Original Article

Association between Obesity & Dyslipidemia among Master Health Check-up Beneficiaries in a Rural Hospital of Erode District

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Abstract

Background : According to WHO, Cardiovascular diseases accounts for most Non-communicable Disease (NCD) deaths globally and in India it is responsible for 24% of all deaths, which can be prevented by early screening and timely treatment. Obesity and Dyslipidemia are emerging as major public health problem in South Asian countries. The alarming increase in prevalence of Obesity and cardiovascular risk raises much threatening. The increase in cardiovascular risk depends to a significant changes in lipid profiles as observed in obesity. The aim of the present study was to determine the association between Obesity & Dyslipidemia among Master Health Check-up beneficiaries.

Materials and Methods : It was a Retrospective Descriptive study which was conducted in Master Health Check-up Department, IRT - Perundurai Medical College and Hospital, Perundurai, Erode District, Tamilnadu. 1273 patients were included in the study. Collected data were entered in Microsoft excel sheet analysed using SPSS Version 16. Chi-square test was used in the analysis of data.

Results : The overall prevalence of Dyslipidemia among the study population undergone Master Health Check-up is 65.4%. Elevated level of Total Cholesterol (30% & 10%) observed maximum in Obese people (I & II) when compared to normal total cholesterol (25% & 7%). Same kind of elevation observed in Low Density Lipoprotein (LDL) and triglyceride too. Body Mass Index (BMI) & waist circumference were statistical significant association with dyslipidemia ($p<0.05$).

Conclusion : There was an increased risk of Dyslipidemia among the Obese group compared with the people with normal but at the same time normal BMI also have elevated lipid profile. Regular screening of population (irrespective of their gender and normal BMI and WC status) on periodic basis should be incorporated from health care facilities to combat the risk factors of Dyslipidemia and to reduce the morbidity and mortality due to CVD.

Key words : NCD, Dyslipidemia, Obesity, LDL, HDL,TG, BMI, WC, WHR.

Health is a fundamental right of every individual and protection of health through health promotion is an intrinsic part of health care. Preventive health care is an essential determinant of health, since it helps to avoid or slow down the course of a disease which is essential for maintaining the wellbeing. The emphasis on preventive health check-ups are justified, as early detection of disease in its latent phase itself and it helps in timely therapeutic interventions, thereby significantly reducing the morbidity, mortality and economic burden due to the disease[1].

According to WHO, Cardiovascular diseases accounts for most NCD deaths Globally[2] and in India it is responsible for 24% of all deaths[3], which can be prevented by early screening and timely treatment. Obesity and Dyslipidemia are emerging as major public health problem in South Asian countries. Dyslipidemia is a recognized, major modifiable risk factor for the development and progression of Coronary Artery Disease (CAD), where early diagnosis and therapy can reduce the incidence of Cardiovascular disease events[4].

Globally, prevalence of Obesity has doubled in the last two decades. In 2008, more than 1.6 billion adults over 20 years were overweight, of these, over 200

Editor's Comment :

- Based on our study findings, high BMI & Waist Circumference (WC) were statistical significant association and correlation with dyslipidemia ($p<0.05$) when compared to high Waist Hip Ratio (WHR). So, WC is the easiest method, less time consuming and it gave statistically significant association between dyslipidemia and obesity near similar to BMI, hence it can also be included in routine screening along with BMI.

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million men and nearly 300 million women were Obese[5,6]. About 44% of the Diabetes burden and 23% of the CVD burden is attributable to overweight and obesity; and mortality due to Obesity occurs in 2.8 million adults each year[7].

The alarming increase in prevalence of Obesity and Cardiovascular risk raises much threatening. The increase in cardiovascular risk depends to a significant changes in lipid profiles as observed in Obesity. These changes are decreased high-density lipoprotein cholesterol and increased triglyceride levels[8]. Central and/or overall obesity has been related to not only elevated triglycerides, decreased High-density Lipoprotein Cholesterol (HDL-C) but also related to insulin resistance/high insulin levels, Diabetes, Hyperuricemia and Hypertension[9].

