



The Effect of Malnutrition at Admission on Length of Hospital Stay among Adult Patients in Tikur Anbessa Specialized Hospital Addis Ababa, Ethiopia: A Cohort Study

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List of Abbreviations and Acronyms

AAU	Addis Ababa University
ANCDS	Australasian Nutrition Care Day Survey
BAPEN	British Association for Parenteral and Enteral Nutrition
BMI	Body Mass Index
CCI	Charlson comorbidity index
DRM	Disease-related malnutrition
ESPEN	European Society for Parenteral and Enteral Nutrition
GI	Gastro Intestinal
GNRI	Geriatric Nutritional Risk Index
HAC	Hospital-acquired condition
LOS	Length of Stay
MUST	Malnutrition Universal Screening Tool
PWL	Percentage weight loss
PI	Principal Investigator
SD	Standard Deviation
SGA	Subjective Global Assessment
SFH	St Francis Hospital
TASH	TikurAnbessa Specialized Hospital
WHO	World Health Organization

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Abstract

Background: Malnutrition in hospitalized adults is a highly prevalent problem. The worldwide prevalence of malnutrition in hospitals ranges from 15–54%. Hospital malnutrition is associated with delays in recovering from illness, increased cost of care, complications, increased the length of stay, mortality and poor quality of life compared to well-nourished patients. In hospitals, length of stay (LOS) is a priority concern but it may be prolonged by malnutrition through its effect on immune functions, wound healing process and greater risk of complications. Amidst the high rates of malnutrition documented worldwide and its associated consequences, little is known on clinical adverse outcomes like prolonged length of hospital stay in the Ethiopian hospital setting

Objective: The study aimed to evaluate the effect of malnutrition at the time of admission on the length of hospital stay among adult patients in Tikur Anbessa Specialized Hospital, Ethiopia

Method: A prospective cohort study was conducted among hospitalized adult patients, who were admitted to Tikur Anbessa specialized hospital medical or surgical wards, with a minimum length of stay of 24 hours were recruited. Proportional allocation and Consecutive sampling method were used to select patients. At admission, Patients Nutritional status were assessed within 48 h using the Subjective Global Assessment (SGA). The main clinical outcome Length of stay in hospital (LOS) was captured for every patient in days. Socio demographic, economic and admission related Patient clinical Characteristics were included. Data were compiled, checked, coded, entered and cleaned using Epi Data 4.4.1 and all statistical tests were done using STAT version 15.1 software. Descriptive statistical tests and multivariate Cox's regression model was used to investigate the effect of malnutrition on the length of hospital stay after adjusted for several potential nutritional and clinical confounders recorded at admission. Results are expressed as hazard ratios (HR) and their 95% CI.

Result: On admission a total of 417 patients, predominantly male (54.2%), were included. The mean age was 38 ± 16 years. Using Subjective Global Assessment (SGA), the magnitude of malnutrition was 62.1% (95% CI: 57.3%, 66.6%). The mean length of stay was 13.84 days ± 7.53 SD, with a significant difference ($p < 0.01$) in length of stay between malnourished patients and well-nourished patients. Malnourished patients had longer hospital stays (17.2 ± 6.8 days vs. 8.3 ± 4.9 days, $p < 0.001$). The final multivariate model, which was controlled for

age, sex, living conditions, number of medications, and number of diagnostic categories, disease severity score, number of comorbidities and presence of cancer showed that malnutrition (SGA B+C) at admission was independently associated with prolonged LOS (HR, 0.29; 95% CI, 0.22–0.38)

Conclusion:The study showed that malnutrition was highly prevalent among hospitalized adult patients and was associated with increased length of stay. The rate of malnutrition tended to be high when the patient was older than 60 years old . Malnourished patients needed longer hospitalization in the present study. More attention should be paid to nutrition in both medical and surgical patients. Therefore, it's essential to assess the nutritional status of patients early in admission and to institute appropriate nutritional therapy to minimize its devastating consequences on the patients and health care system.

1. Introduction

1.1. Background

Malnutrition is a common, worldwide problem, with significant adverse effects on health, which occurs in a community as well as hospital setting (1). Most literature used 'undernutrition' and 'malnutrition' interchangeably. Broadly malnutrition defined as any form of a nutrient imbalance, including under- and over-nutrition, resulting in measurable adverse effects on body composition and functioning, and their associated clinical outcomes (2). It can be developed as a consequence of a deficiency in dietary intake, increased requirements associated with a disease state, from complications of an underlying illness such as poor absorption and excessive nutrient losses, or from a combination of these earlier mentioned factors (3).

Hospitalized patients are vulnerable to undernutrition. Several reasons can lead to hospital malnutrition, among them the disease itself, little knowledge of patients' nutritional status by the healthcare staff, certain diagnostic or therapeutic procedures, the lack of standardized protocols to avoid periods of fasting and identify patients at risk of malnutrition and also lack of routine nutrition monitoring, and intervention (4).

Hospital malnutrition has been shown to be associated with poor health outcomes, rising health care costs, increased utilization of resources, and length of hospital stays, in addition to contributing to morbidity and mortality (5, 6). It can thus be a health outcome as well as a risk factor for the disease.

A poor nutritional status at the time of admission can contribute to a prolonged hospital stay, and may negatively affect prognosis (7). Length of stay is an easily measurable outcome parameter that is directly related to hospital cost and the economic impact of trauma and disease (8). Possible reasons for malnourished patients longer hospital stay is closely associated with functional status (increased muscle fatigue and reduced function), and complications such as infection (5). Malnutrition alters immune competence, increases infection risk, increases the risk of developing pressure ulcers, slows wound healing, reduces nutrient intestinal absorption, changes thermoregulation and alters renal function. All these factors can lead to a prolonged length of stay among patients. Independently from other factors, the presence of malnutrition has been shown to negatively affect length of hospital stay and increased health care costs (9).

Now a day, Patient length of stay (LOS) is one of the biggest issues that hospitals facing. Prolonged length of stay disrupts the patient flow and access to care due to bed shortages. So, reducing the length of stay (LOS) is a priority for hospitals and healthcare systems, because short and brief stay of patients in hospital significantly decrease the costs of health care(10). However, this marker of efficiency may be detrimentally affected by poor nutritional status or a decline in nutritional status during hospitalization. Globally, System-wide strategies are tired to implement, strategies used to decrease a prolonged length of stay due to malnutrition focused on the prevention and treatment of hospital malnutrition (11).

Hospitals develop broader strategies to prevent and manage malnutrition, such as: Routine nutritional screening and assessment, usually done within the first 24 h of admission and periodically rescreened throughout their stay(12). Nutritional interventions are further recommended for patients identified as at risk for malnutrition, include dietary modifications, enteral nutrition, and parenteral nutrition. Analyses of available resources for detailed nutritional evaluations and implementation of nutrition care plans; employment of registered dietitians and nutrition support clinicians; enhancement of electronic record systems to improve follow-up of nutritional status parameters; and provision of more supportive mealtime environments and health providers are some of mostly worldwide used strategies to tackle and control hospital malnutrition(11).

Malnutrition in developing countries including Ethiopia tends to refer to children and awareness about adult disease-related malnutrition is lack, so it still a major problem in a clinical setting. Because of lack of knowledge, routine nutrition screening, assessment and intervention practices are not uniformly done as a part of medical care (13). This will lead to the development of negative outcomes of malnutrition in the hospital including prolonged hospital stay and increment of health care costs. So, it's worth to address this gap and showing the magnitude of this problem in order to influence/encourage health facilities, to give emphasis on this issue.

1.2. Statement of the problem

Malnutrition is a prevalent clinical condition in hospitalized patients (14). Recently it has been taken into consideration and tried to be prevented. However, this awareness has not led to the adequate reduction of malnutrition (15). This is due to in most hospital sittings nutrition screening upon hospital admission is not mandatory, so the patient's nutritional status appears to be overlooked or not considered as a sufficient medical priority(3). It is therefore of concern that many malnourished patients are not identified as such, and thereby not referred for nutrition assessment and treatment.

The prevalence of hospital malnutrition varies depending on a number of factors, including patients' diagnoses, age, nutrition parameters, and the screening and assessment tools used (16). Many studies across continents have cited the prevalence of malnutrition, with malnutrition risk ranging from 15% to 54%(4-8). The burden of hospital malnutrition varies between the developing and developed countries. Its burden is high as 50% in high-income countries(17-19) and nearly 70% in low and middle-income countries (20, 21).

A multi-center cohort study done in 3 African countries (South Africa, Kenya and Ghana) among 2126 adult patients showed that 72.6% were at risk of malnutrition on admission, with a higher prevalence for patients in Kenya and Ghana (74.6%) versus those from South Africa (69.8%) (22). Despite limited data, the prevalence of malnutrition appears to be high in Ethiopia, A study done in four Referral Hospitals found in Amhara National Regional State, shows that prevalence of malnutrition in hospitalized patients is 55.6%(23).

Few studies compared the average LOS between patients admitted 'at risk' of malnutrition and those not at risk. The results indicated that the patients 'at risk' of malnutrition had an average longer hospital stay than those that were well nourished on admission. The average LOS for malnourished patients was found to be 40–70% longer. LOS may be increased five-fold in the severely malnourished patient compared with well-nourished patients (24-27).

Malnutrition led to an increased LOS ranging from 2.4 to 7.2 days(24, 28-31). A longer LOS also increases the likelihood of a hospital-acquired condition (HAC), which harms patients and contributes to an even longer and costlier stay (32). In addition, hospitals face lower patient capacities. Malnutrition led to an additional increase in costs among hospitalized patients ranging between 1640 (33) and 5829 € (29) per patient. Patients at nutritional risk had hospitalization costs which were twice higher than patients not at risk, with an average

additional cost of 2687 € (34). Just in Europe, it has been estimated that 20 million patients are at the risk of malnutrition, with an annual cost up to 120 billion € (35, 36) and malnutrition-related costs represented between 2.1 and 10% of the national health expenditure (28).

In Ethiopia, there is a paucity of evidence regarding the burden of malnutrition in hospitalized patients. Most of the available literatures on malnutrition focuses on children and awareness about adult disease related malnutrition is lack. Hence, we aimed to determine the magnitude of malnutrition among hospitalized patients on admission and its effect on length of stay, using a validated screening tool (SGA)(37).

1.3. Significance and Rationale of the study

Predicting LOS allows maximizing hospital resources and the development of an effective health care plan. So, in developing countries like Ethiopia where healthcare facilities and resource are limited as well as patients' burden is high, determining the effect of malnutrition on the length of hospital stay independently from other factors using validated Subjective Global Assessment (SGA), will help in reducing the economic and human costs of malnutrition. Also, the results of this study used, to convince hospital and healthcare organizations to have a policy and a specific set of protocols for identifying patients at nutritional risk, leading to appropriate nutritional care plans. If healthcare institutions and professionals are convinced that malnutrition has an impact on clinical outcomes like a prolonged length of hospital stay, independent of medical diagnosis, they are more likely to proactively prevent and manage malnutrition.

1.4. Research Question

Does nutritional status of a patient during admission affect the length of hospital stay of adult patients in TikurAnbessa specialized hospital, Ethiopia?

2. Literature review

2.1. Hospital malnutrition

2.1.2. Prevalence of hospital malnutrition

Despite significant advances in prevention, detection, and treatment, protein-calorie malnutrition remains an important problem in hospitalized patients. The prevalence of hospital malnutrition varies with different populations, healthcare settings, socioeconomic status, educational level, age group, the severity of illness and the nutrition screening method used (16). A worldwide prevalence between 20% and 60% of hospital malnutrition at admission has been reported, with 30-55% of all patients being at risk of malnutrition at the time of admission(38-40).

Due to underutilization and poor enforcement of screening tools, malnutrition is still common in many developed countries (41). Reports shows, more than 50% of patients hospitalized for various reasons have varying degrees of malnutrition (13, 30, 42, 43). In Europe and North America, 20–62% of hospitalized patients are at risk of malnutrition (35, 44). In 2017, a study done in Italy showed 52.3% of patients were at risk of malnutrition and 38.7% were malnourished at admission (45). According to the British Association for Parenteral and Enteral Nutrition (BAPEN), 23% of patients were at risk of malnutrition during admission (46).

In developing countries, at least one-third of admitted patients are estimated to be malnourished, which is higher than in developed countries(3).A systematic review conducted among 12 Latin American countries shows, the prevalence was consistently in the range of 40%-60% at the time of admission, with several studies reporting an increase in prevalence with increasing duration of hospitalization(47). A recent study in Singapore reported prevalence rates of hospital malnutrition were 29%(9) . In 2016, a cross-sectional study done in Ghana shows 71.4% of patients were identified as at nutritional risk(40). Another study done in South Africa have shown that the prevalence of malnutrition in hospitalized patients were 76.6% with a significant difference in their length of stay(48).

From the above studies ,we understand hospital malnutrition is a worldwide and a significant public health problem.In addition, it is poorly diagnosed in hospital settings. The prevalence of hospital malnutrition in developing countries is high when we compare it to developed ones.This difference may be explained by differences in the socioeconomicstatus, study area

sample size of the study and geographical area of study setting. In developing countries such as Ethiopia high prevalence of hospital malnutrition can be explained by lack of malnutrition screening and assessment protocols as well as the poor nutritional knowledge of health care personnel, in particular, delays the diagnosis of malnutrition in hospitals.

2.1.3. Cause of hospital 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 (49). The association between malnutrition and disease has been described as a synergistic vicious cycle due to the complementary influence each has on the other(50).

The etiology of malnutrition detected on admission to hospital can be primary, resulting from an inadequate and unsatisfactory dietary intake of nutrients, a consequence of poor socioeconomic conditions, which prevent the replacement of the required energy, protein, and other nutrients; or secondary, resulting the patient's illness itself (disease-related malnutrition), which can interfere with adequate absorption and metabolism of food via a variety of mechanisms, such as infection dependent changes in metabolism, loss of appetite, absorption or digestion disorders, disease-specific catabolism, and treatment complications(3).

The pathogenesis of hospital malnutrition is multifactorial and complex. Under nutrition can be caused by a combination of somatic, functional, psychological and social factors (50). In hospitalized patients, deteriorated nutritional status 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 the origination of under nutrition or deterioration of nutritional status (14, 50).

Organizational factors that contribute to the development of malnutrition includes, nil per os (NPO) status, while awaiting further assessment and medical interventions, absence of nutrition protocols inwards, inadequate or absence of dietitians at the hospital, ignorance of dietitian's nutritional recommendations due to physicians' focus on patients' medical conditions, failure to recognize malnutrition, lack of nutrition screening and assessments and

ignorance of the importance of nutrition(2, 3). 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).

2.2. Hospital Malnutrition and Its Clinical Consequences

Malnutrition has been often overlooked, undiagnosed and untreated in hospitals (3). This leads to a range of poor clinical outcomes. According to the available data, malnutrition is an independent risk factor with a significant effect on the important clinical parameters of mortality, morbidity, complication rates, length of hospital stay, tolerance of treatment, quality of life, prognosis and readmission and cost(50, 51).

Based on widely reported in the literature, and the negative consequences of malnutrition can be separated into two main categories: consequences for the patient and consequences for the healthcare facility. The negative consequences for the Patients include outcomes as longer hospital stay, higher complication, readmission and infection rates, and mortality (3).

Europe-wide multicenter clinical study shows higher mortality (12% versus 1%), significantly longer hospital stays (9 versus 6 days; $p < 0.001$), and a significantly higher complication rate for under-/malnourished patients and patients at risk of malnutrition (52). A current review article by Norman et al. summarizes and explores the significant correlation between malnutrition and morbidity, mortality, and length of hospital stay and the consequently higher treatment costs (14).

The consequence of hospital malnutrition mostly resulted from malnutrition impairment at a cellular, physical and psychological level and also associated with Impaired immune function, delayed wound healing, and convalescence from illness, decreased functional status, decreases nutrient intestinal absorption, alters thermoregulation and compromises renal function(53, 54).

Malnutrition places additional stress on health care facilities. As previously stated, malnourished patients often have higher rates of infections and other complications (and consequently require greater nursing care), require more medications, are less independent due to muscle loss and consequently have longer lengths of hospital stay. All these issues combined indirectly increase hospital costs associated with treating the patient, secondary to the management of their primary medical reason for admission(30).

