مجلة جامعة بابل للعلوم الصرفة والتطبيقية مجلة جامعة بابل للعلوم الصرفة والتطبيقية مجلة جامعة بابل للعلوم الصرفة والتطبيقية

ISSN: 2312-8135 | Print ISSN: 1992-0652

info@journalofbabylon.com | jub@itnet.uobabylon.edu.iq | www.journalofbabylon.com

The Japanese Encephalitis Virus Evolution and Epidemiology

Zahraa Khalid Al- Kheroo
College of Sciences, Mosul university, zahraa.alkhero@uomosul.edu.iq, Mosul. Iraq.
Corresponding author: zahraa.alkhero@uomosul.edu.iq,

تطور فيروس التهاب الدماغ الياباني وعلم الأوبئة

زهراء خالد الخيرو
كلية العلوم, جامعة الموصل zahraa.alkhero@uomosul.edu.iq , الموصل. العراق

Accepted: 29/3/2026 **Published:** 31/3/2026

ABSTRACT

The virus that causes Japanese encephalitis (JEV) is the cause of Japanese encephalitis (JE), a potentially fatal brain infection contracted via mosquito bites. The Japanese encephalitis virus, which is endemic in 24 countries and poses a threat to nearly 3 billion people, is the primary Asia's viral encephalitis cause. An estimated one hundred thousand clinical cases and 25,000 fatalities occur worldwide each year. Travelers to endemic areas must be vaccinated, even though Arab nations are still outside the transmission zones. Prevention: Inactivated (IXIARO), live attenuated (IMOJEV, CD. JEVAX), and Indian (JENVAC) vaccine formulations are among the WHO-prequalified vaccinations. Dosage, target populations, and contraindications vary for each. Although the effectiveness of current vaccines may be threatened by developing genotype V, sustained immunizations has reduced endemic countries by 73–100%. To rule out flavivirus cross-reactivity, primary diagnosis is made by IgM capture ELISA in serum/CSF (WHO-recommended), followed by confirmatory PRNT at reference laboratories. Because of temporary viraemia, RT-PCR is restricted in its ability to diagnose humans, although it is beneficial for surveillance. Socio-environmental Factors, historically recorded during the Korean War (402 US cases, 1950), social instability (war, displacement, and health system collapse) increases burden by disrupting immunization, weakening surveillance, and increasing vector exposure.

Keywords: Japanese encephalitis virus, vaccination, epidemiology, Culex, flavivirus

ISSN: 2312-8135 | Print ISSN: 1992-0652
info@journalofbabylon.com | jub@itnet.uobabylon.edu.iq | www.journalofbabylon.com

INTRODUCTION

It is the viral encephalitis brought on by the Japanese encephalitis virus (JEV). most often in Asia [1]. Japanese encephalitis is occurred by a flavivirus which is spread via mosquitoes [2]. The JEV was identified in the brain of a JE patient in 1935; the patient subsequently succumbed to the disease. This isolate, commonly referred to as believed that the JEV prototype strain is believed to be the Nakayama strain [3]. Compared to adults, infants and kids till they turn fifteen are higher susceptible to JE and face a more risk of neurological complications [4]. The threat of JE is ever-present for over 2 billion people who live in endemic countries, and a rise in the likelihood that the disease may spread is increased by mosquito numbers to previously uninfected areas. A female Culex tritaeniorhynchus mosquito carrying the RNA virus known as the JEV will often bite a victim. Additionally, Culex annulirostris, Culex vishnui, Culex pseudovishnui, Culex gelidus, Culex sitiens, and Culex fuscocephela are mosquito species that have been linked to the spread of JEV. A number of mosquito species, including Anopheles peditaeniatus, Anopheles hyrcanus, and Anopheles subpictus, [5]. A family of birds called Ardeidae is the main source of JEV. which includes egrets and herons. Pigs can infect naive mosquitoes because they are very susceptible to JEV, which results in the virus multiplying to ideal levels and developing into an amplified host with a high circulating viral titer [6]. Pigs are known to normally release the virus orally during this period, which may facilitate JEV's horizontal dissemination [7]. Cattle and the reason horses are regarded as "dead-end" hosts is that they don't generate large virus titers, in contrast to pigs and birds (Figure 1)

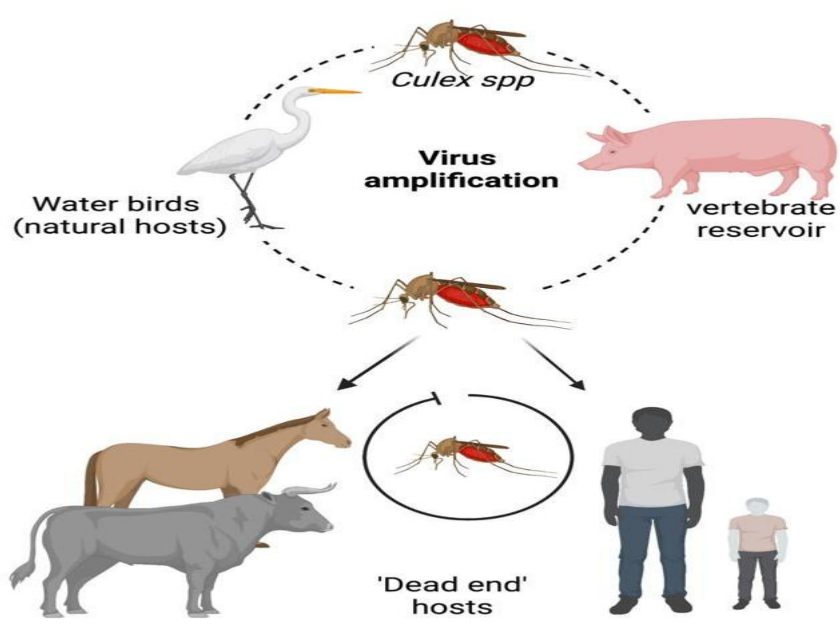

Fig.1 The model of infection with and amplification of the JEV.

ISSN: 2312-8135 | Print ISSN: 1992-0652

info@journalofbabylon.com | jub@itnet.uobabylon.edu.iq | www.journalofbabylon.com

مجلة جامعة بابل للعلوم الصرفة والتطبيقية مجلة جامعة بابل للعلوم الصرفة والتطبيقية مجلة جامعة بابل للعلوم الصرفة والتطبيقية

Nevertheless, JEV possesses a cyclic enzootic cycle that makes it possible for the virus to endure in the surroundings for very long periods, making its quick eradication improbable. Therefore, developing a JEV vaccine and an efficient antiviral treatment are urgently needed. Despite obstacles including the lack of a suitable medication delivery mechanism or a treatment plan that isn't dependent on the infection stage, research on JE has grown quickly. technological developments, with the main goal being the development of therapeutics (drugs and vaccines) that are both safe and affordable for all age groups.

Classification, virion, and genome structure

JEV's genome, an unsegmented, single-stranded positive sense RNA, belongs to the Flaviviridae genus of flaviviruses. One open reading frame is encoded by the approximately 11 kilobases that make up the JEV genome. Once this frame is translated into a large polyprotein, proteases, lead to the synthesis of three proteins that are structural and seven that are not. The virions are spherical particles with a diameter of about 50 nm. A member of the Japanese encephalitis sero-complex, JEV shares an antigenic and genetic composition with other significant arboviruses, including West Nile virus (WNV), Murray Valley encephalitis virus (MVEV), and St. Louis encephalitis virus (SLEV). Break it down, [8].

