Original Article

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Study of Pattern of Dyslipidemia, Risk Factors, Associated Comorbidities and its Cardiovascular Manifestation in Young Adults

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Abstract

Background: Cardiovascular disease (CVD) is the single most commonest cause of death in the developed countries and is among the leading causes of death and disability in the developing nations like India as well. There are an estimated 31.8 million people living with coronary artery disease (CAD) in India alone. Among the patients with atherosclerosis, dyslipidaemia has been shown as one of the significant risk factors. In addition, reports from recent studies have also confirmed the increasing prevalence of dyslipidaemia in urban as well as rural Indian populations. **Subjects and Methods:** This is a cross-sectional study was conducted in the Department of General Medicine, Narayana Medical College, Nellore. Participants were enrolled if they were aged 35–75 years and lived in one of the selected regions for at least 6 of the previous 12 months. The investigation included baseline information, physical examination, and laboratory testing. All investigators underwent professional training before the study. Information on demographic and social characteristics (such as age, sex, ethnicity, residential region, marital status, educational level, and family income), medical history (such as hypertension and diabetes), and lifestyle (such as smoking and alcohol consumption) were collected by interview where conducted at local community health service or door-to-door visits to use a standardized questionnaire. **Results:** In our study, we observed mean age as 37.23 years and mean weight of patients as 69.08 kg and mean height to be 165.35 cm, mean waist circumference as 84.06 cm and mean BMI to be 25.23 among studied cohort. We observed lipid profile in our studied population as mean cholesterol 256.95 mg/dl, mean triglycerides 239.37 mg/dl, mean HDL 50.8, mean LDL 171.69, mean VLDL 38.04, mean LPa 93.55, mean RBS 141 mg/dl, mean HBA1C as 6.18. **Conclusion:** In young Indian cohort, high prevalence of hypertriglyceridemia, high LDL-C, low HDL-C, and atherogenic dyslipidaemia were reported. These lipid abnormalities are known to increase the long-term risk of premature atherosclerotic CVD. Therefore, it is crucial to keep a regular check on these risk factors from young age to prevent or delay the occurrence of premature atherosclerotic CVD and associated mortality and morbidity.

Keywords: Cardiovascular disease, Coronary artery disease, Premature atherosclerotic.

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Introduction

Cardiovascular disease (CVD) is the single most commonest cause of death in the developed countries and is among the leading causes of death and disability in the developing nations like India as well.[1] There are an estimated 31.8 million people living with coronary artery disease (CAD) in India alone.[2] Furthermore, in contrast to developed countries, CVD tends to occur at a younger age in Indians with 52% of CVD deaths occurring under 70 years and 10% of heart attacks occurring in subjects <40 years.[3] The age-standardized estimates for disability adjusted life-years (DALY's) lost due to CAD are three times higher in India than in developed countries.[4]

The premature coronary artery disease (CAD) has increased at an alarming rate in India with an obvious visible impact on the young Indian population. In recent times, over 50% of mortality due to cardiovascular diseases (CVD) has been noticed in individuals aged <50 years.[5] A recently published review discussed the established and emerging risk factors for CAD in very young South Asians and the higher rates of CAD in this population may be partially explained by an increased prevalence of traditional risk factors, including diabetes, hypertension, smoking and metabolic syndrome.[6] The most common attributable risk factors among young individuals with the premature occurrence of coronary heart disease (CHD) include dyslipidaemia, hypertension, and smoking.[7]

Among the patients with atherosclerosis, dyslipidaemia has been shown as one of the significant risk factors. In addition, reports from recent studies have also confirmed the increasing prevalence of dyslipidaemia in urban as well as rural Indian populations.[8,9] Most of these studies had a smaller sample size, representing a small geographic area or

single centre data.[10]

Considering the heterogenous ethnicities of Indian populations and prevalence of atherogenic dyslipidaemia among them, an individualized treatment schedule is a need of the hour, and the young population is not an exception to this approach.[11] Effective public health education and intervention strategies for better management of dyslipidaemia among young Indians will depend on an accurate assessment and understanding of dyslipidaemia pattern in young Indian cohort.[12] In addition, the primary physicians are the first contact in early stage of diseases like hypertension, dyslipidaemia and diabetes mellitus; hence, early screening and identification of dyslipidaemia pattern would help the primary care physicians in future management and to avoid complications including the long-term risk of developing premature atherogenic CVDs and associated comorbidities.[12]

Subjects and Methods

This is a cross-sectional study was conducted in the Department of General Medicine, Narayana Medical College, Nellore. Participants were enrolled if they were aged 35–75 years and lived in one of the selected regions for at least 6 of the previous 12 months.

