Validation of the Scored Patient-Generated Subjective Global Assessment (PG-SGA) in Thai Setting and Association with Nutritional Parameters in Cancer Patients

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Abstract

Background: The Scored Patient-Generated Subjective Global Assessment (PG-SGA) is a multidimensional tool to assess malnutrition and risk factors. The objectives of this study are to determine the validity of the Thai version of the Scored PG-SGA (Thai PG-SGA) and examine the correlations with selected nutritional parameters. Methods: This observational analytic study included 195 cancer patients aged greater than 18 years at a university-affiliated hospital in Bangkok, Thailand. All patients were assessed for nutritional status by Thai PG-SGA in comparison to subjective global assessment (SGA). Anthropometry, body composition, and hand grip strength were evaluated. Results: According to PG-SGA global assessment categories, 39% (75) of 195 cancer patients were well nourished, 27% (53) were moderately malnourished and 34% (67) of patients were severely malnourished. Thai PG-SGA had a sensitivity of 99.1% and a specificity of 86.0% at predicting SGA classification. PG-SGA numerical scores were significantly different between well-nourished and malnourished groups (4.2 ± 2.4 Vs 16.3 ± 4.9; p < 0.001). The PG-SGA scores, nutritional status assessed by PG-SGA, and nutritional status assessed by SGA were correlated with weight, % weight loss in one month, body mass index, body fat, and hand grip strength (p < 0.001) respectively. Conclusions: Thai PG-SGA showed high sensitivity and good specificity in predicting malnutrition in Thai cancer patients. This tool demonstrated the correlations with anthropometric parameters, body composition, and muscle strength.

Keywords: Nutritional assessment- nutritional status- scored patient-generated subjective global assessment-malnutrition

Introduction

Oncology patients are at risk of malnutrition throughout the course of the disease and its treatment (Andreyev et al., 1998). The prevalence of malnutrition in cancer patients ranged from 40% to 80% depending on the tumor type, location, stage, and therapy (Ollenschläger et al., 1991; Shike, 1996; Barrera, 2002). Cancer and anti-cancer treatments could adversely affect the patient’s nutritional status, where they interfere with appetite and dietary intake (Capra et al., 2001). All of which leads to malnutrition and may cause an increased risk of complications, reduced response and tolerance of treatment, decreased quality of life, increased healthcare costs, and prolonged hospitalization (Lis et al., 2012; Arends et al., 2017). Therefore, screening, assessment, and monitoring of malnutrition is essential for triaging patients and provided timely intervention to improve clinical outcomes (Bauer et al., 2002).

The Subjective Global Assessment (SGA) is a well validated tool for assessing nutritional status which has generally been regarded as a standard tool based on the concept of medical history and physical examination (Detkay et al., 1987). It has been used in several clinical settings and has been proven to correlate with clinical variables (anthropometry, biochemistry, clinical and tumor-related characteristics of patients, and quality of life) (Isenring et al., 2003; Li et al., 2011; de Magalhães Cunha et al., 2015). However, this assessment has a limitation of its subjective method in categorizing patient into three categories, which could lead to difficulty to detect small changes in nutritional risks (Barbosa-Silva and Barros, 2006).

The Scored Patient-Generated Subjective Global Assessment (PG-SGA) is a 4-in-1 instrument facilitating proactive screening, assessment, monitoring, and interdisciplinaty intervention triage (Jager-Wittenaar and Ottery, 2017). The PG-SGA was developed as a modification of the original SGA and has been widely used as a reference method for nutrition assessment

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in oncology patients (Bauer et al., 2002; Isenring et al., 2003; Jager-Wittenaar and Ottery, 2017). The scored PG-SGA consists of 2 components. Firstly, the patient-generated component was designed to be completed by the patient. It incorporates four boxes on weight history, food intake, nutrition impact symptoms, and activities/function. These components are officially known as the PG-SGA Short Form and to reflect about 80-90% of the total PG-SGA score (Ottery, 1996). Secondly, professional component includes 5 Worksheets addressing scoring the percentage of weight loss, disease and its relation to nutritional requirements, metabolic demand, physical examination, and the global category rating. The professional component was developed to be filled by the healthcare professionals (Ottery, 1996). In addition, the PG-SGA provides a numerical scoring system which helps prioritizing patients to receive urgent interventions matched with their symptoms based on nutritional triage recommendations and monitoring changes in nutritional risks (Soeters et al., 2008; Sealy et al., 2016; Jager-Wittenaar and Ottery, 2017; Ottery, 2015).

