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An Epidemic Investigation of Acute Encephalitis at Jetpur Taluka, Rajkot District, Gujarat

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ABSTRACT

Background: Investigating an acute encephalitis case, when causative agents and predisposing factors are yet to be investigated, pressure on investigating house conditions, environmental surveys and entomological surveys more precisely and tactfully. Moreover, socioeconomic conditions, living conditions, and man-animal contact contribute to spread of the similar cases in communities.

Methods: To reduce the effect of the epidemic, more comprehensive diagnostic techniques, continued ongoing monitoring and targeted public health measures are required. Living in vulnerable house conditions further increases exposure risk warranting a more comprehensive assessment of environmental, entomological, and socioeconomic determinants to derive conclusion of acute encephalitic cases with negative test results.

Results: A survey of nearby households in Pedhla Vadi Vistar found no similar cases of acute encephalitis, as families had migrated. Health workers conducted an entomological survey, identifying two mosquito larvae-contaminated containers, which were emptied for source reduction. Villagers were educated about symptoms and preventive measures. A sample from a deceased child was tested for Chandipura virus, but no additional cases were found, and no further samples were collected.

Conclusion: Investigating acute encephalitis with negative test results requires considering environmental, entomological, and socioeconomic factors. Ongoing surveillance and extensive diagnostics are essential to identify risks and reduce epidemic threats.

Key-words: Acute Encephalitis, Causative Agent, Predisposing Factors, Man-Animal Contact, High-Risk Areas and Vector Control

INTRODUCTION

Investigating a single case of acute encephalitis with negative test findings has special difficulties, especially if the afflicted family has moved, making it more difficult to identify possible relationships and sources. Acute encephalitis is a serious neurological disorder that causes inflammation in the brain and frequently results in high rates of morbidity and death. When routine tests yield negative findings, as has happened in several outbreaks when the causal agent is still mysterious, the difficulty of diagnosing and treating such individuals is increased [1–3].

A comprehensive epidemiological examination is required because of the increased risk of exposure to

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various environmental variables or infectious agents in the setting of a recently moved family. Prior research has emphasized the need to take into account socioeconomic and environmental variables, such as unsanitary conditions since they can aid in the transmission of encephalitis within families and communities [3]. Furthermore, comparable epidemics have shown the involvement of new diseases like the Chandipura virus, highlighting the necessity of thorough testing that goes beyond standard viral agents [1].

A village survey can offer vital information on the encephalitis epidemiology in the area, assisting in the identification of possible infection origins and the dynamics of transmission. In previous studies, these surveys have been crucial in identifying high-risk communities and exposing trends in the transmission of illness. [2-4] To stop more instances, the results of these surveys might direct public health initiatives like immunization programs or vector control strategies.

A comprehensive strategy that takes into account both established and newly discovered infectious agents as well as thorough epidemiological surveys is necessary when looking into a single instance of acute encephalitis with negative test findings. This method is necessary to identify the root causes and put into practice efficient public health measures to lessen the disease's effects.

MATERIALS AND METHODS

Research Design- The survey was conducted in Pedhla Vadi Vistar, located approximately 5 km from the UHC in Navagadh. This area, part of Jetpur Taluka in Rajkot district, is characterised by dispersed settlements and agricultural fields, with families living in temporary or kutcha houses.

Call for Investigation- An 8-year-old child, who had moved with his family from Madhya Pradesh to Pedhla Vadi Vistar in April 2024, developed fever, bruises, ecchymosis, and oral bleeding on 5th July 2024. The condition worsened, leading to convulsions and altered sensorium by 15th July 2024. Despite being referred to higher medical facilities, the child succumbed within hours of hospitalisation on 15 July 2024. A request from the CDHO office prompted a detailed investigation by the Rapid Response Team (RRT) from PDU Medical College. The team visited the site on 19 July 2024 to investigate the case through environmental surveys and population assessments.

Survey Details- The team conducted a house-to-house survey using a structured proforma to collect demographic details, environmental observations, migration history, and symptom reports. Observations regarding living conditions, potential breeding grounds for vectors, and community practices were documented.

House Environment Survey- The survey revealed that the deceased child's family had returned to their native place by the time of the investigation. The house and surroundings showed favourable conditions for sandfly breeding, such as cracks, crevices, dampness, and proximity to animal habitats. The presence of kutcha houses and the practice of sleeping outdoors increased exposure to potential vectors. However, no sandflies or other vectors were captured as an entomologist was not part of the survey team.

RESULTS

The survey of nearby households in the Vadi Vistar of Pedhla revealed that most families had migrated to their native places, leaving the area vacant. Only two nearby houses were visited, and no family members were present. The farms in the area were mostly abandoned, with only two farms visited. No cases with similar symptoms, such as fever, vomiting, diarrhoea, altered sensorium, or convulsions, were reported. However, it was observed that residents had habits of sleeping outside, working barefoot on farms, and staying in proximity to animals, which could increase health risks.

