

## ORIGINAL ARTICLE

# Assessing Nutrition Risk among Patients in Sarawak General Hospital using Malnutrition Screening Tool (MST)

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## ABSTRACT

**Introduction:** Malnutrition in hospitalised patients is a problem that is frequently observed all around the world. Malnutrition in hospitalised patients is related to poor patient outcomes and high healthcare expenditures. The purpose of this study is to assess the nutrition risk and explore the associated risk factors of malnutrition among hospitalised patient. **Methods:** A cross-sectional study was done in Sarawak General Hospital located in Kuching, Sarawak using convenience sampling among adult aged 18 and above. The Malnutrition Screening Tool (MST) was used to assess the nutritional risk. Demographic characteristics, anthropometric and biochemical data were compared according to nutritional status. The chi-square test was performed to compare the differences between categorical variables. The risk factors of malnutrition were identified using logistic regression analysis. **Result:** A total of 207 respondents were involved in this study with 63.3% and 36.7% were male and female, respectively. Malnutrition risk was observed in 61.3% of respondents according to MST score. The malnutrition risk was significantly higher in older age, those who were admitted to oncology wards and those with lower BMI and impaired biochemical profile. Multivariate analysis revealed that age and BMI of less than 18.5 kg/m<sup>2</sup> were the main factors contributing to the presence of risk of malnutrition. **Conclusion:** The risk of malnutrition is observed to be prevalent among hospitalised patients in Sarawak General Hospital. Therefore, it is important to have a routine nutritional screening and assessment to allow for early nutritional intervention and therapy.

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## INTRODUCTION

Malnutrition is characterised by an acute or chronic state of over or undernutrition, with or without inflammatory activity, which has an impact on the body's function, body composition, and clinical manifestations (1). Hospital malnutrition is related to higher rates of morbidity and mortality, extended stay in hospitals, more re-admissions, and higher healthcare expenses (2, 3). High rates of malnutrition were linked to an increase in mortality risk up to 30 days after hospital discharge, an increase in the average length of hospital stay of 1.6 days and an increase in the average cost of hospitalisation of 30% (4).

The malnutrition rate among hospitalised patients had been reported up to 60%, despite the fact that data vary

greatly since study populations, nutritional parameters used and hospital setting were different (5). A systematic review reported more than 40% of hospitalised of patients in Northeast and Southeast Asia were at risk of malnutrition (6). In Malaysia, studies have shown that rate of malnutrition in hospitalised patients were ranging between 35.0% to 65.0% (7, 8).

Anthropometric measures, biochemical testing, clinical indicators, and dietary analysis are typically the foundation of a thorough nutritional assessment. As the initial stage in nutrition treatment, nutrition screening is recommended to enable early detection and intervention of malnourished patients (9). Nutrition screening can be defined as a quick and easy process to identify an individual who has malnutrition or is at risk of becoming malnourish and help to establish whether additional evaluation and intervention are needed. (10). A simple, user friendly, valid and reliable screening tool is highly advised to identify those at risk (11).

Several nutrition screening tools were developed and recommended by experts to assess malnutrition risk in

the population; for example, Malnutrition Screening Tool (MST), Mini Nutritional Assessments (MNA), Malnutrition Universal Screening Tools (MUST) and Nutrition Risk Screening (NRS) for use in community and clinical setting. The Health Directorate of Norway suggested MST for screening to detect the risk of malnutrition among all adults in the health care setting (12). Despite the high prevalence, malnourished patients remain unrecognized and thus untreated by healthcare providers. Data on malnutrition prevalence among hospitalised patients may be useful for healthcare providers to establish a multidisciplinary team approach to patients' management. Early detection of malnutrition and nutritional management are crucial for delaying or preventing the negative effects that are linked with it. This study aims to estimate the prevalence of nutrition risk and associated risk factors among hospitalised patients admitted to Sarawak General Hospital.