Malnourished patients are more prone to experiencing complications during their period of hospitalization than patients who are in a well-nourished state(55). Complications can be grouped under infectious (such as pneumonia, septicemia, wound infection, cystitis) or non-infectious complications (such as intestinal bleeding, kidney failure, dehydration)(56). A study done in Brazilian hospitals have reported higher complications (27.0%) among patients who were malnourished as measured by SGA at admission compared to well-nourished patients(5). Similarly, Braunschweig et al found a 1.4 and 1.8 times increased risk of complications in moderately and severely malnourished newly admitted patients, respectively (55).

Besides the increased risk of morbidity and cost, hospitalized patients with poor nutritional status face an increased risk of mortality (57). According to the Australasian Nutrition Care Day Survey (ANCDs) in 56 Australian and New Zealand acute care hospitals, of 3,122 patients, the odds of 90-day in-hospital mortality were twice greater for malnourished patients(58). Middleton et al prospectively investigate mortality outcomes of malnutrition using data from national death registers and revealed that mortality at 12 months was 29.7% in malnourished subjects compared with 10.1% in well-nourished Subjects ($p < 0.0005$) (59).

The rates of readmissions are also greater in patients that are malnourished (58). A multicenter Spanish study recorded a higher readmission rate at 15, 30 and 90 days in the malnourished group compared with the well-nourished group (29). In Planas (2004) study, when patients were classified using SGA, there were more total and non-elective readmissions over the next 6 months in patients with malnutrition (30%) than in patients without malnutrition (15%) which is Malnourished patients are twice as likely to be readmitted to hospital compared to well-nourished patients (31).

2.2.1. Hospital Malnutrition and Length of Stay

Poor nutritional status has been associated with longer length of stay (LOS) and treatment durations (48).LOS is an important outcome parameter of nutritional risk or status's reflects the extent and impact of the disease, the role of genetics, treatment duration, quality of care and especially the adverse effects of malnutrition such as poor wound healing, an impaired functional status, quality of life and hospital cost (5, 8).

Many studies have investigated the influence of malnutrition on patient outcomes, including, LOS. In 2014, a multicenter cross-sectional study conducted among Korean hospitalized patients showed patients with malnutrition had longer hospital stay (Moderate malnutrition

=12.18 ± 7.24 days, Severe malnutrition = 9.02 ± 9.96 days, P = 0.018) than well-nourished (7.63 ± 6.03 days) (60). Another study done in Singapore two teaching hospitals showed that malnourished patients had longer hospital stays (6.9 ± 7.3 days vs. 4.6 ± 5.6 days) than well-nourished patients (9).

Malnourished patients stay in hospitals 1.5 to 1.7 times longer than well-nourished Patients (5, 59). A prospective cohort study conducted in 18 Canadian hospitals among hospitalized patients by Johane P. Allard et.al, showed that malnutrition at admission was independently associated with prolonged LOS (hazard ratio, 0.73; 95% CI, 0.62–0.86) (10). Other large national studies in Germany and Brazil have observed a significantly longer LOS of 4-13 days in malnourished patients compared with well-nourished patients (30, 47).

In Brazil, a study conducted by ISABEL et.al among hospitalized adult patients showed that length of hospital stay was shorter in the well-nourished patients (median of 6 days vs a median of 9 days), and hospital costs in malnourished patients were increased up to 308.9% (5). A study done in Saudi Arabia also showed that malnourished patients had increased the tendency to stay in the hospital for longer durations (IQR, 5-11 days; median = 7 days) (61). Similar trends have been reported in the literature, with an increase in stay ranging from 4 up to 43 days (4, 7, 58, 62, 63).

Despite few studies conducted in Africa hospital setting, their results showed a higher LOS in malnourished patients. A study conducted in South Africa among hospitalized adult patients showed a mean length of stay in hospital was 6.9 days ± 5.9SD and a significant difference in length of stay was documented for those patients considered malnourished (7.4 days ± 6.1SD) compared with well-nourished patients (5.2 days ± 4.8SD) (48). Another study conducted in Ghana among adult patients showed that patients with Nutritional risk at admission were associated with a significantly prolonged LOS (9.7 days vs 5.9 days, p < 0.001) (40).

In summary, the similarity of results from several international studies conducted amongst heterogeneous populations in a wide variety of clinical settings verifies that malnutrition has an impact on LOS length of stay in hospitals, where an increased length of stay is related to increased health care cost to the medical institution. Even though no published studies were found concerning hospital malnutrition and its effect on length of hospital stay in Ethiopia, studies conducted in low-income countries have shown admission nutritional status of a

patient will significantly affect hospital stay that will consequently increase health care cost. This showed the need for conducting a research on the area.

2.2.1.1. Potential mechanism of malnutrition and length of hospital stay

Several studies attempted to assess possible mechanism that link malnutrition and length of hospital stay. As shown in Fig1, most chronic or severe diseases cause anorexia which results in malnutrition. Malnutrition together with stress-related catabolism caused by inflammation increases the risk for infections, organ dysfunction and impaired healing. This again—as all other severe acute illnesses—can be a trigger for inflammatory response and consecutively result in starvation and catabolism which further aggravates malnutrition(14).

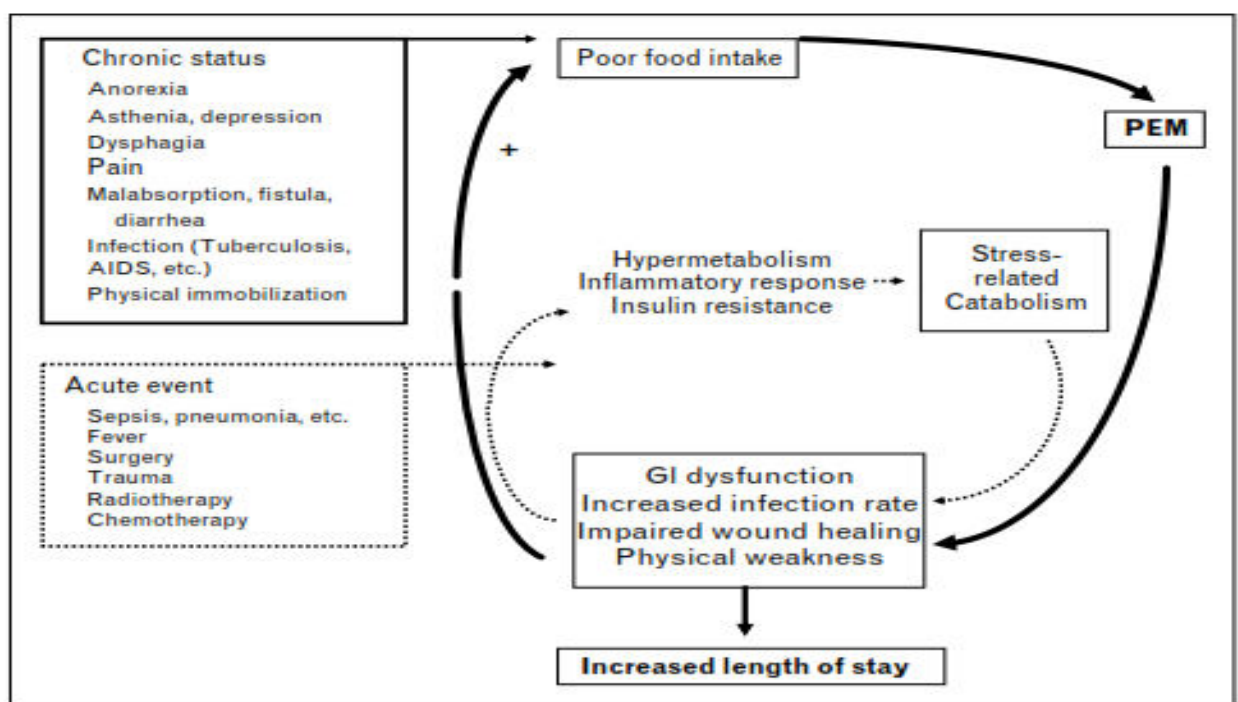


Figure 1: vicious cycle of the development and progression of disease related malnutrition, Adopted from Hospital length of stay and nutritional status (Ursula G. Kyle, Laurence Genton)

2.2.1. Non-nutritional determinants of prolonged length of hospital stay

LOS is an important parameter that is an integration of the severity of illness and patient health status and is affected by genetics, the extent or severity of trauma or disease, overall medical or surgical treatment, quality of care, including resources available, environmental conditions outside of the hospital (e.g. sanitation) and the availability of intermediary and long-term care facilities(8). Although previous studies have shown a prospective association

between malnutrition and clinical outcomes, the confounding effects of age, gender, disease and its complexity have seldom been taken into consideration.

Studies have shown that malnutrition is associated with advancing age(59, 64). As people age, they tend to have more illness, more admissions to hospital and potentially longer lengths of hospital stay(9). Hence, in any clinical outcome study, it is important to control the results for age. Similarly, outcomes can be affected by gender. In 2013 a study conducted by Allard JP showed being male was associated with prolonged LOS(65). Whether this is due to higher nutrition requirements that are not being met or other medical or physiological reasons are unclear.

A study conducted in Brazil among surgical patients showed that gender, disease, and age; anthropometric indicators such as BMI, were investigated as possible risk factors associated with LOS. LOS was greater for males, those aged ≥ 60 years, those with neoplasms, those who lost weight during their stay, and those who were underweight (63). In a retrospective study done in Brazil showed that LOS was prolonged for patients age greater than 60 years, patients with infection and patients having cancer(5).

LOS is also affected by disease severity as severely ill patients require more complex medical treatment (19, 66). One of the methods which can be used to control for disease and its severity or complexities is the Charlson Comorbidity Index (CCI). CCI is a method of categorizing comorbidities of patients based on the International Classification of Diseases (ICD) diagnosis codes found in administrative data, such as hospital abstracts data. Each comorbidity category has an associated weight (from 1 to 6), based on the adjusted risk of mortality or resource use, and the sum of all the weights results in a single comorbidity score for a patient. A score of zero indicates that no comorbidities were found. The higher the score, the more likely the predicted outcome will result in mortality or higher resource use(67). Similar researches used CCI to control disease severity (site) in order to show the independent effect of malnutrition on the length of hospital stay(10, 65).

On the other hand, a more severely ill patient will have a reduced LOS due to premature death (66). Resolving malnutrition through nutrition intervention has been shown to reduce LOS and this has been used as a cost-effective measure to reduce health care costs, the risk of infections and nosocomial infections and to improve patients' quality of life (68).

2.2.2 Economic burden of hospital Malnutrition

Malnutrition has an indirect effect on health care costs. As the malnourished patient is associated with increased LOS, it significantly contributes to extra costs(48). The longer length of hospital stay for malnourished patients is associated with greater health care costs (5, 31). This poses a challenge to societies and governments involved in the planning, provision, receipt of, and payment for health services, as available resources must be spent wisely, without compromising the quality of care, equity and fairness (69).

A cross-sectional study conducted in Portugal among hospitalized patients, where hospitalization costs were calculated for each patient based on hospital length of stay and on the discharge diagnosis-related group (DRG) code, showed that the estimated cost of treatment for a patient at nutritional risk was 20% higher than the average cost of treating the same disease in a patient without nutritional risk. Suggests that DRM may be responsible for an increase of about 20% of hospitalization costs (34).

The British Association for Parenteral and Enteral Nutrition (BAPEN) demonstrated in the United Kingdom the annual expenditure on managing patients with medium or high risk of disease-related malnutrition was estimated to be about £7.3 billion to £10.5 billion (69). In Singapore, a study conducted by Su Lin Lim et al shows Within a DRG, the mean difference between actual cost of hospitalization and the average cost for malnourished patients was greater than well-nourished patients and the average cost of hospitalization was 24% higher for malnourished patients in this study (9).

In the German study, SGA was used to define malnutrition and reported a 19% rate of malnutrition in the patient population, an increased LOS of 4 days in the malnourished patient group, and an annual financial shortfall of €35,280 due to unrecognized malnutrition (24). Another study conducted in Brazil found that treatment costs of the malnourished patient may increase up to 308.9%, compared with those of the well-nourished patient (5).

The economic and human costs of malnutrition can be avoidable by decreasing length of hospital stay; this can be achieved by routine nutrition screening, assessment, and intervention. St Francis Hospital (SFH) which is found in the USA developed a

comprehensive nutrition intervention program that resulted in savings of \$2.4 million over a 2-year period due to decreased LOS and the savings were estimated at \$1,000 for each patient at high risk of malnutrition (70).

2.3 Nutritional assessment tool

Understanding the negative implications of a poor nutritional status highlights the need to address malnutrition as a priority key issue. The first step in the nutritional care plan in treating malnutrition is making a correct diagnosis through the process of nutritional screening(71). Without Nutritional screening and assessment tools, patients with malnutrition will not be recognized. Moreover, adverse outcomes related to being at nutritional risk may not be promptly recognized and averted.

More than 32 available nutrition screening tools exist. Few tools have been designed specifically with the purpose to predict clinical outcome (morbidity, mortality,(postoperative) complications, or length of hospital stay), for example Geriatric Nutritional Risk Index(GNRI), Malnutrition Universal Screening Tool (MUST) and Subjective Global Assessment (SGA) but SGA has been mainly used and selected 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 (72).

Subjective Global Assessment

Subjective Global Assessment (SGA) is well accepted as an assessment tool in clinical practice (26, 73)and also considered one of the best screening tools, as the focus is patient-centred (medical history and physical examination), and associated with patient outcome (length of stay, complications, infections, poor wound healing). The SGA is often considered the gold standard for nutrition screening(74).It has also been recommended by European Society for Parenteral and Enteral Nutrition(ESPEN) for further nutrition assessment(27).

Among all the nutrition assessment tools, subjective global Assessment had the most number of studies that used it to diagnose malnutrition and track clinical outcomes, which equates to prognostic validation of the tool (5, 8, 59). The results of studies using SGA consistently indicated poorer survival, higher length of hospital stay and higher hospitalization costs among malnourished patients (5, 59).

Subjective Global Assessment (SGA) is a validated nutrition assessment tool composed of two sections: a medical history and a physical examination. In the medical history, five

components are assessed, change in weight, dietary intake, the presence of gastrointestinal symptoms and functional impairment through questioning the patient. The change in weight is recorded as weight loss in the preceding six months, previous two weeks, as well as a percentage loss. Less than 5% of weight loss consider as a “small” loss, between 5 and 10% as a “potentially significant” loss, and greater than 10% as a “definitely significant” loss.

The patient’s dietary intake is the second feature of the history and current dietary intake pattern is then compared with their usual intake and classified as normal or 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, diarrhoea). 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 diarrhoea on a daily basis. A low-stress disease might be a smouldering infection or malignancy.

The second part of the SGA focuses on physical evidence of malnutrition. 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 oedema 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 oedema.

On the basis of these features of the history and physical examination, clinicians identify an SGA rank which indicates the patient's nutritional status. Patients are assigned a nutrition rating of SGA-A (well-nourished), SGA-B (moderately or suspected malnourished), or SGA-C (severely malnourished). The mean time to conduct the SGA is nine minutes (ranges between 6–14 minutes)(73).

