ADDIS ABABA UNIVERSITY

COLLEGE OF HEALTH SCIENCES

SCHOOL OF PUBLIC HEALTH

VALIDATION OF THE SGA NUTRITIONAL SCREENING TOOL AMONG SURGICAL PATIENTS IN BLACK LION SPECIALIZED HOSPITAL ADDIS ABABA, ETHIOPIA

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Acronyms

AAU	Addis Ababa University
BMI	Body Mass Index
EFY	Ethiopian Fiscal Year
ESPEN	European Society for Parenteral and Enteral Nutrition
FNA	Full Nutritional Assessment
GI	Gastro Intestinal
LMICs	Low and Middle Income Countries
LOS	Length Of Stay
MoH	Ministry Of Health
MUAC	Mid- Upper Arm muscle Circumference
NGOs	Non-Governmental Organization
NPV	Negative Predictive Value
NRI	Nutritional Risk Index
PI	Primary Investigator
PPV	Positive Predictive Value
PWL	Percentage Weight Loss
SGA	Subjective Global Assessment
SN	Sensitivity
SP	Specificity
TSF	Triceps Skin Fold
UNECA	United Nations Economic Commission for Africa
WHO	World Health Organization

Abstract

Background: Malnutrition is common in hospital and occurs in more than 50% of hospitalized patients. It is one of the most important factors which determine the clinical outcomes of patients. Therefore, most of the developed countries has made tremendous progress in screening for malnutrition at admission and giving nutritional support for those that required. The burden of malnutrition hardly ravages in developing countries especially in Africa and talking about it tend to refer only to children forgetting adults. Thereby, medical awareness is insufficient and in Ethiopia as well as in several countries, screening hospitalized patients for malnutrition is not a routine part of treatment. If so, some hospitals still used certain common anthropometric and biological markers. First step of treating is screening and screened required a validated screening tool which has not been properly addressed.

Objective: To validate subjective global assessment (SGA) against full nutritional assessment (FNA) and to assess its reliability among adult surgical patients for effective integration in daily surgical wards practice in Black Lion Specialized Hospital.

Methods: The study design was a facility based, cross-sectional concurrent validation design. The study was conducted at Black Lion Specialized Hospital in surgical department. Data were collected from February-April 2018 and one hundred hospitalized patients aged ≥18 years were screened randomly using systematic sampling. Concurrent validity was assessed through sensitivity, specificity, positive predictive value and negative predictive value of the SGA comparing to FNA considered as gold standard. Its reliability assessed by cronbach's alpha. SPSS version 21 was used for analysis.

Results: A total of 100 patients aged ≥18 years participated in this study and fifty two percent (52%) were male. Among all abdominal operations performed, fifty nine of the patients (59%) were diagnosed for gastrointestinal cancer and 41 patients (41%) with benign or acute GI disease. Considering FNA as the gold standard, the sensitivity and specificity of SGA were 98.3% and 73.2% respectively. The internal consistency of SGA questionnaire measured using Cronbach's α coefficient gave a value of $\alpha = 0.805$.

Conclusion and Recommendation: In this study, SGA showed a high level of sensitivity with a specificity >70%. The reliability of the SGA questionnaire is acceptable and showed an agreement with FNA. Therefore SGA is applicable in Ethiopian settings. However, to overcome self-weight report issue, further research on modification of the SGA regarding weight change item might be needed for cultural adaptation.

1. INTRODUCTION

1.1. Background

Malnutrition is frequent in the community and considered an existing problem in hospital setting as well. Many studies showed that 20–50% of the patients admitted to the hospital suffer from nutritional depletion (1, 2). Reports have indicated that the prevalence of hospital malnutrition is as high as 50% in high income countries (3-5) and approximately70% in low and middle income countries (6, 7).

The emphasis of that issue comes from the proven mutual relationship between nutritional status and the disease. As result, the situation get worse and frequently deterioration of nutritional status of malnourished patients occurs during their hospitalization. This state could thus have a great impact on clinical outcomes of the patients. Patients with poor nutritional status are susceptible to disease progression and complications, and their recovery from illness or injury is often prolonged (8-10).

Several reports have shown the negative consequences of malnutrition include decreased immune function, decreased in wound bursting strength related to sutures, development of pressure ulcers ,impaired wound healing, impairment of the response to therapeutic planning, loss of body muscle leading to decreased heart muscle mass and decreased respiratory function, increases in the frequency of infectious and noninfectious complications, prolonging hospital stay, and reduced quality of life, increased the cost of treatment and increased mortality in hospitalized patients in the hospital (9, 11-16).

Malnutrition in developing countries tend to referred to children and awareness about adult disease related malnutrition is lack. Regarding the consequences of malnutrition and in order to improve clinical outcomes, screening patients for malnutrition on admission to the hospital is now a standard of care but is still neglected among medical field and some health professionals seldom assess the nutritional status of hospitalized patients (17-19).

There are varieties of methods for nutritional assessment of patients such as anthropometric methods, the use of body weight loss, biochemical parameters, routine history taking and physical examination. There is no gold standard methods of nutritional assessment. Hence, the use of combine methods is recommended for the diagnosis of clinical malnutrition (20, 21).

There is a paucity of information in the African literature regarding the nutritional status of preoperative patients. In addition, there are many nutrition screening tools though, none have

yet been validated in Ethiopian hospital settings. Therefore, it's worth to address this gap through test the capacity in identifying malnourished patients by SGA tool comparing with FNA.

1.2. Statement of the problem

Despite the recognized clinical significance, under nutrition continues to be a common finding with high prevalence among hospitalized patients. Thus, it is considered as a serious public health problem. Poor nutrition is a predictor of poor outcomes, as shown by results of a large multicenter collaboration including hospitals in 3 countries of the Middle East (Lebanon, Egypt, and Libya) and 9 countries in Europe (22).

Malnutrition affects mortality and morbidity in patients for whom surgical intervention is planned. However, in the majority of the medical centers, the nutritional conditions of patients are not completely evaluated pre-operatively (23-25).

The nutritional and immune status of surgical patients are important in their preoperative management and postoperative recovery. If a patient is poorly nourished, and cannot mount an effective response to an infection, the effects of any treatment are diminished. Thus preoperative patient nutrition conditions influence a patient’s tolerance to surgical stress, postoperative physical recovery, local wound healing, and surgical infection rates (26, 27).

It has been confirmed by studies conducted in LMICs that post-operative complications that are influenced by nutrition include pneumonia, surgical site infections and anastomosis leak (28). A prospective cohort study conducted among surgical patients of Hawassa University Referral Hospital in Southern Ethiopia cited undernutrition among surgical site infection predictors (29).

Malnutrition is a well-known risk factor for poor surgical outcomes. Malnutrition in patients with cancer undergoing major surgery is associated with higher postoperative mortality, morbidity, cost, and longer hospital stays (3, 30, 31).

Due to the increased morbidity, malnourished patients experience a significantly prolonged treatment duration and length of hospital stay. The average length of hospital stay in most studies is increased by 40–70% in malnourished patients. On the other hand, when malnutrition is classified in subcategories (mild, moderate, and severe) the prolongation of LOS becomes even more impressive. A multicenter study conducted showed that patients

assessed as severely malnourished according to NRI had a five-fold increase of LOS compared to well nourished patients (32).

Although some solutions have been devised for preoperative malnutrition management it should be recognized before treated. Thus, available validated screening tools measuring anthropometrics, food intake, physical and psychological function, and illness status has to be introduced even in the resource-constrained setting. However, nutritional assessment is not included on the checkup of patients scheduled for surgery in our health care systems potentially owing to inadequate knowledge and absence of validated tools, therefore malnutrition at hospital level continues to be overlooked leading to dire consequences.

