PREVALENCE OF MALNUTRITION BASED ON UNDERWEIGHT INPATIENTS IN PEDIATRIC INTENSIVE CARE UNIT

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Abstract

Background: Childhood malnutrition has severe adverse effects on growth and development and maintain of nutritional state and growth in children as a main aim of nutritional support in Pediatric Intensive Unit (PICU) is considered, but only limited information is available on the prevalence of malnutrition in pediatric hospital patients.

Methods & Material: This cross-sectional study included 69 children hospitalized at PICU of Dr. Sheikh hospital. These children have evaluated for malnutrition. Variables such as Age, gender, cause of hospitalization (main disorder) and weight enrolled at the time of hospitalization and monitored for a week.

World Health Organization (WHO) standards recruited in order to determine state of nutrition. Data were analyzed by SPSS version 16.

Result: Among 69 patients, 43 patients (4.61%) were male and 26 subjects (6.38%) were girls. Z-score exploited to determine nutritional state that indicated 38 subjects (55.1%) had malnutrition, 16 subjects (23.2%) were at risk, 11 subjects (15.9%) had normal state and four subjects (5.8%) had overweight.

By percentile score, 46 (9.60%) had malnutrition, 17 subjects were at risk (6.24%), nine patients (13%) had normal and one subject (4.1%) was overweight.

Conclusion: According to our finding, most of hospitalized children had malnutrition or been at risk. 78% of them endangered by malnutrition and just 22% were at normal state. Therefore, due to the fact that malnutrition is a
predisposing factor to infections and increase the chances of admission, it is recommended that all infants admitted to using anthropometric measurements and nutritional classification of malnutrition evaluated and treated.

Keywords: Malnutrition, Children, Pediatric Intensive Care Unit, PICU.

Introduction:

Nutrition importance in Children: Due to the high rate of infant growth, development of nervous system, high metabolism and require more nutrient element, nutrition state is more importance in children. Appropriate diet in infancy and childhood lead to maintaining to normal weight and sufficient growth. Calories in the age of life are necessary to supply macro and micronutrients that cause vital functions. 60% of growth occurred in childhood, thereby nutrition play main role in first 3 years of life and affect the rate of growth, height and healthy in adulthood (1).

Malnutrition:

Nutritional status and growth maintain is essential in PICU but very difficult to achieve. While, nowadays there is development in the quality of health care, but malnutrition prevalence in children ward has not decreased in the past 120 years. Based on nutrition criteria in children, prevalence of malnutrition is 15-30%. Literatures indicate most of hospitalized children in PICU had malnutrition before their hospitalization and also 1.3 of them had acute or chronic malnutrition of Protein-Energy. Other studies explained that 55 – 24% of hospitalized children had chronic or acute malnutrition which got worse during hospitalization. Malnutrition could be resulted by acute disease such as sepsis, trauma, burning, and cancer, chronic disorders like intestinal inflammation, coronary disease, cystic fibrosis, drug using and insufficient caloric delivery (1,2).

48 hours after hospitalization in PICU, most of children shown underfeeding condition. In this condition acute Protein-Energy reduction had developed by 16-20% that lead to muscle destruction, ulcer healing reduction, immunity system function decreasing, sepsis risk increasing, and increased risk of infection, impaired respiratory function and cardiovascular mortality increased.

Factors that affect insufficient delivery of nutrient element included incorrect assay of daily diet, inappropriate way of feeding, limitation of liquid usage and inaccurate estimate of caloric (1,2).

In other hand, overfeeding lead to impaired liver function, steatosis, inefficient respiratory system, and immune system damage and harder to separate the ventilator. It has shown in literatures that indicated overfeeding enhance fat
production from carbohydrates and this function because more Co₂ consuming and respiratory ratio achieve more than one. This occurrence make ventilator separation would be difficult. When carbohydrate usage increased, the insulin concentration increased and fat oxidation reduced. This phenomenon cause decrease of glucose oxidation and ketone synthesis in presence of insulin resistance and also increasing of Co₂. Oosterveld study indicated 60% of hospitalized patients had malnutrition and 28% had over delivery. Malnutrition and overfeeding in children had contrary effect on children growth (2).

**Nutrition evaluation in PICU:**

Anthropometric and indirect calorimetric measurement recruited in PICU to determine nutrition state. According to literatures anthropometric value is used in most nutrition evaluation in PICU. While anthropometric evaluation influenced by a various range of factors such as edam, age, ventilation and inequality of body fluid, thereby, analysis of this evaluation is difficult. But, weighting of children whom are under parenteral nutrition is common method to evaluation. In other studies demonstrated calculating of arm size is valuable and valid criteria to detect malnutrition in PICU. In some hospitals, nutritional assessment don’t form routinely due to lack of responsible of nutrition evaluation, facility and guideline (3, 4).

