

CASE REPORT

Acquired childhood aphasia as a consequence of COVID-19 and its differential diagnosis from speech–language pathologist perspective: A case study

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Abstract

It is essential to be more vigilant in understanding impact of COVID-19 on children's speech and language skills. As studies in these lines are very sparse, it is imperative to profile these children and derive accurate diagnosis. Accurate diagnosis aids Speech-Language Pathologists (SLPs) to render speech and Language therapy systematically.

KEYWORDS

childhood aphasia, Landau–Kleffner syndrome, speech and language therapy

1 | INTRODUCTION

COVID-19 was declared as a pandemic by WHO in 2019, caused by SARS coronavirus 2, which belongs to the Corona-viridae family. The prominent clinical presentation is with the respiratory disease but neurological manifestations are being increasingly recognized. The common neurological manifestations include stroke and anosmia. However, the rare neurological complications are encephalitis, Guillain–Barrie syndrome, and myelitis. Encephalitis is an acute infection of brain parenchyma characterized clinically by fever, headache, and an altered level of consciousness. They are also associated with focal or multifocal neurologic deficits and focal or generalized seizure activity. According to a systematic review prevalence of COVID-19, encephalitis was 59.4% with a mortality rate of 13.4%.¹ The common symptoms of COVID-19 encephalitis are delirium, aphasia, dysarthria, and seizures. During the disease course, 36% exhibited aphasia, 32% had dysarthria, and 24% had focal motor deficits.²

A neurological illness known as acquired childhood aphasia (ACA) is caused by impairment to the brain areas involved for language production and processing. This can happen quickly in children with a range of communication impairments once they have acquired normal speech–language development within or around the age of two. ACA could be caused by a traumatic, convulsive, or idiopathic event. The symptoms of ACA are mostly determined by the etiology—focal (a single domain is affected) versus generalized (many domains are affected)—and the premorbid language level—mutism, followed by a very limited vocabulary and abnormal development.³

Delay in one or more domains of the regular development pathway is referred to as developmental delay. If no regression is observed during the early visits, ACA is frequently confused with developmental delay; if regression is revealed, it is usually attributed to a neurological disorder such as Landau–Kleffner syndrome.⁴ Genetic abnormalities, cerebral dysgenesis, vascular medications, toxins, and brain infections are all possible causes

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of developmental delay. Landau–Kleffner syndrome is an epileptic encephalopathy in which a child's cognitive, sensory, and/or motor abilities deteriorate after reaching normal developmental milestones due to epileptic activity with abnormal EEG.^{4,5} Because childhood language impairments do not all appear in the same way, a complete profile of the case is required to arrive at an acceptable diagnosis.

We present a case of a child who developed acquired childhood aphasia following COVID-19-related encephalitis. This case study focuses on the linguistic features of a 2-year-old boy who was diagnosed with a diagnostic label due to regression in speech and language skills. After the case has been profiled in multiple domains of language and the multifactorial domains have been considered, the process of arriving at a diagnosis is nevertheless ongoing. As a result, the treatment procedure chosen provides a holistic viewpoint.

2 | CASE HISTORY

R, a 2-year-old boy, presented to a Speech and Hearing Institute with complaints of motor and language skills regression. His parents also reported that he had lost his ability to recognize others and that his limbs were quite weak. R is from a city in Southern India and comes from an Urdu-speaking joint family and has no relevant family history. R experienced a viral encephalitis attack 3 months before his visit.

R was born after a normal, full-term delivery with no complications. He had a five-day high fever when he was 1.7 years old, which was exacerbated by a series of seven seizure bouts over the next 4 days. They were all tonic-clonic in nature, lasting 10 s each and occurring at different times of the day. This form of convulsion is defined by aberrant muscle “stiffening (tonic) subsequent” and “rhythmical jerking (clonic)”, as well as loss of consciousness, according to the Epilepsy Foundation.⁶

After the first convulsion, he was taken to the hospital and supported by a ventilator (which was removed post 6 days). During his stay at the hospital, he had three chest X-rays. Only the second test revealed a slight haziness in the left lung, whereas the first and third tests were both normal. As per protocol amidst the global pandemic of SARS-CoV-2, a real-time reverse transcriptase polymerase chain reaction test (RT-PCR) was also carried out on R and his family members. R alone tested positive for COVID-19 and tested negative on Day 14 for the same.

An MRI was performed which revealed areas of restricted diffusions in certain cortical regions (frontal lobes and medial temporal lobes) and subcortical regions (thalami, basal ganglia, and hippocampi). This led

to an initial diagnosis of COVID encephalopathy on day two of admission. On day fourteen, neuroimaging (CT scan) of the brain revealed ill-defined hypodensities in the left thalamus and capsuloganglionic region (?) Edema. R's diagnosis was altered to Japanese encephalitis with COVID co-infection. An EEG was within normal limits.

R was put on anti-epileptic medication and was discharged because of stable vitals and symptomatic improvement after nearly 40 days of hospitalization.

2.1 | Developmental history of “R”

R's parents report that preceding encephalitis, R had achieved all his milestones across the various domains of development and has been summarized in [Table 1](#) compared with post encephalopathy.

