Water Causing Cancer in Bihar's Gangetic Plains

Why in News?

- Recently, a study by scientists from **Mahavir Cancer Sansthan, Patna** revealed that **Manganese (Mn)** contamination of water is causing cancer in the **Gangetic plains** **of Bihar.**

Key Points

- **Rise in Cancer Cases in Bihar**
  - Significant **increase in cancer cases in Bihar** over the last few decades.
  - Multiple contributors to cancer, with **manganese toxicity** highlighted as a trace element influencing **carcinogenesis.**
- **Study Findings:**
  - **Sample Size:** Blood samples from 1,146 cancer patients across **Patna, Vaishali, East Champaran, Muzaffarpur, Siwan, and Saran.**
  - **Gender Distribution:** 67% females, 33% males, aged 2-92 years.
  - **Cancer Types:**
    - **Breast Cancer**: 33.25%
    - Hepatobiliary and Gastrointestinal Cancer: 26.96%
    - **Cervical Cancer**: 5.58%
    - Other Cancers (Oral, Nasal, etc.): 34.78%
  - **Cancer Classification:**
    - Carcinoma: 84.8%
    - **Leukemia**: 9.86%
    - **Lymphoma**: 3%
    - **Sarcoma:** 2.27%
  - **Observation:**
    - **Blood samples from cancer patients** revealed **Mn contamination**, with **levels reaching up to 6,022 µg/L** in severe cases.
    - **Elevated Mn levels in household hand pump** water showed a strong correlation with Mn in patients' blood.
- **Manganese in Hand Pump Water:**
  - 84.8% of samples were within **Bureau of Indian standards (BIS)** mandated limits (100 µg/L).
  - 15.2% of samples exceeded permissible levels, with some above 400 µg/L.
- **Geospatial Analysis:**
  - **High Mn levels** found **in the Middle Gangetic Plain and southwestern-northeastern Bihar.**
  - **Geo-mapping** highlights correlation between Mn concentrations in water and cancer incidence.
- **Toxicity of Manganese:**
  - Manganese is critical for body **homeostasis** but toxic in excess.
  - **Sources of Exposure** can be from sedimentary or igneous rock deposits, Industrial pollution, etc.
  - **First Case in India was documented in 1957** among **miners in Maharashtra**, movement.
  - Other Affected Areas reported in **West Bengal, Karnataka**, and globally in countries

like **Nigeria, Bangladesh, and China.**

Heavy Metal Pollution

- **Heavy Metals:**
  - **Heavy metals** may be defined as elements with an **atomic number larger than 20** and an **atomic density greater than 5 g cm-3** that must possess metal-like characteristics. **Example: arsenic, cadmium, chromium, copper, lead, manganese, mercury, nickel, uranium etc.**
- **Heavy Metal Pollution:**
  - Heavy metal pollution has been caused in our **rivers, soils, and environment** as a result of rapidly growing **agriculture and metal industries**, **improper waste management, heavy use of fertilizers, and pesticides**.
  - **Agricultural and industrial operations, landfilling, mining, and transportation** are the primary sources of heavy metals in **groundwater.**
  - Through the **agricultural water runoff heavy metals** reach upto river.
  - **Discharge of wastewater** from industries (like the tannery industry which is a big source of chromium heavy metals) directly into **river bodies** intensified the severity of the **heavy metal pollution.**
  - Heavy metals have the property of long persistent in plants, animals and the environment.with symptoms including weakness, emotional instability, and difficulty with