Hearing impairment in low birth weight children

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ABSTRACT

Objective. To investigate the prevalence of hearing impairment in normal and low birth weight children.

Methods. A survey of 9540 Saudi children below 15 years of age was carried out. The survey was performed in the provinces of the Kingdom of Saudi Arabia from September 1994 to May 1998. The subjects were classified into low birth weight (up to 2.5 kg) and normal birth weight (>2.5 kg) groups. Each child was carefully examined for hearing status.

Results. The results of this study showed significantly high prevalence of hearing impairment in low birth weight children (14.87%) as compared to normal birth weight children (9.78%).

Conclusion. Further studies are warranted to identify the potential risk factors associated with the high prevalence of hearing impairment in low birth weight children.

Keywords: Hearing impairment, low birth weight, children.

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Hearing impairment without appropriate intervention among young children can delay the acquisition, speech and language skills that can result in learning and other problems at school age. Thus, the early detection of hearing impairment in children is of utmost importance due to the necessity of starting effective measures to improve the hearing status as well as to provide proper training in speech and language at the youngest possible age. Studies on the epidemiology and etiology of hearing impairment in the children from Kingdom of Saudi Arabia (KSA) started only recently.[1,2,3,4] Several investigators have observed a close association between low birth weight and the outcome of childhood hearing impairment.[5,6,7] This investigation was aimed at determining the current status of hearing impairment in Saudi children as well as to report the effect of low birth weight (LBW) on the prevalence of childhood hearing impairment.

Methods. A survey of 9540 Saudi infants, pre-school and school age children below 15 years of age was carried out from September 1994 to May 1998. The subjects were selected from Central, Eastern, Southern and Western provinces of KSA. The sample selection was randomly designed, with representation of the children from all the socio-economic and demographic groups. Fieldwork was carried out to enumerate and number the administrative, residential, recreational and road areas of the different provinces of KSA. Within each block selected, a random starting point was chosen and the survey team followed the predetermined route. Each survey team included an ears, nose and throat (ENT) specialist, an audiologist, a nurse, a social worker and a field supervisor. After getting permission from the family, a questionnaire modified from the World Health Organization (WHO) was filled in. This included age, sex, parent relation, pregnancy, labor, birth

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weight, family history, exposure to risk factors, immunization and past medical history. Then the team performed the clinical examination of the child. The children were classified into LBW (up to 2.5 kg) and the normal birth weight (NBW) is >2.5 kg groups. The hearing in the children was assessed using free field speech testing and tuning fork tests and a portable screening/audiometer was used, testing at frequencies of 1, 2, 3 KHz. Those who failed the test, or were in doubt, were referred to the Audiology Department of the hospital where complete assessment of hearing took place. Pure tone audiometry using an interacausties AC30 diagnostic audiometer and tympanometer using a Grason Steadler (GS) 133 admittance meter was carried out for confirmation of hearing status of the children. Those with profound deafness were referred for auditory brain stem evoked response (ABR). The data was analyzed by X^2 test using EPI-INFO computer software.

Results. The data of the subjects survey showed that 4% of the children (282) were of LBW and 42% of NBW, whereas birth weight data was not available for 54% of the children. In the LBW group, there were more female subjects (5.6%) than male subjects (2.4%), whereas there was only a slight difference in the frequency of male and female subjects in the normal group, **Table 1**. The frequency distribution of LBW and NBW children from different provinces of KSA is shown in **Figure 1.** Out of 282 children with LBW, 48 (17%) had hearing impairment. The degree of hearing loss was as follows, 37 (13.1%) with mild hearing loss (20-40 decibel [dB]) of conductive type, 6 (2.1%) with moderate (41-70dB) and 5 (1.8%) with severe to profound hearing loss (71-95dB) of sensorineural type. There was a significantly high prevalence of hearing impairment in LBW children (14.87%) as compared to NBW children (9.78%).