Even though Preventive health check-up or screening program is widely adopted by several health care facilities towards this goal, there was a wide debate among policy makers that whether preventive Health Check-up is really a need or mere economic burden to the beneficiaries.

The aim of the present study was to determine the association between Obesity & Dyslipidemia among master health check-up beneficiaries to analyze the need of preventive health check-up in early detection of diseases like CVD.

Materials and Methods

This study was designed to find out the association between Obesity & Dyslipidemia among Master Health Check-up beneficiaries. It was a Retrospective Descriptive study which was conducted in Master Health Check-up Department, IRT - Perundurai Medical College and Hospital, Perundurai, Erode district, Tamilnadu. Individuals who attended the Master Health Check-up section of the hospital for preventive health check-up were included in the study.

Out of which, Socio-demographic characteristics and lipid profile data of 1273 patients not having known Cardiovascular disease, Dyslipidemia status and Obesity status were included for the study purpose from the medical records section.

Collected data were entered in Microsoft excel spreadsheet, compiled and analysed using IBM SPSS Version 16 statistical package. Chi-square test was used in the analysis of data.

Operational Definition:

Dyslipidemia :

Dyslipidemia refers to the derangements of one or many of the lipoproteins; elevations of Total Cholesterol, Low Density Lipoprotein (LDL) cholesterol and/or triglycerides, or low levels of High-density Lipoprotein (HDL) cholesterol[10].

Lipid profile results were categorized as per NCEP-ATP III classification[11].

LDL Cholesterol – Primary Target of Therapy

<100 Optimal
100-129 Near optimal/above optimal
130-159 Borderline high
160-189 High
>190 Very high

Total Cholesterol

<200 Desirable
200-239 Borderline high
>240 High

HDL Cholesterol

<40 Low
>60 High

ATP III Classification of Serum Triglycerides (mg/dL)

<150 Normal
150-199 Borderline high
200-499 High
>500 Very high

Obesity[11]

Obesity refers to Body Mass Index (BMI)-

< 18.5 – underwt
18.5- 22.9 – normal
23-24.9 – overwt
25-29.9 – obese class I
≥ 30 - obese class II

Waist circumference – >90cm in males, >80 cm in females

Waist Hip Ratio (WHR) – >0.9 males, >0.85 in females

Results

Table 1 shows, demographic characteristics among

male female. Majority of the participants (92%) were married, 41% were illiterate, 28% were home maker.

Table 2 shows the lipid profile among the study participants. Among 1273 people 19.9% had high cholesterol, among males and females 20% & 19.3% had high cholesterol respectively. Almost one fourth of the people had low HDL level. Elevated LDL & Triglyceride observed in 48% & 24% respectively. According to ATP classification 65% were dyslipidemic and among males & females 67% & 62% has been observed in this study.

Table 3 explains, obesity assessment among participants. According BMI classification majority of them were males (59%) in class I and female (69%) in class II. In Waist Circumference, obesity in males were 63% and females were 36%. According to WHR 64% & 35% males & female were obese in our study and these male & female differences were statistically significant.

Table 4 explains, Association lipid profile and Body Mass Index (BMI) of study subjects. Among the 1273 people, elevated level of total cholesterol (30% & 10%) observed maximum in obese I & II when compared to normal total cholesterol (25% & 7%). Same kind of elevation observed in LDL and triglyceride too. Likewise, dyslipidemia was observed more in overweight & obese people when compared to normal lipid level people and all these differences between lipid profile and Body Mass Index (BMI) of study subjects were found to be statistically significant ($p<0.001$). But at the same time, we observed among the total people had elevated cholesterol & LDL level, around 30% were normal BMI which cannot be neglected.