The advantages of the PG-SGA are not only reducing time for patient interaction and shortening clinic flow but also potentially allowing proactive prevention of malnutrition by identifying and triaging for necessary interventions (Jager-Wittenaar and Ottery, 2017).

Recently, the Thai version of the Scored PG-SGA (Thai PG-SGA) was officially established which included multiple translation processes according to the principles of good practice by the International Society for Pharmacoeconomics and Outcomes Research (ISPOR) (Wild et al., 2005). It was tested in cancer patients and healthcare professionals with the supervision of copyright holder and an international expert on translation and cultural adaptation of the PG-SGA. The results showed it has conceptual equivalence to the original English PG-SGA and considered easy to use and comprehensible by cancer patients and healthcare professionals (Nitichai et al., 2018). Utilization of this tool in each own country’s language could better reflect nutrition status of cancer patients as well as promote meta-analysis and inter-country comparison of nutrition status in cancer patients since the Scored PG-SGA was translated and culturally adapted to several languages (Jager-Wittenaar and Ottery, 2017). Nonetheless, at present, the validity of Thai PG-SGA and its association with important clinical parameters has not been assessed.

The aims of this study were to validate Thai PG-SGA by comparing with SGA in categorizing nutritional status of cancer patients and evaluate the association of this tool with anthropometry, body composition, and hand grip strength.

Materials and Methods

This study was a cross-sectional design to validate the Thai version of the Scored PG-SGA with the SGA in assessing nutritional status in cancer patients and concurrently analyze the relationship of the assessment outcomes with body weight, body mass index, percentage of weight loss, percentage of body fat, muscle mass, and hand grip strength.

Participants

Cancer patients at the outpatient and the inpatient departments of Division of Therapeutic Radiation and Oncology, King Chulalongkorn Memorial Hospital, Bangkok, Thailand were recruited into the study by convenience sampling between February and April 2017. Eligibility criteria were as follows: age greater than 18 years, having anticancer treatment (chemotherapy and/or radiotherapy and/or surgery), and agreed to participate in the study. Patients having physical limitation or cognitive impairments, being pregnant, or being unable to read and write in Thai, were excluded.

The study was approved by the Institutional Review Board of the Faculty of Medicine, Chulalongkorn University (COA No. 603/2016, IRB No. 259/59). All eligible participants were informed about the study protocol and gave their written consent before participating in the study.

Nutritional assessment

The nutritional status of all cancer patients was assessed using Thai PG-SGA (Nitichai et al., 2018) and SGA (Detsky et al. 1987) by a trained dietitian experienced in using both tools. In the evaluation process, the trained dietitian applies strict criteria to the standard protocols and making measurements with great care in categorizing nutritional status by PG-SGA and SGA. The details of category rating and numerical scoring system of PG-SGA and SGA were addressed by Jager-Wittenaar (2017) and Detsky (1987) respectively. Permission by copyright owner of PG-SGA and SGA were granted. Thai PG-SGA is now available at www.pt-global.org. Each patient was either classified as well nourished (category A), moderately malnourished or suspected of being malnourished (category B), or severely malnourished (category C). The total score of PG-SGA were the sum of scores from patient-generated component and professional component, where the higher score indicating higher severity of malnutrition. The score of 0-1 suggests no intervention required, 2-3, educating patient and family is recommended, 4-8, requiring intervention as indicated by symptoms, and the score of 9 or more implying critical need for intervention. The score was also affected by age, diagnosis, and stages of cancer. These factors were retrieved from medical records.

Anthropometric assessment

Body weight (kg), body fat (%) and muscle mass (kg) were measured by a bioelectrical impedance analysis (BIA) machine (Tanita™ Body Composition Monitor, BC 545 model). The body weight was recorded in kilogram to the nearest 0.1 kg. A stadiometer was used for measuring height and recorded in centimeter to the nearest 0.1 cm. Body mass index was calculated as body weight in kg per height in m² (kg/m²). The anthropometric measurement was evaluated by the same researcher throughout the study.

