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## Highlighting the role of speech language pathologist in assessment and management of post Japanese encephalitis: A single case study

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### Abstract

Highlighting the role of speech language pathologist in assessment and management of post Japanese Encephalitis: A single case study.

**Introduction:** In India Japanese encephalitis activity was first noticed in Nagpur in the territory of Maharashtra in 1952. According to WHO 2019 20-30% patients with Japanese encephalitis suffers from severe speech and language disorders.

**Aim:** The aim of the study was highlighting the role of speech language pathologist in assessment and management of Japanese Encephalitis.

**Method:** A five year old male child with chief complaint of reduced speech and language skills. Assessment was completed by pediatrician, speech-language pathologist, psychologist and audiologist.

**Result and Discussion:** Assessment & Intervention of this case included 12 sessions, which shows drastic improvement in speech, language and cognitive skills.

**Conclusion:** This case study can be a stepping stone in terms of exploring information about assessment and intervention in case of Japanese encephalitis with respect to speech & language aspects.

**Keywords:** Japanese encephalitis, speech, language, cognition

### Introduction

Japanese encephalitis is a neurotropic arboviral disease, which mainly affects the functionality of Central nervous system and is closely related to dengue, yellow fever and West Nile viruses transmitted by the culex mosquito. It is leading causes of acute encephalopathy in children predominately affects the thalamus, anterior horns of the spinal cord, cerebral cortex, and cerebellum. In India JEV activity was first noticed in Nagpur in the territory of Maharashtra in 1952. Japanese Encephalitis is also known as the “plague of the orient” and the commonest cause of epidemic viral encephalitis globally (Rashmi Kumar 2014) [5]. The evolution of the disease marked the gradual onset of consciousness disorder that evolves to coma. The course of the illness can be divided into 3 stages (prodromas, acute encephalitic, and convulsant or late stages). Prodromal stage may be abrupt (1-6 hours), acute (6-24 hours) or more commonly sub-acute (2-5 days).

Various symptoms are noticed in acute encephalitic stage, are paroxysm, altered behavioral changes, generalized weakness and involuntary movement supervene and focal neurological deficit, gastro intestinal pain and vomiting may be dominant. The symptoms of Japanese encephalitis get manifest after few days of non-specific febrile illness followed by headache, vomiting, reduced level of consciousness, often heralded by a convulsion. Some cases shows abnormal behavior may be only the presenting feature in initial diagnosis, or single convulsion is followed by rapid recovery of consciousness results a clinical diagnosis of febrile convulsion. Generalized tonic clonic seizure occur more than focal motor seizure, motor seizure causes convulsive and involuntary movements of eye, twitches on face, and excessive drooling.

Classic description of Japanese encephalitis includes, mask like faces with wide blinking of eyes, generalized hypertonia, opisthotonus and rigidity spasm particularly on stimulation occur in 15% of patient. Extra pyramidal feature include, head nodding, opsoclonus myoclonus, choreoathetosis, bizarre facial grimacing, lip smacking, flexor and extensor posturing. It can also lead to mild complications like uncontrollable shaking of the hands, changes to personality, mild to moderate learning difficulties, hemi paralysis or paresis. In convalescent

Phase's severe headache, stiffness of the body parts, insensibility, and unconsciousness disorientation, sometimes state of comatose, seizures, spastic paralysis, cognitive issues and inability to respond & speak this stage prolongs from a few weeks to several months.

The incubation period of JEV ranges between six and sixteen days. After the bite of an infected mosquito, the virus replicates in the skin and is then transported to regional lymph nodes and amplifies peripherally, causing a transient viremia before invading the central nervous system (CNS). During primary viremia, viral particles are seeded in the extra neural tissues, these virus unfurl into the central nervous system through blood. Major extra-neural sites of replication include connective tissue, skeletal muscle, myocardium, smooth muscle, lympho-reticular tissues, and endocrine and exocrine glands. The infection of JE depends on the susceptibility of the cell, which may or not gives access to cells to invade the Central nervous system. If the infection is limited to extra-neural tissues, the signs may be mild or in apparent however, infection of neural tissues by the same agent leads to encephalitis. Therefore, the mechanism by which the virus penetrates the Central nervous system is of prime importance in understanding the pathogenesis of viral disease.

