ABSTRACT

The Effect of Low Birth Weight at Term on the Postnatal Growth and Morbidity Experiences of Jamaican Infants during the First Two Years

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Purpose: Despite all the scientific and technological advances of the centuries, low birth weight at term (LBW-T, <2500g at ≥37 weeks gestation) continues to be a major public health concern in developing countries.

This study was conducted to investigate the effect of LBW-T on the postnatal growth and morbidity experiences of Jamaican infants during their first two years of life, and the interaction of factors such as their birth characteristics, early feeding practices, and maternal and socioeconomic characteristics on these outcomes.

Study Design: The study comprised a longitudinal study of the postnatal growth and morbidity experiences of term LBW children in Jamaica during their first two years. A comparison cohort of matched term, normal birth weight (NBW; ≥2500g and ≥37 weeks gestation) infants was also enrolled and followed over the two years.

Population: The sample was recruited from the main maternity hospital in Kingston,

Jamaica: the Victoria Jubilee Hospital. One hundred and forty term infants (completed 37- 42 weeks of gestation) who weighed less than 2500g were recruited. Ninety-four normal birth weight infants (37- 42 week gestational age and 2500-4000g) were enrolled as the comparison group.

Methods: Eligible infants were identified within 48 hours of birth and their mothers approached about participation in the study. Upon their agreement the infants' gestational age was determined using the Dubowitz' Method and, if eligible, the mothers then gave written, informed consent. The LBW-T infants were randomly assigned to participate in a psychosocial intervention programme or not. The infants weight, length, head and chest circumferences were then measured. An enrolment questionnaire was administered. Mothers were visited at home one week later where their height was measured, the PPVT administered and further assessment of their socioeconomic status was done.

Weekly visits were conducted for the next two years. At these visits, information on morbidity experiences, breastfeeding and complementary feeding practices was obtained. The infants' anthropometry was assessed every three months up to 24 months of age using weight, length, head and mid-upper arm circumferences, and triceps and subscapular skinfold thicknesses. On the occasion of these measurements, more morbidity information was collected. These related to the infants visit to the doctor or child health clinics due to illness, and any

hospitalization. The infants' current immunization status was also recorded at these visits.

Results: There were no significant differences between the two groups of LBW-T infants in growth or morbidity experiences and they were combined to form one LBW-T group which was used in all subsequent analyses.

The mothers of LBW-T infants obtained significantly lower scores in the PPVT than those delivering NBW infants (92.4 vs 100.9; $p<0.05$). Significantly more of these mothers were primiparous as compared to the mothers delivering NBW infants (47.1% vs 34.0%; $p<0.05$). The mothers of the LBW-T infants were also significantly more likely to have delivered a previous LBW infant (78% vs 22%; $p<0.05$). Significantly more of the mothers delivering LBW-T infants consumed alcohol while pregnant (19.3% vs 9.6%; $p<0.05$). The mothers delivering LBW-T infants made significantly fewer visits for antenatal care and also sought care significantly later in pregnancy than mothers delivering NBW infants. SES indicators showed no significant differences between the groups.

At birth, as expected, the LBW-T infants were significantly lighter and shorter than the NBW infants, $p<0.001$. Despite all the infants being term the LBW-T infants had significantly lower gestational age than the NBW infants (38.6±0.9 weeks vs 39.4±0.7 weeks; $p<0.001$). A significantly larger proportion of the LBW-T infants

were of LPI than the NBW infants, $p<0.001$. There was no significant difference in the gender distribution of the two groups (LBW-T 55.7% females and NBW 51.1% females).

Breastfeeding was as likely to be initiated among the LBW-T infants as the NBW infants. The LBW-T infants were also as likely to be exclusively breastfed as the NBW infants. The total duration of breastfeeding was however significantly lower among the LBW-T infants; 40 weeks for the LBW-T infants vs 65 weeks for the NBW infants, $p<0.05$. The LBW-T infants tended to be given complementary foods earlier than the NBW infants. Maternal, socioeconomic and infant characteristics were found to be associated with the feeding practices.

Anthropometric assessment of the infants over the two years showed that the LBW-T infants were significantly lighter and shorter than the NBW infants, $p<0.001$. They also had smaller HC and MUAC. Skinfold thicknesses were however not significantly different at any age during the first year. During the second year triceps skinfolds were not significantly different at any age but subscapular skinfolds were significantly different at 18 and 24 months when the LBW-T infants had smaller skinfolds, $p<0.05$. Over the two years the effect of birth weight on the anthropometric measures was found to be significant for all the anthropometric measures except for skinfold thicknesses after controlling for maternal, SES, infant, feeding and morbidity variables.

Nutritional status indices were analysed by birth weight group, and in addition for the LBW-T infants only by PI and stunting status at birth. For LAZ scores and WAZ scores the LBW-T infants had significantly lower scores over the entire two years than the NBW infants. WL residuals had to be computed and used due to the small size of some of the LBW-T infants. The WL residuals were also significantly lower except at 3, 6 and 9 months. The WL residuals showed evidence of Growth Faltering among both groups of infants in the second year of life. For PI, the LBW-T infants of API had significantly lower LAZ scores at birth than the LBW-T infants of LPI. The API infants had significantly higher WAZ scores than the LPI infant. The API infants also had significantly higher WL residuals than the LPI infants. This however was at birth and also between 9-15 months of age.

