



## **Atherosclerosis- It's Contributing Factors and Management in India**

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### **ABSTRACT**

*Atherosclerosis is an occlusive arterial disease that occurs due to hardening of endothelium. Risk factors include hypertension, smoking, high cholesterol intake, obesity and use of contraceptives in women. Various treatment approaches have been found to eliminate its course duration. In India high mortality rates have been seen due to atherosclerosis. States of Kerala, Punjab and Tamil Nadu have high mortality rates due to atherosclerosis. The objective of this article is to throw light on the risk factors and management of atherosclerosis in present. This article was reviewed through PUBMED, GOOGLE SCHOLAR, and CINAHL.*

**KEY WORDS-** CAD, HDL, LDL, PAD, CVD

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### **INTRODUCTION**

A leading cause of death in developed nations, atherosclerosis is brought on by hyperlipidaemia and lipid oxidation. It is a vascular intima disease that can affect any part of the circulatory system, including the aorta and coronary arteries.

Atherosclerosis is a Greek word, which means thickening of the intimal layer of arteries due to accumulation of fat. The term, atherosclerosis is made up of 2 words, atheros meaning accumulation of fat and sclerosis meaning fibrous layer comprising leukocyte, and connective tissue.

Small fat particles that gets deposited in the layer of artery is first step in the formation of these plaques. Once inside the arteries, the plaques expand due to the growth of adjacent smooth muscle and fibrous tissues, decreasing blood flow. Sclerosis or hardening of the arteries is brought on by fibroblasts producing connective tissue and calcium being deposited in the lesion. Finally, thrombosis and clot formation due to the uneven surface of the arteries cause an abrupt restriction of blood flow. (1)

### **CONTRIBUTING FACTORS OF ATHEROSCLEROSIS-**

Although the precise origins and risk factors of atherosclerosis remain unknown, some qualities, situations, or behaviours may make atherosclerosis more likely to occur. Plaque rupture accounts for between 55 and 65 per cent of coronary thrombi, followed by erosions at 30 to 35 per cent, and calcified nodules at least occasionally (2-7 per cent). Large, mushy, lipid containing necrotic cores along with thin and inflammatory fibrous crown is common features of rupture-prone plaques. Extensive remodelling, big atheroma size (>30 per cent of plaque area), , neovascularization, adventitial inflammation, and "spotty" calcifications are additional signs that are frequently seen. T lymphocytes, macrophages, and monocytes are present in vulnerable plaques. T cells' impact on macrophages increase plaques' susceptibility [7].

Increased cholesterol - Cholesterol, a lipid, is the precursor of corticosteroids, sex hormones, bile acids, and vitamin D.

Hypertension- It is a risk factor for stroke and cardiovascular disease. In most cases, these issues are brought on by excessive diastolic blood pressure. By increasing the hemodynamic pressure on the endothelium, hypertension harms it. It may also make the artery walls more permeable to lipoproteins. In such patients, increased angiotensin II concentration promotes SMC development, heightens inflammation, and ultimately quickens LDL oxidation. (1)

**Obesity:** People who are obese frequently have a proinflammatory condition that puts them at risk for developing acute coronary syndromes. Elevated serum CRP values, which are indicative of elevated cytokine levels, describe this condition. Adipose tissue produces the hormone leptin, which controls metabolism, appetite, and body weight. It can affect artery tone, and a rise in leptin levels, as in obesity, may be linked to stiffening of the arteries, deteriorated vascular function, and cardiovascular events.

**Smoking** - Smoking significantly reduces the endothelium-dependent vasomotor response and is a significant risk factor for the development of C.A.D. This is also true for passive smoking or environmental tobacco smoke, which results in endothelial dysfunction, presumably through increased oxidative stress.(2)

**Use of hormonal contraceptives-** Depending on the progestin type and mode of administration, using hormonal contraceptives has been demonstrated to decrease macro vascular endothelial function. The use of androgenic or oestrogen-based contraceptives may also cause dyslipidaemia, raising the long-term risk of CVD. According to a case-control research conducted in the Netherlands on women between the ages of 18 and 49, using hormonal contraceptives is related with an elevated risk of PAD (adjusted OR 3.8, 95 percent CI 2.4-5.9) (6)

#### **MANAGEMENT**

Currently, the management of CAD relies on a mix of medication, risk factor reduction, and revascularization techniques including coronary artery bypass surgery (CABS) or percutaneous trans luminal coronary angiography (PTCA). In-stent restenosis (ISR), a post-procedural complication of PCI, which involves angioplasty or stenting, affects 30–60% of patients, necessitating a 5–10 fold greater requirement for re-intervention than in patients receiving surgical revascularization (5)

