

## INTRODUCTION

Language is one of the fundamental basis of human intelligence and a key part of human culture. Children with developmental speech and language impairment constitute a large group of patients attending the paediatric neurology clinic. The exact prevalence and incidence of developmental speech and language delay/ abnormality is not known but various studies have reported that approximately 15-50% of children attending Pediatric Neurology clinics have developmental speech and language delay/impairment/ abnormality [1,2]. Developmental speech and language impairment is a common concurrence with a number of neurodevelopmental disorders including brain malformations, cerebral palsy, genetic leukodystrophies, severe epileptic encephalopathies including Landau Kleffner's syndrome, Electrical status epileptics in sleep (ESES) & Lennox Gestaut Syndrome [3-5]. It may also be associated with many inborn errors of metabolism, autism, severe malnutrition and hearing abnormalities. In many other children with DLD, no structural or metabolic abnormality can be found possibly due to gaps in literature and these cases are labeled idiopathic. Despite extensive research to unravel the pathophysiologic basis of speech and language impairment/ delay, the exact mechanism and pathophysiology still remain unclear [6]. This is further complicated by the fact that there is no definite or surrogate neurophysiologic laboratory marker to quantitate the extent of speech and language impairment.

Literature has shown that ABER (also called BERA Brainstem Evoked Response Audiometry) is a modern non-invasive, objective neurophysiological method for evaluation of hearing threshold and also helps in prognostication of neurological disorders like brain malformations, cerebral palsy, genetic leukodystrophies and abnormalities in the hearing pathway in the brainstem [7]. Many researchers have in the past used ABER to assess hearing deficit in children with speech and language impairment but there is a

paucity of research specifically evaluating the abnormalities in ABER in children of DLD without hearing deficit [8].

With the aforementioned background we hypothesized that auditory evoked potentials are abnormal in children with speech and language impairment/delay who do not have any hearing deficit and these should help in understanding the pathophysiology of the same. The current study was therefore designed to evaluate the abnormalities, if any, in ABER in children with speech and language impairment without frank hearing deficit or autism.

## MATERIALS AND METHODS

The current study was a clinical observational study. All children attending the Paediatric Neurology Clinic between 2011 and 2014 were screened for developmental speech and language impairment/ delay. For the purpose of the current study, DLD was defined as a condition in which a child failed to develop age appropriate speech and language skills and had dysfunction in speech (comprehension, naming, repetition, fluency) and/or language (morphology, semantic, syntax, phonology and pragmatics). Permission from the institutional ethical committee was taken prior to the commencement of the study. Parental consent was obtained in all the selected children and their epidemiological data and detailed clinical history was recorded. Clinical examination was then performed by a Pediatric Neurologist. Clinical history included neurologic history, prenatal, perinatal, postnatal, family history and history of previous hospitalizations. All children less than 24 months, more than 8 years, having associated gross motor developmental delay, major cognitive deficit, traumatic brain injury, hearing impairment, cleft lip or palate and autism (using Childhood autism rating scale) were excluded from the study [9]. The final cohort constituted 94 children in the age group of 2

proof room to confirm and rule out hearing impairment. The peak latencies for waves I, III & V, inter-peak latencies I-III & I-V and wave amplitude ratio V/I was recorded. All the information was registered in a predesigned proforma.

## RESULTS

A total of 1641 patients attended neurology clinic from 2011 to 2014. After using the exclusion criteria the final cohort constituted 94 (5.72 %) children in the age group of 2 to 8 years, out of which 18 (19.14 %) were females and 76 (80.86%) were males. The mean age of the

evoked ABER using a slow presentation rate. However, more recent studies have found that ABERs recorded using clicks presented at a fast rate or speech stimuli may indicate neural dysfunction at the brainstem level for some language-impaired children [14,17,20,21].

In a study by Al-Kandari, ABER was performed in a cohort of children with hearing loss and delayed speech and 37% of these children were found to have normal ABER [22]. In another study hearing was assessed in 76 children aged 1-5 y with speech delay using tympanometry, free field testing, otoacoustic emission recordings and auditory brainstem evoked responses (ABERs). Despite the fact that this cohort also included children with gross hearing abnormalities, ABER was normal in 68.4% of children [23].

The cohort in the current study was bigger as compared to the aforementioned studies and more specifically excluded children having autism and hearing deficit which may have confided the observations. This was a major limitation in the other similar studies conducted in the past. As stated in the observations of our study, none of the 94 children with speech and language impairment who do not have any hearing deficit or autism, had any abnormalities in the auditory evoked responses. This observation emphasizes the fact that in majority of such children, ABER does not show any abnormality even if structural lesions are present in the brain and inadequate verbal communication is proposed to be responsible for the delayed and abnormal language acquisition and speech development.

## CONCLUSION

The results of the current study therefore become very important despite the fact that hypothesis in this study was "ABER is abnormal in children with speech and language impairment or delay". Based on the results of the current study and the aforementioned discussion it is amply clear that ABER does not show any abnormality in majority of children who have a speech and language impairment/delay with or without a hearing deficit. Further, ABER is mostly normal even when there is a structural abnormality in the brain. The current study therefore emphasizes the fact that ABER may not be used/recommended as diagnostic or prognostic tool in children with speech and language impairment without autism or hearing deficit. The results and the recommendations of this study will definitely reduce the burden on electrophysiologists, laboratories and also save time and financial resources. It seems plausible that there is always a functional impairment in speech and language controlling areas of brain and its connecting pathways and we therefore recommend future studies involving use of functional imaging and neurophysiology to find out the exact abnormalities in speech and language processing so that specific diagnostic and prognostic

investigations can be performed to help clinicians plan management of these children.

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