Analysis of the Relationship between Sleep Environment and Sleep Quality in Children with Cancer in the Chemotherapy Phase

Nita Priyanti[1], Retno Palupi Sedyowati[2]
[1,2]Universitas Panca Sakti Bekasi, Indonesia
Email: nitapriyanti@panca-sakti.ac.id

Abstract

The study was conducted to analyze the relationship to find out whether there is a correlation between the sleep environment and sleep quality of children with cancer in the chemotherapy phase. The results of this study will help determine the steps to be taken to improve the bed environment and improve the quality of sleep of children with cancer in the chemotherapy phase. In this study, the method that will be used to conduct research is quantitative research, because it tests hypotheses using certain statistical analysis tools. Quantitative data is statistical data in the form of numbers, both directly extracted from research results and the results of processing qualitative data into quantitative data. This study found that sleep environment and children's sleep quality have a significant relationship. The results show that a good sleep environment, including a comfortable temperature, low noise, and dim lighting, contributes to better sleep quality in children. In addition, other factors such as the comfort of the bed and a regular sleep schedule also affect the quality of a child's sleep.

Keywords: *Sleep Environment, Sleep Quality, Children with Cancer, Chemotherapy Phase.*

A. INTRODUCTION

The incidence rate of sleep disturbances in cancer patients is 30% to 93.1%, which is higher than 9% to 33% in the general population (Bastien et al., 2001; Lin et al., 2013; Miaskowski et al., 2011). Cancer itself and cancer treatment are possible factors contributing to sleep disturbances (Costa et al., 2014; Enderlin et al., 2013; Langford et al., 2012; Qin et al., 2015; Scarpa et al., 2014). Indeed, simultaneous symptoms (eg, fatigue, pain and distress) increase the rate of sleep disturbance (Lin et al., 2013; Lipschitz et al., 2015; Zick et al., 2016). Because of the importance of sleep, more and more attention is being paid to evaluating effective measures of sleep quality.

Chemotherapy is a cancer treatment therapy that can inhibit the growth and kill cancer cells (Di Saia et al., 2017). Treatment options through chemotherapy cause many side effects such as nausea and vomiting, fatigue, anxiety, and can even experience sleep disturbances (Gedaly-Duff et al., 2006). The results of research by the American Society of Clinical Oncology show that about 52% of cancer patients report difficulty sleeping due to insomnia. Some 58% reported that their cancer caused worsening of sleep quality. Cancer patients complain that it is difficult for them to fall asleep, get deep sleep, and feel tired in the morning (Phoolcharoen et al., 2021).

The children and their mothers had poor sleep quality in the pediatric ward. This can affect a child's behavior, recovery and pain tolerance. Lack of sleep adds to

the burden and stress of parents. Sound levels increase significantly in hospitals and can lead to sleep deprivation. Reducing noise levels can improve sleep quality, affect the quality of stay of parents and children (Rosanna et al., 2018)

The sleep environment includes regular bedtime and wake times, limiting noise and light levels, maintaining room comfort and body temperature, avoiding caffeine/alcohol/nicotine intake before going to bed, and maintaining a healthy diet with exercise (Hoyt et al., 2021; Radek, 2012).

Studies conducted to analyze this relationship will help to find out whether there is a correlation between the bed environment and sleep quality of children with cancer in the chemotherapy phase. The results of this study will help to determine the steps to be taken to improve the bed environment and improve the quality of sleep of children with cancer in the chemotherapy phase.

Thus, analysis of the relationship between bed environment and sleep quality of children with cancer in the chemotherapy phase will help to improve the quality of life of patients and help them to overcome the sleep quality problems they face during the chemotherapy phase. This will help them to feel better and have enough energy to go about their daily lives and speed up their healing process.