**Nutrition support in PICU:**

Nutrition supporting as important issue of healing management is considered at PICU. Nutrition supporting will not start before to achieve stable metabolic, coronary and vascular state. While most of hospital guideline is changed and they do nutrition supporting at time of hospitalization before to access stable state. Stress responses to physiologic condition is not stable and have continuously alteration, therefore, proper knowledge of these stresses and physiologic conditions aid nutritionists to have appropriate decision about nutrition supporting time and method. Combination of enteral and parenteral diet in first 72 hours of hospitalization at PICU could be effective to provide nutrition requirement of patient, especially when enteral diet is not sufficient. In a weekly study on PICU nutrition, patients whom achieved parenteral diet (with or without enteral diet) had faster energy delivering and delivery increased in contrast with whom deliver enteral diet were to expose energy loss(1). Another study indicated that 76-90% of patient obtained required energy by enteral diet (5,2). Consider the children physiology and their nutritional differences with adults. Regards to fast growth, difference requirement to liquid, electrolytes, fat, amino acids and carbohydrates,
Parenteral diet for children basically is different with adult. In addition, there is differences in quality of required elements for example Histidine, Proline are semi-necessary in children nutrition. Children parenteral diet must be included estimated nutrient requisite. Liquid, electrolytes, amino acids, carbohydrates requisite must be estimated properly. Appropriate nutrient requirement must be calculated based on stability, flexibility and clinical normal range of nutrient requirement. Personal nutrient requirement must be estimated personally for each person. This study investigated prevalence of malnutrition among hospitalized children in PICU.

**Materials and Methods:**

Age, gender, type of disease and weight of 69 children enrolled at time of hospitalization. Patients categorized into newborn (without consider to age, at time of born till one month old), infant (from one month old till one year old), two years old (one year old till two years old), preschool years (from two years till five years) and middle childhood (6-11 years). Children weighted without clothes by special gearing Seca scale made in Germany with error 10 grams and measurements were carried out by a constant skilled person. Weight of second, fourth, sixth and eighth day recruited for determining of main weight and investigate weight variations. But midarm circumference and head circumference isn’t measured because of barriers and difficulty in measurement such as injection (serum) and ulcer or movement limitation.

Children nutrition situation evaluation during hospitalization done based on Z-score and percentile of W.H.O. Regards to determination of newborn weight in Z score range; 2 till -2 is normal weight, -2 till -3 is in expose to malnutrition, +2 till +3 in expose to overweight and +3 is obesity.

**Results**

Among 69 patients, 43 subjects were male (61.4%) and 26 subjects were females (38.6%).

![Chart-1: Gender Frequency](chart.png)
12 subjects were one day old (17.4%), 20 subjects were neonatal (29%), 23 subjects were infant (33%), five subjects were in second years of life (7.2%), five subjects were preschool (7.2%), three subjects were in middle childhood (4.3%). Most of studied patients were infant.

Chart-2: Age Frequency

Patients suffered from gastrointestinal disorders, seizure, respiratory distress and other disease such as chromosomal syndrome, renal disease, FTT. Patients whom suffered from gastrointestinal anomalies were 32 subjects (46.4%), nine subjects (13%) had seizure, four subjects (5.8%) suffered by respiratory disorders and 24 (34.8%) patients had other diseases.

Graph-1: Diseases Frequency

Nutrition situation based on percentile indicated that 46 subjects (60.9%) had malnutrition, 17 subjects (24.6%) were at risk for malnutrition, nine subjects (13%) had normal situation and one subject had overweight.
In addition, nutrition situation evaluation based on Z-score shown 38 subjects (55.1%) had malnutrition, 16 subjects (32.2%) were at risk, 11 (15.9%) subjects had normal status, 4 (5.8%) subjects had overweight.

Graph-2: Malnutrition Frequency based on Z-score

- **Conclusion:**

According to our finding, most of hospitalized children had malnutrition or been at risk. 78% of them endangered by malnutrition and just 22% were at normal state. The study was conducted by Pawellek et al.(2007) on prevalence of malnutrition in pediatric hospital patients, indicated some 24.1% of the patients were malnourished, with 17.7% of all patients who were mildly, 4.4% who were moderately and 1.7% who were severely malnourished. The very high prevalence of malnutrition among children admitted to a children's hospital is considered intolerable, given the adverse consequences for short- and long-term health and well-being (7). Joosten et al. in a study have shown that decrease in WFA in hospitalized patients who had heart surgery (8). Montazerifar et al. (2001) on 450 children under five years in the
city of Zahedan growth measurements showed that 20.6 percent of children under 6 months, 36.5% of children 3-5 years of age have some degree of malnutrition (9). Sotoudehet al. (2016) investigated prevalence of malnutrition and concurrent over nutrition on 2400 students among 7 -12 years old. They were selected randomly from elementary schools in Zahedan. The results showed that 1.8 % of children had stunting with concurrent overweight (10). Vahidi et al. (2001) have conducted a study on 560 infants hospitalized in southern Kerman managed 6-24 months. The results indicated 76.2 % of the patients underweight and %73/7 of children were stunted (11, 12, 13). Education may enhance the performance (14). Self-care education is emphasized because it leads in active role in treatment process and accepting responsibility for individual health (15). Social networks are used for behavior improvement, educational performance and other self-care education (16). Our funding indicated that any changes in anthropometric parametric in seven days hospitalization but these variation observed in 14 days hospitalization. In our study, short time of study, heterogeneous study group and lack of recruiting of biochemical factor and muac were weakness points of study. It suggested this kind of study do on same group of patients in age, and background diseases. Study on homogenous group could decrease age and stress factor effect on required energy estimation. It is better to exploit mid-arm, head and weight to evaluate nutrition situation. Anthropometric parametric must be calculate regularly and enrolled on Z-score table or CDC table for future following. Also it is suggested to use longer period for weight evaluation, delivering caloric estimation and nutrition situation assessment. Education may enhance the performance (14).

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