Even after the Recovery from infection fewer neurological sequelae, like altered sensorium, cognitive issues and serious behavioral, extra pyramidal syndrome may also preserve. The duration of the coma is associated with repetitive seizures, peduncularis damage, or intracranial hypertension, which are considered poor prognostic factors, leading to fatality. It mainly affects children <15 years, majority of infections are asymptomatic i.e. only 1 in 250 infections develop into encephalitis. Japanese encephalitic tends to be endemic and spread sporadically throughout the year with a peak after the start of the rainy season. According to WHO 2019 20-30% patients with Japanese encephalitis suffers from severe speech and language disorders. About 10% of susceptible population is infected each year, most infection are asymptomatic.

Japanese encephalitis is the most common prevalent and significant mosquito borne viral encephalitis occurring with an estimated 30000 to 50000 of cases and 15000 deaths annually (Gitalim Kakoti et.al 2013). About 20% to 30% of Japanese encephalitis cases are fatal & many survivors continue to have long-term neurologic psychiatric speech, language or cognitive problems. Children under 15yrs of age are more prone to the infection. Thus, the early detection of speech, language & cognitive issues becomes the most important, because early assessment & intervention of speech language & cognitive skills can have a significant impact on the long-term prognosis of many children with post Japanese encephalitis. The need of the present study was to increase expert's knowledge about children affected by Japanese Encephalitis, along with this highlighting the speech & language characteristics, which are highly affecting the overall quality of life in children with Japanese encephalitis. The study was undertaken for a better understanding and to determine the clinical profile, which will be highlighting the clinical features, related to speech, language, hearing and cognition in a case with "Japanese Encephalitis" reported at the department of Speech and Hearing of Sri Aurobindo Institute of Medical Sciences (SAIMS), Indore.

Methods

**Subject:** A case age five- year old male child who reported SAIMS with chief complaint of reduced speech and language skills. Case history revealed that the child was the first baby of consanguineous marriage and had cesarean delivery at 39 weeks of gestational age with normal birth weight (2.8 kg). Child was admitted in hospital at age of 1 year due to high fever for 6 days, he also underwent three episodes of seizures lasting for 5 minutes of altered sensorium. Child was drowsy, disoriented with opsoclonus reduced marginally and had abnormal movements followed by meningeal irritation. The presence of Japanese encephalitis was diagnosed at the age of 19<sup>TH</sup> months and was kept in NICU for 2 months due to the comatose condition. After the complete treatment of Japanese encephalitis client had shown regression in speech, language and cognitive skills, which include no verbal utterance, lack of understanding familiar commands and recognition of family members.

**Design:** A single subject experimental design with multiple baselines across behaviors, which highlights the regression in speech, language and cognitive characteristics in post Japanese encephalitis. The tailor made plan was used to accomplish reacquisition of speech, language and cognitive skills.

Pediatrician, speech—language pathologist psychologist and audiologist, completed assessment. The pediatrician clinically examined the detailed spectrum of the disorder. The MRI of brain revealed prominent sulcal enhancement in parieto occipital with mild restriction in bilateral thalamus area suggestive of meningioencephalitis.

The psychologist assessed the intellectual ability behaviors of social skills using Wechsler Intelligence scale for children Revised (WISC-R; 1974), and Indian adaptation and Social Maturity Scale (VSMS; Malin, 1992) respectively. Psychological evaluation results revealed that mild intellectual deficit.

