CEREBO

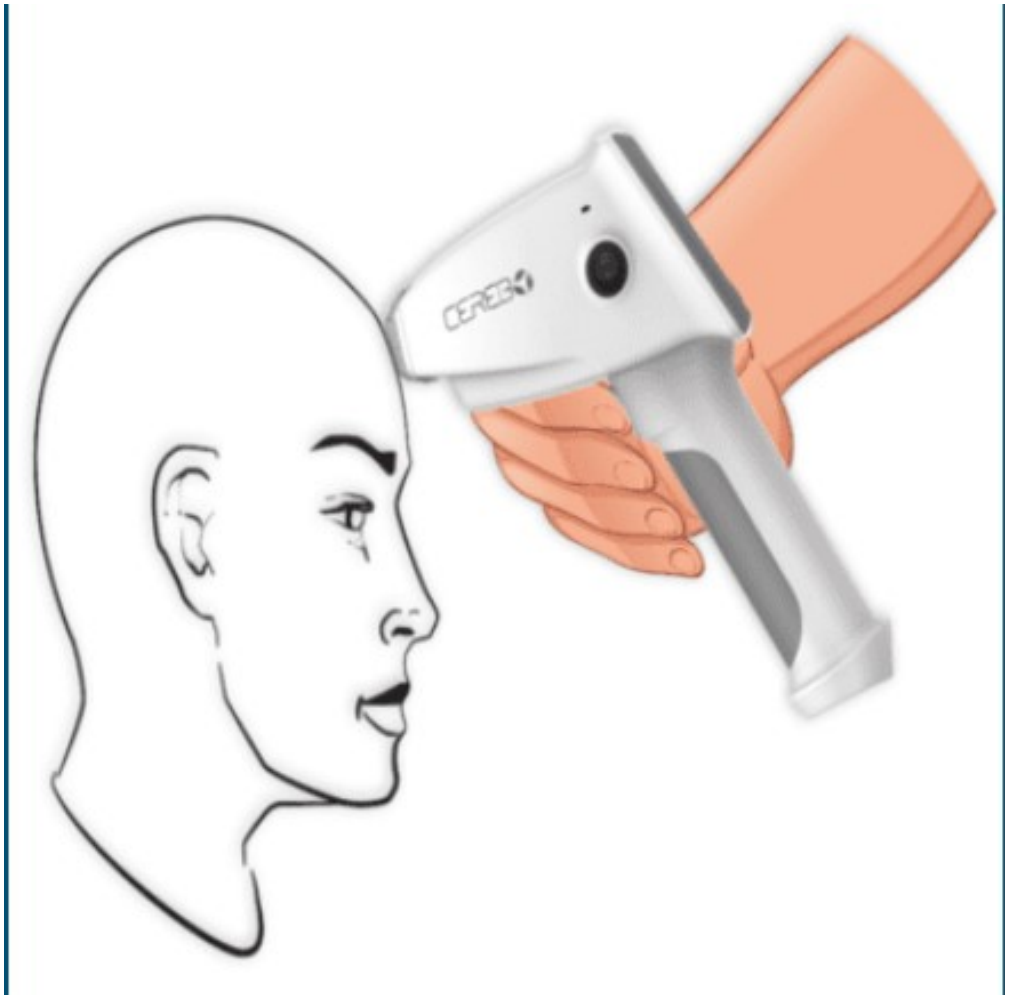
Mains: *GS III – Achievements of Indians in science & technology; indigenization of technology and developing new technology.*

Why in News?

Recently, a device called CEREBO was developed to diagnose Traumatic brain injuries (TBIs).

What is CEREBO?

- **CEREBO** – It is a novel hand-held, portable non-invasive brain injury diagnostic tool.
- **Developed by** – The Indian Council of Medical Research (ICMR), the Medical Device & Diagnostics Mission Secretariat (MDMS), AIIMS Bhopal, NIMHANS Bengaluru, and Bioscan Research.

