

## **Speech Abnormality among Saudi Arabian Children With Hearing Impairment♣**

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**Objectives:** To determine the prevalence of speech abnormalities in Saudi children and hearing impairment.

**Methods:** Children between 4-15 years were assessed as part of a national survey of hearing impairment. They were selected randomly from the four major provinces of Saudi Arabia representing different socioeconomic and demographic groups. A WHO/PDH modified questionnaire was filled by the families and each child was clinically and audiological assessed.

**Results:** Nine thousand five hundred and forty children were surveyed. Two thousand and two children were excluded from the study as they were too young to be assessed. Speech abnormalities and delayed speech development were seen more in children whose parents were cousins or relatives. The incidence of speech abnormality was 61.11% and 12.45% in exposed and unexposed (to risk factors) children respectively. The odd ratio for hearing impairment and the risk of impairment in relation to speech abnormality was found to be 19.13% and 8.02% respectively.

**Conclusion:** Speech abnormalities and delayed speech development were seen more in children whose parents were cousins or relatives. Speech abnormalities were much higher in the children from the Southern province (3.76%) as compared to the Central (1%), the Eastern (1.23%) and the Western (0.56%) provinces.

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Identification of causes of aberrant speech and delayed language development (DLD) is important for early detection and proper management in order to treat the preventable causes. Many risk factors are responsible for delayed language development. One of these is hearing impairment, which is a serious disability, for the population of any age group. However, its impact on childhood population is quite crucial. Hearing impairment even of a mild degree can result in long lasting communicative, social and academic deficits. It is well documented that presence of hearing loss will interfere with the acquisition, development and the use of language<sup>1</sup>.

The greater is the degree of hearing loss the more difficult it will be for the child to readily acquire speech through the auditory apparatus. Children with hearing impairment are also found to have poor self-perception than children of the same age with normal hearing<sup>2</sup>.

In the progression from the first stages of speech receptive and productive ability to the development of mature speech competence, an intact and increasing auditory ability is essential<sup>3</sup>. If a child with hearing impairment has an intact speech-sound production system, then the child is capable of producing the whole range of sound types but will be unable to develop and maintain a normal and intelligible speech. This is because of the monitoring of speech production via the auditory feedback pathway is prevented by hearing impairment<sup>4</sup>.

The aim of this study is to determine the prevalence of speech abnormalities, its relation to hearing impairment and to identify the causes for early prevention and management.

## **METHODS**

A national survey was carried out primarily to determine hearing impairment and speech abnormalities among Saudi children. The subjects were selected from Central, Western, Eastern and Southern provinces of Saudi Arabia. The sample selection was randomly designed, with representation of the children from all socioeconomic and demographic groups. A consent was obtained from the family, then a questionnaire modified from WHO/PDH was completed with help of the parents. This included the age, sex, parent consanguinity, speech and hearing abnormalities in the family, pregnancy, labour, antenatal care clinic attendance, neonatal periods, birth weight, developmental milestone, and history of childhood illnesses. Full ENT examination was carried out which included the vocal tract. The anterior structures (lips, tongue and cheeks) as well as the posterior structures (soft palate, velopharyngeal musculature and vocalcords) involved in speech generation were generally assessed.

Hearing was tested using free field testing and tuning fork tests. Those failing the test or in doubt were subjected to pure tone audiometry. This was performed using interacoustic AC30 clinical diagnostic audiometer. The hearing level was tested at frequencies 1,2 and 3 KHz and tympanometry was also performed using a Grason

Stadler GS133 Admittance meter for further confirmation of hearing level of the children.

Children with speech abnormality or delayed development of speech were identified. Many of them were referred to speech pathology unit for language assessment including receptive, expressive abilities, psychiatric evaluation and management. The data were analyzed by  $\chi^2$  test using EPI-MO computer software.

## RESULTS

This study is a part of a national survey on hearing impairment. Therefore, we will report only the effect of hearing impairment on speech. Out of 9540 children surveyed (4-15 years) only 7538 children were included in this study since 2002 children were below 4 years and it was not possible to evaluate their speech.

Of the seven thousand five hundred and thirty eight children included, 1038 (13%) were found to be hearing impaired and 652 (8%) were at risk of hearing impairment (with positive history of difficult labour, prematurity, exposure to early childhood infection e.g. measles, mumps, meningitis) and 5848 (79%) were having normal hearing (Fig.1). Mild hearing impairment (15-40 dB) was found in 881, moderate (41-70 dB) in 149 and severe to profound (71-95 dB) in 8 of the children. Most of those with mild hearing loss showed type B tympanogram which usually indicates otitis media with effusion (OME) with conductive hearing loss, 73 with sensorineural and 84 with mixed hearing loss.

