

Fatigue in Children with Cancer: Reliability and Validity of the Persian Version of Child, Parent, and Staff Fatigue Scale

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ABSTRACT

Context: The fatigue is reported as the most common and annoying symptom in patients with cancer, timely diagnosis, and treatment can significantly influence the treatment and rehabilitation. It is crucial to have an appropriate tool to accurately assess fatigue status. **Objectives:** Our purpose was to assess psychometric properties of the Persian versions of fatigue scale by Original Scales from the viewpoint of children with cancer (Child Fatigue Scale [CFS]-24 h), their parents (Parent Fatigue Scale [PFS]-24 h), and staff (Staff Fatigue Scale [SFS]-24 h). **Methods:** Convenience sampling of the participants was conducted 100, including children with cancer within the age range of 7–12 years, their parents, and caregivers in medical staff. Test–retest reliability and internal

consistency were evaluated using intraclass correlation (ICC) and Cronbach's alpha coefficient. Dimensionality was determined by factor analysis. The patients' fatigue was also assessed through visual analog scale-fatigue (VAS-F). **Results:** Test–retest ($ICC_{CFS} = 0.71$, $ICC_{PFS} = 0.82$, and $ICC_{SFS} = 0.78$) was acceptable with a high level of internal consistency ($\alpha_{CFS} = 0.80$, $\alpha_{PFS} = 0.83$, and $\alpha_{SFS} = 0.84$). Factor analysis identified three, five, and two components for the CFS, PFS, and Staff Fatigue Scale (SFS), respectively. There was moderate correlation between CFS and VAS-F. **Conclusions:** Results of the current study indicated that CFS in children with cancer, PFS in their parents, and SFS in medical staff were valid and reliable instruments to assess

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fatigue from the viewpoint of children with cancer along with their parents and medical staff.

Key words: Cancer, Persian version of fatigue scale-child, reliability, validity

Introduction

Cancer is one of the important health problems in developed and underdeveloped countries. The number of cancer children and adults is gradually increasing in the world population.^[1] The epidemiology of cancer in children is different from that of adults.^[2] The most common cancers among children are leukemia, brain cancer, lymphoma, and bone tumors. The total prevalence of cancer among children is estimated as 100 cases per one million children, according to the World Health Organization report in the Eastern Mediterranean Region. The total prevalence of cancer varies among Iranian children in different geographical regions, and it is 48–112 females and 51–144 males/one million people, respectively.^[3] Advancements in pediatric oncology in recent decades improved the survival rate in children <14 years old worldwide. The survival rate of children elevated from 25%–30% in 1970 to 80%–85% in 2010.^[4,5]

Different therapeutic interventions such as surgery, radiotherapy, and chemotherapy may be administered based on the cancer stage and medical history of the patient; although such treatments can improve the survival rate of the patient, they may cause different complications.^[6,7]

The most common and usually annoying symptom of cancer and its therapeutic consequence is fatigue, reported in 70%–100% of the cases undergoing treatment.^[8] Fatigue may result from the process of disease and/or related treatments called cancer fatigue. It affects >70% of the patients undergoing radiotherapy and chemotherapy. In most of the patients, cancer fatigue is so severe that interrupts or limits their daily activities and significantly influences different aspects of personal life.^[9] Cancer fatigue influences the quality of life as well as functional conditions of the patients through influencing their abilities to perform activities and play roles in important life events.^[10]

The concept of fatigue in children with cancer was first introduced in a study on a population, including subjects with cancer within the age range of 7–12 (children) and 13–18 years (adolescents), as well as their parents and nurses that took care of them.^[11,12] Hockenberry-Eaton *et al.*, believed that since fatigue is a subjective symptom, the Child Fatigue Scale (CFS) should be personally scored by the patient; in addition, it should be concise and easy to understand; also, it should be developed multidimensionality. Studies show that fatigue has physical, emotional, and mental aspects.^[11] In addition, the interpretation of parents and medical staff of fatigue should be recorded since their ideas are different from those of children with cancer.^[13] The management of

cancer requires the cooperation of children, their parents, and medical staff to determine the symptoms, manage the treatment effectively, and recover the child to normal conditions.^[14,15] Lack of a valid and reliable scale to assess cancer fatigue in children prevents physicians to accurately understand the symptoms in children with cancer in Iran.