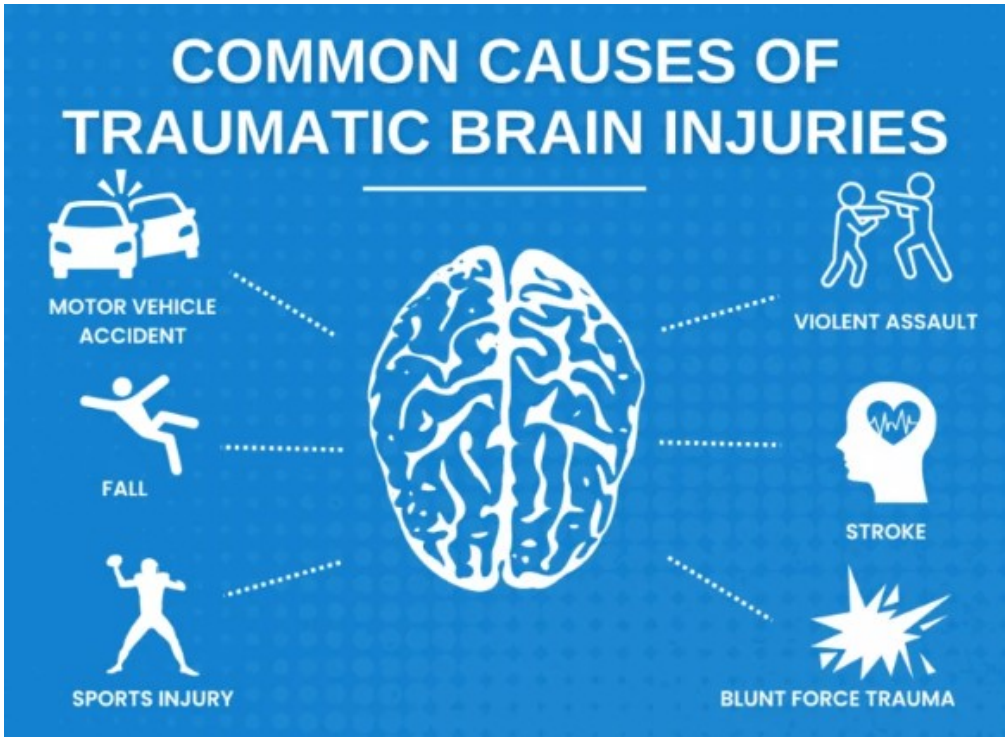


- **Used for** – The device is to be used for Traumatic Brain Injuries (TBIs) and can detect intracranial bleeding and edema within a minute.
- **Accessibility** – It is safe for infants and pregnant women, and can be used by paramedic staff as well as unskilled personnel.

What are Traumatic Brain Injuries (TBI)?

- **TBI** – It is a condition caused by a sudden trauma or injury to the head, which disrupts normal brain function.
- This injury can range from mild (concussion) to severe, often resulting in long-term physical, cognitive, emotional, and behavioural impairments.
- The severity of TBI depends on factors such as the force of impact, the location of the injury, and the individual's overall health.

- **Causes**



- **Symptoms**

Traumatic Brain Injury (TBI)

Symptoms of moderate or severe TBI may change over time.

Some common mild TBI symptoms:

Nausea and vomiting.

Dizziness or balance issues.

Headaches.

Confusion.

Sleeping less or more than usual.

Anxiety.

Some common moderate or severe TBI symptoms:

Losing consciousness.

Hearing or vision issues.

