

Original Research Article

Study of biochemical parameters of atherosclerosis male patients in tertiary care hospital of Rewa, Madhya Pradesh, India

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ABSTRACT

Background: Atherosclerosis is characterized by intimal lesions called atheromas or atheromatous or fibro fatty plaques which protrude into and obstruct vascular lumens and weaken the underlying media. Global in distribution, atherosclerosis over whelming contributes to more mortality approximately half of all deaths and serious morbidity in the Western World than any other disorder. The atherosclerotic plaque is a lumpy thickening of the arterial wall, narrows the passage way and initiates the formation of a blood clot that can ultimately close down a critical artery. The objective of the study was to comparative biochemical parameters in different age group of atherosclerosis male patients.

Methods: It was a prospective study, conducted in department of medicine of tertiary care hospital at Rewa. 30 atherosclerotic patients were selected for this study on the basis of inclusion and exclusion criteria, Biochemical testing was done for all patients and data of biochemical parameters were reported as the Mean±SD. Results were performed by the unpaired student's t-test.

Results: Total 30 atherosclerosis male patients and 27 normal healthy male volunteers were enrolled for the study. Biochemical parameters of both of this group were compared with t-test and p-value was found significant.

Conclusions: Risk factors such as elevations in body mass index, systolic blood pressure, serum LDL cholesterol, triglyceride concentration and cigarette smoking are significantly related to the extent of atherosclerotic lesions.

Keywords: Atherosclerosis, Biochemical parameter, Body mass index, Smoking

INTRODUCTION

Atherosclerosis is characterized by intimal lesions called atheromas or atheromatous or fibro fatty plaques, which protrude into and obstruct vascular lumens and weaken the underlying media. Global in distribution, atherosclerosis over whelming contributes to more mortality-approximately half of all deaths and serious morbidity in the Western world than any other disorder.¹ Golshahi et al, study in Esfahan, central part of Iran in

which they found atheromas in 28.9% of their 204 subjects.²

The incidence of atherosclerosis in coronary arteries is fast increasing worldwide. Coronary Artery Disease (CAD) affects the Indian population at a younger age than in other ethnic groups with more severe and extensive angiographic involvement.³ It is reported that although Kerala has the highest (82.8%) prevalence rate of coronary artery disease in patients above 60 years, states in North West India like Punjab have even higher

prevalence in younger age group.⁴ Epidemiological studies performed in last 50 years have revealed that there is a significant rise in prevalence of coronary artery disease in urban as well as in rural Indian population and CAD has been predicted to assume epidemic proportions in India by the year 2015.^{3,5}

The atherosclerotic plaque, a lumpy thickening of the arterial wall, narrows the passage way and initiates the formation of a blood clot that can ultimately close down a critical artery. Evaluated the associations of lipid levels with both carotid artery thickness and prevalent coronary heart disease and reported that, whereas LDL cholesterol appeared to be the most important lipid factor in carotid artery thickness, triglycerides and high-density lipoprotein (HDL) cholesterol had relatively stronger associations with prevalent atherosclerosis.⁶

Atherosclerosis is an inflammatory disease of large and medium-size arteries. Lesion development involves leukocyte, especially monocyte, adhesion to the vascular endothelium and migration into the intima, where it becomes a macrophage or foam cell.

Experimental evidence shows that in human and animal atherosclerosis, one of the observed changes in the endothelium is an increase in the expression of leukocyte adhesion receptors. The role of these adhesion molecules in mediating monocyte infiltration and promoting the late stages of fibrous plaque lesion development in atherogenesis.⁷

Atherosclerosis is emerging as an important complication of coronary artery disease (CAD) being the major cause of mortality in these patients.⁸ In India, the burden of chronic non-communicable diseases, like atherosclerosis, is on the rise; and increasingly efforts need to be focused on their early detection and treatment. Asian Indians are an ethnically vulnerable race for developing metabolic syndrome and diabetes, both of which are well-known contributors to the pathogenesis of atherosclerotic vascular disease.⁹ Sub-clinical diabetes is an important vascular risk for Asian Indians.¹⁰

Atherosclerosis begins early in life and is the major underlying cause of cardiovascular morbidity and death. Yet, population-based information on age and sex differences in the extent and morphology of atherosclerosis throughout life is scarce.

