RESEARCH ARTICLE

EVALUATION OF THE NUTRITIONAL STATUS IN CHILDREN ADMITTED TO THE NEUROLOGY WARD OF MOFID CHILDREN'S HOSPITAL

BEHESHTI Maryam MSc[1], IMANZADEH Farid MD[2], SHAHIDI Noushin MSC[3]

1. Msc of Human Nutrition, Department of Nutrition, Shahid Beheshti University of Medical Scieces,Tehran, Iran
2. Associate Professor of Pediatric Gastroenterology, Shahid Beheshti University of Medical Sciences,Tehran, Iran
3.Lecturer, Msc of Human Nutrition, Department of Human Nutrition, Faculty of Nutrition Sciences and Food Technology, Shahid Beheshti University of Medical sciences, Tehran, Iran

Corresponding Author:
BEHESHTI Maryam MSc
Mofid Children Hospital, Tehran, Iran
Tel: +98 21 22907329
Email: meheshti@gmail.com

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Abstract

Objective

Malnutrition is commonly considered as an important risk factor that can produce a negative influence on the prognosis of patients with chronic neurological diseases. We aimed to evaluate the nutritional status of patients admitted to the neurology ward of Mofid children's hospital via subjective and objective methods.

Materials & Methods

61 children (2-6 years of age) who were consecutively hospitalized at the neurology ward between January and March 2008 underwent objective (weight, height, mid upper arm circumference– MUAC- and triceps skinfold thickness-TSF) and subjective nutritional assessment.

Results

The result showed that 42.6%, 37.7% and 25.9% of patients were consecutively wasted, underweight and stunted. The z- Scores for TSF and MUAC were below -1 in 32.7% and 41.8% of the patients, consecutively. According to subjective Assessments (SGNA), 52.7% were malnourished. The prevalence of malnutrition was not significantly different between sex or diagnosis groups

Conclusion

malnutrition is of high prevalence in patients with neurologic diseases. Regular assessment and timely nutritional support may improve the situation.

Keywords: Nutritional assessment, Anthropometric, subjective assessment, children, Neurologic diseases

Introduction

Malnutrition is commonly considered as an important risk factor that can produce a negative influence on the prognosis of patients with chronic neurological diseases (1). It decreases muscle strength and this may further impair motor function, moving ability and coordination, and reduce effectiveness of coughing thus predisposing to aspiration. Furthermore, inadequate nutrient intake may result in disturbances in immune functions and in infections. Malnutrition can also impair growth in many children with neurological diseases (2, 3). There are some main mechanisms responsible for a state of malnutrition in these patients: children with motor disability have feeding difficulties because of motor or cognitive dysfunction: dysphagia, swallowing deficits, vomiting, gastroesofageal reflux, aspiration and constipation. Furthermore, chronic use of anticonvulsants is prevalent, which may affect food intake and energy metabolism and their energy

requirement may be changed as their disabilities would impede normal daily activities (1, 2, 4-7). Because of motor impairment, children may have difficulties in self feeding and communication problems may cause difficulties in expressing needs. Prolonged feeding time can be stressful for both the caretaker and the child (2, 7). So It is not unlikely that the prevalence of malnutrition in this group of patients is high. Dahl et al. found an altered nutritional status in 52 % of the children with moderate or severe cerebral palsy: 43% were underweight and 9% were overweight compared to reference values of healthy children. Undernourished disabled children had a significantly lower height for age, weight for height, triceps skinfold thickness and upper-arm circumference than healthy children (8). Bertoli et al. also showed that 40% of the children with refractory epilepsy treated at a Child Neuropsychiatry Department in Italy were malnourished and 24% were wasted (6). Many of these children would benefit from nutritional assessment and management as part of their overall care (7). The aim of our study was to evaluate the nutritional status of patients admitted to the neurology ward of Mofid children's hospital via subjective and objective methods.

Materials & Methods

Sixty one children (2-6 years of age) were included in the study. All subjects were hospitalized consecutively at the neurology ward of Mofid Children's Hospital between January and March 2008. The exclusion criteria were as follows: length of stay <3 days, conditions that involved large variations in hydration (severe hepatopathy, nephrophathy or cardiac insufficiency), therapeutic hypocaloric diets e.g. ketogenic diet, re-hospitalization during study and admission to the emergency or intensive care unit. Mofid Children's Hospital, located in Tehran, is an academic specialty and subspecialty center and serves as a secondary and tertiary care for pediatric patients from all over the country. The study was approved by the Ethics Committee of Shahid Beheshti University of Medical Sciences and National Nutrition and Food Technology Research Institute. All of the subjects were made aware of the content of the study, and a written informed consent was obtained from the responsible caregivers of the children. All subjects underwent anthropometric and subjective assessments during their first 24 hours of hospital stay. General data about each subject was gathered by observing patient's file.

