

The Relationship Between Anemia and Nutritional Status with the Occurrence of Fatigue in Children with Cancer Undergoing Chemotherapy at Dharmais Cancer Hospital in Jakarta

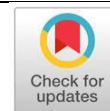
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Abstract

Background: The challenge of fatigue significantly affects children undergoing cancer treatment, impacting their overall well-being and quality of life. Unlike their healthy counterparts, pediatric cancer patients grapple with the demanding impacts of chemotherapy, leading to anemia and nutritional deficiencies that exacerbate fatigue. Beyond fatigue, chemotherapy alters appetite, nutrient utilization, and mental function. Fatigue's multidimensional impact, marked by reduced energy and increased need for rest, can detrimentally affect the quality of life for pediatric patients. Understanding these challenges is essential for devising tailored strategies that comprehensively address the unique needs of children undergoing cancer treatment, enhancing their overall well-being and quality of life.

Objective: This research aims to determine the relationship between anemia and nutritional status with the occurrence of fatigue in children with cancer undergoing chemotherapy at Dharmais Cancer Hospital in Jakarta.

Method: An analytical cross-sectional study conducted in August 2022 included a sample of 24 children selected through accidental sampling. Demographic and disease characteristics, such as age, gender, cancer type, cancer stage, and treatment duration, were collected through a questionnaire. Anemia was determined by hemoglobin levels (<12 mg/dl), and nutritional status was assessed using Body Mass Index. Fatigue was measured with tailored instruments for different age groups: the Parent Fatigue Scale (PFS) for children under 7 years and the Child Fatigue Scale (CFS) for those aged 7 years and older. Statistical analyses included univariate assessment, bivariate analysis with the chi-square test, and logistic regression.

Result: Demographic analysis revealed a predominantly male sample (70.8%) with a significant adolescent presence (41.7%) and a prevalence of leukemia (37.5%). Most participants were in early cancer stages (58.3%), undergoing treatment for over a year (62.5%). Anemia was common (54.2%), and 58.3% were underweight. High fatigue prevalence was observed (62.5%). Chi-square analysis found no significant gender or cancer stage differences in fatigue. Age and treatment duration showed no significant associations with fatigue. Logistic regression revealed a significant association between anemia and fatigue in the first model ($p = 0.022$, Exp. B = 0.104). The second model, incorporating nutritional status, showed a non-significant relationship with anemia but a notable association with normal nutritional status and fatigue ($p = 0.022$, Exp. 0.059). It underscores the crucial role of nutritional interventions in mitigating fatigue.

Conclusion: This study highlights a significant relationship between anemia and nutritional status with fatigue in children undergoing chemotherapy. These findings underscore the importance of considering anemia and nutritional interventions when providing care to pediatric cancer patients undergoing chemotherapy. Nurses play a vital role in addressing these concerns and enhancing the overall well-being of children with cancer.

INTRODUCTION

Cancer has emerged as a significant global non-communicable disease, presenting a pressing public health challenge, notably in Indonesia (Hasanah & Mardiyana, 2023). The rising incidence of cancer in children, ranking as the second leading cause of mortality after accidents, highlights the need for a profound understanding of its consequences. Childhood cancer constitutes about 4% of global cancer cases, with approximately 14,000 new cases annually in Indonesia, contributing to 10% of childhood mortality (Utami et al., 2020; WHO, 2020; Yayasan Onkologi Anak Indonesia, 2023; Ministry of Health, 2021).

Chemotherapy, a prevalent cancer treatment, is linked to various side effects, prominently fatigue, nausea, vomiting, and bone marrow suppression (Kudubes et al., 2019). Among pediatric cancer patients, cancer-related fatigue is pervasive, affecting 36% to 93% of cases, with a higher prevalence during chemotherapy, impacting 70% to 100% of cases (da Silva et al., 2016). This fatigue significantly influences physical and psychosocial well-being, affecting energy levels, cognitive functions, and overall quality of life (Mahdizadeh et al., 2020; Khalili et al., 2023; Lima et al., 2023).