The objective of the study was to comparative biochemical parameters in different age group of atherosclerosis male patients.

METHODS

The study was conducted in department of Medicine in tertiary care hospital of Rewa, Madhya Pradesh from August 2013 to June 2015. Study was started after its approval from institutional ethics committee of S. S.

Medical College, Rewa through letter no. 34 dated 13 August 2013. It was a prospective type of study and conducted in compliance with Good Clinical Practice (GCP). Patients were enrolled from department of medicine in tertiary care hospital of Rewa, Madhya Pradesh on the basis of inclusion and exclusion criteria and 27 age matched healthy male as control.

Inclusion criteria

- Patients have history of symptoms suggestive of atherosclerosis.
- Male patients between the age of 30-70 years.

Exclusion criteria

- Those patients who do not consent are excluded.
- Patients below 30 years and above 70 years of age.
- Female patients
- Patients having disease like history of psychiatric condition, dementia, epilepsy.

Blood sample collection and separation

Blood samples were collected from the patients and male healthy individual controls under all aseptic condition. 3 ml of venous fasting blood samples were collected from each subject by using disposable syringe. Blood samples taken in plain vial were incubated at 37°C for 45 minutes in winter or 20 minutes in hot climate. After incubation, sample was taken in centrifuge test tube. This sample centrifuged at 3000rpm for 10 to 20 minutes. Supernatant (serum) collected in clean and dry serum test tube for analysis of serum lipid profile.

Clinical data of biochemical parameters was recorded in the structured proforma. Mean and standard deviation were obtained. Comparisons of biochemical parameter in atherosclerosis and normal healthy male groups were performed by the unpaired student's t-test for data using the software SPSS-Version-16.

RESULTS

Study comprised total 57 cases sample. Table 1 show Out of them 30 cases of atherosclerosis in which 13 cases in age group 30-50 year and 17 cases in 51-70 year respectively. 27 cases of sample are healthy male control in which 14 and 13 cases in age group 30-50 and 51-70 year respectively. Results of this table revealed that smoking percentage of atherosclerosis male patients in age group 30-50 and 51-70 year 38.46% and 41.17 % respectively. Smoking percentage in healthy male control in age group 30-50 and 51-70 year were 07.14% and 15.38 % respectively.

Table 2 shows different values of lipid profile, diastolic blood pressure and body mass index between healthy male control and atherosclerosis male patients with age range 30-50 years. Results of this table revealed that

serum cholesterol (294.62±18.12), LDL (164.23±06.03), triglyceride (167.62±5.30), diastolic blood pressure (98.62±2.99) and body mass index (38.62±1.56) were increased extremely significant in atherosclerosis male

patients when compared to healthy male control. Serum HDL (23.77±1.24) value was decreased extremely significant in atherosclerosis male patients when compared to healthy male control.

Table 1: Correlation of smoking in normal healthy controls and atherosclerosis male patients.

Age (years) range	Healthy male (control group)			Atherosclerosis male patients		
	No.	Smoking male	Smoking %	No.	Smoking male	Smoking %
30-50	14	01	7.14	13	05	38.46
51-70	13	02	15.38	17	07	41.17
Total	27	03	11.11	30	12	40

Table 2: Comparison of biochemical parameters between normal male healthy controls and atherosclerosis male patients (age 30-50 years).

Biochemical parameters	Healthy male (control group)		Atherosclerosis male patients		t-test	P-Value
	No.	Mean ±S.D.	No.	Mean ±S.D.		
Cholesterol (mg/dl)		181.36±21.38		293.62±18.12	14.66	p<0.0001
HDL (mg/dl)		45.71±5.64		23.77±1.24	13.72	p<0.0001
LDL (mg/dl)		93.71±25.35		164.23±106.03	9.76	p<0.0001
Triglyceride (mg/dl)	14	91.57±19.44	13	167.62±5.30	13.62	p<0.0001
Blood pressure SBP (mmHg)		163.23±85.02		124.08±1.66	1.66	P=0.1099 (NS)
DBP		84.23±1.92		98.62±2.99	14.60	p<0.0001
Body mass index (Kg/m ²)		25.15±4.67		38.62±1.56	9.86	p<0.0001

P<0.0001 = Extremely significant, NS = Non Significant

Table 3: Comparison of biochemical parameters between normal male healthy controls and atherosclerosis male patients (age: 51-70 years).