B. METHOD

In this study, the method that will be used to conduct research is quantitative research, because it tests hypotheses using certain statistical analysis tools. Quantitative data is statistical data in the form of numbers, both directly extracted from research results and the results of processing qualitative data into quantitative data (Sujarweni Wiratna, 2015). Quantitative research is a study whose analysis generally uses statistical analysis. Therefore, in quantitative research the measurement of the symptoms of interest is important, so data collection is carried out using a structured questionnaire which is compiled based on measurements of the variables studied which then produce quantitative data (Duli, 2019).

The research sample is children with cancer who are in Rumah Kita, a choice of residence for patients who are less fortunate and feel that they live far from a cancer therapy center. A total of 47 children in the March 2023 period who stopped by became respondents to the research sample using the CHSQ (Child Habit Sleep Questionnaire) questionnaire.

C. RESULTS AND DISCUSSION

1. Test Average Variance Extracted (AVE)

In this study, the AVE value and the AVE square root for each construct are presented in table 1.

Table 1. Average Variance Extracted (AVE) Value

	Average Variance Extracted (AVE)
Sleep Quality	0.577
Sleep Environment	0.504

From table 1 it is known that the AVE value of each construct is above 0.5. Therefore there is no problem with convergent validity in the model being tested so that the constructs in this research model can be said to have good discriminant validity.

Convergent validity can also be seen from the Average Variance Extracted (AVE) value. In this study, the AVE value of each construct was above 0.5. Therefore there is no problem of convergent validity in the model being tested.

2. Test Discriminant Validity

Table 2 below shows the results of the discriminant validity of the research model by looking at its cross loading value.

Table 2. Discriminant Validity Values

	Sleep Quality	Sleep Environment
X1.1	0.464	0.655
X1.10	0.475	0.651
X1.12	0.516	0.608
X1.14	0.454	0.660
X1.15	0.476	0.655
X1.16	0.431	0.652
X1.17	0.407	0.687
X1.18	0.448	0.666
X1.19	0.426	0.735
X1.20	0.481	0.718
X1.21	0.461	0.665
X1.22	0.532	0.746
X1.23	0.630	0.792
X1.24	0.582	0.766
X1.25	0.485	0.707
X1.26	0.656	0.733
X1.27	0.730	0.786
X1.28	0.623	0.767
X1.29	0.622	0.757
X1.30	0.662	0.786
X1.31	0.545	0.736
X1.32	0.684	0.812
X1.33	0.607	0.696
X1.34	0.549	0.685
X1.35	0.636	0.765
X1.36	0.515	0.627
X1.37	0.624	0.681
X1.38	0.650	0.725
X1.39	0.690	0.715
X1.40	0.726	0.678
X1.42	0.769	0.754
X1.9	0.479	0.573

Y1	0.793	0.731
Y10	0.717	0.704
Y11	0.739	0.617
Y12	0.745	0.600
Y13	0.738	0.662
Y14	0.731	0.640
Y15	0.770	0.630
Y16	0697	0.636
Y17	0.694	0.463
Y18	0.718	0.514
Y19	0.798	0.578
Y2	0.709	0.601
Y20	0.682	0.518
Y21	0.674	0.525
Y22	0.788	0.608
Y23	0.762	0.531
Y24	0.733	0.595
Y25	0.763	0.549
Y3	0.863	0.688
Y4	0.827	0.693
Y5	0.813	0.693
Y6	0.771	0.683
Y7	0.797	0.586
Y8	0.854	0.726
Y9	0.777	0.526

From the results of the estimated cross loading in table 3, it shows that the loading value of each indicator item on the construct (X1, Y) is greater than the cross loading value.

Thus it can be concluded that all constructs or latent variables already have good discriminant validity , where the indicators in the construct indicator block are better than indicators in other blocks.

3. Composite Reliability Test

Output results for composite reliability and cronbach alpha values can be seen from table 3 below:

Table 3. Composite Reliability Value

	Composite Reliability
Sleep Quality	0.971
Sleep Environment	0.970

Table 3 shows that the composite reliability value for all constructs is above the value of 0.7. Thus, it can be concluded that all constructs have good reliability according to the required minimum value limit.

