

Nutritional status of pediatric patients submitted to ostomy procedures

Estado nutricional de pacientes pediátricos ostomizados

Estado nutricional de niños portadores de ostomía

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ABSTRACT

Objective: To assess the nutritional status of children submitted to ostomy for intestinal discharge.

Methods: A descriptive case series was carried out including 30 children aged up to ten years old submitted to colostomy or ileostomy at the pediatric surgery unit of Institute of Medicine Professor Fernando Figueira, Recife, Pernambuco. Socioeconomic, clinical, anthropometric, and laboratorial (hemoglobin and hematocrit) data were collected using a structured questionnaire. Nutritional status was determined based on anthropometric indicators (height/age, weight/age, and body mass index/age), which were stratified by gender, with World Health Organization standards as reference. Arm circumference and triceps skinfold were measured for the evaluation of body composition. Chest and head perimeters were measured on children aged up to five years-old. The Student's *t*-test was applied to compare two independent groups, considering $p < 0.05$ as significant.

Results: All anthropometric indicators revealed nutritional deficit, especially in the height/age index, which revealed a frequency of 24.1% of short stature. Patients submitted to ileostomy presented lower mean Z score of anthropometric indicators, hemoglobin, hematocrit and ostomy time in comparison to those submitted to colostomy, with significant differences only for the Z score of body mass index/age ($p=0.016$), hemoglobin ($p=0.025$), and hematocrit ($p=0.023$).

Conclusions: There is a substantial frequency of nutritional deficit in the analyzed sample, especially based on the height/age index. Although ileostomized patients had less time of ostomy, they had higher nutritional deficit compared to the colostomized ones, likely due to greater risk of postoperative complications, with consequent nutritional impairment.

Key-words: ostomy; nutritional status; child.

RESUMO

Objetivo: Avaliar o estado nutricional de crianças portadoras de ostomia de eliminação intestinal.

Métodos: Realizou-se um estudo descritivo, tipo série de casos, com amostra composta por 30 crianças menores de dez anos, portadoras de colostomia ou ileostomia, admitidas na clínica cirúrgica pediátrica do Instituto de Medicina Integral Professor Fernando Figueira, no Recife, em Pernambuco. Foi utilizado um questionário estruturado para coletar dados socioeconômicos, clínicos, antropométricos e laboratoriais (hemoglobina e hematócrito). O diagnóstico nutricional foi realizado a partir dos indicadores antropométricos (altura/idade, peso/idade e índice de massa corpórea/idade), tomando-se como base o padrão de referência da Organização Mundial da Saúde. Também foram aferidas a circunferência do braço e a prega cutânea tricípital para avaliar a composição corporal, bem como os perímetros torácico e cefálico em crianças menores de cinco anos.

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Utilizou-se o teste *t* de Student para comparar dois grupos independentes, sendo significativa $p < 0,05$.

Resultados: Encontrou-se comprometimento nutricional importante de acordo com os indicadores antropométricos estudados, destacando-se o déficit estatural (24,1%). Os pacientes ileostomizados apresentaram menores médias de escore Z dos indicadores antropométricos, hemoglobina, hematócrito e tempo de ostomia quando comparados aos colostomizados, com diferenças significativas apenas para o escore Z de índice de massa corpórea/idade ($p=0,016$), hemoglobina ($p=0,025$) e hematócrito ($p=0,023$).

Conclusões: Os dados apontam para frequência elevada de déficit nutricional, sobretudo baixa estatura na amostra avaliada. Apesar de os pacientes ileostomizados possuírem menor tempo de confecção da ostomia, apresentaram maior déficit nutricional quando comparados aos colostomizados, provavelmente pelo maior risco de complicações pós-operatórias a que estão expostos, com consequente comprometimento nutricional.

Palavras-chave: ostomia; estado nutricional; criança.

RESUMEN

Objetivo: Evaluar el estado nutricional de niños portadores de ostomía de eliminación intestinal.

