Original Article

Comparative Investigation of Indicators of Growth and Behavioral Disorders in Children with Normal, Low, and Very Low Birth Weight at Pre-school Age in Isfahan during 2015

Abstract

Introduction: Birth weight is one of the most important indicators of infant's health and could predict their health condition in future. This study was conducted to determine and compare indicators of growth [weight, height, and body mass index (BMI)] and behavioral disorders in children with normal, low, and very low birth weight at pre-school age. **Materials and Methods:** In this descriptive analytical study, 236 children (126 with normal weight, 100 with low birth weight, and 10 with very low birth weight) at pre-school age were investigated in three groups. Data collection tools were a two-part questionnaire including the Rutter Children Behavior Questionnaire for parents, and parents' and children's demographic characteristics questionnaire, scale, and stadiometer. Data were analyzed using descriptive statistics, variance analysis, Chi square, and Kruskal–Wallis tests. **Results:** The mean of weight, height, and BMI at pre-school age in three groups had a significant difference ($P = 0.009$) and it was lower in the group with very low birth weight than the other two groups; however, the difference between the group with normal birth weight and the group with low birth weight was not significant ($P = 0.10$). The mean score of behavioral disorder had no significant difference between groups ($P = 0.49$). **Conclusions:** Results showed that children with very low birth weight grew less than the other two groups. Therefore, this group needs special attention and long-term follow-up for taking care of them to ensure better growth. It is recommended to conduct more extended studies to evaluate behavioral disorders in these children.

Keywords: *Child behavioral disorder, growth, Iran, low birth weight, very low birth weight*

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Introduction

Birth weight is one of the most important indicators of infant's health, and it also indicates mother's health condition, hygiene, and prenatal care.[1] At present, birth of low weight infants is one of the most serious health problems in the world.[2] Scientific and technological advances in obstetrics and neonatal care during recent years have increased the rate of survival for premature and low weight infants.[3] Global prevalence of low birth weight is reported to be 15.5%, and 96.5% of these infants have been born in developing countries.[4] In addition, the prevalence of low birth weight and very low birth weight in Iran have been reported to be 71 and 1.30%, respectively; the prevalence of low birth weight in Isfahan province has been reported to be 9.5%.[5,6]

Results of some studies have shown that, despite long and costly intensive care and the survival of some low birth weight infants, outcomes are not promising; these infants would encounter complications in neurodevelopment and congenital malformations three times more than infants with normal birth weight.[2]

These children are prone to many disabilities including cerebral palsy, cognitive disorders, blindness, deafness, impaired short-term memory, ocular deviation, delayed language development, learning, and behavioral disorders.[7]

Some researchers believe that these disabilities would remain until school age and even afterwards; hence, most of these children need special and constant care. Some researchers have also mentioned improvement in survival without increase in their disabilities.[8,9] Results of the study by Wang *et al.* showed that cognitive functioning in children with very low birth weight is lower than term infants, and

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that there was a significant relation between growth and cognitive ability.[10] Further, the results of Gick Fan *et al*. revealed a significant relation between behavioral disorders and birth weight.[11] Santo in a study reported that premature and low weight infants would encounter more cognitive and behavioral disorders at pre-school age;[12] however, in the study of Gurka *et al*., that was conducted on 52 healthy infants with congenital age of 34–36 weeks and compared to term infants, no significant difference was found between the two groups regarding behavioral disorder.[13] Therefore, further studies in this field are required.

Because of the ever increasing birth rate of premature and low weight infants, their parents would care regarding the physical and mental health of their children in the future. Considering the controversial results of previously conducted studies, the fate of these children is ambiguous. Previously conducted studies in Iran have only evaluated the growth of these children, and simultaneous evaluation of their growth and behavioral disorder has not been considered before.

Pre-school is the official start of children's educational activity, and the assessment program before elementary school is performed during this period. In this assessment program, monitoring behavioral disorders is not taken seriously. In time, diagnosis of behavioral disorders in children and referring them to specialized centers at early ages and recognizing their abilities and disabilities would be a great help to families and society. Therefore, this study was conducted to comparatively evaluate the indicators of growth and behavioral disorder in children with normal, low, and very low birth weight at pre-school age in Isfahan during 2015.

Materials and Methods

This descriptive comparative study was conducted using a cross-sectional method during 2015. Study population included all the children with normal, low, and very low birth weight who were enrolled in pre-school centers of Isfahan.

With a 95% confidence interval and 80% statistical power, the number of participants for each group was calculated to be 98.

