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ORIGINAL ARTICLE

Validation of the Chinese version of functional assessment of anorexia-cachexia therapy (FAACT) scale for measuring quality of life in cancer patients with cachexia

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Abstract
Purpose The assessment of quality of life (QOL) is an important part of cachexia management for cancer patients. Functional assessment of anorexia-cachexia therapy (FAACT), a specific QOL instrument for cachexia patients, has not been validated in Chinese population. The aim of this study was to validate the FAACT scale in Chinese cancer patients for its future use.
Methods Eligible cancer patients were included in our study. Patients' demographic and clinical characteristics were collected from the electronic medical records. Patients were asked to complete the Chinese version of FAACT scale and the MD Anderson symptom inventory (MDASI), and then the reliability and validity were analyzed.
Results A total of 285 patients were enrolled in our study, data of 241 patients were evaluated. Coefficients of Cronbach's alpha, test-retest and split-half analyses were all greater than 0.8, which indicated an excellent reliability for FAACT scale. In item-subscale correlation analysis and factor analysis, good construct validity for FAACT scale was found. The correlation between FAACT and MDASI interference subscale showed reasonable criterion-related validity, and for further clinical validation, the FAACT scale showed excellent discriminative validity for distinguishing patients in different cachexia status and in different performance status.
Conclusions The Chinese version of FAACT scale has good reliability and validity and is suitable for measuring QOL of cachexia patients in Chinese population.

Keywords Cancer cachexia · Functional assessment of anorexia-cachexia therapy · Quality of life · Questionnaire validity · MD Anderson symptom inventory

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Introduction

The international consensus has confirmed the definition of cachexia: a multifactorial syndrome with the characteristics of ongoing loss of skeletal muscle mass (with or without fat mass loss) that cannot be fully reversed by conventional nutritional support and leads to progressive functional impairment [1]. Patients with more than 5% weight loss in the past 6 months or more than 2% weight loss when BMI (body mass index) <20 kg/m^2 or sarcopenia can be considered cachexia [1]. Cachexia often occurs in life-threatening diseases, such as cancer, acquired immunodeficiency syndrome, chronic obstructive pulmonary disease, rheumatoid arthritis, and organ failure [2]. Cancer cachexia occurs in about 50% of cancer patients and is a poor prognostic factor [3, 4]. Moreover, cachexia is considered a major cause of morbidity and mortality for cancer patients, and more than 20% of cancer patients die because of cancer anorexia and cachexia syndrome (CACS) [5, 6]. Cancer cachexia, now recognized as CACS, can reduce overall survival [7, 8], increase treatment toxicity [9, 10], decrease tolerance to treatments [11], influence patients' function and performance status [12, 13], and severely impair quality of life (QOL) [14]. Since QOL is one of the important endpoints of cachexia treatment, how to clearly and effectively assess QOL of cachexia patients is crucial. Therefore, good QOL assessment tools are needed for cancer patients with cachexia.

Many QOL instruments have been developed for evaluating cancer patients' quality of life, such as EORTC QLQ-C30 [15], functional assessment of cancer therapy general (FACT-G) [16], and McGill quality-of-life questionnaire (MQOLQ) [17]. As FACT-G is a frequently used QOL instrument, it has smaller variability and larger discriminative ability and requires smaller sample size than the EORTC QLQ-C30 [18, 19]. Moreover, the functional assessment of anorexia-cachexia therapy (FAACT) scale, which consists of the FACT-G scale and the anorexia-cachexia subscale (ACS), is a specific QOL instrument for cancer cachexia patients [20–22]. However, instruments from different countries cannot be used directly because of cultural differences, such as differences in languages, comprehensive abilities, and cultural beliefs. To our knowledge, the FAACT scale has not been widely validated in different countries and no data from the Chinese population is yet available.

Therefore, the aim of our study was to assess the reliability and validity of the Chinese version of FAACT scale, which can be used as a specific QOL instrument for cancer cachexia in Chinese population.