Métodos: Se realizó un estudio descriptivo, tipo serie de casos, con muestra compuesta por 30 niños con menos de diez años, portadores de colostomía o ileostomía, admitidas en la clínica quirúrgica pediátrica del Instituto de Medicina Integral Profesor Fernando Figueira, en Recife, Pernambuco. Se utilizó un cuestionario estructurado para recoger datos socioeconómicos, clínicos, antropométricos y laboratoriales (hemoglobina y hematócrito). El diagnóstico nutricional se realizó a partir de los indicadores antropométricos (altura/edad, peso/edad e índice de masa corporal/edad), teniendo por base el estándar de referencia de la Organización Mundial de la Salud. También se verificaron la circunferencia del brazo y el pliegue cutáneo tricípital para evaluar la composición corporal, así como los perímetros torácico y cefálico en niños con menos de cinco años. Se utilizó la prueba *t* de Student para comparar dos grupos independientes, siendo significativa $p < 0,05$.

Resultados: Se encontró comprometimiento nutricional importante conforme a los indicadores antropométricos estudiados, con destaque para el déficit estatural (24,1%). Se verificó que los pacientes ileostomizados (23,3%) presentaron menores promedios de escore Z de los indicadores antropométricos,

hemoglobina, hematócrito y tiempo de ostomía cuando comparados a los colostomizados (76,7%), con diferencias significativas solamente para el escore Z de índice de masa corporal/edad ($p=0,016$), hemoglobina ($p=0,025$) y hematócrito ($p=0,023$).

Conclusiones: Los datos señalan para la frecuencia elevada de déficit nutricional, sobre todo baja estatura en la muestra evaluada. A pesar de que los pacientes ileostomizados poseen menor tiempo de confección de la ostomía, presentan mayor déficit nutricional cuando comparados a los colostomizados, probablemente por el mayor riesgo de complicaciones postoperatorias a que están expuestos, con consiguiente comprometimiento nutricional.

Palabras clave: ostomía; estado nutricional; niño.

Introduction

Simões⁽¹⁾ defined the term stoma or ostomy as any surgical opening which connects a portion of the body cavity to the outside environment. Two kinds of ostomies are described for bowel elimination: ileostomy, that consists on the union of a portion of the ileum to the abdominal wall; and colostomy, that consists on pulling a section of the colon through an opening in the abdominal wall, both with the purpose of allowing the removal of feces and gases⁽²⁾. Stomas, in Pediatrics, are primarily temporary, and the reconstruction of the gastrointestinal tract depends on the underlying disease and surgical interventions needed⁽³⁾.

It is estimated that in Brazil there are between 80,000 to 100,000 people with urinary and intestinal ostomy. According to the Brazilian Unified Health System Database (DATASUS), R\$ 153,749,490.36 were spent between 2002 and 2008 in procedures of ostomy surgery⁽⁴⁾. Although commonly performed, the production of an ostomy is potentially accompanied by complications, which in most cases are underestimated. Studies show rates of complications related to stomata ranging from 21 to 60%⁽⁵⁾.

Major complications related to stomata include: inadequate adaptation of the board ostomy due to poor location of the stoma on the abdominal wall, peristomal dermatitis, ischemic necrosis, retraction, prolapse, stenosis, peristomal fistula, peristomal hernia, and peristomal abscess. Systemic manifestations that may occur include: hydroelectric disorders in high output stomas, besides anemia, in cases of bleeding of stomal varices⁽⁶⁾.

Some of these complications, both early and late, can influence directly or indirectly, the nutritional status of patients. The ileostomate patient requires intensive care due to the

risk of various complications. Generally, 40% of patients who undergo an ileostomy have one or more complications such as peristomal skin irritation, diarrhea, stoma stenosis, urinary calculus and hemorrhage⁽⁷⁾.

Patients undergoing gastrointestinal surgery, which results in the formation of stoma, present particularly additional risk of developing malnutrition as a result of the effects of the underlying disease, prolonged fasting during pre-and postoperative periods, besides complications resulting from the surgical procedure⁽⁷⁻⁹⁾. However, there is little data in the literature regarding the nutritional status of ostomates in the pediatric population. Therefore, this study aimed to investigate the nutritional status of pediatric ostomates assisted at the pediatric surgery unit within Professor Fernando Figueira Institute of Medicine [Instituto de Medicina Integral Professor Fernando Figueira (IMIP)].

