Original article

Nutritional Status of Low Birth Weight Infants Using Mounla's Method

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Abstract:

Introduction: Low birth weight infants remain a significant public health problem in many developing countries. Poor nutrition recognized as an important cause, which is associated with a short- term and long-term adverse consequences, carrying relatively greater risks of perinatal and neonatal morbidity and mortality.

Methods: The nutritional status was assessed prospectively on 170 LBWI in neonatology ward of Guangxi medical university, Nanning, China, from January 2007 to December 2008; with infant's birth weight, the most obvious day age of weight lost, the lowest weight percentage and the age recovering to birth weight. Mounla's method was based on the excess time expressed in percent beyond the allocated time for an infant to gain the birth weight and the excess drop in weight expressed in percent beyond the allowed drop of weight.

Results: There were61.8% male and38.2% female with gestational age at the time of admission is 28 ~ 37 (33.7±1.9) week; birth weight of 1180~ 2480 (1952±316) gram. The most obvious day age of weight lost was 21~10 (3.7±1.4) days and the regain of the birth weight is 2~23 (7.8±3.8) days. The incidence of malnutrition was 52.3% based on Mounla's method.

Conclusion: Mounla's method used to assess nutritional status of LBWI provides certain reference for the clinical support in nutrition of the infants.

Keyword: Low birth weight, Nutrition, Mounla's method.

Introduction

Newborns with Low birth weight (LBW) remains a significant problem in many developing countries, and poor nutrition recognized as an important cause, which is associated with greater risks of perinatal and neonatal morbidity and mortality, and substandard growth and development in later life.[1-2] Survival rate of premature and extremely premature infants is increasing with advances in neonatal–perinatal medicine. Incidence of prematurity has increased over the past decade, resulting in an ever-increasing number of infants that as a group are a challenge to both neonatologists and nutritionists. [1]

Nutritional assessment is a continuous process for newborn infants in neonatal units and growth compared with standard norms and growth rate remain the cornerstone for evaluation of nutritional adequacy. The nutritional status of the newborn infant is monitored by daily assessments of fluid and energy intake and evaluating the rate of growth in weight, length and head circumference.[9-11] Traditionally, assessment of nutritional status of newborns begins with the plotting of anthropometric measurements on standard intrauterine growth curves.[3-4] Clinical assessment of nutritional status (CAN score) described by Metcoff was developed to differentiate malnourished from appropriately nourished babies. Nutritional assessments was done within 48 hours on the basis of the superficial readily detectable signs of malnutrition in the newborn; a score of < 25 was used to define as malnutrition.[12]The Ponderal index (PI) and mid arm circumference /head circumference (MAC/ HC) ratio are two other measurements of body proportionality used to identify malnutrition in infants. But each has its own drawbacks.[6-7]

In 2004, Nabil Mounla[17] proposed a new method for the assessment of nutritional status of LBW infants in the neonatal period, different with other commonly used measures for defining nutritional status at birth. This study aims to evaluate nutritional status of LBW newborn infants using the method of Nabil Mounla.

Methods

This was prospective study of all newborn infants admitted from January 2007 to December 2008 to the neonatology ward of Guangxi Medical University, Nanning.

The standard inclusion criteria of the study was: 1. minimum hospital stay > 7days, 2. Birth weight <2500 g. 3. Age at admission < 24 hour.

Infants were started with 10% dextrose 60-80 ml/kg body weight for all the admitted patients in first 24 hour. Expressed breast milk (EBM) was gradually started as early as possible orally to the infants > 2 kg birth weight category and by the help of naso-gastric tube (NG) to < 2 kg birth weight category. Infants were discharged only after regular breast feeding. There is no any co-morbid condition contributing to weight loss or gain pattern.

Infants were weighed in an electronic pediatric scale without clothes daily up to date of discharged from the ward. If the infants was using venipuncture material, then its weight was subtracted based on a previously established chart. Weights were express in grams and the scale was calibrated whenever necessary.

