Air Pollution Causes Dementia

Mains: *GS III – Conservation, Environment Pollution & degradation, Environment impact assessment*

Why in News?

Recently, Cambridge University researchers have found that long-term exposure to air pollution is linked to an increased risk of developing dementia.

What is Dementia?

- **Dementia** – It is a term for several diseases that affect memory, thinking and the ability to perform daily activities.
- **Vulnerable** – It mainly affects older people.
- **Symptoms** – Forgetting recent events and having difficult to recalling familiar persons, names.
- **Conversation** – Difficult to communicate with others.
- **Decision making** – Struggling to make quick decision.
- **Spread** – Around 57 million people had dementia worldwide in 2021, with the number expected to increase to at least 150 million by 2050.
- **Vulnerable –** It mainly *affects older people*.
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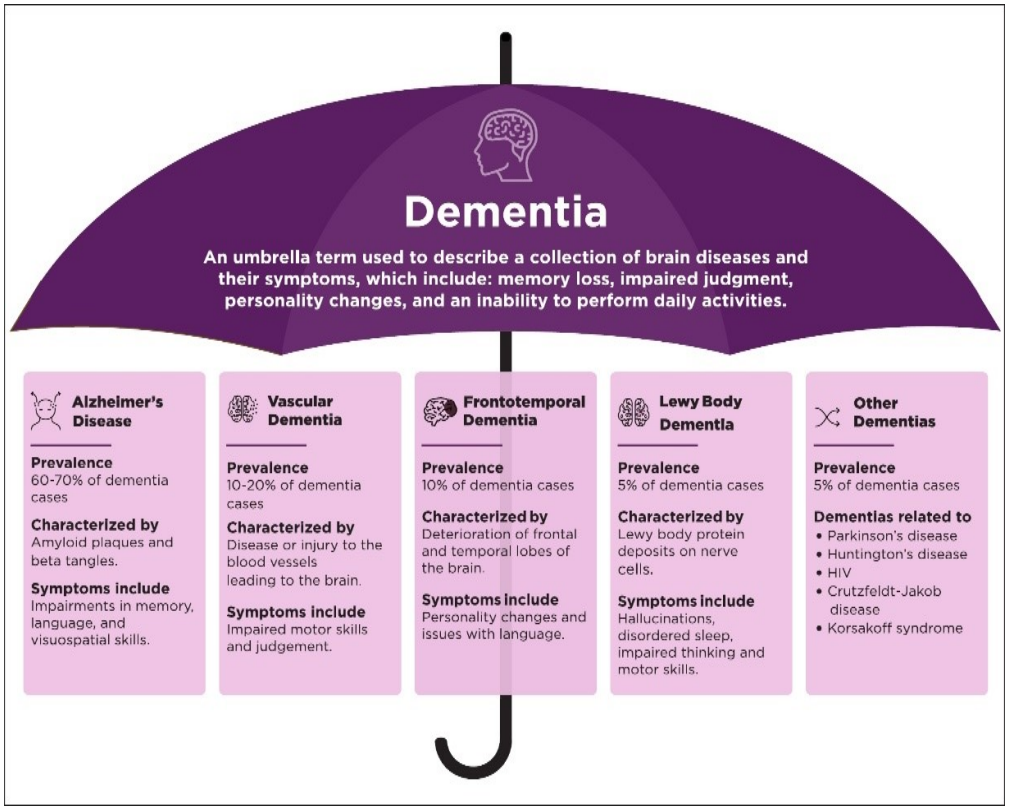

Which air pollutants are related to dementia?

- **Air pollutants** – They are substances present in the air at higher-than-normal levels that may harm living organisms, materials, or the environment.
- They can take the form of solid particles, liquid droplets or gases, and come from both natural and human-made sources.

Primary pollutants	• They directly cause air pollution. • Ex: Carbon monoxide (CO), CO_2, Nitrogen dioxide, Sulphur oxides (SO_2), volatile organic compounds & suspended particles.
Secondary pollutants	• They are formed due to mixing and reacting with primary pollutants. • Ex: Smog, Ground level Ozone, Acid rains.

- **PM2.5 (Fine Particulate Matter) –** PM2.5 is extremely fine particulate matter with a diameter of 2.5 micrometers or less.
- They are predominantly produced by vehicle emissions and thermal power plants.
    - **Risks -** Each 10 µg/m³ increase in long-term exposure to PM2.5 may raise the risk of dementia by 17%.
- **Nitrogen dioxide (NO2) -** Produced primarily due to the burning of fossil fuels by vehicles, thermal power plants, and various industrial processes.
    - **Risks -** For Every 10 µg/m³ of long-term exposure to nitrogen dioxide, the relative risk of dementia increased by 3%.
- **Soot or Black Carbon –** Origin from vehicle exhaust emissions and burning wood.
    - **Risks -** 13% increase in dementia risk per 1 µg/m³ of long-term exposure

How air pollutants increase risks of dementia?

- **Neural damage –** It causes *inflammation in the brain* which leads to neural damage.
- **Oxidative stress** – It results in an *imbalance between reactive oxygen species (ROS) and the body's defence* systems.
- **Cell damage** – Excessive ROS can harm brain cells, contributing to the development of neurodegenerative conditions like dementia.
- **Direct Brain damage** – Air pollutants may directly enter the brain, bypass protective barriers and initiating harmful processes.
- **Indirect effects** – Air pollution can also affect brain health through systemic inflammation and pathways shared with heart and lung diseases.

What lies ahead?

- Individual actions and policy changes may reduce exposure to air pollutants.
- An interdisciplinary approach can support better prevention of dementia.
- Urban planning, transport policy, and environmental regulation can play a key role in promoting public health and preventing dementia.

Reference

The Indian Express | Risk of Dementia