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HEALTH STATUS OF CHILDREN DUE TO JAPANESE ENCEPHALITIS IN GORAKHPUR

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ABSTRACT

Japanese Encephalitis (JE) is a vector-borne viral disease that affects the brain directly leading to coma and finally death. It is a major health challenge in Asia and Pacific regions due to its high epidemic potential, high case-fatality and neuropsychiatric sequelae among survivors. It finally leads to Acute Encephalitis Syndrome (AES) that creates devastation in eastern Uttar Pradesh for more than three decades. The epicentre of Encephalitis in Uttar Pradesh is Gorakhpur, mostly affects its rural areas. Other regions of Uttar Pradesh that are the most affected by JE are Sant Kabir Nagar, Basti, Kushinagar, Maharajganj, Siddharth Nagar, Deoria and Mau. In rainy season, this disease is commonly prevalent in Uttar Pradesh and make the condition of children worse. It is generally spread by mosquitoes, especially those of the genus Culex. Pigs and wild birds are also known for serving as reservoir for Japanese Encephalitis Virus (JEV). Initial symptoms of JE are cold, fever and headache. When it crosses the blood and brain barriers then it becomes threat for life. It is not fully curable disease but its vaccine can prevent this to some extent. there are three types of Japanese Encephalitis vaccinations that are used in India at large scale. In 2006, the Japanese Encephalitis vaccine was launched in our country. A massive encephalitis vaccination program has been launched by Shri Yogi Aditya Nath (Chief Minister of Uttar Pradesh) Government during 2017-18 which is a positive step towards saving the lifes of many people of our country.

KEY WORDS

Japanese Encephalitis, Epidemiology, Vector borne diseases, Gorakhpur, Uttar Pradesh

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OBJECTIVES OF THE STUDY

- To examine the causes of Japanese Encephalitis in the region of Gorakhpur, Uttar Pradesh.
- To test the impact of JE/AES on children between age group 0-10.
- To study the steps taken by Government to reduce the disease in the area.
- To discover the reasons responsible for reduction in the JE cases.

HISTORY AND DEVELOPMENT OF JAPANESE ENCEPHALITIS

The virus of Japanese Encephalitis was first described in Japan in 1870s and then on a continuous basis had rapidly spread throughout large parts of Asia and now more than half of the world population of 24 countries treat it as an epidemic. In recent years, due to globalisation and industrialisation, expansion of a geographic JEV to new geographic area can be seen mostly in peri-urban area causing an increasing risk for the transmission of Japanese Encephalitis in many areas, not necessarily only in rural regions.

In 1924, the outbreak of JE was the largest with more than 6000 cases on which 60% were fatal. In 1934, the virus was found in Monkeys in Hayashi region. While in 1935, neutralizing antibody in recovered patients that succeed in protecting mice from JE was discovered which helped further in demonstrating the geographical distribution of JE, including cluster of cases occurred in Beijing in 1934 and 1935.

In 1938, Hammon et al. provided collaborative evidence of mosquitoe-borne mode of JE transmission by isolating JE virus from Culex tritaeniorhynchus mosquitoes. Viruses which were being isolated from human cases in Japan in 1935 and in Beijing in 1949 provided the prototype Nakayama, Beijing and P3 strain, respectively, that are now used in the production of vaccine. During the first half of the 20th century, temperate region of Japan, Korea and China were being recognised for Japanese Encephalitis virus expansion. Later on the augmentation of the epidemic activity has been reported from much off the Southwest Asia, India and Sri Lanka.

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INTRODUCTION OF JAPANESE ENCEPHALITIS AND ACUTE ENCEPHALITIS SYNDROME IN UTTAR PRADESH

