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Research

The Profile of Physical Activity in Children Surviving Acute Lymphoblastic Leukemia based on the Global Physical Activity Questionnaire in Surakarta

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ABSTRACT

Background: Acute lymphoblastic leukemia is one of the most common malignancies in children with the highest incidence aged 3-7 years. Management and treatments such as chemotherapy and radiotherapy have musculoskeletal and neuromuscular side effects which can significantly reduce the physical activity of leukemia patients and survivors. This study aims to determine the profile of the physical activity level of children with acute lymphoblastic leukemia as assessed by the Global Physical Activity Questionnaire (GPAQ) in Surakarta, Indonesia.
Subjects and Method: This was a study with a cross-sectional design. Children who survived acute lymphoblastic leukemia who had completed chemotherapy at Dr. Moewardi Hospital and met the inclusion criteria were included in this study. A sample of 26 patients was selected through purposive sampling. Demographic data were obtained through interviews and the profile of the patient's physical activity level was assessed using the GPAQ questionnaire. Data analysis was performed using a Pearson Correlation test with SPSS 22.0.
Results: The total sample in this study was 26 children with acute lymphoblastic leukemia. As many as 11.5% of children with acute lymphoblastic leukemia experienced decreased physical activity. There was a significant relationship between length of stay (p=0.001), age (p=0.004), gender (p=0.031), and the degree of risk of acute lymphoblastic leukemia (p=0.004) with the category of physical activity based on the GPAQ score.
Conclusion: As many as 11.5% of children with acute lymphoblastic leukemia experienced decreased physical activity. The length of time being a survivor, the degree of risk of acute lymphoblastic leukemia, the age of the survivor, and gender are risk factors for decreased physical activity in children.

Keywords: physical activity, acute lymphoblastic leukemia survivors, children

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BACKGROUND

Leukemia is a malignancy in blood cells originating from the bone marrow, which affects more than 100,000 infants world-wide with leukemia in severe conditions (Howard et al., 2008). Acute lymphoblastic leukemia is an aggressive neoplasia with un-controlled lymphocyte cell proliferation which is most found in children with the highest incidence at the age of 3-7 years

(Roganovic et al., 2013). Riskesdas data shows that there were 20,000 leukemia patients in 2008. The number of pediatric leukemia patients at Dr. Moewardi Hospital in 2010 was 203 patients, while from January to December 2012 there were 106 leukemia patients, 22 of whom were preschool children in children in Indonesia.

Children surviving acute lymphoblastic leukemia have problems such as decreased physical activity according to age which is influenced by the course of the disease, chemotherapy, and the treatment provided (Simioni et al., 2018). Various efforts have been investigated as a treatment approach for acute lymphoblastic leukemia, such as combination chemotherapy and radiotherapy. Children undergoing treatment and chemotherapy for acute lymphoblastic leukemia are at risk for long-term health problems including physical inactivity, cardiopulmonary toxicity, osteopenia, and secondary malignancies (Anderson et al., 2016).

The survival rate of patients with acute lymphoblastic leukemia in children has increased, so the side effects of therapy need to be considered. Long-term effects of chemotherapy include myopathy, muscle atrophy, osteoporosis, osteonecrosis, corticosteroid-associated obesity, vincristine-induced polyneuropathy, and anthracycline-induced cardiomyopathy. Various studies have shown a decrease in motor performance during and after completing therapy for acute lymphoblastic leukemia (Hartman et al., 2012).

Chemotherapy and radiotherapy have been shown to damage the overall health status and quality of patients and survivors of acute lymphoblastic leukemia through various side effects including osteopenia, muscle atrophy, cardiovascular and cardiopulmonary problems, and changes in metabolism (Wilson et al., 2015). Administration of corticosteroids can also result in significant changes in bone morphology that affect the musculoskeletal and neuromascular systems. This contributes greatly to the decrease in physical activity in survivors of acute lymphoblastic leukemia (Marchese et al., 2013).

Physical activity plays a role in reducing morbidity and mortality in patients with acute lymphoblastic leukemia (Hung et al., 2017). The WHO report in 2009 stated that the main causes of global risk of death are high blood pressure (13%), tobacco use (9%), high blood sugar levels (6%), inactive behavior (6%), overweight and obesity. (5%). These risks have a role in increasing the risk of chronic diseases such as cardiovascular disease, diabetes and cancer and cover all socio-economic levels from high, medium, and low (WHO, 2009).

This study aims to determine the profile of the physical activity level of children with acute lymphoblastic leukemia as assessed by the Global Physical Activity Questionnaire (GPAQ) in Surakarta, Indonesia. By knowing the level of physical activity of children with acute lymphoblastic leukemia, it is hoped that it can improve services and prevent the effects of hospitalization and chemotherapy in patients with acute lymphoblastic leukemia.

