Language outcome of very low birth weight babies at 2-year corrected age: A comparative study

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ABSTRACT

Background: Improved survival of preterm infants has resulted in increase in motor and cognitive dysfunctions which have reduced health-related quality of life. **Objective:** The objective of this study was to assess the receptive and expressive language (EL) development of very low birth weight (VLBW) babies at 2-year corrected age and compare it with normal birth weight (NBW) "at-risk" babies on developmental follow-up. **Materials and Methods:** This was a cross-sectional study which compared the language outcome which was measured using Receptive-Expressive Emergent Language Scale. **Results:** The study included 75 VLBW babies and a comparison group of 26 NBW babies. The mean receptive language quotient in VLBW and NBW babies was 91.37±8.35 and 97.19±7.07, respectively (p=0.002). The mean EL quotient in VLBW and NBW babies was 82.64±12.32 and 92.77±10.47, respectively (p<0.001). A total of 20% of VLBW children had a significant delay in EL as opposed to only 4% of the NBW children (p=0.019). **Conclusion:** VLBW infants have a significantly higher chance of expressive language delay compared to NBW children.

Key words: *Language delay, Receptive-Expressive Emergent Language Scale, Very low birth weight*

In the past decade, the improved quality of neonatal care in developing countries like India has resulted in increased survival of the extreme preterm, extremely low birth weight (ELBW) infants and also infants with serious perinatal morbidities. However, the incidence of preterm births has increased in the past decade as a result of advanced artificial reproductive techniques and infertility treatments [1,2].

The improved survival of extreme preterm and very LBW (VLBW) infants has not resulted in increase in the incidence of major neuro-morbidities such as cerebral palsy or severe intellectual disability. However, more subtle motor and cognitive dysfunctions have emerged, which have reduced health-related quality of life and resulted in increased health-care costs [3]. Studies report significant impairments in the language development of preterm, LBW children compared with children born full term [4-6].

The previous Indian studies on neurodevelopmental outcome of VLBW babies have mainly used the Development Assessment Scale for Indian Infants (DASII) as the assessment tool [7]. In DASII, the mental developmental quotient measures performance in both fine motor and language domains. Therefore, it may not accurately pick up a delay in language which may be compensated by a good performance in fine motor areas. Hence, it is ideal to use a language-specific tool to detect a language delay. Hence, in this study, we evaluated the receptive language quotient (RLQ) and expressive language quotient (ELQ) of the VLBW infants using a standard language assessment tool Receptive-Expressive Emergent Language Scale (REELS).

MATERIALS AND METHODS

A descriptive cross-sectional study was carried out in a child development center in South India for a period of 6 months from December 2016 to May 2017. The study was started after obtaining approval of the Institutional Ethics Committee and the consent of parents was taken before the assessments. Initially, only VLBW infants were included; later, a comparison group of normal birth weight (NBW) infants was included to improve the power of the study.

For calculating minimum sample size to get a significant result, the formula used was: $n=2*S^2/d^2*f$ (alpha, beta) where S=standard deviation of mean; d=difference between two-sample means; and F=function of power which is a constant and when calculated at 80% power with 95% confidence interval, it is 7.85. In the study by Modi *et al*., the mean DQ of VLBW babies at 1 year was 91.5±7.8 and that of NBW babies was 97.8±5.3 [8]. Using the formula, it was calculated that there have to be at least 26 subjects in each sample for the study to be significant.

Hence, the study sample included 75 VLBW babies and a comparison group of 26 NBW during the study period. Babies

Table 1: Comparison of postnatal complications

Postnatal complication	VLBW n (%)	NBW n (%)	χ^2	*p value
Perinatal depression	12 (16.5)	5 (18.8)	0.055	0.558
Shock	4 (5.6)	0	1.44	0.298
Sepsis	4 (5.5)	2 (6.3)	0.019	0.617
Ventilation	7 (9.7)	3 (12.6)	0.191	0.499
Feeding problems	23 (30.2)	8 (31.4)	1.006	0.231
Respiratory distress	68 (90.4)	13 (50.2)	32.28	<0.001
Others	19.2	31.3		

VLBW: Very low birth weight, NBW: Normal birth weight

with major congenital anomalies, chromosomal disorders, hearing, and vision impairment were excluded from both VLBW and NBW samples. RLQ and ELQ were calculated using REELS, which was administered by the investigator and <70% of the values was considered as significant delay.

Quantitative data such as language quotient were analyzed as mean. Significance of difference in mean between two samples was analyzed using Student's t-test and significance of difference in proportion calculated using Chi-square test using SPSS software.

