2019 Bihar encephalitis outbreak

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| **2019 Bihar encephalitis outbreak** | |
| [Bihar district location map Muzaffarpur.svg](https://en.wikipedia.org/wiki/File:Bihar_district_location_map_Muzaffarpur.svg)  Location of Muzaffarpur district in Bihar | |
| **Date** | 1 June 2019 |
| **Location** | [Muzaffarpur](https://en.wikipedia.org/wiki/Muzaffarpur_district) and adjoining districts, [Bihar](https://en.wikipedia.org/wiki/Bihar), India |
| **Type** | [Encephalitis](https://en.wikipedia.org/wiki/Encephalitis) |
| **Deaths** | 152< |

In June 2019, an [outbreak](https://en.wikipedia.org/wiki/Outbreak) of [acute encephalitis syndrome](https://en.wikipedia.org/wiki/Acute_encephalitis_syndrome) occurred in [Muzaffarpur](https://en.wikipedia.org/wiki/Muzaffarpur_district" \o "Muzaffarpur district) and the adjoining districts in [Bihar](https://en.wikipedia.org/wiki/Bihar) state of [India](https://en.wikipedia.org/wiki/India), amidst the [second-longest heatwave](https://en.wikipedia.org/wiki/2019_Indian_heat_wave) in the region,[[1]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-1) resulting in deaths of more than 100 children, mainly due to [hypoglycemia](https://en.wikipedia.org/wiki/Hypoglycemia).[[2]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-:10-2)[[3]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-3)

History[[edit](https://en.wikipedia.org/w/index.php?title=2019_Bihar_encephalitis_outbreak&action=edit&section=1" \o "Edit section: History)]

Outbreaks of [acute encephalitis syndrome](https://en.wikipedia.org/wiki/Acute_encephalitis_syndrome) (AES) have occurred previously in the northern regions of [Bihar](https://en.wikipedia.org/wiki/Bihar) state and eastern regions of [Uttar Pradesh](https://en.wikipedia.org/wiki/Uttar_Pradesh) state of India. The first case of AES in Muzaffarpur district was recorded in 1995.[[4]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-:6-4)[[5]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-np-5)[[6]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-6) There were 143 deaths in 2013, 355 in 2014, 11 in 2015, four in 2016, 11 in 2017 and 7 in 2018.[[4]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-:6-4)[[7]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-:5-7) In most recent years, the death toll had remained under 20.[[5]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-np-5)

Outbreak[[edit](https://en.wikipedia.org/w/index.php?title=2019_Bihar_encephalitis_outbreak&action=edit&section=2" \o "Edit section: Outbreak)]

In June 2019, an outbreak of AES occurred in 222 blocks of [Muzaffarpur](https://en.wikipedia.org/wiki/Muzaffarpur_district" \o "Muzaffarpur district) and the adjoining districts in Bihar.[[5]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-np-5)[[8]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-8)

As a result of the outbreak, since 1 June 2019, 85 children died at the [Sri Krishna Medical College and Hospital](https://en.wikipedia.org/wiki/Sri_Krishna_Medical_College_and_Hospital) (SKMCH), the largest state-operated hospital in Bihar, while 18 children died at the Kejriwal Matrisadan, a trust-run hospital.[[7]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-:5-7)[[2]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-:10-2) Most of them were aged between 1 and 10 years.[[9]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-:2-9)[[10]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-10)[[11]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-:1-11) A total of 440 cases of AES were admitted to hospitals since 1 June 2019. As of 18 June 2019, 154 were being treated in hospitals.[[7]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-:5-7)

Syndrome[[edit](https://en.wikipedia.org/w/index.php?title=2019_Bihar_encephalitis_outbreak&action=edit&section=3" \o "Edit section: Syndrome)]

The term [acute encephalitis syndrome](https://en.wikipedia.org/wiki/Acute_encephalitis_syndrome) (AES) was coined by the [World Health Organisation](https://en.wikipedia.org/wiki/World_Health_Organization) in 2008.[[12]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-:0-12) The symptoms of AES include an acute onset of fever and associated clinical neurological manifestations such as mental confusion, disorientation, delirium, convulsions, or [coma](https://en.wikipedia.org/wiki/Coma).[[12]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-:0-12)[[13]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-:3-13) Early symptoms include headaches and vomiting, along with sudden [hypoglycemia](https://en.wikipedia.org/wiki/Hypoglycemia) (drops in blood sugar levels), but may lead to coma, brain dysfunctions, and inflammation of the heart and lungs. Those that survive AES may have long-term neurological weaknesses.[[14]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-bbc-14) The severe hypoglycemia can cause death.[[15]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-:7-15) The syndrome is locally known as *chamki* fever in Bihar.[[11]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-:1-11)

Cause[[edit](https://en.wikipedia.org/w/index.php?title=2019_Bihar_encephalitis_outbreak&action=edit&section=4" \o "Edit section: Cause)]

The cause of the outbreak is unclear.[[16]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-:11-16)

AES can be caused by different microorganisms including virus, bacteria, fungi, parasites and [spirochetes](https://en.wikipedia.org/wiki/Spirochaete), as well as chemicals and toxins. AES mostly affects children below 15.[[12]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-:0-12)[[17]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-17) In India, AES was chiefly associated with [Japanese encephalitis virus](https://en.wikipedia.org/wiki/Japanese_encephalitis) (JEV) before 1975. The JEV cases and outbreaks became more frequent and endemic regions developed between 1975 and 1999. After 1999, non-JEV cases and outbreaks of AES were increasingly reported caused by other viruses including [Chandipura virus](https://en.wikipedia.org/wiki/Chandipura_virus" \o "Chandipura virus) (CHPV), [Nipah virus](https://en.wikipedia.org/wiki/Nipah_virus" \o "Nipah virus) (NiV), and [enteroviruses](https://en.wikipedia.org/wiki/Enterovirus" \o "Enterovirus). After 2012, it is observed that the cause shifting to JEV.[[12]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-:0-12)[[13]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-:3-13) Initial examination shows little sign of the JEV or other viral routes in the affected children.[[5]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-np-5) A study by [AIIMS Patna](https://en.wikipedia.org/wiki/All_India_Institute_of_Medical_Sciences,_Patna) found the presence of enterovirus.[[18]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-:8-18)

