

Research Article

The relationship between fatigue and play activities of children with acute lymphoblastic leukemia receiving chemotherapy

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ABSTRACT

Background: Children with cancer tend to have various complaints during chemotherapy. Fatigue is one of the most frequent and severe symptoms experienced by paediatric oncology patients during treatment. This study performed to analyse the correlation of fatigue to play activity in children with acute lymphoblastic leukemia (ALL) who undergo chemotherapy.

Methods: Quantitative design, correlation study using cross-sectional approach to 69 children aged within age of 2—12 years treated at Dr. Sardjito General Hospital, Yogyakarta with ALL. Data were collected using PedsQL Multidimensional Fatigue Scale instrument to quantify children’s fatigue through self-report and parent’s report. Play Performance Scale for Children was used to measure children’s play activity. Data were analyzed statistically by Spearman’s rho and Kendall’s tau nonparametric correlation tests.

Results: The total fatigue score based on children’s self-reports and parent’s reports averaged between 50 and 75. This indicates that children sometimes to almost never experience fatigue. Total score of fatigue –child self-report (70.50) was lower compared with parent’s report (70.93). Children’s play activity reported by parents was scored at 70.72. There was a significant positive correlation between children’s self-reported total fatigue score and play activity with medium correlation strength ($r=0.40$, $p=0.02$). The correlation between children’s parent-reported total fatigue score and play activity was also significantly positive with a weak correlation strength ($r=0.27$, $p=0.003$).

Conclusions: There is a positive correlation between children’s self-reported and parent-reported fatigue with play activity in children with ALL. This suggests that as the child experience less fatigue, their play activity will increase to near-normal.

Keywords: Fatigue, Child’s play activity, ALL

INTRODUCTION

Cancer as a disease that could occur in children has been increasing continuously in its incidence, and becoming a cause of mortality. It has been estimated that there will be

13.1 million of deaths occurred as a result of cancer in 2030.¹

According to Indonesian Cancer Registry System (Sistem Registrasi Kanker Indonesia/SriKanDi), cancer incidence in children aged 0—17 years was estimated to 9 cases per

100,000 children in 2005 to 2007. The proportion of cancer in children reached 4.7% from total cancer cases of all age group. The five most common cancer types suffered by Indonesian children are leukemia with 2.8 cases; retinoblastoma with 2.4 cases; osteosarcoma with 0.97 cases; lymphoma with 0.75 cases, and; nasopharyngeal cancer with 0.43 cases per 100,000 children, respectively.²

At Dr. Sardjito General Hospital, Yogyakarta, there were 159 pediatric patients diagnosed with acute lymphoblastic leukemia (ALL) from January 2004 to January 2007.³ There were 1,124 children under 18 years with newly-diagnosed cancer during 10 years (January 2000 to December 2009), with six most common diagnosis were ALL (40.6%), acute myeloblastic leukemia (13.9%), retinoblastoma (6.7%), neuroblastoma (5.5%), Wilm's tumor or nephroblastoma (4.5%) and Non-Hodgkin lymphoma (4.4%). According to age group, most children (58.2%) were diagnosed with cancer during infancy and early childhood (0—5 years).⁴ Meanwhile, data from the registry of Division of Hemato-Oncology in Dr. Sardjito General Hospital enlisted 239 pediatric patients diagnosed with cancer from January 2012 to August 2014, with 119 of them were diagnosed with ALL.

In general, ALL is treated by chemotherapy, which consists of initial induction phase at hospital for 4—6 weeks, followed by consolidation phase and maintenance phase, with total treatment duration of 2 to 3 years.^{5,6} Cancer itself and its treatment may elicit increased energy requirement in children.⁷ The highest prevalence of physical problems reported in children is cancer-related fatigue, occurring both in children who are on medication and those who already completed it.⁸ Children with ALL undergoing maintenance phase of chemotherapy had reported fatigue and sleep disorders during chemotherapy.⁹ Fatigue, nausea and pain are the most common symptoms in majority of children with cancer treated in hospital.¹⁰ Fatigue in children with cancer was reported with prevalence of 44.2% (n=73) in Jakarta.¹¹ Fatigue involves physical, emotional, cognitive and social aspects, multidimensionally. Patient's fatigue is increased during cancer treatment such as chemotherapy, radiotherapy and biotherapy.¹²

