



Quality of Life in Pediatric Cancer Patients

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Authors' contributions

This work was carried out in collaboration among all authors. Authors AH, HAB and SHA had substantial contribution in the study design, analysis, interpretation and writing. Authors FAA, WSAG and EA were involved in data acquisition and writing. Author AH was also involved in drafting the manuscript, critical revision and preparation of the final draft for publication. All authors read and approved the final the manuscript.

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ABSTRACT

Background: In recent years the survival rates for children diagnosed with cancer has increased as result of successful treatment. Evaluation of health related quality of life during the process of treatments is important for recognition of acute dysfunction related to therapy and disease.

Aim: Aim of the study is to identify the health-related quality of life in pediatric cancer patients and to detect the potential predictors of a total quality of life and its domains.

Materials and Methods: It is a cross-sectional study done on convenient sample of pediatric cancer patients. Their diagnosis was confirmed at pediatric hematology clinic and day care unit at King Abdulaziz University Hospital, Jeddah, Saudi Arabia.

Results: A total number of 51 children participated in this study, their age ranging from 8-15 years with mean 10.15 ± 2.52 . Hematological malignancies represented 70.5% of the sample, with the highest percentage for acute lymphocytic leukemia (45%). The mean value of the total quality of life is 73.48, which is referred to as a good quality of life. The best scores of subscales were cognitive problems (92.54), communication (82.67), and nausea (76.86), otherwise poorer score was detected. Although the value of total quality of life was relatively good however visiting the hospital more than 3 times per month, male gender, duration of therapy and duration of diagnosis more associated with more pain and hurt, great worry and treatment anxiety.

Conclusion: Higher frequency of hospital visits, male gender, longer duration of diagnosis, longer duration of therapy, and increased intensity of therapy were all associated with more pain and hurt, great worry, nausea, and treatment anxiety which reflect a poor quality of life among the study group.

Keywords: Health-related quality of life; QOL; cancer; children.

ABBREVIATION

ALL	: Acute Lymphocytic Leukemia
ANOVA	: Analysis of Variance
AOR	: Adjusted Odds Ratio
KAUH	: King Abdulaziz University Hospital
PedsQL 3.0	: Pediatric Quality of Life Inventory TM 3.0 Cancer Module
QOL	: Quality of life
SD	: Standard Deviation
SPSS	: Statistical Package for the Social Sciences
US	: United State

1. INTRODUCTION

In recent years the survival rates for children diagnosed with cancer has increased as result of successful treatment. However, many studies reported that these treatments take part in the formation of physical and psychosocial weakness for cancer survivors [1]. Despite the improved survival statistics, cancer remains a potentially life-threatening condition, and as such poses a major challenge to both child and family. During the course of treatment, most children experience unpleasant physical side-effects. Behavioral and emotional problems have also been identified. In the longer term, there is a considerable risk of late effects. These include reduced linear growth, compromised endocrine and sensory functions, and damage to cardiac and reproductive systems [2].

Globally, the incidence of cancer in children differs from 48 to 70 per million children less than 15 years of age [3]. The incidence of childhood cancer in some developed countries, such as in United State, Ireland, Switzerland, and in Australia has reported with rates of 15.3, 13, 13.5, and 16 per 100,000 children, respectively,

however in Asia the data are generally lower [4-12].

In Saudi Arabia (SA) cancer in children, in the period between 1999 and 2008, reported about 8% of total cancer cases. The greatest prevalent cancers were leukemia (34.1%), after that lymphoma (15.2%), brain (12.4%), and kidney cancers (5.3%). The total incidence of childhood cancers increased from 8.8 per 100,000 in 1999 to 9.8 per 100,000 in 2008. Cancer incidence in SA increased throughout the years because of improvement of health care facilities, their diagnostic capacities, and the development of cancer registration practices [13].

A study was done in Egypt 2013; they stated that the total QOL in children with cancer relatively low with mean value of 62.29. Moreover, they reported female sex and younger age, increased treatment intensity, long duration of hospital admission, and high frequency of hospital visits, were associated with a poorer total QOL [1]. Multi-institutional cross-sectional study (Canada, 2009) included children with cancer receiving any type of active treatment. The primary caregiver provided information on child physical, emotional and social QOL. They reported that children with acute lymphoblastic leukemia had better physical health while intensive chemotherapy treatment and having a sibling with a chronic condition were associated with poor physical QOL. Better emotional health was associated with good prognosis, less intensive chemotherapy treatment and greater household savings, whereas female children and those with a sibling with a chronic condition had poor social QOL [14]. Another study conducted in Canada 2017, Participant experiences reflected concepts of positive and negative duality, including: maintaining physical functioning but longing for

the ability to participate in activities; experiencing a new level of intimacy with family and friends amidst isolation; and developing positivity amidst anger, sadness and lingering worry [15].

