

MINISTRY OF EDUCATION AND TRAINING MINISTRY OF HEALTH
NATIONAL INSTITUTE OF MALARIOLOGY-PARASITOLOGY
AND ENTOMOLOGY

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**CHARACTERISTICS OF SEQUELAE OF VIRAL
ENCEPHALITIS IN CHILDREN AND TREATMENT
EFFECTIVENESS AT NATIONAL HOSPITAL OF
ACUPUNCTURE (2022 – 2023)**

Major: Infectious diseases and tropical diseases
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2. Tran Thi Lien, Tran Van Thanh, Pham Hong Van (2025), Some clinical characteristics of sequelae of viral encephalitis in pediatric patients treated at National Hospital of Acupuncture, 2022-2023. Vietnam Journal of Community Medicine, No. 66(12), pp. 222-226.
3. Tran Thi Lien, Tran Van Thanh, Pham Hong Van (2025), The effectiveness of rehabilitation treatment for motor function in children with sequelae of viral encephalitis at National Hospital of Acupuncture, 2022-2023. Vietnam Journal of Community Medicine, No. 66(5), pp.52-58.
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LIST OF ABBREVIATIONS

CI	Confidence Interval
CMV	Cytomegalovirus
DiD	Difference in Differences
DC	Control
DT	Treatment
EBV	Epstein-Barr Virus
ELISA	Enzyme-linked immunosorbent assay
EV	Echovirus
GMFCS	Gross Motor Function Classification System
HSV	Herpes simplex virus
JEV	Japanese encephalitis virus
MAS	Modified Ashworth Scale
MRI	Magnetic Resonance Imaging
NC	Research
OR	Odds ratio
PCR	Polymerase chain reaction
SD	Standard deviation
WHO	World health organization
$\bar{X}$	Mean value
YHHĐ	Modern medicine
YHCT	Traditional medicine
VZV	Varicella Zoster Virus
Z-score	Child nutritional status assessment index

INTRODUCTION

Encephalitis is an acute inflammation of the brain parenchyma, manifested by localized or diffuse neuropsychiatric dysfunction. There are many causes of encephalitis, but the main cause is viruses. Viral encephalitis has become a top concern globally, especially in Asian countries, including Vietnam, because the disease has a high mortality rate and severe neurological sequelae. Solomon's 2007 study identified the causative agents of encephalitis specific to the Asian region as Japanese encephalitis virus and *Herpes simplex* virus. The sequelae stage is about 2-6 weeks after the acute encephalitis stage. Viral encephalitis often occurs in young children and leaves many severe sequelae for children such as: slow mental and motor development, reduced movement of half the body or limbs, aphasia, language disorders, partial or total epilepsy, muscle tone disorders, parkinsonian tremor; emotional, behavioral, temperamental and personality disorders; memory loss, dementia. According to a study by Ho Thi Bich at the Department of Infectious Diseases at National Children's Hospital in 2019, the rate of children with sequelae of viral encephalitis was 43.3%. Of which, the rate of children with severe sequelae accounted for 79.5%; moderate sequelae 17.9%; mild sequelae 2.6%.

National Hospital of Acupuncture is a grade I specialized hospital under Ministry of Health, ranked as a specialized hospital in the field of acupuncture and traditional medicine. The hospital has regularly received and treated children with sequelae of viral encephalitis with complex and diverse treatment needs using the cerebrolysin hydroacupuncture method. The study and application of a treatment regimen combining electroacupuncture, cerebrolysin hydroacupuncture and acupressure massage opens up a new direction, improves treatment effectiveness, and contributes to building a comprehensive and scientific intervention model based on the foundation of combining Eastern and Western medicine. Based on that reality, we conducted a research on the topic: ***“Characteristics of sequelae of viral encephalitis in children and treatment effectiveness at National Hospital of Acupuncture (2022 - 2023)”***, aiming at the following two objectives:

1. Describe some characteristics of sequelae of viral encephalitis in children treated at National Hospital of Acupuncture, 2022 - 2023.

2. Evaluate the effectiveness of motor rehabilitation treatment in the research subjects.

NEW CONTRIBUTIONS AND SCIENTIFIC SIGNIFICANCE, PRACTICAL SIGNIFICANCE OF THE THESIS

The application of Cerebrolysin hydroacupuncture to acupuncture points in the treatment of sequelae of viral encephalitis in children. This is a unique combination of traditional medicine and modern medicine, in which cerebrolysin is directly injected into acupuncture points to increase bioavailability, while stimulating the nerve reflex area, helping to improve treatment effectiveness. This method has not been widely applied in pediatric rehabilitation in Vietnam. The combination of hydroacupuncture with electroacupuncture and acupressure massage creates a multi-modal, comprehensive and highly applicable treatment regimen. On the other hand, the topic is designed using descriptive research methods, controlled intervention research with a large enough sample size, the data is analyzed using advanced software currently applied in the world and Vietnam, so the thesis data has high reliability.

THESIS STRUCTURE

The 129-page thesis includes: 2-page introduction; 34-page literature review; 25-page research object and method; 33-page research results; 32-page discussion; 2-page conclusion; 1-page recommendation; 1-page new contributions. The thesis has 12 figures, 46 data tables, including 35 data tables of research results. There are 125 references, 71 foreign documents, 54 vietnamese documents and 73 references in the past 5 years.

Chapter 1: LITERATURE REVIEW

1.1. Viral encephalitis

Etiology: There are currently many studies looking for the cause of viral encephalitis. However, scientists have only found out about 25% of cases that have identified the cause of the disease, while up to 75% of cases have not yet identified the cause.

Encephalitis is an inflammation of the brain parenchyma accompanied by neurological dysfunction and is an important cause of illness, death and permanent neurological disability in both adults and children. This disease attacks 1.9 to 14.3 people per 100,000

people/year, causing an average of 20,258 hospitalizations per year. Even those who survive severe encephalitis suffer from sequelae, such as fatigue, irritability, lack of concentration, seizures, memory loss, hearing and vision impairment.

Japanese encephalitis is the largest cause of viral encephalitis globally, while herpes simplex virus is the most common cause of infectious encephalitis in Western countries, the figures are much lower than in developing countries where rabies, Japanese encephalitis virus and tick-borne encephalitis virus account for many times the number of cases each year. The incidence of encephalitis of 5.23 cases per 100,000 per year in the UK has risen to 185 cases per 100,000 in a rural area of Nepal during a Japanese encephalitis outbreak.

Epidemiological characteristics:

Studies in the first decade of the 21st century show that the incidence of the disease is still between 3.5 and 7.4/100,000 people - mainly in children and more in men.

