A Hospital based Cross Sectional Study Done to Evaluate Prevalence of Dyslipidemia in Age Group of 18-30 Years and Assess the Correlation of Dyslipidemia with Increased Waist-Hip Ratio and BMI

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ABSTRACT

Introduction: Dyslipidemia is a modifiable risk factor for coronary heart disease, and other lifestyle diseases. Lipid profile screening is normally advocated after the age of 35 years.

Material and methods: For the study normal 285 subjects were selected from various camps conducted by systematic random sampling. Their fasting lipid profile was collected and anthropometric measurements were taken by WHO protocol.

Result: There was significant positive correlation between BMI and TG while significant negative correlation existed between BMI and TC and HDL. It was observed that Waist Hip Ratio was significantly and negatively correlated with TG, TC and HDL. No significant correlation was found between LDL and the anthropometric indices (BMI and WHR).

Conclusion: Dyslipidemia prevalence was 33.33% in our study. The most common dyslipidemia observed was a low HDL Cholesterol levels. BMI predicted the prevalence of hypertriglyceridemia in our study population. Increase in the age also predicted the prevalence of hypertriglyceridemia in our study. Increase in waist hip ratio >0.9 in men and >0.85 in females showed an increased risk of dyslipidemia.

Keywords: Waist Hip Ratio, Body Mass Index, Dyslipidemia, Young adults.

INTRODUCTION

Lifestyle-related co morbidities is on an increasing trend in India, thanks to westernization of its culture and industrialization.[1] A major cause of morbidity and mortality in developed countries are Coronary artery diseases (CAD). Recent research is showing trends of earlier onset of CAD, as early as 10 years amongst Asian Indians in contrast to other ethnic groups.[2] It is estimated by the National Commission on Macroeconomics and Health, that there would be approximately 62 million patients suffering with CAD by the year 2015 in India and worryingly out of these, patients expected to be younger than 40 years of age is 23 million. A major modifiable risk factor involved in the pathogenesis of CAD is dyslipidemia. An early diagnosis and intervention could reduce this incidence of cardiovascular diseases. The worldwide deaths due to CAD are 4.3 million deaths per year and 39 million disability adjusted life years (DALY) were lost each year.[3] For the sake of detection, evaluation and treatment of high blood cholesterol in adults, The National Cholesterol Education Program (NCEP) developed specific guidelines.[4]

It is seen that the prevalence of dyslipidemia in developed countries is often higher than in developing countries. Further research also showed the prevalence of dyslipidemia to be higher in urban areas, compared to rural population within both the developed and developing countries. From the available data it is projected that the burden of CAD is expected to rise in the developing countries.

Some of the previous studies reported internationally show there is a significant correlation between anthropometric variables and lipid parameters,[5-7]while others opine there are no such statistically significant correlations.[8,9] Many Indian studies have been reported relating anthropometric parameters with lipid profile in type 2 diabetes[10] and also in hypothyroid patients.[11]Garg S et al in a pilot studyon relation between anthropometric measurements and serum lipid profile among cardio-metabolically healthy subjects in India hasrevealed that all the anthropometric measures were significantly correlated with lipid profile.[12]

However, waist circumference (WC) was the best predictor of lipid profile and hence the most important risk factor for cardio-metabolic diseases. It is a very simple, economic and less time-consuming procedure, which can be used as a screening test to predict the cardio-metabolic risk of an individual. Further studies with larger population are needed to quantify the results for application to community health lifestyle modifications.

Hence the present study was done at our tertiary care centre to assess the prevalence of dyslipidemia in age group of 18-30 years and to correlate dyslipidemia with waist-hip ratio and BMI in healthy asymptomatic people.

Aims and objectives

1. To study prevalence of dyslipidemia in age group of 18-30 years.
2. The correlation of dyslipidemia with waist-hip ratio and BMI.
3. To study lipid profile, LDL/HDL ratio with the BMI and waist-hip ratio of healthy, asymptomatic people.