Most of the literature trying to predict QOL in children with cancer has focused on late effects of cancer. Yet, QOL during active treatment also is important to children and their families. Studies of children receiving active treatment primarily have consisted of small studies that did not identify those at high risk of poor outcomes [16]. This study designed to identify the health-related quality of life in childhood cancer patients and to detect the relationship between disease, treatment, and socio-demographic factors with the total quality of life and its subscales. Additionally, to detect the potential predictors of a total quality of life and its subscales. We did not find any similar study in Jeddah through search engines.

2. MATERIALS AND METHODS

2.1 Study Design, Sampling and Setting

This study is a cross-sectional study and conducted on a convenient sample of pediatric cancer patients (We enrolled all cancer patients who came to the hospital from April to November, 2018). Their diagnosis was confirmed at pediatric hematology clinic and day care unit at King Abdulaziz University Hospital (KAUH), Jeddah, Saudi Arabia. Our inclusion criteria of the study including children 8-15 years of age, diagnosed with cancer for more than one month, and receiving cancer treatments during the time of data collection. Data collected by interviewing questionnaire.

2.2 Study Tool

Data collection tool is the Pediatric Quality of Life Cancer Module (PedsQL™ 3.0) [17], in addition to sociodemographic information as age, gender, nationality, educational status of children, family size, and educational status of mother and father. We used the Arabic version after taking consent from the authors [1], the study tool is valid and reliable [17-19], Cronbach coefficient alpha = 87.6%. It is intended to measure health related QOL domains specifically for pediatric cancer. It includes 8 fields with the entire of 27 items for the whole module; pain and hurt include 2 items, procedural anxiety, treatment anxiety, worry, perceived physical appearance, and

communication, each one of them includes 3 items, whereas nausea and cognitive problems include 5 items for each [1].

Each item of the instrument is consisting of a 5-point Likert scale (0 = never a problem; 1 = almost never a problem; 2 = sometimes a problem; 3 = often a problem; 4 = almost always a problem). Then we transformed the scale to an equivalent score from 0 to 100, where 0 denoted the poorest quality of life and 100 denoted the greatest quality of life. The whole QOL is the mean of the scores for all fields, while QOL for each field is the mean of scores of its items. Moreover, we divided the score of whole QOL and fields into two grades, good scale which reflect the good quality of life (> 70) and poor scale (< 70) which reflects the poor quality of life.

Procedures associated with treatments: a) intensity of therapy, which divided into three levels, low intensity had a score 1, represented the patients had surgery only and/or six months chemotherapy with a satisfactory prognosis, medium intensity had a score 2, represented the patients with chemotherapy longer than 6 months with an intermediate prognosis, in addition to high intensity of treatment that referred to treatment according to high risk protocols, bone marrow transplantation, and/or diseases with less satisfactory prediction, it took score 3 [20,21]. b) Rate of hospital visits: classified into less than or equal to 3 and > 3 visits per month. c) Treatment duration: low duration represented less than 6 months, medium duration from 6 months to 1 year, and high duration denoted to more than 1 year. d) Treatment phase: it divided into two sets, one who is on-treatment (continue getting anticancer treatment) and the other who on the follow-up (cases completed their treatment and planned for interval follow up) [22].

2.3 Data Entry and Analysis

The data collected were analyzed using SPSS, version 16. Numerical data denoted by frequency while quantitative data existed as mean, and standard deviation (SD). We used independent sample t-test and analysis of variance (ANOVA) to detect the differences in total and mean subscale scores of the PedsQL3.0 cancer module between the studied variables. Binary logistic regression analysis test used to find out the predictors of total QOL and all subscale. P value < 0.05 was considered significant.

