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Hospital Malnutrition in Pediatric Surgery at dr. Cipto Mangunkusumo General Hospital 2015 and Its Associated Factors

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Abstract

Introduction. Hospital malnutrition is known to increase the length of stays, mortality, and morbidity, however, the factors associated with the development of hospital malnutrition, especially in pediatric surgery patient population, has not been recognized.
Method. This study was done to evaluate the occurrence of hospital malnutrition in pediatric surgery population and to identify the factors associated with hospital malnutrition. Primary data was gathered from pediatric surgery patients hospitalized in the pediatric surgery ward of Dr. Cipto Mangunkusumo General Hospital within July–December 2015. Data on age, diagnosis, nutrition status at admission, whether any procedure was done during a hospital stay, fasting duration, duration of surgery, length of stays and classification of surgical procedure done were collected. Univariate and multivariate analysis was done to identify the association between these variables and hospital malnutrition.
Results. Out of 198 patients admitted in the pediatric surgery ward, 50 subjects were enrolled. The occurrence of hospital malnutrition among these subjects was 40%. Among the categorical variables (age, diagnosis, nutrition status at admission, whether any procedure was done during a hospital stay, classification of surgical procedure) only the classification of surgical procedure was found to be significantly associated with hospital malnutrition ($p = 0.013$). Meanwhile, among the numerical variables (fasting duration, duration of surgery, length of stays) only postoperative length of stays was correlated with hospital malnutrition ($p = 0.009$).
Conclusion. It can be inferred that the burden of surgery is associated with hospital malnutrition, and in turn, hospital–malnutrition is associated with increased postoperative length of stays.

Keywords: *Hospital malnutrition, incidence, classification of surgical procedures, length of stays*

Introduction

Hospital malnutrition is defined as weight loss during hospitalization.[1] Hospital malnutrition is a problem that has long been recognized, the incidence of hospital malnutrition are still high, ranging from 20% to 50% in several countries.[2-4] Hospital malnutrition is known to prolonged hospital stays, increased risk of morbidity and mortality.[5-11] The impact of hospital malnutrition has been extensively studied, yet factors related to the occurrence of hospital malnutrition remains not well–defined.

The incidence of hospital malnutrition in a pediatric surgical ward in dr. Cipto Mangunkusumo General Hospital (CMGH) was first investigated in 2007. At that time hospital malnutrition was found in 52% of patients. The pediatric nutritional care team was established in 2009 and since 2012, malnutrition risk screening using "STRONGkids" instrument was routinely performed. After the implementation of these programs, hospital malnutrition in a pediatric surgical ward in CMGH has not been evaluated.

Hospital malnutrition can be prevented with nutritional care on the right population, therefore, identification of factors related to hospital malnutrition need to be studied. This research was conducted to re-identify the factors related to hospital malnutrition. Factors to be investigated were compiled based on previous literature search, including age, gender, type of diagnosis (whether the patient had gastrointestinal problems or not), initial nutrition status, type of inpatient care (whether the patient proceed to surgery or not), fasting duration, duration of surgery, length of stays, and classification of surgery.

Method

This study is across-sectional one aimed to investigate the incidence of hospital malnutrition in pediatric surgery population, also to investigate factors related to hospital malnutrition. From all patients admitted to surgical pediatric ward in CMGH between July to December 2015, 50 patients were enrolled in the study by convenience sampling. The patients' caretakers were informed and gave their consent to enroll their children in the study. Patients with a disease which will cause bias in their weight measurement such as edema because of nephrotic syndrome and patients with an illness that can cause a disturbance in nutritional status such as malignancy, congenital heart disease, burn, congenital metabolic disease, or HIV/AIDS were excluded.

Subjects' initial weight and height, initial nutritional status was measured. Subjects' weight was measured every day until they were discharged from the hospital. Data on age, gender, length of stays,

fasting duration, duration of surgery, and classification of surgery were collected from medical records. The subjects were categorized into two groups based on whether they had undergone surgery during a hospital stay. For subjects who had undergone surgery, additional data pertaining to surgery such as fasting duration (before and after the surgery), duration of surgery, and length of stays (before and after the surgery, and total). Subjects were also categorized into a gastrointestinal and non–gastrointestinal group based on the type of diagnosis. Further categorization based on classification of surgery was also done. All the subjects were successfully followed up until discharge.

