

# Study of patient profile of children with poor/delayed speech in a tertiary care centre in Western Uttar Pradesh, India



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## ABSTRACT

**Background:** Humans convey their emotions and information to one another through language. Delayed or poor speech can have a profound effect on the social and professional life of a person. **Aim and Objectives:** A study of children with poor/delayed speech in a tertiary care centre in western U.P. Objectives were as follows • To study the risk factors for congenital hearing loss in children with poor/no speech. • To screen them regarding their hearing status. • To analyze results in detail and compare with available literature. **Materials and Methods:** A hospital based prospective observational study was done from Jan - Dec 2019. One-hundred fifteen children were identified. Hearing screening was done in all of them by OAE testing followed by tympanometry and BERA wherever applicable. **Results:** Out of 115 children, 9 (7.8%) had normal hearing, 9 (7.8%) had central cause of deafness and 97 (84.4%) had congenital SNHL. 64% of subjects were male (p value- <0.001). 79% of them had an association with some risk factor during birth (p value- <0.001). 40.8% of them were first order in birth with a typical age group presentation of 2-3 yrs. 60.1% of the study population with SNHL had history of normal delivery at home. **Conclusion:** Improvement in the quality of antenatal care, obstetric services and postnatal care will reduce the number of cases of congenital sensorineural deafness significantly by reducing the number of high-risk babies. Moreover, the introduction of practice of universal hearing screening of newborns will help in identifying them early for proper rehabilitation.

**Key words:** Delayed speech; High risk infants; Otoacoustic emission; Hearing screening; Congenital sensorineural hearing loss

## INTRODUCTION

Verbal communication using language is unique to the human race and is a fundamental part of the normal development & maturation of a child. It has been found that the first years of life are crucial for the successful development of language learning skills because this is the period when the process of maturation of the central auditory system occurs.<sup>1</sup> Normal hearing status with strong auditory stimuli during early childhood is an essential prerequisite for language learning ability. Language learning skills are permanently compromised if the hearing

impairment is present during this time and remain so even if the defect is corrected at a later age.

Congenital hearing loss is mostly sensorineural in origin with multiple etiologies and has a substantial burden in society. It is estimated that congenital bilateral hearing impairment occurs in approximately 1 to 5 per 1000 live births<sup>2,3</sup> and when permanent unilateral hearing loss is included, the incidence increases to 8 per 1000 live births.<sup>4</sup> Another study says that the prevalence of hearing loss is 0.5-6/1000 neonates all over the world.<sup>5</sup> Factors like poor antenatal, natal and post-natal services along with poor access to healthcare, low literacy rate and negligence of parents has a contributory role in this

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problem. Often the diagnosis is missed at birth as there is no universal hearing screening program of newborn in most countries including India. These children are identified later when they present to the clinician with failure to develop proper speech. There are a sizeable number of these cases in the community and some authors have opined that delay in speech and language development is the most common developmental disorder affecting children between 3 and 6 years of age.<sup>6</sup> We have conducted a study to identify the detailed profile of these subjects in order to get an insight into the various causes of this problem.

## MATERIALS AND METHODS

This hospital based prospective observational study was done between Jan - Dec 2019 in the ENT department at Teerthanker Mahaveer Medical College & Hospital, Moradabad. The study was carried out by interview with family of the child and the latter were assessed for hearing, motor, cognitive, emotional, speech and language development. Approval for the study was obtained from the Institutional Ethics Committee.

### Inclusion Criteria

- All children below the age of 12 with poor/delayed speech
- Voluntary participation in the study