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MATERIAL AND METHODS

Source of data

The study was conducted in normal healthy volunteers coming to a tertiary care hospital, Karad from the period of 01/01/2016 to 31/06/2017.

Study design

A hospital based cross sectional study.

Sample size: 285 Subjects

Inclusion criteria

- The volunteers aged between 18-30 year.
- Both sexes.

Exclusion criteria

- Volunteers with any illness or known co-morbidities.
- Volunteers who smoke.
- Volunteers who have drank in the last 48 hours.
- Pregnant female volunteers.
- Patients with known comorbidities.

Methodology

All the healthy volunteers who attended various camps held at a tertiary care hospital in and around Karad were included after screening.

All the volunteers who attended the camps between the age group of 18-30 years were chosen by systematic random sampling. They were given a written and informed consent form with a questionnaire. After their consent, fasting blood samples (for 8-12 hours) for lipid profile were collected. Anthropometric indices i.e. the waist, hip circumferences, height and weight measurements were taken as per WHO protocol and documented. Tools used were a calibrated measuring tape, a stadiometer, and digital weighing machine. After consent, an 8-12 hour fasting 5cc blood sample was collected under all aseptic precautions. Serum was be separated by centrifugation. Serum Triglycerides was calculated by GPO- Glutathione Peroxidase method. Serum cholesterol was calculated by CHODPAP method (cholesterol oxidase - peroxidase method). Serum HDL and LDL levels were calculated by DIRECT (Trinder's) method. All above investigations were done on a EM360 Transasia machine available at the institute.

All the patients included in the study were given Patient Information Sheet and explained about the procedure in detail. Informed and written consent was taken from each subject. Data collection was carried out by trained research staff in the hospital. Fasting blood samples were collected after history of smoking and alcohol consumption was excluded. The height, body weight, waist and hip circumferences were taken and noted.

Patient information collected consisted of Age and gender along with anthropometric measurements such as body weight, height, BMI, waist circumference, hip circumference and waist to hip ratio, lifestyle data of smoking status, alcohol consumption, clinical history of hypertension, diabetes, ischemic heart disease, medication profile and any significant family history.

Glucose and Lipid Analysis

The analyses were carried on an automated clinical chemistry analyser. Serum glucose, was measured by GOD – POD (Glucose oxidase - peroxidase) end point Trinder's method. Total cholesterol was measured using the cholesterol oxidase test. Triglycerides were measured using the enzymatic method. HDL and LDL cholesterol was measured using the direct homogenous method. And a complete clinical examination was done.

Definitions and preferred cut off values

To classify the participants as cases with dyslipidemia, we referred to National Cholesterol Education Program (NCEP) – Adult Treatment Panel (ATP) III Guidelines. According to these standard guidelines, hypercholesterolemia is defined as a 1. TC>200mg/dL, 2. LDL-C >100mg/dL, 3. Hypertriglyceridemia as TG >150 mg/dL and 4. HDL-C <40 mg/dL in men <50mg/dl in women. Dyslipidemia was defined as the presence of one or more than one abnormal lipid concentration. All known cases of diabetes mellitus were excluded from our study and they were defined by referring to the ADA (American Diabetic Association) guidelines. Participants with fasting blood glucose > 126mg/dL were considered as having diabetes mellitus.

Body Mass Index was grouped based on the WHO criteria.

STATISTICAL ANALYSIS

Statistical software which were used for statistical analysis included MS Excel, SPSS ver. 20 and others. Graphical representation was done in MS Excel 2010. Association among the study groups was assessed with the help of Fisher test, student 't' test and Chi-Square test. The 'p' value less than 0.05 was taken as significant.

RESULTS

Majority of the subjects (61.1%) were from the age group of 21-25 years followed by 36.8% from the age group of 26-30 years and 2.1% from the age group of 18-20 years. There was female preponderance (68.4%) while male subjects constituted 31.6% of the study group.

66 (23.2%) subjects were underweight while 145 (50.9%) and 61 (21.4%) subjects were in the normal range and overweight respectively. 13 (4.5%) subjects were overweight. It was observed that there were 95 (33.3%) cases of dyslipidemia in our study.