Functional assessment

Hand grip strength (HGS) was measured using a
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Validation of the Thai Version of PG-SGA

This was the first study to determine the validity of the official Thai translation and cultural adaptation PG-SGA in predicting malnutrition as compared to SGA in terms of sensitivity and specificity. Thai PG-SGA was shown to be valid at identifying malnutrition among Thai cancer patients. The results are consistent with Bauer et al., (2002) who stated that the Scored PG-SGA had 98% sensitivity and 82% specificity when compared to SGA. This may be explained by the similarity of study design which was conducted in oncology setting and experience of dietitian in using the tool. When comparing with SGA as the gold standard, PG-SGA seems to have a lower specificity and interquartile range. A contingency table was used to identify more patients at risk of malnutrition. Being able to identify nutrition impact symptoms and other factors (box 3). In this part, any symptoms affecting eating that patient reports get scored and all points are additive (maximum 24 points in this section) (Jager-Wittenaar and Ottery, 2017). These extensive range of symptoms provided by PG-SGA may be due to the scores obtained from the nutrition impact symptoms and other factors (box 3). In this part, any symptoms affecting eating that patient reports get scored and all points are additive (maximum 24 points in this section) (Jager-Wittenaar and Ottery, 2017). These extensive range of symptoms provided by PG-SGA may be beneficial for proactively preventing malnutrition and functional assessment by handgrip strength showed negative correlation with PG-SGA scores, nutritional status assessed by PG-SGA and SGA. In addition, functional assessment by handgrip strength showed negative correlation with PG-SGA scores, nutritional status assessed by PG-SGA and SGA. In contrast, actual body weight, BMI, % body fat showed inverse correlation with PG-SGA scores, nutritional status assessed by PG-SGA and SGA. In addition, functional assessment by handgrip strength showed negative correlation with PG-SGA scores, nutritional status assessed by PG-SGA and SGA. In addition, functional assessment by handgrip strength showed negative correlation with PG-SGA scores, nutritional status assessed by PG-SGA and SGA.
allowing timely intervention during cancer and anti-cancer treatments. Another possibility for the difference between PG-SGA and SGA is the contribution of the assessment of weight change where weight information in PG-SGA is addressed along a continuum – 6 months (chronic), 1 month (intermediate), and past two weeks (acute) change but that of SGA change is assessed at 2 time-points, only in the past 6 months and 2 weeks.

The prevalence of malnutrition assessed by Thai PG-SGA was high (62%) probably due to the severity of cancer in majority of malnourished patients and inclusion of hospitalized cancer patients. The study findings indicated that cancer patients with advanced stage had a higher prevalence of malnutrition which was comparable to previous studies. The classification of nutritional status in 195 patients with cancer according to the Thai Patient-Generated Subjective Global Assessment (Thai PG-SGA) and Subjective Global Assessment (SGA) is presented in Table 2.

Table 1. Clinical Variables for Cancer Patients as Classified by PG-SGA Global Assessment Categories

