ORIGINAL ARTICLE

Dyslipidaemia & Framingham risk score: Tools for prediction of cardiovascular diseases as public health problem

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Abstract	Introduction	Methodology	Results	Conclusion	References	Citation	Tables / Figures

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Abstract

Background: According to WHO, CVD is the number one cause of death globally and an estimated 17.5 million people died from CVDs in 2012, representing 31% of all global deaths. Dyslipidaemia with other cardio-metabolic risk factors are one of the major risk factors for cardiovascular diseases. This study was under taken to assess the prevalence of cardiovascular risk factors among the urban population aged 18 to 40 years. **Methodology:** This cross-sectional study was done at UHTC (Multan Nagar) in Meerut district from May 2014 to June 2015. 150 study participants aged 18 to 40 years of both sexes were recruited using simple random sampling. Data was collected using WHO's STEPS criteria and modified close ended questionnaire. Data was analysed using Statistical Package for Social Sciences (SPSS v19). **Results:** Overall prevalence of dyslipidaemia was, low HDL-c 58.7%, hypertriglyceridemia 36%, high TC:HDL-c ratio 24%, hypercholesterolemia 14.7% and high LDL cholesterol 8.0% & Framingham risk score of developing Coronary artery disease was 8.6% risk of 6% & above and 91.4% risk of 5% or less. **Conclusion:** The prevalence of two cardio-metabolic risk factors was quite high in both males and females and the association between Framingham risk score & dyslipidaemias were also statistically significant. Clearly indicating that those who were having dyslipidaemia in any form were at a higher risk of having coronary artery disease in the future.

Key Words

Cardio-vascular diseases; Dyslipidaemia; Framingham risk score; hypertriglyceridemia; hypercholesterolemia

Introduction

There have been a sharp increase in the number of deaths due to cardiovascular diseases in the last two decades, in 1990 there were an estimated 50 million deaths globally and approximately 14 million (28%) were due to cardiovascular diseases.(1) Which rose to 17.3 million deaths in 2008.(2) An estimated 17.5 million people died from CVDs in 2012, representing 31% of all global deaths, of these deaths, an estimated 7.4 million were due to Coronary Heart disease (CHD) and 6.7 million were due to stroke. According to WHO as on January 2015, CVDs are the number one cause of death globally: more people die annually from CVDs than from any other cause (3) and it is predicted that by 2030 CVD will be responsible for 23.6 million deaths alone.(4)

The Global Status report on Non-Communicable Diseases 2010 has suggested that there were more than 2.5 million deaths from CVD in India in 2008, two-thirds due to CHD and one-third to stroke.(5) WHO has predicted that from years 2000 to 2020 DALYs lost from CHD in India shall double in both men and women from the current 7.7 and 5.5 million respectively.(6)

In nutshell, today‘s risky behaviours are tomorrow‘s risk factors. Thus, primary and secondary prevention of cardiovascular disease and their common risk factors provide the most sustainable and cost effective approach to cardiovascular disease prevention and control.

Meerut is one of the district of Uttar Pradesh with an estimated population of 3.5 million and an average population growth of 16%.(7)

Aims & Objectives

To assess the prevalence of risk of CVD in urban field practice area of the department of Community Medicine of Subharti Medical College Meerut.

Material and Methods

A community based cross-sectional study was conducted in an urban population of Meerut, to assess the burden of multiple risk factors of cardiovascular diseases. The study was approved by the institutional ethical committee of Subharti Medical College, Meerut.

Sample size was calculated ($n=4Pq/L^2$) to be 150 adults of 18-40 years of both sexes, 150 families were selected randomly from total 350 registered families of the UHTC, home visits were made to the selected families and out of all eligible participants present, only one participant was selected randomly by using lottery method.

Data collection was done using a pre-tested, semi structured modified questionnaire based on WHO's STEP'S criteria.(8) Information was collected regarding socio-demographic profile, educational status, socio-economic status, information regarding history of addiction in any form, chronic diseases (diabetes & hypertension), dietary history and type of physical activity. Blood pressure and anthropometric measurements (height, weight, waist and hip size & body mass index) were estimated along with Framingham risk score. Biochemical assessment of dyslipidaemia was also done.