1.3. Significance of the study

Malnutrition among hospitalized patients is undertreated problem in our context, but it has to be identified before it can be treated. Thus the wide use of simple strategies to quickly identify patients at risk of malnutrition is advocated. Although SGA is largely used among Caucasian population, this study will test its validation regarding Ethiopian hospital realities and context and will show a sight of nutritional status among surgery patients. This tool will be easy to complete by the health care providers and will improve health services quality as well. Patients will be revealed their nutritional status and nutritional advice will be given for those who are malnourished. Program managers and policy makers will get more information about malnutrition in surgical patients and the importance of screening .On the other hand, findings could benefit health care systems to have validated and appropriate screening tool for surgical patients and in a long term may represent a channel for MoH to establish standards for nutritional assessment with the ambition of putting Ethiopia on track to build a foundation of nutritional support to assure better outcome among hospitalized patients.

1.4. Research question

What is the ability of the SGA screening tool to identify malnourished patients comparing with the FNA?

2. LITERATURE REVIEW

2.1. Definition of malnutrition

Malnutrition has been described as the imbalance between intake and requirement which results in altered metabolism, impaired function and loss of body mass or a state of nutrition in which a deficiency or imbalance of energy, protein, and other nutrients causes measurable adverse effects on tissue and/or body form (33, 34)

2.2. Prevalence of malnutrition in surgical patients

Estimating the prevalence of malnutrition is challenging. A significant contributing factor is that for nearly four decades, researchers have used different criteria to define malnutrition. Despite measurement challenges, it is estimated that the prevalence of undernutrition is apparently higher amongst surgical patients, ranging from 35% to nearly 60% (35).

A study conducted in Ethiopia at Amhara National Regional State Referral Hospital showed that the prevalence of malnutrition among hospitalized adult patients was 55.6% (36). Although the prevalence varies by studies, patients with malignant disease or undergoing major surgery showed a consistently high prevalence of pre-operative malnutrition 50–80% (28).

2.3. Causes of malnutrition

Currently, three causes of malnutrition have been identified in the literature, those related to starvation, chronic disease or acute disease .These etiologies consider the presence and degree of inflammation as well as the time frame within which malnutrition may develop. In turn, the etiology helps to form the nutrition treatment plan (37).

Its pathogenesis is multifactorial and complex, undernutrition can be caused by a combination of somatic, functional, psychological and social factors (38). In hospitalized patients, deteriorated nutritional status seems inevitably caused by (somatic and/or functional) disease-related factors, such as loss of appetite, inflammation, mechanical obstructions of the gastrointestinal tract, swallowing difficulties, or pain during eating. During treatment, treatment-related factors, such as episodes of fasting, or side effects of treatment or medication may contribute to origination of undernutrition or deterioration of nutritional status(11, 39). But also psychological (anxiety, depression, loneliness) or social factors (difficulties with shopping or preparing meals, poverty) may contribute to a poor nutritional condition even before hospital admission or initiation of treatment (40).

2.4. Impact of malnutrition on the clinical outcomes of surgical patients

Malnutrition significantly affects convalescence following disease, surgery, or trauma. Wound healing is impaired in malnourished surgical patients. Studies have shown that the inflammatory phase is prolonged, the proliferation of the fibroblasts, the collagen synthesis and the neo angiogenesis are reduced in malnutrition (41).

The degree of malnutrition correlates with the risk of infectious and noninfectious complications. Malnutrition is in general associated with a higher postoperative risk, in particular with the risk for nosocomial infections. Furthermore, malnutrition has been suggested as a risk factor for developing pressure ulcers (42).

Many studies have shown that undernutrition is associated with longer length of hospitalization and a higher readmission rate, impaired quality of life and increased mortality. Accordingly, undernutrition contributes to considerable health care costs (43).

2.5. Variables associated with malnutrition emphasis for surgical cases

As previously identified, malnutrition occurs when there is an imbalance of nutrient intake and expenditure. Inadequate consumption of nutrients may be related to illnesses, increased nutrient needs or the inability to ingest nutrients at a level commensurate with nutritional requirements. Some of intervening variables that contribute to malnutrition are grouped into categories and include: 1) the duration of the illness, 2) physiological processes, 3) organ system dysfunction, and 4) socioeconomic and environmental conditions. Duration, severity and type of illness can directly influence the development of malnutrition. Patients who enter the health care system may be well nourished or may have varying degrees of malnutrition. Regardless of a patient's nutrition level, the risk of developing malnutrition is a threat to the majority of patients who are hospitalized and scheduled for surgery (44).

When an individual becomes sick, the immune system gets activated, and chemical messengers (eg. cytokines) and inflammatory factors are produced and secreted, which increase nutrient needs. Digestive organs including the oral cavity, esophagus, stomach, small and large intestine, liver and pancreas are responsible for nutrient digestion, absorption and utilization. In the general surgery department, patients who have had gastrointestinal problems and who have scheduled to have gastrointestinal surgery constitute an important risk group for malnutrition. In addition to the increased nutrient requirements of disease, patients with stomach or esophageal cancer have reduced oral nutrient intake, due to blockage and

encroachment of tumor. When a patient has liver, gallbladder or pancreatic disease (e.g. inflammation, gall bladder stones, cancer, etc.), nutrient digestion is impaired due to decreased secretion of bile and various digestive enzymes. Intestinal surgery damage absorptive function since intestines are the major area for nutrient absorption (45).

2.6. Screening

Nutrition screening is a process employed to identify patients who are at nutrition risk and who would be served by further nutrition assessment and intervention. The purpose of nutritional screening is to predict the probability of a better or worse outcome due to nutritional factors, and whether nutritional treatments likely to influence this. All patients should be screened on admission to hospital or other institutions. The outcome of screening must be linked to defined courses of action:

a. The patient is not at risk, but may need to be re-screened at specified intervals, e.g. weekly during hospital stay.

b. The patient is at risk and a nutrition plan is worked out by the staff.

c. The patient is at risk, but metabolic or functional problems prevent a standard plan being carried out.

d. There is doubt as whether the patient is at risk.

In the two latter cases, referral should be made to an expert for more detailed assessment. Screening tools are designed to detect protein and energy undernutrition, and/or to predict whether undernutrition is likely to develop/worsen under the present and future conditions of the patient/client (46).

2.7. Validity of nutrition screening tools

For a nutrition screening tool to be accurate and useful, it has to be valid and reliable. Any screening procedure must have an acceptable level of sensitivity and specificity, relative to some definitive diagnostic procedure or "gold standard". Sensitivity (the ability to identify true cases) is important where the consequences of an undetected case may be significant. Specificity (the ability to classify correctly those without the condition) is important to avoid labeling someone with an incorrect presumptive diagnosis, which may result in anxiety for the patient, unnecessary procedures and costs. The sensitivity and specificity of tools allow comparison between the tools to determine which tool to adopt. A nutrition screening tool that has high sensitivity but low specificity may cause too many patients to be referred to the dietitians unnecessarily and waste resources. On the other hand, a tool that has low sensitivity but high specificity is more worrying as many patients who are malnourished will not receive the necessary intervention. To assess, plan and implement interventions to promote optimal

nutritional status of preoperative patients, validated measurements are needed for local settings. The concept of validity was defined as an expression of the degree to which a measure actually measures what it is supposed to measure". Validity is conceptualized as having different components, including; construct validity, content validity and criterion validity. Criterion validity is the extent to which a new measure measures the same phenomenon as an external criterion of the phenomenon under study, often referred to as a 'gold standard'. Criterion validity is classified into two groups: concurrent validity and predictive validity. Concurrent validity is comparing the two measurements at the same time with one another. Predictive validity is the ability of a test measurement to predict the future criterion. Studying the criterion validity of a tool is usually done versus a gold standard. In the absence of a perfect gold standard for malnutrition, studies use different reference methods to validate their tools. Roughly the following main reference methods were identified:

- objective assessment by a professional
- nutritional assessment and anthropometry
- another screening or assessment tool
- other reference methods (47).