Biochemical parameters	Healthy male (control group)		Atherosclerosis male patients		t-test	P-Value
	No.	Mean ±S.D.	No.	Mean ±S.D.		
Cholesterol (mg/dl)		181.54±20.35		300.59±16.68	17.61	p<0.0001
HDL (mg/dl)		52.00±4.98		25.94±1.09	21.02	p<0.0001
LDL (mg/dl)		100.00±19.90		166.47±5.56	13.15	p<0.0001
Triglyceride (mg/dl)	13	92.92±18.13	17	170.63±3.81	16.75	p<0.0001
Blood pressure SBP (mmHg)		125.54±1.66		134.47±31.14	1.02	P=0.3124 (NS)
DBP		83.69±1.60		100.94±1.43	31.03	p<0.0001
Body mass index (Kg/m ²)		25.54±4.35		40.13±1.26	12.81	p<0.0001

P<0.0001 = Extremely significant, NS = Non Significant

Table 4. Comparison of biochemical parameters between the age group of 30-50 years and 51-70 years of atherosclerosis male patients.

Biochemical parameters	Atherosclerosis male patients				t-test	P-Value
	30-50 years		51-70 years			
	No.	Mean ±S.D.	No.	Mean ±S.D.		
Cholesterol (mg/dl)		293.62±18.12		298.63±15.06	0.81	P=0.4230 (NS)
HDL (mg/dl)		23.77±1.24		25.94±1.09	5.53	p<0.0001
LDL (mg/dl)		164.23±6.03		165.94±5.27	0.81	P=0.4233 (NS)
Triglyceride (mg/dl)	13	167.62±5.30	17	170.63±3.81	1.77	p<0.05
Blood pressure SBP (mmHg)		139.92±2.90		142.00±2.53	2.05	p<0.05
DBP		98.62±2.99		100.75±1.24	2.60	p<0.01
Body mass index (Kg/m ²)		38.62±1.56		40.13±1.26	2.89	p<0.01

Note: N C; Number of cases, P<0.05 = Significant, P<0.01 = Highly significant, P<0.0001 = Extremely significant, NS = Non significant

Table 3 shows different values of lipid profile, diastolic blood pressure and body mass index between healthy male control and atherosclerosis male patients with age range 51-70 years. Results of this table revealed that serum cholesterol (300.59 ± 16.68), LDL (166.47 ± 5.56), triglyceride (170.63 ± 03.81), diastolic blood pressure (100.94 ± 1.43) and body mass index (40.13 ± 1.26) were increased extremely significant in atherosclerosis male patients when compared to healthy male control. Serum HDL (25.94 ± 1.09) value was decreased extremely significant in atherosclerosis male patients when compared to healthy male control.

Table 4 revealed that serum HDL (25.94 ± 1.09) value was increased extremely significant in atherosclerosis male patients of age group 51-70 year when compared to 30-50 year of atherosclerosis male patients. Serum triglyceride (170.63 ± 3.81), blood pressure (SBP/DBP; $142.00 \pm 2.53/100.75 \pm 1.24$) and body mass index (40.13 ± 1.26) were increased significantly in atherosclerosis male patients of age group 51-70 year when compared to 30-50 year of atherosclerosis male patients.