Methods

Scale acquisition and data collection

After registration for academic research purposes and obtaining the license agreement to use the questionnaire from the web of FACIT.org (http://www.facit.org/FACITOrg/Questionnaires), we downloaded the Chinese version of FAACT. Patients included in our study were inpatients from the Cancer Center of Tongji Hospital, Wuhan, China. Patients who were diagnosed with advanced cancer in stage III/IV, no less than 18 years old, and could read and understand the questionnaires were included in our study. This study was approved by the Tongji Medical College Research Ethics Board, and written informed consent was signed by all patients before participation.

We collected patients' demographic and clinical characteristics from the electronic medical records. The diagnostic criterion of international consensus for cachexia was used: in the past 6 months, weight loss of more than 5% or weight loss of more than 2% in patients with BMI <20 or sarcopenia. We used the images of CT scans to measure the skeletal muscle cross-sectional areas (cm^2) at the level of L3 [23]. Sarcopenia was defined as skeletal muscle index <55 cm^2/m^2 in men and <39 cm^2/m^2 in women [1, 24]. Patients were asked to complete the FAACT and MD Anderson Symptom Inventory (MDASI) questionnaires to evaluate their quality of life and symptom interferences. After 1 week, in order to calculate the test-retest reliability of FAACT scale, we again asked the patients who were still in the hospital to fill this questionnaire for a second time.

Scoring methods

FAACT scale is a specific QOL instrument for cancer patients with cachexia, which includes five subscales: physical well-being (PWB; 7 items), social well-being (SWB; 7 items), emotional well-being (EWB; 6 items), functional well-being (FWB; 7 items), and anorexia-cachexia subscale (ACS; 12 items). Each item is rated as a five-level scoring system: not at all, a little bit, somewhat, quite a bit, and very much. Positive items are scored directly from 0 to 4 points, while the scores are reversed in negative items. The scores of subscales are the sum of their own item scores. A sum of all the 39 items' scores constitutes the overall score of FAACT scale. As a result, the higher the score, the better the quality of life.

Since there was no golden standard QOL instrument for cancer cachexia patients, we chose a widely used patient-reported method, the interference subscale of MDASI, as a criterion to compare the results of two instruments. MDASI, validated in Chinese population, was widely used for symptom and quality-of-life assessment [25–28]. The interference subscale of MDASI includes six aspects: the interference of general activity, mood, walking, work, relationship with others, and life enjoyment. These aspects are comparable with the subscales of FAACT. Each item in MDASI interference subscale has a range of 0 to 10 with an increasing interference to quality of life. Thus, the scores of MDASI interference subscale are negatively correlated with patients' quality of life [29].

Statistic methods

The completed questionnaires were collected for analysis. The simplified Chinese version of FAACT was evaluated for reliability and validity. We used Cronbach's alpha coefficient to determine the internal consistence of this questionnaire. Test-retest and split-half correlations were also analyzed for its reliability. Pearson correlation was used to calculate the correlation coefficients between each item and its own subscale and correlation coefficients among subscales for construct validity. The construct validity was further confirmed by exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). Criterion-related validity was evaluated by correlation coefficients between FAACT and MDASI interference scores. We further evaluated the clinical validity by comparing the questionnaire scores between patients with or without cachexia and patients in different performance status. The statistical analyses were performed on SPSS version 18.0 and AMOS version 20, and $P < 0.05$ was considered statistically significant.

Results

Among 285 patients, 44 patients who did not completely finish the FAACT questionnaire were excluded. Finally, the

FAACT scores of 241 patients were calculated for analysis. The median age of our patients was 52 years old. Less than half of patients were female and more than 70% of patients were in stage IV. The most common cancer diagnoses included lung cancer (32.0%), digestive system cancer (27.4%), and head/neck cancer (11.6%). More than half of patients had an ECOG performance status of 1 point, and the majority of patients were admitted in the hospital for the reason of receiving chemotherapy. Mean of BMI, calculated by weight (kg) and height (m), was 21.74 in our patients. According to the International Diagnosis Criterion of Cachexia, about half of the patients (49.0%) were considered cachexia. Patients' demographic and clinical characteristics are summarized in Table 1.

