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# The association between achieve of full feeding with mortality in children at sanglah hospital



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## ABSTRACT

**Background:** For pediatric patients who are hospitalized, full feeding nutritional needs is not only to improve BMI but also very useful for accelerating the healing process, shortening the treatment period, reducing complications, reducing morbidity and mortality, and preventing malnutrition due to treatment or medical action. This study aimed to describe the association between the achievement of full feeding with mortality in children

**Method:** The retrospective study was conducted in Pediatric Ward at Sanglah General Hospital, Denpasar Bali period January to December 2021. The inclusion criteria in this study were all pediatric patients who were hospitalized at pediatric wards Sanglah Hospital Denpasar. Inclusion criteria were children aged 1 month-18 years old. Samples were taken by total

sampling. Quantitative variables were tested using variables that scale categorical data will be displayed in the form of absolute numbers and percent. The results of the descriptive analysis are presented using a chi-square test used to analyze all indirect variables (depending on whether the assumptions were met). The results of multivariate analysis were with logistic regression. The results were considered statistically significant at  $p < 0.05$ .

**Result:** Total 258 subjects who met the inclusion criteria. Multivariate analysis with logistic regression shows full feeding (Exp B 0.24; 95% CI 0.032-0.27; P 0.006), nutritional status (Exp B 0.23; 95% CI 0.31-1.55; P 0,004) was statistically significant for mortality.

**Conclusion:** Full feeding and nutritional status were associated with an increase in child mortality.

**Keywords:** Hospital, full feeding, children, mortality, nutritional status.

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## INTRODUCTION

In the developing world, there has been a remarkable improvement in children's survival over the past 3 decades. Although, continued efforts are required to further reduce their mortality rates because many children still die from preventable diseases.<sup>1</sup> According to the 2019 report on the status of the world's children, nearly half of all deaths among children under the age of five are attributable to malnutrition.<sup>2</sup> Globally, infectious diseases, including pneumonia, diarrhea and malaria, along with preterm birth complications, birth asphyxia and trauma and congenital anomalies remain the leading causes of death for children under

five. They are particularly important for preventing pneumonia and diarrhea, the two leading causes of death among infants and young children.<sup>3,4</sup> Diarrhea was the most common reason for admission to Sanglah Hospital (17.1%).<sup>5</sup>

An estimated one to two million children worldwide die annually from severe acute malnutrition.<sup>6</sup> Several populations are also susceptible to mortality in nutrient-deficient environments. The nutritional status of 20 to 50 percent of hospitalized patients worsens during hospitalization, and those who are malnourished or severely malnourished upon hospital admission have a 4.15-fold increased risk of hospital malnutrition. The relationship

between nutrition and hospitalization, recovery, and death is linear and positive. Independent predictor of hospital morbidity and mortality is nutritional status.<sup>7</sup> Risk stratification and targeted interventions for this population during this improved survival. However, current services, such as for the management of malnutrition in the community or largely focus on children < 5 years of age and may not operate in a way that fully addresses the mortality risk in this population. Many factors that contribute to the high frequency of mortality consist of hospital stay, such as procedures that require fasting, diet acceptance, time to achieve full diet, diet efficacy, the disease itself,

and disease severity. A nutritionist team is an essential component of a hospital, particularly for pediatric patients. In children with other diseases, meeting nutritional needs is not only beneficial for increasing BMI, but also for accelerating the healing process, shortening the treatment period, reducing complications, decreasing morbidity and mortality, and preventing malnutrition due to treatment or medical intervention.<sup>8,9</sup>

We conducted this study to know the association between full feeding and patient mortality, particularly in pediatric patients.

## METHOD

A retrospective study will be conducted at a general hospital in Sanglah. Cases included children ages 1 to 18 who visited the pediatric department. The data utilized are secondary data extracted from the medical records of pediatric patients treated between January 2021 and December 2021. Inclusion criteria for this study included all pediatric patients hospitalized in pediatric wards at the Sanglah Hospital in Denpasar. Exclusion criteria included patients with incomplete anthropometric data and nutritional status during hospitalization, patients treated for fluid retention (edema, ascites, hydrocephalus), patients with an obvious mass or tumor, and organomegaly, as these conditions would affect weight measurement.