The outcome of the study was hospital malnutrition, defined as a reduction of body weight during a hospital stay. The data were processed using SPSS 20.0 for windows. Descriptive analysis was done to see the distribution of hospital malnutrition, age, gender, diagnosis (Gastrointestinal [GI[or non–GI), initial nutritional status, types of inpatient care (surgery or non–surgery), fasting duration (before and after the surgery, total), duration of surgery, and type of surgery. The categorical data were presented in percentage, while the numerical data were presented in mean if the data distribution was normal, median if the data distribution was not normal.

Analysis of the association between hospital malnutrition and categorical variables was done using the nonparametric test. Numerical variables were analyzed using independent T-Test, with Mann Whitney test, is an alternative. If significant associations were found ($p < 0.05$), the analysis was continued to multivariate analysis.

Results

Out of a total of 198 patients admitted in the pediatric surgical ward between July and December 2015, 50 patients were enrolled in the study by convenience sampling. Subjects' body weight was measured every day since admission until discharge. There were 44 subjects underwent surgery. Fasting duration, duration of surgery, length of stays, and classification of surgery were recorded. Changes in body weight during hospital stay were described in table 1. There's no significant difference between groups with weight gain, stable, and loss in patients who were hospitalized for more than 14 days.

Table 1. Changes in body weight during hospital stays

Length of stays	Weight Gain	Stable	Weight loss	Significant weight loss*
≤1 week	4 (28.6)	7 (50)	3 (21.4)	Not available*
8–14 days	4 (16.7)	9 (37,5)	11 (45.8)	9 (37.5)
15–30 days	4 (40)	1 (10)	5 (50)	5 (50)
>30 days	1 (50)	0 (0)	1 (50)	1 (50)

Notes: * significant weight loss is defined as weight loss (body weight when the patient was discharged is lower than the body weight when the patient was admitted in the hospital) ≥2% in a week or ≥5% in a month, hence weight loss within one week can't be assessed for the significance.

The change of weight was observed in its relation to the length of time before and after surgery (figure 1). Before the surgery, the subjects' body weight tends to rise, inversely, after the surgery, the subjects' body weight tends to fall. This phenomenon could be linked to metabolic stress from the surgery.

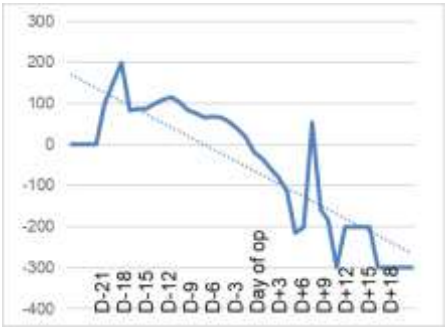

Figure 1. Mean changes in body weight (grams) during hospital stays.

Out of 50 subjects observed, 20 subjects had weight loss during the observation. From 20 subjects who had hospital malnutrition, one subject was from those who did not proceed to surgery, while the rest were those who had undergone surgery. This hospital malnutrition incidence was smaller compared to the previous research conducted in 2007, in which the incidence was 52%. The characteristics of the subjects with and without hospital malnutrition were compared in table 2.

Table 2. Subjects' Characteristics (n = 50)

Variable	Total	Hospital malnutrition	No Hospital Malnutrition
Age			
0–28 days	3	1	2
29 days–12 months	10	3	7
13–36 months	17	7	10
37–60 months	8	2	6
>60 months	12	7	5
Gender			
Male	30	12	18
Female	20	8	12
Diagnosis			
Gastrointestinal	44	18	26
Non–GI	6	2	4
Initial Nutritional Status			
Malnutrition	17	9	9
Severe malnutrition	1	0	1
Mild malnutrition	16	8	8
Overweight	1	1	0
Normal	32	11	21
Types of inpatient care			
Proceed to surgery	44	19	25
Did not proceed to surgery	6	1	5
	Median (min–max) / mean ± SD		
Fasting duration* (minute)	420 (360–1,440)	420 (360–1,440)	420 (360–840)
Prior to surgery	240 (120–10,080)	240 (120–8,640)	240 (120–10,080)
After surgery	720 (480–10,920)	720 (480–9,000)	720 (540–10,920)
Total			

Table 2. Subjects' Characteristics (n = 50) cont.

