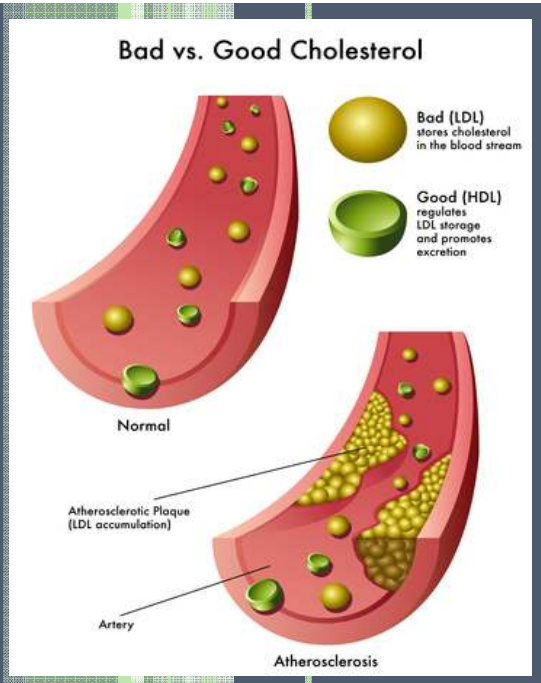


# CHOLESTEROL AND ITS PHYSIOLOGICAL IMPORTANCE

By

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# INTRODUCTION

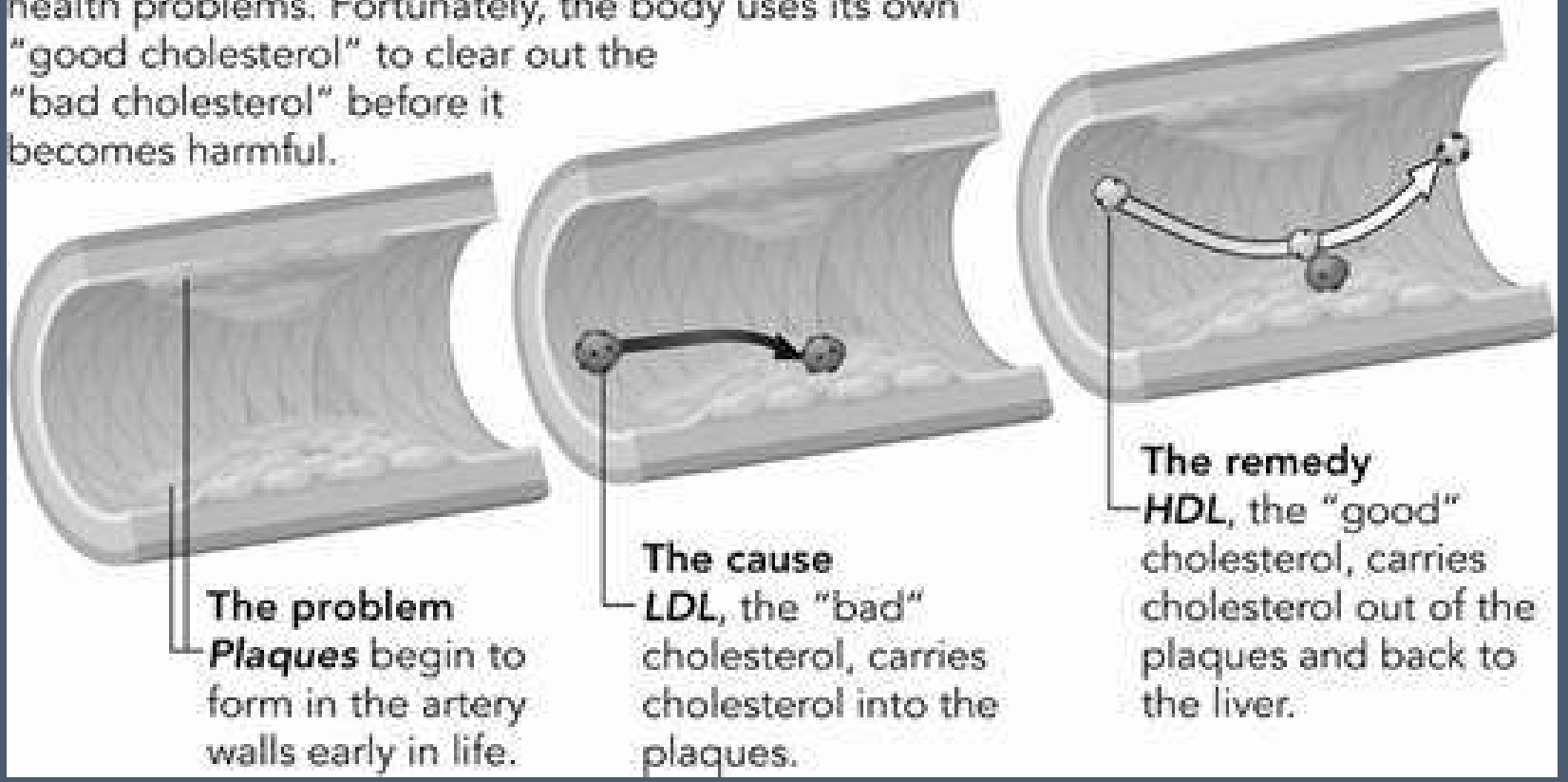
- Cholesterol is a waxy, fat-like substance that your liver produces naturally.
- It's vital for the formation of cell membranes, vitamin D, and certain hormones.
- Cholesterol doesn't dissolve in water and therefore can't travel through the body itself.
- Particles known as lipoproteins help transport cholesterol through the bloodstream.