SUBJECTS AND METHOD

1. Study Design

This research study is a cross-sectional design.

2. Population and Sample

The population in this study were children who survived acute lymphoblastic leukemia who had finished chemotherapy at Dr. Moewardi Hospital Surakarta. Exclusion criteria in this study were patients with impaired mobility, mental retardation, cerebral palsy, Down syndrome, or other disabilities so that they could not fill out the quest-

ionnaire. A sample of 26 patients was selected through purposive sampling.

3. Study Variables

The independent variables assessed were the type of chemotherapy protocol, age, gender, and education of children with acute lymphoblastic leukemia. The dependent variable in this study was the level of physical activity of children with acute lymphoblastic leukemia as measured by the GPAQ questionnaire.

4. Operational Definition of Variables

Acute lymphoblastic leukemia survivors, children who have been diagnosed with acute lymphoblastic leukemia and have completed chemotherapy.

Physical activity, assessed using the Global Physical Activity Questionnaire (GPAQ) which consists of 16 questions and is divided into 3 parts, namely work activeities, walking activities, and leisure activities which are further divided into 3 categories (low, medium, and high).

The type of chemotherapy protocol, divided into Standard Risk (SR) and High Risk (HR) protocols.

Age, adjusted to the GPAQ questionnaire, namely 10 years, >10-15 years, and >15 years.

Gender, divided into male and female.

Education, divided into pre-school, elementary school, junior high school or equivalent, high school or equivalent.

5. Study Instruments

Demographic data were obtained from interviews with the patient's parents/ guardians. The patient's medical condition was obtained from the patient's medical record data, while the profile of the patient's physical activity level was obtained from the GPAQ questionnaire.

6. Data analysis

Data analysis was performed using SPSS-based statistical software (version 22). Univariate analysis describes the descriptive results of various variables. Bivariate analysis using chi-square to obtain a variable with a p value <0.05, which will be included in the multivariate analysis and tested by the Pearson correlation test to find the relationship between variables with physical activity.

7. Research Ethics

This study was approved by the Ethics Committee of RSUD Dr. Moewardi, Surakarta.

RESULTS

1. Sample Characteristics

There was a total sample of 26 children with acute lymphoblastic leukemia in this study. The majority of acute lymphoblastic leukemia survivors in this study were male (53.8%) aged >10-15 years (61.5%), followed by 10 years (26.9%) and >15 years (11. 6%). Most of the patients still had junior high school education (46.1%) followed by elementary school (38.5%). A total of 7 patients had a standard risk level (73.1%) and as many as 18 patients became survivors <5 years (69.2%). The average of the active time of survivors in this study was 69.1% and the sedentary time was 30.85%. A total of 3 children (11.5%) had low GPAQ score, 16 children (61.5%) had moderate GPAQ score, and 7 children (28.9%) had high GPAQ score.

2. Descriptive analysis of the physical activity

The average of the active time of survivors used as a sample in this study was 69.15% with a standard deviation of 10.67%, the shortest active time was 40% and the most active time was length is 83%. Survivors who participated in the study had an average of sedentary time 30.85% with a standard deviation of 10.67%, with the shortest sedentary time was 17% and the longest was 60%.

3. Descriptive analysis of the physical activity category based on GPAQ score

A total of 3 children (11.5%) had low GPAQ

score, 16 children (61.5%) had moderate GPAQ score, and 7 children (28.9%) had high GPAQ score.

Table 1. Sample characteristics

Characteristics	Frequency	Percentage
Gender		
Male	14	53,8
Female	12	46,2
Age		
≤10 years	7	26,9
>10-15 years	16	61,5
>15 years	3	11,6
Education		
Elementary school	10	38,5
Junior high school	12	46,1
Senior high school	4	15,4
Level of risk		
Standard	19	73,1
High	7	26,9
Surviving duration		
<5 years	18	69,2
≥5 years	8	30,8

Table 2. Descriptive analysis of the physical activity

Physical Activity	Mean	SD	Minimum	Maximum
Active time (%)	69.15	10.67	40	83
Sedentary time (%)	30.85	10.67	17	60

Table 3. Descriptive analysis of the physical activity category based on GPAQ score

Physical Activity Level	Total (n)	Percentage (%)
Low	3	11.5
Moderate	16	61.5
High	7	28.9

Table 4. Pearson Correlation

Variabel	r	p
Surviving duration	0.782	0.001*
Age	-0.619	0.004*

Tabel 5. chi-square: Physical Activity Level

variabel		Low	Moderate	High	p
Gender	Male	1 (4%)	7 (27%)	6 (23%	0.031
	Female	2 (8%)	9 (34%)	1 (4%)	
Level of risk	Low risk	2 (8%)	10 (38%)	7 (27%)	0.004
	High risk	1 (4%)	6 (23%)	0	

4. Pearson Correlation

There was a significant relationship between the length of time being a survivor of acute lymphoblastic leukemia and the category of physical activity based on the GPAQ score with a strong correlation level (p=0.001). There is a strong and significant correlation between the categories of physical activity with age (p=0.004).