In Asia, acute encephalitis syndromes are quite common, in which the Japanese encephalitis virus is identified as the leading agent causing acute encephalitis syndromes in children in the Asia-Pacific region including China, Japan, Korea, the Russian Far East, Taiwan, India, Pakistan, Nepal, Bangladesh, Australia... and the whole.

Japanese encephalitis virus is the most frequently recorded cause of encephalitis in children in Southeast Asia and is associated with a high burden of neuropsychiatric sequelae. An estimated 50,000 cases of encephalitis due to Japanese encephalitis virus occur each year in the Greater Mekong Subregion, including Myanmar, China, Laos, Thailand, Cambodia and Vietnam. This estimate may be lower than the actual due to inadequate surveillance and reporting. Furthermore, many other major threats to public health such as dengue virus, West Nile virus, enterovirus A71 can also lead to encephalitis, with high rates of hospitalization, death and long-term sequelae compared to Europe, North America and Australia.

According to data from the Vietnam Preventive Medicine Department, in the period 2001 - 2004, our country had 2,000 - 2,200 cases of the disease each year. In the past 10 years, the number of cases has decreased to about 1,000 - 1,200 cases each year with 20 - 50 deaths. About 60% of cases come from the midlands and deltas. The

peak season of the disease is May - September.

The Department of Infectious Diseases - National Children's Hospital receives and treats about 400 - 500 children with encephalitis every year. The disease occurs sporadically throughout the year but mainly in the summer months. The mortality rate due to encephalitis accounts for 12.4% of the total mortality rate in the hospital, and 5% of encephalitis patients admitted to the hospital.

Pathogenesis: Two main ways for the virus to reach the brain tissue:

- Spread through the blood: After entering the body, they will concentrate in the lymph nodes in that tissue and spread into the blood, causing a "viremia" infection.

- Spread through peripheral nerve fibers: After entering the brain, the virus causes nerve cell death, activating an inflammatory response. Each virus has a different affinity for the brain region, causing specific damage to the invading organ.

Clinical manifestations: Viral encephalitis has diverse clinical characteristics, but the main manifestation is acute brain syndrome causing consciousness disorders of varying degrees.

- Onset stage: Fever: is a common symptom, occurring suddenly, with a continuous fever of 39 - 40⁰C, but sometimes there is no fever; Headache, fussiness, irritability, lack of flexibility; Nausea, vomiting;

- Full-blown stage: Mild to severe cognitive impairment such as drowsiness, lethargy, drowsiness to coma; Convulsions are common; Other neurological signs may be present; Respiratory failure, acute pulmonary edema, heart failure or shock may occur.

Paraclinical: Cerebrospinal fluid test, brain imaging and microbiological testing to find the cause of the disease. Other blood tests are suggestive. Blood tests: slightly increased or normal white blood cell count, electrolytes and blood sugar are usually within normal limits; Tests to determine the cause PCR (Polymerase Chain Reaction) test; Electroencephalogram: Electroencephalogram is often valuable in assessing the progression of encephalitis.

Imaging diagnosis: brain magnetic resonance imaging (MRI).

Diagnosis of viral encephalitis:

Diagnosis of viral encephalitis according to the "Guidelines for diagnosis and treatment of some common diseases in children" issued

by Ministry of Health in 2015. Patients diagnosed with viral encephalitis must satisfy one major criterion and at least three minor criteria:

- Major criterion: Patients with perceptual disturbances lasting more than 24 hours such as drowsiness, lethargy, agitation, confusion, coma or behavioral and personality changes without any other identified cause.

- Minor criteria: Fever $\geq 38^{\circ}\text{C}$ within 72 hours before and after admission. Generalized or partial seizures without evidence of epilepsy or previous seizures. New focal neurological signs. Cerebrospinal fluid cell count ≥ 5 cells/mm³. Brain parenchymal abnormalities on neuroimaging suggestive of encephalitis. EEG abnormalities consistent with encephalitis and not attributable to any other cause.

If 2 minor criteria are present: encephalitis is suspected.

If 3 minor criteria are present: encephalitis is possible, or encephalitis is confirmed if 1 of the following 3 conditions are present: (a) there is histological evidence of brain inflammation; (b) there is evidence of acute infection caused by a microbiological cause of encephalitis determined by histology, microbiology, or serology from appropriate specimens; (c) there is evidence of an autoimmune condition associated with encephalitis. For viral encephalitis, evidence of a viral cause must be accompanied by appropriate specimens such as cerebrospinal fluid, biopsy tissue by culture, PCR, and serology.

Treatment:

- Antiviral treatment: some specific antiviral drugs can be used on viruses: acyclovir, gancyclovir, cidofovir, zidovudine, abacavir, lamivudine, emtricitabine.

- Supportive treatment: Control of impaired consciousness; Immunomodulators: corticosteroids such as dexamethasone, methylprednisolone; Anticonvulsants: diazepam, midazolam. Prevention of prolonged seizures: depakin, phenytoin, carbamazepine.

1.2. Sequelae of viral encephalitis in children

1.2.1. Sequelae of viral encephalitis according to modern medicine

Sequelae of viral encephalitis in children are disorders that exist or arise after the acute encephalitis has passed the treatment phase of about 2-6 weeks, mainly manifested as neurological and mental sequelae. These disorders are not only caused by viruses but also by the

body's immune response and secondary damage to the central nervous system.

Mechanism of sequelae formation: Sequelae of viral encephalitis in children are the result of acute brain damage, cells and the central nervous system are affected for a long time. The main pathogenesis mechanisms are divided into the following groups: Intracranial inflammation and "cytokine storm"; Local cerebral ischemia; Myelin and glial cell damage; Characteristics of vulnerable children's brains;; Secondary epilepsy and abnormal neural reorganization; Vascular dysfunction - inflammatory stroke

Diagnosis of sequelae of viral encephalitis: Based on medical history and previous diagnosis of viral encephalitis. Clinical symptoms as described.

Treatment of sequelae of encephalitis: Treatment principles: Early treatment immediately after the acute phase. Mainly rehabilitation and treatment of accompanying symptoms and complications.

Non-drug treatment: Rehabilitation; Control of muscle tone and correct posture; Control of head, rolling, sitting up, kneeling, standing, balance reflexes; Prevention of contractions and deformities; Teaching daily activities, play and other activities.

Disease prevention: Vaccination against Japanese encephalitis. Vaccination against polio, measles, mumps, chickenpox according to the vaccination schedule.

1.2.2. Sequelae of viral encephalitis according to traditional medicine

According to traditional medicine, encephalitis belongs to the system of warm and epidemic diseases, and belongs to the warm diseases of traditional medicine. The sequelae left after encephalitis are the sequelae of warm diseases. The disease is initially often caused by external warm pathogens. After passing the acute stage of the disease, the patient moves to the sequelae stage.