2.8. Tools for diagnosis of protein energy malnutrition in surgical patients

In severe situations, diagnosis of malnutrition is evident from a physical examination, which reveals a combination of generalized fat and muscle loss typical of the disease, with a history of a weight loss and/or inadequate food intake. However, malnutrition is easiest to diagnose when fat stores are depleted, but it can occur without apparent fat loss in previously obese patients, in chronic protein deficiency without energy deficiency, and in high loss protein-catabolic states. The lean tissues are the fat-free, metabolically active tissues of the body, namely, the skeletal muscles, viscera, and the cells of the blood and immune system. They account for 35%–50% of the total weight of a healthy young adult. As the lean tissues are the largest body compartment, their rate of loss is the main determinant of total weight loss in most cases of malnutrition. For this reason, serial body weight measurements are very useful for assessing the evolution and severity of the disease (this is our first easy tool to assess malnutrition in surgical patients). A weight loss of 40%–50% is usually incompatible with survival, whereas milder lean tissue depletions induce important biochemical and functional abnormalities. These abnormalities, together with an immune system dysfunction, are evident after involuntary weight loss over 10% and they become highly physiologically obtrusive when weight loss exceeds about 15%. Weight measurement, history of weight change and

serial weight determinations are cheap and simple ways of measuring malnutrition. Although single weight determinations may be altered by abnormal body compartment distribution and water retention, body weight determination should always be registered. A way to classify the severity of malnutrition is simply by the degree of weight loss. For "normal" one can use the weight that would give a body mass index (BMI) of 23-24. In older adults, the lower end of the normal range for BMI is about 20, so one might consider malnutrition as mild or absent when the BMI is 20 or more (representing a weight deficit of 5%–15%), moderate when the BMI is over 16 but less than 20 (weight deficit of 16%–33%) and severe when the BMI is 16 or less.

Biochemical parameters can be used to diagnose malnutrition, too. Serum albumin is an example. However some data must be taken to account. For example, serum albumin concentration is normal in successfully adapted malnutrition even when advanced, and it falls when adaptation fails. By contrast, serum levels of the hepatic secreted protein, prealbumin, are reduced in energy deficiency and adapted malnutrition, and may be used to screen for patients whose food intake is inadequate and who need a surgical intervention. Nevertheless, because albumin and prealbumin are negative acute-phase proteins, their serum levels fall in response to metabolic stress even in the absence of malnutrition. The rapid fall in serum albumin that occurs in acute severe inflammation is caused by its redistribution into an expanded extracellular fluid compartment. Despite its lack of specificity, hypoalbuminemia is an important finding in nutritional assessment. For example, a normal serum albumin concentration in a starving patient is a favorable prognostic finding. Hypoalbuminemia has an adverse prognostic implication, irrespective of whether it is due to metabolic stress or failed adaptation to malnutrition. As hypoalbuminemic patients are usually both catabolic and starving, the presence of hypoalbuminemia would mean that a careful nutritional assessment of these patients is necessary. An analysis of a total of 44 screening tools for use in hospital indicated that tools were published with insufficient details regarding their intended use and method of derivation, and with an inadequate assessment of their effectiveness. No one tool satisfied a set of criteria regarding scientific merit. Probably, the most universally accepted method for evaluating malnutrition is the so-called subjective global assessment SGA (48).

2.8.1. Subjective global assessment (SGA)

The SGA is a tool regarded as an assessment tool and is completely based on clinical evaluations. It was developed in 1982 within a surgical population. Validity was demonstrated by correlation of the clinical classification with objective measurement of nutritional status .In its development study, in surgical adult patients, the goal of the SGA was two-fold: to assess

patients at high nutritional risk and to predict postoperative outcome. Specific features of the history and physical examination are considered in the SGA method. Five features of the history are elicited. The first is weight loss in the previous 6 months, expressed as both kilograms and proportionate loss. We consider less that 5% as a "small" loss, between 5 and10% as a "potentially significant" loss, and greater than10% as a "definitely significant" loss. We also considered the rate of weight loss and its pattern. The second feature of the history is dietary intake in relation to a patient's usual pattern. Patients are classified first as having normal abnormal intake. The duration and degree of abnormal intake are also noted (starvation, hypocaloric liquids, full liquid diet, suboptimal solid diet). The third feature of the history is the presence of significant gastrointestinal symptoms (anorexia, nausea, vomiting, diarrhea). By significant, we mean that these symptoms have persisted on virtually a daily basis for a period longer than 2 weeks. The fourth feature of the history is the patient's functional capacity or energy level (bedridden to full capacity). The last feature of the history concerns the metabolic demands of the patient's underlying disease state. An example of a high-stress disease is a bad flare of ulcer active colitis where the patient has suffered a large volume of bloody diarrhea on a daily basis. A low-stress disease might be a smoldering infection or malignancy. There are four features of the physical examination which are noted as either normal (0), mild (1 +), moderate (2+), or severe (3+). The first is the loss of subcutaneous fat measured in the triceps region and the mid-axillary line at the level of the lower ribs. These measurements are not precise, but are merely a subjective impression of the degree of subcutaneous tissue loss. The second feature is muscle wasting in the quadriceps and deltoids as determined by loss of bulk and tone that is detectable by palpation. Obviously, a neurological deficit will interfere with this assessment. The presence of edema in both the ankles and the sacral region and the presence of ascites are noted. Again, a co-existing disease such as congestive heart failure will modify the weight placed on the finding of edema. On the basis of these features of the history and physical examination, clinicians identify a SGA rank which indicates the patient's nutritional status. These categories are: (1) well nourished, (2) moderate or suspected malnutrition, and (3) severe malnutrition. However, history taking and physical examination is time consuming, require skills and training, and with some tools, assessment results may depend on users experiences. SGA has been mainly used due to simplicity, non-invasive, low-cost, high-speed completion, feasibility beside patient's bedside by trained professionals, its ability to identify patients at high nutritional risk in various clinical locations (49).

2.8.2. Full nutritional assessment (FNA)

The FNA instrument examines nutritional status of patients using anthropometric and biochemical parameters. Full nutrition assessment includes body mass index (BMI) and information on unintentional weight loss of more than 5% within the preceding month or 10% or more within the previous 6 months, the triceps skin fold (TSF), mid- upper arm muscle circumference (MUAC), albumin, Prealbumin and total lymphocyte. These parameters are associated to malnutrition and clinical results as well as duration of hospitalization and the mortality, accepted as assessment indicators of nutritional status; definition for malnutrition in these instruments is that 3 or more than these 7 parameters be abnormal. The full nutritional assessment can be considered one of the most comprehensive methods, but it is time consuming, costly, skill dependent, and unsuitable for large scale use. Therefore, there is a need for a method that is easy to use in clinical practice with adequate specificity and sensitivity to assess nutritional status in surgical patients (50).