Table 5 shows, Association lipid profile and Waist

Table 1 — *Socio demographic characteristics of study subjects among Master Health Check-up beneficiaries (N=1273)*

Socio Demographic characters	Sex		
	Male (%)	Female (%)	Total (%)
Sex	719(56.5)	554 (43.5)	1273(100)
Marital status:			
Married	642 (89.3)	535 (99.6)	1177 (92.5)
Unmarried	77 (10.7)	18 (3.2)	95 (7.5)
Single	0	1 (0.2)	1 (0.1)
Education status :			
Illiterate	204 (28.4)	325 (58.7)	529 (41.6)
Upto middle	299 (41.6)	171 (30.9)	470 (36.9)
Middle-HSS	104 (14.5)	27 (f4.9)	131 (10.3)
College	112 (15.6)	31 (5.6)	143 (11.2)
Occupation :			
Skilled	44 (6.1)	5 (0.9)	49 (3.8)
Unskilled	510 (70.9)	136 (24.5)	646 (50.7)
Professionals	97 (13.5)	11 (2.0)	108 (8.5)
House Maker	2 (0.3)	362 (65.3)	364 (28.6)
No work/Student	66 (9.2)	40 (7.2)	106 (8.3)

Table 2 — *Lipid Profile of study subjects among Master Health Check-up beneficiaries (N=1273)*

Lipid Profile	Sex			p value
	Male (%)	Female (%)	Total (%)	
Total cholesterol :				
Normal	573 (79.7)	447 (80.7)	1020 (80.1)	0.660
High cholesterol	146 (20.3)	107 (19.3)	253 (19.9)	
HDL Cholesterol :				
Normal	527 (73.3)	437 (78.9)	964 (75.7)	0.021
Reduced HDL	192 (26.7)	117 (21.1)	309 (24.3)	
LDL Cholesterol :				
Normal	369 (51.3)	287 (51.8)	656 (51.5)	0.865
Elevated LDL	350 (48.7)	267 (48.2)	617 (48.5)	
Triglyceride :				
Normal	511 (71.1)	457 (82.5)	968 (70.0)	<0.001
Elevated TG	208 (28.9)	97 (17.5)	305 (24.0)	
Dyslipidemia :				
Normal	233 (32.4)	208 (37.5)	441 (34.6)	0.058
Dyslipidemia	486 (67.6)	346 (62.5)	832 (65.4)	

Table 3 — *Obesity assessment of study subjects among Master Health Check-up beneficiaries (N=1273)*

Obesity assessment	Sex		p value
	Male (%)	Female (%)	
Body Mass Index (BMI) :			
≤18.4- underwt	56.1	43.9	< 0.001
18.5-22.9-normal	54.6	45.4	
23-24.9-overwt	66.5	33.5	
25-29.9-obese class I	59.6	40.4	
≥30-obese class II	30.8	69.2	
Waist Circumference (WC) :			
Normal	50.1	49.9	< 0.001
Obese WC	63.5	36.5	
Waist Hip Ratio (WHR) :			
Normal	16.8	83.2	< 0.001
Obese WHR	64.5	35.5	
Total	56.5	43.5	

Table 4 — *Association lipid profile and Body Mass Index (BMI) of study subjects among Master Health Check-up beneficiaries (N=1273)*

Lipid Profile	BMI					p value
	Under wt≤18.5	Normal 18.5-22.9	Overwt 23-24.9	Obese I 25-29.9	Obese II ≥30	
Total Cholesterol :						
Normal	15.4%	32.3%	18.8%	25.7%	7.8%	< 0.001
Elevated TC	2.8%	32.8%	23.3%	30.4%	10.7%	
HDL Cholesterol :						
Normal	15.0%	33.3%	18.6%	25.2%	7.9%	< 0.001
Reduced HDL	6.1%	29.4%	23.3%	31.1%	10.0%	
LDL Cholesterol :						
Normal	16.9%	33.2%	17.5%	25.5%	6.9%	< 0.001
Elevated LDL	8.6%	31.4%	22.0%	27.9%	10.0%	
Triglyceride :						
Normal	15.6%	34.6%	17.9%	24.6%	7.3%	< 0.001
Elevated TG	4.3%	25.2%	25.6%	33.1%	11.8%	

Circumference (WC) assessment among participants. Among 1273 people those who had elevated Total Cholesterol level seems to be high in obese Waist Circumference and vice versa when compared to normal level of Cholesterol. Same differences observed in LDL & triglyceride level and Dyslipidemia and these differences were statistically significant except HDL cholesterol level ($p<0.05$).

