



STUDY OF SERUM CHOLESTEROL BINDING RESERVE AND CHOLESTEROL LEVELS IN MYOCARDIAL INFARCTION PATIENTS AT TERTIARY CARE HOSPITAL FROM CENTRAL INDIA

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ABSTRACT

Myocardial infarction is most common cardiovascular disorder. It occurs due to coronary artery disease. It is leading cause of death in elderly people in India. Increased serum cholesterol plays an important role in etiopathogenesis of myocardial infarction. Serum cholesterol binding reserve is the capacity of serum to solubilise additional cholesterol. To estimate the serum cholesterol and serum cholesterol binding reserve in myocardial infarction patients and its association with disease activity. A case control study was conducted on 60 clinically diagnosed cases of myocardial infarction patients and 60 age and sex matched healthy controls. Blood samples were collected from each study subjects and analyzed for serum cholesterol and serum cholesterol binding reserve. Serum cholesterol was found to be significantly (<0.001) higher (282.10 ± 75.78 mg/dl) in myocardial infarction patients as compare to healthy control (187.76 ± 20.58 mg/dl). Whereas serum cholesterol binding reserve significantly (<0.001) decreased (19.40 ± 5.58 mg/dl) in myocardial infarction patients as compare to healthy control (59.05 ± 6.22 mg/dl). We concluded that levels of serum cholesterol are higher and cholesterol binding reserve value were lower in myocardial infarction patients as compare to normal healthy controls.

KEYWORD: *Myocardial infarction; serum cholesterol; cholesterol binding reserve; coronary artery disease*



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INTRODUCTION

Myocardial infarction is a common presentation of coronary artery disease. Coronary artery disease (CAD) and myocardial infarction is becoming a more common cause of death in India due to changes in life style.¹ Myocardial infarction (MI) is commonly known as a heart attack. It occurs when blood flow stops to a part of the heart causing damage to the heart muscle. The most common symptom is chest pain, which may radiate towards the shoulder, arm, back, neck, and jaw. Commonly it is the left side of the chest and lasts for more than a few minutes.² Cholesterol is the most important animal steroid. Elevated cholesterol concentrations in serum (hypercholesterolemia) potentially associated with cardiovascular disease because low density lipoprotein (LDL) particles promote atherosclerosis development in coronary arteries and leads to myocardial infarction³. Serum cholesterol binding reserve (SCBR) denotes the capacity of serum to solubilise additional cholesterol. It has been suggested that a decrease of the SCBR have prognostic value in patients of myocardial infarction.⁴

MATERIAL AND METHOD

A case control study was conducted to estimate the levels of serum cholesterol and serum cholesterol binding reserve (SCBR) in freshly diagnosed myocardial infarction patients. In this study we took 60 (40 male

and 20 female) untreated cases of myocardial infarction from outpatient department of medicine, Hamidiya Hospital, Bhopal (M.P.), and 60 (40 male and 20 female) healthy controls are recruited from population of Bhopal. This study was conducted during the period from March 2016 to December 2016. The age of cases and controls were range from 40-75 years (Table1). A selection of study subjects was based on the WHO criteria.^{5, 6} This study was approved by ethical committee on research Gandhi Medical College, Bhopal (M.P.). We also took informed consent from all subjects those who participated in this study. A method⁴ for determining serum cholesterol binding reserve of human blood serum which comprises the steps of: Admixing in predetermined amounts an excess amount of finely divided cholesterol with a specimen of blood serum. Incubating the mixture for a period of time and at temperatures sufficient to maximize the solubilisation of cholesterol in the serum while obtaining continuous contact of said serum with said cholesterol by suitable means. Separating the incubated serum of step (b) from the excess of cholesterol and thereafter measuring the amount of cholesterol in said incubated serum, and subtracting from this amount the measured cholesterol content of a reference specimen of the same serum prior to incubation with cholesterol. Test results in case-control studies of premature myocardial infarction have demonstrated the usefulness of SCBR in assessing the risk of coronary artery disease.

Table1
Age and sex-wise distribution of myocardial infarction cases and healthy controls

Subjects	Age (in years)	Cases (No.)	Controls (No.)
Male	40-75	40	40
Female	40-75	20	20
Total	-	60	60

STATISTICAL ANALYSIS

The statistical analysis was performed using SPSS version 16.1. In this study to evaluate the difference between the cases and control, we used student's t test. Results were expressed as mean \pm SD. A p-value of 0.05 or less was considered as statistically significant.

RESULTS

In our study the mean levels of serum cholesterol were

282.10 \pm 75.78 mg/dl in myocardial infarction patients and 187.76 \pm 20.58 mg/dl in healthy control respectively (Table 2). The statistical analysis by student's t-test shows that serum levels of cholesterol significantly increased in myocardial infarction patients when compared to healthy controls ($p < 0.005$). The mean levels of SCBR were 19.40 \pm 5.58 mg/dl and 59.05 \pm 6.22 mg/dl in myocardial infarction patients and healthy control respectively. SCBR are significantly ($p < 0.005$) lower in myocardial infarction patients as compare to healthy controls.