#### **Anti-HMG-CoA reductase agents (statins)**

By increasing the expression of Low density lipoprotein receptors (LDL-R) on the surface of liver cells, 3-hydroxy-3-methylglutaryl-coenzyme A (HMG-CoA) reductase inhibitors, also known as "statins," increase the uptake of LDL-C from the blood and decrease the concentration of LDL-C and other apo B-containing lipoproteins, including TG-rich particles. (8)

#### **Inhibitors of cholesterol absorption**

Ezetimibe lowers LDL-C via preventing cholesterol absorption. In clinical investigations, ezetimibe lowered LDL-C levels when used alone or in combination with a statin by 15–22% and by 15-20% when coupled with a statin . No regular serious side effects have been noted. (8)

#### **ATHEROSCLEROSIS IN INDIA**

The prevalence of CAD and CVD is rising in India. Since 1990, the burden of disease and the overall number of fatalities in India attributable to CVD has nearly doubled. An estimated 2.8 million Indians passed away from CVD in 2016. In India, CVD caused 28 percent of all fatalities in 2016 compared to 15 per cent in 1990. States of Kerala, Punjab, and Tamil Nadu have the highest rates of CAD, hyperlipidaemia, and high blood pressure, India has a wide range of CVD burdens. In India, including the poorest states and rural areas, CVD has now surpassed all other causes of death as the number one killer. Between 1970 and 2013, the occurrence of CAD rises four-fold in rural India and seven-fold in urban India. Current prevalence of 14% in the urban and 7% in the rural populations. In 2016, the cases of CAD also increased to 24 million. It was seen that CAD was one of the leading cause of deaths (18% of all deaths) while stroke was the 5<sup>th</sup> leading cause (7% of total deaths) in India in 2016.

Indians are especially prone to early CAD that results in AMI at a younger age. In an Indian study of 877 patients with angiographically confirmed CAD, the mean age was 48 years, with majority of the patients being over 55 and one-third being under 45years. Despite their youth, 79 per cent of patients had multivessel disease, which includes left main disease, double-vessel disease, and three-vessel disease. Additionally, most arteries had several sites of blockage from widespread coronary atherosclerosis. The median age of CABG operation was 60 years old in a different sizable Indian study, while 6% of CABG surgeries were done on patients under the age of 45. Enas and Mehta first used the term "malignant CAD" in 1995 to describe the distinct characteristics of CAD in young Indians. Malignant CAD in Indians is characterised by three characteristics: (1) great prematurity; (2) exceptional severity; and (3) high mortality at a young age. The presence of low levels or absence of known risk factors is an important aspect that might be regarded as the fourth characteristic of malignant CAD.

Indians have a surprisingly greater frequency of CAD in younger adults (45 years for males and 50 years for females), accounting for 10% to 15% of total CAD, compared to the 2–5% seen in Western societies. 820 (10%) of the 8268 patients with ACS in a large single-centre study in India were under the age of 40. (with a mean age of 35years). Surprisingly, 611 people (or 75% of those under 40) got STEMI.

Although the modifiable risk factors (dyslipidaemia, high blood pressure, smoking, and diabetes) are unquestionably significant CAD risk factors, they may not entirely account for malignant CAD in young Indians, suggesting the possibility of other risk variables. A quarter to a third of CAD patients from India

has total cholesterol levels below 150 mg/dl and/or LDL levels below 100 mg/dl. Indians with and without CAD have cholesterol and LDL-C values that are 20 to 30 mg/dl less than those of their Western counterparts. Indians of all ages have a 3–4 times greater prevalence of diabetes than white people in US and UK. Diabetes is possible cause of Coronary artery disease in adults, young Indians have a low prevalence of the disease, between 5 and 15 per cent.

Surprisingly, metabolic disorders and metabolic syndrome are more common among Indians at lower BMIs. However, in prospective studies conducted in Trinidad and the UK, high rates of insulin resistance, and diabetes were unable to account for the increased prevalence of CAD among Indians.

We need extensive screening for primary prevention since cardiovascular disease is so prevalent.

The following factors can be taken into account when assessing cardiovascular risk. There are elements that increase risk for the Patient-clinician risk evaluation, including:

**Early Coronary Artery Disease with in Family (males 55 years; females 65 years)**

**LDL-C** ranges from 160 to 189 mg/dL (4.1 to 4.8 mmol/L);

**Non-HDL-C** ranges from 190 to 219 mg/dL (4.9 to 5.6 mmol/L) in primary hypercholesterolemia.

**Greater waist measurement (as measured using ethnically suitable cut points)**

The metabolic syndrome is associated with a **high triglycerides** (>150 mg/dL, no fasting), increased blood pressure, high glucose, and low High - density lipoprotein (40 mg/dL in male population, 50 mg/dL in women); three of these variables must be observed in addition to making the diagnosis.