Reliability

Cronbach's alpha coefficients for subscales were used to measure the internal consistency of the FAACT questionnaire. In our results, Cronbach's alpha coefficient values for all subscales were greater than 0.8, and in FACT-G and FAACT were greater than 0.9. Eighty patients finished the FAACT questionnaire for a second time, and the test-retest reliability correlation coefficients were all greater than 0.8. The split-half reliability for the total questionnaire was 0.814. These results were shown in Table 2.

Table 1 Demographics and clinical characteristics of patients ($n = 241$)

Variables	No. patients	Percent
Age (median (range); years)	52 (18–77)	–
BMI (mean (SD); kg/m^2)	21.74 (3.24)	–
Gender		
Female	102	42.3%
Male	139	57.7%
ECOG performance status		
0	3	1.3%
1	160	66.4%
2	62	25.7%
3	16	6.6%
Primary diagnosis		
Lung cancer	77	32.0%
Digestive system cancer	66	27.4%
Head and neck cancer	28	11.6%
Lymphoma	23	9.5%
Gynecological cancer	19	7.9%
Soft tissue tumor	10	5.0%
Breast cancer	12	4.1%
Others	6	2.5%
Tumor stage		
III	64	26.6%
IV	177	73.4%
Receiving chemotherapy	206	85.5%
Cachexia status		
No	123	51.0%
Yes	118	49.0%

Clinical validity

The construct validity of FAACT was evaluated by calculating the correlation between each item and its own subscale. According to the analysis of Pearson correlation, almost all the items had correlation coefficients greater than 0.4 and the majority of correlation coefficients were greater than 0.6. We then calculated the correlation among different subscales. Correlation coefficients among different subscales were in the range of 0.2–0.7, and each subscale had a moderate to strong correlation with the total FAACT scale. Details are shown on Table 3.

The construct validity was further evaluated by factor analysis. We first calculated Kaiser-Meyer-Olkin (KMO) = 0.876 and $p < 0.001$ in Bartlett's test of sphericity, which indicated that the FAACT questionnaire was fit for factor analysis. Then, we selected five factors to stand for the five subscales of FAACT questionnaire. In factor analysis, the cumulative contribution of variance was 55.67%. The first component reflecting functional well-being included GF1 (0.624), GF2 (0.685), GF3 (0.768), GF4 (0.630), GF5 (0.668), GF6 (0.737), and GF7 (0.747). The second component reflecting anorexia-cachexia syndrome had higher scores on ACT2 (0.647), ACT3 (0.782), ACT4 (0.735), ACT6 (0.732), ACT7 (0.628), and ACT10 (0.673). The third component reflecting physical well-being included GP1 (0.576), GP2 (0.735), GP3 (0.524), GP4 (0.556), GP5 (0.664), GP6 (0.558), and GP7 (0.584). The fourth component reflecting emotional well-being had higher scores on GE1 (0.550), GE3 (0.597), GE4 (0.740), GE5 (0.798), and GE6 (0.780). The fifth component reflecting social well-being with higher loadings on GS1 (0.529), GS2 (0.850), GS3 (0.739), GS4 (0.824), GS5 (0.796), and GS6 (0.739). Finally, we performed CFA to further assess the construct validity of the FAACT scale. In our results, goodness-of-fit indices are as follows: $X^2 = 767.418$, $df = 293$, $X^2/df = 2.619$, $p < 0.001$; root mean squared error of approximation (RMSEA) = 0.082, with 90% CI (0.075, 0.089), root mean squared residual (RMR) = 0.105, goodness-of-fit index (GFI) = 0.806, normal-fit index (NFI) = 0.785, comparative-fit index (CFI) = 0.854, and Tucker-Lewis index (TLI) = 0.838.