Table2
Mean value of serum cholesterol and Serum cholesterol binding reserve in Myocardial patients and healthy controls

Parameters	Cases	Controls	p Value
Serum Cholesterol mg/dl (\pm SD)	282.10 \pm 75.78	187.76 \pm 20.58	<0.005
Serum cholesterol binding reserve mg/dl (\pm SD)	19.40 \pm 5.58	59.05 \pm 6.22	<0.005

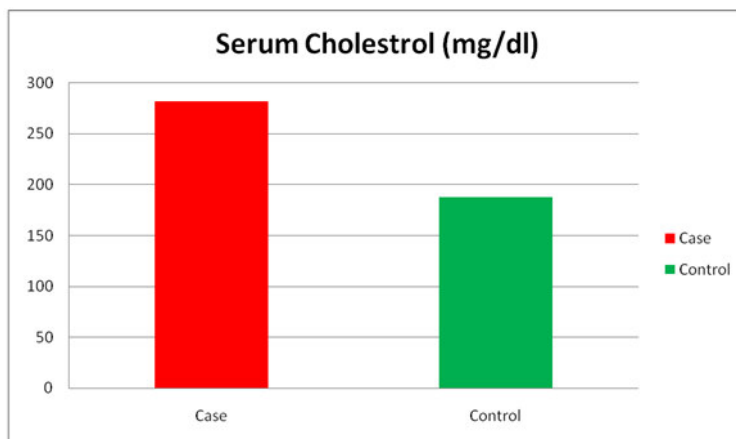


Figure 1
Serum Cholesterol level in myocardial infarction Patients and healthy controls

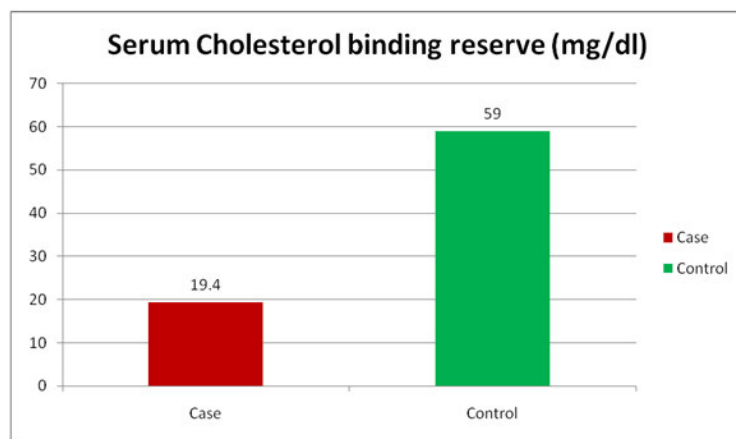


Figure 2
Serum cholesterol binding reserve in myocardial infarction patients and controls

DISCUSSION

Atherosclerosis is a major vascular sequel of coronary heart disease. Increased serum cholesterol and hypertension is well known risk factor for myocardial infarction. Serum cholesterol binding reserve depict an intrinsic capacity of plasma to solubilise the additional cholesterol and hence it act as a possible carrier of free cholesterol in body. Our results were in accordance with Hsia et al⁴ who reported that SCBR levels are significantly lower in myocardial infarction patients as compare to healthy controls. Majority of studies suggested that a large number of factors e.g. catecholamine, renin, mineral corticoids, dietary sodium, serotonin, histamine and bradykinin are involve in altering the cellular metabolism of arterial wall and producing vascular damage.⁹ Serum cholesterol level was highly elevated in myocardial infarction patients when they were compared with that of healthy controls. These findings are in accordance with study of Kukita, H., Imamura, Y., Hamada, M., Joh, T. and Kokubu, T¹⁰ A study on relation of SCBR and myocardial infarction showed that reduced SCBR levels are aggravating factor for premature atherosclerosis leading to premature myocardial infarction.¹¹ A study conduted by Valensi P, Lorgis L, Cottin Y¹² evaluate the prevalence