Modified Kuppuswamy's classification of socio economic status was used for assessing the socio economics status of the study participants.(9) Overall more than 20gms of visible fat consumption by per person per day was consider to be abnormal. Fruits and vegetables intake of less than 3 times a week and less than 3 servings per day was considered as low fruit and vegetable intake. 80gms of fruits and one bowl of cooked vegetables constituted 1 serving. Persons engaged in >30 minutes of continuous physical activity ≥ 5 times per week were classified as moderately active. And those persons involved in >60 minutes of physical activity ≥ 5 times per week were classified as highly/vigorously active.(10)

BMI was defined according to WHO's criteria for Asian adults underweight (<18.5 kg/m2), normal (18.5 -22.9 kg/m2), overweight (23-24.9 kg/m2) and obese (>25 kg/m2).(11) Abdominal obesity (increased waist circumference) >90 cms for males & >80 cms for females and increased WHR >0.9 for males & >0.8 for females.(12) Hypertension was defined according to JNC-VII criteria when systolic blood pressure >140 mmHg and diastolic blood pressure >90 mmHg.(13) Framingham risk score is an online tool which uses the following parameters of an individual to predict the 10 year risk, age, sex, total cholesterol, HDL cholesterol, smoking status, systolic blood pressure and history of any medication to treat hypertension.(14) Dyslipidaemia was defined according to the guidelines laid by National Cholesterol Education Program Adult Treatment Panel-III (NCEP-ATP III). Various dyslipidaemias are defined as the presence of high total cholesterol (≥200 mg/dl), high LDL cholesterol (≥130 mg/dl), low HDL cholesterol (<40 mg/dl in men and <50 mg/dl in women), high triglycerides (≥150 mg/dl) and high TC:HDL-c ratio (≥4.5).(15)

Data was analysed using Statistical Package for Social Sciences (SPSS) software version 19.0. Pearson‘s Chi square test and Fischer's exact test were applied to find out significant association between independent and dependent variables

Results

Socio-demographic distribution of the total 150 study participants was, 58.7% were male while 41.3% were females. The mean age of male participants was 30.7 ± 7.03 years and of female participants was 29.8 ± 8.22 years. Out of the total study participants, 24% were graduate/post-graduates, followed by 22% of intermediate/post high school diploma holders, 14.7% were high school certificate holders, 12.7% were middle school certificate holder, 12% were primary school certificate holder, 12.7% were illiterates while only 2% were professionals/honours. Table 1

Almost 45.3% of the participants were Unemployed/Housewife (mainly including the females who were housewives) followed by clerical/ship-owners 21.3%, 11.3% skilled workers and 10% were professional and semi-professionals. Majority 46% of the participants were belonging to upper-middle class, 30.7% were belonging to lower-middle class, 21.3% were belonging to upper-lower middle class and only 2% were from upper class.

Table 2 shows a positive relation between Framingham risk score and dyslipidaemia which shows that, those participants having ≤5% risk only 6.8% were having high LDL cholesterol whereas participants having ≥6% risk 27.3% were having high LDL cholesterol with statistically significant association. Similarly, participants with ≤5% Framingham risk 11.1% were having hypercholesterolemia, 30.8% were having hypertriglyceridemia & 19.7% were having high TC:HDL-c ratio and participants with ≥6% risk 72.7% were having hypercholesterolemia, 90.9% were having hypertriglyceridemia & 45.5% were having high TC:HDL-c ratio respectively

Discussion

There are not many studies done in Meerut on cardio-metabolic risk factors. The prevalence of ever smoker in the present study was 52.3% in males comparable with Mohan V. *et al*(15) and lower prevalence were observed by Garg A. *et al*16 & Gupta R. *et al*(12). The prevalence of ever-tobacco user in present study was 22.7% which was comparable with Aroor B. *et al*(11), whereas lower prevalence were reported by studies Gupta *et al(*10). Also, the prevalence of alcohol consumption was 54.5% in males which was comparable to Garg A. *et al*(16) & Sugathan T.N. *et al*(17), whereas lower prevalence were reported by Mohan V. *et al(*15) & Gupta R. *et al(*12) but high prevalence was reported by Mishra P.J. *et al*(18).

The prevalence of low fruits (79.5% males & 83.9% females) & low vegetables (56.8% males & 74.2% females) consumption was high in our study, which was comparable to Gupta *et al(*10) and Aroor B. *et al(*11) and lower prevalence was reported by Garg A. *et al(*16) & Mishra P.J. *et al(*18). Present study reported high fat intake (≥ 20mg/day) in 77.3% males & 66.1% females but lower prevalence were reported by Gupta R. *et al*(12). High prevalence of physical inactivity/sedentary behaviour (54.6% males & 68.9%) was reported in our study whereas lower prevalence were reported by Aroor B. *et al*11 & Sugathan T.N. *et al*(17) and high prevalence were reported by Gupta *et al*(10) & Mohan V. *et al*(15).