Clinical forms of yin deficiency; blood and qi deficiency.

1.3. Studies on sequelae of viral encephalitis in children

Research abroad:

In 2009, Feng Jing conducted a controlled intervention study on 60 children with sequelae of viral encephalitis. The results of the treatment group showed a significant reduction in signs and symptoms

such as paralysis compared to the control group. Hu Linchun and colleagues conducted a study on viral encephalitis intervention for 80 children. The results of the post-treatment study on the group combining modern medicine and Chinese medicine showed a good treatment effect of 90%. While the group treated only with modern medicine only achieved 77.5%. In 2017, HU Wenjing conducted a controlled clinical trial on 123 children with sequelae of encephalitis at Hunan Children's Hospital - China, the results: in the main treatment group, the overall effectiveness rate was 96.8% (61/63), in the control group (81.7%, 49/60). He concluded that in the treatment of sequelae of encephalitis in children, the combination of acupuncture and drug treatment can improve treatment efficacy and reduce complications.

Research in Vietnam:

In 2022, Pham Ngoc Thuy studied 103 pediatric patients after acute encephalitis caused by *Herpes simplex virus*. The results of normal motor function recovery in the research group were 11.3%; mild sequelae 77.4%; moderate sequelae 11.3%; reduction in average paralysis in the research group from 3.17 ± 0.82 to 1.19 ± 0.85 . The ability to recover motor paralysis in the yin deficiency type tends to be better than the yin blood deficiency type generating wind.

Do Thi Thanh Nhan in 2023 study on acupressure massage combined with nursing care in improving motor function in 60 pediatric patients with encephalitis sequelae at National Hospital of Traditional Medicine. The results showed that the rate of pediatric patients with normal motor function after intervention was 13.3%. The average paralysis according to Henry decreased from 2.83 ± 0.87 before treatment to 1.3 ± 0.75 after treatment.

Research situation at National Hospital of Acupuncture:

According to statistics from National Hospital of Acupuncture, the number of children with viral encephalitis treated for sequelae: 234 children in 2021, 207 children in 2022, 116 children in 2023, 206 children in 2024. Nguyen Manh Toan studied and evaluated the results of motor function rehabilitation using electric acupuncture combined with massage and acupressure on 96 children with Japanese encephalitis after the acute phase. Results for the group of children < 3 years old: increased ability to maintain neck stability by 61.5%; ability to sit, stand or bounce when the armpit is lifted has improved

significantly. For children over 3 years old, after treatment, the ability to stand, walk normally and run increased by 57.1%; 56.3% and 5.7%, respectively.

1.4. Treatment methods for sequelae of viral encephalitis in children

Electroacupuncture:

Electroacupuncture is a treatment method that combines the effects of acupuncture with the effects of electrical pulses emitted from an electroacupuncture machine that uses alternating current to create regular or irregular pulses, has many stimulation heads, is safe and stable, and has easy and simple adjustment.

Hydroacupuncture:

Hydroacupuncture applies the meridian theory, combined with Western medicine's drug injection and blockade therapy, hydroacupuncture can increase the stimulation area during treatment.

Acupressure massage:

It is a technique that uses the hands, fingers, and possibly the elbows to act on the patient's skin, muscles, and joints to help relieve pain and relax, aiming to achieve the purpose of treatment and disease prevention.

Chapter 2:

RESEARCH METHODS

2.1. Objective 1: Describe some characteristics of sequelae of viral encephalitis in children treated at National Hospital of Acupuncture, 2022 - 2023

2.1.1. Research subjects

- Children aged (1 to 15) were diagnosed with sequelae of viral encephalitis, meeting the criteria for selection into the study.
- Children were diagnosed with viral encephalitis based on the Decision of Ministry of Health No. 3312/QD-BYT dated August 7, 2015 on promulgating the professional document "Guidelines for diagnosis and treatment of some common diseases in children".
- After the acute viral encephalitis phase of 2 weeks or more.
- Diagnostic criteria for sequelae of viral encephalitis: No fever; Pulse, blood pressure, breathing rate within a stable range; There are one or more signs of psychomotor dysfunction: Disorder of consciousness; Aphasia, language disorder; Memory loss, dementia; Disorder of

emotions, behavior, temperament and personality; Muscle tone disorder; Always increased muscle tone; Motor paralysis; Extrapyramidal signs.

- There is consent and voluntary participation in the research by the patient's father (mother) or legal guardian.

2.1.2. Research location

Pediatrics Department - National Hospital of Acupuncture.

2.1.3. Research period

The research was conducted from January 2022 to December 2023.

2.1.4. Research design

Cross-sectional descriptive study.

2.1.5. Research sample size

- Apply the formula for calculating sample size (n) for descriptive research including one sample, determine a proportion, use relative error.

$$n = Z_{1-\alpha/2}^2 \frac{1-p}{p\varepsilon^2}$$

In which: n: Minimum number of children with sequelae of viral encephalitis to be studied; $Z_{1-\alpha/2}$: Value from normal distribution: 1.96 with significance level 5%; p: Rate of cognitive and motor sequelae: 0.47; ε : Relative error: 0.2. With the selected values $n = 108$ children. In fact, the study sample size is 140 children.

- Convenient sampling; All children met the selection criteria and had no exclusion criteria admitted to the hospital during the study period.

2.1.6. Research content

Description of characteristics of pediatric patients with sequelae of viral encephalitis; Description of clinical characteristics of pediatric patients with sequelae of viral encephalitis; Related factors: time of hospitalization for treatment of sequelae of viral encephalitis.

2.1.7. Variables in the study

Variables include: Age, gender, Type of virus causing the disease, time of illness until hospitalization for treatment of sequelae, clinical and paraclinical symptoms, severity of sequelae, degree of motor paralysis, gross motor function; Clinical symptoms of sequelae; Cerebrospinal fluid tests; Blood hematology and blood biochemistry tests; Brain MRI.

2.1.8. Techniques used in the study

Clinical examination techniques for pediatric patients; Blood hematology and blood biochemistry testing techniques; Microbiology and molecular biology testing techniques; Brain magnetic resonance imaging (MRI) techniques

2.1.9. Indicators used in the study

Distribution of children by gender and age; Distribution of children by age and type of virus causing the disease: Rate of disease caused by Japanese encephalitis virus, *Herpes simplex virus*, duration of disease. Clinical and paraclinical symptoms of children; Severity of sequelae according to the Liverpool scale; Assessment of spasticity according to the modified Ashworth scale.