Japanese Encephalitis Epidemiology

With the introduction of JEV vaccines in economically developed countries and the widespread use of pesticides the late 1960s saw a decrease in the JEV load in Asia [9]. However, because of rises in pig production, growth in populations, and irrigated rice agriculture across Southeast Asia, there has been a larger burden of JE and a wider dissemination of JEV in recent decades [10]. A study conducted in Vietnam between 1998 and 2007 found that 217 out of 421 cases (52%) of acute meningoencephalitis (AME) were associated with JEV [11]. JEV was identified as the cause of 23 percent of AME cases in children under the age of 14 in Vietnam, according to ongoing surveillance conducted between 2007 and 2010 [12]. According to reports, JEV infection accounts for 35% of confirmed or highly probable cases of AME in young people younger than 15 old in Cambodia [13]. According to these data, JEV is a primary cause of AME instances in Asian youngsters.

The area of Australia surrounding the Torres Strait and Papua New Guinea, which were previously believed to be JEV-free, has also seen JEV outbreaks. A broad vaccination campaign and the evacuation of pig populations from human environments were the results of a JEV outbreak in the Torres Strait [14]. There hasn't been any fresh information on human JE infections in the Torres Straits, but moving the pigs doesn't completely eliminate the possibility of JEV circulation [15]. Sentinel animal and mosquito surveillance,

مجلة جامعة بابل للعلوم الصرفة والتطبيقية مجلة جامعة بابل للعلوم الصرفة والتطبيقية مجلة جامعة بابل للعلوم الصرفة والتطبيقية

ISSN: 2312-8135 | Print ISSN: 1992-0652

info@journalofbabylon.com | jub@itnet.uobabylon.edu.iq | www.journalofbabylon.com

however, have shown that the virus has persisted in spreading in this area. The first incidence of Japanese encephalitis (JE) was recorded in the Australian Northern Territory in 2021 [16], prompting worries about potential outbreaks in the area in the future. Furthermore, the 2016 discovery of an autochthonous case in Angola raises questions regarding the potential that JEV infection is spreading throughout Africa [17]. In most of Southeast Asia, surveillance for JE illness is still insufficient despite its high prevalence. Because many nations lack the diagnostic tools necessary to establish JEV infection, JE symptoms are frequently mislabeled as other viral illnesses. Because of this, evaluating JEV's situation in the Asia-Pacific area is challenging. Owing to the high viral seroprevalences in people, wild animals, and domestic animals [18]. In many nations without the diagnostic tools necessary to assess the JEV burden, health information is inadequate. JEV infection and transmission rates are underestimated in the Asia-Pacific area. To determine the full cost of JE, there has to be more JEV infection reporting and surveillance.

SYMPTOMS AND SIGNS

Most cases of JE infections are often mild and manifest as subclinical fever or no symptoms at all. But the rate of case fatalities among individuals with severe clinical disease (encephalitis) might reach up to 30%. Approximately 30 to 50 percent of patients who survive a severe illness experience neurological or behavioral consequences, as paralysis, frequent seizures, and/or difficulty speaking [19]. In individuals who develop neurological disease, there are three phases in the course of JE. During the prodromal phase, which is the initial stage, symptoms like chills, muscle soreness, meningitis, vomiting, and diarrhea are common. Reduced consciousness, convulsions, and Parkinsonian syndrome are symptoms of the second stage or acute phase. This condition progresses to viral encephalitis, which can cause cogwheel rigidity, generalized hypertonia, tremors, and other anomalies, possibly leading to a coma. Sometimes the illness advances quickly and has the potential to be fatal. The patient either recovers or experiences prolonged neurological aftereffects during the third stage, sometimes known as the late phase [20]. The most damaged brain region is discovered to be the hippocampus, although there is also damage to the brain stem, the spinal cord's anterior horn cells are called substantia nigra. thalamus, the basal ganglia, the parenchyma, the cerebral cortex, and the midbrain. There have been several histological abnormalities observed, such as cerebral edema, perivascular cuffing, glial mesenchymal nodules, vascular leakage, crowded leptomeninges, development of microglial nodules, and necrotic lesions [21]. The World Health Organization recommends that the primary diagnostic method for Japanese encephalitis be serological detection utilising IgM antibody capture ELISA in serum or cerebrospinal fluid. To rule out cross-reactivity with other flaviviruses, confirmatory diagnosis necessitates extra specialist testing, such as plaque reduction neutralisation testing (PRNT) in reference laboratories (Table 1)

Table (1). Diagnostic Methods for Japanese Encephalitis Virus: Comparison of Available Laboratory Techniques in Terms of Accuracy and Accessibility

Diagnostic method	Advantage	Disadvantage	Source
IgM Antibody Capture ELISA	primary diagnostic tool that the CDC and WHO endorse. • After 3–8 days of symptoms, there is a high sensitivity in serum and CSF. • It can be utilised to increase accuracy in differential testing (JE vs. Dengue). • Economical in situations where resources are scarce	False positives may result from cross-reactivity with other flaviviruses, such as dengue and West Nile. • IgM may last for 30 to 90 days, possibly indicating a previous immunisation or illness. • Convalescent sample retesting is necessary if the results are negative during the first ten days. • Needs qualified staff and laboratory infrastructure.	Siddalingaiah, N., et al. (2025). Enhancing Japanese Encephalitis diagnosis with differential ELISA testing in IndiaJournal of Vector Borne Diseases. Doi.org/10.4103/jvbd.jvbd_43_25.
Hemagglutinations Inhibition (HI) Assay	Easy to use, quick, and economical. • Suitable for screening large quantities of samples at high throughput.	In order to eliminate non-specific inhibitors, sera must be pretreated. • Utilizes goose erythrocytes, necessitating the production of new blood. • Compared to other viruses, JEV is less frequently standardized.	Zhao, J., et al. (2025)., Comparative Analysis of Hemagglutination -Inhibition and Plaque Reduction Neutralization Tests for Japanese Encephalitis Virus, Antibody Detection. Viruses, 17(1), 104. Doi.org/10.3390/v17010104.
Plaque Reduction Neutralization Test (PRNT)	Highest specificity among all JE tests. • Can distinguish between JEV and cross-reactive flavivirus antibodies. • Essential for confirmatory testing after positive ELISA. • Measures functional antibody response.	intricate and time-consuming (takes more than five days). • Needs BSL-3 facilities and live viruses. • Technically complex; needs skilled staff. • Unsuitable for high-throughput screening or routine diagnostics.	
Reverse Transcription-Polymerase Chain Reaction (RT-PCR)	high viral RNA sensitivity and specificity. • The most economical molecular surveillance technique. • Able to	Low/transient viraemia at the time symptoms occur makes it insensitive for human diagnosis. • Clinical human specimens frequently result in false negatives. •	Crispell, G., et al., (2022)., Method comparison for Japanese encephalitis virus detection in samples collected from the IndoPacific region., Frontiers in Public Health., 10,1051754. Doi.org/10.3389/fpubh.2022.1051754

