

Evaluation of growth and development pattern in normal, low and very low birth weight neonates at 18 months of age

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ABSTRACT

Introduction: Growth and development monitoring could lead to general judgment about children's health. With advances in NICUs establishment, the survival rate of very low birth weight (VLBW) neonates has increased in many countries including Iran. Because of the lack of studies about growth and development pattern of low birth weight (LBW) and VLBW neonates in Iran, the present study aimed to compare growth and development of normal, low and very low birth weight neonates at 18 months of age. **Materials and Methods:** In a cross-sectional descriptive study, 214 children with age 18 months were enrolled (90 LBW, 90 LBW and 34 VLBW) and their growth and development were assessed. Data gathering tool was a researcher made questionnaire including anthropometrics measures and developmental key points. Data analyzed by descriptive (mean and SD) and inferential (ANOVA) tests using SPSS version 15. **Results:** There were significant differences in the mean of anthropometric indexes between three groups. Majority of subjects in three groups had normal weight growth trend. Mean scores of gross motor and fine motor development indexes had significant association with birth weight. Meanwhile, there was no significant association between mean scores of social/cognitive and also language developmental aspects and birth weight. **Conclusion:** Findings revealed that in LBW and VLBW children, growth indexes at the age of 18 months are so far from those of NBW neonates. Further nationwide prospective studies, with a longer period of time is needed to estimate when Iranian LBW children reach at the levels of NBW ones.

Key words: Children, development, growth, low birth weight, very low birth weight

INTRODUCTION

Health assessment is the most important issue in pediatrics field and the most valuable point in pediatric care. Awareness

of normal growth and development are essential in giving care. Although normal growth and development are not necessarily a sign for lack of a serious or chronic disease, it can be used to have a general judgment about children's health.^[1]

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In the past two decades, the number of low birth weight neonates has increased due to a raise in preterm deliveries. Although very low birth weight neonates account for 1.4% of all births, their mortality and disabilities are 50 and 50%, respectively.^[2] In Iran, prevalence of LBW and VLBW were reported 6.8 and 1.3%, respectively.^[3] In recent years with advances in perinatal care, the survival chance of VLBW neonates has increased.^[4] These neonates usually are involved in disorders like cerebral palsy, convulsion, hydrocephaly, blindness, deafness and cognitive disorders.^[5,6] Therefore, the follow up of VLBW neonates after discharging from hospital helps rapid diagnosis of their developmental

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disorders. With regard to establishment of NICU in medical centers all over Iran in recent years and lack of studies on growth and development status of LBW and VLBW neonates after birth in Iran, as well as the importance of growth and development of neonates, especially VLBW as an important index for their health status, the present study aimed to compare growth and development of normal, low and very low birth weight neonates at 18 months of age.

MATERIALS AND METHODS

This is a cross-sectional descriptive study. Study population comprised all children referring to health care centers in Isfahan, Iran who had a health file and were at age of 18 months at the time of sampling. Sample size in normal and low birth weight groups, and in very low birth weight group were calculated as 90 and 34, respectively, with regard to mean and SD of normal, LBW and VLBW values, obtained in previous study.^[7] Data were collected by a questionnaire containing subjects' demographic characteristics, their physical growth patterns as well as developmental indexes in motor, sensory, language and social/cognitive dimensions.

Validity and reliability of the questionnaire were confirmed by content validity and test re-tests methods, respectively. Health care centers in Isfahan were randomly selected as research environment. Log books of child health care, existing in health care centers, were used to assign the subjects into three groups. LBW and NBW babies in these centers were selected randomly among those who had inclusion criteria, and selection of the VLBW neonates, due to their low number, was through census sampling and included all VLBW neonates referring to the above-mentioned selected health care centers.

After selection of subjects, the mothers were asked to attend the health care centers at a determined time through phone calls for their babies' duly health care and physical assessment at the age of 18 months. All steps of sampling and filling the questionnaires were administrated by a single researcher. The data related to birth date, weight, height and birth head circumference, gender, length of breast feeding and type of mothers' delivery were recorded in the questionnaire through referring to the existing health file in health care centers. Measurement of weight, height and head circumference at the age of 18 months was conducted by a calibrated and stable scales, through supine height measurement and a measuring

type retrospectively, and was evaluated based on WHO growth charts. The child's developmental status was evaluated through an interview with the parents, held by researchers, and their responses to key points of development in gross motor and fine motor, language and social/cognitive aspects in form of "yes," "sometimes" and "not yet." Responses "yes," "sometimes" and "no" were scored as two, one and zero, respectively. Dimension of gross motor development contained five questions ranging 0-10 scores, that of fine motor included four questions ranging 0-8 scores, language contained six questions ranging 0-12 and dimension of social/cognitive contained five questions ranging 0-10 scores. In case of any doubt about an existing disorder in child's growth and developmental trend, he/she was referred to the physician who was working in the health care center. Descriptive (mean and SD) and inferential (ANOVA) statistical tests were adopted to compare mean of weight, height, head circumference as well as mean scores of development indexes in motor, language and social/cognitive dimensions in three groups.