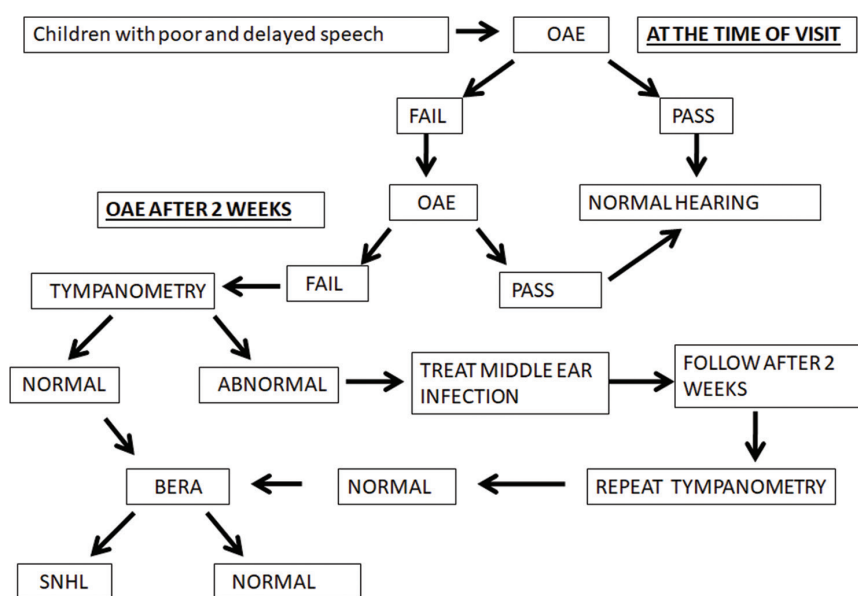
### Exclusion Criteria

1. Atresia or stenosis of external auditory canals of both ears.
2. Middle ear infection: Chronic or acute suppurative otitis media
3. Untreated otitis externa
4. Children with autism etc.

All the relevant information was collected using standard case sheets. All the different parameters like age, gender, age of parent at child birth, order of birth and number of children in family, family history of speech-language delay, history of pregnancy, type of delivery, history of admission to hospital due to any event or disease etc. were recorded. During history taking, special note was made regarding the risk factors which categorize the children as “high risk infants” according to the “Joint Committee of Infant Hearing Position Statement” which are as follows:<sup>7</sup>

- Family history of hereditary childhood SNHL
- TORCH infections (Toxoplasma, rubella, cytomegalovirus and herpes)
- Craniofacial anomalies
- Birth weight < 1500 gm or gestational age < 37 weeks
- Postnatal asphyxia (Apgar Score of 0-4 at 1 min or 0-6 at 5 min)
- Hyperbilirubinemia (more than 15 mg/dl)
- Ototoxic medication (eg: aminoglycosides alone or in combination with loop diuretics)
- Bacterial meningitis or proven bacteriological sepsis
- Mechanical ventilation for 5 days or longer
- Stigmata or other findings associated with a syndrome known to include a sensorineural and/or conductive hearing loss.

After eliciting a proper history from the patient’s mother/relative, the general examination was done followed by local examination. Otoacoustic emission (OAE) screening was done in all cases. Tympanometry (to exclude middle ear pathology) and brain stem evoked response audiometry (BERA) was advised as per indication. The procedure that was followed is depicted in a flowchart given below:



Initial OAE screening of the 115 children showed that 7 had normal OAE (which signified that they didn't have any peripheral cause of impaired hearing) and rest 108 had an abnormal OAE. As per current protocol, the test was repeated after 2 weeks for those who failed the first screening. Out of those 108, 2 more had a normal report. Rest 106 with persistent abnormal OAE result were advised tympanometry, of whom 91 with normal report (thus excluding middle ear pathologies) were advised BERA and rest 15 were treated for middle ear pathologies and after a normal report with repeat tympanometry were advised BERA. Out of the 106 cases which underwent BERA, 9 had no signs of hearing impairment signifying a normal auditory pathway. All the other 97 candidates who had varying degrees of sensorineural hearing impairment in their BERA report was advised trial of hearing aid (HA) with speech therapy. They were also explained regarding the requirement of cochlear implant surgery at a later date. Those children who did not report for OAE screening after two weeks and those who had a persistently deranged tympanometry finding even after medical management were excluded from the study.

The data thus obtained was subjected to statistical analysis using SPSS software version "17" for windows. Chi-square ( $\chi^2$ ) test was performed to find the associations and Fisher Exact Test was used where Chi-square was not applicable. P value of <0.05 was taken to be statistically significant.

## RESULTS

The study identified 115 children who visited the outdoor with poor or delayed speech. The age of subjects ranged between 1-12 years of age with a median age of presentation of 3 years and mean age of presentation of

4yrs. Maximum number of children belonged to the 2-3 years of age group. Figure 1 shows the detailed break-up of cases according to age of presentation.

Out of the 115 children identified in our study, 74 were males and 41 were females. Thus there was a strong male predominance with M: F ratio of 1.8:1. On statistical analysis, male preponderance was significant risk factor (p-value-<0.001) for speech-language delay in our study.

Various risk factors were identified in the study. Out of these 115 children, 91 were high risk category (79.1%) while 24 (20.9%) did not have any apparent risk factor at birth.