Table 2 Cronbach's alpha coefficients (standardized) and test-retest reliability

Module (n = 241)	Cronbach's alpha	Test-retest reliability
Anorexia and cachexia subscale (ACS)	0.837	0.816
Physical well-being (PWB)	0.863	0.854
Social well-being (SWB)	0.851	0.837
Emotional well-being (EWB)	0.847	0.856
Functional well-being (FWB)	0.858	0.874
FACT-G (base FACT scale)	0.906	0.862
FAACT (ACS + FACT-G)	0.927	0.843

A total of 236 patients filled the FAACT questionnaire and MDASI interference subscale at the same time. We compared the correlation among the subscales of FAACT and interference subscale of MDASI to evaluate the criterion-related validity. In the results, scores of FAACT scale were negatively correlated with MDASI interference scores (seen in Table 4). The subscales of FACT-G were more correlated with the same or similar aspects of MDASI interference, rather than other aspects of different domains. For example, PWB was strongly negatively correlated with general activity and walking interference ($r = -0.615$, $r = -0.596$). SWB was strongly negatively correlated with relationship interference ($r = -0.544$). EWB was negatively correlated with mood interference ($r = -0.651$). FWB was negatively correlated with work- and life-enjoyment interference ($r = -0.432$, $r = -0.436$). ACS and the total FAACT scale had similar correlations with the six aspects of MDASI interference subscale.

For clinical validity of FAACT, we compared the scores of FAACT in patients with or without CACS. In CACS group, the scores of all subscales (PWB, SWB, EWB, FWB, and ACS) were lower than the non-CACS group, and all the differences were statistically significant ($p = 0.039$ in SWB, $p < 0.001$ in others), details seen in Fig. 1.

In patients with different ECOG performance status, we also compared the differences between FAACT scores. Patients with ECOG 0–1 had better scores of each domain of FAACT than patients with ECOG ≥2. Except for SWB ($p = 0.224$), all differences were statistically significant ($p < 0.05$), details shown on Fig. 2.

Discussion

To our knowledge, this study was the first study to establish a validation of FAACT scale in a Chinese population. Since QOL is one of the efficient endpoints of cachexia treatment, appropriate QOL instrument is needed for cachexia patients. However, there is no widely accepted QOL instrument in clinical trials of CACS treatment. In the past, EORTC QLQ-C30 was frequently used in several clinical trials [30, 31] and was replaced by FAACT scale and MDASI in several recent studies [32, 33]. The major reason is that the FAACT is a specific QOL instrument for cancer cachexia, which can reflect the specific symptom burden of cachexia patients. Therefore, the validation of this scale is important for its wide use in different countries.

In this study, we analyzed the reliability and validity of FAACT in Chinese population. For reliability evaluation, we analyzed the Cronbach's alpha, the test-retest, and split-half correlation coefficients. The Cronbach's alpha is a commonly used indicator for internal consistency, and the test-retest and split-half coefficients reflect the external consistency of questionnaires. These results are acceptable when greater than 0.7 [34]. In our results, the Cronbach's alpha, test-retest, and split-half coefficients were all greater than 0.8. These results were consistent with several validity studies of QOL questionnaires [34–37], which reflected that the FAACT scale had excellent reliability in Chinese population.

Table 3 Item-subscale correlation and correlation among subscales

FAACT (n = 241)	Item—own scale correlation (range)	PWB	SWB	EWB	FWB	ACS	FAACT
PWB	0.660–0.805	1	0.241	0.681	0.414	0.618	0.823
SWB	0.663–0.818		1	0.282	0.289	0.214	0.437
EWB	0.362–0.880			1	0.423	0.622	0.818
FWB	0.676–0.790				1	0.424	0.696
ACS	0.441–0.765					1	0.833
FAACT	0.311–0.708						1

Table 4 Correlation between FAACT and MDASI interference measurements ($N = 236$)

MDASI	PWB	SWB	EWB	FWB	ACS	FAACT
General activity inference	−0.615	−0.160	−0.577	−0.363	−0.514	−0.613
Mood interference	−0.474	−0.146	−0.651	−0.330	−0.489	−0.633
Walking interference	−0.596	−0.158	−0.526	−0.392	−0.478	−0.589
Work interference	−0.521	−0.138	−0.518	−0.432	−0.404	−0.551
Relationship interference	−0.486	−0.544	−0.537	−0.310	−0.509	−0.559
Life enjoyment interference	−0.558	−0.146	−0.579	−0.436	−0.504	−0.601