Degree of motor paralysis according to the Henry scale: 0 No paralysis; 1 mild paralysis; 2 moderate paralysis; 3: Severe paralysis; 4 very severe paralysis; 5 complete paralysis.

2.2. Objective 2: Evaluate the effectiveness of motor rehabilitation treatment in the study subjects

2.2.1. Study subjects

Pediatric patients aged 1-15 years old were diagnosed with sequelae of viral encephalitis in Objective 1, meeting the criteria for selecting pediatric patients for the study.

2.2.2. Study location

Pediatrics Department - National Hospital of Acupuncture.

2.2.3. Study period

The study was conducted from January 2022 to December 2023.

2.2.4. Study design

Controlled clinical intervention study.

2.2.5. Study sample size

Apply the formula for calculating sample size (n) for controlled clinical intervention studies:

$$n = \frac{[Z_{1-\alpha/2}\sqrt{2PQ} + Z_{1-\beta}\sqrt{p_1(1-p_1) + p_2(1-p_2)}]^2}{(p_1 - p_2)^2}$$

In which: n: Number of children for each group; $Z_{1-\alpha/2}$: With 95% confidence, $Z_{1-\alpha/2} = 1.96$; $Z_{1-\beta}$: Z value from the table with 90% sample power: 1.28; p_1 : Percentage of children with expected improvement in motor function after treatment of the research group: 0.8; p_2 : Percentage of children with improvement in motor function

after treatment of the control group: 0.53; $P = (p_1 + p_2)/2$; $Q = 1 - P$. With the selected values, the minimum sample size for each group is 62 children.

Selecting the research sample:

Select a sample similar in gender and age of children with sequelae of viral encephalitis, meeting the research selection criteria to come for examination and treatment at the Pediatrics Department - National Hospital of Acupuncture from January 2022 to December 2023.

The study group of 65 children was treated with electroacupuncture; Cerebrolysin hydroacupuncture, combined with acupressure massage/40 days. The control group of 65 children was treated with electroacupuncture, Vincosyn plus hydroacupuncture, combined with acupressure massage/40 days.

2.2.6. Research content

- Treatment regimen for 02 groups with a 40-day treatment course (20 consecutive days - T_1 , rest for 5 days and continue treatment for 20 days - T_2): Research group: Electroacupuncture 30 minutes/time x 1 time/day; Cerebrolysin hydroacupuncture 1 ml x 2 tubes x 1 time/day; Control group: Electroacupuncture 30 minutes/time x 1 time/day; Vincosyn plus hydroacupuncture 2ml x 1 tube x 1 time/day; combined with acupressure massage 30 minutes/time x 1 time/day.

- Evaluate the general characteristics of the two groups at the time of starting treatment (T_0): the level of sequelae, the level of stiffness, the level of motor paralysis, and gross motor function. Evaluate the treatment results of the two groups at the time points after treatment T_1 and T_2 using pre-designed assessment scales.

2.2.7. Variables in the study

Degree of sequelae; Degree of motor paralysis; Clinical symptoms according to TCM; Red blood cell, white blood cell, platelet indices, Hematocrits, frequency and amplitude of motor units.

2.2.8. Techniques used in the study

Electroacupuncture technique; Hydroacupuncture technique; Acupressure massage technique; Testing technique to determine hematological indices; Electromyography technique using needle electrodes.

2.2.9. Research indicators

- Severity of sequelae according to the Liverpool scale, spasticity according to the modified Ashworth scale, motor paralysis according to the Henry scale and gross motor function according to the GMFCS scale.

- Clinical symptoms according to modern medicine.
- Electromyography: frequency and amplitude of motor units.
- Effectiveness of motor rehabilitation treatment when the patient is discharged from the hospital: Rate of improvement in spasticity: the rate of children after treatment with a modified Ashworth score reduced by ≥ 1 point and muscle tone not increased significantly; Rate of improvement in motor paralysis: the rate of children after treatment with a Henry score reduced by ≥ 2 points and no severe paralysis; Rate of improvement in gross motor function: the rate of children after treatment with a GMFCS score reduced by ≥ 1 point. Results of motor rehabilitation treatment according to the modified Ashworth score; according to the Henry score; according to the GMFCS score.

- Double Difference Index (DiD):

$$\text{DiD} = (\text{Ync, after} - \text{Ync, before}) - (\text{Ydc, after} - \text{Ydc, before})$$

In which: Ync, before: Mean value of the study group before treatment; Ync, after: Mean value of the study group after treatment; Ydc, before: Mean value of the control group before treatment; Ydc, after: Mean value of the control group after treatment.

2.3. Errors in the study

Comply with the selection and screening criteria for children in accordance with the standards, ensuring the minimum sample size in the study.

2.4. Data entry and analysis

Data were entered and analyzed using IBM SPSS Statistics 20 software. Descriptive and analytical statistical algorithms were applied to calculate the average indexes, percentages, and RR efficiency indexes.

2.5. Ethics in research

The research complies with the regulations in Biomedical Research of the Ethics Council of National Hospital of Acupuncture on January 21, 2022.

Chapter 3: RESULTS OF THE RESEARCH

3.1. Objective 1: Characteristics of sequelae of viral encephalitis in children treated at National Hospital of Acupuncture, 2022 - 2023

- Severity of sequelae according to the Liverpool scale

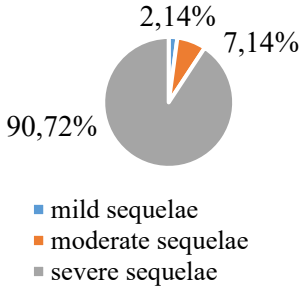


Figure 3.1. Severity of sequelae according to the Liverpool scale (n = 140)

Comments: Children with acute viral encephalitis with moderate and severe sequelae accounted for 7.14% (10/140) and 90.72% (127/140), respectively.

- Modified Ashworth spasticity scale

Table 3.8. Modified Ashworth spasticity scale (n = 140)

Modified Ashworth Score	Number	Percentage (%)
0	0	0.00
1	0	0.00
1.5	0	0.00
2	24	17.14
3	71	50.72
4	45	32.14
Total	140	100
Mean Score $\bar{X} \pm SD$	3.15 $\pm$ 0.69	

Comments: Level 3 points accounted for (50.72%); Level 2 points accounted for 17.14%; Level 4 points accounted for 32.14%. The average modified Ashworth score was 3.15 $\pm$ 0.69.

