International Journal of Research in Medical Sciences
Trimbake SB et al. Int J Res Med Sci. 2020 Jan;8(1):252-255
www.msjonline.org
pISSN 2320-6071 | eISSN 2320-6012
DOI: http://dx.doi.org/10.18203/2320-6012.ijrms20195917

Original Research Article

Serum high sensitivity C reactive protein and lipid profile in obese students

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Received: 06 November 2019
Revised: 19 November 2019
Accepted: 28 November 2019

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ABSTRACT

Background: The prevalence of overweight and obesity is progressively increasing in younger and adult population in India. It is a medical problem that increases risk of other diseases and health problems, such as heart disease, diabetes, high blood pressure and certain cancers. One of the causes of dyslipidaemia is obesity. High sensitivity C-Reactive Protein (hs-CRP), is a marker of systemic inflammation and a predictor of type 2 diabetes and cardiovascular disease. Hence it is important to check the relationship of hs-CRP with lipid profiles in obese and non-obese students.
Methods: A case control observational study was carried out in 60 students. They were divided in to two groups obese and non-obese based on the BMI ranges. Serum lipid levels, hs-CRP and BMI was estimated in both groups to find out correlation of hs-CRP with lipid profile and BMI.
Results: There was a significant rise in serum Total Cholesterol, LDL-C, Triacylglycerol and a significant fall in HDL-C in obese group as compared to non-obese group. Serum hs-CRP and BMI was significantly increased in obese students as compared to non-obese students. There was statistically significant positive correlation found between hs-CRP and total cholesterol, LDL-C, Triacylglycerol in obese students.
Conclusions: Significant correlation was found between hs-CRP and lipid profile except HDL-C. Serum hs-CRP levels may decrease by treatment of dyslipidaemia. This would minimize the incidence of atherosclerosis and hence decrease the risk for development of coronary artery disease. Hence, improving the quality of life.

Keywords: High density lipoprotein-cholesterol, High sensitivity C-reactive protein, Low density lipoprotein-cholesterol, Obesity, Total cholesterol, Triacylglycerol

INTRODUCTION

People are considered obese when their Body Mass Index (BMI), a measurement obtained by dividing a person's weight by the square of the person's height, exceeds 30 kg/m^2, with the range 25-30 kg/m^2 defined as overweight.[1]

Obesity is a medical condition in which excess body fat has accumulated to the extent that it may have a negative effect on health, leading to reduced life expectancy and/or increased health problems.[2,3] Health service use and medical costs associated with obesity and related diseases have risen dramatically and are expected to continue to rise.

Obesity is most commonly caused by a combination of excessive food energy intake, lack of physical activity, and genetic susceptibility, although a few cases are caused primarily by genes, endocrine disorders, medications, or psychiatric illness.

Obesity increases the likelihood of various diseases, particularly ischemic heart disease, type 2 diabetes,

obstructive sleep apnea, certain types of cancer, and osteoarthritis.[2]

Obesity is associated with increase in serum Interleukin-6, 30% of which originates from adipose tissue. Secondly, dyslipidemia associated with obesity leads to inflammatory changes in vessels which also contribute to atherosclerosis.[4,5] Adipose tissue is currently considered to be hormonally active and take part in control of metabolism. It is rich source of many immune related mediators and produces pro inflammatory cytokines such as interleukin 6 and complement factors. The hepatic of acute phase synthesis inflammatory proteins such as C - reactive protein are under the control of these cytokines and hence adipose tissue is a net worthy agent of high circulating C reactive proteins and cytokines.

CRP may be a marker of a chronic inflammatory state that can trigger acute coronary syndrome.[6] Acute coronary syndrome is a condition brought on by a sudden reduction or blockage of blood flow to the heart.

A comparative study was planned to assess serum hs-CRP and lipid profile in obese individuals. There is a growing concern for obesity related morbidity and mortality. Hs-CRP is an emerging inflammatory marker and a predictor of diabetes mellitus and ischemic heart disease.

METHODS

A case control study was carried out in 60 M.B.B.S students of M.I.M.E.R. Medical College during the period of two months after obtaining an approval from Institutional Ethics Committee. Thirty were cases whose BMI was more than 30 kg/m^2 and 30 students were controlling whose BMI was less than 30 kg/m^2.

Inclusion criteria

- Case group: consisted of obese (BMI >30 kg/m^2) students not suffering from any major illness.
- Control group: Consisted of non-obese students who were selected at random after matching age.

Exclusion criteria

- Individuals with diseases like diabetes mellitus, hypertension and thyroid disorders were excluded.

The study was approved by the Institutional Ethics Committee of MIMER Medical College Talegaon Dabhade Pune. A written informed consent was taken from the subjects and 10 ml of fasting (12-14 hr) venous blood sample under aseptic conditions was obtained for checking serum lipid levels and hs-CRP

Biochemical estimations

Serum Total cholesterol, TG, HDL, LDL was estimated and hsCRP was estimated by turbidometric method.10The BMI was calculated by the formula: BMI= weight (in kg)/Height (in m^2).[7-9]

Statistical analysis

The differences were compared with the use of an unpaired student's 't' test. Pearson's correlation coefficient was used to find out the relationship among hs-CRP levels and lipid profile, BMI.

RESULTS

This study was conducted in 60 students who were divided into two groups of 30 each. One group comprised of non-obese individuals with a mean BMI of 22.53±1.28 kg/m^2 and the 2.06 kg/m^2. (Table 1) showing means values of lipid profile, hs-CRP and BMI in both groups.