Descriptive statistical tests were used to compare frequency distribution and lack of an ascending trend in weight growth chart.

RESULTS

Results showed a significant difference in mean of anthropometric indexes in three groups at the age of 18 months ($P = 0.000$) [Table 1].

Mean scores of gross motor and fine motor development indexes had a significant association with birth weight. Meanwhile, there was no significant association between mean scores of social/cognitive and also language developmental aspects and birth weight [Table 2]. With regard to frequency of an abnormal growth trend, the findings showed that five subjects in NBW (5.6%), two subjects in LBW (2.2%) and one subject in VLBW (2.9%) had a flattened growth curve for weight compared to 3 months before study. In NBW group, eight subjects (8.9%); in LBW group, four subjects (4.4%) and in VLBW group, two subjects (5.9%) had a descending growth curve for weight compared to 3 months before study.

DISCUSSION

Present study showed a significant difference in children's weight, length and head circumference at 18 months of

Table 1: Growth parameters in the three groups

	NBW	LBW	VLBW	F	P value
Weight at birth (g)	3139.67±255.23	2364.22±179.97	1282.35±184.03		
Weight at 18 months (g)	10487.78±1303.70	9685.56±1105.45	8790.29±1219.20	26.29	0.000
Height at birth (cm)	49.18±1.93	45.45±1.95	39.13±3.34		
Height at 18 months (cm)	81.39±3.08	79.59±2.42	76.45±3.37	37.25	0.000
Head circumference at birth (cm)	34.69±1.20	32.79±1.52	27.92±2.66		
Head circumference at 18 months (cm)	47.38±1.39	46.44±1.42	45.70±1.60	19.64	0.000

NBW = Normal birth weight, LBW = Low birth weight, VLBW = Very low birth weight

Table 2: Comparison of mean and standard deviation of different developmental aspects' scores between the three groups

Development index	NBW	LBW	VLBW	F	P value (One way ANOVA)
Gross motor	9.81±1.30	8.96±2.05	7.44±3.49	8.85	0.000
Fine motor	5.78±1.28	5.22±1.52	4.68±1.27	8.68	0.000
Language	9.91±2.06	9.28±2.15	9.12±2.04	2.8	0.06
Social/cognitive	9.08±1.25	9.03±1.35	9±1.30	0.052	0.94

NBW = Normal birth weight, LBW = Low birth weight, VLBW = Very low birth weight, ANOVA = Test anova

age in three groups, but weight growth trend was ascending in most of the subjects in three groups. The frequencies of flattened and descending growth cases were not notable. Van der mei *et al.*, in a study on comparison of NLBW and VLBW neonates' growth with reference population (LBW neonates) showed that mean weights of MLBW and VLBW at ages of 2,6,18,48 and 96 months were lower than reference group.^[8] Power *et al.*, in a cohort study monitored 135 very low birth weight infants (gestational age: 23-35 weeks) to 3 years of age at San Antonio, Texas, and showed that weight-gaining pattern in VLBW with gestational age ≥ 27 weeks was low in the first 12 months and got an ascending trend at the age of 18 months. It had an improvement until 30 months of age while growth disorder in neonates whose gestational age was ≤ 26 weeks was constant until the age of 3 years.^[9] In the present study, growth pattern of subjects was investigated in a cross-section design, and contrary to Powers' study, the subjects were evaluated ignoring their gestational age, so the results have the less predictive value which can be considered as a limitation of the present study.

Ford *et al.*, in a cohort study in Melbourne, Australia, showed that VLBW children at the age of 2 years had a shorter height, compared to NBW children, and this difference was constant until the age of 14 years.^[10] Although in the present study, the neonates were investigated at age of 18 months and the obtained results showed that VLBW subjects, compared to LBW subjects, and both of these groups (VLBW and LBW) compared to NBW, had a shorter height, it seems that our findings are consistent with that of Ford's. Latal *et al.*, in their study in Zurich showed that head circumference of VLWB neonates was less than their peers with higher birth weight at the age of 2 years.^[11] Constantine *et al.*, reported that mean head circumference at ages of 4, 18 and 30 months in ELBW group was less, compared to VLBW neonates.^[12] In the present study, mean of head circumference at age of 18 months in VLBW group was less, compared to LBW, and in both groups (VLBW and LBW), compared to children in NBW group, which is consistent with previous studies.