4. Cronbach Alpha test

The construct is declared reliable if the Cronbach alpha value is greater than 0.7.

Table 4. Cronbach Alpha Value

	Cronbach Alpha
Sleep Quality	0969
Sleep Environment	0968

Table 4, the model shows the Cronbach alpha value for all constructs is above the value of 0.7. Thus, it can be concluded that all constructs have good reliability according to the required minimum value limit.

5. R^2 Analysis

The value of R^2 indicates the degree of determination of the exogenous variable towards its endogen. The greater the R^2 value , the better the level of determination.

Table 5. R Square Value

	R Square	Adjusted R Square
Sleep Quality	0.664	0.660

The results of calculating R^2 for each endogenous latent variable in table 5 show that the value of R^2 is in the range of 0.664. Based on this, the results of the calculation of R^2 show that R^2 is very high (0.664-0.660). Because the Adjusted R Square is more than 66%, the effect of all exogenous constructs X on Y is moderate.

6. Q^2 analysis

To calculate Q^2, the formula can be used:

Q2 = 1-(1-0.664)(1-0.660)
Q2 = 1-(0.336) (0.34)
Q2 = 1-(0.11424)
Q2 = 0.88576

Q^2 calculation show that the Q^2 value is 0.88576. According to Ghozali (2014), the Q^2 value can be used to measure how well the observed values are generated by the model and also the parameter estimates. A Q^2 value greater than 0 (zero) indicates that the model is said to be good enough while a Q^2 value less than (zero) indicates that the model lacks predictive relevance. In this research model, the construct or endogenous latent variable has a large Q^2 value of more than 0 (zero) so that the predictions made by the model are relevant.

7. F^2 Analysis

Table 6. Results of F^2 for Effect Size

	Sleep Quality	Sleep Environment
Sleep Quality		
Sleep Environment	0.975	

Based on these criteria, it can be stated that the relationship between innovative leadership and educator performance has a very large F^2 (0.975).

8. Bootstrapping Test (Hypothesis)

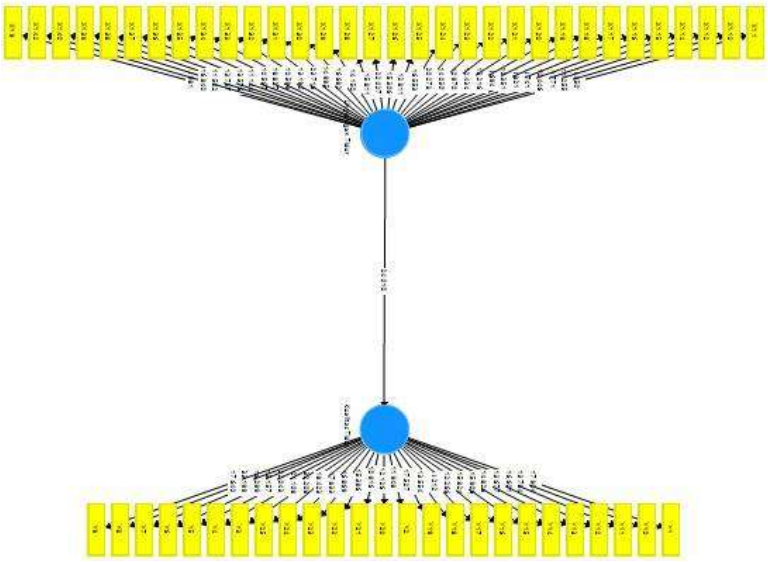

Figure 1 Path of Bootstrapping /Hypothesis Testing

Meanwhile, the calculation results can be seen based on direct, indirect and total relationships.