Variable	Total	Hospital malnutrition	No Hospital Malnutrition
Duration of surgery* (days)	165 (10–435)	195 (30–435)	150 (10–420)
Length of stays:			
– Proceeded to surgery*	4 (0–22)	3 (0–22)	4 (0–21)
Prior to surgery	6 (1–24)	7 (2–24)	5 (1–11)
After surgery	11 (1–46)	11 (3–46)	10 (1–32)
Total			
– Did not proceed to surgery	8 (7–13)	13[#]	8.2 ± 1.1
		Frequency	
Classification of surgery*	2	0	2
Minor	14	3	11
Intermediate	10	6	4
Large	18	10	8
Special			

Notes: * in subjects who undergo surgery during a hospital stay, [#] one patient had hospital malnutrition

Bivariate analysis (table 3) was done to investigate the relation between the demographic and clinical factors to the occurrence of hospital malnutrition. During analysis re–classification in several variables (age, initial nutritional status, type of surgery) needed to be made in order to fulfill analytic test requirements.

Table 3. Bivariate analysis of subject characteristics and hospital malnutrition (n = 50)

Variable	Hospital malnutrition n (%)		p
	Yes	No	
Age[#]			
0–60 months	13 (35.1)	24 (64.9)	0.236
>60 months	7 (53.8)	6 (46.2)	
Gender[#]			
Male	12 (40)	18 (60)	1.000
Female	8 (40)	12 (60)	
Diagnosis[##]			1.000
Gastrointestinal	18 (40.9)	26 (59.1)	
Non–Gastrointestinal	2 (33.3)	4 (66.7)	
Initial Nutritional Status[#]			
Malnutrition	9 (50)	9 (50)	0.279
Normal	11 (34.4)	21 (65.6)	
Types of inpatient care[##]			
Proceed to surgery	19 (43.2)	25 (56.8)	0.381
Did not proceed to surgery	1 (16.7)	5 (83.3)	
	Median (min–max)		
Fasting duration (minute)*~			
Prior to surgery	420 (360–1,440)	420 (360–840)	0.315
After surgery	240 (120–8,640)	240 (120–10,080)	0.242
Total	720 (480–9,000)	720 (540–10,920)	0.528
Duration of surgery (minute)*~	195 (30–435)	150 (10–420)	0.083
Length of stays (days)*~			
Prior to	3 (0–22)	4 (0–21)	0.353
After surgery	7 (2–24)	5 (1–11)	0.009
Total	11 (3–46)	10 (1–32)	0.240
	Hospital Malnutrition n (%)		
Type of Surgery*[#]			
Minor–Intermediate	3 (18.8)	13 (81.3)	0.013
Large–Special	16 (57.1)	12 (42.9)	

Notes: * in surgical patients population, [#] – *chi-square*; [##] – *Fisher*; ~ – *Mann–Whitney*

Among the categorical variables, the only classification of surgery was shown to have an association with hospital malnutrition (p = 0.013; OR 5.7; CI 95% 1.34–24.93). Among the numerical variables, the only length of stays after surgery had a correlation with hospital malnutrition (p = 0.009). This association is further elaborated in figure 2.