In construct validity, high correlations between items and their own subscales were seen in our study, which suggested satisfactory convergent validity of this questionnaire. GE2 had relatively lower correlation with EWB, which was similar with the result in study of Zhou et al. [34]. Subscales of a QOL questionnaire should assess the quality of life from different aspects, and they would be correlated with each other rather than completely independent, which suggested that moderate correlations between subscales were appropriate [36, 38]. In our results, except that the correlations between SWB and other subscales were somewhat weak, the correlations between subscales were acceptable. Possible reason could be that the SWB subscale could be more affected by individual circumstances than the severity of disease. We then further confirmed the five subscales by factor analysis. For RMSEA, a value of equal or less than 0.08 represents a "reasonable fit" and more than 0.10 represents "unacceptable fit" [39]. CFI, GFI, NFI, and TLI values >0.70 were considered an acceptable fit [40]. Therefore, our results showed acceptable fit of this model. Overall, these results reflected good construct validity of the FAACT, which were comparable with other FACT-validating studies [38, 41]. In this study, we chose the MDASI for criterion-related validity, because it was commonly used in some recent cachexia studies for QOL evaluation [14, 32]. Strong correlations between the same aspects of FAACT and MDASI interference subscale were seen in our study, and it suggested reasonable validity of FAACT.

Furthermore, we compared the FAACT scores in patients with different CACS status and different performance status. Except for SWB in different ECOG performance status, all differences in scores of FAACT subscales between two groups were statistically significant. The FAACT can well distinguish patients in different CACS status and in different performance status, which reflected good clinical validity and discriminative validity.

Our study also had some limitations. First, we collected data only from a single center in mainland China, and it may influence the generalization of our results in Chinese population. Second, because of no other specific QOL instrument for cachexia patients, we chose a briefly patient-reported MDASI for criterion-related validity. Although MDASI is not as commonly used as EORTC QLQ-C30 for QOL evaluation, it is quite simple and brief than EORTC QLQ-C30 and it can increase the completion rate of questionnaires. Finally, because our study was a cross-sectional study, we could not measure the responsiveness of this scale before and after treatment.

In conclusion, QOL assessment is important for cancer patients with cachexia. The Chinese version of the FAACT is a reliable and valid tool for measuring QOL in cancer patient with cachexia and is recommended for use in Chinese people due to its good reliability and validity. Further studies are needed to assess the validity in different clinical settings and the responsiveness over time in Chinese population.

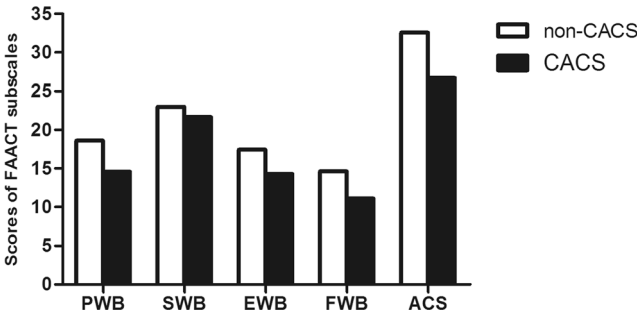

Fig. 1 Means of FAACT scores according to CACS status

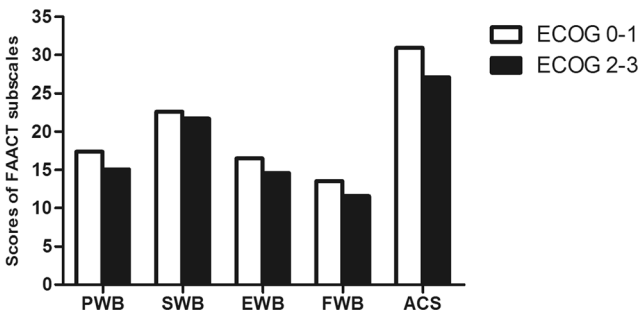

Fig. 2 Means of FAACT scores according to ECOG performance status

Compliance with ethical standards

Conflict of interest The authors declare no potential conflicts of interest with respect to the research, authorship, and publication of this article.

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