Data included patient's age, gender, diagnostic, underlying disease, nutritional status based on weight-for-height (for 1-60 month old) or BMI-for-age (for 5-18 year old) were collected at the same time when the patient was admitted and body weight when the patient was discharged. Length of stay (LOS) was calculated from the day of admission until day of discharge or on the seventh day of treatment. Nutritional status was categorized as severe malnutrition, moderate malnutrition and well nourished. Full feeding is the achievement of 80-100% nutritional needs according to the RDA. The data are presented on a nominal scale. The data was analyzed using SPSS for Mac OS version 25.0. The data were distributed symmetrically. Descriptive data shown as a percentage in table and narration. Univariate analysis

using chi-square test was done between independent and dependent variables and logistic regression test was used to analyze all indirect variables. All variables of bivariate analysis were expressed as Exp (B) and 95% confidence interval (CI). Significance level was considered at  $p < 0.05$ . This research has been approved by the ethics committee of Medical Faculty Udayana University with number of ethical clearance 2191/UN14.2.2.VII.14/LT/2022.

## RESULTS

### Demographic characteristics of children.

From January 2021 to December 2021, we included 265 pediatric patients. Seven subjects were excluded criteria. Total 258 pediatric patients were hospitalized at Sanglah General Hospital in Denpasar who met the inclusion criteria. **Table 1**

lists the characteristics of the patients.

Pediatric was a classification of patients aged 0-18 years. The largest proportion of the sample in this study were children aged 1 to 5 years (61.2%). There were more male patients (55,4%) than female patients (44,6%). Seventy five (29.1) patients were hospitalized because of Respiratory tract infection, 19.0% with hematology and oncology symptoms, 14.7% with GI tract symptom, 8.9% with immunology symptom, and 10.5% with other symptoms such as nephrology, ophthalmology, neurosurgery symptoms. Patients who achieved full feeding were 75.6% and those who did not reach full feeding were 24.4%. Ten (3.9) subjects were obese, 24.8% were well nourished, 17.4% were mild malnutrition, 24.4% were moderate malnutrition, and 29.5% were severe malnutrition. The median length of stay in all subjects was 5 days, 51.6% < 5 days and 48.4% > 5 days.

**Table 1. Characteristics of the study**

Characteristic	N= 258
Gender, n (%)	
Male,	143 (55.4)
Female,	115 (44.6)
Age (year), n (%)	
1 – 5,	158 (61.2)
6 – 18,	100 (38.8)
Diagnostic, n (%)	
Respiratory tract,	75 (29.1)
Hemato-Oncology,	49 (19.0)
GI tract,	38 (14.7)
Immunology,	23 (8.9)
Cardiology,	16 (6.2)
Neurology,	16 (6.2)
Endocrinology,	14 (5.4)
Others,	27 (10.5)
Full Feeding, n (%)	
Yes	195 (75.6)
No	63 (24.4)
Nutritional status, n (%)	
Obesity,	10 (3.9)
Well nourished	64 (24.8)
Mild malnutrition	45 (17.4)
Moderate malnutrition	63 (24.4)
Severe malnutrition	76 (29.5)
Length of stay (days), n (%)	
< 5 days, n (%)	133 (51.6)
> 5 days, n (%)	125 (48.4)

**Table 2. Result of Bivariate Analysis of Selective Variables and Outcomes**

Parameter	Outcome		P
	No Survive, n=52	Survive, n=206	
Gender, n (%)			
Male	30 (21)	113 (79)	0.410
Female n (%)	93 (80.9)	22 (19.1)	
Age (years), n (%)			
1 – 5 n (%)	33 (20.9)	125 (79.1)	0.420
6 – 18 n (%)	19 (19.0)	81 (81.0)	
Full Feeding, n (%)			
Yes,	36 (18.5)	159 (81.5)	0.015
No,	16 (25.4)	47 (74.6)	
Diagnosis, n (%)			
Respiratory tract,	9 (17.4)	66 (32.0)	0.530
Hemato-Oncology,	13 (25)	35 (17.0)	
GI tract,	6 (11.5)	32 (15.5)	
Immunology,	6 (11.5)	17 (8.3)	
Cardiology,	4 (7.7)	12 (5.8)	
Neurology,	5 (9.6)	11 (5.3)	
Endocrinology,	5 (9.6)	9 (4.4)	
Others,	4 (7.7)	24 (11.7)	
Nutritional status, n (%)			
Obesity,	3 (5.8)	7 (3.4)	0.028
Well nourish,	8 (15.4)	56 (27.2)	
Mild Malnutrition,	9 (17.3)	36 (17.5)	
Moderate,	11 (21.1)	52 (25.2)	
Severe,	21 (40.4)	55 (26.7)	
Length of stay, n (%)			
< 5 days,	28 (53.8)	105 (51.0)	0.711
> 5 days,	24 (46.2)	101 (49.0)	

**Table 3. Result of Multivariate Analysis of Selective Variables**

Variable	Exp (B)	CI 95%	P value
Gender			
Male	0.99	0.55-1.93	0.97
Age			
6-18 years	0.81	0.57-2.04	1.08
Diagnostic			
Endocrinology	0.96	0.78-1.18	0.95
Length of stay			
> 5 days	0.81	0.49-1.34	0.42
Full feeding			
Yes	0.24	0.32-1.27	0.006
Nutritional status			
Well nourished	0.23	0.31-1.55	0.004

The relationship between achieving full feeding with outcome can be seen in **Table 2**. In addition, a comparison of demographic characteristics, length of stay, and diagnosis of the patients was also compared.

