Factors Associated with Depression in Parents of Acute Lymphoblastic Leukimia Patients in Childhood Hemato-Oncology Installation at Haji Adam Malik Center General Hospital Medan

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Abstract. Background: Pediatric acute lymphoblastic leukemia is a common form of childhood cancer, occurring before age 15. Parents of children with this disease initially showed signs of depression as well as emotional levels and disturbances in family functioning, in response to their children's diagnosis. Although stigma and lack of awareness of mental disorders lead to increased rates of depression in parents, early detection of symptoms helps prevent further development over time.

Method: The non-probability sampling technique was used and 80 samples of parents with acute lymphoblastic leukemia children were obtained. In addition, this study was conducted at Haji Adam Malik Center General Hospital Medan, Indonesia. Multiple linear regression was used to assess this relationship with a predictive conceptual framework.

Results: The results of the multivariate model showed that the p-value was. $<$ 0.001 with r and β value for the parents' length of education, income, marital status, patients' age, and length of illness were 0.253 (-1.121), -0.293 (-2.163), -0.161 (-2.587), -0.283 (0.643), and 0.234 (0.338), respectively, with a depression score of 89.1%.

Conclusion: Several factors affect the depression scores in parents including the length of education, income, marital status, patients' age, and length of illness.

Keywords: Depression · Parents of pediatric acute lymphoblastic leukemia patients · acute lymphoblastic leukemia patients · BDI-II

1 Introduction

Leukemia is a global cancer disease commonly diagnosed in childhood, accounting for about 25–35% of cases occurring before the age of 15 [1] The symptoms are non-specific and include fever, fatigue, weight loss, bone pain, bruising, and bleeding. Furthermore, a definitive diagnosis requires a bone marrow biopsy, which informs interprofessional

care ranging from chemotherapy to stem cell transplantation [1, 2]. The epidemiological studies of acute leukemia in children examined possible risk factors, such as genetic, infectious, and environmental, to determine the etiology. Therefore, it affects all age groups, specifically children [3], though the diagnosis and treatment in childhood present challenges and is a source of stress for children and their parents. A systematic review stated that 85.8% of caregivers, specifically parents of children with leukemia, showed initial signs of depression in response to their child's diagnosis, and 42.8% showed emotional levels and disturbances in family functioning. The onset of depression occurs early in the month after diagnosis, and parents experience a variety of psychosocial symptoms [4, 5]. Therefore, children with leukemia and their families require long-term assistance and support from various agencies, including the primary health team [6].

Caregivers provide physical and psychological care for people in need and they include family members including parents, who are usually unpaid. Parents significantly contribute to the care and treatment of children with leukemia and other chronic health problems. Furthermore, the most important aspect of handling leukemia patients is emotional support [7, 8].

Parents and other family caregivers provide care for patients by managing various tasks ranging from bathing, and dressing to taking medication, as well as providing emotional support which may include listening, counseling, and friendship. There are several family members referred to as caregivers, including relatives, friends, and neighbors [6, 7]. Caregivers offer physical and psychological care for people in need, including family members such as parents, and are usually unpaid [8]. Caregivers are stressed by 4 domains including, background and context of stress, stressors, mediators of stress, and outcomes. The background characteristics involve age, gender, education level, socioeconomic status, and medical history as well as the patient relationship, length of stay, program use, etc. [9, 10]. This hypothesis shows the relationship between age, gender, length of education, marital status, parents' employment status, number of children cared for by parents, age of children with leukemia, and length of illness and depression in parents of children with acute lymphoblastic leukemia.

2 Method

2.1 Design and Population Studies

This is a multivariate analytic study with a linear regression prediction concept framework. It involves a cross-sectional approach, which uses the BDI-II instrument to analyze the relationship between several dependent and independent variables. Furthermore, the population includes parents of pediatric acute lymphoblastic leukemia patients treated at Pediatric Hematology Oncology Outpatient Installation, Haji Adam Malik Center General Hospital Medan from September – December 2021.