مجلة جامعة بابل للعلوم الصرفة والتطبيقية مجلة جامعة بابل للعلوم الصرفة والتطبيقية مجلة جامعة بابل للعلوم الصرفة والتطبيقية
ISSN: 2312-8135 | Print ISSN: 1992-0652
info@journalofbabylon.com | jub@itnet.uobabylon.edu.iq | www.journalofbabylon.com

ISSN: 2312-8135 | Print ISSN: 1992-0652
info@journalofbabylon.com | jub@itnet.uobabylon.edu.iq | www.journalofbabylon.com
مجلة جامعة بابل للعلوم الصرفة والتطبيقية مجلة جامعة بابل للعلوم الصرفة والتطبيقية مجلة جامعة بابل للعلوم الصرفة والتطبيقية

	distinguish between genotypes. • Beneficial for animal samples and mosquito vectors.	Needs laboratory infrastructure and skilled workers. • Contamination risk.	
Biosensor-based Detection (Electrochemical, Nanomaterial-based)	Results come quickly (in minutes to hours). • Possibility of field deployment and point-of-care. • With nanomaterial augmentation, it may be extremely sensitive. • It's compact and portable.	Not available for regular use on the market. • Needs further standardization and validation. • Limited information on clinical evaluations. • Technology is still developing.	Kumar, A., et al., (2022)., A review on Japanese Encephalitis virus emergence., pathogenesis and detection., International Journal of Biological Macromolecules, 217, 1045-1058.

PATHOGENESIS OF JEV

The virus requires passage through several physical and physiological obstacles before it may begin to multiply. Once it has drawn blood from an infected host the virus releases its DNA into the cytoplasm after merging its viral envelope with the intestinal epithelial cells' plasma membrane upon entering the midgut. The virus then begins to replicate, releasing virions into the hemocoel. Once these virions pass via the trachea, they eventually arrive at the salivary glands. The virus releases virions into the saliva when it eventually penetrates the barrier protecting the salivary glands from infection and infects the acinar cells. Currently, the carrier mosquito is ready to inject the virus into the next victim. When a mosquito bites a healthy individual, the virus enters the skin and spreads to other parts of the body, where it might cause either a persistent infection that penetrates the nervous system or a latent infection that just affects mononuclear cells [22]. Pathogen-associated molecular patterns (PAMP) trigger genes by connecting to pathogen recognition receptors (PRR) via the JNK pathway. The virus can alter these interferons, changing the antiviral state of both nearby uninfected host cells and infected host cells. The skin's innate immune cells are the main targets of the virus [23]. Tissue macrophages and blood monocytes are where the virus multiplies. If humoral IgM is produced throughout the initial five days of the virus's incubation phase, the immune system might be able to eradicate the virus before it enters the central nervous system(CNS) [24].

In the event that this is not the case, the virus start to access the CNS by overcoming the blood-brain barrier, thereby initiating the clinical phase that poses the greatest risk (BBB). The cerebral blood barrier (BBB) can be compromised in a number of ways: (a) the virus can replicate directly through endothelial cells; (b) the virus can colonize in inflammatory

مجلة جامعة بابل للعلوم الصرفة والتطبيقية مجلة جامعة بابل للعلوم الصرفة والتطبيقية مجلة جامعة بابل للعلوم الصرفة والتطبيقية

ISSN: 2312-8135 | Print ISSN: 1992-0652
info@journalofbabylon.com | jub@itnet.uobabylon.edu.iq | www.journalofbabylon.com

cells or blood lymphocytes and enter the CSF through a Trojan horse mechanism; (c) Chymase, which relaxes the tight connection between endothelial cells, can be released by metalloproteases (MMP 2/MMP 9) or mast cells or (d) by receptor-mediated endocytosis [25].

Neuronal bystander death or direct neuronal cell death may arise from any of these processes. The virus causes an excess of cytokines that promote inflammation, including IL-6, iNOS, and TNF-α, after it enters the CSF. This finally causes inflammation in particular brain regions (neuroencephalitis) by activating astrocytes, pericytes, and microglial cells [26].
Research indicates that protection against JEV is provided by IFN-α (anti-inflammatory cytokine), This prevents assembly, release, and replication at various phases. Although its effectiveness has been investigated in vitro, no comparable result was seen in humans [27]. JEV further uses GKN3 and PLVAP receptors to enter neuronal cells. It then causes the death of neuronal cells and a decrease in the levels of IL-10 and IL-4, two anti-inflammatory cytokines. Further neuronal death is brought caused by the synthesis of inflammatory mediators by microglial and astrocyte cells, which is triggered by the destruction of nerve cells [28]. By enabling blood lymphocyte entrance into the CSF, chemokines (IP-10/ RANTES/ IL-8/ and MCP-1) secreted by microglial cells and astrocytes also contribute to an increase in infection. Neuron progenitor stem cells (NPSCs), which regulate the immune response to CSF, are prevented from proliferating by viral infection. For healthy brain cells, Interferon-induced long-term reduction of protein synthesis can be lethal. Research has shown that people with greater CSF levels of anti-JEV IgM have a higher chance of surviving without experiencing significant adverse impact on the central nervous system [29].

Created at the surface of the endoplasmic reticulum through the interplay of host factors, non-structural virus proteins, and LC3-1, EDEM 1, and SEI1L are examples of proteins known as endoplasmic reticulum-associated protein degradation (ERAD) [30]. In order to create double-stranded replicative forms, single-stranded RNA (ssRNA) must multiply. These forms serve as templates for the creation of positive sense mRNA. Next, host and viral proteases produce and break down viral proteins. Once the host furin at the trans-Golgi cleaves it to M, the virion matures by the release of prM, which forms in the lumen of the ER (figure 2) [31].

مجلة جامعة بابل للعلوم الصرفة والتطبيقية مجلة جامعة بابل للعلوم الصرفة والتطبيقية مجلة جامعة بابل للعلوم الصرفة والتطبيقية
ISSN: 2312-8135 | Print ISSN: 1992-0652
info@journalofbabylon.com | jub@itnet.uobabylon.edu.iq | www.journalofbabylon.com