The prevalence of obesity in present study (38.6% males & 45.2% females) was similar to the results of Mohan V. *et al(*15) whereas high prevalence as reported by Garg A. *et al(*16) and low prevalence by Gupta R. *et al*(12) & Sekhri T. *et al*(19).In the present study high prevalence of abdominal obesity was reported in 62.9% females compared to 30.7% males similar findings were also reported by Gupta R. *et al* (12) whereas Aroor B. *et al*11 & Gupta *et al*10 reported low prevalence but high prevalence was reported by Garg A. *et al*(16). Similarly, in our study the prevalence of WHR was also high among 95.2% females than in 75% males and similar prevalence were reported by Gupta R. *et al* (12) & Gupta *et al*(10). The prevalence of hypertension in the present study was equal 27% among both the sexes and similar results were observed by Mishra P.J. *et al(*18) whereas high prevalence was reported by Gupta R. *et al*12 & Garg A. *et al*16 and low prevalence was reported by Sekhri T. *et al*(19).

Our study reported, high prevalence of low HDL cholesterol in males (52.3%) as well as in females (25.8%), similar prevalence was reported by Sekhri T. *et al*19, Gupta R. *et al*(12) & Garg A. *et al*(16). Whereas the prevalence of LDL cholesterol was low (5.7% males & 11.3% females) in the present study as compared to studies by Mohan V. *et al(*15) & Gupta *et al(*10) reporting high prevalence of LDL-c. Also, the prevalence of hypercholesterolemia was high in both males (17%) and females (11.3%), similar high prevalence was also reported by Gupta *et al*(10), Garg A. *et al*16 & Sekhri T. *et al(*19). The prevalence of hypertriglyceridemia was also high in males (36.4%) and females (35.5%) in the present study and similar findings were also reported by Gupta R. *et al*12 & Mohan V. *et al*(15). The prevalence of high TC:HDL-c ratio was also high in males (21.6%) and females (27.4%) in present study and similar prevalence was also reported by Sekhri T. *et al*(19)

Conclusion

This study clearly indicates that those who were having dyslipidaemia in any form was at a higher risk of having coronary artery disease in the future. Thus, we can conclude that further interventions like lifestyle modifications along with health education and periodic clinical monitoring of the individuals at risk are required to halt the progression of the risk factors to prevent the development of cardiovascular diseases.

Recommendation

At primary level, emphasis should be made on the screening of disease as well as the cardio-metabolic risk factors & their prevention. Estimation of Framingham risk scores & lipid profile to check dyslipidemia should be done once in a year for those who are at a greater risk.

Limitation of the study

Due to limited resources further investigations to diagnose the cardiovascular diseases were not done.

Relevance of the study

The present study revealed that the Indian young population is at a greater risk of developing CVD, indicated by high prevalence of dyslipidemia & Framingham risk scores along with other cardiometabolic risk factors.

Authors Contribution

SKS: Conception, design, acquisition & analysis of data. BP: Concept design, drafting of manuscript, reviewing it critically. AD: Reviewing the manuscript critically for intellectual inputs. AKS: Statistical Analysis & Interpretation of Data, SA: Critical inputs and final approval of the version to be published.

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Tables

TABLE 1 PREVALENCE OF VARIOUS CARDIO-METABOLIC RISK FACTORS IN MALES AND FEMALES

Variables	Males (n=88)	Females (n=62)	Total (n=150)
Smoking & Tobacco use			
Ever-smoker	46 (52.3%)	0 (0.0%)	46 (30.7%)
Ever tobacco user	20 (22.7%)	0 (0.0%)	20 (13.3%)
Alcohol consumption			
Ever-drinker	48 (54.5%)	0 (0.0%)	48 (32%)
Fruit intake			
<3 serving/day	70 (79.5%)	52 (83.9%)	122 (81.3%)
≥3 serving/day	18 (20.5%)	10 (16.1%)	28 (18.7%)
Vegetable intake			
<3 serving/day	50 (56.8%)	46 (74.2%)	96 (64%)
≥3 serving/day	38 (43.2%)	16 (25.8%)	54 (36%)
Visible fat intake			
≥20 gms	68 (77.3%)	41 (66.1%)	109 (72.7%)
Physical exercise			
Sedentary	48 (54.6%)	43 (68.9%)	91 (60.4%)
Moderate/Heavy	40 (45.4%)	19 (31.1%)	59 (39.3%)
BMI			
Obese	34 (38.6%)	28 (45.2%)	62 (41.3%)
WC [>90/>80 cm, M/F]	27 (30.7%)	39 (62.9%)	66 (44%)
WHR [>.9/>.8, M/F]	66 (75%)	59 (95.2%)	125 (83.3%)
Hypertension	24 (27.3%)	17 (27.4%)	41 (27.3%)
Framingham Risk Score**			
≤5%	66 (85.7%)	51 (100%)	117 (91.4%)
≥6%	11 (14.3%)	0 (0%)	11 (8.6%)
Dyslipidaemias			
HDL[<40(M)/<(F)]	46 (52.3%)	16 (25.8%)	62 (41.3%)
LDL (≥130 mg/dl)	5 (5.7%)	7 (11.3%)	12 (8%)
TC (≥200 mg/dl)	15 (17%)	7 (11.3%)	22 (14.7%)
Triglycerides (≥130 mg/dl)	32 (36.4%)	22 (35.5%)	54 (36%)
TC:HDL-c (≥4.5)	19 (21.6%)	17 (27.4%)	36 (24%)