In the present study, despite of a significant difference between three groups concerning anthropometrics indexes at 18 months of age, comparison of mean of these indexes at birth and 18 months after showed that mean of weights increased by 3.5- and 4-folds during this period in NBW and in LBW children. Meanwhile, this value increased by 7-folds

in VLBW group. Mean of height increased by 37.04 cm in VLBW children until 18 months of age; by 33.1 cm in LBW children, and by 32.1 cm in NBW children. Increase of mean in head circumference until the age of 18 months in NBW children was 12.61 cm, and in LBW children, it was 13.61 cm while it was 18.1 cm in VLBW children. This issue reveals the appropriate growth of children in two groups of LBW and VLBW, compared to NBW group as these children have the growth potentiality to compensate their low weight after birth. On the other hand, parents' precise supervision on their nutrition and health care compared to parents of NBW children could be a reason for their proper growth, as the findings showed the frequency of abnormal growth trend in LBW and VLBW is less than NBW group.

It is expected that LBW neonates reach the level of NBW neonate in growth parameter at the end of age 2, in the absence of congenital anomalies, CNS injuries or severe intra uterine growth retardation (2). Our findings revealed their growth indexes at the age of 18 months are so far from those of NBW neonates. Therefore, further nationwide prospective studies seem essential with a longer period of time and with higher number of subjects to enable us to estimate when Iranian LBW children reach the levels of normal children's growth.

As now, because LBW children's growth patterns are checked based on NBW children chart, interpretation of their growth trend cannot be appropriately done. So, creation and use of a growth chart specified for such children is essential for monitoring the health status of LBW children.

Results showed a significant difference in mean scores of gross motor and fine motor indexes between three groups. In study of Power *et al.*, mean score of motor development in VLBW children with gestational age of ≥ 27 weeks was low in their infancy period while it improved at the age of 18 months, meanwhile in children with gestational age of ≤ 26 weeks, the developmental delay persisted until the age of 3 years.^[9] Gutbrod *et al.*, investigated the effects of small for gestational age (SGA) in very low birth weight (VLBW) infants on growth and development until the fifth year of life, and showed that developmental test results were similar for the SGA and AGA-BW groups at 5 and 20 months.^[13]

In the present study, investigation of children was conducted in a cross-sectional, not a prospective design, and it was just based on birth weight ignoring the neonates' gestational age. Spittle *et al.*, showed that 35% of preterm neonates were abnormal concerning motor development at the age of 12 months, 16% had a moderate to acute motor function defect and 5% were CP.^[14] Another study showed that preterm children had a significant delay in their general development compared to term children, and their developmental outcomes were significantly associated with their birth weight.^[15] In the present study, mean scores of language and social/cognitive development indexes were not significantly different between three groups. These findings are not consistent with that of others.^[12,15]

Constantinou *et al.*, evaluated the impact of birth weight on development of very low birth weight (VLBW) infants at 12, 18 and 30 months of age, and showed that there was no significant difference in language development between VLBW and extremely low birth weight (ELBW) groups, but ELBW neonates obtained significant lower scores concerning cognitive development at the age of 30 months compared to VLBW.^[12] Ozbek's study on preterm neonates in Izmir, Turkey showed that they had a significant delay in language and cognitive developmental aspects at pre-school age.^[15] Power's *et al.*, showed that in VLBW children with gestational age ≥ 27 weeks, cognitive developmental skills got normal at the age of 30 months.^[9] In the present study, due to lack of adequate information existing in children's health files, evaluation of the subjects concerning their preterm status and level of prematurity was not conducted, which is one of the limitations of our study.

CONCLUSION

In the present study, we investigated growth pattern and developmental indexes in children at the age of 18 months. The results showed a significant difference in anthropometric measures, and also children's motor development index scores in three groups, but there was no significant difference in language and social/cognitive developments until the age of 18 months. In our investigation, growth assessment was conducted based on WHO growth charts, and developmental assessment based on a researcher made questionnaire. It seems that if the study had been conducted based on growth charts for LBW infants, and upon scales such as Bayley or ASQ, and with a higher number of subjects, or with consideration of subjects' gestational age, different results would have been obtained.

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