2.2 Calculation of the Samples Number

The sample size for a numerical correlational analytical study diagnosis was determined using the following [11]:

$$n = \left[\frac{(Z\alpha + Z\beta)}{0,5ln\left(\frac{1+r}{1-r}\right)} \right]^2 + 3$$

From the calculation of the total sample, a total of 80 subjects for each parent and pediatric acute lymphoblastic leukemia patient was obtained and the non-probability sampling method was used [11].

Eligible subjects are any parents of 18–55 years of age with minimum educational background of senior high school who are willing to participate in the study. Anyone with any history or on going psychiatric disorders or history of psychotic drugs and additives consumption is excluded from the study.

2.3 Data Analysis

The Microsoft Excel and Statistical Package for the Social Sciences (SPSS) software was used for the data analysis. Multivariate linear regression was used in this study after the following prerequisites are met; (1) normal residual spread can be proved by histogram, (2) residual mean from descriptive statistic equals to 0, (3) no outlier (as shown in case wise diagnostic), (4) constant (as shown in scatter graph between residues and independent variable), (5) independent (as shown by Durbin-Watson test), (6) no indication of multicollinearity (as proved by Pearson and correlation test on independent variables), and (7) linearity between independent and dependent variables (as shown in scatter graph). Kolmogorov–Smirnov test was conducted initially to assess normality of the data. When data are normally distributed, Pearson test can be used, while, on the other hand, when data are not normally distributed, Spearman test will be used.

3 Results

In this study, the demographic data for the largest sample was female and the marital status was mostly married with 54 and 47 subjects, accounting for 67.5% and 58.8%, respectively. The variable number of children cared for was >1 child and the work status of parents who did not work with 63 and 65 subjects, respectively, each accounting for 81.3%. Furthermore, the average age, income, and length of education of parents were 34.05 years, IDR 4.190 million, and 12 years (12–16), respectively. Table 1 showed that patients' age and disease duration had a mean of 8.85 and 13.71, respectively.

Table 1. Demographics of Parents and Patients with Acute Lymphoblastic Leukemia

Variable	Mean ± s.b	Median (min-max)	n %
Age of Parents (Years)	34,05 ± 6,075		
Gender of Parents			
-Male			26 (32,5)
-Female			54 (67,5)
Length of Parents' Education (Years)		12 (12–16)	
Marital status			
-Marry			47 (58,8)
-Single			33 (41,2)
Number of Children Treated			
- =1 child			17 (21,2)
->1 child			63 (72,8)
Parents' Employment Status			
-Working			15 (18,8)
-Not work			65 (81,3)
Revenue (million IDR)	4,190 ± 1,080		
Patient Age (years)	8,85 ± 3,508		
Patients' length of illness	13,71 ± 5,521		
BDI Score	20,93 ± 7,977		

The bivariate analysis was carried out for each variable, consisting of 5 numerical and 4 categorical variables. Furthermore, the Pearson test was used on the independent variable with a numerical scale. In the linear regression multivariate analysis test with a predictive concept framework, the five numerical variables with a p-value <0.001 were eligible because of $p < 0.25$ (Table 2) [12]. The Mann-Whitney U test was used for the independent variables with a categorical scale. Table 3 showed that the four categorical variables with a p-value <0.001 met the requirements to be included in the linear regression multivariate analysis test with a predictive concept framework.

The four times testing was conducted before obtaining a suitable model using the backward method (Table 4). Furthermore, model 4 proved to have the highest determinant coefficient of 89.1%. The variables included in the study after the test were the depression score, parents' length of education, income, marital status, patients' age, and length of illness. Table 4 shows that the adjustment for R2 is 89.1% with a Durbin Watson test of 1.861, indicating a zero residue.