| Clinical variables              | PG-SGA Global Assessment Categories | P-value |
|--------------------------------|-------------------------------------|---------|
|                                | Well-nourished patients (PG-SGA A) |         |
|                                | Malnourished patients (PG-SGA B+C) |         |
|                                | All patients (n=195)                |         |
| Age (years)                    | 57                                  | 58      | 58      | 0.776 * |
|                                | (47.0 - 65.0)                       | (47.0 - 64.8) | (47.0 - 65.0) |         |
| Gender (Male/Female)           | 75 (17/58)                          | 120 (56/64) | 195 (73/122) | 0.001*, b |
|                                | < 0.001*, b                         |         |
| Primary tumor localization; n (%) | Breast                              | 35 (67.3) | 17 (32.7) | 52 (26.7) |
|                                | Head and neck                       | 16 (33.3) | 32 (66.7) | 48 (24.6) |
|                                | Gynecologic                         | 6 (24.0) | 19 (76.0) | 25 (12.8) |
|                                | Digestive/ gastrointestinal          | 3 (12.5) | 21 (87.5) | 24 (12.3) |
|                                | Respiratory                         | 2 (18.2) | 9 (81.8) | 11 (5.6) |
|                                | Neurologic                          | 1 (11.1) | 8 (88.9) | 9 (4.6) |
|                                | Genitourinary                       | 4 (50.0) | 4 (50.0) | 8 (4.1) |
|                                | Musculoskeletal                     | 5 (33.3) | 4 (66.7) | 6 (3.1) |
|                                | Endocrine                           | 2 (12.5) | 21 (87.5) | 24 (12.3) |
|                                | Others                               | 1 (20.0) | 4 (80.0) | 5 (2.6) |
|                                | Unknown primary organ               | 0 (0.0) | 1 (100.0) | 1 (0.5) |
| Stage of cancer; n (%)         | Stage 0                              | 0 (0.0) | 1 (100.0) | 1 (0.5) |
|                                | Stage I                             | 11 (78.6) | 3 (21.4) | 14 (7.2) |
|                                | Stage II                            | 11 (47.8) | 12 (52.2) | 23 (11.8) |
|                                | Stage III                           | 16 (44.4) | 20 (55.6) | 36 (18.5) |
|                                | Stage IV                            | 20 (26.7) | 55 (73.3) | 75 (38.5) |
|                                | Unknown stage                       | 17 (37.0) | 29 (63.0) | 46 (23.6) |
| Actual body weight (kg)        | 60.6 ± 13.9                         | 52.4 ± 10.6 | 55.6 ± 12.5 | 0.226 c |
| BMI (kg/m²)                    | 24.4 ± 4.7                          | 20.0 ± 3.8 | 21.7 ± 4.7 | 0.230 c |
| Weight loss in 1 month (%)     | 0.5 ± 1.6                           | 6.0 ± 8.0 | 3.9 ± 6.9 | < 0.001*, c |
| Body fat (%)                   | 30.8 ± 9.3                          | 20.7 ± 10.5 | 24.8 ±11.2 | 0.544 c |
| Muscle mass (kg)               | 36.5 (33.2 - 41.9)                  | 36.6 (32.9 - 41.8) | 36.6 (33.0 - 41.8) | 0.728 c |
| Hand grip strength (kg)        | 23.8 ± 6.9                          | 20.0 ± 8.1 | 21.5 ± 7.9 | < 0.001*, c |
| PG-SGA numerical scores        | 4.2 ± 2.4                           | 16.3 ± 4.9 | 11.7 ± 7.2 | < 0.001*, c |

Data are presented as mean ± standard deviation number, or median (25th and 75th percentile in brackets); PG-SGA: Patient-Generated Subjective Global Assessment, BMI: body mass index; a, p-values are for comparisons between well-nourished and malnourished patients using Mann-Whitney-U test; b, p-values are for comparisons between well-nourished and malnourished patients using Chi-square; c, p-values are for comparisons between well-nourished and malnourished patients using Independent t-test; ‡, Neck lymph node/ Thymus gland/ Skin cancer; *, p value < 0.05.

Table 2. Classification of Nutritional Status in 195 Patients with Cancer According to the Thai Patient-Generated Subjective Global Assessment (Thai PG-SGA) and Subjective Global Assessment (SGA)

| Thai PG-SGA | SGA | Total |
|-------------|-----|-------|
| Malnourished| True positive 108 (55.38%) | False positive 12 (6.15%) | All positive 120 |
| Non-malnourished | False negative 1 (0.51%) | True negative 74 (37.95%) | All negative 75 |
| Total       | All with malnourished 109 | All with well-nourished 86 | Total patients 195 |
Table 3. Correlations between Measured Clinical Variables, PG-SGA Scores, and Nutritional Status Classified by PG-SGA/SGA

| Clinical variables                  | PG-SGA numerical scores | Nutritional status classified by PG-SGA Category | Nutritional status classified by SGA Classification |
|------------------------------------|-------------------------|-----------------------------------------------|-----------------------------------------------|
|                                    | r                       | p-value                                        | r                                             | p-value                                        |
| PG-SGA numerical scores            | 1                       | -                                             | 1                                             | -                                             |
| Nutritional status by PG-SGA       | 0.84                    | < 0.001a                                       | 0.87                                          | < 0.001b                                       |
| Nutritional status by SGA          | 0.82                    | < 0.001a                                       | -0.36                                         | < 0.001b                                       |
| Actual body weight (kg)            | -0.34                   | < 0.001a                                       | -0.48                                         | < 0.001b                                       |
| BMI (kg/m²)                        | -0.45                   | < 0.001a                                       | 0.5                                           | < 0.001b                                       |
| % Weight loss in 1 month (%)       | 0.66                    | < 0.001a                                       | 0.54                                          | < 0.001b                                       |
| Body fat (%)                       | -0.43                   | < 0.001a                                       | -0.46                                         | < 0.001b                                       |
| Muscle mass (kg)                   | -0.09                   | 0.237a                                         | -0.09                                         | 0.224b                                         |
| Hand grip strength (kg)            | -0.34                   | < 0.001a                                       | -0.36                                         | < 0.001b                                       |