Method

This is a case series study performed with children with ostomy for bowel elimination, admitted at the pediatric surgery unit of IMIP, in Recife, Pernambuco, during 10 consecutive months between 2010 and 2011.

The study included patients with ostomy for bowel elimination for at least 30 days, under the age of 10 years, admitted to the service for treatment of complications, tests, reconstruction of bowel tract, or other surgeries during the study period, comprising a total sample of 30 patients. Exclusion criteria were: conditions that impaired anthropometric measurements (edema, anasarca, limb amputation, and intensive care), besides neurological diseases, genetic syndromes, or metabolic diseases. However, during the study period there were no patients in these conditions.

For data collection a structured questionnaire was used containing identification, socioeconomic, and clinical data, applied next to the parent or guardian of the minor. This information was supplemented with data obtained in the patient's medical records. To characterize the socioeconomic situation, the following facts were collected: data on the caregiver (age, education, and occupation), per capita income (Brazilian currency), and the number of residents in the household. The aspects relating to housing conditions were the number of rooms, garbage disposal, sewage type, type of construction, and water supply conditions.

On clinical examination, data on sex and age was obtained on admission, and it was categorized into three age groups (0–1, 1–5 and 5–10 years), as well as data relating

to clinical conditions, such as type of ostomy (ileostomy and colostomy), time of stoma-forming surgery, indication, diseases, and associated complications. It was considered as immediate postoperative the period of 30 days elapsed after the procedure, and late, the period exceeding 30 days.

For the anthropometric assessment, measures of weight, height, arm circumference (AC), triceps skinfold thickness (TSF), head circumference (HC) and thoracic perimeter (TP) were used, whose measurements were performed within 72 hours after admission. For those under 2 years old, weight was obtained by an electronic scale (Welmy[®], 109-E, São Paulo-SP, Brazil) with accuracy of 0.100kg and 15.0kg capacity; and height, horizontally, through an infantometer 120cm long and with 0.1cm precision. Children older than 2 years had their weight measured on a digital scale (Welmy[®], W-300A, São Paulo-SP, Brazil) with a precision of 0.500kg and capacity of up to 200kg; height was measured using an anthropometer coupled to the scale.

The nutritional assessment was performed using anthropometric indicators height/age (H/A), weight/age (W/A) and body mass index/age (BMI/A) according to sex, taking as a basis the standard reference of the World Health Organization (WHO)⁽¹⁰⁾ and using the WHO AnthroPlus^{®(11)} program, version 3.2.2. The results were expressed as Z scores, considering that: children below 2 standard deviations presented nutritional deficits, above 1 standard deviation for the indicator of BMI/age, overweight/obesity, and above 2 standard deviations for weight/age, presented high weight for age.

The measures of HC and TP were also collected in children under 5 years, both obtained by inextensible tape measure (with proximity of 0.1cm), taking into account the largest occipitofrontal diameter and the level of xiphoid appendix on expiration, respectively. From the values of HC and TP, the indicator TP/HC was built, calculated from the division of TP by the HC, being indicative of protein-energy malnutrition the relation of TP/HC <1.0.

In body composition assessment, to measure AC an inextensible tape measure was used and, for the TSF, a Lange[®] scientific skinfold caliper with 10gr/mm² constant pressure (Beta Technology Incorporated, Cambridge - MD). Measurements were taken at the midpoint between the olecranon and the acromion in non-dominant arm. The body composition measurements were performed in children older than 1 year, totaling 19 patients. Values below the 5th percentile were considered as indicators of risk of diseases and disorders associated with malnutrition,

and values above the 95th percentile were associated to risk of diseases related to overweight, using the reference values of Frisancho⁽¹²⁾.

Aliquots from peripheral blood for hemoglobin and hematocrit were collected, whose analysis was performed with an automatic counter (Sysmex SF - 3000, Roche Diagnostics). The cutoffs indicative of inadequate levels of hemoglobin and hematocrit were defined according to age: hemoglobin – <1 year, <10.0g/dL; 1 to 5 years, <11.0g/dL, and > 6 years, with 11.5g/dL; hematocrit – <2 years, <31.0g/dL; 2 to 5 years – <34.0g/dL, and > 6 years, with <36.0g/dL.

