Sufficient protein intake is necessary for lean mass accretion. Early growth of preterm infants is profoundly influenced by protein intake and by the protein-energy ratio. Robust monitoring of lean mass accretion would aid researchers and clinicians looking to optimize nutrition in preterm infants, but current methods (such as stable isotope dilution or bioimpedance measures) are cumbersome or of questionable reliability. Limb circumference measures predict whole body muscle mass in adults and have been suggested as a simple bedside test to monitor lean mass accretion. This study assessed whether such measurements correlated with protein intake and protein-energy ratio.

Infants born prior to 30 weeks post-menstrual age were recruited from a single neonatal unit. Mid-upper arm circumference (MUAC), mid-thigh circumference (MTC), weight, length and head circumference (OFC) were measured at recruitment and weekly until discharge. Baseline characteristics were recorded. Detailed nutritional intake information was recorded for each day of each infant’s admission and daily nutrient intakes calculated. Mixed effects linear modelling was used to assess the influence of total energy intake, protein intake and protein-energy ratio on changes in each of the measurements (standardised by SD score). Optimized models were compared to elicit which anthropometric measurements responded most sensitively to variation in protein intake and protein-energy ratio.

212 infants were recruited with a mean gestational age (GA) at birth of 27 weeks and birthweight (BW) of 930g. Modelling (see table 1) of baseline characteristics demonstrated that BW and corrected GA significantly influenced all growth parameters (p<0.01 for all). Weight, length and OFC changes were influenced by total energy intake, protein intake and protein-energy ratio, though the model using total energy intake was superior, with a lower Akaike and Bayesian information criteria (AIC/BIC). MTC was significantly influenced by total energy intake but not protein intake, though replacement of total energy intake with protein-energy ratio improved the model, with a lower AIC and BIC. MUAC was not influenced by total energy intake or by protein intake when taken in isolation. However, the model was improved by using protein-energy intake as an independent variable.

MUAC and MTC growth varies in response to the protein-energy ratio of nutritional intake in preterm infants. Their patterns of response to energy and protein intake are distinct from those of conventional anthropometric measurements and are perhaps more reflective of lean tissue accretion. Further work using gold standard body composition techniques is required to establish whether MUAC/MTC growth reflects lean mass accretion in preterm infants.
Information criteria scores for models to predict growth of anthropometric measurements. AIC – Akaike Information Criterion; BIC – Bayesian Information Criterion; MUAC – Mid-Upper Arm Circumference; MTC – Mid-Thigh Circumference; NS – p-value for the introduced variable >0.05. All models where new parameters had a significant influence (p<0.05) have the AIC and BIC provided, with the best model for each measurement highlighted in grey.

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TITLE: DOUBLE-BLIND RCT ON TARGET FORTIFICATION OF BREAST MILK WITH PROTEIN, CARBOHYDRATE AND FAT FOR PRETERM INFANTS – EFFECT ON NEURODEVELOPMENT

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CONTENT:

We recently reported a double-blind RCT on target fortification (TFO) of breast milk (BM). Using BM macronutrient analysis, fortification was individually adjusted (TFO) using a standard fortifier (SF) and 3 modular products (protein, carbohydrates (CHO), fat) to achieve ESPGHAN recommendations. This approach was found to be feasible in clinical routine and safely improved short-term growth and outcome until discharge. The aim of this study was to investigate the impact of TFO on neurodevelopmental outcome (ND) at 18-month follow-up.

Single center RCT, infants born <30 gestational weeks on BM; intervention (INTVN) group received SF+TFO, control (CTL) group only SF. For INTVN, three modulars (protein, CHO, fat) were added to SF after native BM content was measured 3x/week using a validated near-IR spectrometer (SpectraStar) to achieve intakes of 4.5, 13.2 and 6.6 g/kg/d for protein, CHO and fat, respectively. To obtain total macronutrient intake, all daily native BM samples were reanalyzed; near-IR for protein and fat; UPLC-MS/MS for lactose. Weight, length, head circumference and body composition (air displacement plethysmography) was measured at 36 weeks. ND was assessed at 18 months using Bayley III scale.

103 infants received SF (n=51, CTL) or SF+TFO of BM (n=52, INTVN) per protocol. 69 infants (CTL: n=35, GA: 27.1 weeks, BW: 970g; INTVN: n=34, GA: 27.2 weeks, BW: 950g) had a follow-up visit and received a Bayley scale at 18.9±1.9 (CTL) and 18.5±1.3 (INTVN) months. Weight, length, and head circumference were not different between the groups. In the INTVN group, infants had higher Bayley scores for all categories (Fig1). The highest differences were observed between the subgroups “CTL, low protein” and “INTVN, high protein”. Statistical significance was achieved for language scores (p<0.05).

TFO has clinically relevant positive effect on short-term outcome. Long-term ND may be explained by combined exposure to nutrition, during NICU stay (protein and calories, TFO+SF vs SF) and ex-NICU (high vs low protein content of native BM). Effects of TFO are present for long-term outcome, but attenuated, esp. in the group of infants with low protein content of native BM. There might be a role for TFO following the end of routine fortification

IMAGES:
https://www.eiseverywhere.com/eselectv3/v3/events/351149/submission/files/download?fileID=61e9dca5a2f2cb52299b03ce797bdb5b-MjAxOS0wNSM1Y2UyMjY2YzY2NGE5

Figure 1: Neurodevelopmental outcome of preterm infants receiving target fortified (TFO) breast milk compared to standard fortified breast milk (Control), * p<0.05

COI: None declared