- Degree of motor paralysis according to the Henry scale

Table 3.9. Degree of motor paralysis according to the Henry scale (n = 140)

Level of motor paralysis	Henry score	Number	Percentage (%)
Grade I	1	0	0.00
Grade II	2	0	0.00
Grade III	3	19	13.57
Grade IV	4	71	50.71

Grade V	5	50	35.72
Total		140	100
Mean Henry Score $\bar{X} \pm SD$		4.22 $\pm$ 0.66	

Comments: Level IV paralysis 50.71%; Level V 35.72%; Level III 13.57%. Mean Henry score 4.22 $\pm$ 0.66.- Gross motor function level according to GMFCS scale.

Table 3.10. Gross motor function level (n = 140)

Level	Gross motor function score	Number	Percentage (%)
Grade I	1	0	0.00
Grade II	2	0	0.00
Grade III	3	8	5.71
Grade IV	4	102	72.86
Grade V	5	30	21.43
Total		140	100
Mean Score $\bar{X} \pm SD$		4.16 $\pm$ 0.50	

Comments: Children with level IV 72.86%; Level III 5.71%; Level V 21.43%. Average gross motor function 4.16 $\pm$ 0.50.

- Some factors associated with sequelae of viral encephalitis in children treated at National Hospital of Acupuncture

Related factors include the viral etiology of acute encephalitis, late admission.

Table 3.15. Association between encephalitis caused by Japanese encephalitis virus and severe sequelae (n = 140)

Virus infection	Severe	Mild, moderate	Total	OR, 95%CI:, p
Japanese encephalitis	97	2	99	17.78: 4.49 - 29.78, 0.001
No Japanese encephalitis virus infection	30	11	41	
Total	127	13	140	

Comment: There is an association between Japanese encephalitis virus encephalitis and severe sequelae, with OR=17.78, 95%CI: 4.49-29.78; p = 0.001.

Table 3.16. Time of hospitalization and treatment outcome (n = 140)

Time of admission (days)	Severe sequelae	Mild, moderate sequelae	Total	OR, 95%CI: p
Late admission	120	8	128	4,04 (1.47-12.71), 0.001
Early admission	7	5	12	
Total	127	13	140	

Comments: There is a correlation between late hospitalization and sequelae of viral encephalitis, OR = 4.04, 95%CI = 1.47- 12.71, p = 0.001.

3.2. Evaluation of the effectiveness of motor rehabilitation treatment in the study subjects

- *Treatment results of clinical symptoms according to modern medicine*

Table 3.19. Changes in clinical symptoms according to modern medicine of the two groups at time T_2

Symptom \ Group		Research group			Control group			P _{NC-DC}
		T ₀ n (%)	T ₂ n (%)	P _{T0-T2}	T ₀ n (%)	T ₂ n (%)	P _{T0-T2}	
Disorder of consciousness	Awake, not yet aware	47 (72.31)	12 (18.46)	0.001	46 (70.77)	35 (53.85)	0.03	0.001
	Sober, know the familiar and the strange	18 (27.69)	48 (73.85)	0.001	19 (29.23)	30 (46.15)	0.03	0.03
	Sober, good contact	0 (0.00)	5 (7.69)	0.04	0 (0.00)	0 (0.00)		0.04
Language disorders	Complete aphasia	13 (20.00)	11 (16.92)	0.96	12 (18.46)	11 (16.92)	0.97	0.97
	Mumbling, with sounds but no sound	49 (75.38)	14 (21.54)	0.001	50 (76.92)	27 (41.54)	0.02	0.04
	Can speak single words	3 (4.62)	24 (36.92)	0.03	3 (4.62)	20 (30.77)	0.03	0.97
	Speak short sentences	0 (0.00)	13 (20.00)	0.02	0 (0.00)	7 (10.77)	0.04	0.01
	No disorder	0 (0.00)	3 (4.62)	0.67	0 (0.00)	0 (0.00)		0.12
Swallowing Disorders	Swallow slowly, can only eat liquids	44 (67.69)	12 (18.46)	0.001	42 (67.14)	24 (36.92)	0.001	0.03
	Swallow slowly, can eat solid food	21 (32.31)	43 (66.15)	0.001	23 (32.86)	38 (58.46)	0.02	0.47
	No disorder	0 (0.00)	10 (15.39)	0.04	0 (0.00)	3 (4.62)	0.79	0.04
Sphincter Disorder	Incontinence	20 (30.77)	6 (9.23)	0.02	20 (30.77)	11 (16.92)	0.04	0.04
	Sometimes incontinent	42 (64.62)	32 (49.23)	0.03	40 (61.54)	34 (52.31)	0.04	0.86
	No disorder	3 (4.61)	27 (41.54)	0.004	5 (7.69)	20 (30.77)	0.01	0.04

Autonomic nervous system disorder	Increased salivation	36 (55.38)	9 (13.85)	0.001	38 (58.46)	12 (18.46)	0.001	0.63
	Increased sweating	24 (36.92)	11 (16.92)	0.02	23 (35.38)	15 (23.08)	0.03	0.59
	Body temperature disorder	15 (23.08)	0 (0.00)	0.001	16 (24.62)	2 (3.08)	0.001	0.96

Comments: After treatment (T_2), the study group and the control group had statistically significant changes $p_{T_0-T_0} < 0.05$.

- Treatment results of the level of sequelae according to Liverpool
Table 3.21. Changes in the level of sequelae according to the
Liverpool scale

Liverpool score	Research group			Control group			P_{NC-DC}
	T_0 n (%)	T_1 n (%)	T_2 n (%)	T_0 n (%)	T_1 n (%)	T_2 n (%)	
Mild sequelae 61 - 74	1 (1.54)	13 (20.00)	37 (56.92)	2 (3.08)	10 (15.38)	25 (38.46)	0.04
Moderate sequelae 43 - 60	5 (7.69)	11 (16.92)	13 (20.00)	5 (7.69)	9 (13.85)	13 (20.00)	0.98
Severe sequelae 33 - 42	59 (90.77)	41 (63.08)	15 (23.08)	58 (89.23)	46 (70.77)	27 (41.54)	0.03
Mean score $\bar{X} \pm SD$	38.18 ± 4.91	45.38 ± 11.98	57.34 ± 12.63	38.91 ± 5.94	44.45 ± 11.52	51.60 ± 13.53	0.02
$P_{T_0-T_1}$	0.001			0.001			
$P_{T_0-T_2}$	0.001			0.001			

Comments: After 20 days of treatment (T_1), the number of children with mild sequelae increased by 20%; severe sequelae decreased by 63.08% in the study group. The average Liverpool score increased from 38.18 ± 4.91 at T_0 to 57.34 ± 12.63 at T_2 , while the control group increased from 38.91 ± 5.94 to 51.60 ± 13.53 .