44 (48.9%) male patients and 51 (26.2%) of female patients had dyslipidemia. There was no significant association of sex with dyslipidemia (p=0.154). It was observed that the incidence of dyslipidemia significantly increased with increasing WHR >0.9 in males. There was significant association of WHR >0.9 in males with Dyslipidemia (p=0.0158). It was observed that the incidence of dyslipidemia significantly increased with increasing WHR >0.85 in females. There was significant association of WHR >0.85 in females with Dyslipidemia (p=0.0089) (figure 1,2). The Waist Circumference (WC) and Hip Circumference (HC) were significantly higher in male as compared to female subjects (p<0.05) whereas the Waist Hip (WH) Ratio

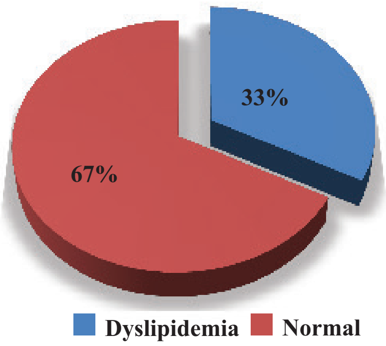


Figure-1 - Association of Males with Dyslipidemia

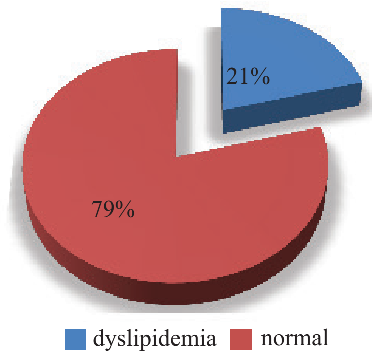


Figure-2: Association of Females with Dyslipidemia

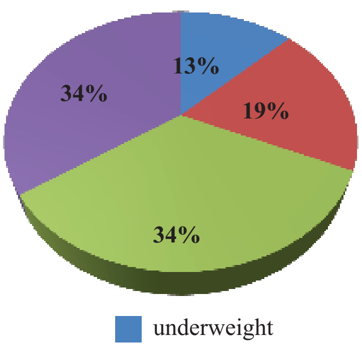
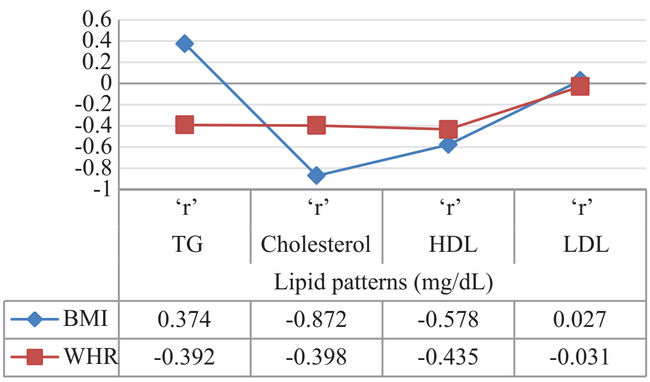


Figure-3: Association of BMI and Dyslipidemia



	'r' TG	'r' Cholesterol	'r' HDL	'r' LDL
BMI	0.374	-0.872	-0.578	0.027
WHR	-0.392	-0.398	-0.435	-0.031

Figure-4: Correlation of Waist-Hip Ratio and BMI with Dyslipidemia

of male and female subjects were comparable.

The lipid profile parameters (TC, LDL, VLDL, HDL, LDL/HDL and TG) of male and female subjects in our study were comparable and statistically not significant (p>0.05). The incidence of dyslipidemia significantly increased with increasing BMI. There was significant association of BMI with Dyslipidemia (figure-3).

Waist Circumference (WC), Hip Circumference (HC) and Waist Hip (WH) Ratio increased significantly with increasing BMI. There was significant association of Anthropometric measurements with Underweight, Normal, Overweight and Obese BMI.

