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Parenteral nutrition therapy for neonates: Experience in a tertiary care centre in Sri Lanka

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Abstract

Background: There is scarce literature about the practice of parenteral nutrition (PN) in neonates in Sri Lanka.

Objectives: To describe the characteristics of neonates receiving PN, the current practice of PN and the complications developing in neonates receiving PN in Sri Lanka.

Method: A descriptive cross-sectional study was conducted on babies receiving PN after admission to the Special Care Baby Unit of a Tertiary Care Centre in Sri Lanka during 2014. Data was gathered from mothers, medical records and by clinical examination of the babies.

Results: Fifty six neonates were on PN during 2014. Twenty (36%) were on PN for 4 days. All babies were fed on breast milk as the trophic feeds except one who was given formula milk. Initiation of trophic feeds was early (median day 2). Fifty one (91%) were started on trophic feeds by day 3 with 14 (25%) on day 1. Twenty six (46%) developed complications consisting of septicaemia (5), hypoglycaemia (9), hyperglycaemia (2), hypernatraemia (23), catheter site related complications (4) and thrombocytopenia (7).

Conclusions: The median duration of PN was 4 days. Trophic feeds with expressed breast milk were started in 91% by day three. Forty six percent of babies on PN developed complications.

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Introduction

First few days of life are a transient period where the newborn adapts to postnatal life where there is a high risk of growth restriction, if adequate nutrients are not received by the baby. The adverse effects of poor nutrition are more pronounced among the premature and low birth weight babies^{1,2}. Therefore, adequate nutrients via parenteral nutrition (PN) in babies who are unable to be fed on enteral route have a positive impact on the growth and the reduction of mortality and morbidity of these babies³. However, PN is associated with the risk of contamination and sepsis, cholestasis and metabolic derangements such as hyperlipidaemia, hypernatraemia and hyperglycaemia in neonates^{2,4}. In the Sri Lankan set up, research evidence on PN in neonatal healthcare is scarce and needs to be studied.

Objectives

To describe the characteristics of neonates receiving PN, the current practice of PN and the complications developing in neonates receiving PN at the Special Care Baby Unit (SCBU) of a Tertiary Care Centre in Sri Lanka.

Method

A prospective cross-sectional study was conducted in the SCBU of a Tertiary Care Centre in Sri Lanka among babies receiving PN in 2014. Babies with cholestasis due to anatomical obstruction of the hepatobiliary tract, metabolic disease or inborn errors of metabolism and those whose mothers refused were excluded. After obtaining informed written consent from the mother, data was gathered using an interviewer-administered questionnaire from mothers and from the bed head ticket, investigation reports, and monitoring charts and by the examination of babies. Ethical clearance was obtained from the local ethics review committee. Data was presented as percentages and frequencies.

Results

Out of 766 total admissions to SCBU, 56 babies received PN in 2014. The descriptive data of the newborns are shown in Table 1.

Table 1: Descriptive data of the babies (n=56)

Character	Result
Median duration of stay at Special Care Baby Unit in days = No. (range)	22 (05-56)
Median duration of parenteral nutrition in days = No. (range)	04 (02-09)
<i>Gestational age at birth</i>	
Less than 28 weeks - No. (%)	09 (16.1)
28 to 31 weeks - No. (%)	20 (35.7)
32 to 37 weeks - No. (%)	25 (44.6)
More than 37 weeks - No. (%)	02 (03.6)
<i>Birth weight</i>	
Less than 1000g - No. (%)	17 (30.3)
1000-1499g - No. (%)	33 (58.9)
1500-2499g - No. (%)	06 (10.7)
<i>Route of parenteral nutrition</i>	
Central route (umbilical catheter) - No. (%)	39 (69.6)
Peripheral route - No. (%)	17 (30.4)
<i>Indication for parenteral nutrition</i>	
Prematurity and low birth weight - No. (%)	54 (96.4)
Respiratory distress - No. (%)	02 (03.6)
Treated as necrotizing enterocolitis - No. (%)	08 (14.5)
<i>Complications</i>	
Septicaemia - No. (%)	05 (08.9)
Hypoglycaemic episodes - No. (%)	09 (16.0)
Hyperglycaemic episodes - No. (%)	02 (03.6)
Hyponatraemia - No. (%)	23 (41.0)
Thrombocytopenia - No. (%)	07 (12.5)
Catheter site related infection - No. (%)	04 (07.1)

Complications were observed among 26 (46.4%) out of the 56 babies who received PN and several babies had more than one complication. There were no babies with evidence of cholestasis and liver injury. Catheter line was inserted and PN was started in 49 (87.5%) babies on day one. Twenty (35.7%) of them were on PN for four days. Vaminolact was used to provide amino acids, while 20% Intralipid or 20% Lipofundin was administered to supply lipid. Dextrose, potassium, calcium and sodium were administered separately as a cocktail. Other micronutrients were not included in the PN regime. All babies were fed on breast milk as the trophic feeds except one baby who was given formula milk, because of a maternal problem. Initiation of trophic feeds ranged from day one to day nine with a median of day two. On day one itself trophic feeds were started on 14 (25%) of the babies and 51 (91.0%) babies were started on trophic feeds by day three.