Japanese Encephalitis Virus infection mostly occurs in temperate and tropical regions of Asia. The countries such as China, Japan, Korea and India as well as other countries of Asia are severely affected by this virus but most of the countries controlled the spread of disease by vaccination. In India, it has become a major issue of health department of pediatric and the epidemics are reported frequently in many areas of the country. Based on the serelogical surveys, the first case of JE in India was reported from Tamil Nadu in 1955. In between 1955-1966, a total number of approximate 65 cases were reported from Southern India. In 1973, in Bankura district of West Bengal, a major outbreak of the virus of 42.6% fatality rate was reported. While in Uttar Pradesh, the first outbreak of JE virus was occurred in 1973 in Gorakhpur with 1005 cases and 298 deaths. However, in August 2017, due to the negligence in Encephalitis treatment ward and lack of oxygen supply at Baba Raghav Das (BRD) medical college, the deaths of 30 children in just 48 hours were reported. This incident put the Government behind the bar and a series of political war got accelerated between Government and oppositions. But incident like this is not new to Gorakhpur, as this district is the epicentre of Encephalitis which affect mostly its rural areas. The cultivation of paddy is common in Gorakhpur that requires heavy amount of water which bolsters the breeding of the mosquitoes. According to the season and location of the weather condition of Uttar Pradesh is dynamic, i.e. changes frequently. In east Uttar Pradesh (Sant Kabir Nagar, Basti, Kushinagar, Maharajganj, Siddharth Nagar and Gorakhpur) are flood-prone areas and people also depend on domestic animals like cows, goats, pigs, horses, baffaloes and dogs. Pigs are the great amplifier of the JEV but the population is not aware of this fact. According to the figures, in recent years around 50,000 children died without reaching to hospital. JE can be air borne, water borne, the result of the bite of mosquitoes or spread by ticks. The present study will show thw status and trends of the JE and AES cases in Gorakhpur, Uttar Pradesh through the data obtained from the health authorities of the district. This also draws out the seasonal variations in the occurrence of the cases and mortality due to the JE along with other details associated with it.

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METHODOLOGY

Study Area

The Gorakhpur district covers an area of 3,483.8 square kilometers (1,345.1 sq mi). The district is located in the Purvanchal district of Uttar Pradesh. The district is about 270 kilometers east of Lucknow and about 102 kilometers from the Nepal border. It is located on the banks of the Rapti River.

According to the 2011 census, Gorakhpur district has a population of 4,440,895. This gives it the 40th position (out of 640) in India. The population density of the region is 1337 inhabitants per square kilometer (3460 inhabitants per square kilometer). Its population growth in the decade 2001-2011 was 17.81%. Gorakhpur has a sex ratio of 944 females per 1,000 males and a literacy rate of 70.83%. Scheduled Castes constituted 21.08% of the population and Scheduled Castes 0.41%.

Medical Facility of Gorakhpur

One of the nation's most backward regions continues to be Gorakhpur's location in eastern Uttar Pradesh. Poverty and inadequate health care are closely linked in the region. The public or charity hospitals are overburdened.

BRD Medical College Hospital is the only facility capable of treating encephalitis and other infectious diseases in a 300-kilometer-wide region.

This hospital receives patients from the eastern districts of Bihar, Basti, the terai regions of Nepal, and Gonda. In these districts, sanitation and cleanliness have been a major problem. In fact, India's dirtiest district was named Gonda in the 2017 Swachh Bharat Survey.

In these areas, encephalitis is highly common, especially in children under the age of 10 years. Culex vishnui and Culex tritaeniorhynchus mosquito bites cause Japanese encephalitis and Acute Encephalitis Syndrome. These mosquito species reside in filth. The monsoon season is consistently the worst for kids in Gorakhpur.

Data Collection

The survey method has been done on 50 families of various regions of the Gorakhpur district. A study on the basis of age distribution and sex distribution has been conducted. An analysis of the secondary data has been performed in order to get the better result or conclusion of the research.

The study shows that the children are more susceptible to get this disease than adults. If we see

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the average age of the children who get affected in eastern Uttar Pradesh is 6.8%. It has also been reported that maximum cases were found from the age group of 4 to 6 years. With the help of vaccination campaign and spreading awareness among the locals, the cases has been prevented a bit.

Age Group (years)	0-5 years	5-10 years	More than 10 years
Total =50	27	16	7

Table 1: JE Cases on Age Distribution

Sex	Males	Females
In percentage (%)	**60%**	**40%**

Table 2: JE Cases on Sex Distribution

From table 1, it is clear that the age group from 0-5 are more susceptible followed by 5-10 age group and more than 10 are less likely get infected from this JE virus. The rate of infection in 0-5 age group is much higher, i.e. 27 cases from total 50 cases. Table 2 shows the susceptibility of males to get affected by the disease over females. Females are 20% less percentage (60%-40%) of getting infection over the males.

TRANSMISSION OF JAPANESE ENCEPHALITIS VIRUS

Most of the time, JEV is spread in rural agricultural areas through rice cultivation and flooded irrigation. In some parts of Asia, these conditions might be close to major cities. In the temperate regions of Asia, the JE virus only spreads during specific seasons. Human illness typically rises during the hot and wet seasons. A zoonotic infection known as JE is spread by a vector. Humans are infected with the disease when Culex mosquitoes bite them. The JE virus is primarily zoonotic in its natural cycle, with man acting as an unintentional host. The neurotropic and arbovirus JE viral's primary target is the central nervous system. After the initiation of rainstorm, it will require 3 months for JE cases to surface.