TC, VLDL, LDL/HDL and TG increased significantly with increasing BMI. Similarly HDL decreased significantly with increasing BMI. There was significant association of Lipid profile findings except LDL with Underweight, Normal, Overweight and Obese BMI.

There was significant positive correlation between BMI and TG while significant negative correlation existed between BMI and TC and HDL. It was observed that WH Ratio was significantly and negatively correlated with TG, TC and HDL. No significant correlation was found between LDL and the anthropometric indices (BMI and WHR) (figure-4).

DISCUSSION

Obesity is associated with many metabolic risks; however, far fewer studies of obesity-related disorders have been performed on Asian population compared with the western population.[13] Research trends have shown an increasing trend in the prevalence of obesity, which is expected to further rise in the future due to increasing urbanization.[14]

In the present study, majority of the subjects (61.1%) were from the age group of 21-25 years followed by 36.8% from the age group of 26-30 years and 2.1% from the age group of 18-20 years. There was female preponderance (68.4%) while male subjects constituted 31.6% of the study group. Raj SA et al[15] found 190 (58.5%) males and 135 (41.5%) females. A majority of 45.3% males and 45.9% females were in the age group of 45-59 and 30-44 years respectively and Thomas S et al[16] found 24.8% were in between the age groups 20 – 25. 88 ie; 17.6% were in between the age group 26 – 30.136 ie; 27.2% were in between the age group 31– 35.152 ie; 30.4% were in between the age group 36 – 40. Out of the 500 asymptomatic adults, 315 (63%) were males and 185 (37%) were females. The mean age was 31.12 years.

In our study, 66 (23.2%) subjects were underweight while 145 (50.9%) and 61 (21.4%) subjects were in the normal range and overweight respectively. 13 (4.5%) subjects were overweight. Chehrei A et al[17] cross sectional population based study percentage of overweight was 55.1% in females and 43.7% in males (p<0.01) and among obese subjects 5.78% were very obese. Raj SA et al[15] found overweight and obesity constituted 58.8% and 63.1% of urban and rural subjects respectively.

It was observed that there were 95 (33.3%) cases of dyslipidemia in our study. 44 (48.9%) male patients and 51 (26.2%) of female patients had dyslipidemia. There was no significant association of sex with dyslipidemia (p=0.154). It was observed that the incidence of dyslipidemia significantly increased with increasing WHR >0.9 in males. There was significant association of WHR >0.9 in males with Dyslipidemia (p=0.0158). It was observed that the incidence of dyslipidemia significantly increased with increasing WHR >0.85 in females. There was significant association of WHR >0.85 in females with Dyslipidemia (p=0.0089). Raj SA et al study[15] reported 74.5% in urban population and 68.8% amongst the rural population.

Observations in the present study showed that the Waist Circumference (WC) and Hip Circumference (HC) were significantly higher in male as compared to female subjects ($p<0.05$) whereas the Waist Hip (WH) Ratio of male and female subjects were comparable. The lipid profile parameters (TC, LDL, VLDL, HDL, LDL/HDL and TG) of male and female subjects in our study were comparable and statistically not significant ($p>0.05$). It was observed that the incidence of dyslipidemia significantly increased with increasing BMI. There was significant association of BMI with Dyslipidemia. ManjareekaM et al[18] study found BMI was not significantly different in both the age groups, there was a significantly greater WC in the older group than the younger group. Each of TG and VLDL was significantly greater in the older age group than the younger group. There was a weak correlation between BMI and lipid parameters. WC was best correlated to lipid parameters. Furthermore, the correlation of BMI with lipid parameters in the BMI <25 group was weak and insignificant; in the BMI ≥25 group BMI showed a significantly negative correlation with HDL ($P = 0.03$, $r = -0.3$).