## INTRODUCTION CONT . . . . .

- There are two major forms of lipoproteins.
- *Low-density lipoproteins (LDL)*,
- also known as "bad cholesterol," can build up in the arteries and lead to serious health problems, such as a heart attack or stroke.
- *High-density lipoproteins (HDL)*,
- sometimes called "good cholesterol," help return the LDL cholesterol to the liver for elimination.

## HDL TO THE RESCUE

High cholesterol levels result in atherosclerosis, a narrowing or hardening of the arteries that can cause heart disease, stroke, and other important health problems. Fortunately, the body uses its own "good cholesterol" to clear out the "bad cholesterol" before it becomes harmful.



**The problem**
***Plaques*** begin to form in the artery walls early in life.

**The cause**
***LDL***, the "bad" cholesterol, carries cholesterol into the plaques.

**The remedy**
***HDL***, the "good" cholesterol, carries cholesterol out of the plaques and back to the liver.

# Reasons for high Cholesterol

- The foods you eat. Eating too much saturated fat, trans fat, and cholesterol can raise your cholesterol.
- Being overweight. This may lower HDL ("good") cholesterol.
- Being inactive. Not exercising may lower HDL ("good") cholesterol.
- Age. Cholesterol starts to rise after age 20.
- Family history. If family members have or had high cholesterol, you may also have it.

# Reasons for high Cholesterol

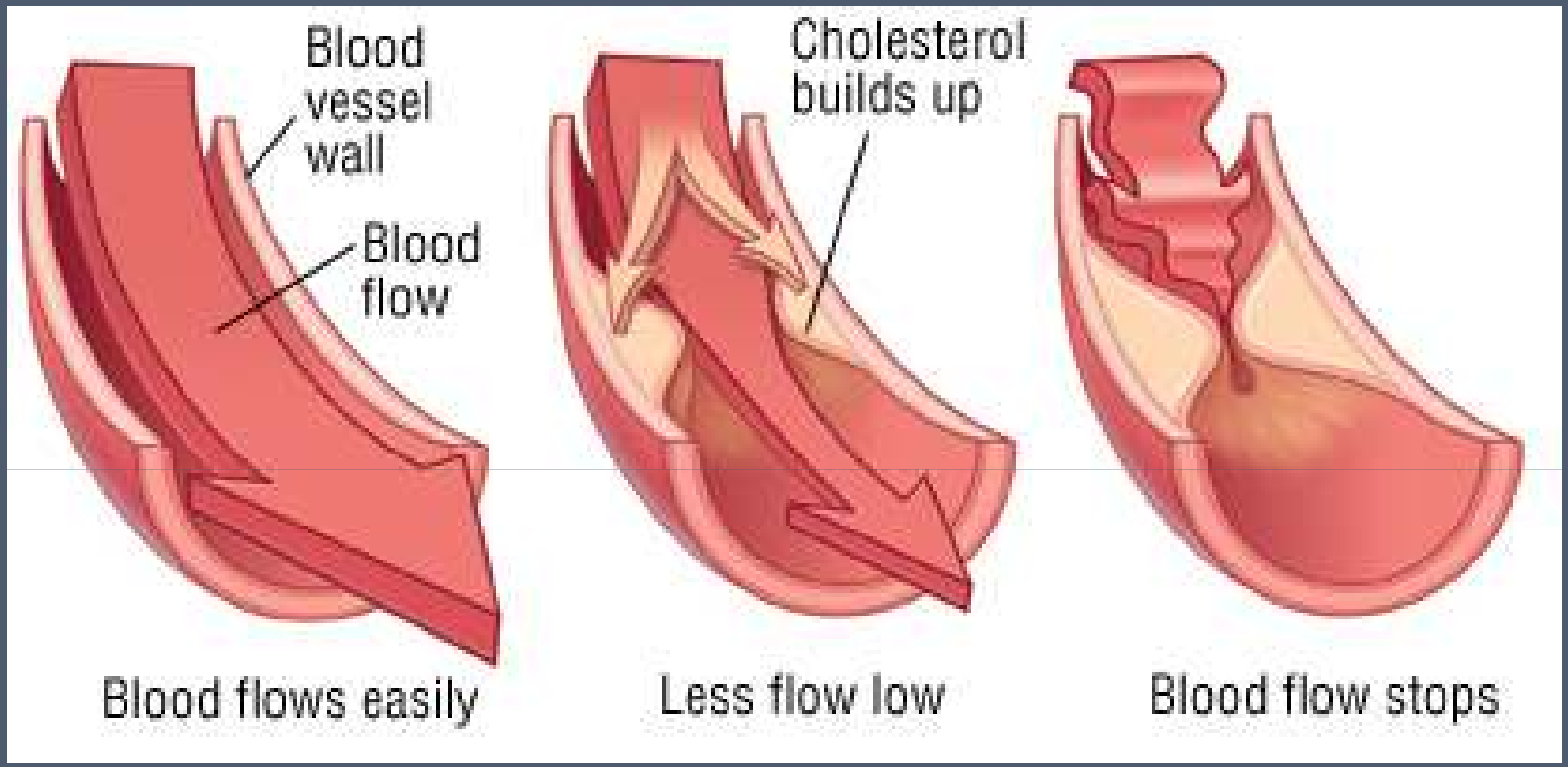
- *Primary Reasons*
  - eating a diet high in saturated fat
  - not being physically active
  - being overweight or obese
  - smoking
- *Secondary Reasons*
  - type 2 diabetes
  - underactive thyroid gland (hypothyroid)
  - kidney problems
  - liver problems
  - alcohol intake