- Treatment results of spasticity level according to the modified
Ashworth scale

Table 3.23. Spasticity level according to the modified Ashworth scale

Modified Ashworth score	Research group			Control group			P_{NC-DC}
	T_0 n (%)	T_1 n (%)	T_2 n (%)	T_0 n (%)	T_1 n (%)	T_2 n (%)	
0	0 (0.00)	4 (6.15)	8 (12.31)	0 (0.00)	1 (1.54)	5 (7.69)	0.56

1	0 (0.00)	14 (21.54)	30 (46.15)	0 (0.00)	12 (18.46)	18 (27.69)	0.04
1.5	0 (0.00)	5 (7.69)	10 (15.39)	0 (0.00)	4 (6.15)	7 (10.77)	0.61
2	9 (13.85)	7 (10.77)	4 (6.15)	10 (15.38)	8 (12.31)	5 (7.69)	0.51
3	32 (49.23)	21 (32.31)	5 (7.69)	35 (53.85)	26 (40.00)	17 (26.16)	0.04
4	24 (36.92)	14 (21.54)	8 (12.31)	20 (30.77)	14 (21.54)	13 (20.00)	0.09
Mean score $\bar{X} \pm SD$	3.23 $\pm$ 0.68	2.38 $\pm$ 1.24	1.46 $\pm$ 1.08	3.15 $\pm$ 0.67	2.58 $\pm$ 1.10	2.04 $\pm$ 1.27	0.01
P _{T0-T1}	0.001			0.001			
P _{T0-T2}	0.001			0.001			

Comments: The degree of spasticity according to the modified Ashworth scale improved significantly in both groups after treatment with $p < 0.01$.

- Treatment results of the degree of motor paralysis according to the Henry scale

Table 3.25. Degree of motor paralysis according to the Henry scale

Level of motor paralysis	Henry score	Research group			Control group			P _{NC-DC}
		T ₀ n (%)	T ₁ n (%)	T ₂ n (%)	T ₀ n (%)	T ₁ n (%)	T ₂ n (%)	
Grade 0	0	0 (0.00)	4 (6.15)	8 (12.31)	0 (0.00)	1 (1.54)	4 (6.15)	0.36
Grade I	1	0 (0.00)	14 (21.54)	30 (46.15)	0 (0.00)	13 (20.00)	21 (32.31)	0.09
Grade II	2	0 (0.00)	5 (7.69)	12 (18.46)	0 (0.00)	3 (4.62)	8 (12.31)	0.33
Grade III	3	8 (12.31)	7 (10.77)	4 (6.15)	10 (15.38)	9 (13.85)	6 (9.23)	0.75
Grade IV	4	37 (56.92)	21 (32.31)	5 (7.69)	36 (55.39)	22 (33.85)	15 (23.08)	0.02
Grade V	5	20 (30.77)	14 (21.54)	6 (9.24)	19 (29.23)	17 (26.15)	11 (16.92)	0.19

Mean score $\bar{X} \pm SD$	4.18 $\pm$ 0.63	3.06 $\pm$ 1.65	1.78 $\pm$ 1.46	4.14 $\pm$ 0.66	3.37 $\pm$ 1.51	2.62 $\pm$ 1.67	0.01
P _{T0-T1}	0.001			0.001			
P _{T0-T2}	0.001			0.001			

Comments: The treatment time in each group (T₀ - T₁, T₀ - T₂) had statistically significant improvements with $p < 0.05$.

- Treatment results of gross motor function according to the Gross Motor Function Classification System (GMFCS) score.

Table 3.27. Changes in gross motor function

Level	Gross motor function score	Research group			Control group			P _{NC-DC}
		T ₀ n (%)	T ₁ n (%)	T ₂ n (%)	T ₀ n (%)	T ₁ n (%)	T ₂ n (%)	
Grade I	1	0 (0.00)	2 (3.08)	6 (9.24)	0 (0.00)	0 (0.00)	2 (3.08)	0.28
Grade II	2	0 (0.00)	13 (20.00)	24 (36.92)	0 (0.00)	6 (9.23)	18 (27.69)	0.27
Grade III	3	3 (4.62)	8 (12.31)	15 (23.08)	5 (7.69)	7 (10.77)	13 (20.00)	0.67
Grade IV	4	47 (72.31)	34 (52.30)	14 (21.54)	47 (72.31)	41 (63.08)	23 (35.38)	0.07
Grade V	5	15 (23.07)	8 (12.31)	6 (9.22)	13 (20.00)	11 (16.92)	9 (13.85)	0.41
Mean score $\bar{X} \pm SD$		4.18 $\pm$ 0.50	3.51 $\pm$ 1.05	2.85 $\pm$ 1.15	4.12 $\pm$ 0.52	3.88 $\pm$ 0.80	3.42 $\pm$ 1.07	0.02
P _{T0-T1}		0.002			0.05			
P _{T0-T2}		0.001			0.01			

Comments: The average gross motor function score of the study group decreased faster than the control group: 3.51 $\pm$ 1.05 at T₁ and 2.85 $\pm$ 1.15 at T₂, the control group 3.88 $\pm$ 0.80 at T₁ and 3.42 $\pm$ 1.07 at T₂, $p < 0.01$.

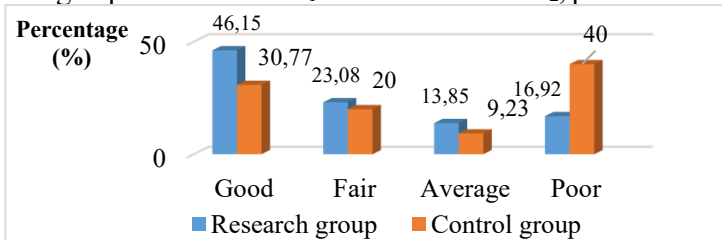


Figure 3.4. Results of motor rehabilitation treatment upon discharge

Comments: Results of the research group: Good 46.15%; Fair 23.08%; Average 13.85%; Poor 16.92% higher than the control group: Good 30.77%; Fair 20.00%; Average 9.23%; Poor 40.00%.

Chapter 4: DISCUSSION

4.1. Objective 1: Describe some characteristics of sequelae of viral encephalitis in children treated at National Hospital of Acupuncture, 2022 - 2023

Previous studies have shown that sequelae of viral encephalitis can cause many serious symptoms such as disorders of consciousness, language, swallowing and other neurological sequelae. The above clinical symptoms are also recorded at a high rate and are consistent with our research results. This shows that early treatment is very important to minimize long-term sequelae and improve the quality of life of children.