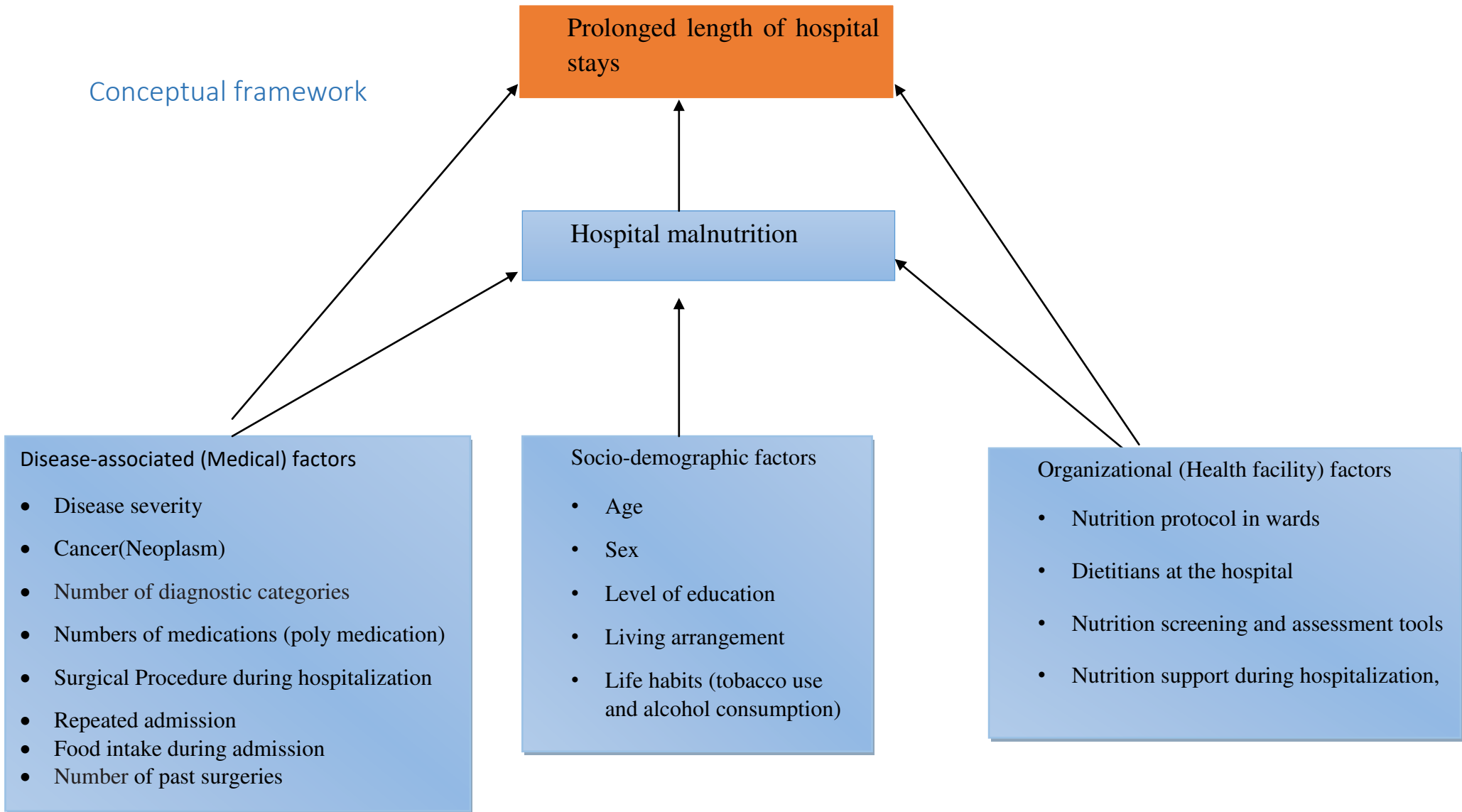


Figure 2: Conceptual framework of hospital malnutrition and prolonged length of hospital stays, adopted from different literature

3. Objectives

3.1. General objective

The general objective of the study was to determine the effect of malnutrition at the time of admission on length of hospital stay among hospitalized adult patients

3.2. Specific objective

The study had two specific objectives ;

1. To assess the magnitude of hospital malnutrition at the time of admission among hospitalized adult patients
2. To evaluate the effect of malnutrition at the time of admission on the length of hospital stay among hospitalized adult patients

4. Methods and Materials

4.1 Study area/setting

The study was conducted in Tikur Anbessa specialized hospital or Tikur Anbessa specialized hospital (TASH) which is Ethiopia's largest specialized and referral public hospital . In 1998, the hospital was transferred to the School by the Federal Ministry of Health, and it has since become a University teaching hospital. Tikur Anbessa specialized hospital is now the main teaching hospital for both clinical and preclinical training of most disciplines. It is also an institution where specialized clinical services that are not available in other public or private institutions are rendered to the whole nation. Tikur Anbessa is a very large referral hospital and offers diagnosis and treatment for approximately 370,000- 400,000 patients a year but the exact number is not known. It has above 800 beds in medical, gynecological and obstetrics, surgical, pediatrics and emergency departments and facilitated with the outpatient department (OPD). The hospital has also specialized units (referral clinics) and these are chest, renal, neurology, cardiology, dermatology, gastro intestine, infectious disease, orthopedics, general surgical, gynecologic and obstetrics, diabetic, hematology, medical intensive care unit (ICU) and surgical ICU units. It is also the training center for fellows, postgraduate undergraduate, medical students, dentists, nurses, Radiographers and laboratory technicians. There are about 200 doctors, 130 specialists, 25 fellows, 379 nurses 500 Residents, 1396 medical students and 99 Interns and 115 other health professionals dedicated to providing health care

service. The hospital receives patients who are referred from across the country(75).It was selected because it is the largest tertiary referral hospital and it is possible to obtain a sufficient number of patient's comes from different parts of Ethiopia.

4.2 Study design

A prospective cohort study design was employed among hospitalized adult patients who were admitted to TASH medical or surgical wards.

4.3 Source population

All adult patients (>18 y) admitted to TikurAnbessa specialized hospital

4.4 Study population

The study population were adult hospitalized patients who were admitted to the surgical and medical wards and fulfilled the inclusion criteria.

4.5 Inclusion criteria:

Patients whose ages were greater than 18 years and patients admitted to the surgical medical wards were included in the study

4.6 Exclusion criteria:

We exclude patients who were not able to be weigh standing, as the measurement (SGA) requires standing taking weight . In addition, clinically unstable or unconscious patients, comatose, bedridden and obstetrics patients, patients with dementia and emergency surgery and patients on chemo/radio therapy were excluded.

4.7 Sample size determination

For the first objective

To assess the magnitude of hospital malnutrition at the time of admission among hospitalized adult patients

The sample size was determined using single population proportion formula

$$n = \frac{Z (\alpha/2)^2 P (1-P)}{d^2}$$

Z (standard normal distribution) with C.I of 95% and (a=0.05)	P (expected prevalence of hospital malnutrition)	d (Absolute precision or tolerable marginal error)	Non response rate	n (minimum sample size)
1.96	0.556(23)	0.05	10%	417

For the second objective

To evaluate the effect of malnutrition at the time of admission on the length of hospital stay among hospitalized adult patients

The sample size was calculated using double population proportion formula, by using epi info 7 stat calc

$$n = \frac{[z_{\alpha/2} \sqrt{(1+1/r)} + z_{\beta} \sqrt{p_1(1-p_1) + p_2(1-p_2)/r}]^2}{(p_1 - p_2)^2}$$

The following assumptions is made;

α - 0.05 probability of committing type 1 error (1.96)

β - 20% probability of rejecting a true difference

r- the proportion of n1 to n2 is 1

P1 (Proportion of prolonged length of hospital stay among malnourished patients)	P2 (Proportion of prolonged length of hospital stay among well-nourished patients)	P (pooled proportion)	r	β	α	Non rspnse rate	n
37.2%(7)	14.1%(7)	20%	1	20%	0.05	10%	267

Since the sample size calculated for the first objective using single population proportion formula yield the largest sample size which is 417, it will be taken as a final sample size.

4.8. Sampling procedure

Due to higher number of cases flow ,we selected Tikur Anbessa specialized hospital purposely . Consecutive sampling method were used to enroll study participants. All adult hospitalized patients admitted to the medical and surgical wards of TikurAnbessaSpecialized Hospital during the study period and fulfill the inclusion criteria were included.

4.8.1. Selection of Sample

First ,a list of wards of Tikur Anbessa specialized hospital in line with the inclusion criteria were obtained. Second, we stratified the eligible wards into two categories; namely medical, and surgical. Third the eligible wards further stratified into subunit ward. Four from surgery (Gastrointestinal, Urology, Chest, Neurology) and four from medical (Chest/Gastrointestinal, Cardiac/Neurology/Infectious disease, Hematology, Hematology/Renal). Finally, eight wards were included and the sample size of the study was allocated to the wards proportionally. This helps to ensure that a representative sample is obtained. Based on the total number of beds available in each ward-category the sample size of the study was allocated to the wards proportional to the number of beds. The recruitment of the study participants was continuing consecutively until the number of sample size was reached.

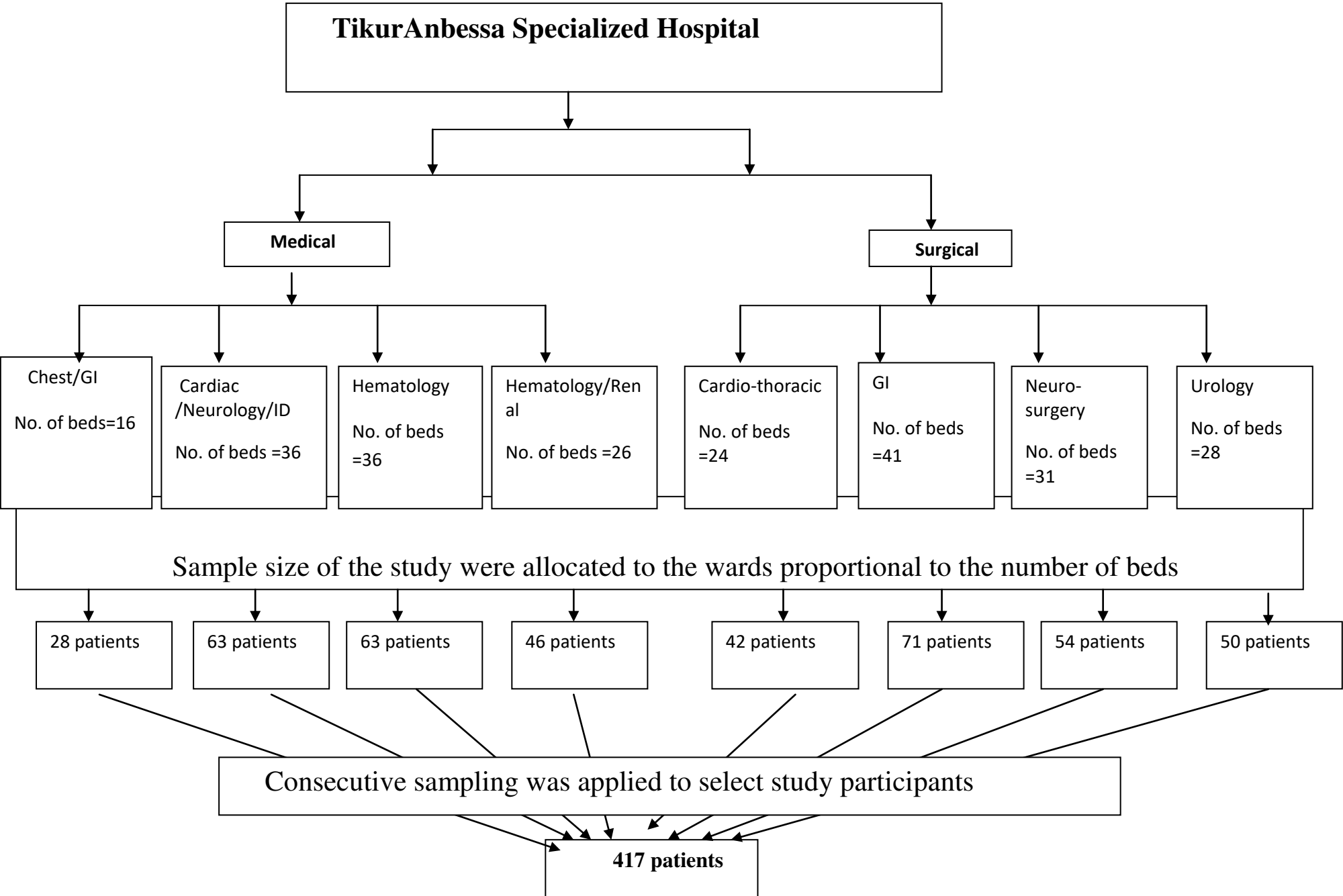


Figure 3: schematic presentation of Sampling procedure

4.9 Study variable

4.9.1. Exposure variable and measurement

Nutritional risk status at admission

The nutritional status of the patients was assessed by SGA within the initial 48 h of hospitalization. Subjective Global Assessment (SGA) is a validated nutrition assessment tool composed of two sections: a medical history and a physical examination. In the medical history, five components are assessed, change in weight, dietary intake, the presence of gastrointestinal symptoms and functional impairment through questioning the patient. The second part of the SGA focuses on physical evidence of malnutrition. There are three features of the physical examination which are Subcutaneous Fat, Muscle tone and bulk, Edema/Fluid Overload and noted as either normal (0), mild (1 +), moderate (2+), or severe (3+).

After complete medical history and physical examination, patients were assigned a nutrition rating of SGA-A (well-nourished), SGA-B (moderately or suspected malnourished), or SGA-C (severely malnourished).

SGA history components

1. weight loss was calculated based on the following formula

$$\% \text{ Weight loss} = [(usual \text{ weight (kg)} - current \text{ weight}) / usual \text{ weight.}] \times 100$$

Weight measured to the nearest 0.1 kg with light clothing and no shoes, using an electronic portable scale (Seca). To ensure measurement accuracy the scale will be checked for zero reading before each weighing. It will also calibrate with a metal every morning before data collection. 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.

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

3. Gastrointestinal Symptoms: include nausea, vomiting, dysphagia, diarrhea

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

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

SGA Physical Examination components

1. Subcutaneous Fat: the following area were assessed
 - Triceps
2. Muscle tone and bulk: the following muscles were assessed
 - Temporalis Muscle, Interossei and Shoulder Area
3. Edema/Fluid Overload
 - Ankle edema, sacral edema, ascites

4.9.2. Outcome variable and measurement

Length of hospital stay

LOS was determined from the date of hospital admission to discharge. It was calculated by subtracting date of admission from date of discharge and documenting the total number of days that the patient stayed in the hospital. LOS was censored at 30 days, hence patients who died during hospitalization or stayed in the ward more than 30 days were treated as censored observations.

4.9.3 Covariate

Demographic and socio-Economic Characteristics

Socio-demographic characteristics such as age, sex, religion, level of education and Living arrangements were included.

Age was measured in complete years,

Education levels of patients using scales ranging from: 1) illiterate, 2) read and write, 3) primary education 4) secondary education 5) some college and technical school 6) college graduate and above were assessed.

Living arrangements prior to admission were categorized (Alone at home vs Lives with others at home vs Other (not at home); Other” includes supportive housing, retirement home/assisted living, nursing home, and patients with no permanent home.

Medical conditions

Admission ward; patients were categorized as medical and surgical, based on their admission Number of diagnostic categories (number of diagnoses) defined as 1, 2, or 3 diagnostic categories based on admission; Due to the variety of diagnoses, these were classified under

11 broad standard categories (Cardio vascular, Genito urinary, Gastro intestine, Musculoskeletal, Respiratory, Hematology, Neurology, Metabolic, Surgical, Trauma). If there is more than one category for the same patient, a 2nd and 3rd diagnostic category was coded.

Presence/absence of cancer; Biopsy proven or tumor marker suggested cancer recorded at admission or diagnosed in hospital

Poly medication (poly pharmacy); polypharmacy is described as the numerical definition of five or more medications daily

Charlson comorbidity index (CCI);

The Charlson comorbidity index is a method which can be used to control for disease and its severity or complexities and predicts the one-year mortality for a patient who may have a range of comorbid conditions, such as heart disease, AIDS, or cancer (a total of 22 conditions). Each condition is assigned a score of 1, 2, 3, or 6, depending on the risk of dying associated with each one. Scores are summed to provide a total score to predict mortality. Based on the CCI score, the severity of comorbidity was categorized into three grades: mild, with CCI scores of 1–2; moderate, with CCI scores of 3–4; and severe, with CCI scores ≥ 5 . The higher the score, the more likely the predicted outcome will result in mortality or higher resource use (clinical outcomes).

Clinical conditions and associated scores are as follows:

1 each: Myocardial infarct, congestive heart failure, peripheral vascular disease, dementia, cerebrovascular disease, chronic lung disease, connective tissue disease, ulcer, chronic liver disease, diabetes.

2 each: Hemiplegia, moderate or severe kidney disease, diabetes with end organ damage, tumor, leukemia, lymphoma.

3 each: Moderate or severe liver disease.

6 each: Malignant tumor, metastasis, AIDS.

4.10 Data collection procedure

Data was collected between February and March 2019 through self-administered and interviewer-guided structured questionnaire. Three-day training was given for data collectors (ward nurses) about SGA administration and anthropometric measurements.

Information was gathered by using structured questionnaires detailing sociodemographic (age, sex, religion, marital status and occupation), anthropometric (usual normal weight, present weight,), 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).