**Assessment:** Overall speech language assessment revealed delayed in speech, language and cognitive skills with the presence of oro motor weakness, reduced strength, reduced range of motion, tone and accuracy in active articulators followed by absence of routing, sucking, snouting and lip smacking with delayed gag reflex. With assessing of these domains, regression was prominently seen in speech, language, cognitive and pragmatic skills. Based on standardized test following results were described as Receptive Expressive Emergent Language Scales, (Kenneth R Bzoch,) receptive language age 20 to 24 months and expressive language age 3 to 4 months respectively. Attention level (Reynell 1978) was administered it revealed level 1 i.e. (1-2 years), speech language development chart 2<sup>nd</sup> Ed (Gilman.L, Gorman.G) was administered which depict following ages as Phonology – 0 to 3 months, semantics -3 to 6 months, play development -0 to 3 months, and pragmatics age -3 to 6 months respectively. 3D LAT (Geeta Harlekar) revealed comprehension age 18 to 20 months, expression age less than 9 months and cognition age 9-11 months. Informally memory was assessed which demonstrated lack of identification about family members, common objects and body parts. COMDEALL assessment of oro-motor skills in toddlers was used to examine oral peripheral structures. Reflexes were assessed. Audio logical evaluation was done by audiologist included tympanometry reflexometry was done it revealed bilateral "A type" tympanogram with present acoustic reflexes suggestive of

no middle ear pathology and Brainstem Auditory Evoked Potential (BAEP) testing suggestive of bilateral hearing sensitivity within normal limits.

**TREATMENT:** Nuffield post Japanese encephalitis incorporated with multisensory approach and language approaches. Frequency of the therapy was set thrice in a week for 45 minutes/session. Treatment goals were focused on <sup>[1]</sup> To facilitate preverbal skills <sup>[2]</sup> To enhance language using mand, modeling, and extension and expansion techniques. <sup>[3]</sup> To work upon memory recall. <sup>[4]</sup> To facilitate strengthening exercises for oral peripheral structures.

**Procedure:** To enhance pre verbal skills different skills were focused such as attention span, gaze pattern and turn taking skills. To facilitate language list of familiar and unfamiliar items was used for identification and naming of different lexical category. To improve cognition scrapbook was prepared for the identification and recalling of family members, counting.

To facilitate oral peripheral structures horn blow technique, candle blowing technique, and thermal stimulations were done, various materials like finger brush (infradent tooth brush), bite block, cross bar, different size of straws,

whistles, thermo coal balls, blow lit candle were used. Several Oral alerting activities such as finger tapping, hand tapping, lip tapping were done. Management of tonicidity was facilitated by various massages, exercise using block bite and cross bar, movement of articulators from resting position to extreme position and few imitation tasks was done for the betterment of oral peripheral structures.

#### Results and Discussion:

The classic description of this present case shown illness in all three stages of Japanese encephalitis were categorized by fever, headache, vomiting, altered sensorium, seizure, disorientation, facial weakness, choreoathetosis, facial grimacing, and lip smacking with ataxia. With these clinical features, pediatrician diagnosed the case as “JAPANESE ENCEPHALITIS”. After detailed speech and language evaluation and 36 sessions of therapy, performance on language, speech and cognition suggested improvement with automaticity in language and cognition task while flexibility seen in speech task. To obtain discrete findings for all affected domains, therapy session was monitored to see the improvements. After 12 sessions, re-evaluation was done to assess the progress.

