

The Incident of Hospital Malnutrition Among Children

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Abstract

Hospitalized children are at risk of losing weight, causing malnutrition during the treatment period. The prevalence of hospital malnutrition in various countries is quite high. Hospital malnutrition (HM) can affect the prognosis and course of the disease by increasing the incidence of infection, slowing wound healing, reducing the body's immunity, affecting the action of drugs, prolonging the length of treatment, and increasing morbidity and mortality rates. This study aims to describe the incidence of hospital malnutrition at pediatric inpatient ward. **Methods** : A descriptive study of all sick children aged 1 month to 18 years who were being treated in pediatric wards at H. Adam Malik General Hospital, from March - April 2023 were recruited for this study. Samples were collected using consecutive sampling. Primary data was obtained from interviews and anthropometric measurements, including body weight and height, were taken during hospital admission and discharge. Secondary data was obtained from medical records. **Results**: Fifty-five children were included with the average length of stay was 7 days. The prevalence of hospital malnutrition in children was 29.1%. **Conclusion**: The prevalence of hospital malnutrition at RSUP H. Adam Malik Medan has decreased compared to previous research. Even though the prevalence of malnutrition at H. Adam Malik Hospital has decreased, it is necessary to carry out regular training and evaluation of staff involved in using hospital malnutrition screening assessments.

Keywords: Nutritional status, Malnutrition, Hospital malnutrition

Hospitalized children are susceptible to weight loss, leading to malnutrition during their treatment.(1) The average length of stay (LOS) is only a few days; nevertheless, it can be extended in children with chronic or underlying illnesses. Currently, the primary focus in child care has been solely on medical concerns.(2) The observation of the child's nutritional condition remains insufficient, and the presence of inadequate nutrition upon admission or the decline of nutrient status during hospitalization is associated with worse clinical outcomes.(1-3)

Extended hospital stays can serve as both a contributing factor and a consequence of malnutrition. Research has demonstrated that prolonged hospital stays negatively impact children's nutritional status, resulting in a significant decrease in their body mass index (BMI). This decline is linked to a reduction in food consumption in relation to the prescribed nutritional standards. Studies had shown that there was a decline of more than 0.25 BMI Z-score in 2.8% of children hospitalized for 3-5 days, 29.4% in 6-8 days, and 40.8% in children in hospital for 8 days.(4,5)

The incidence of malnutrition in hospitals is high across different regions of the globe.(2,3,5) Multiple global studies have documented that a significant proportion, ranging from 13% to 69%, of individuals admitted to hospitals experience malnutrition. Hospital malnutrition (HM) refers to the condition of malnutrition that arises in patients who are admitted to a hospital. The definitive criteria for hospital malnutrition are lacking.(3,6) Malnutrition is commonly linked to both infectious and non-infectious

problems, prolonged hospital stays, elevated rates of repatriation, and greater morbidity and mortality. Approximately 38 percent of patients who are not malnourished upon admission may encounter a decline in their nutritional condition during hospitalization. This applies to both patients who were malnourished upon admission and those who become malnourished during treatment. Consequently, these patients will endure longer hospital stays and incur higher treatment expenses.(6-8)

The high rate of malnutrition in hospitals is indicative of the quality of hospital care. Many investigations have been conducted on the causes and effects of malnutrition in hospitals, and the results suggest that this condition causes a major financial strain on the hospital's healthcare system.(6) Adequate nutrition for hospitalized children is beneficial for their nutritional needs in addition to other benefits, including hastening healing, shortening treatment duration, reducing complications, lowering morbidity and mortality, and preventing malnutrition from occurring as a result of medical interventions or treatment. (2,4,7,9)

