The Social Sciences 11 (9): 2014-2017, 2016
ISSN: 1818-5800

Comparison the Enteral Nutrition and Total Parenteral Nutrition Supports in the Course of Malnutrition Prevalence in Children Referring to Pediatric Hospital, Mashhad, Iran

[1]Mitra Sotoude, [1]Tahmine Salehian, [2]Bahareh Imani and [2]Gholamreza Kademi
[1]Faculty of Nursing and Midwifery, Iranshahr University of Medical Science, Iranshahr, Iran
[2]Department of Pediatric, PICU Dr. Sheikh Hospital,
Mashhad University of Medical Sciences, Mashhad, Iran

Abstract: The aim of current study was to evaluate malnutrition in children who nourished by Eternal Nutrition Support (ENS) and Total Parental Nutrition (TPN) among children refer to Pediatric Intensive Care Unit (PICU). This cross-sectional study was carried out during November 2014 through November 2015 included 200 children which hospitalized at PICU of Sheikh hospital, Mashhad University of Medical Sciences, Mashhad, Iran. Age, gender, cause of hospitalization (main disorder), kind of nutrition intervention TPN or enteral nutrition EN were recorded. Malnutrition and obesity prevalence was determined using Z-scores. Among 186 children, 100 patients (54.3%) were male and 86 ones (45.7%) were female. Z-score exploited among 182 cases to determine nutritional state that indicated 76 persons (41.75%) had malnutrition, 64 ones (35.16%) were at risk, 22 ones (12.08%) had normal state and 20 ones (10.98%) had over weight. There are not any significant difference between age of these studied groups ($p = 0.59$) and the difference between nutritional groups and total energy uptake was not meaningful ($p = 0.29$). Children who were under nourished by TPN and EN Method had similar Z-score ($p = 0.09$; $p = 0.18$). We concluded that due to our finding, most of hospitalized children had malnutrition or been at risk. Our findings presented that there are not any difference between kind of nutritional intervention and malnutrition.

Key words: Children, hospital, malnutrition, Z-score, Iran

INTRODUCTION

Malnutrition is still a health problem, especially in undeveloped and developing countries (Tzioumis and Adair, 2014). Due to the World Health Organization (WHO) reports, under nutrition-related factors contribute to near 45% of deaths in children below 5 years old. Therefore under nutrition is an important social and public health problem which is observed in all age groups but the most affected are children between the ages of 6 months and 5 years. According, to the national family health survey-3, under-5 mortality is 74 per 1,000 live births and one of the millennium development goals is to reduce it to 38 per 1,000 live births. Total Parenteral Nutrition (TPN) remains a vital medical intervention and it has lost favor in the treatment of conditions that were previously thought to require parenteral alimentation including acute pancreatitis, pediatric and adult burns, critical care and preoperative use in patients with mild or moderate malnutrition (Archer *et al*., 1995). On the other hand, clinical indications for Enteral Nutritional (EN) in infancy and early childhood are well recognized. This method is undoubtedly responsible for a better overall outcome of extremely premature and medically fragile infants often with severe underlying medical conditions (Agostoni *et al*., 2010).

The decision to start enteral feeding is usually based on the published guidelines (Agostoni *et al*., 2010) that set a clearly defined nutritional goal for the duration of the intended EN. Apart from the best clinical practice and nutritional recommendations (Koletzko *et al*., 2005; Pearce and Duncan, 2002) there is limited published data on related topics such as ongoing tube management and tube maintenance and exit strategies in cases of temporary tube placement (Scheer *et al*., 2009).

There is paucity of literature regarding comparison of TPN and EN about calorie intake and incidence of malnutrition in malnourishedchildren in a hospital based setting, particularly in Iran in recent years; hence the present study wasconducted.

Corresponding Author: Bahareh Imani, Department of Pediatric, PICU Dr. Sheikh Hospital,
Mashhad University of Medical Sciences, Mashhad, Iran

MATERIALS AND METHODS

This cross sectional study was conducted from November 2014 through November 2015 in the pediatric ward of Sheikh Hospital of Mashhad University of Medical sciences, Mashhad, Iran. Children older than 1 month of age were enrolled. Permission and consent form was obtained from all the parents of patients. Institute Ethics Committee of Mashhad University of Medical Sciences (MUMS) approved study protocol.

