)	13 (40.6 %)	26(38.8 %)
Total Cholesterol, mg/dL ^e	7 (36.8 %)	11 (64.7 %)	14 (43.7 %)	26 (38.8 %)
HDL cholesterol, mg/dL	8 (44.4 %)	14 (82.3 %)	9 (28.1 %)	31 (46.2 %)
Family history of diabetes	18 (100 %)	17 (100 %)	32 (100 %)	100 (100 %)
Family history of hypertension	18 (100 %)	17 (100 %)	32 (100 %)	100 (100 %)
Chewable tobacco	7 (38.8 %)	2 (11.7 %)	8 (25 %)	17 (25.3 %)
Smoking	5 (27.7 %)	4 (23.4 %)	10 (31.2 %)	19 (28.3 %)
Alcoholic	2 (11.1 %)	1 (5.8 %)	1 (3.1 %)	4 (5.97 %)
SCORE	≥2	≥4	≥2	
Total	18 (100 %)	17 (100 %)	32 (100 %)	

^a Obesity: BMI: Body mass index>23; Waist circumference for Males: > 90 cm or > 80 cm for females; ^bHypertension is defined as diastolic blood pressure higher than 90 mmHG or systolic blood pressure higher than 140mmHG or taking antihypertensive drugs; ^c FPS: Fasting plasma sugar >126mg/dl.; ^d HbA_{1C}: Glycated haemoglobin >6.5%; ^e Total Cholesterol – total cholesterol (>200mg/dl); HDL-Cholesterol – high-density lipoprotein cholesterol (<35mg/dl).

Cardiovascular general risk factors with SCORE (Systematic Coronary Risk Evaluation) are represented in Table 4 and Figure 1. Physical activity and dietary scores with various socio-demographic variables are depicted in Table 5 and Figure 2-4); the higher score represents higher the risk. Consequently, the highest physical activity score was obtained on the basis of regular exercise, exercise for at least 30 minutes.

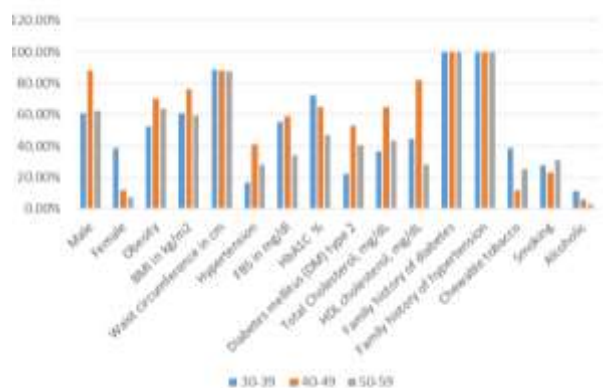


Figure 1: Baseline characteristics and cardiovascular risk factors with SCORE (systematic coronary risk evaluation).

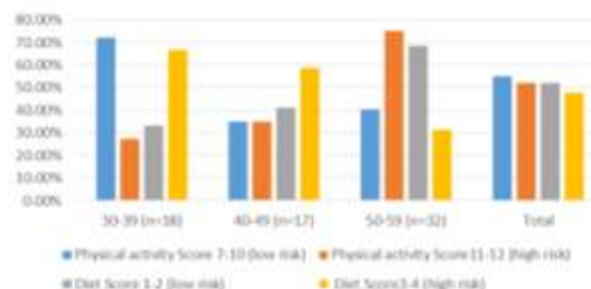


Figure 2: Physical activity and dietary risk factor score in relation to age.

It was also observed that the high-risk dietary pattern was observed more by the younger age group as compared to older age. This score was higher with higher income group as compared with lower income group. The risk factor scores increased with age of the study population and score was also found to be higher in males as compared with females. The score of ≥ 4 was obtained more among the 40–49 year old age group than the 30-39 and 50-59 year old age groups (≥ 2). It was also observed that the risk factor score of ≥ 3 was significantly more in the higher income group that is \geq Rs 5000 monthly per capita income (PCI) group as compared with the $<$ Rs 5000 PCI group (74% vs. 26%).

Table 5: Physical activity and dietary risk factor score in relation to sociodemographic variables (n=67).

Physical activity score*	30-39 (n=18)		Age in years		
			40-49 (n=17)	50-59 (n=32)	Total
7-10 (low risk)	13 (72.2 %)		6 (35.2 %)	13 (40.6 %)	32 (55.2 %)
11-12 (high risk)	5 (27.2 %)		6 (35.2 %)	24 (75 %)	35 (52.2 %)
Diet score**					
1-2 (low risk)	6 (33.3 %)		7 (41.1 %)	22 (68.7 %)	35 (52.2 %)
3-4 (high risk)	12 (66.6 %)		10 (58.8 %)	10 (31.2 %)	32 (47.7 %)
PCI (in Rs)					
Physical activity score*	< 5000 (n=18)		\geq 5000 (n=49)		Total
7-10 (low risk)	10 (55.5 %)		23 (46.9 %)		33 (49.2 %)
11-12 (high risk)	8 (44.4 %)		26 (53.1 %)		34 (50.8 %)
Diet score**					
1-2 (low risk)	14(77.7 %)		34 (69.3 %)		48(71.6 %)
3-4 (high risk)	4 (22.2 %)		15 (30.6 %)		19 (28.3 %)
Educational background					
Physical activity score*	Illiterate (n=8)		Literate (n=59)		Total
7-10 (low risk)	6 (75 %)		40 (67.7 %)		46 (68.6 %)
11-12 (high risk)	2 (25 %)		19 (32.2 %)		21 (31.3 %)
Diet Score**					
1-2 (low risk)	6 (75.0 %)		40 (67.7 %)		46 (68.6 %)
3-4 (high risk)	2 (25.0 %)		19 (32.2 %)		21(31.3 %)

*The lowest score obtained was 7 while the highest score obtained was 12; **The lowest score obtained was 1 while the highest score obtained was 4.