4.11 Data quality management

Before data collection, a three-day theoretical and practical training was given for the data collectors on SGA administration, weight measurement, data collection techniques and procedures based on the questionnaires and also about the main purpose of the study. The training was given by the principal investigator.

The questionnaire was prepared in English and translated to Amharic and back to English to check the consistency of the questions. During data collection the principal investigator was supervise all activities during the data collection. Data completeness and consistency was checked on spot questionnaires with missed variables were turned back to the data collectors for correction by revisit.

Measuring equipment's were tested regularly during data collection. Faulty equipment was replaced. The following was checked on a daily basis: Test each scale with a standard weight of at least 5kg.

4.12 Operational definition

- Event (outcome): in this case the event is patient who discharge from hospital on any particular day alive (Recover)
- Length of hospital stay: LOS was determined from the date of hospital admission to discharge/days from hospital admission to discharge
- Censored: Patients who died during hospitalization or stayed in the ward more than 30 days were treated as censored observations
- Subjective global assessment nutritional status classification
 - ✓ Well-nourished: No decrease in food/nutrient intake; < 5% weight loss; no/minimal symptoms affecting food intake; no deficit in function; no deficit in fat or muscle mass OR *an individual with criteria for SGA B or C but with recent adequate food intake; non-fluid weight gain; significant recent improvement in symptoms allowing adequate oral intake; significant recent

improvement in function; and chronic deficit in fat and muscle mass but with recent clinical improvement in function.

- ✓ Mildly/moderately malnourished : Definite decrease in food/nutrient intake; 5% - 10% weight loss without stabilization or gain; mild/some symptoms affecting food intake; moderate functional deficit or recent deterioration; mild/moderate loss of fat and/or muscle mass OR *an individual meeting criterion for SGA C but with improvement (but not adequate) of oral intake, recent stabilization of weight, decrease in symptoms affecting oral intake, and stabilization of functional status.
- ✓ Severely malnourished : Severe deficit in food/nutrient intake; > 10% weight loss which is ongoing; significant symptoms affecting food/ nutrient intake; severe functional deficit OR *recent significant deterioration obvious signs of fat and/or muscle loss.

4.13 Data analysis procedure

Data management

First of all, data was cleaned manually, entered first to Epi-data, checked & cleaned for consistency, for any missing values and finally, exported to STATA Version 15.1 for analysis.

Data Analysis

Principal Component Analysis was done to construct wealth index based on household data such as ownership of fixed asset including type of house and its building materials, agricultural land ownership, animal ownership, source of drinking water, ownership and type of toilet facility, having domestic servant, and saving account. Assets owned by less than 5% or more than 95% of households were excluded from wealth index construction.

Descriptive analysis was performed to describe the study variables. Frequency analysis was run for socio-demographic and economic, diseases classification, Prevalence of malnutrition based on SGA criteria were estimated. To see the association between the nutrition status SGA (A, B, and C) and selected variables, we conduct a chi square tests for categorical variables (Age, sex, living arrangement, wealth and disease related variables) and Kruskal-Wallis test for LOS. To enable comparison with other studies, age was further categorized into two groups under 60 years and greater or equal to 60 years.

Bivariate and multivariate cox regression were done to assess the effect of malnutrition (according to SGA Criteria), on LOS. Based on the results of bivariable analyses and clinical input, SGA categories B and C were combined for multivariable analyses. Covariates (Covariates to control for in the model) selected to assess the effect of malnutrition (SGA B+C) at admission on the length of stay were selected based on literature and clinical experience and included demographic (age and sex), socioeconomic (living arrangements and Wealth index), and disease-related (number of diagnoses, presence of cancer, presence of infection, number of medication and CCI) characteristics. Variables that have 20% ($p < 0.20$) significant level were considered for multivariable cox regression.

Cox proportional hazard assumption was assessed by Schoenfeld residuals test and by their observed and predicted graph and $-\ln -\ln$ graph. Cox regression model was used to investigate the effect of malnutrition on the length of hospital stay nutritional status after adjusted for several potential nutritional and clinical confounders recorded at admission. Hazard ratio (HR) < 1 indicates reduced chances for discharge on any particular day, that is, association with prolonged LOS. A P-value of < 0.05 was considered to denote statistical significance.

Finally, the findings were described in text, percent, mean, Hazard ratio () and presented using frequency tables, charts and Kaplan Meier curve.

4.14 Ethical consideration

First, ethical clearance was obtained from School of Public Health; College of Health Science Addis Ababa University Institutional Review Board. Permission were obtained from Tikur Anbessa Specialized Hospital to be studied letter. Furthermore, during the data collection, written informed consent was obtain from each respondent by first explaining the objectives of the study. To maintain anonymity identifiers like names was not include 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. It had also been clearly stated to the participants that the information they were provide whether orally or in writing were for research purposes and strictly confidential. The benefit of the study and

the fact that it has no invasive physical harm was explained for the patients. Patients identified as 'at risk' of malnutrition using SGA were informed for responsible ward physician and nurses to be linked for further nutritional intervention. But due to the unavailability of nutritional intervention in the ward the patients didn't get the intervention. Respondents were also informed that they could refuse or discontinue participation at any time.

4.15 Dissemination of results

The finding of the study will be disseminated to Addis Ababa University, School of Public Health, Ministry of Health, Addis Ababa City Health Bureau, and Tikur Anbessa specialized hospital. In addition, great efforts will be made to disseminate the results through presentation in different seminars, workshop, scientific conference. Attempts will also be made to publish the information on reputable peer reviewed journal.

5. Result

5.1. Socio demographic & economic characteristic

A total of 417 adult hospitalized patients were enrolled and giving a response rate of 100%. Table 1 shows the socio-demographic and economic characteristics of the participants. Among the 417, 226(54.2%) were male participants while 191 (45.8%) were female. The median age of the participants was 34 years ranges from 18 to 85 years (IQR=26). The majority of the patients (67.3%) were urban residents and 19% of the patients (44.1%) attended technical school and above.

In this study, 62 % of the respondents were Orthodox Christian followed by Muslim (25%) and Protestant (12.7%). More than half of the patients (55.2%) were married and 51% of the participants' lives with their parent/s. Regarding the occupation of participants, majority of patients 107 (26%) were Government or Private employee. (Table 1)

Table 1: Socio-demographic and economic characteristics of adult hospitalized patients in Tikur Anbessa specialized hospital, Addis Ababa, Ethiopia., 2019

Characteristics	Frequency	Percent (%)
Age		
< 60	350	83.9
≥60	67	16.1
Sex		

Female	191	45.8
Male	226	54.2
Residence		
Urban	281	67.39
Rural	136	32.61
Religion		
Orthodox	258	61.87
Muslim	104	24.94
Protestant	53	12.71
Catholic	2	0.48
Educational status		
No formal education	164	39.33
Primary school	89	21.34
Secondary school	88	21.10
Technical school and above	76	18.23
Marital Status		
Single	152	36.45
Married	230	55.16
Divorced	4	0.96
Separated	3	0.72
widowed	28	6.71
Occupation		
Housewife	84	20.14
Farmer	58	13.91
Government or Private employee	107	25.66
Merchant	36	8.63
Daily Laborer	22	5.28
Student	84	20.14

Unemployed	6	1.44
Other	20	4.80
Living Arrangement		
Living alone	20	4.80
Living with a partner	185	44.36
Living with a parent/s	212	50.84
Wealth Index		
Poorest	84	20.14
Poor	83	19.90
Medium	84	20.14
Rich	83	19.90
Richest	83	19.90

5.2. Admission Primary Diagnosis /Classification of diseases

Because of vast number of diagnoses , Patients primary diagnostic categories were classified under 8 broad standard categories. Figure .4 shows percent distribution of patients by their primary admission diagnosis. The most common causes for hospitalization were Gastrointestinal diseases(20.3%), Neurological diseases(18.7 %), Cardiovascular diseases (15.5 %), Genitourinary diseases(15.1%), Hematology diseases (13.6 %) ,and Respiratory (10.7%. Other causes accounted for 5.7% of the hospitalizations.(Figure.4)

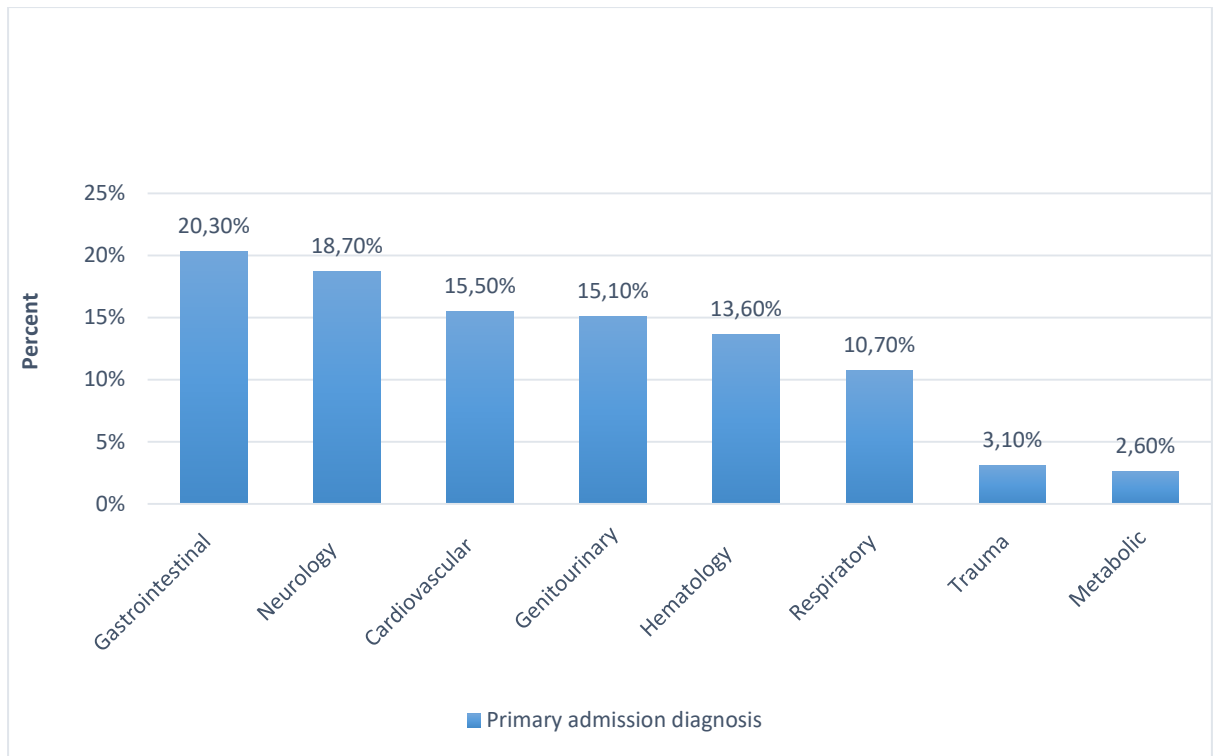


Figure 4: Percent distribution of patients by Primary admission diagnosis, Tikur Anbessa hospital, Addis Ababa, Ethiopia 2019

5.3 Magnitude of hospital malnutrition

Figure 5 shows the magnitude of malnutrition among adult hospitalized patients. Out of 417 adult hospitalized patients, the overall proportion of malnourished patients (SGA B+C) at admission was 62.1% (95% CI: 57.3%, 66.6%) while 38% (95% CI: 33.3%, 42.6%) were well nourished. According to SGA tool ranking 42% (95% CI: 37.5%, 47%) were moderately malnourished and 20% (95% CI: 16%, 24%) were severely malnourished (Fig. 5). Figure 6 shows percentage of nutritional status of adult hospitalized patients per department of admission. The malnutrition rate at admission was highest in the patients admitted for medical treatment (70.1%) compared to patients admitted to surgical wards (52.2%) (Fig. 6)

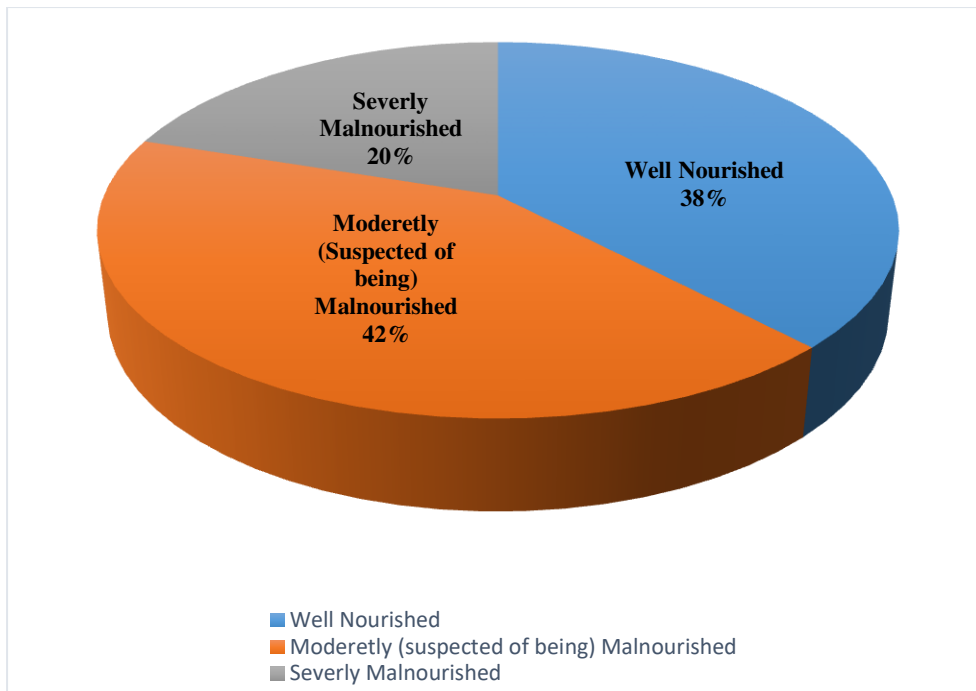


Figure 5: Magnitude of malnutrition among adult hospitalized patients in Tikur Anbessa Specialized hospital, AddisAbaba, Ethiopia, 2019

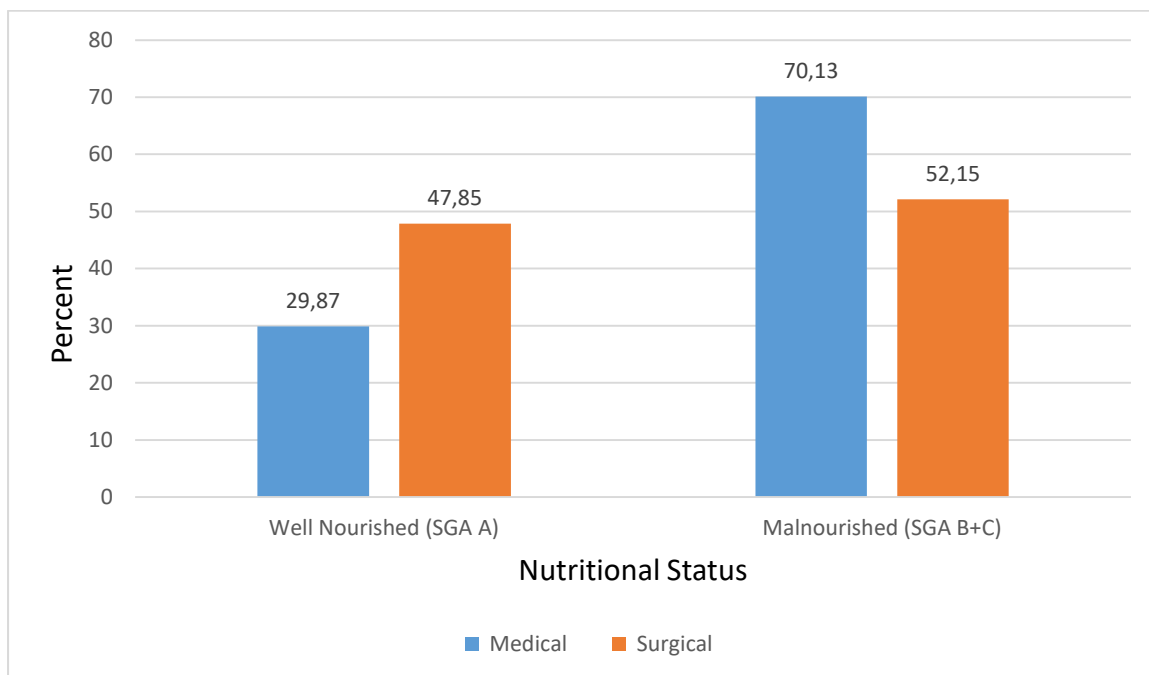


Figure 6: Percentage of Nutritional status of adult hospitalized patients per department of admission.

