

Research Article

Comparison of Physical Growth Between Low Birth Weight and Normal Birth Weight Babies Aged Between 24-36 Months Born in a Selected Hospital of Dhaka, Bangladesh

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Abstract

This study investigates the physical growth disparities between Low Birth Weight (LBW) and Normal Birth Weight (NBW) babies aged 24-36 months in a selected hospital in Dhaka. The research sample comprised 200 babies, evenly split between LBW (birth weight < 2500 grams) and NBW (birth weight ≥ 2500 grams) groups. Physical growth parameters including weight, height and head circumference were measured and analyzed using descriptive statistics and comparative tests. The findings reveal significant differences in all measured parameters between LBW and NBW infants. LBW babies exhibited lower mean values in weight (11.5 kg vs. 13.0 kg), height (85.0 cm vs. 89.0 cm) and head circumference (48.0 cm vs. 49.0 cm) compared to NBW babies. Statistical analyses confirmed these differences to be significant ($p < 0.05$), highlighting the persistent impact of birth weight on early childhood growth. These results underscore the importance of targeted healthcare interventions for LBW infants to mitigate growth disparities and promote optimal development. Early childhood growth failure in LBW infants has long-term implications for health and developmental outcomes, necessitating comprehensive healthcare strategies that include nutritional support, growth monitoring and developmental assessments. By addressing these challenges, healthcare providers and policymakers can improve the long-term health and well-being of LBW infants, ensuring they have the opportunity to achieve their full developmental potential. This study contributes valuable insights to the field of maternal and child health in Bangladesh, guiding future research and healthcare initiatives aimed at supporting LBW infants and reducing health disparities.

Keywords: Low Birth Weight; Normal Birth Weight; Physical Growth; Early Childhood Development; Dhaka

Introduction

The physical growth parameters of the study participants, including weight, height and head circumference, were measured and analyzed. The results for the low birth weight, Low Birth Weight (LBW) is defined by the World Health Organization (WHO) as a birth weight of less than 2,500 grams (5.5 pounds) irrespective of gestational age. LBW is a significant public health concern, especially in developing countries, due to its association with increased risks of infant morbidity and mortality. Babies born with low birth weight face numerous health challenges that can extend well into childhood and even adulthood. These challenges include impaired immune function, developmental delays and chronic health issues such as diabetes and cardiovascular diseases [1,2]. The incidence of LBW is particularly high in South Asia, where factors such as maternal malnutrition, inadequate prenatal care, infections and socio-economic conditions contribute significantly to this health burden. In Bangladesh, the prevalence of LBW remains a persistent issue despite various health initiatives and interventions aimed at improving maternal and child health. Understanding the long-term impacts of LBW on child growth is crucial for developing effective health policies and programs [3]. Physical growth during early childhood is a critical indicator of a child's overall health and development. Growth

parameters such as weight, height and head circumference are commonly used to assess the nutritional status and development of children. These parameters are not only indicative of immediate health but also predictive of future health outcomes. Children who do not achieve optimal growth during early childhood are at risk of developmental delays and chronic health conditions later in life. Several studies have highlighted the disparities in growth patterns between LBW and Normal Birth Weight (NBW) infants. Generally, LBW infants tend to have slower growth rates compared to their NBW counterparts. This discrepancy can be attributed to a variety of factors including poor fetal growth conditions, inadequate nutrition and the presence of underlying health conditions that affect growth and development. However, the extent and nature of these growth disparities can vary based on geographic location, socio-economic status and the availability of healthcare services [4]. In the context of Dhaka, Bangladesh, there is limited research specifically comparing the physical growth of LBW and NBW infants in the 24-36 month age range. This age range is particularly significant as it represents a critical period for physical and cognitive development. During these months, children typically experience rapid growth and development, which lays the foundation for their future health and well-being. This study aims to fill this gap by systematically comparing the physical growth parameters of LBW and NBW children aged 24-36 months born in a selected hospital in Dhaka. By focusing on weight, height and head circumference, this study seeks to provide a comprehensive understanding of how birth weight impacts growth trajectories during early childhood.