Cancer related fatigue is a subjective. National Comprehensive Cancer Network/NCCN (2008) defines cancer-related fatigue as "a distressing persistent, subjective sense of physical, emotional and/or cognitive tiredness or exhaustion related to cancer or cancer treatment that is not proportional to recent activity and interferes with usual functioning".^{13,14} Incredible fatigue and decreased physical activity and the soul at a level not normally continuously.¹⁵

Children with cancer are classified as a high risk group who tend to ignore their fatigue problem caused by cancer therapy and its adverse effects. The other reason commonly acknowledged by both patients and health

professionals is that fatigue is assumed to be a non-life-threatening, subjective feeling and an unavoidable consequence of cancer therapy.¹⁶

Without appropriate management, fatigue could reduce children's quality of life.¹³ In children who enter remission from cancer, the effects of fatigue are identified as growth disorder, reduced memory capacity, limited short-term memory (becoming forgetful), difficulties in learning, hormonal changes and complications with other diseases, including secondary cancer.¹¹ Fatigue may also become a mental health-related problem in pediatric cancer patients.¹⁸

The main activity in children is playing. It is an important aspect and a requirement in children's life. Play activity could be assessed as a parameter of performance status in children with cancer, as it enables measurement of day-to-day activity performance. In addition, play activity could be appraised effectively to review therapy result, progress of rehabilitation program and comprehensive long-term survival, as well as evaluation of functional status.^{19,20} Observed that children with illness often have limitation imposed in their activities, thus they are frequently absent from school and lacking capacity in maintaining friendship with their peers.²¹ Assessment of changes in performance could give insight to alterations in children's quality of life caused by cancer therapy and its adverse effects.²²

Despite the harm of fatigue to patients, this has not been addressed as a priority in caring patients with cancer. Nurses have not routinely assessed cancer-related fatigue in patients who undergo chemotherapy, although guides on caring patients with fatigue already exist in nursing diagnosis and procedures. The increasing prevalence of ALL in children, particularly in Yogyakarta, Indonesia, encourage us to study the correlation between fatigue and play activity in children with ALL who undergo chemotherapy

METHODS

We designed a quantitative, non-experimental correlation study using cross-sectional approach.²³

Participants

The study population was children diagnosed with ALL who underwent chemotherapy at Dr. Sardjito General Hospital from January 2012 to August 2014. Patients were sampled by purposive sampling method, with sample size of 69 children.²⁴

The inclusion criteria in this study were:

- Children diagnosed with ALL who had undergone minimum 5 weeks of chemotherapy;
- Children hospitalised in cancer ward or treated at one-day-care; and
- Aged within 2—12 years old with their parents.

While our exclusion criteria to the subjects were:

- a. Suffering from a physical impairment, for instance: incomplete limbs and visual or hearing impairment;
- b. Suffering from a mental retardation; and
- c. Not consenting to be a respondent.

Instruments

Demographic instrument

We obtained demographic data to identify respondents' characteristics, which consisted of children's name initial, age, sex, educational level, parent's educational level, parent's occupation, amount of time needed to travel from hospital to home, and patient's medical diagnosis data, such as diagnosis, type of protocol, phase of chemotherapy and week of treatment.

PedsQL Multidimensional Fatigue Scale (PedsQL MFS)²⁵

We utilised PedsQL MFS to assess the fatigue in children. For children aged 2–4 years, fatigue was assessed through parent's report. Meanwhile, fatigue was assessed through child's self-report and parent's report in children aged 5–12 years. The instrument queried general fatigue (6 items), fatigue during sleep or rest (6 items) and cognitive fatigue (6 items). All items were measured using Likert scale, with 0=never and 4=almost always. The highest score indicated that fatigue was never experienced.^{26,27} This instrument was done validity and reliabilities with high cronbach's alpha value.^{11,28,30,31} In this study was used validity and cronbach's alpha value 0,921 for fatigue-child self report and r alpha = 0,845 for fatigue –parent report.