Anthropometric measurements: All measurements were performed with a standard method by a single operator (a trained MSc of nutrition), using standard equipment. According to NHANES (National Health and Nutrition Examination Survey) height was measured in two forms; recumbent length for all children <4 years of age (1-47 months) by using an infantometer (Seca417) with a fixed head piece and horizontal backboard and an adjustable foot piece and standing height was measured using a stadiometer (Seca213) with a fixed vertical backboard and an adjustable head piece. The registered weight in patient's medical record was considered as the current weight of child. The Seca725 mechanical baby scale for infants and Seca760 mechanical scale for older children weight measurement were applied formerly. Demographic variables include age, sex, weight and height were recorded. The 7 days record of nutrition support after surgery was include of intra-lipid, amino acid, dextrose, Median Chain Triglycerides (MCT) oil and breast milk feeding rate. Enteral Nutrition (EN) Parenteral (PN). Calorie requirement were calculated using the following ratio:

- Premature infants: 120 kcal/kg×1.2 (stress factor related to surgery)
- Mature infants: 100 kcal/kg×1.2 (stress factor related to surgery)

If patients were >4 years old but incapable of standing, the length was measured and 0.7 cm was reduced in order to convert it to height. The patient's height was measured to the nearest 0.1 cm. Body Mass Index (BMI) was calculated for all the children above 2 years old and then the charts were interpreted according to CDC (centers for disease control and prevention) standards. Z-scores were calculated by using a WHO software called "AnthroPlus 1.0.4" for children below 2 years old and with the CDC software called "EPi Info 3.2.2" for children above 2 years old.

Nutritional status assessment: According to WHO classification for malnutrition, children with Z-scores of <-3 for Weight-For-Height (WFH) and Height-For-Age (HFA) are classified as severely malnourished and stunted, respectively. Those with WFH or HFA Z-scores between -3 and -2 are classified as moderately malnourished. Weight For Height (WFH) was only calculated for those with a height <120 cm. Z-scores for WFH detects acute malnutrition and Height For Age (HFA) detects chronic malnutrition. Weight-For-Age (WFA) Z-scores were also calculated.

Statistical analysis: The data were analyzed using SPSS 15 for windows version 11.05 (SPSS Inc., Chicago, IL, USA). Numerical data are expressed as mean±SD or as proportions of the sample size. All data including age, calorie intake by TPN or ENS Method and total energy uptake were checked for normality by Kolmogorov-Smirnov test (K-S test). Comparison different malnutrition groups between TPN and ENS Method was performed by ANOVA tests. $p<0.05$ was considered significant.

RESULTS AND DISCUSSION

In total 200 children were considered for enrollment over the period of the study. Fourteen children were excluded from enrollment due to unable to be enrolled by the interviewers. The final study population comprised 186 children, 100 (54.3%) and 86 (45.7%) of whom were male and female respectively. Some demographic and anthropometric characteristics of subjects is presented in Table 1. Age of studied subjects were 23.45±40.27 month. The most common cause of patients hospitalization were distress in 45 (23.3%), vomiting in 34 (17.6%), fever, edema in 14 (7.3%), atresia and lethargy in 8 (4.1%) and diarrhea and convulsion in 6 (3.1%). Besides the main diagnosis were breathing problem and distress.

According to Z-score definition, most of the patients presented sever to moderate malnutrition (Table 2). Among available documents of 182 cases, 76 persons (41.75%) had malnutrition, 64 ones (35.16%) were at risk, 22 ones (12.08%) had normal state and 20 ones (10.98%) had overweight.

Table 1: Demographic and anthropometric characteristics of subjects. The anthropometry of 186 hospitalized children was assessed at admission to a tertiary pediatric hospital. SD = standard deviation

Demographic and anthropometric characteristics	Measure
Gender (No., %)	
Male	100 (54.3)
Age categories in years (No., %)	
0-12 months	130 (69.5)
12-24 months	9 (4.8)
24-36 months	10 (5.3)
36-48 months	4 (2.1)
>5 years	34 (18.2)
Height for age percentile (Mean±SD)	906.41±33.34
Weight for age percentile (Mean±SD)	67.65±27.88
BMI percentile (Mean±SD)	56.7±31.2

Table 2: Evaluation of gender, age and total energy between different studied groups

Malnutrition group	Number (%)	Gender (%) (Male)	Age, month (Mean±SD)	Total energy (Mean±SD)
Malnutrition	76 (41.75)	40 (40.4)	22.32±4.740	703.67±46.63
Normal	64 (35.16)	35 (35.4)	20.40±4.490	643.48±52.15
Overweight	22 (12.08)	10 (10.1)	27.27±10.38	749.27±50.97
Obesity	20 (10.98)	14 (14.1)	23.80±9.850	889.50±52.43