Observations in the present study showed that the Waist Circumference (WC), Hip Circumference (HC) and Waist Hip (WH) Ratio increased significantly with increasing BMI. There was significant association of Anthropometric measurements with Underweight, Normal, Overweight and Obese BMI. It was observed that TC, VLDL, LDL/HDL and TG increased significantly with increasing BMI. Similarly HDL decreased significantly with increasing BMI. There was significant association of Lipid profile findings except LDL with Underweight, Normal, Overweight and Obese BMI. Chehrei A et al[17] cross sectional population based study compared anthropometric indices (BMI, WC, and W/Ht) reported overweight subjects presented higher total cholesterol, higher triglyceride, lower HDL-C, higher LDL-C, higher TC/HDL-C, higher LDL-C/HDL-C and higher fasting blood glucose compared to normal weight subjects. Total serum cholesterol was increased in 28.5% of subjects (22.9% of women and 30.2% of men ($p>0.05$)). Triglyceride (TG) was increased to more than or equal to 150 mg/dL amongst 29.3% of the subjects. Hypertriglyceridemia was observed to be 28.9% and 30.7% among women and men respectively ($p>0.05$). Elevated low-density lipoprotein (LDL-C≥130 mg/dL) was found in 25.5% of subjects. 19.9% of men and 27.3% of women showed LDL-C level above the normal range. Low high-density lipoprotein (HDL-C <40 mg/dL was found in 31.7% of subjects. Among study participants 41.6% of men and 29.4% of women had HDL-C level below the normal range ($p<0.01$). Raj SA et al[15] published a descriptive cross-sectional study which reported a prevalence of hypercholesterolemia which was marginally higher in the urban area (30.9%) with a mean value of 186.36±37.40 compared to the rural area (25.1%) with a mean value of 177.76±35.32. The HDL Cholesterol levels less than 40 mg/dl were found in 69.1% of urban and 63.1% of rural subjects. The LDL cholesterol was found to be significantly higher in urban (33.4%) than in the rural (23.1%) study population and the difference was statistically significant (Chi-square value = 10.38; df=2; p-value = 0.035). Hypertriglyceridemia was higher in the urban (47.9%) than in the rural (40%) study population with the difference being statistically significant (Chi-square value = 9.059; df=1; p-value = 0.011).

In the present study, there was significant positive correlation between BMI and TG while significant negative correlation existed between BMI and TC and HDL. It was observed that WH Ratio was significantly and negatively correlated with TG, TC and HDL. No significant correlation was found between LDL and the anthropometric indices (BMI and WHR). ChehreiA et al[17] with a cross sectional population based study found that the abnormal total cholesterol, LDL-C, and HDL-C levels were variable in different age groups. Subjects in the 51-60 age groups had highest abnormal levels of total cholesterol and LDL-C. On the other hand lowest HDL-C level was seen among the individuals who were older than 70 years. LDL-C level was more markedly abnormal than total cholesterol and HDL-C level for all age groups.

Anthropometric measurements correlate with various medical disorders[19] and BMI is the most commonly used measurement to assess obesity. However, measuring the BMI, does not discriminate the weight distribution related to increased muscle mass or the accumulation of fat in the body.[20] Individuals with a similar BMI can vary considerably in their abdominal fat mass, with premenopausal women typically having half the abdominal fat mass of men.[21] Also its limitations are recognized by its dependency on race, with Asians having large percentages of body fat at low BMI values[22] and the variation of BMI as a person ages.[20] Because of these drawbacks, a measure of obesity that would take into consideration only the increase of abdominal fat is required. There is a new tendency to use waist circumference[20,23,24] or waist to height ratio[25-27] rather than waist to hip ratio, because studies with computed tomography have disclosed them to have a closer correlation with intra-abdominal fat[28,29] and with the changes in metabolism of intra-abdominal fat stores.[30] An increase in the waist circumference is directly related to visceral fat accumulation, and hence correlates with an elevated risk factors associated with it. The likely pathogenesis may involve excess supply of fatty acids to the liver.[31] The combination of WC and height that is W/Ht could manifest better the morphology of an enlarged abdomen with inappropriate short stature.[32]