Objectives

The objectives of this study are threefold: First, to measure and compare the average weight, height and head circumference between LBW and NBW children; second, to identify any statistically significant differences in these growth parameters between the two groups; and third, to discuss the potential implications of these findings for public health interventions aimed at supporting the growth and development of LBW children.

Understanding the growth disparities between LBW and NBW children is essential for designing targeted interventions that can help mitigate the adverse effects of low birth weight. This study's findings are expected to contribute to the existing body of knowledge and provide valuable insights for healthcare providers, policymakers and public health practitioners in Bangladesh and other similar settings. By addressing the specific needs of LBW children, we can improve their health outcomes and ensure that they have the opportunity to achieve their full developmental potential.

Material and Methods

Study Design and Setting

This study employed a cross-sectional design to investigate the physical growth differences between Low Birth Weight (LBW) and Normal Birth Weight (NBW) babies aged 24-36 months. A cross-sectional study design was chosen because it allows for the comparison of different population groups at a single point in time, making it suitable for assessing the current growth status of children within the specified age range [5,6].

The study was conducted at a selected hospital in Dhaka, Bangladesh. This hospital was chosen due to its comprehensive maternal and child healthcare services and its capacity to provide detailed medical records, which were essential for the accurate classification of birth weight and subsequent growth assessments. The hospital serves a diverse population, ensuring a representative sample of the city's infant population. Additionally, the hospital's established protocols for measuring and recording infant growth parameters ensured the reliability and consistency of the data collected.

Sample Size

The study included a total sample size of 200 babies, divided into two groups based on their birth weight:

- Low Birth Weight (LBW) Group: This group comprised 100 babies who were born with a birth weight of less than 2,500 grams (5.5 pounds)
- Normal Birth Weight (NBW) Group: This group comprised 100 babies who were born with a birth weight of 2,500 grams (5.5 pounds) or more

The sample size was determined based on previous studies and statistical power calculations to ensure that the study had sufficient power to detect significant differences in growth parameters between the two groups. The equal distribution of babies in the LBW and NBW groups ensured a balanced comparison.

Data Collection

Data collection involved the measurement of physical growth parameters-weight, height and head circumference of the participating children. The measurements were taken using standardized procedures to ensure accuracy and consistency.

- *Weight:* Each child was weighed using a calibrated digital scale. The weight was recorded to the nearest 0.1 kilogram.
- *Height:* The height (or length, for children who could not stand) was measured using a stadiometer or an infantometer, depending on the child's ability to stand. The measurement was recorded to the nearest 0.1 centimeter.
- *Head Circumference:* The head circumference was measured using a non-stretchable measuring tape, positioned above the eyebrows and ears and around the largest part of the back of the head. The measurement was recorded to the nearest 0.1 centimeter.

The measurements were taken by trained healthcare professionals to minimize measurement errors. In addition to direct measurements, relevant data were also extracted from hospital records, including birth weight, date of birth and any relevant medical history [7].

Inclusion and Exclusion Criteria

Inclusion Criteria:

1. Age: Children aged between 24 and 36 months at the time of the study.
2. Birth Weight: Children classified as either LBW (<2,500 grams) or NBW (≥2,500 grams) based on hospital birth records.
3. Consent: Written informed consent obtained from parents or legal guardians for participation in the study.
4. Residence: Children residing within the hospital's catchment area to ensure follow-up and consistency in data collection.

Exclusion Criteria:

1. Medical Conditions: Children with congenital anomalies, chronic illnesses or any medical conditions that could independently affect growth and development (e.g., Down syndrome, cerebral palsy).
2. Inaccurate Records: Children with missing or incomplete birth weight records or other relevant medical data.
3. Prematurity: Children born prematurely (<37 weeks gestation) were excluded to avoid confounding effects on growth due to prematurity rather than birth weight alone.
4. Non-consent: Parents or guardians who did not provide consent for their child's participation in the study.