According to Nguyen Thi Tu Anh in 2001, a study on 116 children with Japanese encephalitis after the acute phase showed a rate of consciousness disorder of 68.1%; extrapyramidal disorder of 80.2%; autonomic nervous disorder of 72.4%; sphincter disorder of 67.2%. Research by Nguyen Duc Minh and colleagues in 2016 showed that children after encephalitis had consciousness disorders and sphincter disorders 76.7% - 86.7%; increased phlegm secretion disorder 36.6% - 43.3%; swallowing disorders 40% - 53.3%. In 2022, Pham Ngoc Thuy studied the effects of acupuncture in the rehabilitation of psychomotor function on 103 children after acute encephalitis caused by *Herpes Simplex virus*, consciousness disorders accounted for 77.4% - 80%; language disorders 86.7% - 88%; swallowing disorders 84% - 85%; 100% of children had sphincter disorders; increased phlegm secretion 73.6% - 76%. In 2023, Do Thi Thanh Nhan and colleagues studied the effectiveness of acupressure massage combined with nursing care in improving motor function on 60 children with encephalitis sequelae, showing that the rate of children with impaired consciousness was 53.3%, and children with incontinence accounted for 73.4%.

- Severity of sequelae according to the Liverpool scale

The research results (Figure 3.1) showed that: Severe sequelae accounted for the highest rate: 127/140 children (90.72%), with an average score of 37.11 ± 2.52 . This is a group of children with severe

disorders of movement (paralysis, spasticity, dystonia), language (loss or limitation of speech), self-care ability and may be accompanied by cognitive and behavioral impairment. Moderate sequelae accounted for only 7.14% (10 children), with an average score of 47.00 ± 4.24 . This group may still have limited mobility, communicate in single or short words but still need support in daily personal activities. Mild sequelae account for a very low rate of 3/140 (2.14%), with an average score of 64.00 ± 2.65 , showing that this group of children has almost recovered well neurologically, can study, communicate and live relatively independently, although there are still minor impairments in movement or language. The average score of the entire study group is 38.39 ± 5.29 , within the threshold of severe sequelae, reflecting a state of profound neurological impairment in the majority of children after viral encephalitis. Compared with the study of Ho Thi Bich et al. (2020), among 78 children with sequelae of viral encephalitis: 79.5% of children have severe sequelae; 17.9% of children have moderate sequelae; 2.6% of children have mild sequelae. Severe sequelae were found in the group of children with Japanese encephalitis 25/30 (83.3%) and the group of children with HSV encephalitis 17/18 (94.4%). Through this, we see that Japanese encephalitis and HSV encephalitis are the leading causes of neurological damage and leave severe sequelae. The rate of children with severe sequelae in the study of Ho Thi Bich et al. was lower than the results in this study.

- Level of spasticity according to the modified Ashworth scale

The research results in Table 3.8 show that all children in the study sample had moderate to severe spasticity (≥ 2 points according to the modified Ashworth scale), no case scored 0, 1 or 1.5 points. Specifically, the most common spasticity level was score 3 (accounting for 50.72%), followed by score 4 (accounting for 32.14%) and score 2 (accounting for 17.14%). The average score of the entire group was 3.15 ± 0.69 , reflecting moderate to severe muscle spasticity. Spasticity is a common and serious sequela in pediatric patients with viral encephalitis, directly affecting the mobility and quality of life of the patients. High levels of spasticity can reduce the effectiveness of motor rehabilitation treatment and prolong the treatment time. The results of this study emphasize the important role of early and systematic rehabilitation intervention to limit the progression of spasticity and

improve motor function. At the same time, periodic monitoring and assessment of spasticity levels is also necessary to adjust the appropriate treatment plan according to each recovery stage.

- Degree of motor paralysis according to Henry scale

The results of Table 3.9 show that most children with sequelae of viral encephalitis have moderate to severe paralysis, clearly reflecting damage to the central motor system after the acute encephalitis phase.

Compared with the research results of Nguyen Thi Tu Anh (2001), Dang Minh Hang (2003), the rate of children with level III - IV paralysis is very high. According to Nguyen Thi Tu Anh's research on 116 children with Japanese encephalitis after the acute phase, the rate of children with level III - IV paralysis is 76.7%. Dang Minh Hang's research on combining acupuncture and traditional acupressure massage to restore motor function on 60 children with sequelae of Japanese encephalitis, 100% of the children had motor paralysis, of which 90.3% had level III - IV paralysis. Comparing the research results of Hoang Ngoc Tam (2015) and Pham Ngoc Thuy (2022), the average paralysis level in our study was higher. This shows that the paralysis level of children in our study is higher than that of the research of authors Hoang Ngoc Tam and Pham Ngoc Thuy. According to Hoang Ngoc Tam, the average paralysis level according to the Henry scale of 60 children is 2.77 ± 0.57 . Pham Ngoc Thuy's research has the average paralysis level according to the Henry scale of 3.17 ± 0.82 .

- Gross motor function level according to the GMFCS scale

The results according to the Gross Motor Function Classification System (GMFCS) scale show that 72.86% of children are classified at level IV, meaning they need significant support to maintain a sitting position and move, and 21.43% at level V, showing severe impairment of motor function, completely dependent on external support. Meanwhile, only 5.71% of children reached level III and no cases were at level I or II (mild level).

The average gross motor function score of the whole group was 4.16 ± 0.50 , clearly reflecting the severe level of motor impairment in this group of children. This is a remarkable feature showing that neurological sequelae after encephalitis are not only manifested in muscle spasticity but also accompanied by severe motor impairment.

The results of this study emphasize the urgent need to develop and apply motor rehabilitation intervention programs, especially for children with gross motor function levels IV and V, to improve self-care ability and quality of life.

- Some factors related to sequelae of viral encephalitis in children treated at National Hospital of Acupuncture

Currently, in Vietnam, there is still a large proportion of children with encephalitis caused by the Japanese encephalitis virus. Up to 70.71% of children have encephalitis caused by the Japanese encephalitis virus, which is a virus that causes severe clinical symptoms, the treatment time for the acute encephalitis phase is very long, and the consequences leave many sequelae, so prolonging the time of admission to National Hospital of Acupuncture to treat and overcome the sequelae is completely reasonable.

There is a relationship between encephalitis caused by the Japanese encephalitis virus and severe sequelae, children with the Japanese encephalitis virus as the cause have a risk of sequelae 17.78 times higher than children without the Japanese encephalitis virus as the cause with OR = 17.78 (4.49 - 29.78), $p = 0.001$. There is a correlation between late hospitalization and sequelae of viral encephalitis, with OR = 4.04, (1.47 - 12.71), $p = 0.001$, children admitted late have a risk of severe sequelae 4.04 times higher than children admitted early. The results of this study are completely similar to the study of Ho Thi Bich et al. (2020), also in the pediatric population. 79.5% had severe sequelae, 17.9% had moderate sequelae and 2.6% had mild sequelae. The cause of viral encephalitis in Ho Thi Bich's study is also completely similar to our study, 83.3% was encephalitis caused by Japanese encephalitis virus while ours was 70.71%.