Raj SA et al[15] their study showed that with the BMI of 27.5 and more, the chances of dyslipidemia increased to 2.26 compared to normal BMI. The showed that for the BMI 23-27.49, there was a 1.85 times risk of dyslipidemia over normal BMI. On the contrast, the chance of dyslipidemia was 0.6 times for individuals with a BMI of <18. It can be concluded that BMI is closely associated with lipid profile. They also concluded that an increase in BMI and age of the person were associated with dyslipidemia. Rest of the variables had no significant association with dyslipidemia. Odd's ratio showed a chance of having dyslipidemia was 1.83 times higher in the 45-59 age group compared to the age group of 30-44 years. Chances of having dyslipidemia was 3.21 times higher for people more than 60 years in comparison to the age group of 30-44 years. The chance of dyslipidemia was 2.61 times higher for a person with a BMI of 23.00-27.49 compared to a person with BMI of 18.50-22.99. Lastly, in comparison with a person of BMI 18.50-22.99, the chance of having dyslipidemia is 2.99 times higher when the BMI is above 27.5. As the age and body mass index increases, the chance of dyslipidemia also increased was shown by multiple regression models. Arun Babu B et al[33] study reported there were statistically significant increase in BMI. WHR. TG, and AlP when obese individuals were compared to their non-obese counterparts. Thomas S et al[16] found Cholesterol 406 subjects (81.2%) had cholesterol levels less than 200. 70 subjects (14%) had cholesterol levels in between 200 –239. 24 participants (4.8%) had cholesterol levels above 240. 403 had their triglyceride levels less than 150 (80.6%). 39 had levels in between 150 – 199 (7.8%). 55 had levels in between 200 – 499 (11%). 3 had TG levels greater than 500 (0.6%). 165 had their HDL levels less than 40 (33%). 335 had HDL levels greater than 40 (67%). 341 (68.2%) had LDL levels less than 100. 66 (13.2%) had LDL levels in between 100 – 129. 70 (14%) had LDL levels in between 130 – 159. 22 (4.4%) had LDL levels between 160 – 189. And 1 (0.2%) had LDL level greater than 190.Aziz J et al[34] study found that mean TG, TC and LDL levels had a higher risk of getting elevated in obese subjects compared to non-obese subjects even in the absence of cardiometabolic diseases. Lakka HM et al[35] study on Abdominal obesity is associated with increased risk of acute coronary events in men reported male obese subjects were more vulnerable to have altered lipid parameters with metabolic abnormalities. According to literature, higher WC has a twofold risk of metabolic impairments, especially coronary heart diseases in men. Puavilai W et al[36] study found that obese subjects with higher WC have an association with altered lipid profiles in terms of TG, TC and LDL. ManjareekaM et al[18] study reported in the younger age group, the mean values of lipid and anthropometric variables were generally higher for the males than the females; mean values of TC, TG and LDL were significantly higher. For both the genders, the mean values of all variables were higher in the older age group than the younger age group. However, in the older age group the difference in the mean values of VLDL, WC and WHR were significant between the genders.

Limitations

Some of the limitations in our study are summarized below:
The study population was in the town of Karad and it does not account for any geographical or ethnic differences.
There were more females subjects than males. Hence more research may be required for males to check if the results are consistent.
Further, larger population based studies, with ethnic and racial considerations should be undertaken.

CONCLUSION

Dyslipidemia was quite prevalent in the young adults of our study population (33.3%). Low HDL- Cholesterol was the most common pattern of dyslipidemia found being common among ≤ 30 years age group. BMI predicted the prevalence of hypertriglyceridemia in our study population. Increase in the age also predicted the prevalence of hypertriglyceridemia in our study. Combination of lifestyle therapies ie; enhanced physical activity, dietary modification and therapeutic intervention could help us in treatment and management of dyslipidemia. Our study concluded that, there is a significant association of dyslipidemia with an increase in age and Body mass index. Hence, awareness programs on desirable diet and regular screening of population on periodic basis should be incorporated at the primary health care level.
To answer the question, is there a need to screen for dyslipidemia in the younger age group of 18-30? It would be Yes, in subjects of the population, who are overweight, obese, or who have WHR >0.9 for males and >0.85 females a lipid profile screening should be advised.

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