2.2 | Screening protocol on “R”

R's receptive and expressive language skills were screened using the Assessment Checklist for Speech-Language Skills (ACSL).⁷ R's receptive language age fell in the category of 1.7 to 1.9 years which was nearly age adequate at the time of testing, whereas his expressive language age fit into the range of 0.7 to 0.9 months, thus revealing a significant disparity with his chronological age in that domain. R was provisionally diagnosed with “Spoken Language Disorder secondary to Developmental Delay (post-seizures).”

According to the psychological evaluation, his developmental age was 1.6 years with an IQ of 75. A motor examination was conducted through MMT (Manual Muscle Testing Grading System).⁸ The findings of the test revealed; the child was provisionally diagnosed with hemiparesis on the left side.

2.3 | Management and outcome

Although cognitive and language impairments following encephalitis have not been extensively described in the literature, it is observed that language and speech impairments develop mostly in children with severe encephalopathy. Language deficits overlap with impairments in other cognitive abilities and motor functions, and impairment in one ability may affect the others.⁹ Therefore, a multi-domain approach must be taken wherein (1) The child is profiled across domains; (2) goals are set under each domain; and (3) goals are executed by combining multiple target skills into functional activities.

TABLE 1 Pre- and Post-details of R on various domains

Domain	Pre-morbid		Post-morbid
Motor skills	Started walking by 9 months of age		Required assistance to walk and did so with a wide-based gait. Poor fine motor skills were noted.
Self-help skills	Started learning how to use the washroom on his own. Was able to partially feed and dress himself		All acquired skills regressed.
Speech and language skills	Receptive language skills	Age adequate receptive language skills	Regression in receptive language skills particularly, objects of daily use (e.g., toys of his play). Required assistance for following single-step commands
	Expressive language skills	Vocabulary of 50-word and emerging 2-word utterances. Normal voice	Expressed himself by crying and facial expressions. Inconsistent spontaneous vocalizations and occasional use of gestures on command. Stridor and high-pitched cry. weaker voice post morbidly (as reported)
Vegetative skills	All skills achieved (sucking, biting and chewing, blowing and swallowing).		Swallowing achieved (only for liquids and thick liquids). Intolerant to solid foods. Blowing, sucking, biting, and chewing skills were absent. Drooling present (Degree 3)
Social interaction and play	A playful child with healthy interaction with people		Poor communication intent. Poor joint attention skills, attended only to own choice of activity and had a fleeting eye contact.

TABLE 2 Summary of goals considered and achieved progress for various domains of speech and language

S.N	Domains	Skills targeted	Progress
1.	Cognitive pre-linguistic	Joint attention and task compliance	Self-play improved while easily distracted in presence of adults/caregivers
2.	Linguistics	Reception	Able to follow single-step command consistently with 90% accuracy.
		Non-verbal and verbal expression	Pointing and pragmatic (e.g., waving for bye) skills emerged
3	Oro-motor control and coordination	Oro-motor feeding skills	Reduction in Drooling (Degree 2). Food tolerance (for solids) improved.
4	Pragmatics	Communication Intent and request	Greeting skills improved significantly from no greetings to greetings through hand gestures on command
			Symbolic communication using conventional gestures emerging

The client had undergone speech and language therapy from December 24, 2020, to February 16, 2021, under different domains such as cognitive pre-linguistic skills, linguistic skills, oro-motor feeding skills, and pragmatic skills and has been summarized in [Table 2](#) below.

3 | DISCUSSION

R's distinctive age at the time of the viral attack, its manifestations, and resultant effects on his development made

the process of diagnosing highly arduous. Although a treatment plan was devised and followed, its enhancement and efficiency depended on appropriate diagnosis.

3.1 | Possible diagnosis

Considering the significant gap between R's chronological age and his language, motor, and cognitive spheres of development, he was provisionally diagnosed with "Spoken Language Disorder secondary to Developmental Delay."

Developmental delay occurs when a child does not achieve developmental milestones in comparison with peers of the same age range. A significant delay in two or more developmental domains affecting children under the age of 5 years is termed global developmental delay (GDD).¹⁰ Keeping the above definition in mind, it could be argued that R has global developmental delay—but a closer look at Table 1 suggests that R had achieved all his milestones age-appropriately and seemingly lost the acquired skills post the encephalitis attack. Since his case leaned, more toward regression of skills previously learned than an inherent “delay,” that diagnosis was later ruled out.

According to the Epilepsy foundation, epilepsy is characterized by repeated and unprovoked seizures¹¹ which confirm with R's medical history. That led to another possible diagnosis: Landau-Kleffner syndrome (LKS). This was first characterized by Landau and Kleffner¹² and is also known as “Acquired Aphasia with convulsive disorder.” It has been reported to manifest as a “predominantly receptive aphasia and epileptic seizures with paroxysmal EEG abnormalities” within children of 3–8 years of age. R was 1.7 years of age at the time of the encephalitis attack, and his medical history reveals a sleep record of EEG within normal limits with no epileptic activity recorded in tracing. This led to the ruling out of LKS as a diagnosis for R but paved the way to the third suggestion: acquired childhood aphasia (ACA).