The investigation included baseline information, physical examination, and laboratory testing. All investigators underwent professional training before the study. Information on demographic and social characteristics (such as age, sex, ethnicity, residential region, marital status, educational level, and family income), medical history (such as hypertension and diabetes), and lifestyle (such as smoking and alcohol consumption) were collected by interview where conducted at local community health service or door-to-door visits to use a standardized questionnaire.

Two consecutive blood pressure measurements were taken and the mean blood pressure value of the two readings was used. For each participant, blood pressure measurement was performed on the right upper arm after 5 min of rest, with the participant in a seated position, using an electronic sphygmomanometer. Fasting blood samples were collected after at least 10 h of overnight fasting. Venous blood specimen was collected in Vacutainer tubes containing ethylenediaminetetraacetic acid (EDTA). Fasting plasma glucose (FPG) was analyzed enzymatically using an autoanalyzer (BeneCheck, PDG001–2). Serum total cholesterol (TC), low-density lipoprotein cholesterol (LDL-C), high-density lipoprotein cholesterol (HDL-C), triglycerides (TG) were measured by an automatic biochemical analyzer (Cardiocheck PA).

All laboratory equipment was calibrated. Height and weight were measured, with participants wearing lightweight clothing and no shoes, to the nearest 0.1 cm and 0.1 kg, respectively. BMI was computed as weight (kg) divided by the square of height (m2). Waist circumference (WC) was measured at the level of the navel using a tape measure, to the nearest 0.1 cm. Hypertension was considered with systolic blood pressure (SBP) ≥140 mmHg or diastolic blood pressure (DBP) ≥90 mmHg or reported use of antihypertensive medication.

The diagnosis criterion of diabetes mellitus was FPG ≥120 mg/dL or having received treatment for diabetes [13]. Participants with BMI ≥28 kg/ m2 were diagnosed with obesity, and central obesity was identified as WC ≥90 cm in men and WC ≥85 cm in women.[14]

Results

In our study, we observed mean age as 37.23 years and mean weight of patients as 69.08 kg and mean height to be 165.35 cm, mean waist circumference as 84.06 cm and mean BMI to be 25.23 among studied cohort. (Table 1 and fig. 1)

We observed lipid profile in our studied population as mean cholesterol 256.95 mg/dl, mean triglycerides 239.37 mg/dl, mean HDL 50.8, mean LDL 171.69, mean VLDL 38.04, mean LPa 93.55, mean RBS 141 mg/dl, mean HBA1C as 6.18. [Table 2]

There was significant correlation of PTCA among patients with and without significant ECG changes in this study seen. [Table 6]

There was significant correlation of PTCA among patients with and without significant cardiovascular findings in this study seen. [Table 7]

Table 1: Demographic profile of studied patients

Parameters	Mean	SD
AGE (years)	37.23	5.78
WEIGHT (Kgs)	69.08	9.79
HEIGHT (cm)	165.35	5.93
WAIST CIRCUMFERENCE (cm)	84.06	4.30
BMI	25.23	3.18

Table 2: Lipid profile of studied patients

Parameters	Mean	SD
TOTAL CHOLESTEROL	256.95	47.16
TRIGLYCERIDES	239.37	142.38
HDL	50.8	12.44
LDL	171.69	36.39
VLDL	38.04	25.53
LPa	93.55	41.2

RBS	141.5	73.1
HBA1C	6.18	2.53

Table 3: Tabulation of ECG changes

ECG Changes	FREQUENCY	PERCENTAGE
ACP	29	14.5
ACS	54	27.0
CCS	9	4.5
NSR	49	24.5
PVC/NSR	26	13.0
ST	33	16.5

Table 5: Tabulation of CAG Findings

CAG findings	FREQUENCY	PERCENTAGE
AWMI	2	1.02
DVD	44	22.34
NORMAL	83	42.13
SVD	51	25.89
TVD	17	8.63

Table 6: ECG Changes ptca1, r col exact chi2

ECG Changes	PTCA-NO	PTCA-YES	TOTAL
ACP	24	05	29
ACS	0	54	54
CCS	22	09	09
NSR	27	22	49
PVC/NSR	13	13	26
ST	21	12	33
TOTAL	85	115	200