4.2. Evaluation of the effectiveness of motor rehabilitation treatment in the study subjects

- Treatment results of the level of sequelae according to the Liverpool scale

Before treatment (T_0), the majority of children in both groups had severe sequelae, accounting for 90.77% in the research group and 89.23% in the control group, showing that the initial characteristics of the children between the two groups were similar. However, after

treatment (T_2), the rate of severe sequelae in the research group decreased sharply to 23.08%, while the control group remained at 41.54%, showing that the treatment effectiveness in the study group was higher than in the control group. In particular, the rate of children with mild sequelae (Liverpool score from 61 - 74) in the research group increased significantly from 1.54% at T_0 to 56.92% at T_2 , compared to 38.46% in the control group. The mean Liverpool score in the research group increased from 38.18 ± 4.91 (T_0) to 57.34 ± 12.63 (T_2), significantly higher than that in the control group (51.60 ± 13.53), with a statistically significant difference ($p < 0.05$). The treatment method in the research group not only helps improve individual symptoms but also has a comprehensive impact on reducing the level of neurological sequelae, helping children increase the opportunity for functional recovery and the ability to reintegrate into society.

- Treatment results of spasticity level according to the modified Ashworth

The spasticity level tended to decrease significantly after treatment in both groups, however, the study group had a more obvious improvement and the difference was statistically significant with $p < 0.05$. After treatment (T_2), the mean score decreased to 1.46 ± 1.08 in the research group, compared with 2.04 ± 1.27 in the control group. This improvement was statistically significant between the two groups ($p_{\text{NC-DC}} < 0.05$), showing the superior effectiveness of the treatment in the study group in improving spasticity. Analysis of the distribution level also showed significant improvement in the study group. The number of children achieving no spasticity and mild spasticity increased from 0 to 58.46% at T_2 , while the control group only achieved 35.38%. In contrast, the rate of children with severe spasticity in the research group decreased sharply from 86.15% to 20%, significantly lower than the control group at 36.16%.

- Treatment results of motor paralysis according to the Henry scale

Motor paralysis is a common and serious sequela in children after viral encephalitis. The motor paralysis level assessed by the Henry scale showed that both groups improved after treatment, but the research group achieved superior results compared to the control group and the difference was statistically significant with $p < 0.05$.

After treatment (T_2), the average score decreased to 1.78 ± 1.46 in the research group and 2.62 ± 1.67 in the control group. The improvement in the study group was more pronounced and reached a statistically significant difference compared to the control group ($p_{NC-DC} < 0.05$). Thus, the improvement in the motor paralysis level according to the Henry scale in the study group is an important clinical result showing the superior effectiveness of the treatment method, while contributing to improving the independence and quality of life of children.

- Results of treatment of gross motor function according to GMFCS scale

Electroacupuncture stimulates peripheral nerves, increases nerve conduction and improves motor reflexes. Hydroacupuncture helps increase local effectiveness by delivering drugs to acupuncture points, contributing to reducing muscle stiffness and improving mobility. Acupressure massage helps increase blood circulation, relax muscles, reduce pain and improve joint range of motion. The results of this study are consistent with domestic and foreign studies on the effectiveness of the method applied in rehabilitation for children with sequelae of viral encephalitis. Once again affirming the clear clinical effectiveness of the treatment regimen using electroacupuncture, hydroacupuncture vincozyn plus and cerebrolysin, combined with acupressure massage.

- General assessment of the effectiveness of motor function rehabilitation treatment when children are discharged from the hospital

Viral encephalitis in children is a serious condition and can leave long-term sequelae if not treated promptly. The combination of treatment methods: electroacupuncture, acupressure massage combined with hydroacupuncture vincozyn plus and cerebrolysin in the research group in the recovery of motor function brought about higher treatment effectiveness than the research results in the control group with DiD > 0. The treatment results in the research group reached the levels: Good 46.15%; Fair 23.08%; Average 13.85%; Poor 16.92%. This result proves once again the effectiveness of the combined treatment of electroacupuncture, acupressure massage, hydroacupuncture cerebrolysin in the research group in the recovery of motor function in children with sequelae of viral encephalitis.

CONCLUSION

1. Some characteristics of sequelae of viral encephalitis in children treated at National Hospital of Acupuncture, 2022 - 2023

Clinical characteristics of pediatric patients according to modern medicine:

The rate of children who are not aware and have severe muscle tone disorders is 73.57%; language disorders are 71.43%; slow swallowing, only eating liquids is 68.57%; sometimes self-control in urination and defecation is 58.57%; severe extrapyramidal disorders are 67.86%. The rate of severe sequelae is 90.72%; mild and moderate sequelae are 2.14% and 7.14%. The rate of spasticity is 3 points is 50.72%; 4 points accounted for 32.14% and 2 points accounted for 17.14%. The proportion of children with motor paralysis levels IV and V according to the Henry scale accounted for 50.71% and 35.72%, respectively. The proportion of children with gross motor function at levels IV and V according to the GMFCS scale accounted for 72.86% and 21.43%, respectively.

Some factors related to sequelae of viral encephalitis:

The proportion of sequelae due to Japanese encephalitis: severe 97.98%; moderate 2.02%; due to *Herpes simplex*: severe 73.17%; moderate 21.95%; mild 4.88%.

There is a relationship between encephalitis due to Japanese encephalitis virus and severe sequelae; Children with Japanese encephalitis virus as the cause have a 17.78 times higher risk of sequelae than children without Japanese encephalitis virus as the cause with OR = 17.78.

There is a relationship between late hospitalization and sequelae of viral encephalitis. Children admitted late have a 4.04 times higher risk of severe sequelae than children admitted early with OR = 4.04.

2. Effectiveness of rehabilitation treatment for children

The rate of improvement in spasticity in the research group was 80.00%; higher than the control group (53.84%) with DiD = 0.66. The rate of improvement in motor paralysis in the research group was 76.92%; higher than the control group (50.77%) with DiD = 0.88. The rate of improvement in gross motor function in the research group was 83.09%; higher than the control group (56.92%) with DiD = 0.64.

Treatment results in the research group reached the following levels: Good 46.15%; Fair 23.08%; Average 13.85%; Poor 16.92%. Treatment results in the control group reached the following levels: Good 30.77%; Fair 20.00%; Average 9.23%; Poor 40.00%.