In the 30-39 year old group, only 27.2% study population experienced high-risk physical activity. On the other

hand, high risk physical activity (75%) was observed in older age (50-59) group, because of lack of physical

activity in older age, while young participants with higher total risk can be warned and given preventive measures. Besides, literate and higher income group show a high-risk physical activity pattern as compared with the illiterate and the relatively lower income group (32.2 vs. 25% and 53.1 % vs. 44.4% respectively). The lowest and highest dietary score has been depicted in Table 5, the lowest score obtained by the study population was 1 while the highest score secured was 4.

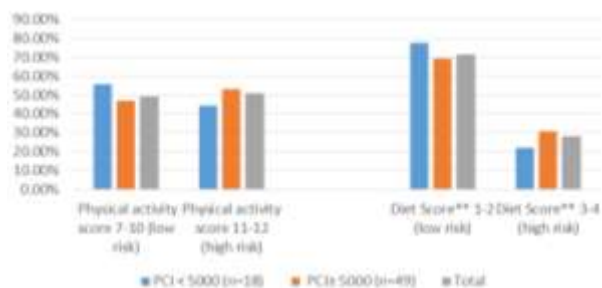


Figure 3: Physical activity and dietary risk factor score in relation to PCI.

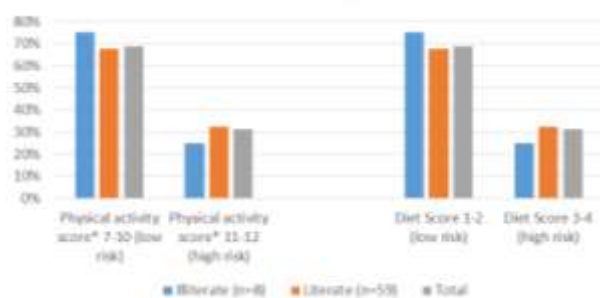


Figure 4: Physical activity and dietary risk factor score in relation to educational background.

Similarly, a low-risk dietary pattern was considered for those obtaining a score of 1-2 while a high-risk dietary pattern was considered for those obtaining a score of 3-4. A high-risk dietary pattern was found to be significantly more in the literate group as compared with the illiterate group (32.2% vs. 25%).

DISCUSSION

The risk factors increased with age, although systolic and diastolic blood pressure was higher in age groups 40-49 than in older age groups (50-59). These data correlate with the reported study of Mariana D et al.¹¹ It was also observed that the risk factor was more in the higher income group, that is ≥ 5000 monthly per capita income (PCI) group as compared with the $< Rs 5000$ PCI group (74% vs. 26%). The risk was higher, when compared with the reported study (55% vs. 29%) by Deb et al.¹⁵ The risk factor score was also found to be higher in males as compared with females.

With regard to individual general risk factors in the study population, the prevalent risk factor of hypertension in the present study was lower, when compared with the reported literature (28.3 % vs 46 %), while the prevalence of Type 2 diabetes measured during the study was found to be higher (38.8%) compared with the reported study (38.8 % vs 13 %).¹⁵

The prevalence of smoking was higher in North India (37%) as compared with the present study (28.3%), but smoking (28.3 %) and chewing tobacco (25.3 %) was higher with reported study i.e., 21 % and 18 % respectively.^{15,20} Obesity was more prevalent in the present study (62.6%) when compared with the north Indian study (27%) and western study.^{15,20} A study conducted in Andhra Pradesh, when compared with the results of this study, the latter showed higher risk with a prevalence of diabetes (24% vs. 38.8%), hypertension (28% vs. 28.3 %), smoking (24% vs. 28.3%), and obesity (36% vs. 62.6%).²¹

One of the limitations of the present study is that there were fewer participants in the study in the age group of 25-34, which may be due to the low number of participants in this age group. However, this age group is not even included in the score chart. Another limitation is that the studies with individuals above 60 years have not been examined. Moreover, the participants who have more than one cardiovascular risk factors at younger age may be at higher relative risk for an event than those with no or one risk factor at later age. High cardiovascular total risk in the productive age groups of 40-49 and 50-59 is most affecting due to its negative economic and social impact.

CONCLUSION

It can be concluded that the risk factors for cardiovascular disease were highly prevalent in the study population and the major risk factors are associated with hypertension and obesity. The high-risk physical activity score was significantly more in the older age group and higher income group. A high-risk dietary pattern was seen to be more in the younger age group and the literate group. Even with the current status of knowledge, the changing life style increases the risk factors for CVD. The magnitude of the problem is large enough to demand urgent attention and action. Many of the risk factors like obesity, smoking, dietary pattern, physical inactivity etc., are modifiable and need special attention. Urgent measures based on primary prevention need to be taken especially from the school level to modify the lifestyle and behaviour of the people otherwise the epidemic of non-communicable disease may be difficult to treat and also there is a need of systemic and effective solution. These findings can be contributed to control cardiovascular risk in general population.

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