Play-performance scale for children (PPSC)

We used PPSC to measure performance status based on child's play activity reported by parents in rating scale of 0–100, with 0 as no response and 100 as normal, full activity.^{19,32} The score results were stratified into three categories: 80–100 as able to perform normal play activity, 50–70 as mild-to-moderate limitation in play activity, and 20–40 as moderate-to-severe limitation in play activity and 0-10 indicates completely disabled. Kappa's value $\kappa = 0,525$ is good agreement for this study.

Procedure

The study was conducted from July 2014 to September 2014 at pediatric clinic in one-day-care unit of Dr.Sardjito General Hospital, Yogyakarta. Fatigue assessment were completed through parent's report for children aged 2-12 years, otherwise self-report were administered for children aged 5–12 years under researcher's direct supervision and assistance. Assessments of play activity were completed by children's parents (mainly the mother).

Data Analysis

IBM SPSS Statistics program version 21 used for data analysis. Univariate analysis performed for the characteristics of respondents and variables (fatigue and play activities of children). The distribution curves of the variable revealed a non normal distribution and then non parametric statistical test were used. Spearman rho test or Kendall-tau is used to explained the correlation between fatigue with play activities children.^{33,34} Interpretation of strength correlation if the value of 0.0 - <0.2 was very weak, 0.2 - <0.4 weak, 0.4 - <0.6 moderate, 0.6 - <strong 0.8 and 0.8 - 1 very strong.³⁵ This study with a significant level used is 0.05. Multivariate analysis is used to exclude confounding variables.²³ Ordinal logistic regression was used to describe the relationship of age, sex, education of children, the type of chemotherapy and chemotherapy phase with fatigue and play activities.

RESULTS

Characteristics of subjects

There were 69 children with ALL recruited as respondents in this study. Table 1 describes the distribution of subjects' age, gender, educational level, as well as type and phase of chemotherapy. There were more boys recruited in comparison with girls. The predominant age group was 2–4 years old, with educational level of preschool. The majority of children underwent Standard Risk (SR) chemotherapy protocol, with first and second SR maintenance phase as the most frequent phases.

Children's fatigue and play activity scores

The total fatigue scores assessed by children and their parents were averaged between 50–75, suggesting that children were seldom to almost never experience fatigue. The total fatigue score from self-reports were lower than parent's reports. Children's play activity score through parents' reports averaged in 70,72, which interpreted as existing limitation in play, a short play time, but play actively. This result indicates play activity is in mild-to-moderate limitation category.

Of 69 children, 46,4% (n=32) parents scored their children's play activity in range of 50–70, that stratified as mild-to-moderate limitation. As many as 43.5% (n=30) of parents reported play activity of their children in the score range of 80–100, which categorized into near-normal play activity. Meanwhile, only 10.1% (n=7) parents assessed their children's play activity in a score range of 20–40, which categorized into moderate-to-severe limitation.

1. Correlation between children's fatigue and play activity

Statistical analysis by Spearman's rho correlation test measured a medium-strength positive correlation ($r=0.4$) between children's self-reported total fatigue and play activity, with significance level of 0.02 ($p<0.05$). The Kendall's tau analysis for correlation between children's parent-reported total fatigue and play activity resulted in a weak strength positive correlation ($r=0.27$) and a significance level of 0.003 ($p<0.05$). These findings suggest that as the total fatigue score increased to almost never experienced fatigue, the play activity score is increased as well to fully-active and near-normal.

Table 1: Characteristics of subjects.