**Table 1:** Depicting Improving Results Of speech, language and cognition domain

	<b>Baseline</b>	<b>12 sessions</b>	<b>24 sessions</b>	<b>36 sessions</b>
<b>Attention level</b>	<b>Level 1(0 to 1 yr)</b>	<b>Level 2(1 to 2yr)</b>	<b>Level 2(1to 2 yr)</b>	<b>Level 3(2 to 3yr)</b>
Sldc	0 to 3 months	18 to 24 months	18-24 months	24-30months emerging
Phonology	3 to 6 months	12 to 18 months	18-24months	24-30months emerging
Semantics	0 to 3 months	9 to 12 months	9-12months	12-18months
Play development	0	12-18months	12-18months	18-24months emerging
Syntax-morphology development	3 to 6 months	12 to 18 months	12-18months	18-24months emerging
Pragmatics	18 months to 20 months	24 to 26 months emerging	24-26months	27-29months
3 dlat	Less than 9	12 to 14 months	12-14months	15-17months emerging
Comphrehension	9 to 11 months	15 to 17 months	18-20 months	21-23months emerging
Expression				
Cognition				

Initially child's performance of language speech and cognitive skills were affected. Preverbal skills was effectively improved the child's attention, joint attention, turn taking skills which helps in to enhance comprehensive and expressive language and cognition. Due to reoccurrence of pre speech and language skills child was used to vocalize, scream and say specific words, which he denotes earlier for specific situations and for needs.

Informally memory assessment revealed child is able to identify family members, common objects and body parts names of fruits and vegetable, he could also understand and follow familiar commands, he recollects the previously learned things and applies that to the present which was regressed and himself take efforts to talk.

According to Grascenkov (1964) <sup>[3]</sup>, investigated the Japanese encephalitis case with different stages, he reported that virus infection impacts the central nervous system which leads to different stages of Japanese encephalitis which shows collective effect on social, cognitive, speech, language and hearing mechanism. He reported that language was affected in terms of auditory comprehension, repetition identification, naming. Speech was commonly seen as

abrupt, slurred with poor speech intelligibility.

Cognitive decline shows difficulties in sequencing and organizing memory task, recalling the previously learned things, retention of language, identification of familiar items and family items. Cranial nerves functions were also affected.

In severe cases medulla oblongata lesions are seen, some of which may persist into the residual stage. In some cases paresis and facial palsies were seen and usually these paresis are unilateral, but they may sometimes be bilateral also. There is impact on auditory nerve due to which impairment of hearing and buzzing in the ears was observed. Functional disturbance of the ninth cranial nerve is seen, in the form of prolonged disorganization of taste. Motor disturbances of the tenth cranial nerve are shown by unilateral or bilateral paralysis of the velum. Finally, functional disturbance of the twelfth cranial nerve i.e. hypoglossal cranial nerve, which is having reduced ability in the function of the tongue. He concluded that the virus infection gives directly impact on central nervous system that affects various domains it reflects regression mainly in speech, language and cognitive skills and overall affect the quality of life of children.

**Table 2:** Showing the results of Oral Peripheral Structures

Oral peripheral structures examination	Baseline		12sessions		24 sessions		36 sessions	
	Obt. score	Max. score	Obt. score	Max. score	Obt. score	Max. score	Obt. score	Max. score
Jaw movement	5	12	6	12	7	12	9	12
Tongue movement	3	20	7	20	9	20	12	20
Lip movement	1	16	5	16	8	16	9	16
Speech	0	12	0	12	2	12	4	12