In the past, healthcare providers perceived fatigue in children undergoing cancer therapy as a subjective and non-life-threatening element of treatment (da Silva et al., 2016; Keener, 2018). However, contemporary research reveals the enduring consequences of inadequately managed fatigue. It extends beyond treatment, impacting the child's overall quality of life, growth, memory, and learning abilities and contributing to mental health challenges, even in survivors (Mahdizadeh et al., 2020; Nunes et al., 2017; Nurhidayah et al., 2020). This evolving understanding emphasizes the critical importance of recognizing and addressing fatigue in pediatric cancer patients beyond its immediate context.

The complexity of fatigue in pediatric cancer patients necessitates a comprehensive understanding of its multifactorial contributors. Various factors have been identified, including

cancer type, sleep disturbances, hemoglobin levels, psychological considerations, nutritional problems, and the impact of radiotherapy (Allenidekania et al., 2012; Yilmaz et al., 2016). Anemia and nutritional status emerge as pivotal determinants in the occurrence and severity of fatigue, with hemoglobin levels singled out as a significant contributing factor (Utami et al., 2020). Recognizing these interconnected medical, psychological, and treatment-related factors provides valuable insights for effectively managing fatigue in children undergoing cancer therapy.

Moreover, it is crucial to differentiate between fatigue attributed to the cancer itself and fatigue induced by chemotherapy to develop targeted intervention strategies. Chemotherapy introduces challenges, including alterations in taste and smell, significant weight loss, and disruptions in nutritional intake. This complexity is heightened by the release of cytokines and hormonal changes, leading to compromised nutrition and energy depletion (Grain et al., 2023; Yu et al., 2017). These chemotherapy-induced factors contribute to the intricate interplay between treatment-related side effects and the overall well-being of pediatric cancer patients, necessitating a precise approach to address their unique challenges.

Given the complexity of these interactions, this study seeks to explore the relationship between anemia, nutritional status, and the occurrence of fatigue in children undergoing chemotherapy at Dharmais Cancer Hospital in Jakarta. This investigation aims to contribute valuable insights to the understanding and management of fatigue in pediatric cancer patients, addressing a critical knowledge gap and providing a foundation for more targeted and effective interventions. The study will employ an analytical cross-sectional design to comprehensively examine the intricate connections between anemia, nutritional status, and fatigue, thereby enhancing our understanding of these factors and their collective impact on the well-being of pediatric cancer patients undergoing chemotherapy.

METHOD

Design and Sampling

The research design employed in this study is a descriptive correlation study. This research was conducted in the pediatric ward of Dharmais Cancer Hospital from August to December 2023. The sample consisted of 24 children with cancer undergoing chemotherapy, with inclusion criteria that patients and parents were willing to be respondents, and the children had no severe comorbidities. The participant age range for this study encompassed children from zero years to 18 years old. The screening process for participant selection involved a comprehensive review of medical history, consultation with healthcare professionals, and examination of relevant medical records. This rigorous screening aimed to ensure that selected participants were representative of the intended population and that other major health concerns did not unduly influence the study's focus on chemotherapy-related fatigue. This study aims to describe and analyze the correlation between various variables. However, due to the limitation of sample size inherent to the availability of cancer patients, statistical power analysis using the X^2 test was conducted. With a sample size of 24 and a medium effect size of 0.3, the power analysis indicated a power of 0.40. Despite the small sample size, this study aims to provide valuable insights into the fatigue experienced by children undergoing chemotherapy.