Systemic inflammation diseases such HIV/AIDS, lupus, osteoarthritis, and dermatitis

History of eclampsia and early menopause (before the age of 40), both of which increase the likelihood of Atherosclerosis later in life

High-risk race or ethnicity community (e.g. South Asian ancestry)

Oxidized cholesterol: associated with a greater risk of cardiovascular disease **(3)**

## TREATMENT STRATEGIES IN INDIA

India's healthcare systems are facing a significant challenge as a result of the CVD epidemic there. However, putting Western countries' understanding of CVD prevention techniques into practise offers a chance to stop the epidemic in India. Advances in risk variables that effect the population as a whole, such as cardiovascular disease, lipid, and nicotine usage, can be considered accountable for more over half of the mortality decrease. Modifications in prevalent risk factors and medical interventions at the population level led to a reduction in cardiovascular risk in these regions. However, modelling studies imply that taxing tobacco, palm oil, and sugar-sweetened beverages in India could result in significant gains. According to estimates, a 20% tax on sugar-sweetened beverages would lower the incidence of obesity by 3% and type 2 diabetes mellitus by 2%. 106 Similar to this, a 20% tax on sales of palm oil is predicted to prevent 363,000 fatalities over ten-year period from myocardial infarctions (MIs) and strokes (a 1.3 percent absolute reduction in CVD deaths).

By moderately reducing salt intake among middle-aged Indians by 3 g/d over a 30-year period, it is possible to prevent over 400,000 cardiovascular disease events (Myocardial Infarction and strokes) and 81,000 deaths. 108 Last but not least, smoking laws and taxes over tobacco may prevent 25% of cardiovascular disease events in India. In this context, the policies framed by the India to impose a new 5 per cent tax on sugar-sweetened beverages and increase the excise duty on tobacco goods in 2014 to a maximum of 72% are appreciated (Union budget 2014-2015: <http://www.indiabudget.nic.in/>). The indirect tax on tobacco related products has risen from 11% to 72% for cigars, from 12% to 16% for flavoured tobacco, from 50% to 55% for raw tobacco, and from 60% to 70% for chewing tobacco. Nevertheless, because their production is categorised as a small-scale industry, bidis, which are frequently utilised by Indians, are not properly taxed. Indian government have created a national framework on surveillance to meet the WHO targets after historic United Nations high-level meeting on NCDs and the World Health Assembly's endorsement of a global action plan<sup>110</sup> for the prevention and control of NCDs [4]

## CONCLUSION

The development of atherosclerosis is a multifactorial, multipath way disease that is influenced by both genetic and environmental factors. Clarifying the function of the emerging risk variables will require additional research in order to improve cardiovascular risk assessment in an individual. A novel contributing variable should ideally contribute to risk assessment in addition to the traditional risk factors, have a conventional assay with formal structured boundary limits to help interpret reports, and be supported by a therapeutic intervention that lowers the risk of cardiovascular events. New risk factors should ideally be curable. However, future treatments might be obvious as a result of their clarification.

For some patients, such as those who have a hereditary background of early-onset CHD or a moderate multiyear coronary risk, measurement of conditional risk variables should be taken into consideration. The

generated data may encourage the patient to change their lifestyle and assist the doctor in adjusting the threshold for treating traditional risk factors. Each conditional risk factor is treatable with medication, but there is still no proof that doing so can reduce cardiovascular incidents.

#### REFERENCES

1. Madihi Y, Merrikhi A, Setorki M, Baradaran A, Ghobadi S, Shahinfard N et al. (2013). Bioactive components and the effect of hydroalcoholic extract of *Vaccinium myrtillus* on postprandial atherosclerosis risk factors in rabbits. *Pakistan Journal of Medical Sciences.*;29(1(Suppl)).100-108
2. Altman, R. (2003). Risk factors in coronary atherosclerosis athero-inflammation: the meeting point. *Thrombosis J.* Available from: <https://thrombosisjournal.biomedcentral.com/articles/10.1186/1477-9560-1-4>
3. CAD burden on Indians [Internet]. Narayana Health Care. 2022 [cited 23 July 2022]. Available from: <https://www.narayanahealth.org/blog/cad-burden-on-indians/#:~:text=The%20prevalence%20of%20CAD%20has,increased%20to%2024%20million%20in2016.>
4. Prabhakaran D, Jeemon P, Roy A. (2016). Cardiovascular Diseases in India. *Circulation.* 133(16):1605-1620.
5. Sallustio F, Rotondo F, Di Legge S, Stanzione P. Cilostazol in the Management of Atherosclerosis. *Current Vascular Pharmacology.* 2010;8(3):363-372.
6. Pouncey A, Woodward M. (2022). Sex-Specific Differences in Cardiovascular Risk, Risk Factors and Risk Management in the Peripheral Arterial Disease Population. *Diagnostics.*;12(4):808.
7. Bergheanu S, Bodde M, Jukema J. (2017). Pathophysiology and treatment of atherosclerosis. *Netherlands Heart Journal.* 25(4):231-242.

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