2.9. Importance of having a valid screening tool

The World Health Organization describes screening as a simple test to identify the patients who have disease but do not have symptoms. In 2002, ESPEN defined nutrition screening as a rapid and simple method conducted by admitting staff to accurately identify those patients who are malnourished or at risk of malnutrition, and who could benefit from nutritional therapy and support. About 50% of all patients in hospital are undernourished. A large part of these patients are undernourished when admitted to hospital and in the majority of these, undernutrition develops further while in hospital. Moreover, malnutrition is a well-known risk factor for poor surgical outcomes and it is associated with higher postoperative mortality, morbidity, cost, and longer hospital stay in patients undergoing major GI surgery .This can be prevented if special attention is paid to their nutritional status by quickly recognize malnutrition, and implement appropriate treatments. Therefore, nutrition screening is an initial step in the identification of patients who are malnourished or at risk for becoming malnourished. Completing a nutritional screening of all patients at admission is now recommended. Nutrition screening can be performed by any trained health professional and the tools must be easy to complete,

cost-effective, quick and valid (able to identify individuals at nutritional risk) (45).

2.10. Assessment

The assessment of a patient's nutrition status is the crucial next step following the identification of risk by screening so that appropriate intervention can be implemented. However, such an assessment can be difficult to perform. Since there is no "gold standard" by which nutrition status can be defined or measured, the clinician must rely on a wide array of surrogate measures and possess knowledge of how each can best be used. No one surrogate measure is optimal for assessing nutrition status for all patients in all clinical situations; the sensitivity, specificity, and overall validity of each measure as a nutrition marker vary dramatically depending on the clinical situation. The cost, availability, and acceptability to a patient may also limit the use of many of these putative nutrition indicators. For these reasons, assessment of nutrition status needs to involve a multicomponent evaluation that is comprehensive enough to allow the assessing clinician to interpret each measure in context. Nutrition status cannot be assessed in isolation (51).

2.11. Treatment .

There is a need for hospital care to identify individuals at nutrition risk and put in place a system to help improve the nutritional status of these patients. Nutrition screening alone is insufficient to achieve beneficial effects and more research is needed to explore interventions that will improve patient outcomes. Possible ways to improve the outcomes of malnourished patients are to raise the awareness of malnutrition amongst healthcare workers, and to put in place an action plan that facilitates early identification of malnourished or at risk patients so that appropriate medical nutrition therapy and adequate follow-up care can be provided. A large and growing body of evidence to show that nutrition support is effective and leads to improved nutritional status and clinical outcomes in malnourished patients. The first line of treatment for malnourished patients is to increase nutrient intake using food-based approach or through food fortification. If dietary intake is not able to meet requirements, oral supplementation is the next line of treatment, followed by tube feeding and finally, if the gut is not working and there is contraindication to feed enterally, parenteral nutrition can be explored (47).

▲

3. OBJECTIVES OF THE STUDY

3.1. General objective

The overall objective of the study is to validate SGA against FNA tool (concurrent validity) and to assess its reliability (internal consistency) among adult surgical patients for effective integration in daily surgical wards practice in Black Lion Specialized Hospital.

3.2. Specific objectives

1. To compare SGA tool sensitivity with FNA among surgical patients in Black Lion Specialized Hospital.

2. To compare SGA tool specificity with FNA among surgical patients in Black Lion Specialized Hospital.

3. To determine SGA tool predictive values among surgical patients in Black Lion Specialized Hospital.

4. To assess SGA reliability using cronbach's alpha

4. METHODS

4.1. Study area and period

This study was carried out in Addis Ababa city administration, one of the two city administrations of Ethiopia. It is the base of the African Union and hosts the headquarters of the United Nations Economic Commission for Africa (UNECA) and numerous other continental and international organizations. It is the largest city in Ethiopia and doubles as the country's capital city (52). According to the regional health bureau report of 2004 (EFY) the city has 52 hospitals, 84 Health Centers (80 government owned and 4 by NGOs) and more than 760 health clinics from low to higher (all Private) (53).

The Black Lion Specialized Hospital is selected because it is the largest tertiary referral hospital and it is possible to obtain a sufficient number of patients scheduled to have GI surgery coming from different parts of Ethiopia. It is also a teaching hospital of Addis Ababa university with over 700 beds, and serves as a training center for undergraduate and postgraduate medical students, dentists, nurses, midwives, pharmacists, medical laboratory technologists, radiology technologists, and others who shoulder the health problems of the community and the country at large (54).

4.2. Study design

This study design employed a facility based, cross-sectional concurrent validation study. Concurrent validation was conducted by comparing the test instrument (SGA) scores with criterion instrument (FNA) scores.

4.3. Source of population

All patients admitted or referred to Black Lion Specialized Hospital surgical department aged ≥18 years.

4.4. Study population

The study population was patients who were scheduled to have major or minor GI surgery and fulfilled the inclusion criteria. Gastrointestinal ward was selected because eating is related to digestive system which is all about Gastrointestinal tract. Furthermore it has been proved that patients having major gastrointestinal problems or cancer are proned to develop malnutrition and at increased risk of developing complications after surgery.

Inclusion criteria:

All randomly selected patients aged ≥18 years admitted or referred to Black Lion Specialized Hospital surgical department, scheduled to have major or minor GI surgery who were willing

to participate in the study and able to give informed consent, prior to any surgical procedures during the study period.

Exclusion criteria:

Patients who were not able to be weigh standing

Clinically unstable or unconscious patients

Patients with dementia and emergency surgery

4.5. Sample size

A formula for calculating sensitivity, specificity and sample size for screening tests was used from Statistical methodology book

Sample Size Required for Sensitivity

$$N1 = \frac{TP + FN}{P}, \text{ where } TP + FN = Z\alpha/2 \frac{SN(1 - SN)}{W2}$$

Sample Size Required for Specificity

$$N2 = \frac{FP + TN}{(1-P)}, \text{ where } FP + TN = Z\alpha/2 \frac{SP(1 - SP)}{W2}$$

Where **n** = the larger Sample size between N1 and N2

Z = Z value corresponding to a 95% level of significance = 1.96

TP+FN=number of subjects required for an estimated sensitivity

FP+TN= the number of disease-free subjects required for an estimated specificity

P= Assuming prevalence

SN= Expected sensitivity

SP= Expected specificity

W= maximum clinically acceptable width or precision of the 95% CI.

Assuming a sensitivity of 90%, expected specificity of 85%, prevalence of malnutrition among surgical patients 50%, W of 10%, the maximum feasible sample size of 98 was required. Assuming a 5% non-response rate, the final sample size for the study was 103 participants.

4.6. Sampling procedure

The sampling strategy used was both purposive and systematic sampling. The study was conducted in the surgical department of Black Lion hospital. Out of the different surgical wards under this department, Gastrointestinal ward was selected purposively. In patients attending a health center, it is not possible to predict in advance who will be attending. Although the sampling frame was not readily available, systematic sampling was conducted base on the list of patients who were scheduled to have surgery daily. A total of 5 patients

were operated per day and an estimation of 25 patients in a week. The sample fraction was the number of units in the sample to the number of units who were scheduled on a week basis (100 /25). The sample interval was 4, therefore every 4th patient were approached and recruited until the sample size is reached. The first patient was selected by lottery method after ensuring he met the inclusion criteria.