Table 7. Direct Relationship

	Original Sample	Sample Average (M)	Standard Deviation (STDEV)	T Statistics	P Values
Sleep Environment -> Sleep Quality	0.168	0.160	0.057	2,962	0.003

Table 7 shows the results of the PLS calculation which states a direct relationship between variables. It is said that there is a direct relationship if the p-value is < 0.05 and it is said that there is no direct relationship if the p-value is > 0.05. Based on table 7, it can be stated that the sleep environment affects the sleep quality variable with a P-Value of 0.003 <0.05.

bootstrapping results, it can be summarized in the explanation below. The results of this study can also be seen from the results of the T-Statistic value and the probability value, if the P-Value <0.05, then this indicates that there is a significant relationship or relationship between these variables, if not significant then the P-Value > 0.05.

Most cancer patients treated with chemotherapy show poor sleep quality, this finding is consistent with previous studies (Berger et al., 2005; Dickerson et al., 2014; Hinds et al., 2007; Wang et al., 2023) . In addition, disease- and treatment-related factors, such as cancer stage, previous and current therapy, did not have a significant impact on sleep, unlike symptoms and functional or psychological status. We observed an independent association between poor sleep quality and anxiety and stress symptoms of lung cancer patients. However, the influence of depressive symptoms is attenuated by the confounding effects of other physical symptoms, highlighting the detrimental effect of symptom burden on patients' emotional states.

Activation of the hypothalamic-pituitary-adrenal axis due to increased physical and psychological stress was found to have the most pronounced effect on sleep quality of newly diagnosed cancer patients in a recent study, supporting our conclusion.

Number of nocturnal awakenings related to fatigue based on patient reports; patients who had 20 or more awakenings had significantly higher fatigue scores than those who had fewer awakenings. Nocturnal awakening was also significantly associated with sleep duration by patient and parent reports. Pediatric patients hospitalized with cancer who wake up more frequently at night are more tired and sleep longer. Implications for Nursing: Nurses may be able to control for some of the factors that contribute to nocturnal awakenings and disruption of the sleep environment that affect fatigue and sleep duration in pediatric patients hospitalized with cancer. Some quality of sleep in cancer patients before surgery. Female patients, preoperative anxiety, and confined ward environment are independent risk factors for subjective sleep disturbance.

This review shows relevant aspects of sleep quality in cancer patients undergoing chemotherapy because in this population, sleep quality has a strong impact on quality of life and can persist for years after treatment ends (Mercadante et al., 2017). Detailed understanding of factors related to sleep quality allows for larger interventions and provides multiple perspectives in providing care to improve sleep quality. Changes in sleep patterns in cancer patients have negative effects on disease prognosis, survival and treatment efficacy (Innominato et al., 2012).

All selected studies used an observational methodology, which, according to the classification of evidence from the Joanna Briggs Institute (2013), represents an intermediate level in the hierarchy of evidence. Of these studies, only two used a control group, which is a factor that adds to the robustness of the results. This is a relevant finding that reinforces the need for research with a better level of evidence and greater methodological rigor to explain the nature of the problem. Although not classified as the best evidence, observational studies are increasingly considered in health decision making, especially given that under certain conditions, intervention studies are not always feasible (Fronteira, 2013). The use of study designs with comparison groups, follow-up over multiple time periods, large numbers of participants, tight confidence intervals, etc., are characteristics of rigorous studies that are not considered by benchmarking of evidence. Therefore, the classification of evidence is contentious because of the heterogeneity and non-inclusion of these dimensions (Glasziou, Vandenbroucke, & Chalmers, 2004). However, the methodological quality of the study must be considered satisfactory according to a set of criteria. This aspect is noted in expert consensus and presented in clinical practice guidelines published by the Cancer Journey Advisory Group of the Canadian Partnership Against Cancer (Howell et al., 2013). Due to the weak evidence from studies available in the literature, these guidelines provide recommendations for prevention, screening, evaluation and treatment of sleep quality in children with cancer.

D. CONCLUSION

This study found that sleep environment and children's sleep quality have a significant relationship. The results show that a good sleep environment, including a comfortable temperature, low noise, and dim lighting, contributes to better sleep quality in children. In addition, other factors such as the comfort of the bed and a regular sleep schedule also affect the quality of a child's sleep.

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