The most prevalent risk factors were premature birth (18%), low birth weight (14%) and post-natal asphyxia (15%) among others in decreasing order of frequency. Many children had a history of more than one risk factor also. Premature birth was found in relation with nearly all cases of low birth weight. All subjects who had a maternal history of TORCH infections and/or meningitis had received ototoxic drugs (aminoglycoside antibiotics, anti-epileptics, diuretics etc.). Those children with any identifiable syndrome along with SNHL also showed association with premature birth, low birth weight, post-natal asphyxia and mechanical ventilation. The various risk factors obtained in history are enumerated in Figure 2.

Again, the study association between all the risk factors and speech-language delay was statistically significant with  $p < 0.001$ .

Figure 3 shows the picture of a 4yr old male with Wardenburg syndrome (Type I) who presented with poor speech and associated sensorineural hearing loss.

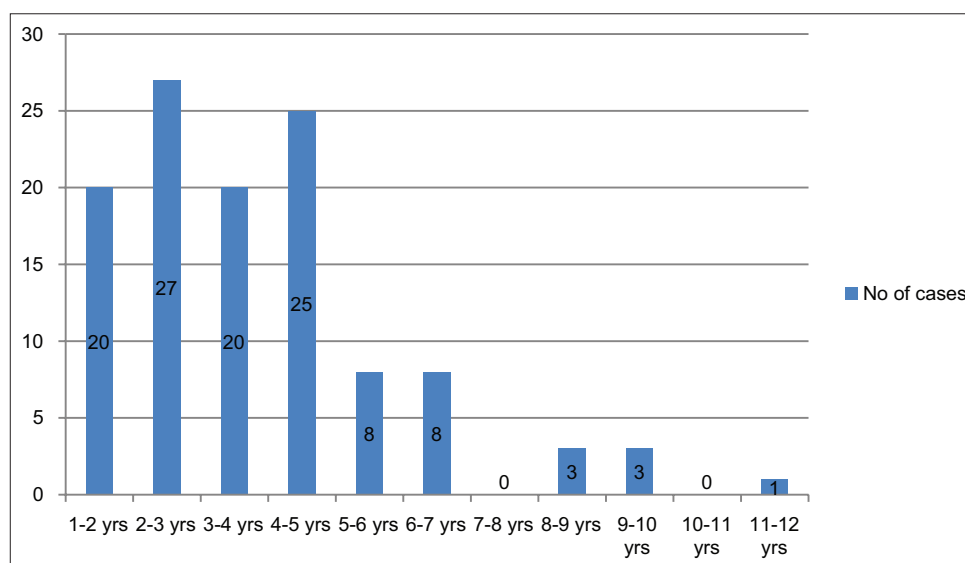


Figure 1: Age distribution of patients

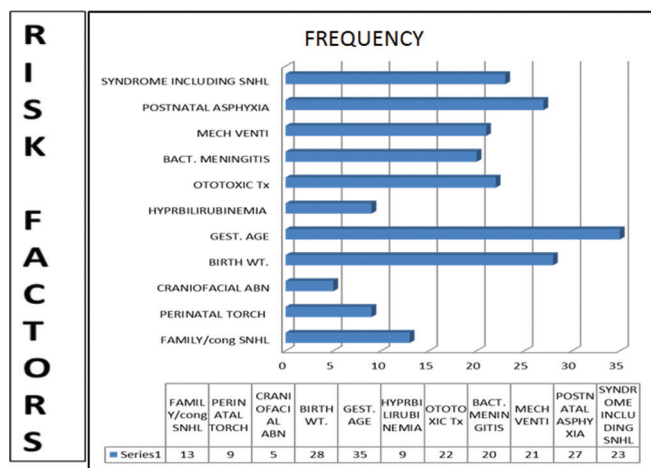


Figure 2: Various risk factors



Figure 3: Wardenburg syndrome (Type I) showing heterochromia of iris and white forelock

Though NICU stay is not one of the criteria of “high risk” infants, a strong association of history of NICU stay was found with speech delay. About 27% of the study population had an associated history of NICU stay either immediately after birth or thereafter.

Majority of children in our study i.e. 47 (40.8%) were first order births within the family followed closely by 43 cases (37.4%) second order, 17 cases (14.8%) third order, 4 cases (3.5%) fourth order, 3 cases (2.6%) fifth order and a solitary case (0.9%) sixth order birth. In other words, nearly four-fifth of cases comprised of either first or second order births within the family.

Place of delivery also had a strong association with delayed/poor speech especially for those 97 children who had variable degree of sensorineural hearing loss on BERA. Fifty-nine out of those 97 (60.1%) had history of normal delivery at home which were conducted by dais and relatives.