Discussion

The median duration of PN was 4 days in this group of neonates and trophic feeding had been started by day three in 91% babies. Early initiation of trophic feeding does not increase the risk of necrotizing enterocolitis (NEC), but promotes the maturation of the gastrointestinal tract and sustains its integrity and decreases the adverse effects associated with prolonged PN⁵.

Different professional bodies have laid down the indications for PN in neonates. PN is indicated when enteral feeding fails or where there is a contraindication to enteral feeding in neonates such as oesophageal atresia, intestinal atresia and risk of NEC or to uplift the growth of the premature babies^{6,7}. Among the many indications prematurity was the commonest to start PN according to our study.

Postnatal growth retardation is common among the very low birth weight premature infants. Proper nutrition in the early critical period of life plays an important role in growth, long-term health, neurodevelopment and in the healthy retinal development in the baby^{8,9}. Early aggressive PN is beneficial and useful in reducing postnatal growth restriction especially in premature small for gestational aged neonates¹⁰. Therefore PN is life-sustaining, but early establishment of enteral feeding is always preferred to prolonged PN which is associated with many complications^{4,5}. Hence, duration of PN should be as short as possible or at least partial enteral feeding should be started as early as possible to minimize the adverse effects and to reduce NEC and death¹¹. There are many suggested risks associated with PN such as cholestasis and liver disease, venous thrombosis, metabolic changes such as hypoglycaemia and

hyponatraemia especially in babies who are small for gestational age or preterm^{12,13}.

The main route of administration of PN was central via the umbilical catheter according to our study, because percutaneous central catheters are expensive and are therefore not freely available locally. Due to the increased rate of complications associated with umbilical catheter use in PN administration, many neonatal units prefer to use percutaneous intravenous catheters (PIC) for PN¹⁴. Though placing PIC is potentially difficult, it has a better delivery of nutrition and is more stable than peripheral cannula and is less associated with invasive infections than peripheral cannula^{15,16}. However, the nutritional impact of various routes on neonatal growth and long term outcome is not clear and there is limited data available. One such trial has assessed nutrient input of neonates and has found that infants who received parenteral nutrient via peripheral cannula had a statistically significant higher nutritional deficit than infants who received nutrition via a central venous catheter¹⁷.

In the Sri Lankan setup, commercial formulas in separate bags such as Vaminolact and Intralipid or Lipofundin were used to supply amino acids and energy and these formulas contain standard amounts of nutrients. A study done in a group of very low birth weight (VLBW) babies who received PN prescriptions with energy and high doses of amino acids were shown to promote protein synthesis more than newborns who received no lipids and standard amounts of amino acids during the first two days of life¹⁸. This finding suggests that the high amount of amino acid supply has a better outcome in the new tissue laid down among newborns. Therefore the availability of PN formulas of which the content can be adjusted is important. However, with the available formulas at the local setting we have been unable to provide adequate amino acids in a given volume without restricting the other intravenous infusions such as dextrose which may leads to hypoglycaemia in the neonate. The preparations which are usually used in the local setting lack other micronutrients such as zinc, magnesium, copper and molybdenum. Locally we use a cocktail which contains dextrose, potassium, calcium and sodium. PN should supply trace elements also other than energy and amino acids to minimize the metabolic disorders and growth impairment in the early life¹⁹. Therefore, all PN prescription should include a physiological dose of trace elements to prevent imbalances and deficiencies. Prolonged PN therapy may be associated with the development of deficiency syndromes if adequate micronutrients are not supplied from the PN formulas²⁰. Optimization of PN therapies is necessary by outcome assessment

with regards to the formula we used²¹. Unfortunately the outcome of locally used formulas has not been evaluated by scientific studies yet. Small sample size and the inability to eliminate the effect of confounding on the occurrence of complications related to PN were the major limitations of the study.

Conclusions

The median duration of PN was 4 days. Trophic feeds with expressed breast milk were started in 91% by day three. Forty six percent of babies on PN developed associated complications.

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