3. RESULTS

3.1 Characters of the Study Group

A total number of 51 children participated in this study, 62.7% male and 37.3% female, their age ranging from 8-15 years with mean 10.52; median 8 years and 5.45 as mean family size. About 94.1% of them are non-Saudi (other nationalities as Syrian, Egyptian, Indian, Pakistanis, Sudanese; but they are living in Saudi Arabia) and 5.9% are Saudi. 58.8% of children stopped learning and going to school,

while 41.2% are continuous. Hematological malignancies represented 70.5% of the sample, with the highest percentage for acute lymphocytic leukemia (ALL) (45%). A high proportion of children (60.8%) were visiting the hospital more than 3 times per month. Regarding the type of treatment, most of them (88.2%) on chemotherapy treatment. Low intensity of therapy (54.9%) was more frequent than medium and high intensity (35.3% and 9.8%, respectively) (Table 1). In addition, 72.5% of the participants had treatment duration less than one year at the time of data collection with a

Table 1. Demographic and medical characteristics of the study group

Variable	Frequency (n=51) n (%)
Age /year	
Mean \pm SD	10.15 \pm 2.52
Rang	8-15
Median	8
Gender:	
Male	32 (62.7)
Female	19 (37.3)
Nationality:	
Saudi	3 (5.9)
Non-Saudi	48 (94.1)
Educational Status:	
Continuous:	21 (41.2)
Stopped	30 (58.8)
Type of malignancy:	
Hematological:	36 (70.5)
ALL (Acute Lymphoblastic Leukemia)	23 (45.0)
AML = Acute Myeloid Leukemia	5 (9.8)
chronic myeloid leukemia	1 (2.0)
HD = Hodgkin Lymphoma	4 (7.8)
NHD= non-Hodgkin lymphoma	3 (5.9)
Solid:	15 (29.5)
Brain tumor	6 (11.7)
Nephroblastoma	1 (2.0)
Skin cancer	1 (2.0)
Ewing's sarcoma	5 (9.8)
Adenocarcinoma	1 (2.0)
Malignant neoplasm of parotid gland	1 (2.0)
Hospital visits:	
Three times or less/ month	20 (39.2)
More than three times /month	31 (60.8)
Type of treatment:	
Chemotherapy	45 (88.2)
Radiotherapy	2 (3.9)
Surgical	4 (7.8)
Intensity of therapy:	
Low	28 (54.9)
Medium	18 (35.3)
High	5 (9.8)
Treatment phase:	
On-treatment	31 (60.8)
Follow up	20 (39.2)

ALL (Acute Lymphoblastic Leukemia), AML = Acute Myeloid Leukemia
Chronic myeloid leukemia, HD = Hodgkin Lymphoma, NHD= non-Hodgkin lymphoma

compliance rate of 98% of the sample. About 84.3% and 90.2% of the mothers and fathers, respectively, had education at different levels.

3.2 PedsQL 3.0 Subscales

Table 2 shows mean scores of total health QOL and its subscales among the study group. The value of total health related QOL is 73.48. The best scores of subscales (greater than 70) were detected in three out of eight subscales which are cognitive scale (92.54), communication (82.67) and nausea (76.86). while the lowest scores were found in procedural anxiety (60.78) followed by worry (61.76), pain & hurt (65.45) treatment anxiety (66.01) and perceived physical appearance (69.77).

3.3 Association between Study Group Characteristics and PedsQL 3.0 Subscales

The influence of variables on total health related QOL and subscale were demonstrated in Table 3. We observed that worry subscale was statistically great among patients visiting the hospitals more than 3 times per month than children visiting less than 3 times ($P=0.03$) and those with duration of diagnosis equal to one year or more in comparison to children with diagnosis duration less than one year ($P=0.01$). However, pain and hurts statistically increased among male children than female ($P=0.04$). While treatment anxiety was statistically increased among children with duration of therapy equal to 1 year or more ($P=0.03$).

3.4 Predictors of Health-Related Quality of Life in the Study Group

The binary logistic regression model represented in Table 4 and showing predictors of health related QOL in each subscale. The most common predictors for pain and hurt subscale were gender, age at the time of diagnosis and

duration of diagnosis. Males were more likely to have pain and hurt than female (AOR= 8.77), children diagnosed with the disease at age less than 7 years are more likely to have pain & hurt than those who diagnosed with cancer at an age equal to 7 years or more (AOR=4.74), and children with duration of diagnosis more than one year are more likely to feel pain and hurt than those with duration of diagnosis less than one year (AOR= 8.87), the differences were statistically significant. Children with a medium score of treatment intensity are likely to have more nausea than those with the low and high score (AOR=3.28). Moreover, males likely to worry four times more than female (AOR=4.53).