Category	n	%
Gender		
a Boys	45	65.2
b Girls	24	34.8
Age group		
a 2--4 years old	31	44.9
b 5--7 years old	20	29.0
c 8--12 years old	18	26.1
Educational levels		
a Preschool	29	42.0
b Kindergarten	13	18.8
c Elementary school	27	39.2
Types of chemotherapy protocol		
a High Risk (HR)	20	29.0
b Standard Risk (SR)	49	71.0
Phases of chemotherapy		
a HR induction phase	0	0
b HR reinduction phase	2	2.9
c HR consolidation phase	4	5.8
d HR maintenance phase I	5	7.2
e HR maintenance phase II	8	11.6
f SR induction phase	2	2.9
g SR consolidation phase	3	4.3
h SR maintenance phase I	21	30.4
i SR maintenance phase II	24	34.8
Parent's (mother's) educational level		
a Elementary school	22	31.9
b Junior high school	20	29.0
c Senior high school	14	20.3
d Higher education	13	18.8

To validly estimate the correlation between independent and dependent variables, we performed controlling to children's age, gender, educational level, chemotherapy regimen types and phases using multivariate analysis of ordinal logistic regression with risk factor modeling. Through multivariate analysis of all assumed confounding variables, only age and chemotherapy phase were found to play a role in 19% of correlation between children's fatigue with play activities. The 81% of

correlation was considered to be influenced by other variables outside of the model used in this study (Table 4).

Table 2: Score distribution of children's fatigue and play activity.

Variables	Score			
	Mean	SD	Min	Max
Children's fatigue--self-report				
General fatigue	74.26	14.78	42	100
Fatigue rest/sleep	63.38	7.91	46	83
Cognitive fatigue	74.03	11.68	50	92
Total score of fatigue	70.50	8.25	53	85
Children's fatigue--parent's report				
General fatigue	75.28	14.02	21	100
Fatigue rest/sleep	61.17	10.81	33	100
Cognitive fatigue	76.69	12.42	46	100
Total score of fatigue	70.93	9.17	42	89
Children's play activity	70.72	19.80	30	100

SD: Standard of Deviation; Total score of fatigue is the combined scores from subdimensions score. A higher fatigue score reflects less of fatigue; A higher score in play activity reflects a near-normal play activity.

Table 3: Correlation between children's fatigue and play activity.

Variables	Children's play activity	
	r	p value
Children's fatigue--self-report^a		
General fatigue	0.38	0.06
Fatigue rest/sleep	0.28	0.12
Cognitive fatigue	0.13	0.47
Total score of fatigue	0.40	0.02*
Children's fatigue-parent's report^b		
General fatigue	0.23	0.02*
Fatigue rest/sleep	0.10	0.45
Cognitive fatigue	0.26	0.01*
Total score of fatigue	0.27	0.003*

^aSpearman's rho test; ^bKendall's tau test; *There is a significant correlation if p value <0.05 ; Correlation strength (r) is very strong if close to 1.

Table 4: Statistical analysis results from ordinal logistic regression test on age groups and chemotherapy phases variables

No	Factors	Estimates	p value	95% Confidence Interval		R ²
				Minimum	Maximum	
1.	Age group					
	2-4 years old	2.07	0.01*	0.61	3.52	
	5-7 years old	0.85	0.27	-0.67	2.37	
	8-12 years old	0 ^a				
2.	Chemotherapy phases					
	HR reinduction	3.32	0.05*	0.03	6.60	0.19
	HR consolidation	2.91	0.01*	0.64	5.18	
	HR maintenance I	-0.06	0.96	-2.53	2.41	
	HR maintenance II	1.44	0.09	-0.24	3.12	
	SR induction	4.10	0.02*	0.77	7.43	
	SR consolidation	1.58	0.22	-0.93	4.10	
	SR maintenance I	1.03	0.11	-0.21	2.27	
	SR maintenance II	0 ^a				

Link function: Logit; ^aControlling parameter; significant if p value <0.05

DISCUSSION

This study showed a significant positive correlation with medium strength between children's self-reported fatigue and play activity, while the correlation between parent-reported fatigue and children's play activity also exhibited a significant positive correlation albeit with a weaker strength. These suggest that as children experience less fatigue, their play activity will become more fully-active to near-normal, and vice versa. Our finding is similar to a previous study that explained a weak correlation between children's fatigue and performance status.^{30,36} and affected quality of life and daily functional capacity of patients.³⁷