a, Pearson's correlation; b, Spearman's rho correlation

As shown in the table, there are strong correlations between measured clinical variables and PG-SGA scores, indicating a close association between these variables. The correlations are positive, indicating that as the measured variables increase, so do the PG-SGA scores. The correlations are also significant, as indicated by the p-values. These findings are consistent with previous studies, which have shown that clinical variables such as body mass index (BMI), body weight, muscle mass, and hand grip strength (HGS) are positively correlated with nutritional status evaluated by PG-SGA and SGA.

Regarding functional assessment of upper extremities, HGS has been shown to be a useful indicator of malnutrition. In this study, we found a strong correlation between HGS and PG-SGA scores (r = -0.42, p < 0.001). This finding is consistent with previous studies, which have shown that HGS is a sensitive indicator of muscle strength and is negatively correlated with nutritional status.

To further explore the relationship between these variables, we conducted a correlation analysis, which revealed that there were significant correlations between measured clinical variables and nutritional status assessed by both tools. These findings are consistent with previous studies, which have demonstrated that clinical variables such as BMI, body weight, muscle mass, and HGS are positively correlated with nutritional status assessed by both PG-SGA and SGA.

In summary, the findings of this study highlight the importance of using a combination of clinical variables and functional assessments to evaluate nutritional status. These findings are consistent with previous studies and have important implications for clinical practice, as they suggest that a comprehensive approach to assessing nutritional status is necessary to identify patients at risk of malnutrition.
loss in one month and PG-SGA numerical scores and moderate correlation with nutritional status classified by PG-SGA/SGA. Therefore, percentage of weight loss in one month is shown to be significant clinical parameter, a better indicator than other clinical variables. The results also suggested that nutritional status could not be determined by using any single clinical parameter alone because each parameter has different limitation in nutrition assessment. Therefore, data collection from a variety of domains are necessary for nutrition assessment to determine appropriate diagnosis of malnutrition (Jensen et al., 2012). The systematic review showed that PG-SGA could serve as a nutritional assessment tool as it covers all components of the definitions of malnutrition as published by European Society for Clinical Nutrition and Metabolism (ESPEN) and the American Society for Parenteral and Enteral Nutrition (ASPEN) (Sealy et al., 2016). It also has several advantages as a nutritional instrument in comparison to SGA in terms of numerical scoring system rather than category. In addition, it provides extensive range of nutritional impact symptoms which often experienced by oncology patients (Bauer et al., 2002; Jager-Wittenaar and Ottery, 2017).

The strength of this study is that some clinical parameters were evaluated by anthropometric and functional assessment. In addition, there were various kinds of cancer patients with all cancer staging and treatment from both outpatient and inpatient department enrolled to the study. The principal limitation of this study is the acquiring of participants by convenience sampling and the exclusion of cancer patients who had cognitive impairments and physical limitation that prevented them from completing the Scored PG-SGA. This limitation may influence the study results and limit the generalizability. Another potential limitation of this study is that the nutritional assessment was evaluated by trained dietitian only which may affect to the results. However, it avoids inter-rater variability. Further study is needed to assess interobserver reliability or reproducibility of Thai PG-SGA evaluation among health professionals by a standard method such as a test-retest model. More could be explored for validate the use of Thai PG-SGA in specific type of cancer as well as different treatment regimens. Currently, the Thai PG-SGA has only paper-based version. Development of an application-based tool may yield a better result in terms of reducing time spent, accuracy of PG-SGA score calculation, and convenience of data collection.

In conclusion, the results of this study suggest that Thai PG-SGA is a valid nutritional instrument in identifying malnutrition among cancer patients. This tool could serve as a suitable assessment method for cancer patients in Thailand. The nutritional status assessed by Thai PG-SGA is well correlated with percentage of weight loss in one month. The other clinical variables, while having a weak to moderate correlation, were also partially contribute to nutrition diagnosis. Therefore, the multidimensional tools which include assessment of various key clinical variables could be used to identify appropriate nutritional status.

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Statement conflict of Interest
No conflict of interest in this study.

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