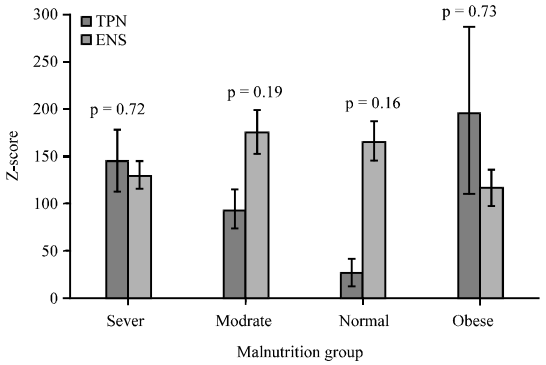

Fig. 1: Comparison of TPN and ENS in different malnutrition group. Standard deviation presents as error bars

Statistical analysis showed that there wasn't any significant difference between male and female patients or different age range in various malnutrition group ($p = 0.43$, $p = 59$, respectively). Evaluation of total energy uptake was similar in different malnutrition group ($p = 0.29$).

There was not any significant difference between energy uptake by TPN and ENS Method ($p = 0.83$; $r = 0.01$). Statistical analysis was performed to compare energy uptake by TPN and ENS Method into different malnutrition group (Fig. 1). Although, there is higher energy uptake in ENS Method than TPN method in normal and moderate malnutrition group but these differences were not meaningful.

In this prospective study, 41.75% of children were acutely and/or chronically malnourished. Management was suboptimal for children identified as at risk for malnutrition on admission: they received only 66.9% of recommended energy intake. However, management was acceptable or malnourished children with energy intake averaging 92.5% of recommended intake. However, in present study we couldn't find any significant difference between total energy uptakes in different subgroups of malnourished children.

Total parenteral nutrition and enteral nutritional are two major nutritional supports clinically. Previous studies has been validated that long-term TPN may aggravate the liver damage (Bavdekar *et al*., 2002).

Some existing problems including unknown effect of lipid on nutrient metabolism and unknown rational and safe dose and the suitable percentage of lipid supplied as the energy source could be impede the extensive use of PN (Ling *et al*., 2002; Jia *et al*., 1999; Takagi *et al*., 2000). On the other hand, the consequent enteric bacterial translocation would also cause endogenous infection even multiple organ failure and death. Enteral nutritional is a more physiological, cheaper and has protection function on gut barrier. But in some cases using EN are inevitable due to intact of gastrointestinal tract, tolerate the indwelling nasogastric tube by patient, abdominal distention in hypertonic patient, diarrhea and sometimes nausea and vomiting and enhancement of the liver burden (Zhou and Chen, 2000; Chen, 2000).

In present study, we compared two methods EN and TPN in relation of malnutrition. Although, Z-score of normal and moderate patients who nourished under EN method was higher than those under TPN method but we found Z-score of sever and obese malnourished patients was higher in TPN method than EN method. However, we couldn't find any significant difference between two methods and kind of supplements.

There are rare studies which investigate EN and TPN in malnourished children. Previous studies compared these supplements in pancreatitis and liver function (Windsor *et al*., 1998; Hu and Zheng, 2003). They found that enteral feeding modulates the inflammatory and sepsis response in acute pancreatitis and is clinically beneficial than TPN. Also another study concluded that TPN is not clearly superior to individualized enteral feeding and suggested that TPN be reserved for bone marrow transplant recipients who demonstrate intolerance to enteral feeding (Szeluga *et al*., 1987). Furthermore met analysis study by Peter *et al*. (2005) found that there was not any significant difference on mortality effect with the type of nutritional supplementation. Although, early enteral nutrition support significantly decreased the complication rates. They concluded that early EN as compared with early PN, would reduce mortality appears misplaced (Peter *et al*., 2005).

CONCLUSION

In present study, we concluded that due to our finding, most of hospitalized children had malnutrition or been at risk. We didn't evaluate some independent variables predicting malnutrition including mother's education, pre lacteal feeds and comorbidities. Although, several studies have reported a prevalence of illness-related or secondary malnutrition of 6-51% in hospitalized children, this condition is probably under-recognized (Hendricks *et al*., 1995; Secker and Jeejeebhoy, 2007).

LIMITATION

Limitation of this study besides these points are low sample size which hospitalized due to different diagnosis. In this study, we concluded that there are not any significant difference between two intervention methods including enteral nutrition and total parental nutrition and malnutrition and total energy uptake in hospitalized children.

SUGGESTIONS

The researcher suggest further studies on relation of malnutrition on hospitalized children with similar diagnosis who under TPN or EN Method along with investigation of independent variables predicting malnutrition. These finding could help physician to deal with disorder in children and monitoring of nutritional state might be useful to have appropriate view of cure. Therefore, we require proper to cope with malnutrition in pediatric intensive care unit in the related hospitals.

ACKNOWLEDGEMENT

The researchers thank all the staff members of Sheykh hospital of Mashhad University of Medical sciences for participation in the present study.

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