The relationship between achieving full feeding with mortality of pediatric patients was analyzed by comparing (comparing) the distribution of nutritional status and its changes among patients who achieve full feed, as can be seen in **Table 2**. In addition, a comparison of demographic characteristics was also carried out. The results found marginal differences ( $p = 0.015$ ) in achievement full feed with mortality. There were no significant differences in sex ( $p = 0.410$ ) and child age ( $p = 0.420$ ) between pediatric patients who reached full feed and those who did not reach full feed with mortality.

Comparison of distribution of nutritional status showed significant difference ( $p=0.028$ ). At the time before the patient was discharged from hospitalization, the proportion of patients with malnutrition and malnutrition in the group of patients who achieved full feed was smaller than in the group of patients who did not achieve full feed, and the proportion of patients with good nutrition in the group of patients who achieved full feed was greater compared to the group of patients who did not achieve a full feed. Comparison of this distribution shows that patients who achieve full feed have a better final nutritional status. Comparison of the distribution of changes in nutritional status confirms the finding that, regardless of the predominant proportion of patients without changes in nutritional status, the group of patients who achieved full feed experienced more improvements than decreases in nutritional status. On the other hand, the group of patients who did not achieve a full feed significantly decreased and none experienced an increase in nutritional status.

This study used binary logistic regression for multivariate analysis. The results of the analysis are shown in **Table 3**. This study found that unaccomplished full feeding (Exp B 0.34; 95% CI 0.32-1.27;  $P 0.006$ ) and well nourished (Exp B 0.33; 95% CI 0.31-1.55;  $P 0.004$ ) were associated with increased mortality.

## DISCUSSION

Children who are hospitalized for treatment are at a high risk for malnutrition and mortality, which can be caused by the disease or by the treatment process. Malnutrition will increase morbidity and mortality, hospitalization length, and treatment expenses. It is expected that providing complete nutrition to hospitalized pediatric patients will improve their nutritional status. The results of this study revealed that 143 (55.4%) of the research subjects were male and 115 (44.6%) were female. According to De Longueville et al., the ratio of males to females is 57.5 percent for men and 42.6 percent for women.<sup>3</sup> According to the study by Yuniar et al, there were twice as many males as females (2:1), which differs slightly from the study by Groleau et al, in which there were 50.9% more females than males (49.1% vs. 49.1%).<sup>10</sup> The comparison between men and women in the study did not differ significantly. According to the characteristics of the study conducted by Yuniar et al where the age group 1 month - 1 year had the largest proportion of 33% and was followed by the age group >1 -5 years as much as 26.7%, the majority of patients in this study were aged 1-5 years with a percentage of 61.2%.<sup>10</sup> The average length of stay for patients is 5 days, which differs slightly from the findings of Groleau et al, who found that the average length of stay for patients with acute illnesses such as infections, trauma, or minor surgery was 3 days (1-5 days).<sup>11</sup> The patient's diagnosis has a substantial impact on variations in hospitalization duration data. Patients with a chronic disease will have a longer hospital stay compared to those with an acute illness. Compared to the study by Mehta et al, in which the average patient weight was 20.3 kg, the average patient weight in this study was 10.5 kg (5.4-20.0). The average height is 86 cm (62-124) compared to a study that showed the average height of the subjects was 93 cm.<sup>5,12</sup> The difference in average height and weight can be influenced by the age of the patients and their race. Mehta et al. studied patients in Boston who were likely predominately white, whereas this study consisted primarily of Southeast Asian patients.

For nutritional status, the results

showed that the patients with good nutrition were 24.8%, patients with severe malnutrition were 29.5%, patients with moderate malnutrition were 24.4%, and patients with mild nutrition were 17.4%. This study is slightly different from the study conducted by Amin et al at Ulin Hospital where as many as 50 subjects were obtained by purposive sampling according to the inclusion criteria, 2 patients with overweight status, 37 patients with good nutritional status, 8 patients with poor nutritional status, and 3 patients with bad nutritional status.<sup>13</sup> A study conducted by Yuniar et al showed that the nutritional status of patients with malnutrition was 2.2%, patients with malnutrition were 48.9%, patients with normal nutrition were 37.8%, patients with overweight were 2.2% and obese patients were a total of 8.9%.<sup>10</sup> This study found that 75.5% of patients had fulfilled the full feeding. It was found that underfeeding (providing <90% requirement) occurred in providing 30 calories (66.7%), 39 protein (86.67%), and 27 fat (60%) patients overfeeding calories, protein, and fat, respectively in 8 (17.8%), 1 (2.2%), and 7 (15.6%) of 45 patients.