RESULTS

Mean birth weight of the VLBW sample (n=75) was 1297±176 g and that of NBW sample (n=26) was 3100±530 g. Of the 75 VLBW babies, eight were ELBW (<1000 g). The most common antenatal risk factors in VLBW babies were pregnancy-induced hypertension (PIH). Certain antenatal complications such as PIH, antepartum hemorrhage, urinary tract infection, abnormal Doppler, and multiple gestations were significantly higher in VLBW when compared to NBW babies. A total of five babies in VLBW group were extremely preterm (<28 weeks), 20 babies were late preterm (34–37 weeks), and the majority of cases were in the range of 28–34 weeks. Almost half (48%) of the VLBW babies in the study were small for gestational age. Respiratory distress was the most common postnatal complication among both the VLBW babies and NBW babies. Of 75 VLBW babies, only two had spastic diplegia.

Periventricular leukomalacia (PVL) Grade 1 (diffuse increased echogenicity after 7 days) in neurosonogram was found to be significantly associated with VLBW compared with NBW babies (33% vs. 8%; p=0.013). PVL Grades 2, 3, and 4 were not found in any of the subjects in the study. The mean RLQ was significantly lower in VLBW infants compared to NBW infants (91.37±8.35 vs. 97.19±7.07, p=0.002) Table 1. The mean ELQ was significantly lower in VLBW infants compared to NBW infants (82.64±12.32 vs. 92.77±10.47, p<0.001). None of the VLBW or NBW babies had a significant delay in RLQ (<70). However, a significant delay in ELQ was seen in 15 (20%) of the VLBW babies as opposed to only 1 (4%) in NBW babies (p=0.019).

DISCUSSION

In the current study, we have found that the language development of VLBW infants is significantly low when compared to their NBW counterparts at 2-year corrected age. The percentage of EL delay in our VLBW sample was 20%, which is similar to the earlier study done by Kessenich, in 2003, which showed an early language delay in 22%–28% of premature, LBW infants [9]. The difference in the language development was more prominent in the EL domain than in the RL. Even though the mean RLQ of VLBW infants was significantly lower than NBW group, it was not <70%.

Significant RL delays are more suggestive of conditions such as hearing impairment and autism spectrum disorders. Severe hearing impairment was an exclusion criterion for our study and children with autism spectrum disorders may have been less in our study; even though we have not done any screening for autism in our study. Moreover, studies in literature also show that EL is more commonly affected than RL in LBW infants. In a study by Byrne *et al*., 28% had delayed EL while only 5.7% had delayed RL at 2-year corrected age [10].

Other than the birth weight and gestational age differences, the postnatal morbidities were similar in both the VLBW and NBW group, respiratory distress being the most common. Only 2 children (2.7%) in VLBW group had a major neurodevelopmental disorder. However, the percentage of language delay was much higher (20%) in the VLBW group compared to NBW group (4%). Hence, we can infer that differences in the language development are present even in the absence of major disabilities and independent of environmental factors [11,12].

Even though magnetic resonance imaging was not done for the babies; the fact that, PVL Grade 1 was significantly associated with VLBW compared with NBW babies which indicates that subtle white matter abnormality may be associated with language outcome. The results were in accordance to a study done by Reid *et al*. [13]. Hence, in VLBW infants, the difference in language abilities may be part of a global deficit that impairs many areas of cognitive functioning, and hence, it is more likely to be significant when compared to early speech delay in low-risk children [14,15]. In the study by Abou-Elsaad *et al*., it was observed that prematurity increased the risk of language and cognitive delay significantly by 3.9-fold [16].

Language delay may also be an early sign of certain neurodevelopmental disorders such as autism spectrum disorder, attention deficit hyperactivity disorder, or specific learning disability which are more common in VLBW children [17-21]. Early identification of speech delay and appropriate intervention

can assist in educational planning of the child and is often associated with better long-term outcomes [22]. Although routine screening for language delay is not recommended in low-risk children [23], it would definitely be useful in high-risk children.

There were few limitations of this study. As the sample size of the comparison group was less than that of the VLBW group, it was not possible to do a case–control study. Furthermore, there was no follow-up. The children with EL delay should be followed up to see if they persist to have difficulties in preschool and primary school years or whether they develop any neurodevelopmental disorders.

CONCLUSION

VLBW infants are at higher risk of language delay when compared to their normal-weight counterparts. Early recognition and intervention are necessary to provide children with speech/language disorders with the best possible outcome.

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