4. DISCUSSION

Our study reported that the score of total QOL in childhood cancer was 73.48 and seemed to be relatively good score for quality of life may be due to half of the study group had low intensity of therapy (represented the patients had surgery only and/or six months chemotherapy with a satisfactory prognosis), this means good prognosis and short period of chemotherapy. This result agrees with some studies done in different countries as United State (US), it was 73.6, 72.2 for the Indonesian, 71.02 for the Chinese mandarin child- hood cancer patients and 72.75 for Lebanon [23-27]. Moreover, our score is better than the results of the Pakistani study [28] which demonstrated a much lower total QOL score of 42.07 and 62.29 in the Egyptian study [1].

In this study, although the mean value of total health related QOL was relatively good and similar to the score of some developed countries, however we observed low mean value in pain and hurt; procedural anxiety, treatment anxiety; worry and perceived physical appearance subscales. We did not find any statistically significant effect when the total QOL compared with the social and medical characteristic of study group, maybe due to small sample size.

Table 2. Mean scores of total health QOL and its subscales among study group

Scale / subscale	No of items	Mean	Std. Deviation	Median
Total Quality of life		73.48	15.78	77.60
Pain & hurt	2	65.45	25.58	70.50
Nausea	5	76.86	24.69	90.00
Procedural Anxiety	2	60.78	34.85	66.66
Treatment Anxiety	3	66.01	33.41	75.00
Worry	3	61.76	30.51	66.66
Cognitive Problem	5	92.54	14.36	100.00
Perceived Physical appearance	3	69.77	27.02	75.00
Communication	3	82.67	28.52	100.00

Table 3. Association between study variables with total QOL and its subscales

	Total QOL	Pain & Hurts	Nausea	Procedural anxiety	Treatment anxiety
Age at diagnosis:					
<7 years (n=18)	72.30±15.18	84.02±29.01	80.83±18.96	57.87±34.82	62.03±32.36
≥ 7 years (n=33)	74.12±16.30	73.86± 29.70	74.69±27.35	62.37±35.30	61.61±29.96
t test	-0.38	1.18	0.94	-0.46	-0.48
P value	0.69	0.24	0.35	0.66	0.63
Gender:					
Male (n=32)	75.26±15.50	71.87±33.89	77.65±21.92	63.28±34.96	70.57±32.16
Female (n=19)	70.49±16.22	86.84±17.41	75.52±29.38	56.57±35.19	58.33±34.91
t test	1.04	2.07	0.29	0.66	1.27
P value	0.30	0.04	0.76	0.51	0.20
Family size:					
≤ 5 children (n=28)	73.63±15.87	81.25±26.24	76.07±27.05	63.09±33.44	63.69±35.73
> 5 children (n= 23)	73.30±16.03	72.82±33.21	77.82±22.04	57.97±37.05	68.84±30.89
t test	0.07	1.01	-0.25	0.51	-0.54
P value	0.94	0.31	0.80	0.60	0.58
Hospital visits:					
≤ 3 times/ month (n=20)	71.19±16.07	80.00±29.63	77.75±24.35	56.25±34.50	60.00±31.36
>3 times / month (n=31)	74.95±15.68	75.80±29.91	76.29±25.29	63.70±35.32	69.89±34.60
t-test	-0.82	0.49	0.20	-0.74	-1.03
P value	0.41	0.62	0.83	0.46	0.30
Type of treatment:					
Chemotherapy (n=45)	72.83±15.84	76.38±29.70	75.44±25.10	58.70±34.81	65.37±33.84
Radiotherapy (n=2)	81.19±2.87	56.25±44.19	77.50±31.81	70.83±41.24	75.00±35.35
Surgical (n=4)	76.92±20.13	1.00±0.00	92.50±15.00	79.16±36.32	68.75±36.24
F test	0.36	1.75	0.87	0.71	0.09
P value	0.69	0.18	0.42	0.49	0.91
Duration of diagnosis:					
< 6 months (n=24)	70.39±17.24	72.39±32.96	73.75±24.41	65.27±31.81	64.23±33.28
6 months-1year (n=7)	85.00±8.19	85.71±24.39	77.85±27.21	63.09±40.78	90.47±12.19
>1 year (n=20)	73.16±14.61	80.62±27.04	80.25±24.99	54.58±37.11	59.58±35.79
F test	2.46	0.73	0.37	0.52	2.40
P value	0.09	0.48	0.68	0.59	0.10