5.4 Patient clinical Characteristics and Nutritional status

Table 2 shows admission-related characteristics of the patients as per risk of malnutrition. A difference in malnutrition rate was found between different age groups, the elderly (aged >60

years) had a significantly higher malnutrition rate than the younger age group (< 60y)(76% Vs. 59%, P < 0.001). When stratified by sex, magnitude of malnutrition in men was greater than women (63% Vs 61%,P < 0.001).Malnourished patients had a greater number of comorbidities compared to well-nourished patients (84% Vs 50%, P < 0.001 value). Cancer patients were more likely to be malnourished (87% Vs 54%, P < 0.001 value) and infection was present in more than half of the malnourished individuals(86%).

On admission ,the majority of patients considered to be a malnourished were patients who took poly medications (≥ 5 number of medication) than patients who took less than 5 number of medication (84% Vs 41%,P < 0.01) .Patient who had previous admission were found to be malnourished than patient who didn't have previous admission (78% Vs 53%,P < 0.01). According to Charlson comorbidity index 33.20 % of malnourished patients had mild class (1-2) (65.5%) a CCI class 1–2; 18.53% of patients had moderate CCI class (3–4) ; 22 patients (8.49 %) had severe CCI class ≥ 5 . Statistical differences were seen between malnourished and not malnourished patients

With respect to the length of hospital stay, the mean number days of the population at the hospital was 13.84 ± 7.53 days with a median of 12 days. Length of hospital stay was two times prolonged in malnourished patients than well-nourished patients (17.2 ± 6.8 days Vs 8.3 ± 4.9 days, $p < 0.001$).In addition ,severely malnourished patients had a longer hospital stay compared to moderately malnourished patients (19.7 ± 6.3 days Vs 15.9 ± 6.6 days, $p < 0.001$)(Table 2).

Table 2: Admission-related characteristics of the patients According to Nutrition Status (Subjective Global Assessment Categories) at Baseline

Parameters	All Patients (N=417)	SGA A (N=158)	SGA B + C (N=259)	P-Value
Demography and socioeconomic parameters				
Age	417			0.01*
< 60y		142(40.57)	208(59.43)	
≥ 60 y		16(23.88)	51(76.12)	

Sex			0.741
Female	74(38.74)	117(61.26)	
Male	84(37.17)	142(62.83)	
Living arrangements			0.13
Living alone	4(20.00)	16(80.00)	
Living with a partner	77(41.62)	108(58.38)	
Living with a parent/s	77(36.32)	135(63.68)	
Wealth Index			0.882
Poorest	31(36.90)	53(63.10)	
Poor	34(40.96)	49(59.04)	
Medium	30(35.71)	54(64.29)	
Rich	34(40.96)	49(59.04)	
Richest	29(34.94)	54(65.06)	
Admission and disease-related Parameters			
Admission ward			<0.001*
Medical	69(29.87)	162(70.13)	
Surgical	89(47.85)	97(52.15)	
Number of diagnostic categories at admission			<0.001*
1 category	137 (49.3)	141 (50.72)	<0.001*
>1 category	21 (15.1)	118 (84.89)	
CCI at admission			<0.001*
No CCI(0)	93(47.5)	103(52.5)	
Mild (1-2)	58(40.3)	86(59.7)	
Moderate (3-4)	7(12.8)	48(87.2)	
Severe (≥ 5)	0(0)	22(100)	

Presence of Cancer			<0.001*
Yes	12(12.90)	81(87.10)	
No	146 (45.06)	178(54.94)	
Presence of Infection at admission			<0.001*
Yes	14(13.21)	92(86.79)	
No	144(46.30)	167(53.70)	
Number of medications taking at admission			<0.001*
<5	127 (58.80)	89(41.20)	
≥5	31 (15.42)	170(84.58)	
Previous surgery in the past five years			0.016
Yes	16 (24.62)	49(75.38)	
NO	142 (40.34)	210(59.66)	
Previous admission in the past five years			<0.001*
Yes	32(21.77)	115(78.23)	
No	126(46.67)	144(53.33)	
Length of stay, days (mean,SD)	8.3±4.9 days	17.2± 6.8days	

CCI:Chalson Comorbidity Index,SGA A: Well-nourished SGA B + C: Malnourished* Statistically significant

5.5 Nutritional risk status and length of stay

Three hundred eighty-four patients with complete data on LOS and candidate predictors were included in the analysis (Table 4, Supplementary Figure 7). Among them, 16 patients died in hospital and 17 patients were stayed in the ward more than 30 days. HencePatients who died

during hospitalization or stayed in the ward more than 30 days were treated as censored observations.

Covariates fitted in the model were selected to assess the effect of malnutrition (SGA B+C) at admission on the length of stay and selected from literature and clinical experience. It includes demographic (age and sex), socioeconomic (living arrangements and Wealth index), and disease-related (number of diagnoses, presence of cancer, presence of infection, number of medication and CCI) characteristics.

From the bivariate Cox regression fit with these covariates; Age, Admission ward (pvalue<0.01), Number of diagnostic categories at admission (pvalue<0.01), CCI at admission (pvalue<0.01), SGA at admission (pvalue<0.01), Presence of Cancer (pvalue<0.01), Presence of Infection at admission (pvalue<0.01), Number of medications taking at admission (pvalue<0.01), Surgical procedure during hospitalization (pvalue<0.01) were found significant. The rest of the variables were not found to be significant at 20% level of significance and were not included in the second model.

Table 3 shows multivariable cox regression analysis model for the effect of malnutrition on the length of hospital stay among adult patients. For multivariate analysis of the outcome LOS, SGA was included in the model as a binary covariate: SGA A (well-nourished) vs SGA B+C (malnourished). When the LOS and nutrition status according to the subjective assessment were analyzed, it was shown that those who had been classified as malnourished remained in the hospital for longer periods than well-nourished patients. There was a statistically significant difference between the groups (17.2 ± 6.8 days Vs 8.3 ± 4.9 days, $p < 0.001$) (Fig.7). In addition, severely malnourished patients had a longer hospital stay compared to moderately malnourished patients (19.7 ± 6.3 days Vs 15.9 ± 6.6 days, $p < 0.001$). The final multivariate model, which was controlled for age, sex, living conditions, number of medications, and number of diagnostic categories, disease severity score, number of comorbidities and presence of cancer showed that malnutrition (SGA B+C) at admission was independently associated with prolonged LOS (HR, 0.29; 95% CI, 0.22–0.38)

Patients who aged ≥ 60 years were found to have reduced chances for discharge on any particular day thus, older patients stayed significantly longer LOS (mean 14 ± 6.7 SD). Patients who are taken poly medication during admission were reduced chances for discharge by 57% compared to those who are not taken poly medication (HR: 0.57, 95% CI: 0.47- 0.7)

.Patients who admitted for medical treatment stayed in hospital longer than patients who admitted for surgical treatment : HR and 95% CI were 0.61 (0.5, 0.7). As compared to patients that don't have Infection during admission , patient who diagnosed to have infection stayed in hospital for longer period HR=0.51, 95% CI; (0.4,0.6).Furthermore Patients who diagnosed to have cancer stayed in hospital longer than patients who were cancer free during admission : HR and 95% CI were 0.57(0.4, 0.7). Significant differences were found between number of diagnostic categories and LOS with patients that had more than one diagnostic category's stayed in hospital longer time(HR: 0.67, 95% CI: 0.54, 0.83). Surgical procedure during hospitalization was associated with shorter length of stay ,whereas previous admission and previous surgery were associated with a prolonged stay (HR 0.67, 95% CI 0.47–0.71)(Table 3).

Based on Bradford hill criteria, we conduct Mantel-Haenseldose response analysis to check the causality effect of malnutrition on the length of hospital stay . Hospitalized patients who stayed 1-20 days in the hospital were two times more likely to be malnourished at admission compared to those who stayed 1-10 days in the hospital ($p < 0.05$). In similar manner, hospitalized patients who stayed 1-30 days in the hospital were 8 times more likely to be malnourished at admission compared to those who stayed 1-10 days in the hospital ($p < 0.05$) .Since mantel-Hansel summary odds ratio and crude or each exposure level were equal, there was no confounding effect.

Table 3:Multivariable cox regression analysis model for the effect of malnutrition on the length of hospital stay among adult patients in Tikur Anbessa specialized hospital Addis Ababa, 2019

Covariates	Length of stays ,days Mean ± Standard Devlation	Bivariate		Multivariate	
		CHR((95% CI)	p-value	AHR(95% CI)	p-value
SGA at admission					
SGA A (Well Nourished)	8.2±4.9	Reference			
SGA B + C (Malnourished)	17.1± 6.7	0.25(0.2,0.31)	<0.01	0.29(0.22, 0.38)	<0.01*
Age					

< 60y	13.7±7.6	Reference			
≥ 60 y	14± 6.7	0.94 (0.72, 1.23)	0.064	0.7(0.53, 0.93)	0.017*
Sex					
Female	13.6±7.2	Reference			
Male	13.9±7.7	0.94(0.77, 1.15)	0.56		
Living arrangements					
Living alone	14.9±8	Reference			
Living with a partner	13.1±7.3	1.23(0.75, 2.01)	0.39		
Living with a parent/s	14.2±7.6	1.11(0.68, 1.79)	0.68		
Wealth Index					
Poorest	13.8	Reference			
Poor	13.4	0.95(0.7, 1.3)	0.78		
Medium	14.5	0.84(0.61, 1.14)	0.27		
Rich	14.3	0.89(0.65, 1.22)	0.5		
Richest	12.7	0.97(0.71, 1.33)	0.88		
Admission ward					
Surgical	12±6.7	Reference			
Medical	15.2±7.8	0.61 (0.5, 0.75)	<0.01	1.01(0.51, 1.9)	0.98
Number of diagnostic categories at admission					
1 category	12.6±7.3	Reference			
>1 category	16 ±7.2	0.67(0.54,0.83)	<0.01	0.83(0.61, 1.13)	0.24
CCI at admission					
No CCI(0)	12.1	Reference			
Mild (1-2)	14.7	0.64(0.51, 0.8)	<0.01	0.59(0.31, 1.1)	0.1
Moderate (3-4)	16.3	0.55(0.4, 0.76)	<0.01	0.68(0.33, 1.3)	0.3

Severe (≥ 5)	16.4	0.63(0.4, 0.99)	<0.05	0.96(0.44,2)	0.9
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Presence of Cancer

No	12.6 \pm 7.2	Reference			
Yes	17.6 \pm 7	0.57(0.45,0.73)	<0.01	0.8(0.6, 1.1)	0.1

Presence of Infection at admission

No	12.4 \pm 6.9	Reference			
Yes	17.6 \pm 7.8	0.51(0.4,0.65)	<0.01	0.81(0.6,1.1)	0.1

Number of medications taking at admission

<5	11.5 \pm 7.1	Reference			
≥ 5	16.1 \pm 7.2	0.57(0.47,0.7)	<0.01	0.92(0.7, 1.1)	0.5

Previous surgery in the past five years

NO	13.5 \pm 7.4	Reference			
Yes	15 \pm 7.7	0.67(0.47,0.71)	<0.01	0.88(0.62, 1.2)	1.2

Previous Admission in the past five years

NO	12.8 \pm 7.2	Reference			
Yes	15.4 \pm 7.7	0.69(0.56, 0.86)	<0.01	0.89(0.69, 1.1)	0.4

Surgical procedure during hospitalization

Yes	12.1 \pm 6.7	Reference			
NO	14.9 \pm 7.8	0.64(0.52,0.78)	<0.01	0.65(0.4,1.1)	0.08

Global test 0.5437

CI: Confidence interval, CHR: Crude Hazard Ratio, AHR: AdjustedHazard Ratio, * Statistically significant

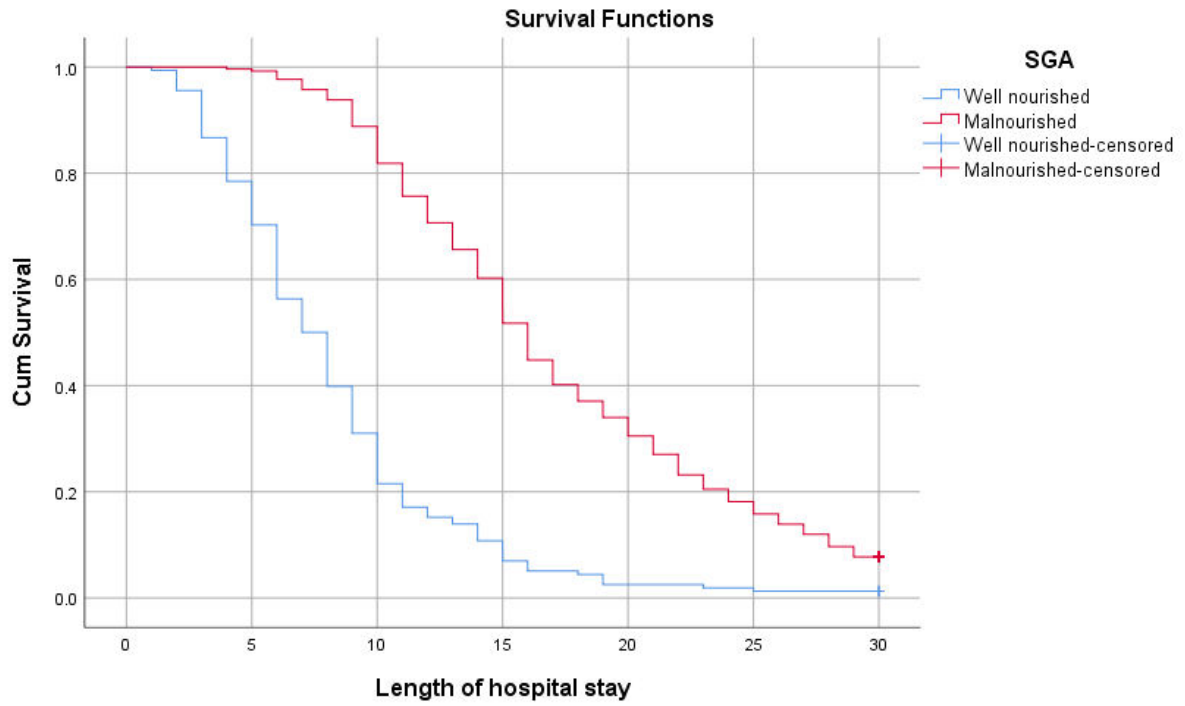


Figure 7:Kaplan-Meir curve comparing Length of hospital stay between malnourished and well-nourished patients($p < 0.01$)

6. Discussion

Malnutrition in hospitalized patients is common and has been extensively reported in the literature but still remains undetected and untreated in our setting. Recognition of malnutrition in hospitalized patients should remain a significant component of in-patient care as it has vast clinical and economic consequence (62). 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 subjective global assessment (SGA). SGA has been used in various patient populations worldwide and is associated with clinical outcome(5,9,30,76,77).

A facility-based study was conducted in the largest tertiary referral hospital of Ethiopia to assess the magnitude of hospital malnutrition and to evaluate the effect of malnutrition on the length of hospital stay among hospitalized adult patients. Findings from this study revealed high magnitude of malnutrition during admission and malnutrition during admission was independently associated with prolonged LOS. This research showed that, 62% of the hospitalized patients had malnutrition at the point of admission. This finding was nearly similar with the result of a study conducted in four referral Hospitals found in Amhara National Regional State, which shows that prevalence of malnutrition in hospitalized patients was 55.6% (23).

Results of this study is consistent with previous studies that evaluated the hospital malnutrition rate according to SGA rank. A multi-center cohort study done in 3 African countries showed that 72.6% of patients were at risk of malnutrition on admission, with a higher prevalence for patients in Kenya and Ghana (74.6%) versus those from South Africa (69.8%) (22). However, it was higher than that of developed countries (21, 73). An Australian study performed in 2008 by Gout et al. reported a 23% malnutrition rate in tertiary hospitals using the SGA rank (3) and a German study performed by Pirlich et al. reported a malnutrition rate of 27.4% in 13 hospitals(30). Like our study, these studies only evaluated nutritional status at the point of admission. The difference may be explained by differences in the socioeconomic status, sample size of the study ,geographical area of study setting and use of different gold standards tool in various setting to identify hospital malnutrition (12-15).