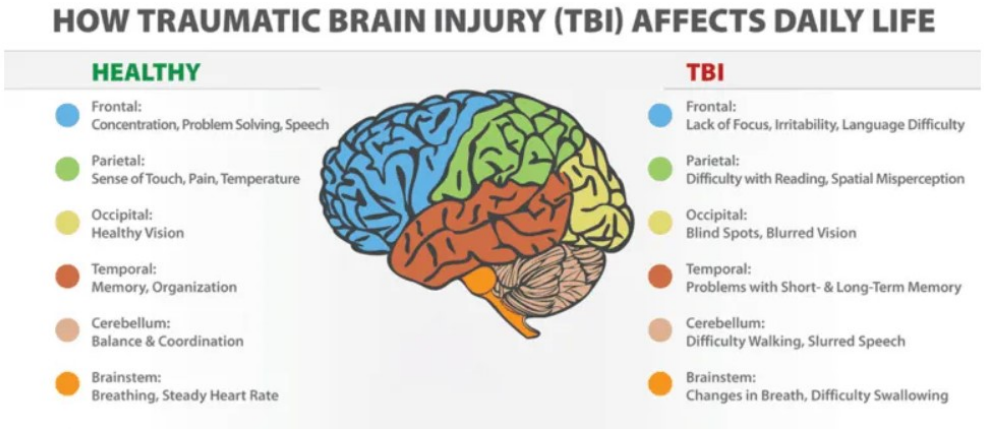
Aggressiveness.

Trouble communicating.

Changes in sensory perception.

What are the effects of TBIs?

- **Public health challenge** – TBIs are a significant public health challenge, particularly in emergency settings, rural areas, and underserved populations.
- **Increasing cases in developing countries** – According to an article titled, 'Epidemiology of traumatic brain injuries, TBIs are a leading cause of morbidity, mortality, disability and socio-economic losses in India and other developing countries.
    - ***For example**, it is estimated that nearly 1.5 to 2 million persons are injured and one million succumb to death every year in India.*



- **Leading causes** – Road traffic injuries are the leading cause (60%) of TBIs followed by falls (20%-25%) and violence (10%).
- It is possible for a TBI to go undiagnosed initially, especially if symptoms are mild or if there are no visible signs of injury.
- **Severe cases** – A TBI can cause permanent brain damage in some cases, particularly if the injury is severe or if there are complications such as bleeding or swelling in the brain.
- **Mild cases** – Patients with mild TBIs (concussions) may only require monitoring and observation to ensure symptoms do not worsen.
- Close monitoring of neurological status, vital signs, and cognitive function is important, especially in the first 24 to 48 hours after injury,'' it adds.
- **Long-term consequences** – This include cognitive impairments (such as memory problems), emotional and behavioural changes (such as depression, anxiety), physical disabilities, and increased risk of neurodegenerative diseases later in life, say experts.

Why is this device important?

- **Ineffective traditional tools** – Traditional diagnostic methods, such as the Glasgow Coma Scale (GCS), are prone to errors and subjective interpretations.
- The imaging techniques require specialised infrastructure, trained personnel, and are cost-intensive.
- It is to address this issue that CEREBO has been developed using advanced near-infrared spectroscopy technology powered by machine learning.
- **Increased accessibility** – Offered as an option in settings where advanced diagnostic tools like CT or MRI scans are inaccessible or delayed, CEREBO provides colour-coded, radiation-free, and cost-effective results.

- **Portability** – The device is designed for deployment in ambulances, trauma centres, rural clinics, and disaster response units and is aimed at enhancing early TBI detection and patient outcomes.
- **Recognition** – According to the ICMR, CEREBO has undergone clinical validation, regulatory approvals, and feasibility studies, paving the way for global adoption in emergency and military healthcare systems.
- **Undergone multiple trials** – ICMR added that multi-centre clinical performance evaluation and utility trials were conducted at leading trauma care and neurosurgical centres.
- It generates prospective evidence on diagnostic accuracy, time-to-decision benefits, and integration feasibility within emergency care pathways.
- **Categorization of patients** – Post-market surveillance supported by ICMR-MDMS further confirmed its role in user adoption as a tool for effective categorization of patients for further neurological assessments.
- Health technology assessments also recommended the adoption of the device in tertiary care to accelerate CT scans, optimise triage, and reduce imaging costs.

Reference

The Hindu| CEREBO