Measurement

Several instruments were utilized in this study, including a questionnaire on demographic and disease characteristics that encompassed age, gender, cancer type, cancer stage, and duration of treatment since the first diagnosis. Anemia was assessed through hemoglobin values, categorizing participants as anemic if the result was less than 12 mg/dl. Nutritional status was calculated based on Body Mass Index, derived from measurements of body weight and height. The instruments employed to assess the occurrence of fatigue were specifically selected to cater to different age groups. For children under 7 years old, the Parent Fatigue Scale (PFS) was utilized. The Parent Fatigue Scale is a structured questionnaire designed to capture and quantify parental observations of fatigue-related behaviors and symptoms in their young children. In contrast, for children aged 7 years and older, the Child Fatigue Scale (CFS) was implemented

(Mahdizadeh et al., 2020). The Child Fatigue Scale is a validated instrument tailored to measure and evaluate fatigue directly in older children. It comprises a series of age-appropriate questions and self-reporting mechanisms that allow children to express their experiences of fatigue. These instruments were selected to ensure a comprehensive and age-sensitive approach to fatigue assessment within the pediatric population undergoing chemotherapy. By employing both the Parent Fatigue Scale and the Child Fatigue Scale, the study aims to capture a nuanced understanding of fatigue experiences in children across different developmental stages, thus enriching the depth and accuracy of the findings.

Data Analysis

By utilizing descriptive statistics, the study summarizes key participant characteristics, such as age, gender, cancer type, cancer stage, duration of treatment since the first diagnosis, anemia status, nutritional status, and the occurrence of fatigue. The presence or absence of fatigue, evaluated as a binary outcome, was determined through responses obtained from the Fatigue Scale. In investigating relationships, chi-square analysis was employed to explore associations among anemia, nutritional status, and the occurrence of fatigue. The chi-square test evaluates independence within categorical variables, including anemia status, nutritional status, and the presence of fatigue. Subsequent to descriptive statistics and chi-square analysis, logistic regression was used to explore the relationship between anemia, nutritional status, and fatigue likelihood while considering potential confounding variables. This approach offers nuanced insights into the factors influencing fatigue, extending beyond descriptive and chi-square analyses. Results were interpreted in the context of study objectives and limitations, enhancing our understanding of fatigue dynamics in children undergoing chemotherapy.

Ethical consideration

Ethical approval for this study was obtained from the Ethics Review Board of KEPK Universitas Indonesia Maju, with reference number 4743/Sket/Ka-Dept/RE/UIIMA/VI/2022. This approval ensures adherence to ethical guidelines, participant confidentiality, and voluntary informed consent.

RESULT

Demographic & Disease Characteristics of Participants

The characteristics of children with cancer undergoing chemotherapy at Dharmais Cancer Hospital in Jakarta in this study were predominantly male ($n = 17$, 70.8%). In terms of age, a significant proportion comprised adolescents, accounting for 41.7% ($n = 10$). The most common type of cancer was leukemia, representing 37.5%. In terms of the cancer stage, the majority were in the early stages ($n = 20$, 58.3%). Regarding the duration of treatment since the first diagnosis, a substantial portion has undergone treatment for at least one year or more, constituting 62.5% ($n = 15$). In terms of hemoglobin levels, the majority of the children experienced anemia at 54.2%. In terms of Body Mass Index (BMI), a significant proportion was underweight at 58.3%. Regarding the occurrence of fatigue, the majority of children complained of fatigue, with a prevalence of 62.5% (See Table 1).

Relationship Between Demographic and Disease Characteristics with Fatigue

The chi-square analysis explored the connection between demographic factors (gender, age, cancer stages, and duration of treatment since the first diagnosis) and fatigue status in pediatric cancer patients (Table 2). Notably, 64.7% of male children experienced fatigue, while 52.7% of females reported fatigue. Conversely, 35.4% of males and 42.8% of females did not experience fatigue. However, the p-value for the association between

gender and fatigue was 1.000, indicating a lack of statistical significance. Although the percentage of male children experiencing fatigue appears higher than that of females, this difference is not statistically significant.

In the context of cancer stages, our analysis revealed distinct patterns of fatigue occurrence among pediatric cancer patients. Specifically, 65% of children in the early stage experienced fatigue, contrasting with 50% in the late stage who reported similar experiences. Conversely, 50% of those in the late stage did not experience fatigue, while 35% of those in the early stage were also non-fatigued. The p-value associated with the comparison of cancer stages and fatigue was found to be 0.615. Meanwhile, the percentage of children experiencing fatigue appears higher in the early stage compared to the late stage. This difference does not reach statistical significance at the chosen significance level.