5. Chi-Square Physical Activity Level

There was a significant relationship between gender and the category of physical activity based on the GPAQ score (p=0.031). There was a significant relationship between the degree of risk of acute lymphoblastic leukemia and the category of physical activity based on the GPAQ score (p=0.004) with a moderate correlation.

DISCUSSION

In this study, 14 patients (53.8%) were male, and 12 patients (46.2%) were female. This is in accordance with previous studies which stated that acute lymphoblastic leukemia was more common in male patients than female patients. Several studies have stated that boys tend to have a worse prognosis than girls because boys have a tendency to testicular relapse, a high incidence of T-cell leukemia, hyperleukocytosis, and organomegaly and mediastinal masses (Permono et al., 2010).

Survivors of acute lymphoblastic leukemia who are undergoing elementary school as many as 10 children (38.5%), 12 children in junior high school (46.1%), and high school as many as 4 children (15.4%). This is in accordance with the average age of the patients in the sample, which is 12 years, according to the age of the children entering junior high school. Thus, patients with acute lymphoblastic leukemia who undergo controlled chemotherapy until completion of chemotherapy can continue their education according to their age.

A total of 19 survivors (73.1%) had a history of acute lymphoblastic leukemia with standard risk and 7 patients (26.9%) had a history of high risk. This is consistent with previous studies which state that more standard risk patients have a better prognosis than high risk patients. Standard risk patients also have higher survival and cure rates. Classification of acute lymphoblastic leukemia based on morphological features can be divided into L1, L2, and L3. In this study, the majority of cases of acute lymphoblastic leukemia were L1 as much as 85%, L2 (14%) and L3 (1%). L2 leukemia has a higher incidence of relapse than other morphologies and has a worse prognosis than other types.

Patients with acute lymphoblastic leukemia showed different responses to the therapy given, some had a higher cure rate, and some had a lower cure rate, so the treatment was longer. In this study, 18 children (69.2%) had been survivors of acute lymphoblastic leukemia for less than 5 years and 8 children (30.8%) had survived for more than 5 years.

Physical activity levels in children who are undergoing or have completed treatment for acute lymphoblastic leukemia are lower than in healthy children. In addition, they usually have post-treatment physical disorders, especially decreased motor performance and decreased physical function (Hartman et al., 2012). A study conducted at Pantai Indah Kapuk Hospital (PIK) Jakarta showed that children with acute lymphoblastic leukemia had physical activity that was not in accordance with the recommendations of the Centers for Disease Control (CDC) (Tanjung et al., 2014). The average active time of survivors of acute lymphoblastic leukemia used as samples in this study was 69.1% with the shortest active time of 40% and the longest active time of 83%. Meanwhile, the average inactivity time for acute lymphoblastic leukemia survivors in this study was 30.85%, with the shortest inactivity was 17% and the longest was 60%.

Physical activity is very important for children to facilitate normal growth and development, especially to maintain health and prevent disease, as well as motor and psychosocial development related to child-

ren's quality of life (Hartman et al., 2012). However, malignancy interferes with developmental opportunities and normal physical activity due to side effects of hospitalization and treatment, both of which contribute to physical impairment and reduced motivation to perform physical activity (Hung et al., 2017).

Children undergoing treatment for acute lymphoblastic leukemia and lymphoma are at risk for several long-term health problems including neuropathy, cardiopulmonary toxicity, osteopenia, and secondary malignancies (Varedi et al, 2018). In this study, it was found that length of stay, gender, degree of acute lymphoblastic leukemia and age of the patient were related to physical activity. Low levels of physical activity have been widely reported to have a negative impact on cardiopulmonary and musculoskeletal function, cognitive abilities, social functioning, and psychological well-being. Research with larger samples is needed to get better results.

AUTHOR'S CONTRIBUTION

Dini Safitri Zahara is the lead author who conducted the research, conducted data analysis, and wrote the manuscript. Hari Wahyu Nugroho examined the backround and discussion of the research. Muhammad Riza formulated the research framework.

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CONFLICT OF INTEREST

In this study there was no conflict of interest.

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