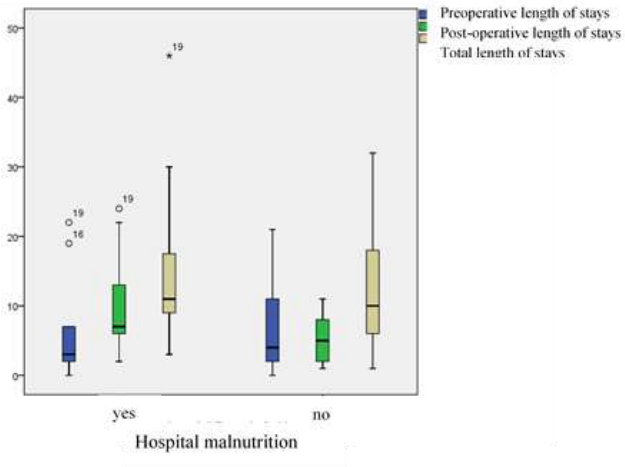

Figure 2. Length of stays among groups with and without hospital malnutrition

Discussion

All subjects enrolled were followed until the end of the study without any dropout. There were no mortality or morbidity found in any subject. The characteristics of the subjects were like previous studies. The ratio of male: female was 3: 2, like the research conducted in Brazil in 2000. Based on the diagnosis of the patients, 88% of the subjects were admitted to the hospital because of gastrointestinal problems.

The age of the subjects was not evenly distributed. Most of the subjects were 13–36 months of age. This is because most of the subjects admitted to Pediatric surgery ward were elective patients planned for a definitive procedure or follow up surgery for Hirschsprung's disease or anorectal malformations. Younger subjects tend to require emergency treatments for any congenital malformation they have and were admitted through the emergency room. Subjects aged >37 months also tend to be admitted from the emergency ward, mostly due to acute appendicitis.

The prevalence of malnutrition on admission was 34%, lower compared to 57.1% found in a previous study (Budianto, 2007).

Minimum fasting duration prior to surgery was 6 hours with an additional 2–3 hours while queueing for the operating chamber or sedation. There was one subject who had been admitted from the emergency room who had no oral intake for 24 hours because of suspicion of intestinal perforation. This subject had no oral intake while the general condition was treated. Inversely, fasting duration after surgery varies a lot. Some of the subjects could be given oral intake after fully awake, while some subjects had no oral intake for several days. These subjects were given parenteral nutrition, usually started on the second day after surgery. Based on the recommendation from Herman, et al (2011), parenteral nutrition could be considered if the patients had no oral intake for more than two days in neonates or more than five days in older children. In adult patients, based on ESPEN recommendation, parenteral nutrition after surgery is recommended if the patient could not use their gastrointestinal tract for seven days or more.

Most of the subjects in this research stayed in the pediatric surgery ward for less than 14 days with a median of 11 days. Subjects that were discharged earlier tend to be admitted from the emergency room. Most of the surgery done in the emergency operating room were appendectomy and colostomy. Subjects who had undergone emergency surgery for more severe cases, for example, intussusception, would be admitted to PICU instead of the pediatric surgery ward following surgical intervention, and therefore were not included in this study. This could cause bias in the analysis as if elective cases are more severe than the emergency ones.

In this study, hospital malnutrition was found in 40% of subjects, and significant weight loss was found in 41.6% of subjects. Compared to previous data in 2007 (52%), hospital malnutrition incidence has decreased, but the number was still high compared to hospital malnutrition in nonsurgical pediatric patients in CMGH, which was 14.8% in 2013. The decrease in hospital malnutrition rate between 2007 and 2015 could be related to many factors; development of surgery technique or anesthesia so the metabolic burden was reduced, development of early detection and early nutritional treatment in the surgical pediatric patient, overall better nutritional status, etc. To have a better understanding of the pattern and contributing factors, further research is needed.

Linear observation of weight change pattern showed a specific pattern. Within the first seven days of hospital stay, subjects' weight relatively stable, then in the second week of hospital stay, more subjects tend to lose weight. After the second week, there's no significant difference between subjects who gain weight and lose weight. We could say that weight loss peak by the end of the second week of hospitalization. If the weight loss occurred on the early days after surgery, the pattern is consistent with the timing of surgery. In this study, most of the surgeries were done at the end of the first week of hospital stay (median 4 days).