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*Figure 1. Frequency distribution of total subjects showing the number and percentage of children with normal hearing, impaired hearing and at risk of hearing impairment*

**Table 1. Effect of various risk factors on the outcome of Hearing Impairment.**

RISK FACTORS	EXPOSED		UNEXPOSED		ODD RATIO	P VALUE
	Normal	Hearing Impaired	Normal	Hearing Impaired		

Abnormal Pregnancy	140	40	6410	948	2.41	***
Not Attended Antenatal care	201	50	6338	949	1.82	**
Abnormal Labor	110	30	6400	998	2.09	**
Risk factor High in Family	78	56	6429	975	4.99	***
Speech Abnormality	15	50	6500	973	19.13	***

\*P<0.01, \*\*P<0.0001 and \*\*\*P<0.00001 using  $\chi^2$  test.

Clinical examinations did not show any syndromic features such as cleft lip or any other vocal tract abnormalities. Ear examination revealed impacted wax in 117, dull tympanic membrane in 753 and otitis media in 11 cases. Speech abnormality was found to be significantly associated with hearing impairment. The incidence of speech abnormality was 61.11 % and 12.45% in exposed and unexposed children respectively (Fig.2). The odd ratios for hearing impairment and the risk of impairment in relation to speech abnormality were found to be 19.13 (Table 1). Speech abnormality was much higher in the children from the Southern province (3.76%) as compared to the Central (1%), the Eastern (1.23%) and the Western (0.56%) provinces. Children whose parents were cousins had a higher incidence of speech abnormality (2.65%) as compared to children whose parents were distant relatives (0.89%) or not related (0.58%). Speech abnormality was higher in male children (1.43%) than female children (0.89%).

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*Figure 2. Bar graphs showing the percentage of hearing impairment in the children with and without exposure to various risk factors.*

*\*P<0.01, \*\*P<0.0001 and \*\*\*P<0.00001 using Chi-square test*

## **DISCUSSION**

The study showed that children from the Southern province had higher incidence of speech abnormality as compared to children from the other provinces. This could be attributed to the high prevalence of consanguineous marriages and poor antenatal care. The influence of different risk factors on hearing impairment and language development is a complex and multifactorial phenomenon. Therefore, further research is necessary to determine the role of these risk factors on the outcome of hearing impairment and language development e.g. low birth weight, prematurity, complicated pregnancy and labour. Thomas<sup>5</sup> observed that bacterial meningitis was associated with sensorineural hearing loss, learning difficulties and delayed speech. The language scores in very low birth weight infants were significantly lower than full term controls.

The majority of our cases were due to otitis media with effusion which were referred for treatment. Hearing loss secondary to otitis media has increasingly been associated with significant developmental and educational problems<sup>6</sup>. Hanson<sup>7</sup> reported potentially adverse effects of otitis media with effusion on hearing, speech development and language acquisition.

Robert<sup>8</sup> examined long-term associations between otitis media with effusion and patterns of intellectual development. Parent consanguinity and the genetic factor was noticed to affect language development in our study. Bishop<sup>9</sup> reported the role played by genetics in the aetiology of language impairment. Positive family history of deafness was reported by Robinson<sup>10</sup> to have a significant importance as a cause of language disorders. Complicated abnormal pregnancy was found to be a risk factor especially if the pregnant woman did not attend antenatal care and have assessment in the early stage. Korkman<sup>11</sup> who studied the effects of prenatal exposure to alcohol and cigarettes, reported an association between these with cognitive and receptive language disorders.

The major risk factor for speech abnormality is hearing impairment, so early detection of hearing impairment is very important for the successful treatment and to save the child from severe developmental disabilities. Proper antenatal and natal cares can prevent some of the risk factors. Special programs should be launched with the coordination of the school teachers, social workers and parents for timely identification of hearing problems. Moreover, the use of sophisticated instruments such as otoacoustic emission, pure tone audiometry and tympanometry will help in early screening and diagnosis of hearing impairment especially for those with delayed language development or at risk.