During the monsoon, vector mosquitoes proliferate in large numbers, which raises the risk of JEV and mosquito-human interaction. In the end, the JEV transmission raises the JE instances. The JE is a JEV-caused brain illness that is perpetuated in a cycle involving mosquitoes and

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vertebrate hosts (primarily pigs and birds). The JE virus naturally infects water birds of the Ardeidae family, primarily cattle egrets and pond herons. Pigs play a significant part in this natural cycle and act as an amplifier host. They support protracted viraemia and allow for the proliferation of many viruses without causing illness. As a result, mosquitoes have a greater probability of contracting an infection from pigs. Humans are accidental or dead-end hosts because they typically do not produce the necessary amounts of

DIAGNOSIS OF JAPANESE ENCEPHALITIS

Commercially available confirmatory tests that look for JEV-specific antigens and antibodies serve as the foundation for diagnosis. Complement fixation testing (CF), hemagglutination inhibition testing (HI), and enzyme-linked immunosorbent assays (ELISA) for IgG (pair) and IgM (MAC) antibodies are all used to test for antibodies. In order to detect antigens, one should perform an immunofluorescence assay (IFA), an immunoperoxidase test, and a rapid, sensitive, and specific reverse passive hemagglutination (RPHA) test. The IgM ELISA test is the most common, but this is because of the drawbacks most of the aforementioned tests have. The test is IgM antibodies in the cerebrospinal fluid/serum of patients within 3-5 days after infection. However, no detectable IgM was found in the serum after 8 days. In the United States, only the Centers for Disease Control and Prevention (CDC) and a few specialized reference laboratories offer confirmatory tests. Indirect fluorescent antibody staining is used to demonstrate viral antigens in tissues.

CLINICAL FEATURES OF JAPANESE ENCEPHALITIS

Japanese Encephalitis cases show signs and symptoms similar those of viral origin encephalitis. As JE does not show any specific manifestations, it misleads the symptoms of many other causes that may be viral, fungal, bacterial and protozoan. For making diagnosis and facilitation of observation easy, the NVBDCP in 2006 altered the definition of JE case as those AES case which is identified in a person of any age and facing a change in mental status with the high degree of fever and symptoms of confusion, disorientation leading to coma and talking inability. The incubation period of JEV varies from 2 to 15 days, however many of the infection show no symptoms. This virus greatly affects children with variation in mortality rate. The major symptoms are fever, headache and laziness while signs that developed during ARS includes neck rigidity, hemiparesis, cachexia and fever between 100.5 -105.9 degree F (38-48

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degree C). At later stage, mental retardation can be the result of JE followed by long-lasting neurological defect such as emotional liability, deafness, etc. due to the impairment of central nervous system.

TREATMENT OF JAPANESE ENCEPHALITIS

The JE virus cannot be completely treated because there is no specific antiviral medication available. The only effective treatment for it, though, is vaccination. By fogging with extremely low levels of insecticides and immunizing children, JEV can be prevented as well as its vector mosquitoes. Inactivated vaccines derived from cell culture, live attenuated vaccines derived from mouse brains, and cell culture vaccines are the three types of vaccines that have been widely used. There are currently three vaccines on the market: SA-I4-I4-2, ICS1, and JESPECT (marketed as IMOJEV in other countries and as JESPECT in New Zealand and Australia). Currently, genotype-III virus is the basis for all vaccines. India started immunizing 1 million people against JE in 2006. Children aged 1 to 15 in India began receiving the JE vaccine in 2006. After that, only one dose of the JE vaccine (SA-I4-I4-2) was administered as part of the national immunization program. It is necessary to raise community awareness in order to protect people from mosquito bites and to identify JE cases early.

PREVENTION AND CONTROL OF JAPANESE ENCEPHALITIS

Japanese Encephalitis can be prevented largely based on two interventions:

- Mosquito/vector control
- by an immunization system

Vector Control

It is an important way to control and prevent the Japanese Encephalitis. For controlling the vector population, the methods that are adopted in endemic area since long are insecticides and bed nets. For preventing local transmission especially in peri-urban, thermal fogging with ultra-low volume insecticides such as malathion and pyrethrum has been recommended. Some other ways to prevent larval development are water management and irrigation practices such as intermittent irrigation, constant flow system periodic lowering of water level. But this is not possible in rural areas to prevent mosquito breeding, therefore there vector control alone cannot prevent JE.