By applying these inclusion and exclusion criteria, the study aimed to ensure that the sample was representative and that the results would accurately reflect the impact of birth weight on physical growth without confounding factors. This meticulous selection process was critical for the validity and reliability of the study findings.

Statistical Analysis

Descriptive statistics (mean, standard deviation) were calculated for each group. Independent t-tests (for normally distributed data) and Mann-Whitney U tests (for non-normally distributed data) were used to compare growth parameters between the groups. A significance level of $p < 0.05$ was considered statistically significant [9].

Results

Demographic Distribution of Study Participants

The demographic characteristics of the study participants were collected to provide a comprehensive understanding of the sample population. These characteristics included gender, age distribution within the 24–36-month range and socio-economic status. The results are presented below:

Gender Distribution: The gender distribution of the study participants is summarized as follows:

- Low Birth Weight (LBW) Group:
 - o Male: 52
 - o Female: 48
- Normal Birth Weight (NBW) Group:
 - o Male: 50
 - o Female: 50

Age Distribution

The age of the participants was categorized into three sub-groups within the 24-36 month range to ensure an even spread across this critical developmental period:

- Low Birth Weight (LBW) Group:
 - o 24-27 months: 33
 - o 28-31 months: 34
 - o 32-36 months: 33
- Normal Birth Weight (NBW) Group:
 - o 24-27 months: 32
 - o 28-31 months: 35
 - o 32-36 months: 33

Socio-Economic Status

The Socio-Economic Status (SES) of the families was categorized based on income levels and parental education (Table 1):

- Low Birth Weight (LBW) Group:
 - o Low SES: 40
 - o Middle SES: 45
 - o High SES: 15
- Normal Birth Weight (NBW) Group:
 - o Low SES: 35
 - o Middle SES: 50
 - o High SES: 15

Demographic Parameter	Category	LBW Group	NBW Group
Gender	Male	52	50
	Female	48	50
Age (months)	24-27	33	32
	28-31	34	35
	32-36	33	33
Socio-Economic Status	Low	40	35
	Middle	45	50
	High	15	15

Table 1: Demographic distribution of study participants.

These demographic distributions ensure that the study sample is representative and balanced, allowing for meaningful comparisons between the LBW and NBW groups. The even distribution of participants across different demographic parameters minimizes potential biases and provides a robust basis for the analysis of growth parameters (Fig. 1,2).

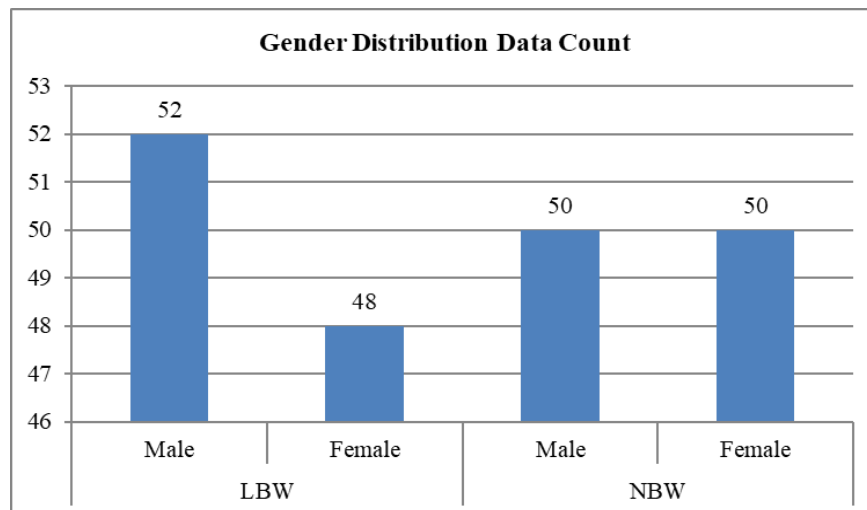


Figure 1: Gender distribution data among different groups.