Table 1 - Percentage of low and normal birth weight children and sex distribution.

Birth weight	Total %	Male %	Female %
Low birth weight	4	2.42	5.77
Normal birth weight	42	40.72	43.35
Undecided	54	56.86	50.88
Total	**100**	**100**	**100**

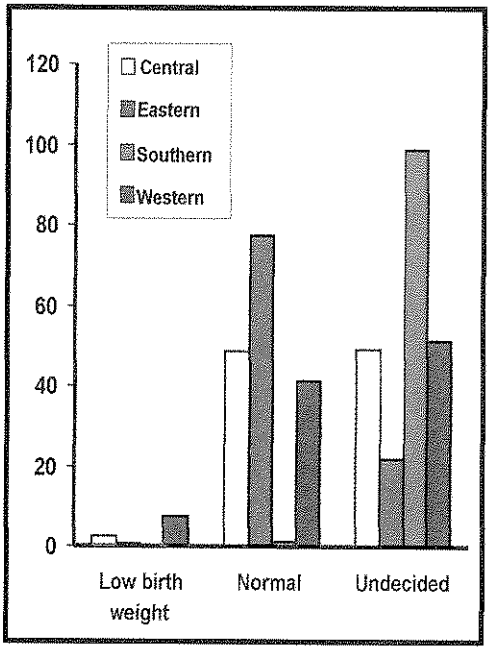

Figure 1 - Low birth weight and normal birth weight children from different provinces of the Kingdom of Saudi Arabia.

Discussion. Although a large number of children were surveyed for this study, the data regarding birth weight was available only for 46% of the cases. The frequency of LBW was higher in female children, **Table 1**, whereas the prevalence of LBW children from different provinces of KSA could not be concluded due to the variable frequency of children whose birth weight records were not available, **Figure 1.** However, the results of this study showed significantly high prevalence of hearing impairment in LBW children as compared to NBW children, which is comparatively higher than reported earlier.[5] Recently, Sutton and Rowe[7] suggested a close association between LBW and childhood hearing impairment. They observed the odds ratio for the children with birth weight below 2500g to be 4.5, whereas the odds ratio for the children with birth weight below 1500g was much higher at 9.6. Boo et al[8] also reported a significantly high risk (odds ratio, 12.0) of sensorineural hearing loss in very low birth children from Malaysia. Another study which was conducted in a cohort of 79 very LBW children showed mild hearing loss in 26%, moderate hearing loss in 13% and severe hearing loss in 3% of the children.[9] Our study showed mild hearing loss occurred in 13.1%, moderate hearing loss in 2.1% and severe to profound hearing loss in 1.8% of the children with LBW.

The influence of LBW on hearing impairment is multifactorial due to certain risk factors, which are more frequently observed in LBW children. Leslie et al[10] observed increased risk of hearing loss in LBW children who spent more than 90 days on oxygen. Bowen et al[11] have reported that supplemental oxygen, treatment with post-natal steroids and intraventricular hemorrhage are significantly associated with neurological impairment including hearing loss. Sensorineural hearing loss was also associated with the use of high doses of aminoglycoside antibiotics, more episodes of low pH, hypoxemia and high bilirubin levels in LBW children.[12] The potential harmful effect of incubator noise on hearing loss has been suggested by several investigators but with conflicting results. Falk et al found the cochlea of newborn guinea pig to be more susceptible to high intensity noise than that of adult animals.[13] Douek et al demonstrated considerable loss of outer hair cells in the cochlea of newborn guinea pigs after subjecting them to incubator noise while no such change was observed in adult guinea pigs.[14] Clinical studies have shown that the ambient noise caused by incubator motors has no effect on hearing loss in LBW children.[15,16]

In conclusion, the present study clearly demonstrated a significantly high prevalence of hearing impairment in LBW children. However, further studies are warranted to identify the causative risk factors associated with childhood hearing loss in LBW children.

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