Anthropometric assessment

Body weight was measured barefoot with light clothing to the nearest 0.1 Kg with a Seca digital scale. Their height was measured to the nearest 0.1 cm on a stadiometer. Mid Upper arm circumference (MUAC) was also measured halfway between the acromion process of the scapula and the tip of elbow to the nearest 1 mm, and the skinfold thickness was measured over triceps with a caliper to the nearest 0.5 mm (9). To determine nutritional status, weight for height, weight for age and height for age Z- scores was calculated using NUTSTAT anthropometric software package (Epi Info, version 3.5.1; Centers for Disease Control and Prevention) (10). Z- scores for MUAC and TSF were calculated using Frisancho 1990 Data (11). Body weights of the dehydrated patients were measured after complete rehydration. To determine the baseline nutritional status, we used weight for height and malnutrition was classified according to this parameter using WHO criteria: malnutrition was severe if Z- scores were less than -3SD, moderate from -2 to -3 SD and mild from -1 to -2 SD (12).

Subjective Global Nutritional Assessment

To gather subjective data, Subjective Global Nutritional Assessment (SGNA) tool was used. The tool consists of a questionnaire and nutrition-related physical examination, looking at specific sites on the body for signs of fat and muscle wasting as well as edema. The questionnaire consists of questions about child's recent and current height and weight history as well as parental heights, dietary intake, rating of appetite and recent changes; feeding or eating problems, diet restrictions, frequency and duration of gastrointestinal symptoms (loss of appetite, vomiting, diarrhea, constipation, stomach pain and nausea), and current functional capacity and recent changes (alertness, ability to run and play games or sports with friends, and length of sleep). Finally, the presence or absence of the specified features in the past, metabolic

demands of the underlying condition, and physical signs associated with malnutrition are considered to come to a global assessment of the patient's nutritional status, assigning a global rating of well-nourished, moderately malnourished, or severely malnourished. In this kind of assessment, a rigid scoring system based on specific criteria is not used (13).

Statistical analyses

Statistical analyses were performed with SPSS version 17 software. Descriptive statistics was employed to determine the prevalence of malnutrition according to weight for age, weight for height, height for age and SGNA. To test the probable difference in malnutrition distribution between sex and diagnosis groups, Pearson Chi- Square was used. P less than 0.05 was considered as statistically significant.

Results

Patients' characteristics are shown in table 1. Thirty six (59%) patients were male. The median age was 38 months (range: 24- 69.5 months). The main cause of admission was epilepsy.

The result showed that 42.6%, 37.7% and 25.9% of the patients were consecutively wasted, underweight and stunted. According to weight for height, 25.9%, 7.4% and 9.3% of the patients had mild, moderate and severe malnutrition. Also, 21.3%, 9.8% and 6.6% of the patients were mildly, moderately and severely underweight. Stunting was mild, moderate and severe in 20.4%, 3.7% and 1.9% of the patients, respectively. The z- Scores for TSF and MUAC were below -1 in 32.7% and 41.8% of the patients, respectively. According to subjective Assessments (SGNA), 52.7% were malnourished: 41.8% of patients were moderately and 10.9% were severely malnourished.

The prevalence of malnutrition was not significantly different between sex or diagnosis groups (Table 2, 3).

Table 1. patient's characteristics and diagnoses

Sex: number (%)	Male	36 (59.0)
	Female	25 (41.0)
Diagnosis: number (%)	Epilepsy	40 (65.6)
	other Neurologic disorders	21 (34.4)
Age at admission (month): median (range)		38 (24- 69.5)
weight for height (Z- Score): mean (SE)		-0.78 (0.22)
weight for age (Z- Score): mean (SE)		-0.63 (0.18)
Height for age (Z- Score): mean (SE)		-0.18 (0.16)
TSF (Z- Score): mean (SE)		-0.19 (0.22)
MUAC (Z- Score): mean (SE)		-0.59 (0.15)

Table 2. The prevalence of malnutrition according to sex

	Male	Female	P (Chi² test)
Malnutrition according to weight for height			
Malnourished (%)	52.2	47.8	0.503
Not malnourished (%)	61.3	38.7	
Malnutrition according to weight for age			
Malnourished (%)	69.6	30.4	0.192
Not malnourished (%)	52.6	47.4	
Malnutrition according to height for age			
Malnourished (%)	64.3	35.7	0.545
Not malnourished (%)	55.0	45.0	
Malnutrition according to SGNA			
Malnourished (%)	69.0	31.0	0.08
Not malnourished (%)	46.2	53.8	

Table 3. The prevalence of malnutrition according to diagnosis

	Epilepsy	Other Neurologic Disorders	P (Chi² test)
Malnutrition according to weight for height			
Malnourished (%)	65.2	34.8	0.957
Not malnourished (%)	64.5	35.5	
Malnutrition according to weight for age			
Malnourished (%)	65.2	34.8	0.964
Not malnourished (%)	65.8	34.2	
Malnutrition according to height for age			
Malnourished (%)	64.3	35.7	0.962
Not malnourished (%)	65.0	35.0	
Malnutrition according to SGNA			
Malnourished (%)	62.1	37.9	0.234
Not malnourished (%)	76.9	23.1	