1. Methods

This study is a descriptive study to determine the incidence of hospital malnutrition at pediatric inpatient ward. The study was conducted in pediatric wards at H. Adam Malik General Hospital, from March - April 2023. The subjects were covered all pediatric patients between the ages of one month and 18 years, following specific inclusion and exclusion criteria. The study employed two inclusion criteria: pediatric patients receiving treatment in pediatric wards, and a minimum LOS of 72 hours. In contrast, individuals who met the following criteria were excluded from the study if they: underwent nutritional intervention by the Department of Pediatric Nutrition and Metabolic Disease; were classified as overweight or obese; exhibited any form of fluid retention such as peripheral edema, ascites, or hydrocephalus; had a substantial tumor; were admitted to the intensive care unit; passed away; or declined to participate. After accounting for a confidence interval of 95%, a prevalence rate of 40.7%, and a projected loss-to-follow-up rate of 10%, the minimum sample size consisted of 55 participants. The study employed the consecutive sampling technique. All patient and parents were informed for consent and signed the informed consent form. Primary data was obtained from interviews and anthropometric measurements, including body weight and height, were taken during hospital admission and discharge. In children under the age of 24 months, body weight was measured using a digital scale with an accuracy of 0.01 kg. Conversely, in patients older than 24 months, a mechanical scale was used with an accuracy of 0.1 kg. The measurement of body height was taken using an infantometer with a precision of 0.1 cm for participants under the age of 24 months. In cases where individuals were older than 24 months, a standing scale was employed. The Z score from the WHO 2006 or CDC 2000 graph was adopted to determine the nutritional status. Secondary data such as the assessment of dietary intake, age, sex, medical history, and LOS, were obtained through interviews and medical records. Hospital malnutrition refers to the condition of malnutrition that arises during a patient's hospitalization and is characterized by a decrease in weight based on the LOS: $\geq 2\%$ during the first 7 days; $>5\%$ during 8–30 days; or over 7.5% for 90 days of hospitalization. (15,18) These data were gathered into a digital spreadsheet. Dichotomous data were presented as percentages and continuous data as mean-standardized deviations or medians with minimal-maximal. A univariate analysis was carried out to examine the characteristics of the participants. All statistical analysis was performed using SPSS (Version . 21) software. A p-value less than 0.05 was deemed statistically significant.

2. Results

The study included a total of 55 children who received treatment at the pediatric wards of H. Adam Malik Hospital in Medan. **Table 1** displays the subject's characteristics. The majority of the participants were male and aged 13- <18 years old. Based on nutritional status, 47.3% of the participants had adequate nutrition. Chronic illness was more prevalent than acute illness, and the majority of the underlying disease was

associated with haematological disorders. Sixty percent of the participants were hospitalised for less than 7 days, yet the average LOS was 7.19 days. More than half of the of the participants had <50% nutritional intake. The incidence of hospital malnutrition was 29.1%, accounting for 16 children, this is shown in **Table 2**.

Table 1. Demographic Characteristics

Variables	n = 55
Sex, n (%)	
Male	30 (54,5)
Female	25 (45,4)
Age, n (%)	
1 month - < 1 year	9 (16,4)
1 - < 4 year	10 (18,2)
4 - < 6 year	2 (3,6)
6 - < 9 year	6 (10,9)
9 - < 13 year	12 (21,8)
13 - < 18 year	16 (29,1)
Nutritional Status, n (%)	
Severe Malnutrition	15 (27,3)
Malnutrition	14 (25,5)
Adequate Nutrition	26 (47,3)
Disease Chronicity, n (%)	
Acute	21 (38,2)
Chronic	34 (61,8)
Underlying Disease, n (%)	
Infectious	
Tropical Infectious Disease	3 (5,5)
Gastro-hepatology	3 (5,5)
Neurological	14 (25,5)
Respiratory	5 (9,1)
Non- Infectious	
Allergy and Immunology	3 (5,5)
Hematological	20 (36,4)
Cardiovascular	4 (7,3)
Nephrological	3 (5,5)
Length of Stay, n (%)	
≤ 7 days	33 (60)
> 7 days	22 (40)
Mean (SD), days	7,29 (3,8)
Median (Min – Max), days	7 (3 – 18)
Food Intake, n (%)	
< 50 %	30 (54,5)
≥ 50 %	25 (45,5)

Table 2. The incidence of hospital malnutrition.