High temperature, humidity, malnutrition, poor hygiene and lack of awareness are known aggravating factors of AES.[[19]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-:4-19)[[7]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-:5-7)[[19]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-:4-19)[[4]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-:6-4) Cases of AES tend to occur during the country's monsoon season.[[14]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-bbc-14) Since 1 June 2019, the temperature in Muzaffarpur has remained above 40 °C (104 °F) and the rains were delayed which may have aggravated the situation.[[7]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-:5-7)[[18]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-:8-18) Poverty and malnutrition is widespread among children in the region. Malnourished children lack a buffer stock of sugar as glycogen in the liver which puts them at higher risk of hypoglycemia.[[18]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-:8-18)[[20]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-:9-20)[[16]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-:11-16) Awareness campaigns were carried out in March–April 2019 but were not conducted later due to the [2019 Indian general elections](https://en.wikipedia.org/wiki/2019_Indian_general_election). The local administration was not watchful due to the few cases of AES in recent years.[[7]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-:5-7)

[](https://en.wikipedia.org/wiki/File:Litchi_chinensis_fruits.JPG)

[Lychee](https://en.wikipedia.org/wiki/Lychee) fruits, which naturally include toxins related to encephalitis, are suspected to have been a contributing factor in the outbreak.

The region is the largest producer of lychee fruits in India. A 2014 study published in Lancet found that the [methylene cyclopropyl acetic acid](https://en.wikipedia.org/wiki/Methylene_cyclopropyl_acetic_acid) and [hypoglycin A](https://en.wikipedia.org/wiki/Hypoglycin_A" \o "Hypoglycin A) found in unripe lychee fruit can cause hypoglycemia and cited them as plausible cause of AES outbreaks. A diet heavy on unripe lychee fruits without having an otherwise full meal later in the day may put malnourished children at risk of hypoglycemia.[[15]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-:7-15)[[5]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-np-5)[[19]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-:4-19)[[18]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-:8-18) Others disputed the findings citing the unlikeliness of very large consumption of unripe lychee fruits, lack of cases in well-nourished children and many other pediatric illnesses causing hypoglycemia.[[21]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-21)[[18]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-:8-18)[[20]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-:9-20) Health officials reported that most of the victims suffered severe hypoglycemia.[[22]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-AJ-22)[[23]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-23)

The hospitals and primary health centres lacked the required facilities to treat children.[[7]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-:5-7)

Government response[[edit](https://en.wikipedia.org/w/index.php?title=2019_Bihar_encephalitis_outbreak&action=edit&section=5" \o "Edit section: Government response)]

Chief Minister of Bihar [Nitish Kumar](https://en.wikipedia.org/wiki/Nitish_Kumar" \o "Nitish Kumar) announced an [ex gratia](https://en.wikipedia.org/wiki/Ex_gratia) payment of ₹4 lakh (US$5,800) to the next of the kin of the children who died from AES.[[11]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-:1-11)[[9]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-:2-9) He also visited the hospital and ordered the expansion of the hospital.[[2]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-:10-2)[[24]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-24)

The union minister of health [Harsh Vardhan](https://en.wikipedia.org/wiki/Harsh_Vardhan_(Delhi_politician)) visited and announced the set-up of 100-bed pediatric ward at the SKMCH as well as five virology laboratories in Bihar. He also announced the upgrade of the [India Meteorological Department](https://en.wikipedia.org/wiki/India_Meteorological_Department)’s observatory in Muzaffarpur for better study of climate. Seven pediatric [intensive care units](https://en.wikipedia.org/wiki/Intensive_care_unit) are being established. The interdisciplinary team consisting of experts from [Indian Council of Medical Research](https://en.wikipedia.org/wiki/Indian_Council_of_Medical_Research), [National Institute of Mental Health and Neurosciences](https://en.wikipedia.org/wiki/NIMHANS), [National Institute of Malaria Research](https://en.wikipedia.org/wiki/National_Institute_of_Malaria_Research); [National Institute of Nutrition](https://en.wikipedia.org/wiki/National_Institute_of_Nutrition,_Hyderabad), [National Institute of Virology](https://en.wikipedia.org/wiki/National_Institute_of_Virology); [National Institute of Epidemiology](https://en.wikipedia.org/wiki/National_Institute_of_Epidemiology) and [All India Institute of Medical Sciences, New Delhi](https://en.wikipedia.org/wiki/All_India_Institute_of_Medical_Sciences,_New_Delhi) was formed and sent to Bihar to study the syndrome and establish the cause.[[7]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-:5-7)[[25]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-25)

A Supreme Court bench has ordered the Bihar government to file an affidavit to show the competence of medical facilities and other hygiene conditions in the state in the wake of this.[[26]](https://en.wikipedia.org/wiki/2019_Bihar_encephalitis_outbreak#cite_note-26)

The [National Human Rights Commission](https://en.wikipedia.org/wiki/National_Human_Rights_Commission_of_India) (NHRC) sent notices to the [Ministry of Health and Family Welfare](https://en.wikipedia.org/wiki/Ministry_of_Health_and_Family_Welfare) and the [Bihar government](https://en.wikipedia.org/wiki/Bihar_government) over the deaths and asked for a report in four weeks.