Discussion

The aim of our study was to evaluate the nutritional status of patients admitted to the neurology ward of Mofid children's hospital via subjective and objective methods. The result showed that 42.6%, 37.7% and 25.9% of the patients were wasted, underweight and stunted, respectively. These results are comparable to Bertoli's. In that study, which was carried out on 17 children with refractory epilepsy treated at a Child Neuropsychiatry Department in Italy, 40% of the children were malnourished (Cut-off point: 80% of the weight for age value) and 24% were wasted (% ideal body weight for height < 90% compared with reference values), but in contrast to our study, no child was stunted (% body < 80%) (6). In another study done by Dahl et al., it was demonstrated that 43% of the children with moderate or severe cerebral palsy where underweight. Kilpinen-Loisa et al. also showed that among 54 patients with motor disability, 28% were moderately or severely stunted (2). In a database consolidating result from 13 epidemiologic studies on epilepsy in sub-Saharan Africa, Quet found a prevalence of 25.4% for malnutrition in people with epilepsy (14).

It is suggested that even under seemingly ''good'' conditions (appropriate environment and regular medical attention), children with CP grow more slowly than children without chronic health conditions and the differences in growth increase with increasing age. When no specific growth chart is available for motor disabled children, skinfold thickness can be of more help (15). The TSF and MUAC measurements were below the z-score of -1 in 32.7% and 41.8% of our patients respectively which confirms the high prevalence of malnutrition detected by weight and height related criteria. In Bertoli's study, mean values of arm circumference (19.52 ± 4.08) and subscapular thickness (6.74 ± 2.76) were found to be 6% and 4% lower than the reference values for sex and age, respectively. On the contrary, mean values of triceps thickness (9.63 ± 6.46) were 20% higher than reference values for sex and age (8.04 ± 1.99) which could be related to the modified fat mass distribution in the form of a prevailing increase of fat mass in the limbs of that group of patients which was discovered when evaluating body composition by dual-energy X-ray absorptiometry (6).

In our study, wasting was more prevalent than being underweight. This shows the acute nature of malnutrition in this group of patients. The more number of patients with MUAC below the -1 Z- score, compared to TSF, confirms this finding. A low MUAC is related to deficient protein reserves and acute malnutrition, while a low TSF is related to deficient fat reserves and a chronic situation (9).

The prevalence of malnutrition according to SGNA was higher than those detected by anthropometric parameters. This can be attributed to this fact that subjective assessments make it possible to identify patients at risk of developing malnutrition before changes in anthropometric and laboratory measurements occur (16).

The high prevalence of malnutrition found in patients with neurologic disorders can be assigned to different factors. It is even suggested that malnutrition may contribute to the high prevalence of epilepsy in developing countries. There are several hypotheses about the possible mechanisms involved such as the reduction of the seizure threshold or an immunological vulnerability. Biochemical variations due to malnutrition such as electrolyte abnormalities and hypoglycemia could affect seizure threshold. Decreased availability of inhibitory amino acid neurotransmitters in the brain combined with a low dietary intake of amino acids or precursors and hippocampal damage associated with a low protein diet are also suspected. Studies show that malnutrition reduces resistance to infection; this can make malnourished people more vulnerable to a range of infections including neurotropic infections that cause epilepsy and which are prevalent in developing countries (14). On the other hand, neurologic disorders can also contribute to malnutrition: several authors have shown that feeding difficulties and malnutrition are common in disabled children: intake may be reduced because of anorexia, chewing and swallowing difficulties, or vomiting. Moreover, most of the commonly used anticonvulsants influence nutritional status. In particular, some drugs affect the regulation of energy balance and appetite with consequent loss

(topiramate) or gain (carbamazepina, valproate) of body weight (1, 2, 4-7). Some studies have shown that energy intake in children with motor disability can vary from normal to less than 75% of RDA: Kilpinen-Loisa showed that the median energy intake was 76% of the recommendation and <80% in 57% of the 54 children with motor disability and children with a low energy intake were shorter and lighter and had more severe motor disability than children with a sufficient energy intake (2). On the contrary, Bertoli et al. found that energy intake per body weight was higher in more malnourished patients. An explanation was the higher resting energy expenditure per body weight (REE/BW) in those more malnourished children and REE/BW index was linked to the degree of neurological impairment. Among the children in that study, those with the worst neurological condition were hypercatabolic (6).

in order to confirm malnutrition as a risk factor for epilepsy and other neurologic disorders or vice versa , more studies especially in the cohort design are needed to test one direction of the hypothesis (malnutrition as the exposure factor or epilepsy as the exposure factor) (14). Since there are no official nutritional guidelines for these children, feeding problems should be individually assessed with the help of a dietician. Diet therapy in these conditions involves specific instructions for properly choosing, handling and eating food, in order to allow patients to preserve their autonomy and safety while eating, thus preventing malnutrition (4). The efficacy of enteral feeding in complete nutritional restoration of patients with chronic neurologic diseases has also been demonstrated before (1).

In conclusion, we showed that malnutrition was highly prevalent in patients admitted to the neurology ward. Considering malnutrition as an important risk factor that can produce a negative influence on the prognosis of patients with chronic neurological diseases, every effort must be done to improve this condition. This can be done by regular assessment of nutritional status and providing nutritional support more often and earlier to help provide sufficient energy and nutrients.

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