Table 7: CVS findings ptca1, r col exact chi2

CVS Findings	PTCA-NO	PTCA-YES	TOTAL
ACP	33	11	44
AWMI	0	44	44
CCS	0	19	19
CP	0	11	11
HTM/CAD	0	01	01
HTN	13	06	19
IWMI	0	11	11
PALPITATION	39	12	51
TOTAL	85	115	200

Fisher's exact Test, p value= < 0.0001

Table 8: Comorbidity ptca1, r col exact chi2

Comorbidity	PTCA-NO	PTCA-YES	TOTAL
AN	03	05	08
N	13	28	41
OBESITY	9	10	19
OWERWEIGHT	27	39	66
PCOD	10	05	15
PO	01	0	01
TOTAL	63	87	150

Fisher's exact Test, p value = 0.175

There was no significant correlation of PTCA among associated comorbidities by patients in this study seen.

Fisher's exact test, p value = 0.059.

Discussion

The salient observations of this study were; (1) In our study, we observed mean age as 37.23 years and mean weight of patients as 69.08 kg and mean height to be 165.35 cm, mean waist circumference as 84.06 cm among studied cohort. (2) overall 50.1% of population had one or comorbidities that included diabetes and/or hypertension; (2) family history of diabetes and hypertension were the predominant non-modifiable risk factors; (3) overall the population was overweight with mean BMI to be 25.23 kg/m2 illustrating the contribution of BMI to dyslipidaemia in young adult population; (4) sedentary lifestyle was observed in 28% of the patients across all the age groups depicting it as a

plausible risk factor; and (5)

We observed lipid profile in our studied population as mean total cholesterol 256.95 mg/dl, mean triglycerides 239.37 mg/dl, mean HDL 50.8, mean LDL 171.69, mean VLDL 38.04, mean LPa 93.55 mg/dl. Hypercholesterolemia, hypertriglyceridemia, high LDL-C, and low HDL-C were significant findings across the population; further, an alarming observation was 35% of youngest individuals (≥18 to ≤40 years) had atherogenic dyslipidaemia which was the highest among all groups. In this study, we observed that 131 (65.5%) patients were without endothelial dysfunction while 69 (34.5%) were having endothelial dysfunction. In this study, we also observed stress factor as one of the risk factors among 41.5% patients of this study.

There was no significant correlation of significant coronary angiographic findings or PTCA among patients in terms of gender as causative factor in this study. This pattern was unlike other population-based studies worldwide that show this pattern, although admission and mortality rates due to myocardial infarction in hospital-based studies are higher in males.[15]

A systematic review of studies from India also showed little increase in prevalence rates of ECG-diagnosed CHD among men while finding significant increases in women.[16] A study in urban Delhi, which followed the same methodology as the current study from Vellore, also showed increase in CHD prevalence in women but not in men,[17] with higher rates for CHD in urban Delhi as compared to urban Vellore, probably reflecting the differences in socio-economic status in the two populations.

Family history was an independent risk factor for CHD in our study, as has been seen in the INTERHEART study.[18]

While traditionally women have been considered less likely to develop heart disease in the pre-menopausal age, with alarming rise in body mass indices as seen in this population over the last 20 years,[19] the advantage of being a premenopausal woman seems to be disappearing. The rates of CHD in this population were higher in women compared to men, irrespective of menopause, although previously known disease was least among pre-menopausal women.

As the rates of both ECG abnormalities as well as symptoms were higher in females, it is unlikely that these findings are merely due to different perceptions of heart disease and its symptoms between the genders, although such factors could explain some of the differences in symptom rate between populations. Awareness regarding chest pain, chest pain as part of somatization, and muscle weakness due to vitamin D deficiency could be other reasons why Indian women report chest pain on exertion more than males, which could be explored in future research. Occurrence of CHD in females at a later age than males may be one reason why women are less likely to be hospitalized for CHD, as it may be causing deaths among elderly women, before hospitalization.[20,21]

Conclusion

In young Indian cohort, high prevalence of hypertriglyceridemia, high LDL-C, low HDL-C, and atherogenic dyslipidaemia were reported. These lipid abnormalities are known to increase the long-term risk of premature atherosclerotic CVD. Therefore, it is crucial to keep a regular check on these risk factors from young age to prevent or delay the occurrence of premature atherosclerotic CVD and associated mortality and morbidity. The major limitation of this study is that all the patients were symptomatic and were seeking for medical attention as far as their cardiovascular complaints are concerns. So we need to explore it to general population having dyslipidemias to have more concrete evidence of dyslipidemia related cardiovascular manifestation.

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