and incidence of silent myocardial infarction in subjects with or without a history of cardiovascular disease and in diabetic patients. A research work conducted by Menno Vergeer, Adriaan G. Holleboom, and Jan Albert Kuivenhoven¹³ showed an inverse association between plasma high-density lipoprotein cholesterol concentrations and the risk of cardiovascular disease. Their finding supports the hypothesis that HDL protects from atherosclerosis. The study conducted by Dwivedi SK, Chandra A, Kapoor NK¹⁴ showed the decreased serum cholesterol binding reserve is underlying etiopathogenesis of atherosclerosis in hypertension patients. In contrast, the result of study from Borresen AL, Berg K, Dahlén G, Gillnäs T, Ericson C¹⁵ suggest that Gemfibrozil elevate the serum level of HDL and strikingly increased serum cholesterol binding reserve. A study conducted by Saha A, Sahu S and Paul G¹⁶ observed that cardiovascular risks are higher in persons with excessive stress. They found that hypertension, increased triglyceride level are positively correlated to severity of cardiovascular disorders. As a conclusion, our findings support the hypothesis that higher levels of serum cholesterol are major etiopathological factor in myocardial infarction patients. Whereas decreased serum cholesterol binding reserve are suggesting the worst prognosis of myocardial infarction. Conclusively SCBR is a potential marker for monitoring disease

activity in myocardial infarction. It provides better information about the severity of atherosclerosis. Finally, we also feel the need of further elucidation to establish the correlation of serum cholesterol binding reserve and disease activity in myocardial infarction patients with large number of samples. At last our research work will

be helpful in making novel strategies for diagnosis, treatment and prognosis myocardial infarction.

CONFLICT OF INTEREST

Conflict of interest declared none.

REFERENCES

- Gupta R, Joshi P, Mohan V, Reddy S, Yusuf S, Joshi et al. Epidemiology and causation of coronary heart disease and stroke in India. *Heart*. 2008; (1): 16–26.
- Van de Werf F, Bax J, Betriu A, Blomstrom-Lundqvist C, Crea F, Falk V et al. Management of acute myocardial infarction in patients presenting with persistent ST-segment elevation: the Task Force on the Management of ST-Segment Elevation Acute Myocardial Infarction of the European Society of Cardiology. *European Heart Journal*. 2009; (23): 2909–45.
- Cholesterol and lipoprotein. In: Vasudevan D M, Sreekumari S, editors. *Textbook of Biochemistry*. 6th edi: Jaypee Brothers Medical Publishers (P) Ltd; 2011:197-198.
- Hsia SL, Chao YS, Hennekens CH, Reader W. Decreased serum cholesterol binding reserve in premature myocardial infarction 1975;(22):1000-4.
- World Health Organization: Arterial hypertension and ischemic heart disease, preventive aspects. *Tech. Rep, Ser 1962; (231):17*.
- World Health Organization: Expert Committee on Auxiliary Dental Personnel. *Tech. Rep. .Ser., 163: 25, 1959*.
- Abbott RD, Garrison RJ, Wilson PW and Castelli W P. Coronary heart disease risk: The importance of joint relationships among cholesterol levels in individual lipoprotein class. *Preventive Medicine* 1982; 11:1311-41.
- Lewis B, Chait A, Oakley CMO, Wootton IDP, Krikler DM, Onitiri A, Sigurdsson G. Serum lipoprotein abnormalities in patients with ischemic heart disease: Comparison with a control population. *Brit. Med. J.* 1974; 3:489-493.
- Wiesner RA, Fuchs RJ, Kay TD, Traibvasee R, Lancaster MC. Body fat: its relationship to coronary heart disease, blood pressure, lipid and other risk factors measured in large male population. *American journal of medicine*. 1976; 61:815-20.
- Kukita H, Imamura Y, Hamada M, Joh T and Kokubu T. Plasma lipids and lipoproteins in Japanese male patients with coronary artery disease and in their relatives. *Atherosclerosis*. 1982; 42:2129-31.
- Singh VS, Gupta PP, Tyagi PP, Gupta RR, Garg BK. Serum cholesterol and cholesterol binding reserve in children of patients of myocardial infarction. 1986; 32(2): 5969-71.
- Valensi P, Lorgis L, Cottin Y; Lorgis C. Prevalence, incidence, predictive factors and prognosis of silent myocardial infarction: a review of the literature. *Arch Cardiovasc Dis*. 2011; 104(3):178–88.
- Menno V, Adriaan G, Kastelein JP, and Kuivenhoven JA. The HDL hypothesis: does high-density lipoprotein protect from atherosclerosis. *Journal of lipid research* 2010; 51(8):2058-2073.
- Dwivedi SK, Chandra A, Kapoor NK. Serum cholesterol reserve binding in hypertension: Its role in atherogenesis. *Pakistan Heart Journal* 1989; 22(3):49-52.
- Borresen AL, Berg K, Dahlén G, Gillnäs T, Ericson C. Effect of Gemfibrozil on human serum apolipoproteins and on serum reserve cholesterol binding capacity. *Artery* 1981; 9(1):77-86.
- Saha A, Sahu S and Paul G. Evaluation of cardiovascular risk factor in police officers. *International Journal of Pharma and Bio Sciences* 2010; 1(4):263-267.

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