Table 6 shows, Association lipid profile and Waist Hip Ratio between study participants. Among 1273 people those who had elevated Total Cholesterol level seems to be slightly high in obese Waist Hip Ratio and vice versa when compared to normal level of Cholesterol. Same differences observed in LDL & triglyceride level. These differences were statistically significant only for Total Cholesterol and Triglyceride level ($p<0.05$).

Table 7 shows, Association of lipid profile and obesity assessment between study participants. Among 1273 people those who were obese seems to be slightly high dyslipidemia level. Among these, BMI & Waist Circumference were statistical significant association with dyslipidemia ($p<0.05$).

Table 8 shows, Correlation Coefficient for Obesity assessment and Lipid levels. Triglycerides showed weak positive correlation (0.220) with Waist Circumference likewise HDL showed negative correlation with BMI & WC and it was found to be statistically significant. Based on this present study findings, BMI and WC were better correlation with lipid levels when compared to WHR and it was statistically significant.

Table 5 — *Association Lipid Profile and Waist Circumference (WC) assessment of study subjects among Master Health Check-up beneficiaries (N=1273)*

Lipid Profile	Waist Circumference (WC)		p value
	Normal	Obese WC	
Total Cholesterol :			
Normal	54.8%	45.2%	0.002
Elevated TC	43.9%	56.1%	
HDL Cholesterol :			
Normal	54.1%	45.9%	0.055
Reduced HDL	47.9%	52.1%	
LDL Cholesterol :			
Normal	57.6%	42.4%	< 0.001
Elevated LDL	47.3%	52.7%	
Triglyceride :			
Normal	56.8%	43.2%	< 0.001
Elevated TG	39.3%	60.7%	
Total	52.6%	47.4%	

Table 6 — *Association Lipid Profile and Waist Hip Ratio (WHR) of study subjects among Master Health Check-up beneficiaries (N=1273)*

Lipid Profile	Waist Hip Ratio (WHR)		p value
	Normal	Obese WHR	
Total Cholesterol :			
Normal	18.1%	81.9%	0.011
Elevated TC	11.5%	88.5%	
HDL Cholesterol :			
Normal	17.9%	82.1%	0.056
Reduced HDL	13.3%	86.7%	
LDL Cholesterol :			
Normal	18.0%	82.0%	0.247
Elevated LDL	15.6%	84.4%	
Triglyceride :			
Normal	19.4%	80.6%	< 0.001
Elevated TG	8.5%	91.5%	
Total	16.8%	83.2%	

Discussion

Dyslipidemia is frequently encountered in obese individuals. The Dyslipidemia associated with Obesity plays a major role in the development of atherosclerosis, CVD and cancer in Obese individuals[12]. All the components of the dyslipidemia, including higher TGs, decreased HDL levels and increased LDL particles have been atherogenic. It has been suggested that BMI should be routinely measured in primary health care clinics for children, adults and elderly people in order to facilitate early identification, evaluation and treatment of obesity and

Table 7 — *Association Lipid Profile and Obesity assessment of study subjects among Master Health Check-up beneficiaries (N=1273)*

Obesity assessment	Lipid Profile		Total	p value
	Normal	Dyslipidemia		
Body Mass Index (BMI) :				
Non obese	315(71.4)	512(61.5)	827(65.0)	<0.001*
Obese	126(28.6)	320(38.5)	446(35.0)	
Total	441 (100)	832 (100)	1273 (100)	
Waist Circumference (WC) :				
Normal	268 (60.8)	402 (48.3)	670 (52.6)	<0.001*
Obese WC	173 (39.2)	430 (51.7)	603 (47.4)	
Total	441 (100)	832 (100)	1273 (100)	
Waist Hip Ratio (WHR) :				
Normal	86 (19.5)	128 (15.4)	214 (16.8)	0.062
Obese WHR	355 (80.5)	704 (84.6)	1059 (83.2)	
Total	441 (100)	832 (100)	1273 (100)	

