

The Impact of Low Birth Weight and Small for Gestational Age Infants on Longitudinal Growth and Nutritional Status in The Philippines

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Background

Relatively few studies have longitudinally examined the impact of low birth weight (LBW) and small for gestational age (SGA) on linear growth and nutritional status during infancy in low- and middle-income countries. Further, none have employed pre-natal ultrasound to determine gestational age or a healthy reference curve genetically similar to the study population. The objectives of this study were to longitudinally compare rates of stunting, wasting and underweight among LBW, non-LBW, SGA, and non-SGA infants in Leyte, The Philippines to identify whether specific infants in this setting catch up to normal newborns, and whether there are independent factors that might predict when catch up is more likely to occur.

Methods

Birth weights of 357 infants born in rural villages in Leyte, The Philippines were obtained within 48 hours of delivery and infants were evaluated at 1, 6 and 12 months. Newborns could be classified as LBW, SGA, or both, and could be included in one or both categories. We derived length-for-age, weight-for-length and weight-for-age Z-scores using the WHOAnthro software module.. Generalized estimating equation models were used to compare the differences in prevalence and mean Z-scores for growth and nutritional outcomes, with separate models made for LBW and SGA as distinct primary predictors. We compared the longitudinal risk of stunting, wasting and underweight during infancy among LBW versus non-LBW and SGA versus non-SGA infants, while also evaluating key potential confounding, explanatory and modifying covariates.

Results

Overall, 8.9% (32/357) of infants were born prematurely, 14% (50/357) of infants were LBW and 33.6% (120/357) were SGA. LBW infants had significantly increased odds of stunting, wasting and underweight and SGA infants had significantly increased odds of stunting and underweight persisting to 12 months of age. LBW and SGA infants had higher rates of weight-for-length gain in the first month of life than non-LBW and non-SGA infants. Maternal educational attainment and exclusive breastfeeding decreased the risk of stunting and undernutrition.

Conclusion

In conclusion, our study showed that in this setting, LBW and SGA infants have higher rates of growth stunting and undernutrition during the first year of life and do not exhibit catch-up growth by 12 months of age. Factors such as maternal education and breastfeeding appear to increase the chance for catch-up growth among these vulnerable infants. Exclusive breastfeeding may increase catch up growth among these vulnerable infants. Further studies are being conducted in this population to elucidate whether these trends persist at 5 years of age.

Table 1. Basic descriptive data by birth weight and size for gestational age.

Variable	Birth weight			Size for gestational age		
	Low birth weight ^a (N=50)	Normal birth weight (N=307)	<i>P</i> value ^b	Small-for-gestational age ^c (N=120)	Appropriate-for-gestational age (N=237)	<i>P</i> value
Birth data						
Female (%)	44.0	47.2	0.671	40.0	50.2	0.068
Length (cm)	44.9 (44.0-45.8)	47.2 (46.8-47.5)	<0.001	45.8 (45.2-46.3)	47.4 (46.9-47.8)	<0.001
Weight-for-length	0.049 (0.047-0.051)	0.063 (0.062-0.064)	<0.001	0.055 (0.054-0.056)	0.064 (0.063-0.065)	<0.001
Weight (kg)	2.19 (2.09-2.28)	2.96 (2.93-3.00)	<0.001	2.51 (2.45-2.56)	3.03 (2.99-3.07)	<0.001
Gestational age (weeks)	37.5 (36.8-38.2)	38.7 (38.6-38.8)	<0.001	38.8 (38.5-39.0)	38.4 (38.2-38.6)	0.043
Small-for-gestational age (%)	90.0	24.4	<0.001			
Low birth weight (%)				37.5	2.1	<0.001
Feeding						
Exclusively breast feeding						
Birth to 1month	90.0	94.5	0.212	92.5	94.5	0.455
1 to 6 months	84.0	93.2	0.045	90.0	92.8	0.356
6 to 12 months	82.0	90.6	0.069	87.5	90.3	0.419
Maternal data						
Maternal age (year)	25.3 (23.2-27.4)	26.2 (25.5-26.9)	0.186	25.7 (24.5-26.9)	26.2 (25.4-27.0)	0.397
Maternal height	146.6 (145.2-148.0)	147.6 (147.0-148.2)	0.255	146.6 (145.6-147.6)	147.9 (147.2-148.6)	0.043
Maternal body mass index	21.7 (20.8-22.5)	21.9 (21.6-22.3)	0.556	21.7 (21.1-22.2)	22.0 (21.6-22.4)	0.425
Maternal weight	46.6 (44.7-48.5)	47.7 (46.9-48.5)	0.281	46.5 (45.4-47.6)	48.1 (47.1-49.0)	0.082
Social economic status (%) ^d						
Q1 - Highest	26.0	24.8	0.643	23.3	25.7	0.596
Q2	18.0	25.7		21.7	26.2	
Q3	44.0	36.8		42.5	35.4	
Q4 - Lowest	12.0	12.7		12.5	12.7	