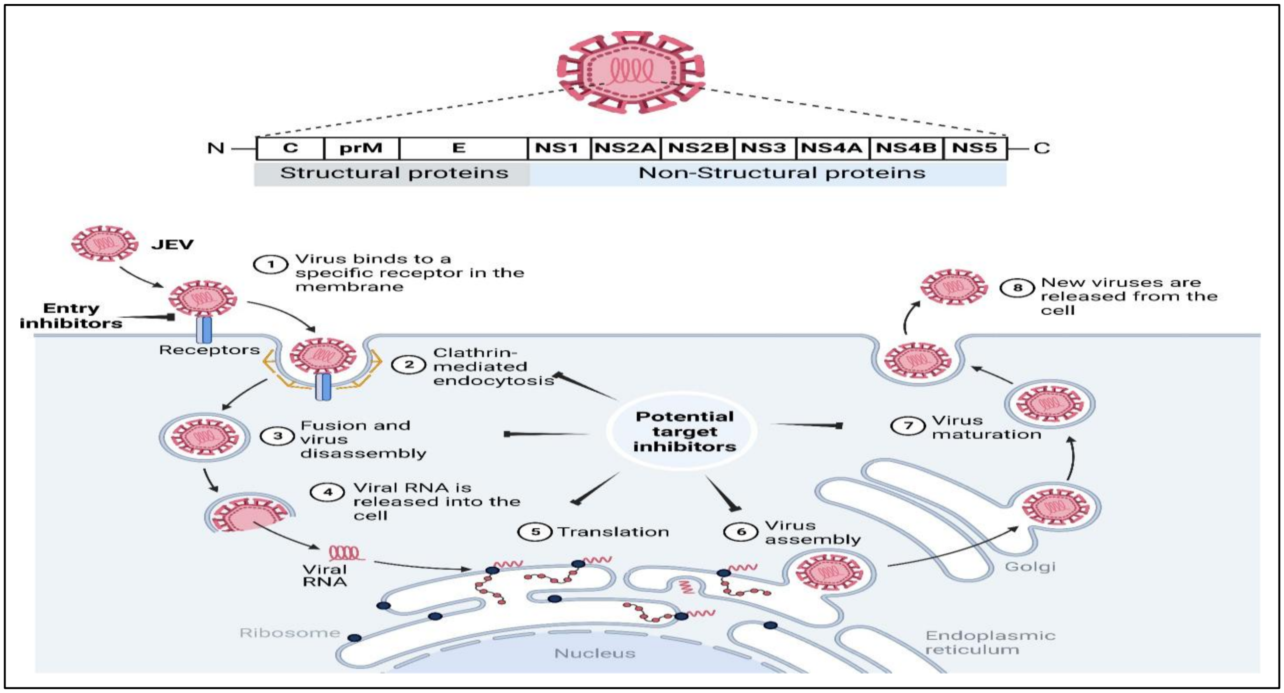

Fig.2 JEV structure, pathogenesis, and potential drug targets

Potential Consequences of Climate Change

The range of hosts, reservoir species, virus genotypes, and viral vectors can all be significantly impacted by climate change, which includes rising global temperatures, altered wind patterns, precipitation, and temperature changes. In addition to rising temperatures, potential JEV habitats may see periods of low precipitation, longer and more severe droughts, and higher-than-normal rainfall. There's also a chance that extreme weather phenomena like hurricanes and cyclones will happen more often and with more force. Climate is one of several variables that affect the intricate JEV ecology and epidemiology drivers, which include contributions from human, viral, vector, and host genomes behavior [49,50].

Temperature variations can affect the Culex mosquito's fertility, size, blood-feeding habits, immature and adult survival rates, and period of development. Variations in extrinsic incubation duration and vector competency are possible [32]. An essential component of field conditions is fluctuating diurnal temperatures, which might have a bigger impact than what can be inferred from changes in mean temperature alone [33].

The distribution of aquatic birds, like herons, that may carry the JEV virus but not show any symptoms, can also be impacted by temperature variations. The modeling of the reservoir species' distribution may include both daytime and nighttime temperatures as significant components [34]. Climate can have an impact on viral genotype; data indicates that tropical genotypes are G1-a and GII, while temperate genotypes are GIII and GI-b. However, more research is required to confirm these patterns because bias resulting from sampling and

مجلة جامعة بابل للعلوم الصرفة والتطبيقية مجلة جامعة بابل للعلوم الصرفة والتطبيقية مجلة جامعة بابل للعلوم الصرفة والتطبيقية

ISSN: 2312-8135 | Print ISSN: 1992-0652
info@journalofbabylon.com | jub@itnet.uobabylon.edu.iq | www.journalofbabylon.com

sequence availability could be the cause of these relationships. It will need more research to see whether genotype-defining substitutions may shed any light on the molecular mechanisms behind this phenomenon [35].

Long-lasting dry spells may be linked to fewer mosquito breeding grounds and the species that serve as their reservoirs, which will lessen the spread of JEV. Lower river flows can result in less irrigation water available, and significantly fewer rice fields can lead to much lower transmission. There will always be a replacement for amplifying species, like pigs. Pig vaccination is an uncommon practice, and in situations where there is little to no transmission, there may be less motivation for immunizing humans. Both human and pig populations that are vulnerable may rise significantly as a result of this scenario. JEV can spread over great distances by aquatic birds and is greatly amplified by pigs that lack immunity following a severe rain event that causes flooding [36], leading to a cascade into the vulnerable human populace.

Wind can carry mosquitoes a considerable distance [37]. Despite the well-established role that cyclones and other weather phenomena contribute to the spread of bluetongue and infected Culicoides outbreaks, there is little proof that wind-borne mosquitoes can disseminate the Japanese encephalitis virus (JEV) to new locations. Global warming-induced increases in the frequency and severity of these occurrences could enhance JEV's dispersion or bring it into regions where outbreaks are not yet occurring. In the future, there's a significant likelihood that endemic and epidemic zones with obvious seasonal fluctuations may disperse throughout Asia [38].

According to the most recent data, the following table shows the incidence, fatalities, and geographic distribution of Japanese encephalitis worldwide (table 2)

مجلة جامعة بابل للعلوم الصرفة والتطبيقية مجلة جامعة بابل للعلوم الصرفة والتطبيقية مجلة جامعة بابل للعلوم الصرفة والتطبيقية
ISSN: 2312-8135 | Print ISSN: 1992-0652
info@journalofbabylon.com | jub@itnet.uobabylon.edu.iq | www.journalofbabylon.com

Table (2) incidence, fatalities, and geographic distribution of Japanese encephalitis worldwide.

statistic	value	source
Annual Deaths	Approximately 25,000 deaths per year	Gavi (2025)., Japanese encephalitis. Gavi., the Vaccine Alliance. Retrieved from https:www.gavi.org/types-support/vaccine-support/japanese-encephalitis
Annual Cases (Estimated Primary)	Every year, about 100,000 clinical cases	WHO (2024)., Japanese encephalitis., World Health Organization. Fact sheet., Retrieved from https://www.who.int/news-room/fact-sheets/detail/japanese-encephalitis
Case Fatality Rate (CFR)	Up to 30% of people with symptoms of acute encephalitis	
Endemic Countries	24 nations in the Western Pacific and South-East Asia regions	
The Population at Risk	More than 3 billion individuals	

There are no local epidemiological statistics available for Arab countries because, according to all sources, they are beyond the virus's conventional transmission zone.

Vaccination against JEV

Several JEV-endemic nations are now using a number of JEV vaccines that have been developed. Across Southeast Asia, mouse brain or cell culture-derived inactivated vaccinations have shown astounding efficacy. Early research, carried out in Taiwan in 1965, showed an 80% effectiveness rate. Acceptance of the vaccine has been hindered due to its poor long-term immunity, expensive production costs, and reports of unpleasant effects, despite the fact that it has been found to be 80–100% efficacious in adults in the US, Thailand, Japan, India, and other countries. Vaccinations that are inactivated have gradually been replaced by live attenuated vaccinations. Children receive two or three doses of these vaccinations [39].

The immunogenic live-attenuated vaccine takes one or two doses throughout childhood and produces long-term immunity. 97.5% and 98% of recipients in China and Nepal, respectively, experienced seroconversion after two dosage regimens, and strong antibody levels persisted for up to five years following immunization [40].