**Only 128 participants were eligible for FRS, M=Male, F=Female, HDL=High density lipoprotein, LDL=Low density lipoprotein, TC=Total cholesterol

TABLE 2 ASSOCIATION BETWEEN VARIOUS RISK FACTORS & DYSLIPIDAEMIA

Variables	HDL cholesterol		LDL cholesterol		Total cholesterol		Triglycerides		TC:HDL-c	
	Normal	Low	Normal	High	Normal	High	Normal	High	Normal	High
Ever smoker	26 (56.5%)	20 (43.5%)	42 (91.3%)	4 (8.7%)	36 (78.3%)	10 (21.7%)	27 (58.7%)	19 (41.3%)	37 (80.4%)	9 (19.650
	p=0.012		p=0.835		p=0.103		p=0.368		p=0.398	
Ever tobacco user	12 (60%)	8 (40%)	18 (90%)	2 (10%)	16 (80%)	4 (20%)	10 (50%)	10 (50%)	15 (75%)	5 (25%)
	p=0.897		p=0.723		p=0.469		p=0.161		p=0.91	
Ever drinker	25 (52.1%)	23 (47.9%)	45 (93.8%)	3 (6.3%)	39 (81.3%)	9 (18.8%)	29 (60.4%)	19 (39.4%)	35 (72.9%)	13 (27.1%)

		p=0.067		p=0.588		p=0.332		p=0.531		p=0.544	
Fruit intake (<3 servings/day)		72 (59%)	50 (41%)	111 (91%)	11 (9%)	106 (86.9%)	16 (13.1%)	81 (66.4%)	41 (33.6%)	95 (77.9%)	27 (22.1%)
		p=0.856		p=0.338		0.262		p=0.202		p=0.263	
Vegetable intake (<3 servings/day)		54 (56.3%)	42 (43.8%)	85 (88.5%)	11 (11.5%)	82 (85.4%)	14 (14.6%)	64 (66.7%)	32 (33.3%)	73 (76%)	23 (24%)
		p=0.423		p=0.037		p=0.969		p=0.364		p=0.987	
Fat intake (≥20gms/day)		64 (58.7%)	45 (41.3%)	101 (92.7%)	8 (7.3%)	95 (87.2%)	14 (12.8%)	70 (64.2%)	39 (35.8%)	86 (78.9%)	23 (21.1%)
		p=0.984		p=0.627		p=0.304		p=0.927		p=0.175	
Physical activity (Sedentary)		37 (40.7%)	54 (59.3%)	85 (93.4%)	6 (6.6%)	78 (85.7%)	13 (14.3%)	57 (62.6%)	34 (37.4%)	68 (74.7%)	23 (25.3%)
		p=0.835		p=0.43		p=0.87		p=0.666		p=0.65	
Obesity (BMI)		26 (41.9%)	36 (58.1%)	54 (87.1%)	8 (12.9%)	49 (79%)	13 (21%)	37 (59.7%)	25 (40.3%)	42 (67.7%)	20 (32.3%)
		p=0.799		p=0.277		p=0.227		p=0.469		p=0.142	
Abdominal obesity (WC)		26 (39.4%)	40 (60.6%)	58 (87.9%)	8 (12.1%)	52 (78.8%)	14 (21.2%)	39 (59.1%)	27 (40.9%)	45 (68.2%)	21 (31.8%)
		p=0.669		p=0.099		p=0.045		p=0.267		p=0.047	
WHR		80 (64%)	45 (36%)	113 (90.4%)	12 (9.6%)	104 (83.2%)	21 (16.8%)	81 (64.8%)	44 (35.2%)	94 (75.2%)	31 (24.8%)
		p=0.003		p=0.106		p=0.099		p=0.648		p=0.608	
FRS	≤5% (n=117)	47 (40.2%)	70 (59.8%)	109 (93.2%)	8 (6.8%)	104 (88.9%)	13 (11.1%)	81 (69.2%)	36 (30.8%)	94 (80.3%)	23 (19.7%)
	≥6% (n=11)	7 (63.6%)	4 (36.4%)	8 (72.7%)	3 (27.3%)	3 (27.3%)	8 (72.7%)	1 (9.1%)	10 (90.9%)	6 (54.5%)	5 (45.5%)
		p=0.132	p=0.021	p<0.001	p<0.001	p=0.048			p=0.132	p=0.021	p<0.001