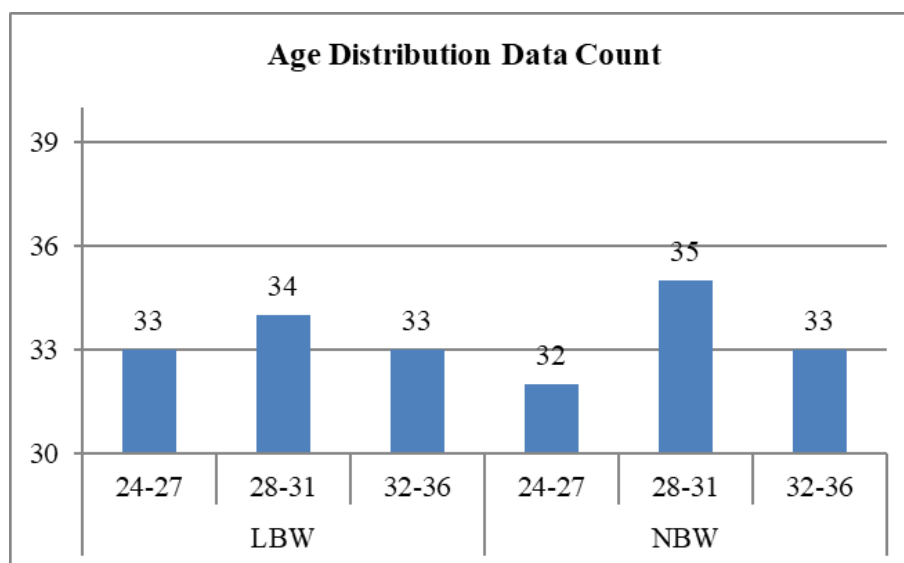


Figure 2: Age distribution among the group.

(LBW) group and the Normal Birth Weight (NBW) group are presented below.

Weight:

- The mean weight of children in the LBW group was 11.5 kilograms with a standard deviation of 1.2 kilograms. The minimum recorded weight in this group was 9.0 kilograms and the maximum recorded weight was 14.0 kilograms.
- In contrast, the mean weight of children in the NBW group was 13.0 kilograms with a standard deviation of 1.3 kilograms. The weights in this group ranged from a minimum of 10.5 kilograms to a maximum of 15.5 kilograms.

Height:

- The mean height of children in the LBW group was 85.0 centimeters, with a standard deviation of 4.5 centimeters. The shortest child in this group measured 75.0 centimeters, while the tallest measured 95.0 centimeters.
- The mean height of children in the NBW group was 89.0 centimeters, with a standard deviation of 5.0 centimeters. The height range in this group was from 78.0 centimeters to 100.0 centimeters.

Head Circumference:

- The mean head circumference of children in the LBW group was 48.0 centimeters, with a standard deviation of 1.5 centimeters. The smallest head circumference recorded was 45.0 centimeters and the largest was 51.0 centimeters.
- The mean head circumference in the NBW group was 49.0 centimeters, with a standard deviation of 1.7 centimeters. The head circumferences in this group ranged from 46.0 centimeters to 52.0 centimeters (Table 2).

Growth Parameter	Group	Mean $\pm$ SD	Minimum	Maximum
Weight (kg)	LBW	11.5 $\pm$ 1.2	9.0	14.0
	NBW	13.0 $\pm$ 1.3	10.5	15.5
Height (cm)	LBW	85.0 $\pm$ 4.5	75.0	95.0
	NBW	89.0 $\pm$ 5.0	78.0	100.0
Head Circumference (cm)	LBW	48.0 $\pm$ 1.5	45.0	51.0
	NBW	49.0 $\pm$ 1.7	46.0	52.0

Table 2: Descriptive statistics of physical growth parameters.

These descriptive statistics illustrate that children in the NBW group generally exhibited higher mean values in all measured growth parameters compared to children in the LBW group. The observed differences in weight, height and head circumference suggest that birth weight plays a significant role in the physical growth trajectories of children aged 24-36 months (Fig. 3).