مجلة جامعة بابل للعلوم الصرفة والتطبيقية مجلة جامعة بابل للعلوم الصرفة والتطبيقية مجلة جامعة بابل للعلوم الصرفة والتطبيقية

ISSN: 2312-8135 | Print ISSN: 1992-0652
info@journalofbabylon.com | jub@itnet.uobabylon.edu.iq | www.journalofbabylon.com

Although it was once exclusively available in China, it is currently the advised vaccination for numerous Asian endemic nations. In addition, a recombinant, live attenuated form JEV vaccine was created; it is both safe and efficacious, with 97% of children showing seroprotection five years following the booster dose. The efficiency of immunizations has come under scrutiny due to the emergence of JEV GI. Though at lower degrees of neutralization, serum from GIII-inactivated vaccine users could cross-neutralize GI viruses. Comparable research shows little cross-protection against local GI isolates when using animal antisera from GIII vaccinations [41]. Consequently, more investigation is needed to assess the efficacy of GIII JEV vaccines (table 2).

Campaigns, recurring immunization schedules, or a combination of the two are examples of JE vaccination tactics. A successful immunization approach is a one-time campaign aimed at young individuals, with the vaccine then being incorporated into routine immunization programs. 94% of the target population in Nepal was covered by widespread immunization efforts conducted between 2006 and 2009, aimed at children aged 1 to 15 [42]. In order to immunize children between the ages of 5 and 15, a JEV vaccine program was started in Myanmar in 2017. 2018 saw the implementation of routine immunization [43]. With around 12.6 million youngsters immunized, the campaign achieved 92.5% coverage nationally. As of yet, no information about the impact of this campaign on JEV circulation in Myanmar has been released. According to an extensive study conducted on 14 endemic countries between 2007 and 2021, campaign and routine immunization programs reduced cases of juvenile epilepsy (JE), deaths, and cases with sequelae. This decreased the number of disability-adjusted life years (DALYs) by 6,622,923 and saved USD19 million in cases of adult male epilepsy [44]. Therefore, it is anticipated that the introduction of JE vaccination programs in endemic nations will be extremely advantageous.

JEV is becoming easier to control thanks to vaccination campaigns, but more surveillance is required to raise the accuracy of JEV burden estimates. One of the main issues in determining the local and worldwide burden of JE and improving the identification of disease-risk areas is underreporting. The WHO has surveillance guidelines accessible [45]. Nevertheless, the ability to diagnose JEV is restricted in many JE-endemic nations. A WHO JEV laboratory network has been created to address this problem; it is modeled after laboratory networks for measles and polio [46]. Through growth and training, the network hopes to increase capacity for surveillance and diagnosis. With the network, JE surveillance is currently conducted in 92% of endemic Asian nations, up from 75% in the previous year [47]. These reports are most likely the result of earlier reporting irregularities combined with improvements in surveillance techniques.

مجلة جامعة بابل للعلوم الصرفة والتطبيقية مجلة جامعة بابل للعلوم الصرفة والتطبيقية مجلة جامعة بابل للعلوم الصرفة والتطبيقية
ISSN: 2312-8135 | Print ISSN: 1992-0652
info@journalofbabylon.com | jub@itnet.uobabylon.edu.iq | www.journalofbabylon.com

Table (3) Decline in Japanese Encephalitis cases and the role of vaccination

Country	Evidence of decline	Role of Vaccination	Source
Global Estimates	Annual global burden estimated at 100000 cases and 25,000 deaths	JE is a vaccine-preventable disease, widespread vaccination has significantly reduced incidence globally over the past two decades	WHO (2024)., Japanese encephalitis., World Health Organization. Fact sheet., Retrieved from https:www.who.int/news-room/fact-sheets/detail/japanese-encephalitis
Vaccine-introducing counties prior to 2006 (5 countries + Chinese Taipei)	73–100% decrease in the incidence of JE in all age groups between 5 and 20 years after introduction	Significant reductions were attained by long-term national immunization campaigns, but it required about 20 years and significant funding.	Letson, G. W., et al., the JE Vaccine Global Impact Assessment Team (2024)., Impact of vaccination against Japanese encephalitis in endemic countries. PLoS Neglected Tropical Diseases, 18(9), e0012390. Doi.org/10.1371/journal.pntd.0012390
Six countries have been introducing vaccines since 2006.	Between 2015 and 2021, the incidence of JE among children under the age of fifteen decreased by 14–79%.	Impact was shown, but after the first introduction, coverage needs to be maintained by ongoing delivery system upgrades.	
Japan	Before the 1960s, there was a sharp drop from over 1,000 cases annually to less than 10 instances annually; however, new reports reveal that this number may have been underestimated.	The JE vaccine was first developed in 1954, and its widespread use in children starting in 1967 significantly reduced the burden of disease.	Yoshizawa, K., et al., (2025)., Emergence of Japanese encephalitis in a previously non-reported area: Three consecutive annual cases from a tertiary center in Narita, Chiba, Japan. Journal of Infection and Chemotherapy., 31(6), 102706. Doi.org/10.1016/j.jiac.2025.102706.
Guizhou Province, China	A notable decrease in the prevalence of JE was observed between 2005 and 2021; the average incidence was 0.83 per 100,000, and it peaked in 2020 during the COVID-19 pandemic.	Participation in expanded immunisation programmes and catch-up efforts had a notable effect on the incidence rate's decline.	Zhang, W.X. Zhao, S., Pan, C., Zhou, Y., Wang, C., Rui, L., Du, J., Wei, T. T., Liu, Y. Q., Liu, M., Lu, Q. B., & Cui, F. (2024). Mass immunisation to eradicate Japanese encephalitis: Real-world evidence from Guizhou Province in 2005–2021. Journal of Virus Eradication, 10(1), 100366. https://doi.org/10.1016/j.jve.2024.100366

Gavi supported countries (Laos, Nepal, Myanmar, Cambodia, Indonesia)	By the end of 2023, more than 7.8 million children had received vaccinations through regular programs, and more than 17.7 million through catch-up initiatives.	The Gavi programme started in 2015, and Bangladesh is expected to launch a subnational campaign in 2026.	Gavi (2025). Japanese encephalitis. Gavi, the Vaccine Alliance. Retrieved from https:www.gavi.org/types-support/vaccine-support/japanese-encephalitis

Table (3) Types of Japanese Encephalitis Vaccines Available in Arab Countries: Advantages and Disadvantages

Vaccine type	Advantages	Disadvantages	Source
Inactivated Vero Cell Vaccine IXIARO® (Valneva, Austria) / JESPECT	Most extensively accessible abroad and in travel clinics. All children ≥2 months are approved (paediatric data available). • Safe for pregnant women and those with impaired immune systems (where risk exceeds risk). 95% seroprotection at 1 month after the first series and 92% at 5–6 months indicate high immunogenicity. • Shown to be interchangeable with booster doses from other vaccination classes.	requires a two-dose main series spaced 28 days apart to provide complete protection. • Series completion is required at least one week prior to departure. • Seniors have lower seroprotection (65% in those aged ≥64 years). Among the local reactions are redness, discomfort, and soreness (50 per cent in adults and children). Fatigue (11%), fever (8%), and muscle discomfort (31%) are examples of systemic responses.	Furuya-Kanamori, L., et al., (2021). Comparison of immunogenicity and safety of licensed Japanese encephalitis vaccines, A systematic review and network meta-analysis. Vaccine., 39(32), 4429-4436. Doi.org/10.1016/j.vaccine.2021.06.023.
Live chimeric vaccine (yellow fever 17D backbone) IMOJEV® (Sanofi Pasteur) / JE-CV / ChimeriVax™-JE	just one dosage. • Of all the JE vaccines, the most immunogenic: OR = 5.93 for seroconversion compared to previous mouse-brain vaccines. • Long-term protection: Following	Immunocompromised and pregnant women should not use this medication. • Has the backbone of the yellow fever virus (rare hypersensitivity potential). • Inadequate data on senior citizens. •	