Furthermore, there is no statistical significance in the association of age and duration of treatment since the first diagnosis with fatigue based on the chi-square analysis, with p-values of 0.210 and 0.675, respectively. Consequently, if the bivariate analysis does not reveal a significant association of these variables with fatigue occurrence as the dependent variable, they will not be included in further multivariate analyses.

Table 1. Characteristics of Children with Cancer Undergoing Chemotherapy at Dharmais Cancer Hospital Jakarta (N= 24)

Variable(s)	Frequency (n)	Percentage (%)
Gender		
Male	17	70.8
Female	7	29.2
Age		
Early Childhood (0 to 6 years old)	6	25.0
Middle Childhood (7 to 12 years old)	8	33.3
Adolescents (13 to 18 years old)	10	41.7
Type of Cancer †		
Leukemia (ALL, AML, CML)	9	37.5
Lymphoma (HL, DLBCL)	3	12.5
Sarcoma (OS, ES)	4	16.7
Solid Tumor (KnF, NB, EPN, OC, GTC)	8	33.3
Cancer Stages		
Early Stage (stage 0 – 2)	20	83.3
Late Stage (stage 3 – 4)	4	16.7
Duration of Treatment Since First Diagnosis		
Less than 1 year	9	37.5%
≥ 1 year	15	62.5%
Anemia		
Yes	13	54.2
No	11	45.8
Body Mass Index (BMI)		
Underweight	14	58.3
Normal	10	41.7
Occurrence of Fatigue		
Yes	15	62.5
No	9	37.5
Total	24	100

Note: † types of cancer: Acute Lymphoblastic Leukemia (ALL), Acute Myeloid Leukemia (AML), Osteosarcoma (OS), Hodgkin Lymphoma (HL), Nasopharyngeal Carcinoma (Knf), Neuroblastoma (NB), Ependymoma (EPN), Chronic Myeloid Leukemia (CML), Diffuse Large B-cell lymphoma (DLBCL), Germ Cell tumor (GCT), Ovarian Cancer (OC), Ewing Sarcoma (ES)

Table 2. Relationship Between Demographic and Disease Characteristics with Fatigue (N=24)

Variables	Fatigue Occurrence				Total		P value
	No		Yes		n	%	
	n	%	n	%			
Gender							
Male	6	35.3	11	64.7	17	100.0	1.000
Female	3	42.8	4	57.2	7	100.0	
Age							
Childhood (0 to 12 years old)	7	50.0	7	50.0	14	100.0	0.210
Adolescents (13 to 18 years old)	2	20.0	8	80.0	10	100.0	
Cancer Stages							
Early Stage	7	35	13	65	20	100.0	0.615
Late Stage	2	50	2	50	4	100.0	
Duration of Treatment Since First Diagnosis							
Less than 1 year	5	45.4	6	54.6	11	100.0	0.675
≥ 1 year	4	30.7	9	69.3	13	100.0	

Note: The analysis was conducted using the chi-square test and Fisher's exact test for cells with counts less than 5

Relationship Between Anemia, Nutritional Status, and Fatigue among Children with Cancer Undergoing Chemotherapy

Logistic regression analysis aims to uncover the intricate relationship between anemia, nutritional status, and fatigue in children undergoing chemotherapy (Table 3). The inclusion of nutritional status as a variable was pivotal in revealing its potential significance in the occurrence of fatigue.

In the first model, logistic regression indicated a statistically significant relationship between anemia and fatigue (B = -2.264, p = 0.022, Exp. B = 0.104). Compared to the anemia group, individuals with unanemia had a lower odds (approximately 10.4% lower) of experiencing fatigue. The negative coefficient (B = -2.264) signified an inverse association. For those with higher hemoglobin scores (unanemia), the likelihood of fatigue occurrence decreased compared to those with anemia.