Due to the differences among languages, which affects the completion method of the self-reporting questionnaires and the validity of the obtained scores, and owing to the lack of any studies in Iran on the validity and reliability of the CFS, the current study aimed at evaluating the validity and reliability of the Persian version of Child fatigue scale-24 h (CFS-24), parent fatigue scale-24 h (PFS-24), and medical staff fatigue scale-24 h (SFS-24) in Iran.

Methods

Participants

The current nonexperimental study that employed the convenience sampling method to select the participants was conducted 100, including children with cancer within the age range of 7–12 years, their parents, and caregivers in medical staff (in fact, the number of nurses was 16. Each nurse was almost responsible for the care of six children in the pediatric unit and completed the information for each child individually.) Data were collected in MAHAK highly specialized Pediatric Cancer Hospital and Research Center, and Hazrat-e Ali Asghar Pediatrics Hospital in Tehran, Iran.

The inclusion criteria were as follows:

- CFS-24 h including children within the age range of 7–12 years diagnosed with cancer by an oncologist and medical records indicating lack of associated illnesses that cause fatigue according to the confirmation of oncologist, lack of developmental delay, ability to communicate, and fluently speaking in Persian
- PFS-24 h including the ability to read and write, and being the main caregiver of the child
- SFS-24 h, according to the child and his/her parents, the person who is most familiar with the child is a medical staff such as a nurse.

Children with evidence of second malignancy or with cognitive or behavioral problems in their medical records, incomplete completion of the questionnaires, lack of patient collaboration during testing and no timely referral for re-testing were excluded.

Written parental consent, staff consent, and child verbal assent were obtained. The patient version of the fatigue

instrument was read to the child by the researcher and parents and staff completed the questionnaire on their own.

Procedure

The scales were translated into Persian and three valid scales with clear, simple, and perceptible contents were prepared in the authors' previous study.^[16] After the selection of eligible participants, the cancer diagnosis was confirmed in the children by an oncologist. Validity was assessed through factor validity and convergent validity. Convergent validity was examined between the visual analog scale-fatigue (VAS-F) and CFS-24 h schedule. Initially, the child responded to fatigue in CFS-24 h and instantly marked the fatigue intensity visually in the VAS-F. The internal consistency of the Persian version of CFS-24 h, PFS 24-h, and SFS-24 h were assessed using Cronbach's alpha. To assess test-retest reliability, an examiner collected data about cancer fatigue from 30 children with cancer as well as their parents and caregiving medical staff using CFS-24 h, PFS 24-h, and SFS-24 h twice with a week interval. The average time to complete questionnaire was 30–50 min in a room with constant conditions.

Tools

- CFS-24 h schedule includes ten items. The schedule is personally completed by the child within 5–7 min. These items are about the problems annoying the child, and the scoring is based on a five-point Likert scale from “never” to “most often” to score the severity of fatigue. The severity of fatigue is scored from 10 to 50. The higher scores indicate the more fatigue experienced by the child^[13]
- PFS-24 h is a 17-item questionnaire and indicates the perception of parents from the level of fatigue experienced by their child within the last 24 h. The items are scored based on a five-point Likert scale from 1 (never) to 5 (always). The scores range from 17 (no fatigue) to 85 (the highest fatigue). The questionnaire is completed by the parents within 5–8 min and higher scores indicate the perception of parents about more fatigue experienced by their child^[13]
- SFS-24 is a nine-item scale regarding the perception of the medical staff of the level of fatigue experienced by the child within the last 24 h. The medical staff complete the questionnaire based on the activities of the children in the last 24 h. It is a four-point Likert scale questionnaire and the scores range from nine (no fatigue) to 36 (the highest fatigue)^[13]
- VAS-F is an instrument to visually assess the level of fatigue. It is a five-option Likert scale ranging from one to five, and higher scores indicate more fatigue in the child.^[1]

Statistical analysis

Normal distribution of the data was investigated by the Shapiro–Wilk test ($P > 0.05$). The demographic characteristics were described by the mean and standard deviation. The inter-rater reliability was calculated by the intraclass correlation (ICC) coefficient, two-way random (absolute agreement), and single measure with a confidence interval of 95%. This measure is used to assess the reproducibility of an instrument between different sessions or evaluators on one subject. An ICC >0.80 indicates a high reliability.^[17] The internal consistency was analyzed calculating Cronbach's alpha coefficient. A coefficient >0.80 indicates a high correlation.^[18] To investigate dimensionality, the Exploratory Factor Analysis, Varimax rotation was employed (eigenvalues ≥ 1).^[19] To assess convergent validity, the Spearman rank correlation test was applied to examine the correlation between the total CFS-24 h score and VAS-F. A period of 2–14 days is considered adequate, and hence, we used a 7 days interval in the study.^[20–22] The interpretation of the result was based on the Monroe Scale (very high = 0.9–1.00; high = 0.70–0.89; moderate = 0.50–0.69; low = 0.26–0.49).^[23,24] Correlation of CFS-24 h, PFS-24 h, and SFS-24 h (Spearman correlation) the fatigue symptom for the same patient was evaluated by the child, the parent, and the nurse.