Data were entered in Excel for Windows®. Analyses were performed in the Statistical Package for the Social Sciences (SPSS) program, version 13.0. Continuous variables were tested for normality using the Kolmogorov-Smirnov, and the study had normal distribution. Student *t* test was used to compare two independent groups. We adopted a significance level of 5%.

The Research Bioethics Committee within IMIP approved this study under the number 1,857, and the procedures were in accordance with the ethical standards of the responsible committee on human experiments.

Results

The present study analyzed 30 children under 10 years old, 15 boys and 15 girls with a mean age of 20.8±17.1 months, most of them aged from 1 to 5 years (60.0%). Table 1 presents the socioeconomic characteristics of the sample. We observed low income (88.9% of patients with

Table 1 - Socioeconomic characteristics of pediatric ostomates assisted in a reference hospital in Pernambuco, 2010/2011

Variable	n	%
Per capita income (MW)*		
≤1/2	24	88.9
1/2–1	03	11.1
Maternal education (years)**		
≤8	15	50.0
>8	15	50.0
Maternal age (years)**		
<20	6	20.0
≥20	24	80.0
Marital status***		
Stable Union	22	75.9
Single	05	17.2
Other	02	6.9

MW: minimum wage; *n=27; **n=30; ***n=29

per capita income equal to or less than half the minimum wage). Most parents were over 20 years of age (80.0%), had more than 8 years of education (50.0%) and a stable relationship with a partner (75.9%). The sample had good housing conditions: 96.7% were masonry homes, 58.6% with coated floor, 66.7% with piped water, 73.3% with garbage collection and 90.0% with public electricity.

Most patients had ostomy for bowel elimination for 12 months or more (46.4%), and colostomy was the most frequent type (76.7%). Regarding the indication of this procedure, it was found that the diagnosis of anorectal abnormality (53.2%) was the most frequent, followed by congenital megacolon (13.3%), being also cited: acute abdomen (3.3%), Fournier gangrene (3.3%), necrotizing enterocolitis (10.0%), intussusception (6.7%), bowel perforation (3.3%), meconium peritonitis (3.3%), and pneumatosis intestinalis (3.3%), as it can be observed in Table 2.

Table 2 - Clinical variables of pediatric ostomates assisted in a reference hospital in Pernambuco, 2010/2011

Variable	n	%
Type of ostomy*		
Ileostomy	7	23.3
Colostomy	23	76.7
Time of ostomy (months)**		
<6	5	17.9
6–12	10	35.0
≥12	13	46.4
Indication for ostomy*		
Anorectal anomaly	16	53.0
Congenital Megacolon	4	13.3
Other	10	33.7

*n=30; **data refer to 28 patients, as it was not possible to obtain the date of stoma-forming surgery in 2 patients

Table 3 - Nutritional status of ostomate patients in a reference hospital in Pernambuco, 2010/2011

Indicator	n	%
Height/age		
Stunting	7	24.1
Proper height	22	75.9
Weight/age		
Low weight	6	20.0
Proper weight	24	80.0
BMI/age		
Low weight	2	6.9
Eutrophy	22	75.9
Overweight/obesity	5	17.2

BMI: body mass index

Among the patients, 80% reported some type of clinical complication in the immediate postoperative period or later. In the immediate postoperative period, the most frequent complications were: diarrhea (53.3%), weight loss (50%), and bleeding at the site of the ostomy (23.3%). In the later period, besides diarrhea (30%) it was also observed ostomy prolapse (20%) and hernia (20%). The current reason for hospitalization in 70% of children was performing surgery to rebuild the intestinal transit.

In nutritional assessment there were high frequencies of nutritional deficits: 24.1% had short stature by the indicator H/A, 20.0% were underweight for W/A, and 6.9% were underweight by BMI/A. However, the percentage of overweight/obese children was 2.5 times higher than those with low weight (17.2 versus 6.9%, respectively), as shown in Table 3. For measures of body composition, among 19 patients whose circumference measurements and folds were evaluated, 100% showed normal weight, both in relation to fat and muscle reserves. Through the measures of HC and TP, the indicator TP/HC was built, which is an additional parameter for nutritional assessment of patients under 5 years. According to analyses of this indicator, it was found that 85.7% (24) of these children were eutrophic.