# Cholesterol inheritance

- High cholesterol can be inherited
- Inherited conditions that cause high cholesterol:
  - Familial* Hypercholesterolaemia (FH)
  - Familial* Combined Hyperlipidaemia (FCH)
  - Type 3 Hyperlipidaemia
  - Polygenic Hypercholesterolaemia
  - Lysosomal Acid Lipase Deficiency (LALD)

# High Cholesterol condition

- Eating too many foods that contain excessive amounts fat increase the level of LDL cholesterol in your blood.
- This is a condition called high cholesterol, also known as hypercholesterolemia.
- If levels of LDL cholesterol are too high or levels of HDL cholesterol are too low, fatty deposits build up in your blood vessels.
- Eventually, these deposits make it difficult for enough blood to flow through your arteries, causing problems throughout your body, particularly your heart and brain.


Blood vessel wall
Blood flow
Cholesterol builds up
Blood flows easily
Less flow low
Blood flow stops

# DISEASE RELATED WITH CHOLESTEROL

- *Stroke*
- The buildup of plaque caused by having high cholesterol can put you at serious risk of having an event in which the blood supply to an important part of your brain is suddenly cut off.
- A stroke occurs when the blood supply to part of your brain is cut off or reduced.

- *Heart Attack*
- The arteries that supply the heart with blood can slowly narrow due to the buildup of plaque.
- When this happens, a blood clot forms around the plaque and can block blood flow to the heart muscle, depriving it of oxygen and nutrients
- the heart becomes damaged or part of the heart begins to die due to the lack of oxygen, it's called a heart attack.

- *Peripheral Arterial Disease*
- Peripheral artery disease (PAD) can occur when plaque builds up in the walls of the arteries, blocking the blood flow in the arteries that supply blood to the kidneys, arms, stomach, legs, and feet.

# Symptoms of High Cholesterol

Chest-pain

Shortness of breath


Feeling sickness

Fatigue

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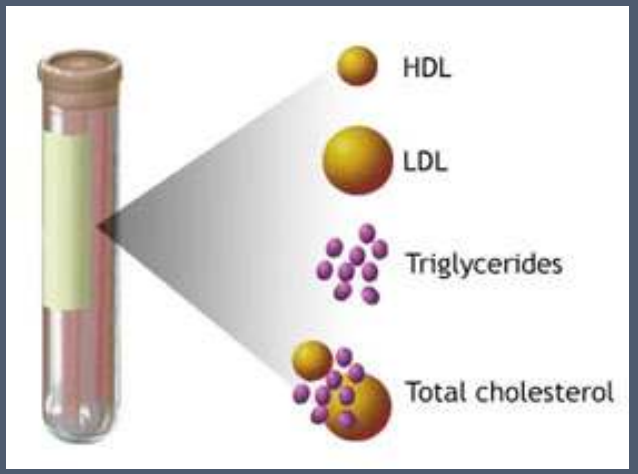
# How Can Cholesterol Levels Be Monitored?




| | HDL<br>Good Cholesterol | LDL<br>Bad Cholesterol | Total<br>Cholesterol |
|---|---|---|---|
| High Risk | Below 40 | Above 160 | Above 240 |
| Intermediate Risk | 41 - 59 | 130 - 159 | 200 - 239 |
| ✓ Desirable | Above 60 | Below 129 | Below 200 |
| unit | mg/dl | mg/dl | mg/dl |

# Reduce Cholesterol

- *Eat heart-healthy foods*
- *Eliminate trans fats*
- *Eat foods rich in omega-3 fatty acids*
- Omega-3 fatty acids don't affect LDL cholesterol. They have other heart benefits, such as helping to increase high-density lipoprotein (HDL, or "good"),
- Walnuts, almonds.