The study was conducted on all childhood cancer, used different of fatigue instruments with this research, but used the same instrument play activities that PPSC to assess the performance status of child's. The previous study investigated children with all types of cancer using a different fatigue instrument from our study, although we use an identical play activity instrument (PPSC) to assess children's performance status. Our study supported the study that a similar study also mentioned that fatigue, sleep problems and pain are significant symptoms experienced by children and teenagers during cancer treatment. These symptoms often affect alteration of behaviour and impair physical performance.³⁸ Through parent's report, the average fatigue score in control and intervention group fell in range of 50 to 75 percent, which indicates that children seldom to almost never experience fatigue. Functioning status score through PPSC instrument measured a score of 67.5, which interpreted as presence of limitation in play, a short play time, but play actively.¹¹

This finding confirms the theory of symptoms experience, which explains fatigue may affect performance status or children's play activity in this case.

The theory of unpleasant symptoms (TOUS) in nursing asserts that the consequence of final component in the theory is performance. Performance is defined as the impact of symptoms or complaints to an individual ability in performing functional activities. Functional performance activities of daily living, social activities and interaction, and role performance including work and other role-related tasks (e.g., work) activities, and manifested as play activity in children.³⁹⁻⁴¹

The results of this study different from previous studies that children with ALL exhibited a significant decrease in daytime activity during 5 days of dexamethasone administration in maintenance phase of therapy.⁴² We assert a hypothesis that children in maintenance phase who statistically showed mild-to-moderate limitation in play activity are displaying a form of adaptation from previous chemotherapy phases. Their prior familiarity may influence experience of next phases and enable them to enjoy developmentally-appropriate play activity, despite limitation imposed by their parents. Supports from family members, friends and interactions with environment provide coping resources that the children need. One of coping resources utilized by children is playing. Every child has their own developmental pattern characteristics that affect various aspects of diagnosis, prognosis, treatment, communication, decision-making, understanding to course of disease and the achieved result.⁴³

The weak-to-moderate strength of positive correlation found in this study is attributed to age groups and chemotherapy phases as confounding factors that statistically affect 19% correlation probability for children's fatigue and play activity, although the other 81% events are influenced by other, uninvestigated variables (Table 4). Future researches shall address factors that contribute to fatigue, such as physiological factors (level of haemoglobin or presence of anaemia,

nutritional status, and hydration status), types of medication, anxiety and depression.

One of our study limitations is the single mean of data collection to measure fatigue, which only based on filling out an instrument, without conducting structured interview as a form of validation to strengthen the result of fatigue assessment. Fatigue assessment was done through self-reporting by children and parent's report. In children aged 5 to 7 years, fatigue assessment was completed with assistance from an interviewer or complemented by conducting an interview.²⁵

Other finding in this study is as children with ALL undergoing chemotherapy grow older, their estimate values will become more positive. This means that play activity will be increased along as children become older. In addition, as children get further in chemotherapy phases (i.e., to second maintenance phase), play activity will progress to near-normal.

CONCLUSION

We report a positive correlation between children's fatigue, assessed through self-report and parent's report, with play activity in children with ALL treated at Dr.Sardjito General Hospital, Yogyakarta. This suggests that as children experience less fatigue, their play activity will increase to fully-active or near-normal.

Therefore, we suggest all parents to persevere with their children's chemotherapy, because less fatigue will be experienced as the phase advances (i.e., to second maintenance phase) and children's play activity will become near-normal. Nurses and other hospital health professionals are advised to assess cancer-related fatigue continuously. Nurses, in particular, are expected to identify fatigue in nursing diagnosis, determine nursing plan and provide nursing care towards fatigue in children with ALL who undergo chemotherapy in order to manage fatigue successfully and improve children's quality of life.

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