4.7. Data collection

Data were collected from February to April 2018. The invitation to participate in the study was done in collaboration with respective health care providers and screening for malnutrition prior to any surgical procedures. The data collector was a medical doctor and were trained before SGA administration. Information was gathered by using questionnaires detailing socio-demographic (age, sex, religion, marital status and occupation), anthropometric (height, usual normal weight, present weight, triceps skinfold thickness, mid-arm muscle area, mid-upper arm muscle circumference), laboratory parameter (serum albumin, total lymphocyte count) and clinical data (diagnosis at admission, type of surgery, change in dietary intake, significant GI symptoms, functional capacity, loss of subcutaneous fat muscle wastage, edema, ascites). The questionnaire was translated in Amharic and measurements were taken with assurance of confidentiality. Anthropometrics measurement were collected using a portable weight scale, a stadiometer, an arm circumference tape, a skinfold calipers and the serum tests were carried out by the hospital laboratory.

4.8. Measurements

4.8.1. Anthropometric measurements

a. Weight

Anthropometric measurements was performed using standard methods. Body weight measured with light clothing and no shoes, using a portable weighing scale and recorded in kilograms (kg) to the nearest 0.5 kg.

-Self-reports of usual body weights (weight of the patient before his illness), was used to define percentage weight loss (PWL). PWL calculated as usual body weight in kg minus current weight in kg divided by usual weight multiplied by a hundred.

b. Height

Height was measured to the nearest 0.5 cm with a stadiometer in all patients in the erect position. BMI calculated as current weight in kilograms divided by height in meters squared and expressed as kg/m2 and classified using the World Health Organization (WHO) criteria:

underweight if <18.5 kg/m2, adequate if 18.5-24.9 kg/m2, overweight if 25-29.9 kg/m2 or obese if ≥30 kg/ m2

4.8.2. Blood sample collection and processing

After met the inclusion criteria and consent given by the patients, blood specimens were collected in tubes by a nurse and analyzed in the hospital lab. Serum albumin and measured by immunonephelometry. Therefore, biochemical measures and reference values were obtained from the laboratory at black lion Hospital.

Patient files were used to retrieve clinical data diagnosis at admission, duration. The types of GI surgery were classified in minor and major and the admission diagnoses classified according to convenient disease entities as used in the hospital registers.

4.8.3. Subjective global assessment (SGA)

SGA History

–The most important component is weight loss > than 10% unintentional weight loss over 6 months or less is severe weight loss ,5-10% unintentional weight loss over 6 months or less is moderate weight loss . Patients considered well nourished if they have lost weight but have had recent gains in weight.

–Dietary intake – determine if decreased intake over specific period of time. (significant if <50% plate)

–Gastrointestinal Symptoms: nausea, vomiting, dysphagia, diarrhea may limit oral intake, increase losses.

– Functional Capacity – patients who are malnourished are frequently less mobile (ambulatory, bedridden)

–Metabolic demand – patients with inflammatory diseases (eg infections) are likely to become malnourished sooner due to ↑ muscle breakdown

SGA Physical Examination

–Subcutaneous Fat: the following areas are assessed

•Triceps

•Anterior chest

•Lateral ribs

•Muscle tone and bulk: the following muscles are assessed

•Temporalis Muscle

•Interossei

•Shoulder Area

–Supra and infra scapular

•Deltoid, biceps and triceps

•Quadriceps

•Gastrocnemius

–Edema/Fluid Overload

•Ankle edema, sacral edema, ascites

4.9. Data quality control

The data collector was fluent in English as well as in the local language. Supervision was done in-process and feedback was held at the end of each day with the data collector to discuss any issues raised during the day and clarify issues that could hampered collection of good data. The PI has visited the site during the data collection period to oversee data collection process and checked all previously completed questionnaires for consistency and completeness. To assure more quality, the medical doctor was previously trained before perform the SGA and blood samples were drawn before initiation of intravenous anti-inflammatory or intravenous fluids.

4.10. Data processing and statistical analysis

Data were entered using Epi Data and analyzed using SPSS version 21. Frequencies were generated for variables and tables or graphs were used to present the data. Descriptive statistics was used to show the frequency and percentage of the characteristics. To enable comparison between the tools, the results were reorganized into two variables: malnourished (SGA: B+C), (FNA: when three or more of the seven parameters are abnormal) and well nourished (SGA: A), (FNA: Normal value of the parameters). The results from the FNA tool was considered as the gold standard and the result from SGA as the test tool. The specificity, sensitivity, positive predictive value (PPV) and negative predictive value (NPV) for the SGA tool was computed. With regard to the reliability, Cronbach's alpha was calculated to determine the internal consistency of SGA. The acceptable range was between 0.7 – 0.9 and above 0.9 values indicated excellent reliability (55, 56).

4.11. Ethical considerations

Before conducting the study, ethical clearance was obtained from Research and Ethics Committee of School of Public Health, Addis Ababa University. Permission letter for doing research and collecting data was also obtained from Black Lion Specialized Hospital.

Furthermore, during the data collection, written informed consent was obtained from each respondent by first explaining the objectives of the study. To maintain anonymity identifiers like names were not included in the questionnaire. All measure to maintain human rights including informed consent, the right to participate in the study, right to privacy and confidentiality and right to prevention from any type of harm were taken into consideration. All Participants were informed that their participation is on voluntarism bases and none rock-solid for participation. It has also been clearly stated to the participants that the information they will provide whether orally or in writing will be for research purposes and strictly confidential.

5. Results

One hundred three adult patients (≥18 years) admitted to Black Lion hospital surgical ward and scheduled to have major or minor GI surgery were eligible for this study. Of the total eligible study subjects, one hundred adults participated which give a response rate of 97%.

5.1. Socio-demographic characteristics

Male participants were 52 (52%) and female were 48 (48%) in the study sample. The mean age was 47 (SD±16) years with a minimum of 18 and a maximum of 80. To enable comparison with other studies, age were further categorized into two groups under 65 years and greater or equal to 65 years. A total of 88% of the study subjects were in age group less than 65 years while 12% of the study subjects were older than 65 years. Majority of the patients were employed (65%) while thirty five (35%) were unemployed. (Table 1)

Table 1 Percent distribution of patients in gastrointestinal surgical ward by selected socio-demographic background characteristics prior to operation, black lion hospital, Addis Ababa, Ethiopia 2018

Variable		Frequency	Percent
Age	**< 65 years**	88	88.0
	≥ 65 years	12	12.0
Gender	**Male**	52	52.0
	Female	48	48.0
Marital status	**Single**	18	18.0
	Married	78	78.0
	Divorced	1	1.0
	Widowed	3	3.0
Religion	**Orthodox**	44	44.0
	Catholic	8	8.0
	Protestant	19	19.0
	Muslim	29	29.0
Occupation	**Unemployed**	35	35.0
	Employed	65	65.0

5.2. Classification of diseases

Abdominal operations was performed in 100 patients admitted for non-elective surgery. Fifty nine patients (59%) were diagnosed for gastrointestinal cancer and 41patients (41%) with benign or acute GI disease. Among cancer patients, the most prevalent was esophagus cancer (19%) following by appendicitis (10%) among non cancer patients.