Data collection tools were digital scale in kilograms, standard standing stadiometer in cm made by Seca, Germany, which was accurately calibrated before each measurement, and a two-part questionnaire including parents' and children's demographic characteristics such as age, gender, educational level and job, and the Rutter Children Behavior Questionnaire for Parents. This questionnaire consists of 31 three-choice questions about children's behavioral characteristics, which parents answered according to the rating scale. The rating scale was in the form of "no problem or issue," "few problems or some issues," and "a lot of problems or many issues," which were scored as 0, 1, and 2, respectively. The total score of the test varies between 0 and 62 for each individual, and if children scored 13 or more (cut-off point) they were determined to be a person with behavioral disorders.

Validity and reliability of this questionnaire was first evaluated in iran by mehryar in 1996. According to Agha Yousef (2012) using split-half method, and its durability was reported to be 85% and its cut-off point for parents' version was set at 13 by Mehryar.[14] The inclusion criteria for all three groups were being enrolled in pre-school, not having a birth weight more than 4600 g, not having any congenital malformation, obviously or according to the mother, not having any chronic diseases, being of Iranian nationality, living with both of the parents, and no experience of any severe mental stress during the past 6 months according to the parents. Children with normal birth weight should not have had a long hospitalization during infancy due to any disease. Child's birth specifications were completely be mentioned in their birth card, and parents providing full consent for participation of their child in the study. Moreover, unwillingness to participate in the study and not completing the questionnaire were the exclusion criteria.

The researcher referred to pre-school centers from January 2015 to June 2015 and performed the sampling. After obtaining necessary permissions for this study from all the pre-school centers in Isfahan, 25 were selected using random cluster and quota sampling methods (14 centers under the supervision of Ministry of Education and 11 under the supervision of Welfare Organization).

From all the children who were present at pre-school centers, appropriate to the population of each center, children with normal birth weight were selected using convenience sampling. Due to their small population, children with low birth weight and very low birth weight were selected based on enumeration method. The information of children who had the inclusion criteria were recorded in the questionnaire from their birth cards by the researcher. To complete other questions and to answer the questions of the Rutter Children Behavior Questionnaire for Parents, the questionnaire and the consent form were handed to parents by the researcher or pre-school teacher. They were asked to answer the questions and return the forms to the pre-school teacher. After the parents completely answered the questionnaire, the researcher accurately measured the growth indicators of the child. At the end, a small gift was given to the children to appreciate their cooperation.

Data were analyzed using descriptive (mean and standard deviation) and inferential (variance analysis, Chi square, Kruskal–Wallis tests) statistics. Data analysis was performed by Statistical Package for the Social Sciences version 15. The significance level was set at 0.05.

Ethical considerations

With regards to ethical consideration, aims of the study were explained to the parents and written informed consent was obtained from them. Participants' information was remained confidential.

Results

In this study, 236 children (126 children with normal birth weight, 100 with low birth weight, and 10 with very low birth weight) who were enrolled in pre-school centers under the supervision of Ministry of Education and Welfare Organization were selected as participants. The mean age of fathers and mothers at the time of their child's birth was 31.40 and 26.90 years, respectively. Most of the mothers were housewives, most of the fathers were freelancers, and the educational level of most of the parents was diploma.

Chi square and Kruskal–Wallis tests showed no significant difference between the gender and age of children as well as their parents' job and educational level along with other demographic characteristics of the three groups.

The means of weight, height, and body mass index (BMI) are shown in Table 1. Results of one-way analysis of variance (ANOVA) showed a significant difference between the mean of weight and height of three groups at pre-school age ($P = 0.009$, $F = 4.802$). In addition, post-hoc least squares difference (LSD) test showed that the mean of weight and height in the group with very low birth weight was significantly lower than the normal ($P = 0.004$, $P = 0.001$) and the low birth weight ($P = 0.003$) groups. However, the difference between the mean of weight and height of the normal and low birth weight groups had no significant difference ($P = 0.10$, $P = 0.66$).

Furthermore, one-way ANOVA showed that the mean of BMI of three groups had a significant difference among each other ($P = 0.03$, $F = 3.61$). Moreover, post-hoc LSD test showed that the BMI of the group with normal birth weight was significantly higher than the group with low birth weight ($P = 0.02$) and the group with very low birth weight ($P = 0.04$). However, the difference between low birth weight group and very low birth weight group was not significant ($P = 0.52$).

Table 1: Mean and standard deviation of growth indicators of normal birth weight, low birth weight, and very low birth weight children in preschool age

Growth indicator Grouping	Weight (kg)		Height (cm)		BMI (kg/m²)	
	Mean	SD	Mean	SD	Mean	SD
Normal Birth Weight	19.80	3.40	114.60	4.80	15.03	1.98
Low Birth Weight	19.10	3.01	114.90	5.20	14.42	1.75
Very Low Birth Weight	16.70	3.40	108.80	5.50	14.02	1.89

SD, Standard deviation

The results also revealed that 63.2% of the normal weight group, 52% of low birth weight group, and 60% of very low birth weight group had behavioral disorders. Results of Kruskal–Wallis test showed that the condition of behavioral disorder had no significant difference between all three groups ($P = 0.13$, $\chi^2 = 4.11$). The mean score of behavioral disorders in the normal weight group was 9.10, in the low weight group was 10.2, and in the very low weight group was 10.10. Furthermore, one-way ANOVA showed that the difference between the three groups regarding behavioral disorders was not significant ($P = 0.49$, $F = 0.70$).