In this study, there was significant improvement in the achievement of full feed and mortality ( $p=0.015$ ). In this study, comparison of the distribution of nutritional status did show a significant ( $p=0.028$ ) on the mortality of pediatric patients who were hospitalized. Nutritional therapy is an important part of the management of critically ill pediatric patients. Inadequate nutritional therapy is associated with increased morbidity and mortality. This situation is especially true in patients with long intensive care. The energy requirements of critically ill children are reduced for several reasons, such as the use of sedation and analgesics which decrease the basal metabolic rate, the energy required for minimal activity, and the state of severe metabolic stress. However, the majority of critically ill children display a protein hypercatabolic state, with high consumption of endogenous reserves, which can be minimized by an effective treatment plan.<sup>14</sup> Malnutrition can increase susceptibility to critical illness, especially in children, as well as lead to secondary

immunodeficiency. Patients with longer intensive care due to metabolic stress and severe infections can result in more severe malnutrition, especially those with poor nutritional status due to increased efforts to compensate for the body's metabolism in a critical state. Child malnutrition is associated with various physiological changes, micronutrient imbalance, gastrointestinal dysfunction, decreased cellular immune function, decreased phagocytosis, and the complement system. The degree of disease can exacerbate pre-existing malnutrition and predispose to disease complications. This results in longer hospitalization days for critically ill children. Critically ill children are at risk from the effects of prolonged fasting or stress. This is because the percentage of muscle and fat in critically ill children is lower and the basal energy requirement is higher. Critically ill children are not recommended to fast for more than 24 to 48 hours. The presence of nutrients in the digestive tract will improve the integrity of the intestinal mucosa, stimulate intestinal secretion, hormones, and blood flow, even if the use is only small, 2-3 ml/hour enteral formula can maintain the level of several important hormones of the digestive tract.<sup>15</sup> Providing enteral nutrition as early as possible can provide a better outcome. This is in accordance with Dewi and Supriatna research conducted at dr. Kariadi Semarang which showed a relationship between early enteral nutrition with better outcomes.<sup>16</sup> A recent study by Dwijayanti et al (2018) at Sanglah General Hospital also showed that there was a relationship between early enteral nutrition and lower mortality in critically ill pediatric patients.<sup>17</sup> This supports research where the group of patients who achieved full feed experienced more improvement than decreased nutritional status. This is similar to the study by Amin et al in which patients with poor nutrition and poor nutrition had an average longer hospital stay than patients with good and sufficient nutrition.<sup>13</sup>

The multivariate analysis revealed that incomplete RDA and malnutrition were associated with mortality. In line with this study, a study in Zaire demonstrated that severe malnutrition increases the risk of death.<sup>18</sup> A study of mechanically ventilated

critically ill children in the PICU found that underweight children had a higher mortality risk and fewer ventilator-free days.<sup>19</sup> According to a recent review, vitamin A supplementation is associated with a clinically significant reduction in morbidity and mortality among children.<sup>20</sup> According to a study, the utilization of community-level nutritional programs can significantly improve the nutritional status and feeding practices of children under the age of five.<sup>21</sup> This alternative may be useful for improving nutritional status and decreasing mortality.

The limitation of this study is that we used secondary data, so the validation data is not as good as it would be if we had used primary data. As a result, there are a large number of individuals who were not recorded and must be excluded, and the researchers did not conduct an analysis of the severity of disease or consider the mode of nutritional intake, whether enteral or parenteral. The results of this study can be used to predict nutritional status using full feeding in pediatric patients and as a guide for providing enteral nutrition to critically ill children as early as possible to improve outcomes and length of stay in pediatric patients.

## CONCLUSION

Nutritional status and full feeding are associated with an increased risk of mortality in pediatric patients.

## AUTHOR CONTRIBUTION

All authors are responsible for the publication of this research, from preparing the research concept framework, data collection, data analysis, and data interpretation in the form of research reports.

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## CONFLICT OF INTEREST

None

## ETHICAL STANDARD

This research has obtained ethical clearance from the *Unit Penelitian dan Pengembangan (Litbang)* Medical Faculty of Udayana University/Sanglah Hospital No: LB.02.01/XIV.2.2.2/39085/2022 as well as a research permit at Sanglah Hospital Denpasar with Number: LB.02.01/XIV.2.2.2/39085/2022.

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