ISSN: 2312-8135 | Print ISSN: 1992-0652
info@journalofbabylon.com | jub@itnet.uobabylon.edu.iq | www.journalofbabylon.com

	a single dose, models anticipate protection for up to 25 years. • Shown to be interchangeable with CD. JEVAX® enhancer	Typical response: children's fever and agitation	
Inactivated Vero Cell Vaccine (Indian Strain) JENVAC® (Bharat Biotech, India)	Unlike other inactivated vaccines that need two doses, a single-dose primary series is feasible. • At 1 year, the highest long-term immunogenicity was GMT 33.7, compared to 12.2 for live attenuated. • One-year seroprotection: 81.7% (compared to 47.9% for live attenuated). • Seroprotected at 2 years: 88.5%. • Showed that live attenuated SA 14-14-2 could be interchanged.	primarily accessible in South Asia and India at the moment. • International availability is lower than that of IXIARO. • In non-endemic traveller populations, there is less data.	Infectious Disease Advisor (2020). Long-Term Immune Response With Single-Dose, Inactivated Japanese Encephalitis Vaccine. Based on Vadrevu, K. M., et al. (2020). Persistence of immune responses, with an inactivated Japanese encephalitis, single-dose vaccine., JENVAC and interchangeability with a live-attenuated vaccine. Journal of Infectious Diseases., 222(9), 1478-1487. Doi.org/10.1093/infdis/jiz672.
Live Attenuated Vaccine (SA14-14-2 strain) CD.JEVAX® (Chengdu Institute, China)	Mass campaigns are made simpler with a single-dosage primary series. • WHO prequalified, extensively utilised in Asia. • Long-term protection: five years after the booster, 97.5% seroprotection was observed. • GMT 2092.4 at 30 days after booster; highly immunogenic. • Proven compatibility with IMOJEV® for booster dosages	Not recommended for immunocompromised people (live virus) or pregnant women. • Within seven days, 20% of recipients experience a common reaction: fever. • Lower GMT (12.2 vs. 33.7) in comparison to inactivated JENVAC at 1 year. • Only 47.9% of patients had 1-year seroprotection (compared to 81.7% for JENVAC). • In certain schedules, a booster is advised after a year	Porntharukchareon, T., et al. (2024)., Long-term immunogenicity of the SA14-14-2 Japanese encephalitis (JE), vaccine (CD.JEVAX) booster following chimeric JE (IMOJEV) vaccine priming in Thai children. Human Vaccines and Immunotherapeutics, 20(1), 2407663.

ISSN: 2312-8135 | Print ISSN: 1992-0652
info@journalofbabylon.com | jub@itnet.uobabylon.edu.iq | www.journalofbabylon.com

مجلة جامعة بابل للعلوم الصرفة والتطبيقية مجلة جامعة بابل للعلوم الصرفة والتطبيقية مجلة جامعة بابل للعلوم الصرفة والتطبيقية

Inactivated Vaccine (Indian Pediatric) JEEV® (Biological E. Limited, India)	WHO was prequalified. • Offered in formulations for adults (6 µg) and children (3 µg). • Frequently utilized in Indian vaccination campaigns	• Limited availability outside of South Asia and India. • Needs two doses	The Tribune (2025). JE vaccine interchangeability, ICMR to study mixed regimen impact. Retrieved from https:www.tribuneindia.com/news/je-vaccine-interchangeability-icmr-to-study-mixed-regimen-impact/

CONCLUSIONS

In many Asian countries, despite the availability of safe and effective vaccinations, vaccination rates are still low in the majority of places where JEV is most needed, making it a persistent public health risk. As mosquito species that have adapted to human habitats spread regionally and climate change may have an effect, there are worries that the Japanese encephalitis virus may continue to spread to new places because there are insufficient vector control measures in place.

Conflict of interests.

There are non-conflicts of interest.

References

1. Peng, C., Qin, H., Yu, F., Hao, Y., Yuan, Y., Ma, W., ... & Li, N. Epidemiology, Transmission, and Evolution of Japanese Encephalitis Virus. *Microorganisms*,2025, 13(6), 1226.
2. Simmonds, P.; Becher, P.; Bukh, J.; Gould, E.A.; Meyers, G.; Monath, T.; Muerhoff, S.; Pletnev, A.; Rico-Hesse, R.; Smith, D.B.; et al. ICTV Virus Taxonomy Profile: Flaviviridae. *J. Gen. Virol.* **2017**, *98*, 2–3.
3. Mackenzie, J.S.; Williams, D.T.; Hurk, A.F.V.D.; Smith, D.W.; Currie, B.J. Japanese Encephalitis Virus: The Emergence of Genotype IV in Australia and Its Potential Endemicity. *Viruses* **2022**, *14*, 2480.
4. Campbell, G.L.; Hills, S.L.; Fischer, M.; Jacobson, J.A.; Hoke, C.H.; Hombach, J.M.; Marfin, A.A.; Solomon, T.; Tsai, T.F.; Tsu, V.D.; et al. Estimated global incidence of Japanese encephalitis: A systematic review. *Bull. World Health Organ.* **2011**, *89*, 766–774.
5. Pearce, J.C.; Learoyd, T.P.; Langendorf, B.J.; Logan, J.G. Japanese encephalitis: The vectors, ecology and potential for expansion. *J. Travel Med.* **2018**, *25*, S16–S26.
6. Ricklin, M.E.; García-Nicolás, O.; Brechbühl, D.; Python, S.; Zumkehr, B.; Nougairede, A.; Charrel, R.N.; Posthaus, H.; Oevermann, A.; Summerfield, A. Vector-free transmission and persistence of Japanese encephalitis virus in pigs. *Nat. Commun.* **2016**, *7*, 10832.
7. Chiou, S.-S.; Chen, J.-M.; Chen, Y.-Y.; Chia, M.-Y.; Fan, Y.-C. The feasibility of field collected pig oronasal secretions as specimens for the virologic surveillance of Japanese encephalitis virus. *PLoS Negl. Trop. Dis.* **2021**, *15*, e0009977.
8. Kumar, S., Verma, A., Yadav, P., Dubey, S.K., Azhar, E.I., Maitra, S.S. and Dwivedi, V.D., 2022. Molecular pathogenesis of Japanese encephalitis and possible therapeutic strategies.

ISSN: 2312-8135 | Print ISSN: 1992-0652
info@journalofbabylon.com | jub@itnet.uobabylon.edu.iq | www.journalofbabylon.com

مجلة جامعة بابل للعلوم الصرفة والتطبيقية مجلة جامعة بابل للعلوم الصرفة والتطبيقية مجلة جامعة بابل للعلوم الصرفة والتطبيقية

ISSN: 2312-8135 | Print ISSN: 1992-0652
info@journalofbabylon.com | jub@itnet.uobabylon.edu.iq | www.journalofbabylon.com

Archives of virology, 167(9), pp.1739-1762.