Analyzing the frequency of malnutrition, according to time after the stoma-forming surgery (<6 months, 6–12 months, ≥12 months) it was found, respectively, 20, 30, and 23.1% of small stature, whereas low weight, measured by indicator BMI/A, was present in only 20% of patients with ostomy time of 6–12 months.

According to the biochemical tests, more than half of the sample (59.3%) had anemia, according to

hemoglobin levels (mean of 10.4 ± 0.9 g/dL). However, with regard to the values of hematocrit, 40.7% of patients showed inadequate levels (mean 32.3 ± 2.7 %). It is noteworthy that 29.9% of patients reported making use of mineral supplements (ferrous sulfate), and 23.2% of multivitamin for at least 3 months before admission to the hospital.

When the clinical and laboratory variables between patients with ileostomy and colostomy were analyzed, it was found that ileostomates showed lower averages compared to colostomates. However, differences were statistically significant only for the BMI/A z score ($p=0.016$), hemoglobin ($p=0.025$), and hematocrit ($p=0.023$), as shown in Table 4. Regarding time of ostomy, colostomate children had an average approximately 2.5 times greater than ileostomates, $p=0.040$ (Table 4).

Discussion

The analysis of data revealed a higher frequency of colostomate (76.7%) than ileostomate (23.3%) patients. This finding is similar to that found in the study by Santos *et al*⁽⁶⁾, made with ostomates from the center of medical specialties of Campo Grande (centro de especialidades médicas de Campo Grande), state of Mato Grosso, where colostomates comprised 85.4% of the analyzed group. Also regarding the characterization of intestinal stoma, Light *et al*⁽¹³⁾, while studying patients undergoing intestinal stoma in a public hospital in the state of Piauí, found that 15.8% had ileostomies, and 84.2%, colostomies.

Table 4 - Mean and standard deviation of clinical variables among patients with ileostomy and colostomy assisted at a reference hospital in Pernambuco, 2010/2011

Variable	Ileostomy	Colostomy	p-value*
	Mean±SD n=7	Mean±SD n=23	
W/A Z score	-2.40±2.56	-0.58±1.19	0.112
H/A Z score	-2.31±2.58	-1.66±2.10	0.214
BMI/A Z score	-1.66±2.10	-0.07±1.17	0.016*
TSF (mm)	7.50±2.12	8.82±2.16	0.418
AMC (mm)	12.24±1.23	12.58±1.67	0.784
Hemoglobin (g/dL)	9.68±0.59	10.61±0.89	0.025*
Hematocrit (%)	30.11±2.42	32.95±2.54	0.023*
Time of ostomy (months)	6.43±3.55	17.10±12.72	0.040*

*Student's *t* test; TSF: triceps skinfold thickness; AMC: arms muscle circumference; SD: standard deviation; W/A: weight/age; H/A: height/age; BMI/A: body mass index/age

The main indications found to perform ostomy were congenital anomalies such as anorectal malformations (53.2%), followed by congenital megacolon (13.3%). Sanchez *et al*⁽¹⁴⁾, in a study with surgical patients, showed nearly half of the sample with a diagnosis of congenital megacolon (48.3%) as a motivator of ostomy surgery. Carvalho *et al*⁽¹⁵⁾ reported that among the numerous indications of ostomy, congenital anomalies are the most frequent causes in Pediatrics. Birth defects comprise the disruption of normal anatomical architecture of one or more organs, and some may be fully or partially corrected by surgical interventions⁽¹⁵⁾.

Most patients analyzed in the present study had some type of complication (80%) in the postoperative of the stoma-forming surgery. This percentage was higher than that shown by Santos *et al*⁽⁶⁾, which reported that 57.9% of patients had complications related to the stoma. However, in the literature there are frequencies that range from 16 to 90%^(5,16,17). In the present study it was observed that, in the immediate postoperative period, the most frequent complication was diarrhea, followed by weight loss and bleeding at the site of the ostomy. In the late period, besides diarrhea ostomy prolapse and hernia were also observed. There are few studies characterizing complications in pediatric ostomates; however, the literature mentions as most common in adult patients the presence of peristomal dermatitis (28.7%) and hernia (10.7%)⁽¹⁷⁾.