Discussion

Results of the present study showed that there was a significant difference between the three groups regarding the indicators of growth at pre-school age; comparing the weight and height of three groups at pre-school age revealed that the mean of weight and height in the group with very low birth weight was lower than the other two groups. The mean of BMI of three groups had a significant difference with each other, and the BMI of group with normal birth weight was significantly higher than the group with low birth weight and the group with very low birth weight. Growth disorders could have many complications including increased number of referrals for medical treatment, having longer school periods, growth disorders during childhood, and decreased capacity and volume of lungs.[15] Results of this study are similar to many previous studies. Results of Karimi *et al*. (2009) showed that the mean of weight and height in 5-year-old children with a history of low birth weight was lower than children with normal birth weight.[15] The results of the study by Mahram *et al*. revealed a significant difference between 6-year-old children with normal birth weight and low birth weight regarding their weight and height.[16]

A study by Kato *et al*. showed that low birth weight children, despite their high rate of growth until the age of 3.5 compared to children with normal birth weight, have a lower BMI and height at the age of 5 than children with normal birth weight.[17]

Darendeliler *et al*. showed that, although the BMI of premature children was within normal range, it was lower than the BMI of children with normal birth weight.[18] Karimi *et al*. also showed that the mean of BMI in children with low birth weight and children with normal birth weight at the age of 5 had a significant difference and the group with low birth weight had a lower mean of BMI than the normal group.[15]

In the present study, participants were divided into three groups of normal birth weight, low birth weight, and very low birth weight, however, in the abovementioned studies, only two groups existed normal birth weight and low birth weight. In the present study, children with low birth weight showed no significant difference with

normal weight children regarding their weight and height growth; this implies that these children have the potential to recover from their low birth weight and have a growth spurt, and also due to their low birth weight, their parents would have more sensibility and concern regarding their nutrition and health care, which is another reason for them to have a desirable growth. It seems that genetic factors are also effective for growth. However, children with very low birth weight were lower than the other two groups regarding indicators of growth; this could imply that very low birth weight is a predicting factor for growth during childhood. Regarding the BMI of the participants in the present study, results were similar to the studies of Kato *et al.*[17] and Darendeliler *et al.*[18] In these studies, children with low birth weight also had a lower BMI than normal children, which could be due to children's growth rate and nutritional factors.

Comparing behavioral disorders between the three groups showed no significant difference between the mean score of behavioral disorder of the groups. In this regard Crombi *et al.* and Gurka *et al.* have reported that premature children and children with low birth weight are more prone to behavioral problems and have weaker emotional signs and mental health compared to healthy term infants, and these problems would occur in preterm infants more than term infants at the age of pre-school.[13,19] In contrast, results of Guellec *et al.* revealed that birth weight had no significant relation with children's cognition, behavior, and academic performance,[20] which is similar to the results of the present study.

It seems that the reason for no significant difference between these three groups regarding behavioral disorder is the high prevalence of these disorders among children of pre-school age in this study. In addition, many other factors including parents' educational level and economic, social, and environmental status would also affect children's behavior. Another reason for the differences between the present results and the results of other studies could be the differences in data collection tools. Some studies have used Achenbach questionnaire.

Conclusion

Results of this study revealed that children with very low birth weight have lower indicators of growth than children with normal and low birth weight. It appears that birth weight could be an important and effective factor in the growth of these children and serious follow-ups should be conducted to monitor their growth. In addition, regarding the high prevalence of behavioral disorder among participants of this study, it is recommended that monitoring and educational programs regarding behavioral disorders should be conducted before the start of elementary school.

In this study, children with low birth weight and very low birth weight who were enrolled in pre-school were evaluated. Probably some of these children were not able to go to pre-school due to the complications caused by their low birth weight, hence if all of the children with low and very low birth weight have been evaluated, the results would have been different. It is necessary to conduct long-term prospective studies with larger sample sizes all over the country to evaluate the growth of these children more accurately.

One of the limitations of this study was the individual differences in children and their parents and how parents react to their child's behavior, which was controlled as much as possible through random sampling. Another limitation was not studying children with extremely low birth weight due to their little number.

Conflicts of interest

There are no conflicts of interest.

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