## CONCLUSION

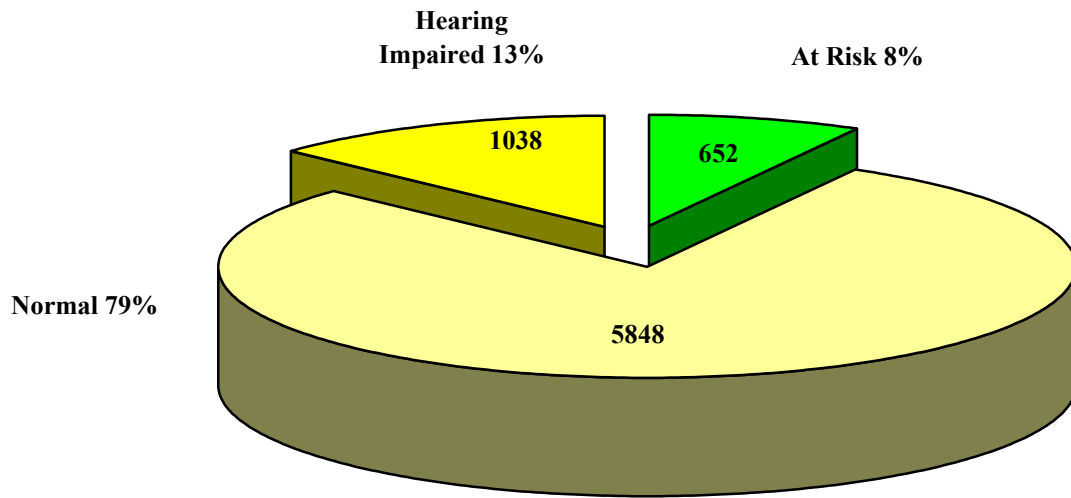
**This study in the four main provinces of Saudi Arabia showed that speech abnormalities and delayed speech development were seen more in children whose parents were cousin or relatives.**

**Speech abnormalities were much higher in the children from the Southern province as compare to the Central, Eastern and Western provinces. This can be explained by more consanguineous marriages in that region.**

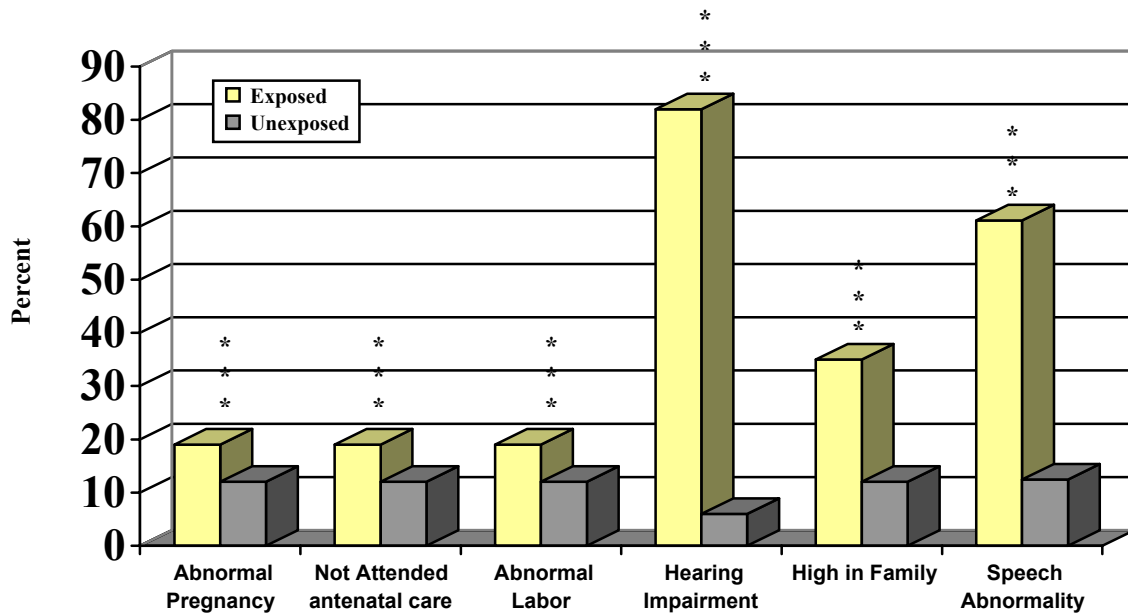
**Further research is necessary to determine the role of the different risk factors on the outcome of hearing impairment and language development eg. low birth weight, prematurity and complicated pregnancy or labour.**

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**Fig. 1** Frequency distribution of total subjects showing the number and percent of children with normal hearing, impaired hearing and at risk of hearing impairment.



**Fig. 2.** Bar graphs showing the percentage of hearing impairment in the children with and without exposure to various risk factors. \*P<0.01, \*\*P<0.0001 and \*\*\*P<0.00001 using Chi-square test.