Variables	n = 55
Hospital Malnutrition, n (%)	
Yes	16 (29,1)
No	39 (70,9)

3. Discussion

Insufficient or excessive intake of calories, protein, and/or other essential nutrients is the underlying cause of malnutrition.(9-12) Malnutrition can be classified into two categories: primary malnourishment, which arises from environmental and behavioral causes, and secondary malnourishment, which is caused by one or more conditions leading to hormonal imbalances.(11) Malnutrition in developed countries is predominantly attributed to disease, whereas in developing countries, malnutrition results from primary and disease-related factors, as well as malnutrition occurring in hospitals.(12)

Currently, there is a lack of consensus over the precise definition and criteria used to determine HM. This is reflected in the use of different MRS criteria in various existing studies, such as anthropometric data, biochemical data, or a combination of both.(9) Malnutrition acquired in hospitals, as defined by the American Society of Parenteral and Enteral Nutrition (ASPEN), refers to a nutritional imbalance that arises during a patient's hospital stay, irrespective of their initial malnutrition status.(12)

Some researchers adopt the Body Mass Index (BMI) or body weight per height below a standard deviation (SD) of more than 2 to assess acute malnutrition, whereas height per age below a standard deviation (SD) is used for recognizing chronic malnutrition.(2,13) Other research defines hospital malnutrition as a reduction in body weight > 2% or a decrease in BMI beyond 0.25 standard deviations.(5,14) The diagnosis criteria for HM in this study are established as a condition that arises from inadequate child nutrition support and is indicated by a decrease in weight during hospital stays. In particular, weight loss more than 2% of the reference weight within a period of 7 days, 5% if the treatment duration ranges from 8 to 30 days, or 10% if the treatment length exceeds 30 days.(13,15-17)

Hospital malnutrition is highly prevalent in many countries.(9) The prevalence of malnutrition among children admitted to hospitals ranges from 6% to 32%.(2) The application of diverse HM criteria in different studies, such as anthropometric data, biochemical data, or a combination of both, can significantly influence the prevalence of HM, especially when laboratory indicators, such as albumin levels or hematocytes, are included in the analysis.(2,9,12)

Based on weight percentage calculations and anthropometric measurements, this study found that 16 children (29.1%) had hospital malnutrition. This finding is similar to other studies.(12) A previous study in Belgium concluded that the incidence of HM was 31.8 percent (109 out of 343). (13) A multi-center study showed that 217 (23%) of the 938 patients who spent more than four days in the hospital had lost weight. The study included 2,567 patients, aged one month to eighteen, from 14 centers located across 12 European nations.(18) In 2016, a multi-center study in Canada reported a HM incidence of 14%.(19) According to this study, the HM incidence in HAM hospitals was 29.1%. This incidence was lower compared to the previous study in 2014, with an incidence of 40.9%.(17) Joosten and Hulst emphasized the significance of reference selections when evaluating the rates of malnutrition, which may have significant therapeutic implications. (2,18) This study applies the WHO growth standard since it is a worldwide reference. The application of different inclusion criteria, diagnostic tools, and baseline characteristics could influence the incidence of malnutrition.(2,9,12)