**Statistically significant*

Table 8 — *Correlation Coefficient for Obesity assessment and Lipid levels*

Lipid Profile	Body Mass Index (BMI)	Waist Circumference (WC)	Waist Hip Ratio (WHR)
Total Cholesterol	0.183*	0.177*	0.019
HDL Cholesterol	-0.067*	-0.086*	-0.025
LDL Cholesterol	0.129*	0.099*	-0.024
Triglyceride	0.159*	0.220*	0.119*

**Statistically significant*

its related complications[13,14].

This study was attempted to understand the association between Dyslipidemia and Obesity.

The overall prevalence of Dyslipidemia among the study population undergone Master Health Check-up is 65.4%, which is higher compare to similar study[15,16] done by Karna SK, *et al* (57.7%) among individuals attending preventive health check-up in Rural Tertiary Care Hospital.

Dyslipidemia in our study was significantly higher in males (67.6%) compared to females (62.5%). Similar results was observed in studies conducted by Estari, *et al*[17] in Warangal.

An Indian study performed by Pandya, *et al*[18] among the Gujarati population mentioned that Obese patients are more prone to develop Dyslipidemias than the non-obese patients. The present study showed that Cholesterol was significantly higher in high BMI people compared with people with normal BMI. These findings correlate well with the findings of Philip, *et al*[19].

Among the 1273 people, elevated level of Total Cholesterol (30% & 10%) observed maximum in obese people (I & II) when compared to normal Total Cholesterol (25% & 7%). Same kind of elevation observed in LDL and triglyceride too. Likewise, dyslipidemia was observed more in overweight & obese people when compared to normal lipid level people in the same way Dyslipidemia was observed less in underweight people and all these differences between lipid profile and Body Mass Index (BMI) of study subjects were found to be statistically significant ($p<0.001$). But at the same time, we observed among the total people had elevated cholesterol & LDL level, around 30 % were normal BMI. So, we cannot avoid screening the lipid profile in normal BMI people because they also had elevated lipid profile.

From this study, it can be inferred that LDL-C was significantly higher in people with high BMI compared with people with normal BMI, while the values of HDL-C did not show any significant association between the two groups (high BMI and normal BMI); these findings correlate well with the study of Grundy[20]. In our study, the TG levels were significantly higher among the high BMI group when compared with the normal BMI group, and the findings are in par with the study performed by Lemieux, *et al*[21].

Conclusion

After analyzing the results of the study conducted, it was concluded that the overall prevalence of dyslipidemia in our study is alarming. The order of statistically significant association with Obesity and dyslipidemia ($p<0.05$) as follows BMI, WC and WHR. Inspite of giving health education on lifestyle modifications through pamphlets, awareness programme and various media, the prevalence of obesity & dyslipidemia is increasing worldwide, and this is being considered as one of the major public health problems, also proven by the present study. There was an increased risk of dyslipidemia among the obese group compared with the people with normal but at the same time normal BMI also have elevated lipid profile. Among the male and female there were approximately 60% of them had dyslipidemia. Based on our study findings, high BMI & Waist Circumference were statistical significant association and correlation with Dyslipidemia ($p<0.05$) when compared to high WHR. So, WC is the easiest method, less time consuming and it gave statistically significant association between Dyslipidemia and obesity near similar to BMI, hence it can also be included in routine screening along with BMI. Hence these highlights the extensive need for regular screening of population (irrespective of their gender and normal BMI and WC status) on periodic basis and awareness programmes on recommended diet should be incorporated from Primary Health Centers to Medical College Hospitals to combat the risk factors of Dyslipidemia and to reduce the morbidity and mortality due to CVD.

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Conflict of Interest : None declared

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