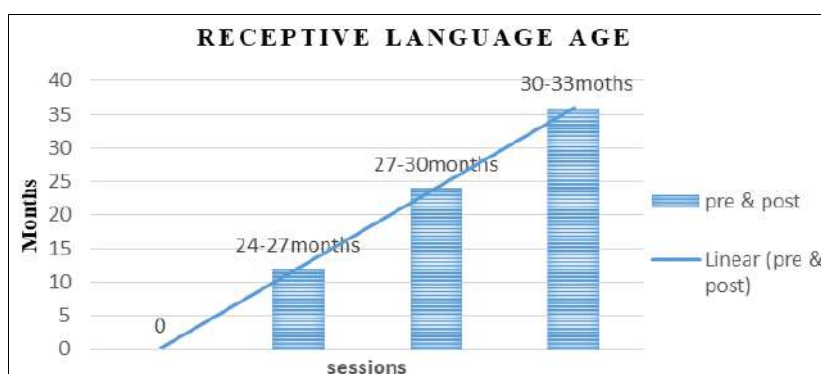
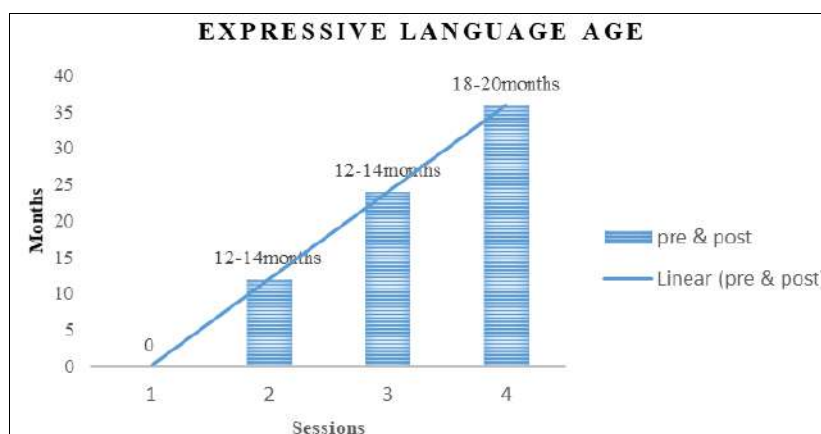
(COMDEALL checklist was done which assessed the jaw movements were consistently present, tongue movements were on demand, lip movements were done spontaneously and speech was assessed as absent).

In the beginning Child's performance on verbal and non-verbal tasks of oro motor speech were mostly inaccurate and not synchronized followed by weakness, reduced strength, reduced range of motion, tonicity and in terms of accuracy. To monitor the oro motor skills COMDEALL checklist was used to assess the functionality of oral structures.

Due to the regression in speech, language and cognitive skills, child's initial performance was more affected, inadequate for verbal and non-verbal task for language and cognition. Speech for verbal and non-verbal tasks gave specific information related to oral peripheral structures which shown significant improvement and increased

strength in all active articulators.

Progressively it was found that incorporation of oro motor and multisensory approaches facilitated active articulators sequencing and strengthening task more accurately and effortlessly in comparison to no response and inaccurate. These results reflect the occurrence of differentiation and enhancement, which lead to gradual acquisition of independent control over individual articulators like tongue, lip and jaw. It also suggests that development of automaticity and flexibility which happened over time. Now, the child's status shows drastic improvement specifically shown in receptive language in figure 1 and expressive language in figure 2 in 36 sessions. Early evaluation and effective therapy management helps in child's overall performance in all domains.

**Fig 1:** Improvement of Receptive Language Age in 36 sessions.**Fig 2:** Improvement of Expressive Language Age in 36 sessions.

## Conclusion

Etiological diagnosis is based on virus isolation or demonstration of virus specific antigen or antibodies in the cerebrospinal fluid/blood. For the supportive management no antiviral drug is effective for the better prognosis safe and effective Japanese encephalitis vaccines are available to prevent disease. WHO helps & recommends strong JE prevention and control activity, including Japanese

encephalitis immunization in all regions where disease is recognized. Assessment of speech and language skills in Japanese encephalitis showed regression in speech, language and cognitive skills. Proper tailor made therapy plan helped in achieving adequate speech & language abilities. Regular speech & language therapy showed drastic improvement in speech, language and cognitive skills in this specific case study. Research can be a stepping stone in



terms of exploring information for assessment and intervention protocol in case of post Japanese encephalitis and adequate awareness and counseling of parents and professionals are helpful to improve the overall quality of life of the child.

Future directions: After the complete medical treatment proper referral should be made to audiologist speech and language pathologist for the early detection of the speech language & cognitive problem so as to make further intervention plans for the regression of language and speech to get better prognosis.

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