Based on literatures, Hospital malnutrition is an independent risk factor with a significant effect on the important clinical parameters including length of hospital stay. In the present study, a poor nutritional status was associated with longer length of hospital stay. This study

found that malnutrition during admission was strongly associated with a prolonged LOS (9.8 days versus 5.2 days, $p < 0.001$, $d = 0.74$) and this finding was consistent in different studies. In South Africa, an observational, descriptive prospective cohort study showed the mean length of stay in hospital was 6.9 days ± 5.9 SD and a significant difference in length of stay was documented for those patients considered malnourished (mean 7.4 days ± 6.1 SD) compared with well-nourished patients (mean 5.2 days ± 4.8 SD)(48). Another study conducted in Ghana among adult patients showed that patients with nutritional risk at admission were associated with a significantly prolonged LOS (9.70 days versus 5.95 days, $p < 0.001$, $d = 0.74$) (40).

A prospective cohort study conducted in Canadian hospitals showed that malnutrition at admission was independently associated with prolonged LOS (hazard ratio, 0.73; 95% CI, 0.62–0.86) (10). A multicenter cross-sectional study conducted among Korean hospitalized patients showed patients with malnutrition had longer hospital stay (Moderate malnutrition = 12.18 ± 7.24 days, Severe malnutrition = 9.02 ± 9.96 days, $P = 0.018$) than well-nourished (7.63 ± 6.03 days) (60). Another study done in Singapore two teaching hospitals showed that malnourished patients had longer hospital stays (6.9 ± 7.3 days vs. 4.6 ± 5.6 days) than well-nourished patients (9). The length of hospital stays varies across countries and continents, this difference can be explained by lack of malnutrition screening and assessment protocols, and the severity of the disease itself.

These results thus verify that nutritional status has an impact on length of stay, where an increased length of stay is related to increased healthcare cost to the medical institution (Increased LOS is associated with higher costs for health care (6, 39, 41). In addition, prolonged stay in hospitals increases the risk of hospital-acquired infections in patients, and disrupts patient flow and access to care due to bed shortages. Furthermore, the high prevalence of patients at nutritional risk or malnourished admitted to hospital contributes to workload, requiring more nursing care because of higher rates of infection, complications, pressure sores, medications and decreased functional capacity(40). In addition, hospital malnutrition contributing to morbidity and mortality (5,6).

Inpatient length of stay (LOS) is one of the most useful indicators which can be used for various purposes such as managing hospital care, quality control, appropriateness of hospital use, hospital planning, estimating the hospital efficiency and resources consumption (5-7). Logical reduction of hospital LOS provides the opportunity to increase revenue, lower costs, reduce clinical variations, enhance the quality and improve the margins. Also, reducing LOS

based on evidence-based guidelines results in increase in admissions, increase in revenue and improvement of the quality by reducing practice variations (8).

Our study also found that patients aged ≥ 60 years according to the subjective assessment was an independent factor associated with greater LOS. Many physiological, social, and psychological changes ensue as patients get older, which makes the elderly particularly vulnerable to malnutrition(13,14). Studies have shown that malnutrition is associated with advancing age(59, 64). As people age, they tend to have more illness, more admissions to hospital and potentially longer lengths of hospital stay. Considering the high prevalence of malnutrition ,in this group routine and periodic nutritional assessment is recommended.

The limitation of this study was ,First, nutritional status was only evaluated on the day of admission and patients who were already hospitalized were not included in this study; therefore, this study may have underestimated the malnutrition rate of all the hospitalized patient. Other limitations include 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. Furthermore ,it could give a better result if more hospitals were recruited in the study ,which potentially could influence the generalizability of our findings.

In summary, the similarity of results from several international studies conducted amongst heterogeneous populations in a wide variety of clinical settings verifies that malnutrition has an impact on LOS length of stay in hospitals, where an increased length of stay is related to increased health care cost to the medical institution. Therefore, nutritional assessment should be routinely performed at admission in an attempt to reduce nutrition-related complications.

7. CONCLUSION AND RECOMMENDATIONS

7.1. Conclusion

In conclusion, malnutrition was highly prevalent among hospitalized adult patients and was associated with increased length of stay. The rate of malnutrition tended to be high when the patient was older than 60 years old . Malnourished patients needed longer hospitalization in the present study. More attention should be paid to nutrition in both medical and surgicalpatients. Therefore, it's essential to assess the nutritional status of patients early in admission and to institute appropriate nutritional therapy to minimize its devastating

consequences on the patients and health care system. Hospital malnutrition should become the common interest of hospital administration, doctors and health authorities represented in collaboration with and appreciation for nutritional teams.

7.2. Recommendations

Based on the study findings; the following recommendations were drawn:

The Federal Ministry of Health (FMOH) should give emphasis on early nutritional screening and assessment of clinical malnutrition in adults and to develop a nutritional support plan in order to improve outcomes of hospitalized patients

Hospitals should integrate Nutritional screening and assessment tool in their care packages for all patients admitted to hospital and hospital protocol should include and practice early nutritional assessment as part of every medical examination at admission. Hospitals should also develop broader strategies to prevent and manage malnutrition, such as: analyses of available resources for detailed nutritional evaluations and implementation of nutrition care plans

Clinicians need to be aware of the impact of malnutrition and of the potential role of worsening nutritional Status in prolonging hospital stay, not only in critically ill bed ridden patients, but in all patients admitted to hospital who may require nutritional support and Nutritional assessment should be systematically included as part of the clinician's hospital practice

Interested researchers shall conduct high-quality trials/ interventional studies focused on the effect of nutritional interventions on length of stay in hospitals if this can minimize or reduce length of hospital stay.

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Annex: Informed Consent and/or Assent Form (English version)

Addis Ababa University, School of public health

Subject Information Sheet

Hello, my name is _____ I am here on behalf of Dr. Yakob Desalegn, a student in Addis Ababa University School of public health nutrition unit. He is conducting a research on “The Effect of Malnutrition on the Length of Hospital stay among hospitalized adult patients in TikurAnbessa specialized hospital”. He has received permission from Addis Ababa university school of public health.

You are selected by consecutive sampling technique to participate in this study because you are currently admitted to the selected wards on the research conducting period. Your participation on this study will only be based on your willingness. You have the right to choose not to take part in this study. If you choose to take part, you have the right to stop at any time. If you are willing to participate or refuse or decide to withdraw later, you will not be subjected to any ill-treatment.

If you agree to participate in the study, your weight will be measured. Only light clothes will be wearing during weight measurement. You will also be interviewed about sociodemographic status, base line clinical data and your nutritional status using subjective global assessment. You can stop at any time if you don't feel comfortable during an interview and measurement process. The measurement and filling the questionnaire will take about 15 minutes.

This study will help in designing a policy for hospitalized patients in term of nutritional management. The information that you provide will be kept confidential by using only code numbers and locking the data. Your name will not be written on the questionnaire. No one will have access to the non-coded data except the principal investigator and the data will not be used for purposes other than the study. Your willingness and active participation is very important for the success of this study.

Informed Consent and/or Ascent Form

Based on the understanding of the above information, are you willing to participate in this study?

A) Yes

B) No

If yes, I will continue and

If no, I will skip to next participant after writing the reasons of refusal _____

Respondent

Signature _____ Date _____

Data collector

Name _____ Signature _____

Questionnaires ID number _____

Name of hospital ward _____

Date of data collected _____

Complete	
Incomplete	
Refused	

Result of data collected (*Tick in the box*):

Checked by Supervisor: Name _____ Signature _____

For further explanation, use the Principal Investigator's Address;

Name: Dr. Yakob Desalegn

Email: yakobdesalegne@gmail.com

Cell phone: +251 912664563

Annex II: English version questionnaire

Part 1. Socio-demographic data

Instruction: Now I am going to ask you questions about your socio-demographic information Ask the following questions carefully and circle the response unless there is no specific instruction

No.	Questions	CODING CATEGORIES	skip
101	How old are you now?	Age in completed years..... <input type="text"/> <input type="text"/>	
102	Sex of respondent	Female.....1 Male2	
103	What is your religion?	Orthodox1 Muslim2 Protestant.....3 Catholic.....4 Other(specify): _____5	
104	What is the highest level of school you attended?	Unable to read and write.....1 Able to read and write.....2 Primary level (1-8)3 Secondary level (9-12)4 Technical/Vocational.....5 Higher (University)6	
105	What is your maritalstatus?	Single.....1 Married2 Separated.....3 Divorced4 Widowed.....5	
106	What is your occupation?	House wife.....1 Farmer2 Civil Servant3 Merchant.....4 Daily Laborer.....5 Student.....6 Other (specify)_____7	
107.	Place of Residence	Urban.....1 Rural.....2	

108.	How is your living arrangement prior to admission? (please read the options)	Living alone.....1 Living with a partner.....2 Living with a parent/s.....3 Other.....4	
------	---	--	--

Part 2. Household socio-economic status (Wealth Index)

I am going to ask you questions about your household assets, services, housing and related conditions





1.Housing conditions – please answer the following questions thinking about the housing condition of your household			
No.	Questions	CODING CATEGORIES	skip
201.	Home ownership	Private1 Government.....2 Rent3 Other (specify).....4	
202	Number of rooms in the house?	ROOMS <input type="text"/> <input type="text"/>	
203	How many rooms in the household are used for sleeping?	ROOMS <input type="text"/> <input type="text"/>	
204	Main construction material used for the roof: CIRCLE ALL THAT APPLY	<p style="text-align: center;"><u>Natural roof</u></p> Thatch/mud.....1 <p style="text-align: center;"><u>Rudimentary roof</u></p> Rustic mat/ plastic sheet.....2 Reed/bamboo3 Wood planks.....4 Cardboard5 <p style="text-align: center;"><u>Finished roof</u></p> Metal/corrugated iron.....6 Wood7 Cement8 Ceramic tiles9 Other(specify):10	
205	Main construction material used for the floor: CIRCLE ALL THAT APPLY	<p style="text-align: center;"><u>Natural floor</u></p> Earth/sand.....1 Dung.....2 <p style="text-align: center;"><u>Rudimentary floor</u></p> Wood planks.....3 Palm/bamboo.....4 <p style="text-align: center;"><u>Finished floor</u></p> parquet or polished wood.....5 vinyl or asphalt strips/plastic tile.....6 Ceramic Tiles.....7 Cement..... 8 Carpet.....9 Other(specify):10	





206	<p>Main construction material used for exterior walls:</p> <p>CIRCLE ALL THAT APPLY</p>	<p style="text-align: center;"><u>Natural walls</u></p> <p>No walls 1 Cane/Trunks/Bamboo/Reed 2</p> <p style="text-align: center;"><u>Rudimentary walls</u></p> <p>Wood with Mud 3 Stone with mud 4</p> <p style="text-align: center;"><u>Finished walls</u></p> <p>Cement.....5 Stone with lime/cement 6 Bricks 7 Cement blocks.....8 Wood planks/shingles 9 Other (specify): _____ 10</p>	
207	<p>What kind of toilet facility does your household have?</p> <p>[INTERVIEWER: LIMIT TO ONE RESPONSE; IF TWO TYPES ARE MENTIONED, RECORD THE TYPE CLOSEST TO THE TOP OF THE LIST]</p>	<p>Pour flush toilet.....1 Ventilated improved pit latrine....2 Pit latrine with slab.....3 Pit latrine without slab.....4 No latrine.....5 Other (specify): _____6</p>	
208	<p>Does the household have its own water source within the compound?</p> <p>(Multiple Response is possible)</p>	<p>Yes, unprotected well.....1 Yes, protected well.....2 Yes, pipe water3 No4</p>	
209	<p>What is the main source of drinking water for members of your household?</p> <p>(Do not read the options, just ask and circle what they told you)</p>	<p>Piped water 1 Protected well 2 Unprotected well 3 Protected spring 4 Unprotected spring 5 Surface water (River/stream/ Pond/lake//Dam) 6 Tanker 7 Bottled water 8 Other (specify) _____ 9</p>	
<p>2. Household assets & services – In answering the questions below please think of assets & services available in your household</p>			
210	<p>Does any member of this house hold own any agricultural land?</p>	<p>Yes1 No.....2</p>	<p>212</p>
211	<p>How many (LOCAL UNITS) of agricultural land do members of this</p>	<p>Local units <input type="text"/> <input type="text"/></p>	

	house hold own?																																												
212	Does your house hold own any livestock, herds, other farm animal or poultry?	Yes1 No2	214																																										
213	How many of the following animals do your household own? If none, record '00'. If 95 or more, record '95'. If unknown, record '99'. a. Milk cows, oxen or bulls? b. Other cattle? c. Horses, donkeys, or mules? d. Goats? e. Sheep? f. Chickens or other poultry? g. Beehives?	<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 80%;"></th> <th style="width: 10%; text-align: center;">Yes</th> <th style="width: 10%; text-align: center;">No</th> </tr> </thead> <tbody> <tr> <td>a. Cows, oxen or bulls</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> </tr> <tr> <td>b. Other cattle.....</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> </tr> <tr> <td>c. Horses, donkeys, or mules.</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> </tr> <tr> <td>d. Goats.....</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> </tr> <tr> <td>e. Sheep.....</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> </tr> <tr> <td>f. Chickens or other poultry...</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> </tr> <tr> <td>g. Beehives?</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> </tr> </tbody> </table>		Yes	No	a. Cows, oxen or bulls	1	2	b. Other cattle.....	1	2	c. Horses, donkeys, or mules.	1	2	d. Goats.....	1	2	e. Sheep.....	1	2	f. Chickens or other poultry...	1	2	g. Beehives?	1	2																			
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214	Does your house hold have? a. Electricity? b. A radio? c. A television? d. A non-mobile telephone? e. A computer? f. A refrigerator? g. A table? h. A chair? i. A bed with cotton/ Sponge/ spring mattress? j. An electric mitad? k. A kerosene lamp/pressure lamp? l. Solar? m. Sofa?	<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 80%;"></th> <th style="width: 10%; text-align: center;">Yes</th> <th style="width: 10%; text-align: center;">No</th> </tr> </thead> <tbody> <tr> <td>a. Electricity?</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> </tr> <tr> <td>b. A radio?</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> </tr> <tr> <td>c. A television?</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> </tr> <tr> <td>d. A non-mobile telephone?</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> </tr> <tr> <td>e. A computer?</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> </tr> <tr> <td>f. A refrigerator?</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> </tr> <tr> <td>g. A table?</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> </tr> <tr> <td>h. A chair?</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> </tr> <tr> <td>i. A bed with cotton/ sponge/ spring mattress?</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> </tr> <tr> <td>j. An electric mitad?</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> </tr> <tr> <td>k. A kerosene lamp/ pressure lamp?</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> </tr> <tr> <td>l. Solar?</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> </tr> <tr> <td>m. Sofa?</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> </tr> </tbody> </table>		Yes	No	a. Electricity?	1	2	b. A radio?	1	2	c. A television?	1	2	d. A non-mobile telephone?	1	2	e. A computer?	1	2	f. A refrigerator?	1	2	g. A table?	1	2	h. A chair?	1	2	i. A bed with cotton/ sponge/ spring mattress?	1	2	j. An electric mitad?	1	2	k. A kerosene lamp/ pressure lamp?	1	2	l. Solar?	1	2	m. Sofa?	1	2	
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l. Solar?	1	2																																											
m. Sofa?	1	2																																											
215	Do any members of this household own? a. A watch? b. A mobile phone? c. A bicycle? d. A motorcycle? e. An animal-drawn cart? f. A car or truck? g. A Bajaj?	<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 80%;"></th> <th style="width: 10%; text-align: center;">Yes</th> <th style="width: 10%; text-align: center;">No</th> </tr> </thead> <tbody> <tr> <td>a. A watch?</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> </tr> <tr> <td>b. A mobile phone?</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> </tr> <tr> <td>c. A bicycle?</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> </tr> <tr> <td>d. A motorcycle?</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> </tr> <tr> <td>e. An animal-drawn cart?</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> </tr> <tr> <td>f. A car or truck?</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> </tr> <tr> <td>g. A Bajaj?</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> </tr> </tbody> </table>		Yes	No	a. A watch?	1	2	b. A mobile phone?	1	2	c. A bicycle?	1	2	d. A motorcycle?	1	2	e. An animal-drawn cart?	1	2	f. A car or truck?	1	2	g. A Bajaj?	1	2																			
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g. A Bajaj?	1	2																																											