Values are means (95% confidence intervals) and proportions. ^aDefined as birth weight < 2.5kg. ^bTested by Student's *t* test or Wilcoxon's rank-sum test for continuous variables and Fisher's exact or Chi-square test for categorical variables. ^cDefined as size < 10th percentile for gestational age. ^dCategorized after calculating a summary social economic status score based on the questionnaire that addressed parental education, occupation, ownership of home/land, and assets.

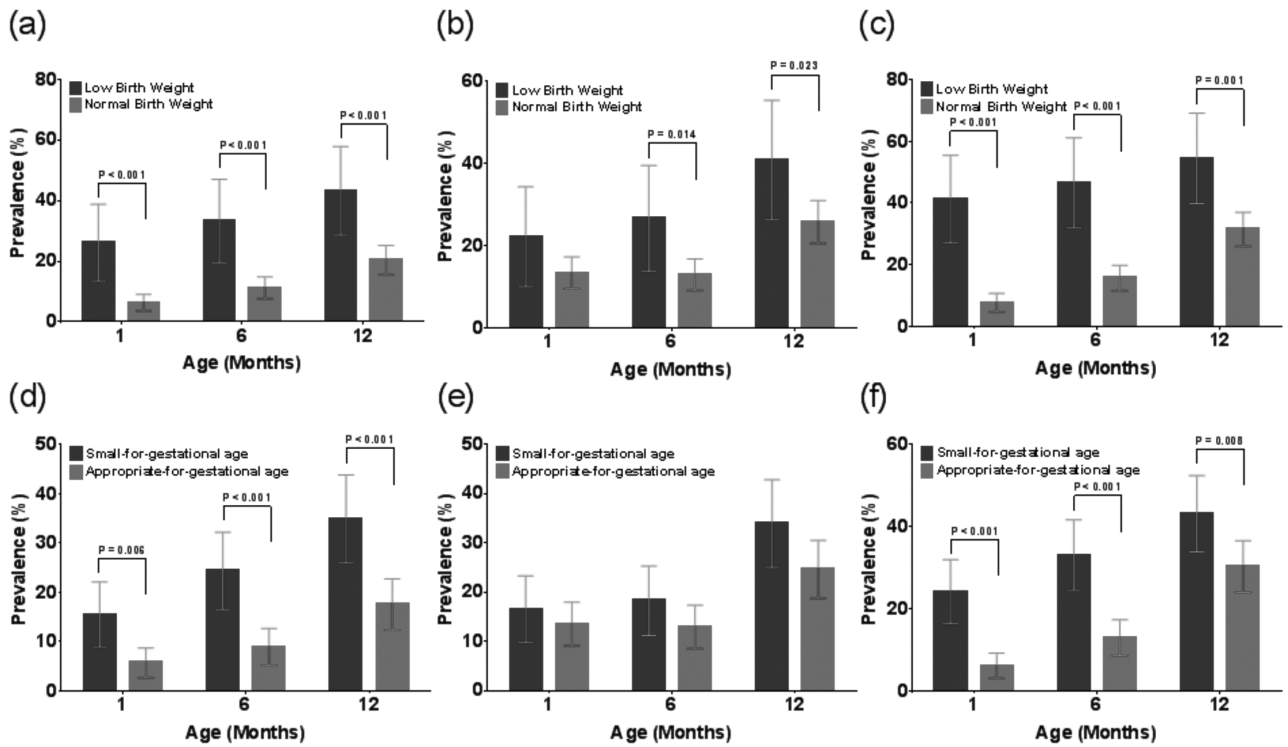


Figure 1. Stunting, wasting, and underweight at 1, 6, and 12 months of age by birth weight (a, stunting; b, wasting; c, underweight) and size for gestational age (d, stunting; e, wasting; f, underweight). Stunting, wasting, and underweight were defined as height-for-age Z score < -2.0, weight-for-height Z score < -2.0, and weight-for-age Z score < -2.0, respectively. Low birth weight was defined as birth weight < 2.5kg. Small-for-gestational age was defined as size < 10th percentile for gestational age. Error bars represent 95% confidence intervals.