9. Mulvey, Peter, Veasna Duong, Sebastien Boyer, Graham Burgess, David T. Williams, Philippe Dussart, and Paul F. Horwood. "The ecology and evolution of Japanese encephalitis virus." Pathogens 10, no. 12 (2021): 1534.

10. Laborte, A.G.; Gutierrez, M.A.; Balanza, J.G.; Saito, K.; Zwart, S.J.; Boschetti, M.; Murty, M.V.R.; Villano, L.; Aunario, J.K.; Reinke, R.; et al. RiceAtlas, a spatial database of global rice calendars and production. *Sci. Data* **2017**, *4*, 170074.

11- Sharma, Priya, Krupanshu Parmar, Aishika Datta, Bijoyani Ghosh, Deepaneeta Sarmah, Anupom Borah, and Pallab Bhattacharya. "Recent Progress and Challenges of Acute Encephalitis Syndrome: An update on pathogenesis and Interventional Approaches." Brain Disorders (2025): 100267.

12-Ho Dang Trung, N.; Le Thi Phuong, T.; Wolbers, M.; Nguyen Van Minh, H.; Nguyen Thanh, V.; Van, M.P.; Thieu, N.T.; Le Van, T.; Song, D.T.; Le Thi, P.; et al. Aetiologies of central nervous system infection in Viet Nam: A prospective provincial hospital-based descriptive surveillance study. *PLoS ONE* **2012**, *7*, e37825.

13-Horwood, P.F.; Duong, V.; Laurent, D.; Mey, C.; Sothy, H.; Santy, K.; Richner, B.; Heng, S.; Hem, S.; Cheval, J.; et al. Aetiology ofacute meningoencephalitis in Cambodian children, 2010–2013. *Emerg. Microbes Infect.* **2017**, *6*, 1–8.

14-Khan, Afsheen, Rumaisa Riaz, Abdullah Nadeem, Ayesha Amir, Tasmiyah Siddiqui, and Nahid Raufi. "Japanese encephlu emergence in Australia: the potential population at risk." Annals of Medicine and Surgery 86, no. 3 (2024): 1540-1549.

15-Van den Hurk, A.F.; Ritchie, S.A.; Johansen, C.A.; Mackenzie, J.S.; Smith, G.A. Domestic pigs and Japanese encephalitis virus infection, Australia. *Emerg. Infect. Dis.* **2008**, *14*, 1736.

16- Mackenzie, John S., David T. Williams, Andrew F. van den Hurk, David W. Smith, and Bart J. Currie. "Japanese encephalitis virus: the emergence of genotype IV in Australia and its potential endemicity." Viruses 14, no. 11 (2022): 2480.

17-Simon-Loriere, E.; Faye, O.; Prot, M.; Casademont, I.; Fall, G.; Fernandez-Garcia, M.D.; Diagne, M.M.; Kipela, J.M.; Fall, I.S.; Holmes, E.C.; et al. Autochthonous Japanese encephalitis with yellow fever coinfection in Africa. *N. Engl. J. Med.* **2017**, *376*, 1483–1485.

18 Mansfield, K.L.; Hernández-Triana, L.M.; Banyard, A.C.; Fooks, A.R.; Johnson, N. Japanese encephalitis virus infection, diagnosis and control in domestic animals. *Vet. Microbiol.* **2017**, *201*, 85–92.

19 Tiwari, S.; Singh, R.K.; Tiwari, R.; Dhole, T.N. Japanese encephalitis: A review of the Indian perspective. *Braz. J. Infect. Dis.* **2012**,*16*, 564–573.

20 Unni, S.K.; Ružek, D.; Chhatbar, C.; Mishra, R.; Johri, M.K.; Singh, S.K. Japanese encephalitis virus: From genome to infectome. *Microbes Infect.* **2011**, *13*, 312–321.

21- Campbell, G.L.; Hills, S.L.; Fischer, M.; Jacobson, J.A.; Hoke, C.H.; Hombach, J.M.; Marfin, A.A.; Solomon, T.; Tsai, T.F.; Tsu, V.D.; et al. Estimated global incidence of Japanese encephalitis: A systematic review. *Bull. World Health Organ.* **2011**, *89*, 766–774.

22-Eynde, C.V.D.; Sohier, C.; Matthijs, S.; De Regge, N. Japanese Encephalitis Virus Interaction with Mosquitoes: A Review of Vector Competence, Vector Capacity and Mosquito Immunity. *Pathogens* **2022**, *11*, 317.

23- Muhammad, Imaan, Kaia Contes, Moses T. Bility, and Qiyi Tang. "Chasing Virus Replication and Infection: PAMP-PRR Interaction Drives Type I Interferon Production, Which in Turn Activates ISG Expression and ISGylation." Viruses 17, no. 4 (2025): 528.

24- Chauhan, S.; Rathore, D.K.; Sachan, S.; Lacroix-Desmazes, S.; Gupta, N.; Awasthi, A.; Vrati, S.; Kalia, M. Japanese Encephalitis Virus Infected Human Monocyte-Derived Dendritic Cells

Activate a Transcriptional Network Leading to an Antiviral Inflamma- tory Response. *Front. Immunol.* **2021**, *12*, 638694.

25- Srivastava, Kumar Saurabh, Vandana Jeswani, Nabanita Pal, Babita Bohra, Vaishali Vishwakarma, Atharva Ashish Bapat, Yamini Prashanti Patnaik, Navin Khanna, and Rahul Shukla. "Japanese encephalitis virus: an update on the potential antivirals and vaccines." Vaccines 11, no. 4 (2023): 742.

26-Bertrand, Luc, Madhavan Nair, and Michal Toborek. "Solving the blood-brain barrier challenge for the effective treatment of HIV replication in the central nervous system." Current pharmaceutical design 22, no. 35 (2016): 5477-5486.

27- Wongchitrat, Prapimpun, Theerawut Chanmee, and Piyarat Govitrapong. "Molecular mechanisms associated with neurodegeneration of neurotropic viral infection." Molecular Neurobiology 61, no. 5 (2024): 2881-2903.

28- Gao, X.; Liu, H.; Li, M.; Fu, S.; Liang, G. Insights into the evolutionary history of Japanese encephalitis virus (JEV) based on whole-genome sequences comprising the five genotypes. *Virol. J.* **2015**, *12*, 43.

29- Jurcau, Anamaria, and Aurel Simion. "Neuroinflammation in cerebral ischemia and ischemia/reperfusion injuries: from pathophysiology to therapeutic strategies." International journal of molecular sciences 23, no. 1 (2021): 14.

30- Sakamoto, R.; Tanimoto, T.; Takahashi, K.; Hamaki, T.; Kusumi, E.; Crump, A. Flourishing Japanese encephalitis, associated with global warming and urbanisation in Asia, demands widespread integrated vaccination programmes. *Ann. Glob. Health* **2019**, *85*, 111.

31- Agarwal, A.; Parida, M.; Dash, P.K. Impact of transmission cycles and vector competence on global expansion and emergence ofarboviruses. *Rev. Med. Virol.* **2017**, *27*, e1941.

32- Samuel, G.H.; Adelman, Z.N.; Myles, K.M. Temperature-dependent effects on the replication and transmission of arthropod-borneviruses in their insect hosts. *Curr. Opin. Insect Sci.* **2016**, *16*, 108–113.