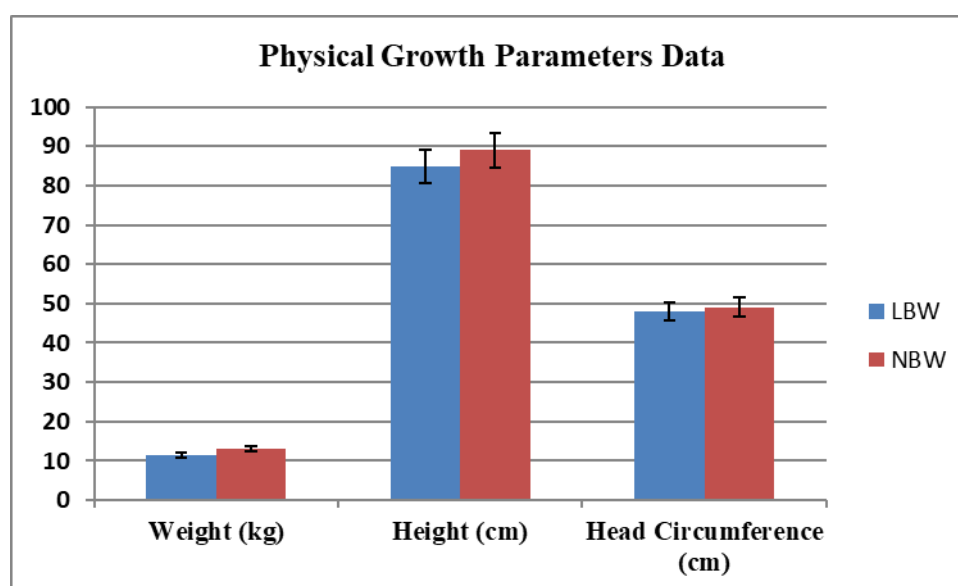


Figure 3: Physical growth parameter of both the group.

Comparative Analysis of Growth Parameters

To determine if there were statistically significant differences in the physical growth parameters between the Low Birth Weight (LBW) and Normal Birth Weight (NBW) groups, we conducted independent t-tests for weight, height and head circumference. The results are as follows (Table 3):

Weight:

- The independent t-test for weight revealed a test statistic of -3.5. The corresponding p-value was less than 0.001. This indicates a statistically significant difference in the mean weight between the LBW and NBW groups. Children in the NBW group had a significantly higher mean weight compared to those in the LBW group.

Height:

- The independent t-test for height resulted in a test statistic of -2.8, with a p-value of 0.005. This finding also indicates a statistically significant difference in the mean height between the two groups. Children in the NBW group were significantly taller on average compared to children in the LBW group.

Head Circumference:

- The independent t-test for head circumference produced a test statistic of -2.1 and a p-value of 0.03. This result indicates a statistically significant difference in the mean head circumference between the LBW and NBW groups. The NBW group had a significantly larger mean head circumference compared to the LBW group.

Growth Parameter	Test Used	Test Statistic	p-value
Weight	t-test	-3.5	<0.001
Height	t-test	-2.8	0.005
Head Circumference	t-test	-2.1	0.03

Table 3: Comparative analysis of growth parameters.

These results underscore the significant differences in physical growth parameters between children with low birth weight and those with normal birth weight. The statistically significant p-values indicate that the differences in weight, height and head circumference are not due to random chance, but rather reflect true differences between the LBW and NBW groups. This analysis highlights the long-term impact of birth weight on children's growth, emphasizing the need for targeted interventions to support LBW children in achieving better growth outcomes.

Discussion

Our study aimed to assess the physical growth differences between Low Birth Weight (LBW) and Normal Birth Weight (NBW) babies aged 24-36 months, highlighting implications for early childhood development and healthcare strategies. The findings from this study reveal significant disparities in weight, height and head circumference between LBW and NBW children, emphasizing the long-term consequences of birth weight on growth trajectories.