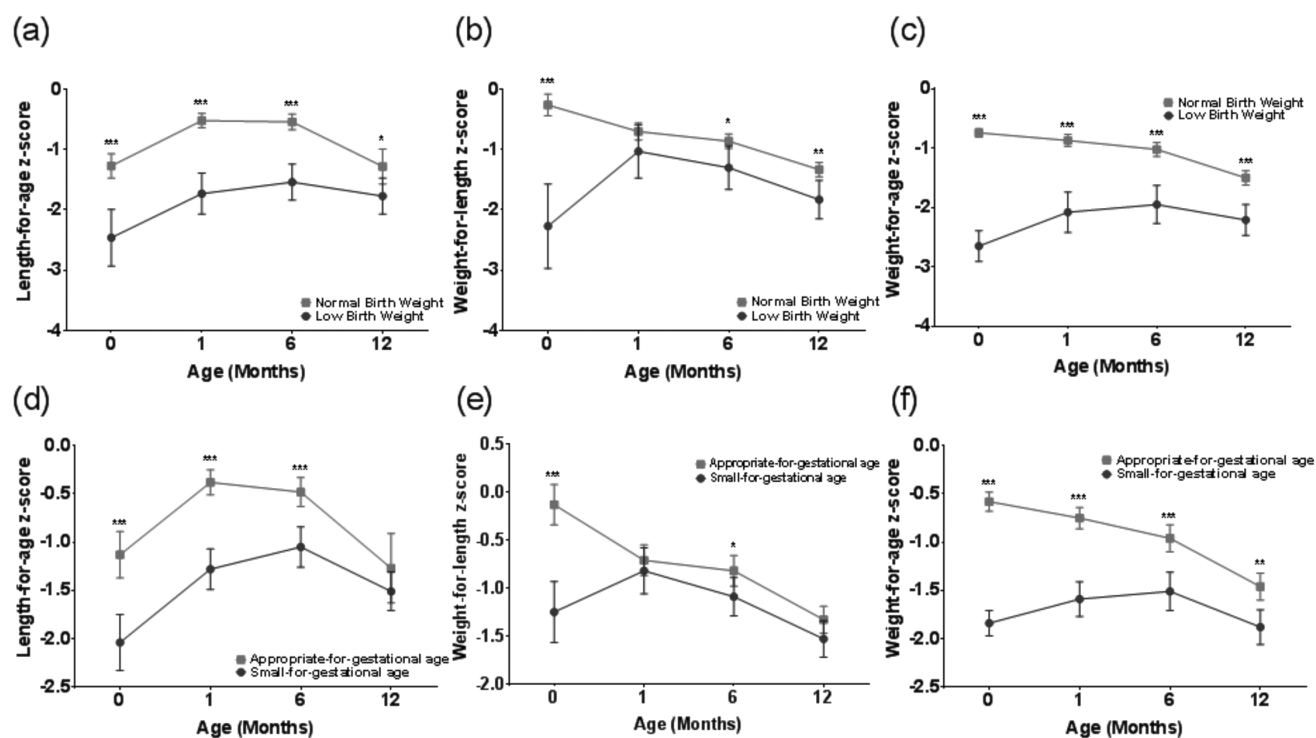


Figure 2. Length-for-age, weight-for-length, and weight-for-age z scores at birth to 12 months of age by birth weight (a, length; b, weight-for-length; c, weight) and size for gestational age (d, length; e, weight-for-length; f, weight). Low birth weight was defined as birth weight < 2.5kg. Small-for-gestational age was defined as size < 10th percentile for gestational age. Error bars represent 95% confidence intervals. * < .05, ** < .01, ***<.001 compared with low birth weight or small-for-gestational group.