33- Furlong, Morgan, Andrew Adamu, Roslyn I. Hickson, Paul Horwood, Maryam Golchin, Andrew Hoskins, and Tanya Russell. "Estimating the distribution of Japanese encephalitis vectors in Australia using ecological niche modelling." Tropical Medicine and Infectious Disease 7, no. 12 (2022): 393.

34- Schuh, A.J.; Ward, M.J.; Leigh Brown, A.J.; Barrett, A.D. Phylogeography of Japanese encephalitis virus: Genotype is associatedwith climate. *PLoS Negl. Trop. Dis.* **2013**, *7*, e2411.

35- Huestis, D.L.; Dao, A.; Diallo, M.; Sanogo, Z.L.; Samake, D.; Yaro, A.S.; Ousman, Y.; Linton, Y.M.; Krishna, A.; Very, L.; et al. Windborne long-distance migration of malaria mosquitoes in the Sahel. *Nature* **2019**, *574*, 404–408.

36- Fernández-Carrión, E.; Ivorra, B.; Ramos, Á.M.; Martinez-Lopez, B.; Aguilar-Vega, C.; Sánchez-Vizcaíno, J.M. An advection- deposition-survival model to assess the risk of introduction of vector-borne diseases through the wind: Application to bluetongue outbreaks in Spain. *PLoS ONE* **2018**, *13*, e0194573.

37- Metelka, J.; Robertson, C.; Stephen, C. Japanese encephalitis: Estimating future trends in Asia. *AIMS Public Health* **2015**, *2*, 601–615.

38-Wongchitrat, Prapimpun, Theerawut Chanmee, and Piyarat Govitrapong. "Molecular mechanisms associated with neurodegeneration of neurotropic viral infection." Molecular Neurobiology 61, no. 5 (2024): 2881-2903.

39-Asawapaithulsert, Punyisa, Thundon Ngamprasertchai, and Amornphat Kitro. "Japanese encephalitis vaccine acceptance and strategies for travelers: insights from a scoping review and practitioners in endemic countries." Vaccines 11, no. 11 (2023): 1683.

ISSN: 2312-8135 | Print ISSN: 1992-0652
info@journalofbabylon.com | jub@itnet.uobabylon.edu.iq | www.journalofbabylon.com

40- Chatterjee, Kripasindhu, Atanu Bhadra, Swapan Kumar Ray, Subhasis Mukherjee, and Sukanta Sen. "Review of Japanese encephalitis vaccines in India." Asian Pac J Health Sci 9 (2022): 272-83.
41- Hills, Susan L. "Japanese encephalitis vaccine: recommendations of the advisory committee on immunization practices." MMWR. Recommendations and Reports 68 (2019).
42- Vodicka, Elisabeth, Marita Zimmermann, Anna Lena Lopez, Maria Wilda Silva, Leonita Gorgolon, Toda Kohei, Jessica Mooney, Farzana Muhib, Clint Pecenka, and Anthony A. Marfin. "Japanese encephalitis vaccination in the Philippines: A cost-effectiveness analysis comparing alternative delivery strategies." Vaccine 38, no. 13 (2020): 2833-2840.
43- Ngwe Tun, Mya Myat, Aung Kyaw Kyaw, Khine Mya Nwe, Shingo Inoue, Kyaw Zin Thant, and Kouichi Morita. "Effectiveness of the SA 14-14-2 live-attenuated Japanese encephalitis vaccine in Myanmar." Vaccines 9, no. 6 (2021): 568.
44- Win, Aung Ye Naung, Khin Thet Wai, Anthony D. Harries, Nang Thu Thu Kyaw, Tin Oo, Wint Phyo Than, Htar Htar Lin, and Zaw Lin. "The burden of Japanese encephalitis, the catch-up vaccination campaign, and health service providers' perceptions in Myanmar: 2012–2017." Tropical Medicine and Health 48, no. 1 (2020): 13.
45- Quan, T. M., Thao, T. T. N., Duy, N. M., Nhat, T. M., & Clapham, H. (2020). Estimates of the global burden of Japanese encephalitis and the impact of vaccination from 2000-2015. Elife, 9, e51027.
46- Vannice, Kirsten S., et al. "The future of Japanese encephalitis vaccination: expert recommendations for achieving and maintaining optimal JE control." npj Vaccines 6.1 (2021): 82.
47- Goel, V., Mathew, S., Gudi, N., Jacob, A., & John, O. (2023). A scoping review on laboratory surveillance in the WHO Southeast Asia Region: Past, present and the future. Journal of Global Health, 13.

ISSN: 2312-8135 | Print ISSN: 1992-0652
info@journalofbabylon.com | jub@itnet.uobabylon.edu.iq | www.journalofbabylon.com

ISSN: 2312-8135 | Print ISSN: 1992-0652
info@journalofbabylon.com | jub@itnet.uobabylon.edu.iq | www.journalofbabylon.com

الخلاصة

فيروس التهاب الدماغ الياباني(JEV) هو سبب التهاب الدماغ الياباني(JE) ، وهو عدوى دماغية قد تكون قاتلة تنتقل عبر لدغات البعوض. يُعدّ فيروس التهاب الدماغ الياباني (JEV)، المتوطن في 24 دولة ويُشكّل خطرًا على ما يقرب من 3 مليارات شخص، السبب الرئيسي لالتهاب الدماغ الفيروسي في آسيا. ويُقدّر عدد الحالات السريرية بنحو 100,000 حالة، وعدد الوفيات بنحو 25,000 حالة سنويًا في جميع أنحاء العالم. يجب على المسافرين إلى المناطق الموبوءة التطعيم، حتى وإن كانت الدول العربية لا تزال خارج مناطق انتقال العدوى. الوقاية: تشمل اللقاحات المعتمدة من منظمة الصحة العالمية لقاحات معطلة (IXIARO)، ولقاحات حية مُضعفة (IMOJEV، CD. JEVAX)، ولقاحات هندية (JENVAC). تختلف الجرعة والفئات المستهدفة وموانع الاستخدام لكل لقاح. على الرغم من أن فعالية اللقاحات الحالية قد تتأثر بظهور النمط الجيني الخامس، إلا أن حملات التطعيم المستمرة قد خفضت عدد الدول الموبوءة بنسبة تتراوح بين 73% و100%. لاستبعاد التفاعل المتبادل مع فيروسات الفلافيفيروس، يُجرى التشخيص الأولي باستخدام اختبار ELISA لالتقاط الأجسام المضادة IgM في المصل/السائل النخاعي (موصى به من منظمة الصحة العالمية)، يليه اختبار PRNT التأكيدي في المختبرات المرجعية. ونظرًا لوجود الفيروس في الدم بشكل مؤقت، فإن قدرة اختبار RT-PCR على تشخيص البشر محدودة، على الرغم من فائدته في المراقبة. وتزيد العوامل الاجتماعية والبيئية، التي سُجلت تاريخيًا خلال الحرب الكورية (402 حالة في الولايات المتحدة، 1950)، من العبء بسبب عدم الاستقرار الاجتماعي (الحرب، والنزوح، وانهيار النظام الصحي) من خلال تعطيل التحصين، وإضعاف المراقبة، وزيادة التعرض للنواقل.

الكلمات المفتاحية: فيروس التهاب الدماغ الياباني، التطعيم، علم الأوبئة، الكيولكس، الفيروس المصفر.