Table 2. Bivariate Analysis of Numerical Independent Variables and Depression Score

Variable	Mean ± SD	Median (min-max)	p
BDI–II score	20.93 ± 7.977		
Age	34.05 ± 6.075		0.002
Length of education		12 (12–16)	0.001
Income	4.190 ± 1.0806		0.001
Child's age	8.85 ± 3.508		0.001

Table 3. Bivariate Analysis of Categorical Independent Variables and Depression Score

Variable	Median (min-max)	n	p
Gender of parents			
Men	13(8–31)	26	<0.001
Women	24,5(8–35)	54	
Marital Status	34.05 ± 6.075		
Married	18(8–31)	47	<0.001
Not Married	25(9–35)	33	
Number of children to be cared for by parents			
-≤1 children	11(8–31)	17	<0,001
->1 children	23(11–35)	63	
Parents Job			
-work	9(8–13)	15	<0.001
-doesn't work	24(11–35)	65	

Table 4. Model Summary of the Seventh Linear Regression

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.948[a]	.899	.888	2.671	
2	.948[b]	.899	.889	2.653	
3	.948[c]	.899	.890	2.642	
4	.948[d]	.898	.891	2.628	1.861

No outliers were observed in this study because the difference between the minimum (−2.535) and the maximum values (2.832) (Table 5) was in the interval −3 < SD < 3. In addition, other prerequisites, such as linearity, normal distribution, and constancy were met as shown in the figure below.

Table 5. Residual Statistics

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	6.50	34.96	20.92	7.561	80
Residual	−6.663	7.442	.000	2.544	80
Std. Predicted Value	−1.907	1.856	.000	1.000	80
Std. Residual	−2.535	2.832	.000	.968	80

Table 6. Multivariate analysis

Variable	*Correlation Coefficients*	*Regression Multivariate β*	*P*
Constant			
Parents' education length	−0,253	−1,121	<0,001
Parents' income	−0,293	−2,163	<0,001
Patients' age	−0,283	0,643	<0,001
Patients' length of illness	0,234	0,338	<0,001
Marital status	−0,161	−2,587	<0,001

Table 6 showed that the independent risk factors associated with depression among caregivers include the parents' length of education, income, marital status, patients' age, and length of illness.

4 Discussion

Diagnosis and treatment of pediatric leukemia are stressful for parents and children. The course of the disease and the treatment outcome are influenced by the structure and function of the family, where parents are responsible for child care. Several family variables are associated with the health outcomes in children and studies showed that family has a strong influence on physical health, as well as morbidity and mortality. The effect of education length on depression scores was observed in this study. In addition, education is a stressor for these parents and it is crucial in dealing with the disease, hence those with low education are easily stressed and depressed. According to the study by Kholasehzadeh and his colleagues in Iran in 2014, education varied with 5.2% having a diploma below high school, 28.4% with a high school diploma, 44% graduating from college, and 11.2% with a professional degree. This study showed a negative relationship between the mother's education level and symptoms of depression with a p-value of 0.05 .4

This study demonstrated the effect of parents' opinion on depression scores, where those with lower income tend to be younger with mental disorders. Furthermore, there are reports that children from low-income families are two to three times more prone to depression than those from high socioeconomic status. This is consistent with a study in

Iran that showed high scores of depression in low-income mothers [12, 13]. Leukemia in children is common within the ages of 2–5 years with an average incidence of 4–4.5 cases/year/100,000. The proportion of female patients is smaller than males in several studies and more dominant at the age of 6–15 years. In this study, the age of the child with leukemia influence the depression scores of parents. This is in line with a study by Lutfi and Lami in Iraq in 2019, where the prevalence of major depression was significantly higher among caregivers of children whose age of onset was under 5 years [6, 14].

Several studies revealed that the psychological distress of caregivers increases immediately and decreases 1 year or more after diagnosis. Subsequently, the psychological distress begins to normalize 5 years after diagnosis [15]. This is in line with this study, where there was a relationship between patients' length of illness and depression scores in parents. The marital status of parents is also associated with the depression scores, and this is consistent with a study in Iraq in 2019 [6].

5   Conclusion

Several factors affect the depression scores in parents with acute lymphoblastic leukemia children, including the length of education, income, marital status, patients' age, and length of illness.

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