DISCUSSION

The earliest evidence of atherosclerosis in the form of lipid streaks or spots was met with in the coronary and the cerebral arteries in the second and fourth decades of 20th century respectively. All the coronary arteries after the fourth decade showed evidence of atherosclerosis, whereas some of the cerebral beds were free from any lesion even in the seventh decade.¹¹ Atherosclerosis is a complicated multi factorial pathological process which affects the large and medium sized arteries resulting in macro vascular disease. Though the end-points of atherosclerosis are well defined, there is no clear explanation for the pathophysiology of atherosclerosis. However, the atherosclerotic process could be sequenced as functional changes and structural changes of the artery. The first to occur would be functional changes in the arteries leading to the loss of elasticity. Structural changes like fatty degeneration and foam cell formation occur later leading to intima medial thickening, plaque formation, finally to clogging of the artery interfering with blood flow. The plaque eventually ruptures with consequent intra-luminal thrombosis which results in the end-points like coronary artery disease, cerebrovascular disease and peripheral vascular disease.^{12,13}

Not only the extent but also the morphology of atherosclerosis is important for the development of clinical vascular disease. Soft and lipid-rich plaques in the coronary arteries seem to be particularly prone to rupture and cause occlusive thrombosis and acute coronary syndromes.¹⁴ In the present study, it was observed that 19 cases smoking (38.84%) were males which are more or less similar to most of the studies done in past.¹⁵⁻¹⁷ Some workers reported that elevated blood

lipid levels are a major determinant of coronary heart disease and atherosclerosis diseases. Therefore, the control of hyperlipidemia may lower cardiovascular disease risk.^{18,19} In our study, we were observed similar hyperlipidemia (Table 2 and 3). Current knowledge on incidence and course of atherosclerosis mainly originates from patient based angiographic and Doppler followup evaluations which for methodological reasons are restricted to severe atherosclerosis.²⁰⁻²³ Observation that specific ante mortem risk factors such as elevations in body-mass index, systolic blood pressure, serum LDL cholesterol, triglyceride concentration and cigarette smoking are significantly related to the extent of atherosclerotic lesions in young people.²⁴ In our study (Table 1) active and passive smoking are considered to be important risk factors for atherosclerotic disease in men. Along with hypertension and hypercholesterolaemia, smoking is a major risk factor for coronary, cerebral and peripheral vascular atherosclerosis. The effect of passive smoking on atherosclerosis is relatively lower than that of active smoking, but it remains an important risk factor.²⁵

Severity of atherosclerotic lesions increases with increased age.²⁶ Sex is another non-modifiable risk factor. Males are much more prone to atherosclerosis and its consequences than are females. Severity of atherosclerosis was more in males.²⁷ It seems that in our locality, extracranial atherosclerosis follows the risk factors associated with coronary atherosclerosis and the low incidence of both may partly be explained by the generally lower serum lipid level in the Chinese population.²⁸ In our study, HDL-cholesterol was decreased in age 30-50^{yr} as compared to age 51-70^{yr} of male atherosclerosis patients (Table 11). The high incidence of intracranial atherosclerosis may reflect the contribution of other factors such as hypertension. The prevalence of hypertension is 20% in the local population over 60 years of age.²⁹ Analysis of risk factors from the Oslo, Norway, study has shown high blood pressure and to a lesser extent serum lipid level to be important risk factors in intracranial atherosclerosis.³⁰

Other authors suggested that extracranial carotid atherosclerosis and coronary atherosclerosis might be more closely related to serum lipid level than to blood pressure whereas atherosclerosis in the large intracranial arteries was related more closely to blood pressure than to serum lipid level.³¹ In our study, increased serum triglyceride and blood pressure were found in age 51-70^{yr} as compared to age 30-50^{yr} of male atherosclerosis patients.

CONCLUSION

The study showed unexpectedly high prevalence of atherosclerosis in Rewa Madhya Pradesh. The incidence of atherosclerosis is more in males with smoking addiction. This study highlights the importance of atherosclerosis risk factors screening from early ages of

fourth to fifth decades with hyperlipidemia. Smoking habit was avoided to lower risk of atherosclerosis. Observation showed that elevations in body-mass index, systolic blood pressure, serum LDL cholesterol concentration, and serum triglyceride concentration and cigarette smoking are significantly related to the extent of atherosclerotic lesions.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee of Shyam Shah Medical College, Rewa (M.P.) India

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