216	What type of fuel does your household mainly use for cooking? (Multiple Response is possible)	Electricity.....1 Biogas.....2 Kerosene.....3 Wood.....4 Charcoal.....5 Straw/shrubs/grass.....6 Animal Dung.....7 Agricultural crop.....8 Other (specify): _____9	
217	Does any members of this household have a bank/microfinance account?	Yes1 No.....2	


Part 3. Base line clinical data


No.	Questions	Responses	Skip
301	Admission ward	Medical1 Surgical.....2	
302	Admission primary diagnosis	Cardiovascular.....1 Gastrointestinal.....2 Genitourinary.....3 Respiratory.....4 Neurology.....5 Musculoskeletal.....6 Metabolic.....7 Hematology8 Trauma9 Others _____10	
303	Please specify primary admission diagnosis (please review the chart)	_____	
304	Admission secondary diagnosis (comorbidities)	Yes1 No2 	  
305	If yes to Q304, specify admission Secondary diagnosis	_____	
306	Is there any current diagnosis of cancer? (please review the chart)	Yes1 No2	

307	Is there any clinical evidence /dx of infection at the time of admission?(please review the chart)	Yes1 No2	
308	Are you currently taking any Drugs?	Yes1 No2 	 
309	How many different drugs are you taking per day?	<input type="text"/> <input type="text"/>	
310	Is there any history of previous surgery in the past five years?	Yes1 No2	
311	Is there any history of previous admission in the past five years?	Yes1 No2 	313
312	If yes, please specify the number of admissions	<input type="text"/> <input type="text"/>	

Part 4. Subjective global assessment data (SGA)


Instruction:Now I am going to ask you questions about your nutritional status

No.	Questions	Coding category	skip
401	Have you lost weight in the past 6 months?	Yes.....1 No.....2	
402	What was your usual weight before the disease?	<input type="text"/> <input type="text"/> <input type="text"/> . <input type="text"/> Kg	
403	Current weight (Please measure the current weight of the respondent)	<input type="text"/> <input type="text"/> <input type="text"/> . <input type="text"/> Kg	
404	Is there any change in your dietary intake after the disease	Yes..... 1 No.....2 	406
405	What kind of dietary intake change is there	Borderline or improving or declining1 Poor and decreasing2Starvation, unable to	

		eat3	
406	What type of diet are you currently taking?	Suboptimal liquid diet.....1 Full liquid diet.....2 Starvation.....3	
407	Which of the following gastrointestinal symptoms has persisted for the past 2 weeks and more? (Multiple Response is possible)	None.....1 Nausea.....2 Vomiting.....3 Diarrhea.....4 Anorexia.....5	
408	Is there a change in your functional capacity?	Yes.....1 No.....2 	411
409	How is the type of your functional capacity change?	Working sub optimally.....1 Ambulatory.....2 Bedridden.....3	
410	Skip the following question, it will be filled by the principal investigator Metabolic demand (stress)	No stress1 Low stress.....2 moderate stress.....3 High stress4	
Physical assessment			
411	Loss of SC fat (triceps) Remark None (Fingers don't touch) Low to moderate (Fingers nearly meet) Severe (Fingers touch)	None1 Low to moderate.....2 Severe.....3	

412	<p>Muscle wasting (clavicle area)</p> <p>Remark</p> <p>(Low to moderate)</p> <p>Muscle loss not presenting; visible, but prominent in females</p> <p>In males: a portion of the clavicle is visible</p> <p>In females: the clavicle is prominent deltoid and chest muscle is still intact</p> <p>(Severe)</p> <p>Evident protrusion</p>	<p>None1</p> <p>Low to moderate.....2</p> <p>Severe.....3</p>	
413	<p>Ascites</p> <p>(Please review the chart of the patient)</p> <p>(Remark)</p> <p>Mild edema.... localized to lower extremities (Ankle, pedal, tibial)</p> <p>Severe edema.....generalized edema</p>	<p>No edema1</p> <p>Mild edema.....2</p> <p>Severe edema.....3</p>	

Part 5. Length of stay

No.	Questions	Coding category	Skip
501	<p>Date of admission</p> <p>(dd/mm/yyyy) E.c</p>	<p><input type="text"/> <input type="text"/> / <input type="text"/> <input type="text"/> / <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/></p>	
502	<p>Surgical procedure during hospitalization</p>	<p>Yes.....1</p> <p>No.....2 </p>	504
503	<p>Date of surgical procedure</p> <p>(dd/mm/yyyy) E.c</p>	<p><input type="text"/> <input type="text"/> / <input type="text"/> <input type="text"/> / <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/></p>	
504	<p>Date of Discharge</p> <p>(dd/mm/yyyy) E.c</p>	<p><input type="text"/> <input type="text"/> / <input type="text"/> <input type="text"/> / <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/></p>	

የስምምነት

መጠየቂያ/ማረጋገጫ ቅጽ ከላይ በሰጠን ዎት መረጃ መሰረት በጥናቱ ላይ ለመሳተፍ ፈቃደኛ ነዎት?

- ሀ. አዎ አመክንፍ ማጠቃለያ ተጠቅሞ
 ለ. አይደለም ሆኖ መጠየቂያ ተጠቅሞ

ፈቃደኛ ካልሆኑ ምክንያቱን ፈጠራዊ ማቅረቢያ ለውተሳታፊ እለፍ _____

የተሳታፊ ፊርማ _____ ቀን _____

የመረጃ ሰብሳቢ ስም _____

ፊርማ _____

የመጠየቂያ ቁጥር _____

የተኝበት ክፍል _____

መጠየቂያ ተከላካይነት _____ የ

መጠየቂያ ወጠኛ (በሰጥኑ ውስጥ ጥምልክት አድርግ):

1. መላ በመላ የተሞላ	
2. በከፊል የተሞላ	
3. ምንም ያልተሞላ	

በተቆጣጠሪ ዎች ተረጋግጧል : ስም _____ ፊርማ _____

— ለተጨማሪ መረጃ ያዩ ዋና አጥኝ ውን አድራሻ ይጠቀሙ

ስም ዶ/ር ያቆብደሰ ለኝ

ኢሜይል:

yakobdesalegne@gmail.com

ስልክ: +251 912664563

Annex IV: Amharic version questionnaires

የ አ ሚር ሻ ማጠይቅ

ክፍል 1. ማረጋገጫና የስነ-ህዝብ ሚና ማጠይቅ ተመላኪዎች

አሁን የረስዎን ማረጋገጫና የስነ-ህዝብ ሚና ማጠይቅ ተመላኪዎችን እጠይቅዎታለሁ፡፡

የሚተላለፉትን ጥያቄዎች በጥንቃቄ በማጠየቅ ቅጽ ለሆነ ማረጋገጫ ስን ያክብቡ፤
ነፃ ጥያቄ ከሆነ የሚሰጡትን መልስ ይጻፉ፡፡

ቁጥር	ጥያቄ	ኮድ	ዝላል
101	ዕድሜ/ሽ ስንት ነው?	እድሜ ማሳደግ <input type="text"/> <input type="text"/>	
102	ጾታ	ሴት1 ወንድ2	
103	ሐይማኖት/ሽ ምን ድን ነው?	አርቶዶክስ1 ካቶሊክ4 ሚስጢሪየን2 ሌላ ካለ ይገለጹ5 ፕሮቴስታንት3	
104	የትምህርት ደረጃ ምን ድን ነው?	ማኅበራዊ ማህፀን ማህፀን1 ሁለተኛ ደረጃ (9-12)4 ማኅበራዊ ማህፀን ማህፀን2 ከሌጅ/ቴክኒክ5 አንደኛ ደረጃ (1-8)3 ዩኒቨርሲቲ6	
105	የጋብቻሁኔታ ምን ድን ነው?	ያለ ገባ/ች1 የተፋታ/ች4 ያገባ/ች2 የሞት ገባ/ች የሞት ገባ/ች5 ተጋብተው በተለያዩ ገባ/ች ማኅፀን3	
106	ስራ ምን ድን ነው?	የቤት እሴት1 የቀን ስራ ተኮር5 ገበሬ2 ተሟሪ6 የሚገኝ ስራ ተኮር3 ሌላ (ይገለጹ)፡7 ነጋዴ4	


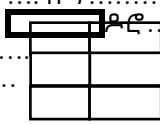
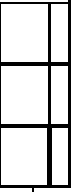
107	የ ማረፊያ አድራሻ	ከተማ.....1 ገጠር.....2	
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1. የ ቤት አሰራር ሁኔታ: - እባክዎ የጭጥሎችን ጥያቄዎች ስለ ማረፊያ ቤት አሰራር ሁኔታ እያሰቡ ይጻፉ

ተ.ቁ	ጥያቄ	ሚልስ
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108	ሆስፒታል ከመግባት በፊት የነበሩት የአኖኖር ሁኔታዎች እንዴት ናቸው? (የተዘረዘሩትን ምርጫዎች ያንብቡ)	ለብቻ.....1 ከቤተሰብ ጋር.....3 ከትዳር አጋር ጋር.....2 ሌላ (ይገለጹ): _____4	
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ክፍል 2. የ ቤተሰብን የሀብት ደረጃ የተመለከቱ ጥያቄዎች

210	ከቤተሰቡ አባላት ውስጥ ጥላላ ማድረግ ማቻል ማይችሉ ያለው አለ?	አዎ.....1 የሌላው.....2	
211	በአጠቃላይ ምን ያህል ጥምር ማይችሉ አሉ?	የ ማይችሉ ብዛት በ ጥምር ... <input type="checkbox"/> <input type="checkbox"/>	
212	ቤተሰቡ የቀን ድክብት፣ ሌላ የእርጅን ስሳ፣ በግ፣ ፍየል፣ ወይም ድረ አለው?	አዎ.....1 የሌላው.....2 	Q214
213	ቤተሰቡ ከሚከተሉት የቤት እንስሳት ውስጥ ምን ያህል አለው? ከሌላ '00' ይሞላ ካልታወቀ '99' ይሞላ	የ ወተት ላም በሬ፣ ወይም ... በግ..... ሌላ የቀን ድ /ከብት..... አሁን/ፈረስ/በቅሎ..... ፍየል..... 	
214	ቤተሰቡ የሚከተሉት ቁሳ ቁሳ ችሎታዎች?	አዎ የሌላው አዎ የሌላው ሀ. የኤሌክትሪክ ማብራት...1.....2 ሸ. ወንበር.....1.....2 ለ. ፊደሎች.....1.....2 ቀ. አልጋ ከነ ፍራሹ.....1.....2 ሐ. ቴሌቪዥን.....1.....2 በ. የኤሌክትሪክ ምጣኔ...1.....2 መ. የቤት ስልክ.....1.....2 ተ. የኩራዝ ማብራት.....1.....2 ሠ. ከምጥ ወተር.....1.....2 ቸ. ሰላር.....1.....2 ረ. ፈረጅ.....1.....2 ኃ. ሶፋ.....1.....2 ሰ. ጠረጌ ወይም.....1.....2	
215	ከቤተሰቡ አባላት ውስጥ ጥምር ማድረግ ማቻል ማይችሉ ያለው አለ?	አዎ የሌላው አዎ የሌላው ሀ. ሰዓት.....1.....2 ሠ. ጋራ.....1.....2 ለ. የስልክ ቀጠል.....1.....2 ረ. ሚኒና.....1.....2 ሐ. ብስክሌት.....1.....2 ሰ. ባጃጅ.....1.....2 መ. ሞተር.....1.....2	
216	ቤተሰብ ብዛት ወላ ምን ብዛት ስለሚከተሉት ያህል ምን ድንገት ይኖራቸዋል?	የ ኤሌክትሪክ ኃይል.....1 ሰር.....6 ባዮጋዝ.....2 የ ከብት ተረፈ ምርት (ከብት).....7 ና ፍታ.....3 የ ሰብል ተረፈ ምርት (ገለባ).....8 እንጨት.....4 ሌላ (ይገለጹ): 9 ከሰል.....5	
217	ከቤተሰቡ አባላት ውስጥ ጥምር ማድረግ ማቻል ማይችሉ ያለው አለ?	አዎ.....1 የሌላው.....2	

ክፍል 3. መሰረታዊ የጤና ነክ መረጃ

ተ.ቁ	ጥያቄ	መልስ	ዝላል
301	የተኝቦት ክፍል	የውስጥ ደዌ.....1 ቀዶ ጥገና.....2	
302	የገቡበት የበሽታ አይነት	የልብና የደም ሁኔታ በሽታ1 የጨንፎ እና የአንጅት.....2 የኩላሊት እና የሽንት ሁኔታ.....3 የመተንፈሻ አካላት.....4 የነርቭ በሽታ.....5 የጡንቻ ና የአጥንት በሽታ.....6 የሜታቦሊክ በሽታ.....7 የደምና ተያያዥ በሽታዎች.....8 ድንገተኛ አደጋ.....9 ሌላ ካለ ይገለጹ _____10	
303	የበሽታውን አይነት በዝርዝር ይጻፉ (ከታካሚው ካርድ ላይ ይመልከቱ)	_____ _____	
304	የገቡበት ሌላ ተጨማሪ በሽታ (ከታካሚው ካርድ ላይ ይመልከቱ)	አለ.....1 የለም.....2	306
305	ታካሚው ተጨማሪ በሽታ አለበት ካሉ በዝርዝር ይጻፉ	_____ _____	
306	የታወቀ የካንሰር በሽታ አለቦት? (ከታካሚው ካርድ ላይ ይመልከቱ)	አለ.....1 የለም.....2	
307	የተኝቶ መታከሚያ ክፍል የገቡበት ቀን ላይ የለ ማንኛውም አይናት የኢንፌክሽን ምልክት ? (ከታካሚው ካርድ ላይ ይመልከቱ)	አለ.....1 የለም.....2	
308	አሁን የሚወሰዱት መድኃኒት አለ (ከታካሚው ካርድ ላይ ይመልከቱ)	አለ.....1 የለም.....2	310
309	ሰንት የተለያየ መድኃኒት በቀን ወሰጥ ይወሰዳሉ ? (ከታካሚው ካርድ ላይ ይመልከቱ)	መድኃኒት..... <input type="checkbox"/>	


310	ባለፉት አምስት አመታት ውስጥ የቀዶ ጥገና አድርገው የውቃሉ?	አድርገለው.....1	አላደረግኩም.....2	
311	ባለፉት አምስት ወብ ተኝተው ታክመው ያውቃሉ?	አወቃለሁ.....1	አላውቅም.....2	313
312	ለጥያቄ 211 አዎ ካሉ ለሰንት ጊዜ ተኝተው እንደታከሙ ይግለጹ	<input type="checkbox"/>		
313	እስከዛሬ ድረስ የትኛውንም አይነት አልኮል መጠጥ (ጠላ/አረቄ/ጠጅ/ቤራ/ወይን/ባፋ-ብሪካ የተመረቱ) ቢያንስ አንድ የአልኮል መጠጥ ለአንድ ጊዜም ቢሆን ጠጥተዉ ያውቃሉ?	አለ.....1	የለም.....2	315
314	ባለፉት 30 ቀናት ውስጥ ስንት ቀን የአልኮል መጠጥ ጠጥተዉ ያውቃሉ?	ቀን.....	<input type="checkbox"/>	
315	በአሁኑ ሰአት ሲጋራ ያጨሳሉ	አለ.....1	የለም.....2	317
316	ባለፉት 24 ሰአት ውስጥ ምን ያክል ሲጋራ አጭሰዋል	ሲጋራ.....	<input type="checkbox"/>	
317	ጫት ቅመው ያውቃሉ	አለ.....1	የለም.....2	401
318	ባለፉት 30 ቀናት ውስጥ ስንት ቀን ጫት ቅመው ያውቃሉ	ቀን.....	<input type="checkbox"/>	