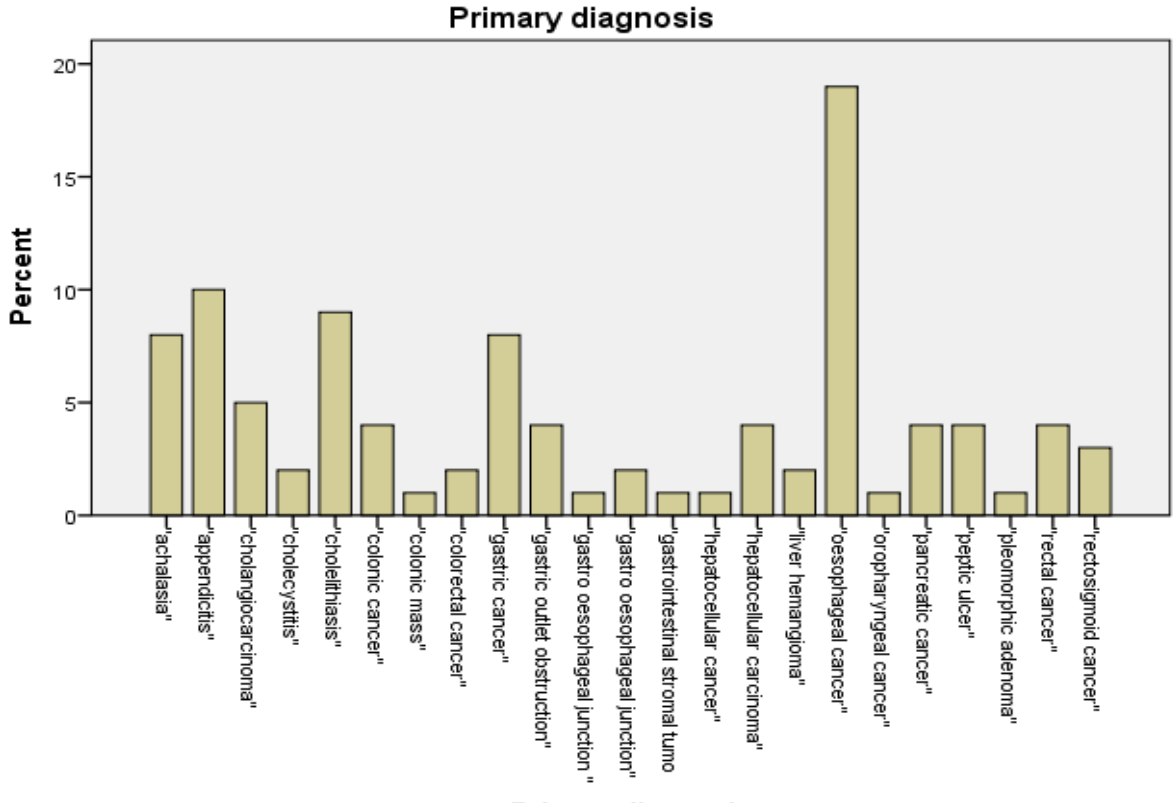

Figure 1 Percent distribution of patients in gastrointestinal surgical ward by diagnosed diseases, black lion hospital, Addis Ababa, Ethiopia 2018

5.3. Identification of patients with malnutrition

According to SGA tool, 31% of patients were well nourished and 69% were classified as malnourished. However according to FNA, 41% of patients classified healthy and 59% of patients have been diagnosed with malnutrition. (Table 2)

When stratified by gender, prevalence of malnutrition according to SGA in men (71.2%) is greater than women (66.7%). On the contrary, FNA have diagnosed more malnourished patients in women (60.4%) than in men (57.7%). (Table 3 and 4)

Table 5 and 6 display that, prevalence of malnutrition based on SGA as well as FNA has been higher in people above 65-year-old than in people under 65 years old.

Table 7 and 8 showed that both SGA (89.8%) and FNA (76.3%) undernutrition was more frequently identified in cancer patients compared to non cancer patients.

Table 2 Frequency and prevalence of malnutrition among patients in gastrointestinal surgical ward according to different tools, black lion hospital, Addis Ababa, Ethiopia 2018

Tool		Frequency	Percent
SGA	Malnourished	69	69.0
	Well nourished	31	31.0
FNA	Malnourished	59	59.0
	Well nourished	41	41.0

Table 3 Frequency and prevalence of malnutrition among patients in gastrointestinal surgical ward based on SGA according to gender, black lion hospital, Addis Ababa, Ethiopia 2018

SGA	Gender	
	Male	Female
Malnourished	37 (71.2%)	32 (66.7%)
Well nourished	15 (28.8%)	16 (33.3%)

Table 4 Frequency and prevalence of malnutrition among patients in gastrointestinal surgical ward based on FNA according to gender, black lion hospital, Addis Ababa, Ethiopia 2018

FNA	Gender	
	Male	Female
Malnourished	30 (57.7%)	29 (60.4%)
Well nourished	22 (42.3%)	19 (39.6%)

Table 5 Frequency and prevalence of malnutrition among patients in gastrointestinal surgical ward based on SGA according to age, black lion hospital, Addis Ababa, Ethiopia 2018

SGA	**< 65 years**	**≥ 65 years**
Malnourished	58 (65.9%)	11 (91.7%)
Well nourished	30 (34.1% **)**	1 (8.3%)

Table 6 Frequency and prevalence of malnutrition among patients in gastrointestinal surgical ward based on FNA according to age, black lion hospital, Addis Ababa, Ethiopia 2018

FNA	**< 65 years**	**≥ 65 years**
Malnourished	50 (56.8**%**)	9 (75.0**%**)
Well nourished	38 (43.2**%**)	3 (25.0**%**)

Table 7 Frequency and prevalence of malnutrition among patients in gastrointestinal surgical ward based on SGA according to disease, black lion hospital, Addis Ababa, Ethiopia 2018

SGA	**GI Disease**	
	Cancer	Non cancer
Malnourished	53 (89.8%)	16 (39.0%)
Well nourished	6 (10.2%)	25 (61.0%)

Table 8 Frequency and prevalence of malnutrition among patients in gastrointestinal surgical ward based on FNA according to disease, black lion hospital, Addis Ababa, Ethiopia 2018

FNA	**GI Disease**	
	Cancer	Non cancer
Malnourished	45 (76.3%)	14 (34.1%)
Well nourished	14 (23.7%)	27 (65.9%)

5.4. Concurrent validity of SGA

We used FNA as gold standard to evaluate the validity of SGA. The analysis showed that SGA had a sensitivity of 98.3%, a specificity of 73.2%, a positive predictive value of 84.1% and a negative predictive value of 96.8%. (Table 9)

Table 9 Sensitivity, Specificity, Positive Predictive Value, Negative Predictive Value, Kappa correlation coefficient SGA compared to FNA among patients in gastrointestinal surgical ward, black lion hospital, Addis Ababa, Ethiopia 2018

Tool	Sensitivity	Specificity	Positive Predictive Value (PPV)	Negative Predictive Value (NPV)
SGA compared to FNA	98.3%	73.2%	84.1%	96.8%

5.5. Reliability

The internal consistency of the SGA questionnaire for assessing homogeneity was analyzed using Cronbach's α coefficient. Overall, a consistency of α =0.805 was obtained. When considering how each item correlates to all of the other items, the variable "gastrointestinal symptoms" was found to have negative correlation, showing little association with the final score. When this variable is excluded from the SGA questionnaire, its reliability improves from α = 0.805 to α = 0.846. On the other hand, the best correlation was found for the variable "muscle wasting" (r =0.783) followed by "loss of subcutaneous fat" (r =0.767) and "unintentional weight loss" (r =0.748) meaning that these variables are more proned to detect malnutrition and if they are excluded from the questionnaire, its reliability will completely decrease. (Table 10)

Table 10 Cronbach's Alpha coefficient of SGA among patients in gastrointestinal surgical ward, black lion hospital, Addis Ababa, Ethiopia 2018

Cronbach`s Alpha = 0.805		
	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Unintentional weight loss	0.748	0 .752
Dietary intake change	0.574	0.787
Gastrointestinal symptoms	-0.498	0.846
Functional capacity	0.585	0.788
Metabolic demand	0.574	0.777
Loss of subcutaneous fat	0.767	0.748
Muscle wasting	0.783	0.745
Ankle edema	0.491	0.787
Sacral edema	0.341	0.802
Ascites	0.341	0.802

6. Discussion

There are varieties of methods for nutritional assessment of patients. Although there is no gold standard, the most universally accepted method for evaluating malnutrition is the so-called subjective global assessment (SGA). The validity and reliability of the nutrition assessment tools should be evaluated in setting where it will be used (48).