Weight change was also observed in relation to the timing of surgery. The pattern was shown in table 1. Overall, preoperative weight tends to rise. On figure 1, we could see the weight of the subject tend to rise and then fall before surgery. This pattern occurred because of mathematical effect, more subjects have short preoperative hospital stay without significant weight change, but the subjects with longer preoperative hospital stay tend to have weight gain. In the postoperative period, subjects' weight fell and then rise on the seventh day of the hospital stay, and then fall again. This pattern was created because most of the subjects were discharged on the seventh day after surgery, while the subjects who were still inpatient after the seventh day were subjects who had undergone surgery of large or special surgery classification.

The age distribution between groups of the subject with and without hospital malnutrition was relatively similar. In both groups, the biggest proportion is in the 13–36 months age range. The difference is in >60 months of age group. In hospital malnutrition group, 35% of the subjects are >60 months of age, but in a nonhospital malnutrition group, only 16% were from this group. Bivariate analysis was done, Age categories were reclassified into, 0–60 months of age and > 60 months of age groups. There was no significant difference with p = 0.236. In the >60 years of age, vulnerability to hospital malnutrition is more evident than in the young adult population. This vulnerability to hospital malnutrition was thought to be found in extreme age patient, but in this research, it is not proven. Gender did not have a significant effect on hospital malnutrition.

Overall, the significant difference between the gastrointestinal and non–gastrointestinal group was not found (p = 1). But with a closer look, we found that the subjects with hospital malnutrition were mostly diagnosed with Hirschsprung's disease and colostomy. These conditions were associated with the risk of nutritional problems due to the colostomy and surgery that had been performed. Most of the subjects with Hirschsprung's disease with colostomy were admitted for stoma takedown. Conventional stoma takedown required colon preparation, including fluid diet for two days before surgery and no oral intake after surgery with various duration (up to five days after surgery). These factors could contribute to hospital malnutrition.

Descriptively, we could see that the subjects who were already in malnutrition state at admission would be more likely to experience hospital malnutrition compared to those who were initially normal (50% to 34.4%). This could be because subjects with bad initial nutritional status will be more vulnerable to weight loss after metabolic stress, but analysis shows that there is no association with hospital malnutrition (p = 0.279). We could see that subjects with initial malnutrition didn't have hospital malnutrition, but subjects who were overweight had hospital malnutrition. These findings could be associated with the metabolic burden of surgery. Subjects with malnutrition had intermediate category surgery, but subjects who were overweight tend to undergo large surgery in this study. Another factor that might contribute to this outcome is the implementation of nutrition screening and care system.

Fasting duration prior to surgery, after surgery, or total length of no oral intake did not have a significant association with hospital malnutrition (p-value respectively 0.315; 0.528; 0.528). Duration of the surgery also did not have a significant association with hospital malnutrition (p = 0.083), while the significant association with hospital malnutrition were the postoperative length of stays (p = 0.009) and classification of surgery (p = 0.013; OR 5.7).

Median of the postoperative length of stays was 7 days in hospital malnutrition group, while in the nonhospital malnutrition group was 5 days. Statistically, this difference is significant, but clinically, two days different does not seem to be significant. Overall, subjects with hospital malnutrition length of stays were 2–24 days, while subjects without hospital malnutrition length of stays were 1–11 days. Subjects with hospital malnutrition mostly underwent large or special surgery category that requires a longer postoperative length of stays.

Regarding that the weight of the subject tend to decrease after the surgery, we could conclude that surgery contributes to hospital malnutrition. Furthermore, specific component from surgery factors that had a role was not any oral intake length or the length of the surgery, but how extensive the surgery was. The subject that underwent large–special surgery, had 5.7 times more vulnerable to hospital malnutrition to subject with mild–intermediate surgery.

Conclusion

This study shows the data on hospital malnutrition in pediatric surgical ward and insight into related factors that contribute to hospital malnutrition. It can be inferred that the burden of surgery is associated with hospital malnutrition, and in turn, hospital–malnutrition is associated with increased postoperative length of stays. After this research, we hope that hospital malnutrition would be routinely evaluated in order to increase awareness and improve care.

Disclosure

Author disclose there was no conflict of interest.

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