Results

According to similar studies, the sample size of 100 children with cancer along with their parents and staff participated in the current study.^[13,14] The demographic characteristics, as well as medical data of the participants, are shown in Table 1. In the current study, out of the 100 children evaluated by CFS, 66 of the participants were male and 34 of them were female within the age range of 7–12 years; most of them left school during the study. The different types of blood cancer were dominant among the children with 44 frequencies. For PFS, 100 of the participants were female. The highest level of education was high school diploma among the mothers. For SFS, 14 of the participants were female and two of them were male. The most frequent educational level and work experience among medical staff was a bachelor degree and >10 years, respectively.

Test-retest reliability and internal consistency

For test-retest reliability, in this study, thirty of the subject participated. In CFS-24 h scale, the average age of children was 9.6 years. Twenty-one (70%) of the subject were male and 9 (30%) were female. Twenty-two (73.3%) of the participants had suffered from leukemia. For PFS-24 h, the average age of parent was 36.5 years and all of the

subjects were female. In SFS 24 h, the average of staff was 32.3 years. All of the participants were female.

In test–retest reliability for total CFS, PFS, and SFS scores, ICC values were 0.71, 0.82, and 0.78, respectively. Cronbach’s alpha for CFS-24 h, PFS-24 h, and SFS-24 h were 0.79, 0.75, and 0.79, respectively [Table 2].

The Kaiser-Meyer-Olkin (KMO) test indicated the test validity, degree of freedom, and level of significance. Since KMO index was 0.764 for CFS, 0.825 for PFS, and 0.800 for SFS, a sample size of 100 subjects was adequate for the factor analysis. The Bartlett test of sphericity showed the suitability of the factor analysis to identify the structural factor model at $P < 0.0001$.^[19]

Convergent validity

The convergent validity of the current study between CFS-24 h and VFS was 0.52, which indicated a moderate between the two questionnaires [Table 3].

Discussion

The current study aimed at evaluating the validity and reliability of the Persian version of CFS, PFS, and SFS and showed good validity and reliability for the scale. In the current study, the self-reporting scales were completed by the participants in about 10 min. All CFS items were clear and easy to understand. Children, their parents, and caregivers did not spend much time to complete the scales. The scales were specifically developed to indicate the level of cancer-related fatigue and evaluate its multidimensional aspects.

The test–retest reliability was performed in the current study with 1-week interval and showed suitable reliability in PFS and SFS, but low in CFS; the reason can be attributed to the point that the questionnaire was heavily influenced by time and the children, every day, reported different levels of fatigue with a week interval. Shun *et al.*, in a study, evaluated the psychological features of three under study scales on 243 children with cancer but did not use the test–retest reliability.^[25] Nunnally and Bernstein showed poor reliability for test–retest. Fatigue is a mental sensation with a dynamic process and changes over time.^[26] Therefore, the use of the test–retest results is not recommended to report the stability of cancer-related fatigue tool, especially when the patient is under treatment.^[25] According to the results of the current study, it is recommended to consider shorter intervals (2–3 days) in further studies to assess the reliability of the test–retest.

The Cronbach’s alpha was 0.79 for CFS-24 h, 0.75 for PFS-24 h, and 0.79 for SFS-24 h. The acceptable Cronbach’s alpha index should range from –1 to +1 for internal consistency that was 0.7 in the current study based on the obtained measures; hence, the internal consistency and