Table 1: Illustrating BMI, hsCRP and lipid levels in cases and controls.

	(Obese) (N=30) (Mean±SD)	(Non- obese) (N =30) (Mean±SD)
Total cholesterol(mg/dl)	164.8±22.7**	142.33±16.57
TG (mg/dl)	148.26±53.46**	106.36±28.66
LDL (mg/dl)	89.13±21.39*	76.03±14.04
HDL (mg/dl)	39.23±8.72**	47.36±6.88
HsCRP (mg/l)	2.0±0.85**	0.74±0.23
BMI	34.96 ±2.06**	22.53±1.28

n = number of subjects
*=significant (p<0.05),
**= significant (p<0.001)

There was a significant rise in serum total cholesterol (p<0.001), LDL-C (p<0.05), Triacylglycerol (p<0.001) and a significant fall in HDL-C (p<0.001) levels of obese students as compared to controls.

Serum hs-CRP and body mass index values were significantly increased in cases as compared to controls.

Table 2: Illustrating Pearson's Correlation coefficient (r) values of hsCRP and lipid profile, BMI in cases and controls.

Hs-CRP v/s	Case (obese) (r)	Control (non-obese) (r)
Total cholesterol	0.66*	0.17
TG	0.51*	0.21
LDL	0.60*	0.30
HDL	-0.11	0.19
BMI	0.55*	0.18

*= significant value, where r value >0.05

Table 2 shows a significant positive correlation in between BMI and hs-CRP in obese students. In obese group there was significant positive correlation in Serum hs-CRP and

Total cholesterol, LDL-C, Triacylglycerol. There was a negative correlation in between HDL-C and hs-CRP in obese students found, but it was not significant.

DISCUSSION

The present study shows a positive correlation between BMI and hs-CRP and the mean hs-CRP levels were high in obese students when compared with students with normal BMI. This is in concurrence with other studies.[11-13] This indicates that obesity has a significant correlation with hs-CRP. Various studies in India observed that 10% to 30% of adolescents are overweight. Decreased physical activity, consuming more junk foodstuffs, watching television programmes and sedentary lifestyles are common in younger people specially students. All of these factors are responsible for increasing predominance of obesity.[14]

Obesity which is a feature of metabolic syndrome was associated with chronic inflammation in obese subjects.[15] In the current study, there is a significant positive correlation of hs-CRP and Total Cholesterol, LDL-C, Triacylglycerol. This is supported by the study done by Mahmoud et al.[16] Serum HDL-C was not significantly correlated with hs-CRP. Similar results were found in study done by Vidyasagar S et al, where TG and HDL were not significant predictors of hs-CRP.[17] This study approved the relation in between obesity and dyslipidemia. Hana T et al, found the overall prevalence of dyslipidemia, overweight and obesity were 10.5%, 30.6% and 19.8% among college students in Kuwait.[18]

C-reactive protein is a classic acute –phase protein that is produced in the liver under the stimulation of cytokines such as tumor necrosis factor, Interleukin-1 (IL-1), and IL-6. IL- 6 is an imp factor in the synthesis of hs-CRP is secreted in an endocrine fashion in proportion to the enlargement of total body mass, principally the abdominal fat.[19] The effects of increase IL- 6 in obesity include two major adverse as insulin resistance and increased risk for cardiovascular complications. Circulating IL- 6 was found to be associated with insulin resistance in healthy men, in obese women and cancer patients.[20,21] Association of visceral fat obesity, insulin resistance may aggravate dyslipidemia. Dyslipidemia associated with obesity leads to inflammatory changes in vessels which also contribute to atherosclerosis.[4,5]

Obese students in this study had significantly raised serumhs-CRP compared to non-obese students. Thus hs-CRP can be an early unique inflammatory indicator in the healthy obese people. As the level of hs-CRP indicates the inflammatory changes occurring at a low level, if estimated early in the process, it would be beneficial. Simple measures like changes in lifestyle, modifications in diet and exercise may minimize or delay the atherosclerotic changes.

Limitation of the study was smaller sample size. The level measurements of other inflammatory biomarkers such as IL-6, TNF-α were not done in the current studies. This inflammatory biomarker requires further outcome studies.

CONCLUSION

There was a significant correlation found between hs-CRP and lipid profile, treatment for dyslipidemia may decrease hs-CRP levels. This treatment for dyslipidemia will include counselling for change in lifestyle i.e. weight reduction and/or use of hypolipidemic drugs. Teaching stress management and self-care skills to medical students is essential to reduce stress. This would minimize the incidence of atherosclerosis and hence decrease the risk for development of coronary artery disease. Hence improving the quality of life.

ACKNOWLEDGEMENTS

The authors sincerely thank the management of MIMER Medical College Talegaon financial assistance to carry out this project. The authors are thankful to Dr A.N. Sontakke, Retd. Principal, professor and Head, Department of Biochemistry, MIMER, Medical College, for her valuable guidance. Author are grateful to the teaching and nonteaching staff of the department of Biochemistry and CCL for the help in processing the samples.

Funding: Research Society MIMER Medical College
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee of MIMER Medical College Talegaon Dabhade Pune

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Cite this article as: Trimbake SB, Majithia YK, Pratinidhi SA. Serum high sensitivity C-reactive protein and lipid profile in obese students. Int J Res Med Sci 2020;8:252-5.