As already mentioned, out of 115 children, only 9 candidates (7.8%) had normal OAE screening signifying some central cause of deafness, while other 9 (7.8%) had abnormal OAE with subsequent normal BERA indicating normal hearing pathway. Rest 97 candidates (84.4%) with poor/delayed speech were diagnosed with congenital SNHL.

## DISCUSSION

There have been extensive studies on speech and language delay in western literature. Various studies have been done on sex predominance in language development as well as hearing status. In the present study, association of speech-language delay with hearing loss showed 64% male predisposition with male: female ratio was 1.8:1. Binu A et al,<sup>8</sup> Karbasi et al,<sup>9</sup> Campbell et al<sup>10</sup> also found male predisposition. Mclaughlim M et al<sup>11</sup> in their study said that males are 4 times more prone to speech and language delay than females.

In our study, 27% of the children were having a history of NICU stay. In a study done by Yoon et al<sup>12</sup> and Yoshinaga-Itano<sup>13</sup> also found NICU stay to be a risk factor for developing sensorineural deafness in infancy.

The most commonly encountered risk factors in our study in decreasing order of frequency was low gestational age, low birth weight and post-natal asphyxia etc. Several studies have confirmed that the incidence of hearing loss among babies with low Apgar scores (in the first and fifth minute after birth) due to one or more of these conditions are much higher than the general population (2 - 4%). These children can also have a high rate of middle ear pathology which would potentially affect their OAE results.<sup>14</sup> Our study showed that 18% of the study population had history of premature birth followed closely by post-natal asphyxia which accounted for 15% of the cases. Elaheh Amini et al<sup>15</sup> also concur that abnormal OAE can be associated with low birth weight due to presence of intra uterine growth retardation. Studies show that the incidence of hearing impairment in premature and low birth weight babies is 20 times more than babies with normal weight.<sup>16</sup> Some authors say that 2% of newborns with <1500 gm suffer from hearing loss.<sup>5</sup>

Our study clearly showed strong association of speech and language delay with NICU admission, family history of SNHL and bacterial sepsis or meningitis. Mondal et al<sup>3</sup> found that there is similar prevalence of speech and language delay in children with history of admission in NICU and with those with family history of the same. They did not find any relation of sepsis with speech and language delay.

Leske's<sup>17</sup> data suggested 2.5–3% prevalence of speech-language disorders in 3 to 5-year-old children. Hull et al<sup>18</sup> and Beitchman et al<sup>19</sup> found 9–10% prevalence of language delay mainly in first grade children. Nelson et al<sup>20</sup> mentioned that the maximum presentation with delay speech is found in 4–5 years of age. In our study the median age of presentation of speech and language delay was 3 years and the maximum number of children presented in the age group of 2–3 years. They also stated that the second born are mostly affected while in our study the first-born children were mainly affected.

Kaplan et al<sup>21</sup> studied Alaskan Eskimo children with a high prevalence of middle ear dysfunction and reported deficits in both language skills and reading achievement with mild hearing loss. In another study Masters and Marsh<sup>22</sup> have reported a significantly higher incidence of middle ear dysfunction in learning-disabled school children than in their regular class peers. In our study, 13% of those with delayed /poor speech had middle ear dysfunction.

According to some authors, approximately 25–33% of children with hearing loss had multiple potentially disabling conditions like mental retardation with cerebral palsy, acyanotic congenital heart disease, atrial septal defect, chiari malformation, cerebral encephalopathy etc.<sup>22</sup> In our study approximately 20% of the candidates had some language delay with hearing loss associated with some coexisting congenital anomaly.

## CONCLUSION

In conclusion, 9 (7.8%) candidates had normal hearing, 9 (7.8%) had central cause of deafness and the rest 97 (84.4%) had congenital SNHL. Males outnumbered females with a ratio of 1.8:1 and 79.1% of the study population belonged to the high-risk category. The most common high-risk factors were premature birth (18%), very low birth weight (14%) and post-natal asphyxia (15%). First births were mainly affected (40.8%) and most patients presented in 2–3 years of age group with a median and mean age of presentation of 3 and 4 years respectively. 60.1% of those with SNHL had a history of normal delivery at home.

It is important to identify babies with congenital hearing loss as early as possible so that prompt intervention can be made to allow the child to develop language skills early in life. Along with this, a robust healthcare system that provides good antenatal and postnatal care to the targeted population along with universal implementation of good hospital-based child delivery services will go a long way in reducing the number of high-risk infants with SNHL.

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**Author's Contribution:**


**MS** - Concept and design of the study, reviewed the literature, manuscript preparation and critical revision of the manuscript; **PC** - Concept, collected data and review of literature and helped in preparing first draft of manuscript.

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