Table 1: Characteristics of participant

Participant	Variable	n (%)
Children	Age (year), mean (SD)	9.30 (1.85)
	Gender	
	Male	66 (66)
	Female	34 (34)
	Diagnosis	
	Leukemia	44 (44)
	Sarcoma	20 (20)
	Other diagnosis	36 (36)
	The duration after the diagnosis	
	< year	58 (58)
	Between 13 and 19 months	19 (19)
	Between 20 and 24 months	9 (9)
	> 2 years	14 (14)
	Admission day	
	Second	40 (40)
	Third	34 (34)
	Fourth	19 (19)
	Fifth	5 (5)
	Sixth	2 (2)
Treatment received		
Chemotherapy	62 (62)	
Radiotherapy	18 (18)	
Surgery	11 (11)	
BMT	9 (9)	
History of cancer in the family		
Yes	42 (42)	
No	58 (58)	
Mothers	Age (year), mean (SD)	33.61 (6.03)
	Education	
	< Diploma	34 (34)
	Diploma	42 (42)
> Diploma	24 (24)	
Staff	Age (year), mean (SD)	33.93 (6.87)
	Gender	
	Male	2 (12.5)
	Female	14 (87.5)
	Work experience (years)	
	< 5 years	3 (18.75)
	Between 5 and 10 years	3 (18.75)
> 10 years	10 (62.5)	

BMT: Bone marrow transplant, SD: Standard deviation

Table 2: Reliability of Persian version of Fatigue in children with cancer

Scales	Number of items	Cronbach's alpha	ICC
CFS-24 h	10	0.79	0.6
PFS-24 h	17	0.75	0.82
SFS-24 h	9	0.79	0.78

ICC: Intra class correlation, CFS-24 h: Children Fatigue Scale 24 h, PFS-24 h: Parent Fatigue Scale 24 h, SFS-24 h: Staff Fatigue Scale 24 h

reliability of the scales were acceptable in the current study, similar to those of other studies.^[13,14]

As we did not have a study for exploratory analysis factor in the 24-h version, we compared the results of the

Table 3: Correlation of the Scales (*n*: 100 children, parent, medical staff)

Scales	Correlation	CFS-24 h	PFS-24 h	SFS-24 h	VAS-F
CFS-24 h	<i>r</i> (<i>P</i> [<i>v</i>])	-	0.28 (0.005)	0.08 (0.438)	0.52 (0.000)
PFS-24 h	<i>r</i> (<i>P</i> [<i>v</i>])	-	-	0.07 (0.513)	-
SFS-24 h	<i>r</i> (<i>P</i> [<i>v</i>])	-	-	-	-

VAS-F: Visual Analog Scale-Fatigue, CFS-24 h: Children Fatigue Scale 24 h, PFS-24 h: Parent Fatigue Scale 24 h, SFS-24 h: Staff Fatigue Scale 24 h

study with a weekly scale. All questions on a weekly scale are similar to the fatigue scale within 24 h. Similar to Hockenberry *et al.*, Factor 1 reported the components of lack of energy, inability to perform, and mood change of CFS.^[13] One of the probable reason for one-factor result is data gathering in 24 h is not affected by other possible cause of fatigue such as medication side effects, environmental demands, as present in a weekly report. For PFS, the factor analysis reported four components of lack of energy, inability to perform, changed sleep behaviors, and mood change. In the current study, items 1, 2, and 3 occurred in Factor 5.^[14] the difference between the results of original sample and those of the current study can be attributed to culture and attitude differences. The current study could not suggest a strong reason for this difference and recommended further studies in this regard.

There was only a factor structure as lack of energy for SFS in the original study. The items 3, 4, 6, and 7 are in Factor 2. The difference between the factors provided in the current study and those of the original analysis can be attributed to the point that the items in Factor 2 showed the concept of lack of energy. For the SFS scale, only one lack of energy factor was obtained in the original study. In the current study, questions 3, 4, 6, and 7 appeared in Factor No. 2. The difference between the factors investigated in the current study and those of the original study can be explained by the fact that the questions quoted in Factor No. 2 conceptually and semantically mean the notion of lack of energy, but this concept and meaning is more mentally and the reader should have a mental impression of the meaning of lack of energy if the remaining questions can very objectively convey the meaning of the lack of energy.^[13]

Correlation analysis between the scales showed a significant relationship between CFS and PFS, while it was not significant with SFS, PFS, and CFS. It was observed that nurses understand fatigue differently from patients and parents. Experience of critical situation can affect reporting fatigue from the parents and staff point of view.^[14]

Limitations

The sample of the current study was limited to children hospitalized in the oncology ward of one children's

hospital. All of the children received chemotherapy as usual protocols.

Conclusion

The scale of fatigue in children with cancer is a reliable and valid instrument to measure the level of fatigue. The scales are brief, reliable, and feasible to assess multi-dimensional aspects of fatigue among such children. The instrument helps health professionals to monitor fatigue in children with cancer.

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Conflicts of interest

There are no conflicts of interest.

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