ACA is a well-debated topic in literature. Researchers have argued on a variety of topics ranging from when we can use this term to its accurate description. One particular point discussed was the inability to agree on when a child has enough linguistic competence for us to claim that it is “lost.”¹³

ACA is a condition that “appears after a period of normal language development and is secondary to cerebral dysfunction.” This definition falls in line with R's medical and developmental history. The authors have added that the child suspected of having acquired childhood aphasia must have a brain lesion occurring after the age of the first sentence.¹⁴ Since R had begun combining words into short sentences pre-morbidly, the latter definition is in agreement as well. Hence, we concluded that acquired childhood aphasia is the most suited provisional diagnosis for client R.

3.2 | Importance of differential diagnosis

Diagnosing an individual is an important step of the rehabilitation process as it helps us understand what are the specific cohort of symptoms the individual is experiencing

and how can we, as professionals, aid them most efficiently in terms of time and effort and plan the most suitable treatment approach.

In R's case, a multi-modal approach was chosen to improve his skills as a functional communicator and establish some fundamental skills that he had previously possessed. This was decided when “developmental delay” (DD) was still the assumption by the rehabilitative team. Hence, one may wonder how does change the diagnosis from DD to ACA influences speech and language therapy?

Also, diagnoses are not made purely based on observations and intuitions; they are backed up by standardized tests. Although ACSLS was administered to document his language age post-encephalitis, no test to confirm acquired childhood aphasia was carried out because tests available for ACA are very few in number. The Children's Acquired Aphasia Screening Test (CAAST)¹⁵ has an age range of 3–7 years. Hence, differential diagnosis is important for the team working with R to consider administering such tests in the future, which might have otherwise been ignored.

The other reasons might be gleaned from a similar case study reported by Donald.¹⁶ The study findings will be summarized below to understand the important highlights of the case. Girl “E” had an epileptic attack at 16 months and was diagnosed with viral encephalitis after 10 days in the hospital. She had no significant family or medical history before the attack. Post-encephalitis, she manifested with mutism till 4 years of age (and was diagnosed with acquired childhood aphasia) and then had a sudden boost of verbal language. Between the ages of 4–9, she developed a 40-word vocabulary. At 10 years, her expressive language age was 6.5 years. EEG tests were carried out four times after the attack at varied intervals and revealed an equal distribution of normal and abnormal findings.

This study shows us that, considering ACA as a diagnosis will prompt the team to be vigilant to refer R for physiological tests (like EEG) at regular intervals to monitor his status. It will aid in the therapy plans as his language development will most likely be atypical (with a sudden spontaneous increase in efforts of communication) than typical development with a delay. It will also aid clinicians to view future clients with a similar profile from a different light and add to our knowledge of acquired childhood aphasia and its manifestations. Hence, differential diagnosis is important in shaping R's future in rehabilitation.

3.3 | COVID encephalopathy

Through this article, we would also like to throw some light on a tangential but relevant topic: COVID

encephalopathy. Coronavirus disease, abbreviated as COVID, is an infectious disease caused by a newly discovered coronavirus and is very similar to SARS (severe acute respiratory syndrome). Although its clinical manifestations are mainly respiratory, multiple case reports with neurological involvement have been described.

COVID-associated encephalopathy has mainly been noted in older patients.¹⁷ But, in recent times, neurological symptoms in children have also been accounted for in the form of isolated case reports and a few combined case studies,^{18–20} both in India and across other parts of the world.

R's medical diagnosis changed from COVID encephalopathy to Japanese virus encephalitis with COVID co-infection. It would be beyond the scope of expertise of the authors of this study to confirm or comment on the medical diagnosis—but we hope that it increases caution among healthcare professionals when it comes to treating children who are infected by COVID and aids in understanding its long-term implications.

4 | CONCLUSIONS

The current case study highlights issues on the appropriate diagnostic label, non-medical line of management, and outcome. The diagnosis swayed between COVID encephalopathy and Japanese virus encephalitis. The impression suggests that encephalitis could be a possible consequence of COVID-19 infection. The client showed regression through formal testing was not done as the client was young for the administration of standardized tests; the pre- and post-comparison showed that there was regression suggesting the diagnosis of acquired childhood aphasia from a speech–language pathologists perspective. Therapy targeted multiple domains, and the improvement at the end of a short tenure was prominent suggesting that the child would improve.

AUTHOR CONTRIBUTIONS

Ridha Fameen, Rinsha Pravin K, Pooja S, and Rashmi V were involved in study design, stimulus preparation, data collection, analysis of the data, interpretation, and writing the manuscript. Biraj Bhattarai and Abhishek B P were involved in concept development, study design, analysis of the results, and writing the manuscript.

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CONFLICT OF INTEREST

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

ETHICAL APPROVAL

All procedures performed in this study were in accordance with the ethical guidelines of bio-behavioral research involving human subjects of the All India Institute of Speech and Hearing, Mysore. The manuscript adheres to the ethical standards according to the declaration of Helsinki.

CONSENT

Written informed consent was obtained from the parents/guardians to publish this report in accordance with the journal's patient consent policy.

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