Therapy duration:					
< 6 months (n=32)	72.35±16.59	73.82±33.05	75.62±22.99	63.02±33.12	67.70±32.70
6 months-1 year (n=5)	81.56±6.98	82.50±24.36	89.00±11.40	53.33±39.79	91.66±11.78
>1 year (n=14)	73.18±16.07	83.92±22.16	75.35±31.34	58.33±39.08	52.97±35.44
F test	0.73	0.63	0.66	0.20	2.76
P value	0.48	0.53	0.52	0.81	0.03*
Intensity of treatment:					
Low (n=28)	72.12±17.53	76.78±30.37	76.42±23.48	62.20±34.43	68.45±31.12
Medium (n=18)	73.61±14.46	79.16±30.01	74.16±27.87	57.87±35.29	58.33±38.87
High (n=5)	80.66±8.49	75.00±29.31	89.00±19.49	63.33±42.73	80.00±20.91
F test	0.61	0.05	0.70	0.09	0.98
P value	0.54	0.94	0.49	0.90	0.38
Treatment phase:					
On-treatment (n=30)	73.69±16.72	75.40±31.37	74.67±24.66	64.78±33.31	70.16±31.6
Follow-up (n=21)	73.16±14.61	80.62±27.04	80.25±24.99	54.58±37.11	59.58±35.79
t-test	0.11	0.61	0.78	1.02	1.10
P value	0.90	0.54	0.43	0.31	0.27

≤ = less than or equal to; > = More than; * = significant (p< 0.05)

Continue Table 3. Association between study variables with total QOL and its subscales

Variables	Worry	Cognitive problem	Perceived physical appearance	Communication
Age at diagnosis:				
< 7 years (18)	62.03±32.36	91.38±14.93	64.35±27.23	75.00±31.95
≥ 7 years (33)	61.61±29.96	93.18±14.24	72.72±26.86	86.86±26.02
t test	0.04	-0.42	-1.05	-1.43
P value	0.69	0.67	0.29	0.15
Gender:				
Male (n=32)	66.92±30.26	95.00±8.13	73.17±25.37	83.59±29.59
Female (n=19)	53.07±29.68	88.42±20.75	64.03±29.40	81.14±27.33
t test	1.59	1.60	1.17	0.29
P value	0.11	0.11	0.24	0.77
Family size:				
≤ 5 children (n=28)	57.14±35.33	93.92±12.71	72.32±26.35	81.54±28.45
> 5 children (n= 23)	67.39±22.87	90.86±16.28	66.66±28.09	84.05±29.18
t test	1.19	0.75	0.74	-0.31
P value	0.23	0.45	0.46	0.75

Hospital visits:				
≤ 3 times/ month (n=20)	69.08±28.07	94.75±6.97	71.66±27.49	78.75±29.67
>3 times / month (n=31)	50.41±31.35	91.12±17.54	68.54±27.10	85.21±27.94
t-test	2.16*	0.87	0.39	-0.78
P value	0.03*	0.38	0.69	0.43
Type of therapy:				
Chemotherapy (n=45)	62.40±29.38	91.77±15.11	69.62±25.57	82.96±27.74
Radiotherapy (n=2)	87.50±17.67	95.00±0.00	87.50±5.89	1.00±0.00
Surgical (n=4)	41.66±41.94	1.00±0.00	62.50±47.87	70.83±43.30
F test	1.62	0.62	0.56	0.70
P value	0.20	0.54	0.57	0.49
Duration of diagnosis:				
<6 months (n=24)	59.37±29.92	90.62±14.01	62.50±29.38	75.00±34.75
6 months-1 year (n=7)	91.66±10.75	98.57±3.77	75.00±26.78	97.61±6.29
>1 year (n=20)	54.16±30.52	92.75±16.81	76.66±22.87	86.66±22.19
F test	4.64*	0.82	1.69	2.11
P value	0.01*	0.44	0.19	0.13
Therapy duration:				
<6 months (n=32)	62.50±29.78	92.65±12.76	65.62±27.98	77.86±32.35
6 months-1 year (n=5)	66.66±38.64	96.00±5.47	76.66±27.25	96.66±7.45
>1 year (n=14)	58.33±31.35	91.07±19.72	76.78±24.49	88.69±21.08
F test	0.15	0.21	1.01	1.39
P value	0.85	0.80	0.37	0.25
Intensity of treatment:				
Low (n=28)	60.11±30.62	92.50±13.50	65.77±28.26	74.70±33.44
Medium (n=18)	63.42±32.35	91.11±17.45	73.61±28.04	91.20±19.06
High (n=5)	65.00±28.50	98.00±2.73	78.33±11.18	96.66±7.45
F test	0.09	0.44	0.73	2.66
P value	0.91	0.64	0.48	0.08
Treatment phase:				
On-treatment (n=30)	66.66±29.96	92.41±12.83	65.32±28.87	80.10±32.03
Follow-up (n=21)	54.16±30.52	92.75±16.81	76.66±22.87	86.66±22.19
t-test	1.44	-0.07	-1.48	-0.79
P value	0.15	0.93	0.14	0.42