An effective strategy for mitigating malnutrition in hospitals involves early detection of patients who are susceptible to undernourishment throughout their treatment. This allows the implementation of appropriate nutritional therapies to minimize malnutrition and its associated problems.(2,3,5,12,13) Hospitals need to establish explicit regulations and procedures for identifying patients who are susceptible to malnutrition. The hospital malnutrition risk test pad helps to identify pediatric patients who are at risk of developing malnutrition. This assessment facilitates optimal nutritional interventions and enhances awareness among healthcare providers of the potential risks associated with malnutrition.(2,3,20-22) Nutrition management for a hospitalized child requires the collaboration of highly organized and coordinated multidisciplinary teams. These teams should possess expertise in clinical nutrition and function together as a holistic nutritional foster team.(22) ESPGHAN and PREDIRE suggest the adoption of nutrition foster teams within hospital settings to enhance the nutritional care of hospitalized children. The main responsibilities involve patient screening to detect nutritional hazards, identification of patients requiring nutritional assistance, provision of sufficient nutritional management for patients, education and training of hospital personnel, and conducting practice audits. The nutrition care team should comprise a diverse group of professionals with specialized understanding in many key areas of clinical nutrition services. This team ought to consist of pediatricians, nutritionists, nurses, and, if possible, pharmacists.(3,22)

4. Study Limitation

The limitation of the study is the heterogeneity in the category of uneven proportions of subjects, which could potentially impact the results. Our study also did not describe the risk of HM using STRONGkids screening equipment, did not measure upper arm range instruments in anthropometry, and applied different approaches to assess nutritional status at ages above and below 5 years. The study did not describe the distribution of illness severity, conduct biochemical testing (CRP, albumin, and IL-6), or administer nutritional therapy or medication therapy to patients. Meal evaluation methods are excessively subjective, depend on the interview method, and do describe aspects that restrict meal intake, such as frequent urination or vomiting, as well as abdominal pain. This study did not assess food intake other than hospital meals. Additional risk factors, such as the parents, the socio-economic level, and the dietary intake during the child's hospitalization, may influence the occurrence of unevaluated HM.

Additional research using long-term longitudinal methods and larger, more balanced subject proportions is required to accurately assess the incidence of hospital malnutrition, the variables contributing to it, and the effectiveness of the nutrition fostering team. Additionally, the approach to evaluating food consumption should be objectively evaluated, encompassing the assessment of food beyond the hospital diet as well as the quantification of factors that restrict food intake. Subsequent studies should analyze the distribution of illness severity, biochemical assessment (CRP, albumin, and IL-6), anthropometric assessment, dietary therapy, and medication therapy administered to patients.

5. Conclusion

The prevalence of hospital malnutrition at RSUP H. Adam Malik Medan has decreased compared to previous research. Even though the prevalence of malnutrition at H. Adam Malik Hospital has decreased, it is necessary to carry out regular training and evaluation of staff involved in using hospital malnutrition screening assessments. Every hospitalized child should receive nutrition assessment and monitoring to prevent hospital malnutrition and extended LOS.