All the infants daily weights were recorded, and calculated the age of the weight lost, the lowest weight, the time to regain the birth weight, and using the Mounla's method, the nutrition status of the infants were assessed on the basis of growth curves charts of low birth weight infants of L.M. Anchieta, 2004 as baseline reference. All the analysis performed by SPSS 13.0 Software to calculate, mean, median and standard deviation values.

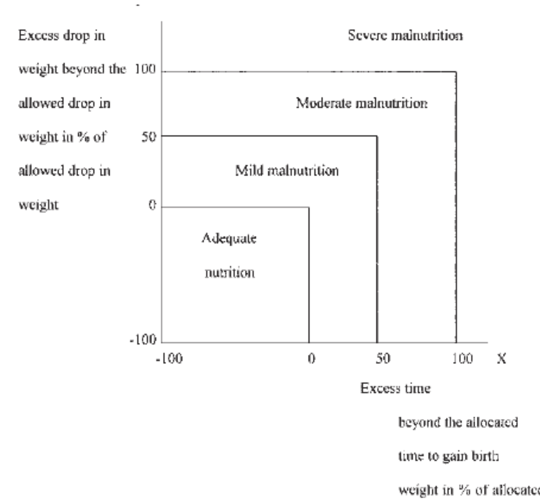

Figure 1 Assessment of nutritional status of Low birth weight infants in the neonatal period.

For example;

According to Wright et al, an infant with a birth weight between 540-746 g drops 7.3%(Y) of his birth weight and it takes him 13 days (X) to gain back his birth weight. Let us consider two infants of similar birth weights: infant A and infant B. Infant A drops 10% (Y1) of his weight and it takes him 15 days (X1) to gain it back. Infant B drops 5% (Y2) of his birth weight and it takes him 10 days (X2) to gain it back.

The formula would read then:

$XA= [(X1-X)/X] \times 100 = [(15-13) / 13] \times 100= 15\%$

$YA= [(Y1-Y)/Y] \times 100 = [(10-7.3) / 7.3] \times 100= 36\%$

$XB = [(X2-X)/X] \times 100 = [(10-13) / 13] \times 100 = - 23\%$

$YB = [(Y2-Y)/Y] \times 100 = [(5-7.3) / 7.3] \times 100 = - 31\%$

According to the grid, Infant A is labeled as having sustained mild malnutrition and Infant B labeled having adequate nutrition during the neonatal period. 17

Results

During the study period 170 newborns were assessed, 70.6% were appropriate for gestational age and 29.4% were small for gestational age, 105 (61.8%) were male and 65 (38.2%) were female. Gestation age at the time of admission was 28-37 (33.7±1.9) weeks, birth weight of 1180-2480 (1952.8±316) g.

Table 1 General characteristics of low birth weight infants study population.

Weight category	G A	BW	AGA (N)	SGA (N)	Total (N)	Proportion (%)
1001-1250g	29.7±1	1180±11.6	7	1	8	4.71
1251-1500g	31.0±2	1390±97.2	7	4	11	6.47
1501-17500g	32.7±2	1638±67.7	10	16	26	15.29
1751-2000g	33.6±2	1879±64.5	36	19	55	32.35
2001-2250g	34.6±1	2148±66.0	25	9	34	20.0
2251-2500g	35.0±1	2370±67.1	35	1	36	21.18
Total			120	50	170	100

Table 2 Nutritional status of low birth weight infants

Birth weight		Weight Lost*	Regain BW*	Average	Nutritional	Status	
Category	No	(%)	(Day)	Adeq	Mild	Mod	Sev
1000~1250g	8	15.2±3.7	15.6±7.0	2	4	1	1
1250~1500g	11	9.8±6.0	9.2±5.2	4	2	1	4
1500~1750g	26	8.2±5.1	8.3±4.1	13	9	2	2
1750~2000g	55	6.8±2.8	7.8±3.6	27	22	5	1
2000~2250g	34	6.7±3.1	7.4±2.9	21	9	3	1
2250~2500g	36	6.3±2.9	7.3±3.2	14	14	4	4
Total	170			81	60	16	13