In the second model, introducing 'nutritional status' insignified the relationship between anemia and fatigue. However, an interesting observation emerged—revealing a notable association between normal nutritional status and fatigue (B = -2.831, p =

0.022, Exp. 0.059). Individuals with a normal nutritional status had lower odds (approximately 5.9% lower) of experiencing fatigue. The negative coefficient (B = -2.831) indicated a negative correlation. In summary, for patients with normal nutritional status, the likelihood of fatigue occurrence decreased.

The p-value of 0.022 signified statistical significance, emphasizing the relevance of nutritional status in influencing fatigue in children with cancer undergoing chemotherapy, even after considering anemia. It suggests that nutritional interventions may play a crucial role in mitigating fatigue. The initial model, where the relationship between anemia and fatigue seemed significant, revealed that nutritional factors could significantly contribute to observed fatigue levels. The interplay of variables, especially between anemia and nutritional status, introduced complexity. The inclusion of nutritional status in the logistic regression model was crucial to disentangle their effects, allowing for a nuanced understanding of their unique contributions to fatigue in children undergoing chemotherapy.

Table 3. Logistic Regression Analysis of the Relationship Between Anemia and Nutritional Status and the Occurrence of Fatigue in Children with Cancer Undergoing Chemotherapy (N=24)

Variable	Model 1					Model 2				
	B	SE	Wald	P value	Exp (B)	B	SE	Wald	P value	Exp (B)
Anemia Status (No/Yes)	-2.264	.992	5.212	.022	.104	-2.477	1.268	3.815	.051	.084
Nutritional Status (Normal/Underweight)						-2.831	1.259	5.054	.025	.059

Note: anemia Hb value less than 12; Underweight: BMI less than 18.5

DISCUSSION

Demographic and Disease Characteristics

The demographic and disease characteristics of the participants in this study offer valuable insights into the population of children undergoing chemotherapy at Dharmais Cancer Hospital in Jakarta. The results indicated that a predominant representation of male participants was observed, constituting 70.8% of the study population. Adolescents comprised 41.7% of the participants, emphasizing potential unique challenges during

cancer treatment. Their dietary habits, including preferences and irregular eating patterns, can influence nutritional status, potentially impacting energy levels and contributing to fatigue. In addition, adolescents undergoing cancer treatment experience heightened fatigue due to a combination of treatment-related factors, cancer-related symptoms, and age-specific lifestyle challenges (Erickson et al., 2010). Treatment disruptions, sedating drugs, and morning chemotherapy impact their developing bodies, intensifying fatigue. Cancer

symptoms like pain and sleep disturbances are more challenging during rapid physical and emotional growth. Adolescent lifestyles, marked by high activity levels and social engagement, contribute to overexertion.

The distribution of cancer types revealed leukemia as the most prevalent, comprising 37.5% of cases. This distribution is indicative of the diverse range of cancers treated at the hospital, underscoring the need for a comprehensive understanding of the factors influencing fatigue across various cancer types. Leukemia, a blood and bone marrow cancer, frequently causes fatigue due to disruptions in blood cell production, leading to anemia. The disease, along with treatments like chemotherapy, impacts red blood cells, which are essential for carrying oxygen. This dual effect significantly contributes to the fatigue experienced by leukemia patients (Fetriyah, 2020).

While the majority of participants were diagnosed at an early stage (58.3%), this study revealed a higher incidence of fatigue in the early-stage group, although the difference is not statistically significant. It suggests a potential association between disease progression and increased fatigue levels. The duration of a treatment since the first diagnosis is a crucial aspect of the participant's medical history. A substantial proportion of children had undergone treatment for at least one year or more, representing 62.5%. This finding underscores the chronic nature of cancer treatment among this population and highlights the need to explore the long-term effects of fatigue.

By investigating the hematological impact of chemotherapy on children, this study assessed hemoglobin levels as a key indicator of anemia. The results were compelling, indicating that a substantial 54.2% of children undergoing chemotherapy experienced anemia. This finding holds significant clinical relevance as anemia can lead to fatigue, weakness, and decreased overall well-being. The prevalence of anemia observed in our study aligns with existing literature on the broader impact of cancer and chemotherapy on hematological parameters in pediatric patients. (Hooke & Linder, 2019; Nunes et al., 2017).