ክፍል 4: ሰብጃክ ቴቭግሎባል አሰስ መንት

ቁጥር	ጥያቄ	ኮድ
401	ባለፉት ስድስት ወራት ውስጥ ያጋጠመዎቹ ክብደት መቀነስ አለ	አለ.....1 የለም.....2
402	ከመታመሞ በፊት የነበረች የሰውነት ክብደት ምን ያህል ነበር	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> . <input type="checkbox"/> ኪ.ግ
403	አሁን ያለ የሰውነት ክብደት (እባኩን አሁን ያለውን የሰውነት እብደት ይለኩ)	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> . ኪ.ግ
404	ከተለመደው የምግብ አወሳሰድ ለውጥ አለ ?	አለ.....1 የለም.....2
405	የምግብ አወሳሰድ ለውጡ ምን ዓይነት ነው?	መካከለኛ አመጋገብ ግንባታ መሻሻል ላይ ያለ.....1 ደካማ እና የምግብ ፍላጎት መቀነስ ላይ ያለ.....2 አለመመገብ.....3

406 አሁን የሚወስዱት የምግብ አይነት ለስለስ ያለምግብ.....1 አለመምገብ.....2
 ፈሳሽ.....2

407 ከሁለት ሰዎች በላይ የቆየዎት የሆኑት ምንም ልክ ቶች አሉ (ማቅለሽለሽ ምንም የለም1 ተቅማጥ.....4
 ፤ ማስታወክ ፤ ተቅማጥ ፤ የምግብ ፍላጎት መቀነስ)? ማቅለሽለሽ.....2 የምግብ ፍላጎት መቀነስ.....5
 ማስታወክ.....3

408 የለትተለት እንቅስቃሴ ንግድ ለምሳሌ የሚከናወን አቅም ለውጥ አለ ለውጥ
 የለም (ሙሉ በሙሉ ማከናወን እችላለሁ).....1 
 ለውጥ አለ.....2

409 ምን አይነት ለውጥ አለ ትንሽ ትንሽ መስራት.....1 የአልጋ ቁራኛ.....2
 መንቀሳቀስ ብቻ.....3

410 ማስታወሻ ይህ ጥያቄ በ ጭና የለውም.....1
 ዋና ተመራ ማረው የሚሞላ ስለሆነ ወስኖ ማቀጠል ለውጥ ያቆይላል ትንሽ ጭና.....2
 የህመም አይነት ከአመጋገብ ጋር ያለው ቁርኝት እና ጭና መካከለኛ ጭና.....3
 ከፍተኛ ጭና አለው.....4

የሰውነት ምርመራ

411 በሰውነት ምርመራ ላይ የተገኘ የለም.....1
 1. የላይኛው የእጅ ጡንቻ መቀጭጭ ትንሽ ወይም መካከለኛ.....2
 ከፍተኛ.....3

2. የጡንቻ መሳሳት (የደረት አጥንት) መጋለጥ የለም.....1
 ትንሽ ወይም መካከለኛ.....2
 ከፍተኛ.....3

3. የሰውነት ውሃ መቆጣጠር (ውሃ አዘልገላ) የለም.....1
 ትንሽ ወይም መካከለኛ.....2
 ከፍተኛ.....3

ክፍል 5: የሆስፒታል ቆይታ

ቁጥር	ጥያቄ	ኮድ	ዝላል
501	የገቡበት ቀን (ቀን/ወር/አ.ም)	<input type="text"/> / <input type="text"/> / <input type="text"/> <input type="text"/>	
502	በቆይታቸው ወቅት የተደረገላቸው ቀዳጭ ደና አለ	አለ.....1 የለም.....2	404
503	ቀዳጭ ገና የተደረገላቸው ቀን (ቀን/ወር/አ.ም)	<input type="text"/> / <input type="text"/> / <input type="text"/> <input type="text"/>	
504	ከሆስፒታል የወጡበት ቀን (ቀን/ወር/አ.ም)	<input type="text"/> / <input type="text"/> / <input type="text"/> <input type="text"/>	

Principal Investigator

Curriculum Vitae: Yakob Desalegn

Personal Information

First name: Yakob Middle name: Desalegn last name: Nigatu

Age: 27 years Sex: Male Marital status: Single

Place of Birth: Addis Ababa, Ethiopia

Date of Birth: 25 November, 1991

Nationality: Ethiopian

Language: Amharic and English: Speak, Read and Write

Email: yakobdesalegne@gmail.com

Phone number (mobile): +251912-66-45-63

Home Address

Lideta sub-city, Kebele 02/03

House number 579, Addis Ababa, Ethiopia

Tel: +251-113-72-72-68

I. Academic Qualification

1. Degree of Doctor of Medicine (MD):

Period of study: September 2009 -November 2015

Program: Medicine

Institution: Addis Ababa University, School of Medicine, Addis Ababa, Ethiopia

2. Ethiopian Higher Education Entrance Certificate:

Period of study: September 2008-July 2007

Program: Preparatory Program

Institution: Medhaniyalem , Addis Ababa, Ethiopia

3. Ethiopian General Secondary Education Certificate:

Period of study: September 2005-July 2006 G.C

Program: High School

Institution: Radical, Addis Ababa, Ethiopia

II. Short courses

1. Nutrition and lifestyle in pregnancy

Program: Online course

Institution: Ludwing-Maximilians-Universiitate Munichen

2. Essentials of Global Health

Program: Online course

Institution: Yale University

III. Work Experience

1. Lecturer

Duration of employment: Since December, 2016

Institution: Addis Ababa University, School of Public Health, Addis Ababa, Ethiopia

2. Lecturer and Medical doctor

Duration of employment: December, 2015 – December, 2016

Institution: Debreberhan University, school of medicine, Debreberhan Ethiopia

3. Clinical Intern

Duration of Employment: November, 2014 – November, 2015

Institution: Tikur Anbessa Specialized Teaching Hospital

Teaching

- Lecture undergraduate medical students of Addis Ababa University on public health nutrition
- Lecture undergraduate clinical students of Debreberhan university

Leadership, Committee Membership, and related activities

- Head of Surgery Department

Other Experience and Professional Memberships

- Member of Ethiopian Medical Association (EMA)

Trainings taken

- Comprehensive HIV Care and Treatment Training Course, Organized by Addis Ababa University HIV Prevention, Care and Treatment (AAU-HiCT) Project in Collaboration with Addis Ababa City Government Health Bureau, Addis Ababa.
- Ethiopia MD training on Treatment of Diabetes Millets

Skills, interests and hobbies

- Know how on statistical software packages (SPSS, EPI INFO, WHO-Anthro,)
- Team leadership
- Good communication skills

Future Plans and Interests

- To upgrade my level of education to the next higher level
- To be an expert on my area of study

References:

1. Dr. EsubalewTeshfahune, Assistant professor, Former dean of school of medicine at Debrebrhan University (esubalew.teshfahune@gmail.com)
2. Dr. Seifu Hagos,Assistant professor, School of Public Health at Addis Ababa University (seif_h23@yahoo.com)

Primary Advisor

Curriculum Vitae: Bilal Shikur

Personal Information

First name: Bilal Middle name: Shikur last name: Endris

Age: 32 years Sex: Male Marital status: Married and father of two

Place of Birth: Addis Ababa, Ethiopia

Date of Birth: 1 October, 1986

Nationality: Ethiopian

Language: Amharic, English and Arabic: Speak, Read and Write

Email: lebiluka@yahoo.com

Phone number (mobile): +251911-47-53-75

Home Address

KolfeKeranio sub-city, Kebele 08/09

House number 1056, Addis Ababa, Ethiopia

Tel: +251-112-792232

Work/office address

Lideta sub-city, Addis Ababa University, College of Health Sciences, School of Public Health

Tikur Anbessa Specialized Referral Hospital, Main building, Second floor, Room number c216

P.O.Box: - 5657

Tel: +251-115-157701

I. Academic Qualification

1. Masters of Public Health in Epidemiology (MPH): Nutrition research

Period of study: September 2012- July 2014

Program: Masters of Public Health, Epidemiology Specialty Track

Institution: Addis Ababa University, School of Public Health, Addis Ababa, Ethiopia

2. Degree of Doctor of Medicine (MD):

Period of study: January 2006-September 2011

Program: Medicine

Institution: Addis Ababa University, School of Medicine, Addis Ababa, Ethiopia

3. Ethiopian Higher Education Entrance Certificate:

Period of study: September 2003-July 2005

Program: Preparatory Program

Institution: Medhaniyalem , Addis Ababa, Ethiopia

4. Ethiopian General Secondary Education Certificate:

Period of study: September 2001-July 2003 G.C

Program: High School

Institution: Dilachin, Addis Ababa, Ethiopia

II. Work Experience

1. Assistant Professor of Public Health

Duration of employment: Since July, 2014

Institution: Addis Ababa University, School of Public Health, Addis Ababa,

Ethiopia

2. Head, Department of Reproductive Health and Health service management

3. Lecturer

Duration of employment: September, 2011 – June, 2014

Institution: Addis Ababa University, School of Public Health, Addis Ababa, Ethiopia

4. **Co-PI** of Addis Ababa Mortality Surveillance Program: June, 2014 - July, 2015

5. **PI** of Addis Ababa Mortality Surveillance Program-Since July, 2015

6. Clinical Intern

Duration of Employment: July, 2010 – July, 2011

Institution: Tikur Anbessa Specialized Teaching Hospital

Publications and Research experience

- Shikur B, Deressa w, Lindtjørn B. Association between malaria and malnutrition among children aged under-five years in Adami Tulu District, south-central Ethiopia: a case-control study BMC-Public Health Journal
- Tesfaye T, **Shikur B**, Shimels T, Firdu N. Prevalence and Factors associated with Diabetes Mellitus and Impaired Fasting Glucose Level among Members of Federal Police Commission Residing in Addis Ababa, Ethiopia (BMC endocrine disorder)
- Fenta E, Yirgu R, **Shikur B**, Gebreyesus H. A single 24 hour recall overestimate exclusive breast feeding practices among infants aged less than six months in rural Ethiopia BMC-International Breast feeding journal(BMC-International breastfeeding journal)
- Gebreyesus H, **Shikur B**, Hanlon C, Lindtjørn B. Maternal depression symptoms are highly prevalent among Food insecure households of Ethiopia. (PHN)
- Marye A, Mesfin E, **Shikur B**. Practice of spinal anesthesia for cesarean delivery in two teaching hospitals, Addis Ababa, Ethiopia. (EMJ)
- Worku F, Haidar J, Shikur B. Factors Associated with Exclusive Breastfeeding Practice of Employed and Unemployed Mother: A Community Based Comparative Cross Sectional Study Woldiya, Ethiopia. African Health Sciences, under-review)
- Michael T, **Shikur B**, Yifter H, Gebreyesus H. Dietary patterns and glycemic control among type 2 diabetes mellitus patients in Addis Ababa, Ethiopia. (BMC-Endocrine, under review)
- Sebsibe B, Gebreyesus H, **Shikur B**. Caregivers' Perception and Values on Infant and Young Child Feeding in Urban setting, Ethiopia: A Focused Ethnographic Study (BMC-Public Health, Under-review)
- Gebreyesus H, **Shikur B**, Beyene G, Mohamed A, Elias F, Bekele H. Anemia among in school and out of school adolescent girls in three districts in Ethiopia (BMC, under review)

Research Support

- Funding source: FMOH/Irish Aid
- Title: Implementation research to create four model nutrition woreda in Ethiopia
- Goal: to create model nutrition woreda
- Status: ongoing
- Funding source: NIH-MEPI Junior faculty
Title: The relationship between food insecurity and depression among women in Butajira, Ethiopia: prospective cohort study
Goal: To determine the effect of food insecurity on women depression and vice versa.
Role: Principal Investigator
Status: ongoing
- Funding source: Micronutrient Initiative
Title: Demonstration project to test effectiveness of delivery modalities and the marginal cost of adolescent girls WIFAS and nutrition education in Ethiopia.
Role: Co-Principal Investigator
Status: ongoing
PI-Seifu Hagos
- Funding source: WHO
Prevalence and factors associated with anaemia among adolescent girls in Ethiopia
Goal: to evaluate the prevalence of anaemia among in school and out of school adolescent girls in Ethiopia
Role: Co-investigator, PI-Seifu Hagos
Status: completed
- Addis Ababa University
Title: The economic, psychological safety and quality aspects of food and nutrition and the effects on pregnancy outcomes, child growth and development: a Mother-Child cohort study in Southern Ethiopia
Goal: to evaluate the effect of food price change, food choice and food safety and nutrition on pregnancy outcomes, child growth and development
Role:(Co-principal Investigator), PI-Seifu Hagos

Status: ongoing

Teaching

- Lecture masters of public health in nutrition students at Addis Ababa University, on Public health nutrition
- Lecture undergraduate medical students of Addis Ababa University on public health nutrition

Leadership, Committee Membership, and related activities

- Head, Department of RH and HSM
- I am fellow of leadership initiative four young faculty (LIYF)
- Chair of CHS-AAU clinical nutrition support group
- I was a chair of SPH strategic plan development
- Member of CHS strategic plan development
- Member of national adolescent nutrition advisory group
- Member of the managing committee of the Butajira Demographic and Health Survey (One of the oldest demographic surveillance sites in Africa)
- Chair of Research Ethics Committee (REC) for the department of Reproductive Health and Health Service management
- I was a member and secretary of School of Public Health's Golden Jubilee Core Committee.

Merits received

- MEPI junior faculty research fellow
- PI in a research award by Addis Ababa University-Medical Education Partnership Initiative (MEPI)
- AMREF young African research scholarship award winner
- Ethiopian General Secondary Education Certificate with **4.00 GPA (9As)**
- Ethiopian Higher Education Entrance Certificate with **Distinction**
- Masters in Public Health with very great distinction with **CGPA-3.97 (the top Grade of the year)**
- MPH Research-**Excellent grade**

Other Experience and Professional Memberships

- Member of Ethiopian Medical Association (EMA)
- Member of Ethiopian Public Health Association (EPHA)
- Member of Ethiopian Society of General Medical Practitioners (ESGMP)
- Member of the managing committee of the Butajira Demographic and Health Survey (One of the oldest demographic surveillance sites in Africa)
- Member of Research Ethics Committee (REC) for the department of Reproductive Health and Health Service management
- Member of strategic plan development committee of College of Health Sciences, Addis Ababa, University

Trainings taken and Conferences attended

- MEPI-JF research fellowship
- Fellow of Leadership initiative for young faculty at CHS/AAU.
- Oral presenter on AMREF health Africa international conference at Nairobi, Kenya
- Oral presenter at EMA 51st conference
- Training on implementation research, University of Washington, USA 2017
- PMTCT training from AAU & John Hopkins University/TSEHAI project, March, 2011.
- ART & HIV care training from AAU School of Medicine & WHO, August 2011.
- Training on “Understanding and Using the Demographic and Health Surveys”, Measure DHS, August, 2012
- Ethiopian Public Health Association 25th Annual Conference, Feb 20 -22, 2014, African Union, Addis Ababa, Ethiopia
- MDR/XDR TB management training from Ethiopian Society of General Medical Practitioners and USAID, September 2010.
- Emergency Medicine training for interns from AAU, September, 2010.
- BPR & Government policy training from Ministry of Health, September, 2011.
- TOT on Application of Behavior Change Communication Strategies for HIV/AIDS, by AAU-MARCH Project, Johns Hopkins University Bloomberg School of Public Health & the US CDC.
- Research Ethics, Addis Ababa University, College of Health Sciences IRB in

collaboration with MEPI

- Reproductive Health Commodity Security, Addis Ababa University School of Public Health in collaboration with UNFPA

Skills, interests and hobbies

- Know how on statistical software packages (SPSS, EPI INFO, WHO-Anthro, ENA-SMART, OPEN EPI, open code, STATA)
- Trainer on life skills
- Team leadership
- Good communication skills

Future Plans and Interests

- To proactively engage in institutional development of SPH/CHS/AAU
- To upgrade my level of education to the next higher level
- To be a distinguished health researcher in public health nutrition

References:

1. Dr Dawit Wondimagegn, Chief Executive Director of College of Health Sciences at Addis Ababa University. (dawit.wondimagegn@gmail.com)
2. Dr Ahmed Reja, former Chief Executive Director, College of Health Sciences, Addis (ahmedreja@yahoo.com)
3. Dr Seifu Hagos, Assistant professor, School of Public Health at Addis Ababa University (seif_h23@yahoo.com)