It is important that more studies be developed with pediatric patients about these possible complications, since many of them, both immediate and late, can influence directly or indirectly the nutritional status of patients⁽⁷⁾. Among these complications, it is known that diarrhea, so evidenced in this study, can lead to dehydration and electrolyte loss, generating nutrition and systemic repercussions.

There are few reports of nutritional status in hospitalized children, especially those suffering from ostomy for bowel elimination. In this study, we found important nutritional impairment, with a higher frequency than that of the WHO reference values, according to the anthropometric indicators studied. According to data from the WHO, only 2.3% of a population has parameters below -2 on the Z score⁽¹⁸⁾. Frequency of nutritional deficits of 24.1, 20.0 and 6.9% were observed, according to analysis of anthropometric indicators H/A, W/A and BMI/A, respectively. Silveira *et al*⁽¹⁹⁾, when evaluating pediatric patients admitted to Hospital das Clínicas de Porto Alegre, in the state of Rio Grande do Sul, obtained a frequency of deficit for the indicator H/A similar to that described previously

(21 versus 24.1%), however, they found a frequency twice as high for the BMI/A indicator (14.7 versus 6.9%). Similar results were also obtained in a study of children admitted to a hospital in Fortaleza, in the state of Ceará, where the prevalence of Z score of less than -2 standard deviations was 18.2, 18.7 and 6.9% for indicators H/A, W/A and W/H, respectively⁽²⁰⁾. According to Joosten and Hulst⁽²¹⁾, studies with the indicator W/H or equivalent found a prevalence of acute malnutrition in the last 10 years in hospitalized children in Germany, France, the UK, and the U.S. between 6.1 and 14%, while in Turkey up to 32% of patients had malnutrition.

Recently, the prevalence of acute malnutrition has decreased, however, that of chronic malnutrition (reflected by the indicator H/A) remains high. According to the III State Health and Nutrition Survey [Pesquisa Estadual de Saúde e Nutrição (PESN III)]⁽²²⁾, held in 2006 with children under 5 years old in the state of Pernambuco, the prevalence of stunting was 7.7%, well below the value found in this study. However, Sigulem *et al*⁽²³⁾ found a similar result to that here described, with 25% of patients presenting impaired linear growth. In a study involving 749 children and adolescents hospitalized in the pediatric surgery at Hospital São Paulo, there was a percentage of 19% for short stature or risk for short stature⁽²⁴⁾.

Currently, according to the Brazilian population-based survey (Household Budget Survey - POF 2008/2009), conducted by the Brazilian Institute of Geography and Statistics (IBGE)⁽²⁵⁾, Brazil coexists with rates of 4.1% of weight involvement and 6.8% of stunting in children aged 5 to 9 years.

Panato *et al*⁽²⁶⁾, who studied children under 5 admitted to a hospital in Maringá, in the state of Paraná, observed a frequency of anemia according to hemoglobin levels of 70.0%, higher than that found in this study (59.3%). It is known that high concentrations of hemoglobin are associated with reduced length of hospital stay and costs⁽²⁷⁾. Furthermore, there is some evidence that anemia is associated with weight loss in hospitalized patients⁽²⁸⁾.

In this study, it was found that although ileostomate patients had a lower time of stoma-forming surgery, they showed lower averages for the anthropometric and biochemical variables, which demonstrate higher nutritional deficit when compared to colostomates, who had time of ostomy approximately 2.5 times higher ($p=0.040$). According to Brunner and Suddart⁽⁷⁾, the ileostomate patient requires intense care because of

the risk of complications. In 40% of patients who undergo an ileostomy, there are usually one or more complications.

In surgical patients comprehensive care should begin at admission, through nutritional assessment, identifying malnourished patients and at nutritional risk, and, thus, optimizing the results of therapy and dietary behaviors during admission and discharge⁽²⁹⁾. Furthermore, the screening and monitoring of the nutritional status of individuals with a stoma should be a continuous process,

beginning preoperatively and continuing after discharge due to potential repercussions, such as the presence of postoperative complications, modifications in diet, and changes in nutrient absorption.

Therefore, more studies are required on the nutritional assessment of patients with bowel elimination ostomy, so that appropriate diet therapies are established, minimizing possible complications related to nutritional deficiencies.

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