≤ = less than or equal to; > = More than; * = significant (p< 0.05)

Table 4. Binomial logistic regression showing predictors of health-related quality of life in study group

	Pain & Hurts			Nausea			Procedural Anxiety			Treatment anxiety		
	B	OR	P	B	OR	P	B	OR	P	B	OR	P
Gender:												
Male	2.06	7.85	.04*	.05	1.05	.94	-.47	.62	.49	-.97	.37	.16
Age at diagnosis time:												
<7 years	2.55	4.74	.04*	-1.02	.35	.14	.80	2.23	.21	.54	1.73	.39
Mother education:												
Educated	-1.20	.32	.28	-1.15	.315	.25	.64	1.90	.45	.67	1.96	.43
Hospital visits:												
> 3 time/m	.48	1.63	.54	.01	1.01	.98	.73	2.08	.24	.92	2.52	.14
Duration of diagnosis:												
> 1 year	2.18	8.87	.04*	.04	1.05	.95	-.78	.45	.33	.43	1.54	.59
Therapy duration:												
> 1year	-.25	.77	.87	-1.97	2.72	.99	.72	2.06	.59	.64	1.91	.63
Intensity of treatment:												
Low	.06	1.06	.97	.61	1.84	.69	-.34	.71	.80	.34	1.40	.79
Medium	-1.37	.25	.38	1.04	3.28	.03*	-.75	.47	.51	-.47	.62	.68

B= β coefficient; OR = odds ratio; P= p value

However, in some subscales, we found males experienced significantly more pain and hurt than females and this is compatible with regression model in our results which reported that the most common predictors for pain and hurt subscale were gender, as males feel pain seven times more than females. This result opposite to that reported from Lebanon, Egypt and US, [26,1,17], the reason may be due to the differences in study type or methodology or age of the participants. In addition to the gender we found also age at the time of diagnosis and duration of diagnosis (more than one year) were other predictors for pain & hurt and this like other study [14].

Additionally, we reported children with a duration of therapy more than one year suffer more treatment anxiety, may be due to high frequency of visiting the hospital and long duration of treatment or may have experience more pain during the procedures, this is in agreement with the results of Canadian and Lebanon studies [27,26].

Furthermore, great worry increased in children visiting the hospital more than three times per month and those with duration of therapy more than one year. Such findings indicated more frequent exposure to hospital atmosphere and subsequently more therapy administration could be a leading reason, this results consistence with other results [14,1].

We observed that Children with a medium score of treatment intensity are likely to have more nausea than those with a low score, the explanation may be the medium intensity of treatment represents the cases treated with chemotherapy longer than six months according to the treatment protocol so they have more nausea than a lower score treatment which represents the surgery only and/or six months chemotherapy and this in agreement with results of some studies [1,14,29].

5. CONCLUSION AND RECOMMENDATION

In this study although the total health related QOL was relatively good however higher frequency of visiting the hospital, male gender and long duration of therapy and increased treatment intensity are associated with a poorer QOL in the subscales among childhood cancer patients. So, an early and continuous evaluation of these factors and predictors can supply the essential for interventions to enhance response to treatment and detection of children at risk of poor QOL during and after treatment. We recommend other studies in the same context and containing large number of children.

6. LIMITATION

This study includes some limitation like dependence on mothers' evaluations of their

child's QOL. Although most of study group were older but there was a difficulty to asking them directly as they tended to be too ill to respond. In addition, we depend more on the mothers than fathers as because she tends to be more contact and care with the child during the period of disease and treatment. They are more responsible for everything as medication, treatment and more likely to stay in the hospital with the child. Others have noted that the multiple different perspectives of QOL including the parent perspective are all important and contribute to our understanding of child health [30]. Although our sample was convenient, but we recruited all children visited the hospital during that period.

CONSENT

Informed and written consent was taken from all parents of the children in the study with the guide lines of ethical committee.

ETHICAL APPROVAL

Ethical approval was obtained from the Institutional Review Board/Ethics Committee at Faculty of Medicine, King Abdulaziz University.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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