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Immunization

For the prevention of any disease, immunization through effective vaccine is necessary, so is the case in JE. It is necessary for the Government to launch a large-scale immunization program for the susceptible human population. Vaccination directly provides antibody to fight against the JEV. There are many vaccines which are being used currently for JE; like purified, formalin-inactivated mouse-brain derived, cell-culture derived, live attenuated and cell-culture derived inactivated. The most produced and internationally distributed among these vaccines is mouse-brain derived inactivated vaccine.

RECOMMENDATIONS AGAINST JAPANESE ENCEPHALITIS

According to current epidemiological studies, the risk of Japanese encephalitis is changing and increasing worldwide. Japanese encephalitis is a volatile and unpredictable danger to travelers; However, there are safe and effective methods of vaccination. Vaccination is recommended for children in all regions and adults in areas endemic for Japanese encephalitis. Vaccination is recommended for all immigrants residing in endemic countries and traveling to rural or peri-urban areas of endemic countries, regardless of length or purpose of stay. Travelers with unknown or appropriately altered plans should also be vaccinated [66]. The decision to vaccinate should be based on factors such as (a) the risks associated with a particular route; (b) the incidence and mortality rates of Japanese encephalitis in the region; (c) the availability of effective vaccination; d) A high risk after vaccination. Adverse reactions, although possible; (e) Possibility of future travel to JE endemic countries, etc. The following are the vaccination schedules recommended by the World Health Organization.

a. Live attenuated vaccine: one dose given before or at the eighth month

B. Live chimeric vaccine: administered in a single dose before or at the ninth month

c) Inactivated vaccine: 2 doses, the first dose is administered before or at 6 months of age, and the second dose is usually administered 4 weeks apart.

Depending on the type of vaccine received, booster doses are also recommended to further enhance immunity against JE. Vaccination against Japanese encephalitis is generally not recommended during pregnancy because of the risk to the fetus; However, if traveling to JE-endemic areas, vaccination is recommended because the benefits to the mother and developing fetus outweigh the risks.

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JAPANESE ENCEPHALITIS VACCINATION IN UTTAR PRADESH, INDIA

During 2006, JE vaccination campaign was launched in the most sensitive districts of Assam, Karnataka and Uttar Pradesh. Other 86 JE endemic districts in the States of Andhra Pradesh, Assam, Goa, Haryana, Bihar, Tamil Nadu, Kerala, Maharashtra, West Bengal and Uttar Pradesh had been covered. ASE/JE case management reorientation training course has been initiated and carried out in Andhra Pradesh, Assam, Haryana, Tamil Nadu, Karnataka, West Bengal and Uttar Pradesh during 2008-2009.

Bharat Biotech manufactured JENVAC got licensed as a 2-dose vaccine in 2014 in India. During 2017-18 which is a positive step towards saving the lifes of many people of our country, a massive encephalitis vaccination program has been launched by Shri Yogi Aditya Nath (Chief Minister of Uttar Pradesh) Government.

Dastak Abhiyan, an initiative launched by Uttar Pradesh government in association with UNICEF on April 15, 2022, has many health workers going door-to-door to all the homes in the encephalitis-affected villages to spread information about it. They urge people not to visit 'quacks' and to adopt preventive measures like drinking clean water and getting an encephalitis vaccine.

CONCLUSION

Japanese Encephalitis is a major public health issue for the entire world. However, a rise trend of JE can be noticed clearly in Asia. Certain ecological and environmental factors are responsible for the expansion of the JEV. Only prevention can control this disease because it has no specific treatment. With a high-quality immunization program, we need a powerful system of surveillance for controlling JE. Other ways can also be adopted for preventing it along with vaccination program, such as modified agriculture practices, pig vaccination, vector control, rigorous monitoring and improved living standards.

The most commonly affected age group is 1-5 years with peak occurrence in the month of September. Safe and effective JE vaccines are available in all JE endemic states in India to prevent the disease and additionally to reduce the risk for JE and AES; all travellers to JE-endemic areas should take precautions to avoid mosquito bites especially in high peak season.

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Though the downward trend in CFR has been started and several encephalitis treatment centres have been established at block level in JE-endemic districts of eastern Uttar Pradesh, but still government needs to be strengthened awareness activities like "Dastak" campaign and intersectoral preventive activities.

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