Table 1: Findings of the household and entomological survey in Pedha

Summary of the Nearby Household Survey (Pedhla Vadi Vistar)	
Total Houses Visited	2
Total Population Covered	8
Total Children Checked	1
History of Travel in the Last 3 Months	0
Symptoms (Fever, Vomiting, Diarrhoea, Altered Sensorium, Convulsion)	0
Practice of Outside Sleeping, Play with Animals, Barefoot in Farms	2

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Summary of Entomological Survey in Pedhla Vadi Vistar	
Total Houses Found Open	2
Total People Surveyed	8
Dusting and Indoor Spray Done	2
Total Containers Checked	11
Containers with Larvae	2
Breeding Places Managed	2

The affected areas were surveyed by healthcare workers to check for breeding sites of vectors. Source reduction activities were carried out, including dusting with Malathion or alpha-cypermethrin, emptying containers, and channelising stagnant water. A health team was specifically assigned to survey the population and conduct a vector survey in Vadi Vistar. Eleven containers were examined for mosquito larvae, of which two were found positive. Immediate measures were taken to empty and manage these breeding sites.

Table 2: Additional Control and Preventive Actions

Action	Description
Meeting with Medical Officers and Health Authorities	Discussed the two deceased cases with the Medical Officer (MO) and Taluka Health Officer (THO). Developed a surveillance strategy and recommended control and preventive measures by the Rapid Response Team (RRT).
Community Awareness Meeting	Educated village residents about the symptoms of acute encephalitis and the necessary actions to take. Guided preventive and control measures, such as maintaining hygiene and reducing vector exposure.
Sample Collection and Testing	A sample from the deceased child was tested for the Chandipura virus during the hospital stay. No other similar cases were found during the survey, so no additional samples were collected.

The recommendation given to health staff- The health personnel were briefed on the recommendations as follows.

Ongoing monitoring of the affected area, as well as prompt reporting and management of any further cases of fever and acute encephalitis.

- **Vector control:** Cover the surrounding areas and treat the affected area with Malathion dust and insecticidal spray. Additional integrated vector control techniques must be used to prevent vector resistance.
- **Eco-friendly solutions:** Cracks and gaps should be filled with cement. The vector population should be managed by frequent application of insecticides.
- Promote the use of personal protective equipment, such as repellents, full-sleeve garments, and bed nets coated with insecticide. Children should not be permitted to engage in outside activities if they are not dressed in full sleeves.
- **Community involvement:** It is important to inform the community about the signs of acute encephalitis. In hospitals, patients are told that Animal habitats should be kept away from human habitations, kept clean, and regularly treated with pesticides.
- To assist them become more sensitive, field personnel should get thorough training on disease. They must do surveillance and monitoring duties daily. It is recommended that they keep an eye out for the same signs and symptoms in the migratory population.
- **Sensitization of healthcare workers and timely referral:** All paramedical and medical personnel should be trained on the need to admit, refer, and treat patients as soon as possible.
- **State and adjacent district alerts:** The state should notify neighbouring districts and talukas of the high alert, each district should do a risk assessment and get ready for these cases, and the state should publish instructions for treating and screening for encephalitis.

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Fig. 1: House of deceased: typically, kaccha type temporary settlement with cracks and crevices

Fig. 2: Search for any insect or sand-fly resting by health team

DISCUSSION

Negative test findings for some viruses, such as the Japanese encephalitis virus (JEV) or the Chandipura virus, are frequently found while investigating instances of acute encephalitis.[5-7] The time of sample collection, the sensitivity of the diagnostic tests, or the existence of other diseases not tested for are some of the causes of this. For example, although the Chandipura virus was confirmed in many patients during the Nagpur division outbreak, not all cases tested positive, suggesting the presence of other etiological agents or testing sensitivity limitations.[8-12] Similarly, local transmission of JEV could not be verified in Pakistan, despite the existence of possible vectors and hosts, underscoring the difficulty in detecting encephalitis cases. [5,13]

A risk of viral transmission may be indicated by the presence of mosquito larvae, especially those of species known to transmit encephalitis viruses. The presence of Culex mosquitoes, which are JEV vectors, was verified in the Malkangiri area, confirming the insects' involvement in the outbreak.[14] Interactions between humans and animals, particularly in rural areas, can potentially help spread zoonotic infections. However, if a kid does not have positive test results despite these risk factors, it may indicate that additional protective factors or other pathogens are at play.

Living arrangements like staying in kacha huts on fields might make people more vulnerable to sand flies and mosquitoes. These settings frequently have insufficient barriers to prevent vector penetration, which raises the possibility of bites and the illness that follows. With significant mosquito concentrations seen in impacted communities, the Odisha research demonstrated the significance of environmental variables in JE transmission.[15]

CONCLUSIONS

A thorough study that takes into account environmental, entomological, and socioeconomic aspects is necessary when looking into instances of acute encephalitis with negative test findings. Although the presence of mosquitoes and sandflies suggests possible hazards of transmission, negative test findings in people may indicate the involvement of other diseases or other protective factors. To completely comprehend and reduce the dangers of encephalitis epidemics, ongoing surveillance and more extensive diagnostic tests are necessary.

CONTRIBUTION OF AUTHORS

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