# Reduce Cholesterol . . . .

- *Increase soluble fiber*
- There are two types of fiber — soluble and insoluble. Both have heart-health benefits, but soluble fiber also helps lower your LDL levels. You can add soluble fiber to your diet by eating oats and oat bran, fruits, beans, lentils, and vegetables.

# PHYSICAL WORK TO LOW CHOLESTEROL

- *Exercise*
- *Walking*
- *Running*
- *Swimming*

- CHANGING THE HABITS
- *Quit smoking*
- *Lose weight*


1 REDUCE BAD FATS
• Cut fat off meat
• Limit cream & butter intake
• Make pastries & takeaways an occasional treat!
2 EAT MORE GOOD FATS
• Choose nuts, like almonds
• Eat fish, like salmon & tuna
• Use heart healthy oils & spreads eg. olive or sunflower oil
milk
3 CHOOSE PLANT STEROLS
• Plant sterols are proven to lower cholesterol absorption
• Look for margarine spread or milk with plant sterols
4 EAT MORE FIBRE
• Choose wholegrain foods
• Eat more legumes, like beans
• Aim for 2 serves of fruit & 5 vegetables each day
5 LEAD A HEALTHY LIFESTYLE
• Be more active
• Take time to relax
• Maintain a healthy weight
• Give up smoking

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PLOS ONE

# Prevalence of Dyslipidemia in Urban and Rural India: The ICMR–INDIAB Study

**Shashank R. Joshi[1], Ranjit Mohan Anjana[2], Mohan Deepa[2], Rajendra Pradeepa[2], Anil Bhansali[3], Vinay K. Dhandania[4], Prashant P. Joshi[5], Ranjit Unnikrishnan[2], Elangovan Nirmal[2], Radhakrishnan Subashini[2], Sri Venkata Madhu[6], Paturi Vishnupriya Rao[7], Ashok Kumar Das[8], Tanvir Kaur[9], Deepak Kumar Shukla[9], Viswanathan Mohan[2]* and for the ICMR– INDIAB Collaborative Study Group***

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**Abstract**

*Aim:* To study the pattern and prevalence of dyslipidemia in a large representative sample of four selected regions in India.

## Abstract

*Aim:* To study the pattern and prevalence of dyslipidemia in a large representative sample of four selected regions in India.

*Methods:* Phase I of the Indian Council of Medical Research–India Diabetes (ICMR-INDIAB) study was conducted in a representative population of three states of India [Tamil Nadu, Maharashtra and Jharkhand] and one Union Territory [Chandigarh], and covered a population of 213 million people using stratified multistage sampling design to recruit individuals ≥20 years of age. All the study subjects (n = 16,607) underwent anthropometric measurements and oral glucose tolerance tests were done using capillary blood (except in self-reported diabetes). In addition, in every 5th subject (n = 2042), a fasting venous sample was collected and assayed for lipids. Dyslipidemia was diagnosed using National Cholesterol Education Programme (NCEP) guidelines.

*Results:* Of the subjects studied, 13.9% had hypercholesterolemia, 29.5% had hypertriglyceridemia, 72.3% had low HDL-C, 11.8% had high LDL-C levels and 79% had abnormalities in one of the lipid parameters. Regional disparity exists with the highest rates of hypercholesterolemia observed in Tamilnadu (18.3%), highest rates of hypertriglyceridemia in Chandigarh (38.6%), highest rates of low HDL-C in Jharkhand (76.8%) and highest rates of high LDL-C in Tamilnadu (15.8%). Except for low HDL-C and in the state of Maharashtra, in all other states, urban residents had the highest prevalence of lipid abnormalities compared to rural residents. Low HDL-C was the most common lipid abnormality (72.3%) in all the four regions studied; in 44.9% of subjects, it was present as an isolated abnormality. Common significant risk factors for dyslipidemia included obesity, diabetes, and dysglycemia.

*Conclusion:* The prevalence of dyslipidemia is very high in India, which calls for urgent lifestyle intervention strategies to prevent and manage this important cardiovascular risk factor.

Thankyou