For stunting status, LAZ scores were lower among the stunted LBW-T infants at all ages investigated over the entire two years with the differences being significant at all ages except at 15, 18 and 24 months of age. WAZ scores showed the stunted LBW-T infants having significantly lower scores than the non-stunted infants from birth to three months of age. After 3 months of age the differences were not significant. The stunted infants had higher WL residuals at birth and between 6-12 months of age. Birth weight group, PI group at birth and stunting status at birth all showed significant group effects on the infants nutritional status over the two years.

Several factors were found to be associated with the size and growth of the LBW-T

infants at three and six months of age. These included gender, PI and stunting status at birth, maternal height, the duration of breastfeeding, the number of days with morbidity symptoms, the number of doctor or clinic visits due to illness and the number of hospitalizations. There was evidence of Catch-up Growth among the LBW-T infants in the first three months for weight and from birth to six months for length. Catch-up Growth was found to be affected by factors such as age at measurement, gender, maternal height, SES, the duration of breastfeeding, PI and stunting status at birth, birth measurements and morbidity variables.

Analysis of the morbidity experiences of the study infants over the two years showed the LBW-T infants having significantly more days of apathy, running nose, diarrhoea, ear infection ($p<0.05$ for all symptoms) and more days with fever, diarrhoea and vomiting in combination ($p<0.05$ at 12-24 months and $p<0.01$ at 0-24 months). The LBW-T infants also had significantly more morbidity episodes of diarrhoea and ear infection and more episodes of fever with diarrhoea and vomiting (in combination) than the NBW infants. The morbidity episodes of apathy, fever, diarrhoea and vomiting and of fever with diarrhoea and vomiting (in combination) were of significantly longer durations among the LBW-T infants ($p<0.05$ for all symptoms). Factors found to be associated with the morbidity experiences of the infants in the two years included the number of weeks breastfed, the age of introduction of complementary foods, maternal age and education, SES, and the infants birth order and gestational age at birth.

PI group at birth affected the infants morbidity experience with LBW-T infants of LPI having more days with vomiting in the first six months and more days with fever, diarrhoea and vomiting (combined) in the first three months than LBW-T infants of API, both $p<0.05$. The LPI infants also had significantly more episodes of vomiting in the first six months and more episodes of fever with diarrhoea and vomiting combined in the first three months. The duration of the episodes of fever with diarrhoea and vomiting in the first three months was also significantly longer among the LBW-T infants of LPI than those of API ($p<0.05$ for all these differences). Stunting status at birth had no significant effect on the morbidity experiences of the LBW-T infants.

The LBW-T infants made more sick visits to the doctor or clinic than the NBW infants during the 12-18, 18-24, 12-24 and 0-24 month intervals. They also tended to be hospitalized more often than the NBW infants. The LBW-T infants were significantly less likely to be completely immunized for age at 18 and 21 months of age than the NBW infants; $p<0.05$ and $p<0.01$ respectively. Immunization status however had no significant effect on the infants morbidity experiences.

Conclusions: The LBW-T infants were as likely to be breastfed as the NBW infants. They were however breastfed for significantly shorter durations than the NBW infants. The LBW-T infants exhibited Incomplete Catch-up Growth and therefore remained shorter and lighter than the NBW infants throughout the two years. The

LBW-T infants experienced more morbidity (more days ill, more episodes and episodes of longer durations, more sick visits to the doctor or clinic and more hospitalizations) over the study period.

Among the LBW-T infants the morbidity factors that most consistently affected growth over the two years were the number of doctor or clinic visits due to illness, the number of hospitalizations and the number of days with fever with diarrhoea and vomiting. Growth was also found to be related to both body proportion and stunting status at birth with the API infants being shorter and heavier than the LPI infants and, as expected, the stunted infants were shorter than the non-stunted infants over the two years. The morbidity experiences of the LBW-T infants were found to be related to body proportion at birth with the LPI infants having more days, more episodes and longer episodes of vomiting and fever with diarrhoea and vomiting combined. Morbidity was however not affected by stunting status at birth.

Within this Jamaican population of term infants the study was able to show that LBW-T is a risk factor for smaller size in early childhood. LBW-T was also identified as a risk factor for increased neonatal and early childhood morbidity experiences. The smaller size of the LBW-T infants at 2 years was found to be due not only to their significantly smaller size at birth but also to higher morbidity, differences in feeding practices and less desirable social and environmental backgrounds. The higher morbidity among the LBW-T infants was also attributable

to smaller size at birth and to the other factors affecting growth thereby showing their interactions.

Modifiable risk factors were identified as being associated with low birth weight at term. These included an early first pregnancy, delivery of a previous LBW infant, delayed antenatal care, insufficient antenatal visits and alcohol consumption during pregnancy. These risk factors need to be addressed as part of any meaningful long-term sustainable development and poverty alleviation programmes in Jamaica. To ignore this group of vulnerable infants is to deny them their fullest potential and the chance to make their maximum positive contribution to the Jamaican society.

Keywords: Carol June Ewan-Whyte; low birth weight at term; postnatal growth; catch-up growth; incomplete catch-up growth; morbidity; intrauterine growth retardation; ponderal index; stunting status; infant feeding practices; breastfeeding; Jamaica