References

1. Westergren A, Wann-Hansson C, Börgdal EB, Sjölander J, Strömblad R, Klevsgård R, et al. Malnutrition prevalence and precision in nutritional care differed in relation to hospital volume--a cross-sectional survey. *Nutr J*. 2009 May;8:20.
2. Joosten KFM, Hulst JM. Prevalence of malnutrition in pediatric hospital patients. *Curr Opin Pediatr*. 2008 Oct;20(5):590–6.
3. McCarthy A, Delvin E, Marcil V, Belanger V, Marchand V, Boctor D, et al. Prevalence of Malnutrition in Pediatric Hospitals in Developed and In-Transition Countries: The Impact of Hospital Practices. *Nutrients*. 2019 Jan;11(2).
4. Budiputri GL, Suryawan IWB, Dewi MR. Analisis faktor - faktor yang mempengaruhi kejadian Malnutrisi Rumah Sakit (MRS) pada pasien anak di Bangsal Kaswari, RSUD Wangaya, Bali, Indonesia. *Intisari Sains Medis*. 2020;11(2):680–5.
5. Campanozzi A, Russo M, Catucci A, Rutigliano I, Canestrino G, Giardino I, et al. Hospital-acquired malnutrition in children with mild clinical conditions. *Nutrition*. 2009 May;25(5):540–7.
6. Kac G, Camacho-Dias P, Silva-Coutinho D, Silveira-Lopes R, Marins V V, Pinheiro AB. Length of stay is associated with incidence of in-hospital malnutrition in a group of low-income Brazilian children. *Salud Publica Mex*. 2000;42(5):407–12.
7. Nasar S, Susanto J, Lestari E, Djais J, Prawitasari T. Malnutrisi Rumah Sakit. In: *Buku Ajar Nutrisi Pediatrik dan Penyakit Metabolik*. 1st ed. Jakarta: IDAI; 2011. p. 165–76.
8. Subagio H, Puruhita N, Kern A. Problema malnutrisi di rumah sakit. *J Clin Med*. 2017;3(3):143–6.
9. Nasar S, Prawitasari T, Lestari E, Djais J, Susanto J. Skrining malnutrisi pada anak yang dirawat di rumah sakit. In: *Health Technology Assessment Departemen Kesehatan RI*. 2007.
10. Norman K, Pichard C, Lochs H, Pirlich M. Prognostic impact of disease-related malnutrition. *Clin Nutr*. 2008 Feb;27(1):5–15.
11. Mehta NM, Corkins MR, Lyman B, Malone A, Goday PS, Carney LN, et al. Defining pediatric malnutrition: a paradigm shift toward etiology-related definitions. *JPEN J Parenter Enteral Nutr*. 2013 Jul;37(4):460–81.
12. Gouveia M, Silva G. Hospital malnutrition in pediatric patient: A review. *Ann Nutr Disord Ther*. 2017;
13. Huysentruyt K, Alliet P, Muyschont L, Rossignol R, Devreker T, Bontems P, et al. The STRONG(kids) nutritional screening tool in hospitalized children: a validation study. *Nutrition*. 2013;29(11–12):1356–61.
14. Sermet-Gaudelus I, Poisson-Salomon AS, Colomb V, Brusset MC, Mosser F, Berrier F, et al. Simple pediatric nutritional risk score to identify children at risk of malnutrition. *Am J Clin Nutr*. 2000 Jul;72(1):64–70.
15. Sidiartha I. Insidens malnutrisi rawat inap pada anak balita di Rumah Sakit Umum Pusat Sanglah Denpasar. *Sari Pediatr*. 2016;9(6).
16. Maryani E, Prawirohartono E, Nugroho S. Faktor prediktor malnutrisi rumah sakit pada anak. *Sari Pediatr*. 2017;18(4).
17. Novianti D, Sembiring T, Sofyani S, Faranita T, W P. Screening for nutritional risk in hospitalized children: comparison of two instruments. *Paediatr Indones*. 2017;57(3).
18. Hecht C, Weber M, Grote V, Daskalou E, Dell’Era L, Flynn D, et al. Disease associated malnutrition correlates with length of hospital stay in children. *Clin Nutr*. 2015 Feb;34(1):53–9.
19. Bélanger V, McCarthy A, Marcil V, Marchand V, Boctor DL, Rashid M, et al. Assessment of Malnutrition Risk in Canadian Pediatric Hospitals: A Multicenter Prospective Cohort Study. *J Pediatr*. 2019 Feb;205:160-167.e6.
20. Hafisah T, Prawitasari T, Djais J. Malnutrisi rumah sakit dan asuhan nutrisi pediatrik di rumah sakit hasan sadikin bandung. *JGKI*. 2019;16(2).
21. Rocha GA, Rocha EJM, Martins C V. The effects of hospitalization on the nutritional status of children.

J Pediatr (Rio J). 2006;82(1):70–4.

22. Agostoni C, Axelson I, Colomb V, Goulet O, Koletzko B, Michaelsen KF, et al. The need for nutrition support teams in pediatric units: a commentary by the ESPGHAN committee on nutrition. J Pediatr Gastroenterol Nutr. 2005 Jul;41(1):8–11.