In this study, an analysis of the Body Mass Index (BMI) distribution underscored a significant finding,

with 58.3% of participants falling into the underweight category. It highlights potential nutritional challenges that individuals undergoing treatment may face, particularly those who have undergone chemotherapy. The prevalence of underweight status not only points to existing nutritional concerns but also suggests a correlation with the possibility of nutrition disturbances stemming from the impact of chemotherapy on dietary habits and absorption.

Relationship Between Anemia and Fatigue in Children Undergoing Chemotherapy

The study highlights a robust connection between anemia and fatigue in children undergoing cancer chemotherapy, extending its impact into post-treatment phases. Consistent with prior research (Hendrawati et al., 2019), fatigue persists in both actively treated and post-treatment children, with hemoglobin levels serving as a key indicator (Utami et al., 2020).

Chemotherapy, a cornerstone of cancer treatment, plays a pivotal role in shaping this association. The myelosuppressive nature of chemotherapy directly impacts the bone marrow's ability to produce blood cells, including red blood cells essential for oxygen transport. This disruption in erythropoiesis contributes to anemia, further intensifying the fatigue experienced by children undergoing treatment (Hockenberry et al., 2017; Uzun and Kucuk, 2019; SHussien et al., 2023).

Cancer-related anemia (CRA) unfolds as a complex interplay involving anemia consequent to cancer (ASC), chemotherapy-induced anemia (CIA), and anemia linked with hematopoietic malignancies. ASC, triggered by malignancy invasion, radiation, or chemotherapy, involves processes such as blood loss, marrow infiltration, and inflammation, contributing to fatigue. The nuanced understanding of these anemia subtypes emphasizes the intricate relationship with fatigue.

Diminished hemoglobin levels, influenced by both the direct impact of chemotherapy and cancer cell actions, substantiate the correlation with fatigue in children undergoing chemotherapy. Recognizing this association is crucial, as timely intervention becomes imperative to prevent a significant compromise in the children's quality of life.

Relationship Between Nutritional Status and Fatigue in Children Undergoing Chemotherapy

Exploring the intricate relationship between nutritional status and fatigue in children undergoing chemotherapy involves unraveling the molecular mechanisms influenced by tumor necrosis factor alpha (TNF α) and interleukins. These cytokines, pivotal in the body's response to inflammation, play a crucial role in hunger regulation.

TNF α , a proinflammatory cytokine produced by immune cells, is recognized for its role in cancer treatment, including the potential to suppress tumor cell proliferation and induce regression (Cherwin, 2012). However, elevated TNF α levels in response to cancer and its treatment can lead to unintended consequences. Together with interleukins, TNF α stimulates the hypothalamus—a key regulatory center—to alter hunger perception and control, resulting in reduced appetite and an increased feeling of fullness (Ben-Baruch, 2022).

In the context of children undergoing chemotherapy, the impact of TNF α and interleukins on hunger regulation becomes pivotal. Chemotherapy triggers an inflammatory response, elevating levels of these cytokines. Consequently, dysregulation in hunger signals contributes to decreased food intake, weight loss, and nutritional imbalances in pediatric cancer patients (Cherwin, 2012; Ben-Baruch, 2022).

This multifaceted interplay between inflammatory cytokines, hunger regulation, and nutritional status adds complexity to the challenges faced by children during chemotherapy. Changes in appetite and dietary patterns directly influence the overall nutritional status of these young patients. Recognizing and addressing these underlying mechanisms are essential for designing comprehensive interventions that not only alleviate fatigue but also optimize nutritional well-being in the pediatric oncology setting. The studies by Cherwin (2012) and Ben-Baruch (2022) significantly contribute to our understanding of these intricate pathways, guiding the development of more targeted strategies to support children undergoing chemotherapy.