A facility based study was conducted in the largest tertiary referral hospital of Ethiopia to investigate concurrent validity of SGA compared to FNA scores. Malnutrition was identified among 69% of patients based on SGA. Sensitivity, specificity, Positive Predictive Value (PPV) and Negative Predictive Value (NPV) in SGA tool compared to FNA tool were equals to 98.3%, 73.2%, 84.1% and 96.8% respectively. The internal consistency using Cronbach's α analysis showed an acceptable reliability $\alpha = 0.805$.

In the present research, prevalence of malnutrition using SGA and FNA has been reported between 59-69% showing that malnutrition is a recurrent problem in our setting. Our results are consistent with the literature where the estimated prevalence of undernutrition among surgical patients, ranging from 35% to nearly 60% (35). Studies in LMICs (16 studies from Latin American countries, 7 from China, 3 from Vietnam, 3 from Turkey, 2 from India and 1 from Thailand) also showed that the prevalence of pre-operative malnutrition among surgical patients varied between 50–80% (28).

The two determining property of measure to assess the accuracy of a screening test are validity and reliability. Overall, within different clinical settings and population under study, SGA have shown a potential as screening tool by diagnosing people with malnutrition from people who are well nourished. Its application is non invasive with a great precision especially when all the items are available and reliable. Conversely, the unvaried limitation is related to its subjectivity.

To assess SGA validity in this study, the level of sensitivity and specificity compared to FNA was determined. When compared with FNA, SGA had a sensitivity of 98.3% and a specificity of 73.2%. It can say that SGA correctly classified 98% of patients as malnourished, while 2% were misclassified as well nourished. On the other hand, its correctly classified 73% of patients as well nourished, meaning that the ability of this tool in diagnosing the patients with malnutrition has been higher than its ability in diagnosing the patients without malnutrition.

The finding of this study are similar with a study conducted by Fatemeh et al among hospitalized patients in Iran in which a sensitivity of 82.75%, and a specificity of 73.17 % has been reported (50). In contrary study by Deveto et al among hospitalized patients where detailed nutritional assessment was used as gold standard, showed a sensitivity of 76.5% and a higher specificity of 83.7% (57). This may be explained by the use of different gold standards tool in various setting.

Likewise, positive predictive value and negative predictive value of SGA have been reported 84.1% and 96.8%. Thus, if a person is diagnosed with malnutrition based on SGA, he will be subjected to malnutrition with probability of 84.1% whereas if a person is diagnosed not malnourished based on SGA, he will be well nourished with probability of 96.8%. This predictive values were greater than those found by Jeejeebhoy et al which were equal to 60% and 53% respectively (58). It is important to notice that both positive and negative predictive value are influenced by the prevalence of the condition tested for in the population.

Regarding reliability, this study demonstrates that SGA has proper internal consistency. The Cronbach's alpha analysis showed the questionnaire to reach acceptable reliability, $\alpha = 0.805$. Most items appeared to be worthy of retention, resulting in a decrease in the alpha if deleted with the exception of "gastrointestinal symptoms" which, besides presenting low correlation and produced a negative result. The characteristics with the largest correlation coefficients are loss of subcutaneous fat, muscle wastage, and unintentional weight loss which are almost the same to that found by Detsky et al. when analyzing the correlation between the variables included in the SGA (49).

Limitations

The serum prealbumin was not included in the full nutritional assessment questionnaire. It is due to the fact that this analysis is not performed in labs found in Ethiopia.

The reliability of weight reports of the patients especially who came from rural parts is questionable. Their usual weights were determined subjectively using some memory technics.

7. Conclusion and Recommendations

7.1. Conclusion

Subjective global assessment is the most consensual method for evaluating malnutrition.

In this study, the sensitivity is high with an acceptable level of specificity. SGA appeared to have a proper internal consistency and demonstrate a substantial agreement when comparing to FNA. Therefore, SGA application is feasible in daily surgical wards practice in Black Lion Specialized Hospital.

7.2. Recommendations

We recommend further study on SGA validation including more hospitals with a large sample size.

Based on the Cronbach's alpha finding, we recommend for Ethiopian settings, the item "gastrointestinal symptoms" to be removed from the SGA tool.

Considering the difficulty to obtain usual weight reports of the patients especially who came from rural parts, further research and modification of the SGA regarding weight change item might be needed for cultural adaptation.

Regarding the high prevalence of malnutrition in this study we also recommend the Ministry of Health to have more focus on clinical malnutrition in adults and to develop a nutritional support plan in order to improve outcomes of preoperative patients.

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ANNEXES

Annex 1. Mean values ± SD and reference values of nutritional parameters used for the full nutritional assessment of patients

Table 11 Mean values ± SD and references values of nutritional parameters used for the full nutritional assessment of patients

Parameters	Male	Female	References
Albumin	3.6 ± 1	3.5 ± 1	>3.5 g/dl
Total lymphocyte count	2185 ± 1056	3351 ± 1147	M: 1180-3740 F: 1320-3570
BMI	19 ± 3	19.7 ± 3	18.5-24.9 kg/m2
Triceps skinfold thickness	12.9 ± 4	19.3 ± 8	M: >12.8 mm F: >19.3 mm
Mid-arm muscle area	32.3 ± 15	24.3 ± 11	M: >32.3 cm2 F: >24.3 cm2
Mid-upper arm muscle circumference	23.6 ± 5	23 ± 4	M: >23.6 cm F: >22.9 cm
Unintentional weight loss previous month	6.4 ± 4	6.3 ± 5	< 5%

Annex 2. English version questionnaire

Information form

Addis Ababa University College of Health Science School of Public Health

Title of the study *"*validation of the SGA nutritional screening tool among surgical patients in black lion specialize hospital*".*

Good morning /Good afternoon, my name is……working as data collector in this study.

Dear respondents here are lists of questions with different sections, which are designed for research work to be conducted in partial fulfillment of master Degree in public health with collaboration of Addis Ababa university school of public Health. The main purpose of the study is to investigate the validity of SGA for effective integration in daily surgical wards practice. we are inviting patients admitted to general surgical ward aged ≥ 18years to contribute for the study but you have been selected randomly. The study will required some blood specimens. Since blood analysis is a routine part of surgical patients checkup, it's not to be considered as an additional harm. However, you are free to express your discomfort or decide not to participate. This study will help in designing a policy for preoperative patients in term of nutritional management. Those who are malnourished will be referred for further investigation and management. Your name will not be recorded and all the information you give will be kept strictly confidential and is to be used only for the purpose of this study.

Consent form

This consent form has been read and explained to me and I have understood, and my questions have been addressed. I therefore willingly agree to take part in the study.