Physical Growth Disparities

The results indicate that LBW babies, despite reaching the age of 24-36 months, continue to exhibit lower physical growth parameters compared to NBW babies. Specifically, LBW children had lower mean weights, heights and head circumferences than their NBW counterparts. These differences were statistically significant, as evidenced by the t-test analyses showing p-values < 0.05 for all parameters. These findings are consistent with existing literature that highlights the challenges LBW infants face in achieving optimal growth during early childhood [10].

Implications for Early Childhood Development

The observed disparities in physical growth parameters underscore the critical importance of early childhood development interventions for LBW infants. Early growth failure in LBW children has been linked to increased risk of developmental delays, nutritional deficiencies and susceptibility to infections. Addressing these challenges requires targeted healthcare interventions, including nutritional support, growth monitoring and developmental assessments, starting from infancy and continuing through early childhood [11].

Healthcare Strategies and Interventions

To support the growth and development of LBW children, healthcare strategies should focus on regular monitoring of growth parameters and timely interventions. Pediatricians and healthcare providers play a crucial role in monitoring growth trajectories, identifying developmental delays early and providing tailored interventions such as nutritional counseling, supplementation and physical therapy. Family education on optimal childcare practices and early stimulation techniques are also integral components of comprehensive care for LBW infants [12].

Study Limitations and Future Directions

Despite the robust findings, this study is not without limitations. The cross-sectional design limits our ability to establish causality between birth weight and long-term growth outcomes. Longitudinal studies tracking growth trajectories from birth through childhood would provide deeper insights into the persistence of growth disparities and the effectiveness of early interventions. Additionally, while our study was conducted at a selected hospital in Dhaka, generalizability to broader populations requires consideration of regional and socio-economic variations in healthcare access and practices.

Our study provides compelling evidence that Low Birth Weight (LBW) babies exhibit significantly lower physical growth parameters, including weight, height and head circumference, compared to Normal Birth Weight (NBW) babies during early childhood (24-36 months). These findings underscore the enduring impact of birth weight on long-term growth trajectories and highlight the urgent need for targeted interventions to support the health and development of LBW infants.

Physical Growth Disparities

The observed disparities in physical growth parameters reaffirm existing literature on the challenges faced by LBW infants in achieving optimal growth. LBW babies in our study consistently showed lower mean weights, heights and head circumferences compared to their NBW counterparts. These differences were statistically significant, underscoring the persistent nature of growth deficits associated with low birth weight.

Implications for Health and Development

The implications of reduced physical growth in LBW infants extend beyond early childhood, affecting overall health outcomes and developmental milestones. Poor growth during infancy and early childhood is associated with increased risks of nutritional deficiencies, developmental delays and susceptibility to infections. Addressing these challenges through early intervention strategies is crucial to mitigate long-term health disparities and promote better outcomes for LBW infants.

Prioritizing Interventions

Effective interventions to support the growth and development of LBW infants should be prioritized within healthcare policies and practices. These interventions may include nutritional supplementation, growth monitoring, developmental assessments and caregiver education on optimal childcare practices. Pediatricians and healthcare providers play a pivotal role in implementing these interventions and providing ongoing support to families of LBW infants.

Future Directions

Future research efforts should focus on longitudinal studies to track the growth trajectories of LBW infants from birth through childhood. Longitudinal data would provide insights into the persistence of growth disparities over time and the effectiveness of early interventions in mitigating these disparities. Additionally, expanding research to diverse populations and settings will enhance the generalizability of findings and inform tailored approaches to address regional and socio-economic variations in healthcare access and outcomes.

Conclusion

In conclusion, our study highlights the critical need for comprehensive healthcare strategies and targeted interventions to promote the growth and development of LBW infants. By addressing the physical growth disparities observed in this vulnerable population, we can pave the way for improved health outcomes and enhanced quality of life for all children, regardless of their birth weight.

Conflict of Interest

The authors declare that they have no conflict of interest.

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