Additionally, our findings echo those of Yasih et al. (2021), underscoring a substantial association between nutritional status and fatigue in pediatric cancer patients undergoing chemotherapy. Weight loss, metabolic imbalances, and treatment-induced side effects collectively contribute to fatigue, necessitating a holistic approach to address these challenges (Hendrawati et al., 2019; Ismuhu et al., 2020).

Despite the indispensable role of chemotherapy in cancer treatment, its unintended impact on nutritional status adds complexity to this relationship. Chemotherapy-induced side effects such as nausea, vomiting, and mucositis can lead to decreased oral intake, directly affecting overall nutrition. Additionally, the inflammatory response triggered by chemotherapy, coupled with alterations in taste perception, further contributes to the challenge of maintaining adequate nutritional intake (Astriani, 2019).

Considering the aftermath of chemotherapy, diminished nutritional status or low BMI, influenced by cancer-related complications, emerges as a key contributor to decreased energy and protein intake, ultimately adversely affecting the overall quality of life for these children. This integrated understanding of the interplay between chemotherapy, nutritional status, and fatigue underscores the need for comprehensive interventions to optimize nutrition and alleviate fatigue in pediatric cancer patients undergoing chemotherapy.

Integrated Relationship Between Anemia, Nutritional Status, and Fatigue

Through logistic regression analysis, we identified the complex relationship between anemia, nutritional status, and fatigue in children undergoing chemotherapy, offering a comparative perspective with previous studies.

By building upon existing literature, our study reinforces the association between anemia and fatigue in children undergoing chemotherapy (Hendrawati et al., 2019; Fernandes et al., 2020). However, the introduction of nutritional status as a variable shifts the narrative. The non-significant relationship between anemia and fatigue in the

presence of nutritional status unveils a compelling association between normal nutritional status and reduced fatigue. The statistical significance underscores the importance of nutritional status in impacting fatigue among these children, even when considering anemia. It not only aligns with previous research but also emphasizes the need for tailored nutritional interventions to mitigate fatigue effectively. Our integrated analysis advances our understanding of these complex relationships, contributing to a more detailed approach to enhancing the overall well-being of children undergoing chemotherapy.

Limitation of The Study

The limitation of this study is twofold. Firstly, the small sample size is inherent to the availability of cancer patients. Statistical power analysis, conducted using the X^2 test, revealed a sample size of 24 with a medium effect size of 0.3, resulting in a power of 0.40. Despite this constraint, the study endeavors to provide valuable insights into the fatigue experienced by children undergoing chemotherapy. Secondly, the variance in cancer types among the participants may influence the results, as different cancers and their treatments can impact fatigue differently. The primary aim of this research is to describe and analyze the correlation between various variables, with an awareness that both the small sample size and the variability in cancer types may impact the generalizability of the findings to a broader population. Additionally, it is essential to note that this study, while assessing fatigue on a scale, would benefit from being supported by objective data explaining fatigue complaints in children with cancer undergoing chemotherapy at Dharmas Cancer Hospital Jakarta.

CONCLUSION

In conclusion, our study explored the relationships among anemia, nutritional status, and fatigue in children undergoing chemotherapy. While the initial significance of the anemia-fatigue link diminished when nutritional status was considered, a compelling association emerged between normal nutritional status and reduced fatigue. Children with normal nutritional status exhibited a statistically significant, approximately 5.9% lower likelihood of experiencing fatigue compared to those with other nutritional statuses. These findings emphasize the

need to integrate nutritional considerations into fatigue management strategies for pediatric cancer patients.

This study suggests avenues for future research, emphasizing the importance of investigating specific nutritional factors influencing fatigue in this population. Longitudinal studies could uncover dynamic patterns, guiding personalized interventions. Evaluating the impact of nutritional interventions on treatment tolerance and overall well-being is crucial for enhancing comprehensive patient care. These insights pave the way for a holistic approach to managing fatigue in children undergoing chemotherapy, integrating both anemia and nutritional status considerations for more effective interventions.

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