* values are mean +SD, Adeq = Adequate; Mod = Moderate; Sev = Sever

In our study, infants maximum days of weight lost is 2-10 day (3.7±1.4 days), The regain of the birth weight is 2-23day (7.8±3.8 days) and the total median length of hospital stay is 12-71 day (20.4±12.9 days). In this study we distributed 6 group of infants according to birth weight category; 1001~1250g, 1251~1500g, 1501~1750g, 1751~2000g, 2001~2250g, 2251~2500g, and discovered the maximum weight drop percentage is 15.2 % -6.3 % , and regain of the birth weight day is 15.6-7.3day and the incidence of malnutrition was 52.3% based on Mounla's method.

Discussion

In 1948, Dancis[8] et al published postnatal growth curves based upon serial weight changes in 100 low birth weight infants. Many investigators have subsequently provided more specific data regarding postnatal growth determinants and expectations, but the grid of Dancis et al continued to be a useful tool to illustrate and compare patterns of postnatal weight change. New growth curves were published by Brousius[9] et al in 1984, Shaffer[18]et al in 1987, and Wright[11] et al in 1993. Comparative to the data of Dancies, Brosius, and Shaffer, Wright's weight curves were accurate reflection of current in-hospital growth trends, especially for very low birth weight infants.

In 2004 Anchieata L.M[19]et al. published the somatic growth of preterm newborns through growth curves during the first 12 weeks of life with 340 preterm infants, birth weight less than 2500-g, of which 240 were AGA and 80 were SGA. The growth curve was characterized by weight loss during the first week (4~6days) ranging from 5.9~9.7% [the greater the percentage, the lower the birth weight], recovery of birth weight ranged from 16 to 19 days, showing these newborns took longer to recover their birth weight. After 3rd week, the newborns maintained increasingly rates of weight gain.

Our study carries out the incidence of malnutrition is 52.3% in LBW infants, and discovered the maximum weight drop percentage in 1001~1250g, 1251~1500g, 1501~1750g, 1751~2000g, 2001~2250g, 2251~2500g groups is15.2 % , 9.8%, 8.2 %, 6.8 %, 6.7%, 6.3 % respectively, and regain of the birth weight day is 15.6d, 9.2d, 8.3d, 7.8d, 7.4d, 7.3d respectively which is lower than published values,[8-19]which needs a further study that could expand the number of samples in order to understand LBW child's growth curve of China. There are no such similar results published in literature in mainland China similar to our result

The factors that determine the adequate growth and development of LBW infants remains little known. Despite technological advances making the possibility of survival ever greater for newborn infants with ever smaller birth weights over recent decades, their growth remains considerably insufficient.[5, 10]

The difference in values show the recent advances in the field of neonatal care which contributes to the improvement in nutritional managements and allows authors[13-16] to report growth rates for LBW infants that exceeds those predicted by Dancies et al. The rate of advancement of parenteral nutrition to maximal intakes should be based on monitoring of protein tolerance and lipid clearance, with 3 g protein /kg.d and 3g lipid /kg.d reached within the first 5 days of life if possible. Recent advances in infant formulas and human milk fortifiers have been shown to enhance weight gain beyond that seen a decade ago.[20]

Early inappropriate nutrition may lead to chronic diseases such as cardiovascular disease, diabetes and other chronic metabolic disease which occurs earlier. Hark[21] and other study found that LBW and small head circumferences may affect children's language learning ability and IQ; therefore, in this period nutritional assessment is important, and this Mounla's evaluation method proposed for the clinical nutritional support provide some reference.

Conclusion

Early initiation of nutrition intake is necessary either parenterally or enterally, since the daily nutritional requirements of LBW newborns are may not be met or may transcend the limitations imposed by their immaturity and diseases resulting in metabolic difficulties for the nutritional management of these nutrients. Neonatal disease states is an inability to provide adequate enteral or parenteral nutrition in the immediate neonatal period and the obligatory weight loss result in postnatal growth deficits. These changes may be exacerbated by postnatal malnutrition and poor growth that LBW infants experience.

Conflict of interests: None declared.

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