1, Yes; continue to the consent form

2, NO; skip to the next participant

Participant signature/ finger print _____

Name of hospital ward_____

Data collector _____ signature _____

Date of screening _____Time started _____time finished _____

Supervisor name _____ signature _____

Part 1. Socio-demographic data

ID. No._____ Date of Screening_____

Questions Number	**Questions**	**Coding category**	**Skip**
101.	How old are you?	……..years (age in complete years)	
102.	Sex of respondents.	Male……..1 Female……..2	
103.	What is your marital status?	Single……..1 Married……2 Divorced……3 Widowed……4 Others Specify…….5	
104.	What is your occupation?	Unemployed……..1 Business…….2 Farmer……3 Student……4 Employed……5 Retired…….6 Others(specify)…….7	
105.	What is your religion?	Orthodox……1 Catholic……..2 Protestant……3 Muslim……4	

		Others (specify)……..5	

Part 2. Anthropometric data

Questions Number	Questions	Coding category	Skip
201.	Weight	☐☐☐.☐ Kg	
202.	Height	☐☐☐.☐ Cm	
203.	BMI	<18.5 kg/m2……1 18.5-24.9 kg/m2……...2 25-29.9 kg/m2……..3 ≥30 kg/m2……..4	

Part 3. Subjective global assessment data (SGA)

Questions Number	Questions	Coding category	Skip
301. **302.**	Weight change Overall loss in past 6 months Change in past 2 weeks:	……kg; % loss Increase……..1 No change……..2 Decrease…….3	
303.	Dietary intake change (relative to normal)	No change……1 Change……2 Duration (weeks)……3 Type…4	**If no change go to question 304**

		Suboptimal liquid diet……....a Full liquid diet……b Hypocaloric liquids……c Starvation……...d	
304.	Gastrointestinal symptoms (that persisted for >2 weeks)	None……..1 Nausea……...2 Vomiting……3 Diarrhea…….4 Anorexia…….5	
305.	Functional capacity	No dysfunction (e.g., full capacity)…….1 Dysfunction…….2 Duration (weeks)……3 Type….4 Working suboptimally……a Ambulatory……b Bedridden……...c	**If no dysfunction go to question306**

306. **307.**	Disease and its relation to nutritional requirements Primary diagnosis (specify) Metabolic demand (stress)	……..... No stress……...1 Low stress……..2 Moderate stress……..3 High stress…….4	
308.	Physical (for each trait specify: 0 = normal, 1+ = mild, 2+ = moderate, 3+ = severe)	Loss of subcutaneous fat (triceps, chest)……..1 Muscle wasting (quadriceps, deltoids)……..2 Ankle edema…….....3 Sacral edema……4 Ascites…….5	
309.	SGA rating	Well nourished…….A Moderately (or suspected of being) malnourished……B Severely malnourished……C	

Part 4. Full nutritional assessment data (FNA)

Parameters Number	Parameters	Male	Female	References
401.	Albumin			
402.	Total lymphocyte count			
403.	BMI			
404.	Triceps skinfold thickness			
405.	Mid-arm muscle area			
406.	Mid-upper arm muscle circumference			
407.	Unintentional weight loss previous month.			

Annex 3. Amharic version questionnaire

የአማርኛ መጠይቅ

ክፍል 1 : መለያ

መለያ ቁጥር._____ ቀን____/_____የቀዶጥገና አይነት_____

ቁጥር	ጥያቄ	ኮድ	ዝለል
101.	ስንት አመቶት ነው (በ ሙሉ አመት)	.....አመት	
102.	ጾታ	ወንድ.....1	
103.	የጋብቻ ሁኔታ	ያላገባ.....ነ ያገባ.....2 የተለያዩ.....3 የተፋታ/የተፋታች.....4 የሞተባት/የሞተበት.....5	
104.	የስራ አይነት	ስራ የለኝም……..1 ነጋዴ…….2 ገበሬ……3 ተማሪ……4 ተቀጣሪ……5 ጡረታ……6 ሌላ ካለ ይገለጽ……7	
105.	ሓይማኖቶት ምንድ ነው	ኦርቶዶክስ.....ነ ካቶሊክ.....2 ፕሮትስታነት.....3 ሙስሊም.....4 ሌላ ካለ ይገለጽ.....5	

ክፍል 2: ቁመት እና ክብደት መረጃ

ቁጥር	ጥያቄ	ኮድ	ዝለል
201.	ክብደት	☐☐☐.☐ኪ.ግ	
202.	ቁመት	☐☐☐.☐ሴ.ሜ	
203.	የክብደት እና ቁመት ንጽጽር	<18.5 ኪ.ግ/ሜ²……1 18.5-24.9 ኪ.ግ/ሜ²……...2 25-29.9 ኪ.ግ/ሜ²……..3 ≥30 ኪ.ግ/ሜ²……..4	

ክፍልሰ 3: ሰብጀክቲቭ ግሎባል አሰስመንት

ቁጥር	ጥያቄ	ኮድ	ዝለል
301. 302.	በስድስት ወር ውስጥ ያጋጠመ የክብደት መቀነስ በሁለት ሳምንት ውስጥ ያጋጠመ የክብደት መቀነስ	……ኪ.ግ; % ጨመረ……..1 ለውጥ የለም……..2 ቀነሰ……3	
303.	የአመጋገብ ሁኔታ ተቀይሮ ነበር	ለውጥ የለም……1 ለውጥ አለ……2 ለውጡ የቆየበት ጊዜ(በሳምንት)……..…3 የለውጡ አይነት……4	ለውጥ የለም ከሆነ ወደ ጥያቄ ቁጥር 304 ይለፉ

		ለስለስ ያለ ምግብ ……..a ፈሳሽ.……b ሀይል ሰጪ ንጥረነገር ያነሰው ፈሳሽ…c አለመመገብ…….……...d	
304.	ከ ሁለት ሳምንት በላይ የቆየ የሆድ ህመም ምልክቶች	ምንም የለም……..1 ማቅለሽለሽ……...2 ማስታወክ…..……3 ተቅማጥ……4 የምግብ ፍላጎት መቀነስ…….5	
305.	የለትተለት እንቅስቃሴን የማከናወን አቅም	ለውጥ የለም(ሙሉበሙሉ ማከናወን እችላለሁ) ……1 ለውጥ አለ……2 ለውጡ የቆየበት ጊዜ(በሳምንት)……..…3 የለውጡ አይነት.....…….4 ትንሽ ትንሽ መስራት……a መንቀሳቀስ ብቻ ……b የአልጋ ቁራኛ……...c	ለውጥ የለም ከሆነ ወደ ጥያቄ ቁጥር 306 ይለፉ

306. **307.**	የህመሙ አይነት ከአመጋገብ ጋር ያለው ቁርኝት የህመሙ አይነት የሰውነት የምግብ ፍላጎት (ጫና)	…….. ጫና የለውም……...1 ትንሽ ጫና አለው……....2 መካከለኛ ጫና አለው……..3 ከፍተኛ ጫና አለው…….4	
308.	በሰውነት ምርመራ ላይ የተገኘ (0 = ኖርማል, 1+ = ትንሽ, 2+ = መካከለኛ, 3+ = ከፍተኛ)	የእጅ እና የደረት አጥንት መጋለጥ(በቆዳ ብቻ መሸፈን) ……..1 የጡንቻ መሳሳት(መቀመጫ አካባቢ)……..2 የቁርጭምጭሚት ውሃ መቁጠር ……....3 የአከርካሪ አጥንት ውሃ መቁጠር……4 በፈሳሽ የተወጠረ ሆድ…….5	
309.	ሰብጀክቲቭ ግሎባል አሰስመንት	የተመጣጠነ አመጋገብ ያለው ……A መካከኛ የምግብ እጥረት ያለበት(ጥረርጣሬ)……B በከፍተኛ ደረጃ የምግብ እጥረት ያለበት……C	

አመሰግናለሁ