## MATERIALS AND METHODS

### Samples

This is a cross sectional study performed in Sarawak General Hospital to evaluate the risk of malnutrition among hospitalised adult patients. Patients aged 18 years and above and meeting the inclusion criteria were recruited using a convenience sampling technique. Data collection was done by a trained dietitian from January to February 2022. Inclusion criteria included patients on oral intake, able to communicate verbally or with the assistance of their caregiver and not having a critically ill condition. Patients on tube feeding or total Parenteral Nutrition (TPN), pregnant and lactating mother and patients with mental illness were excluded from this study. The sample size was determined using the formula by Azmi (13) with a 95% confidence interval and using rate of malnutrition as 61.9% using MST based on a study by Jamhuri et al. (8). The final sample size was estimated after adding a 5% non-response rate was 197 respondents. Ethical approval was received from the Medical Research and Ethics Committee (MREC), Ministry of Health (NMRR ID-22-00002-USU). All participants were provided written informed consent prior to participation. During the data collection period, patients who were at risk of malnutrition were advised by dietitians for nutritional management.

### Materials

Sociodemographic information was collected from medical record and face to face interviews encompassing the respondents' age, gender, level of education, marital status, housing situation, income, smoking history and alcohol intake. The nutritional risk status of respondents was assessed using Malnutrition Screening Tool (MST) which is a rapid and easy nutrition screening tool that consists of two questions regarding recent unintentional weight reduction and appetite changes (14). It has good reliability and validity in hospitalised patients, outpatients and institutionalised subjects (15). The MST

provides a score ranging from 0 to 5 and respondents are considered to be at risk of malnutrition if the total score was 2 or more while patients score 0 to 1 were not at risk of malnutrition.

Participants body weight and height were measured using SECA weighing scale and stadiometer. Body mass index (BMI) is computed by dividing weight in kilogrammes by height in metres squared. BMI classification is based on the World Health Organization (WHO) guidelines in which BMI <18.5 kg/m<sup>2</sup> was indicated as underweight (16).

Biochemical parameters including albumin (g/L) and haemoglobin (g/L), were obtained from the patient's medical record. Biomarkers including albumin and haemoglobin, total protein and, lymphocyte count are reported to be useful biochemical markers of malnutrition, even when chronic inflammation is present (17). Serum albumin is the most abundant protein in human serum and is acknowledged as a sign of malnutrition in individuals who are clinically stable (18). Cut off serum albumin value of 35 g/L is indicative of malnutrition risk, meanwhile the normal haemoglobin generally ranges from 12.0 to 15.5 g/dL for women and 13.0 to 17.5 g/dL for men (17).

### Statistical analysis

Data were analysed using the SPSS Statistic version 22.0 (Armonk, NY: IBM Corp). Demographic information was presented using descriptive statistics, such as frequency, percentage, means and standard deviation, meanwhile chi-square test was used to compare categorical variables and t-test for continuous variables. Multivariate analysis with logistic regression using enter method was used to determine possible risk factors of malnutrition among hospitalised patients. Variables found to be associated were entered into multiple logistic regression models to control the potential confounding effect. Finally, variables that shown to have significant association were recognised on the basis of OR, with 95% CI and p-value. Statistical significance was set at p<0.05.

## RESULTS

A total of 207 respondents were employed in this study. Table I showed the background characteristics of the respondent. More than half respondents were male, aged ≥50 years old and married. Demographic characteristic of respondents according to nutrition risk was presented in Table II. As shown, malnutrition risk did not differ among gender, ethnicity, marital status, education and employment status. However, a difference in the risk of malnutrition rate was observed among age groups and clinical discipline categories in which patients were warded. Respondents aged 50 years and above had a significantly higher rate of malnutrition than those who were younger (70.3% vs 29.7%, p=0.037). The risk of malnutrition rate was highest in the oncology discipline

**Table I: Background characteristic of respondents**

Characteristic	n (%)
Age	
< 50 years	73 (35.3)
≥50 years	134 (64.7)
Gender	
Male	131 (63.3)
Female	76 (36.7)
Ethnicity	
Malay	73 (35.3)
Chinese	45 (21.7)
Bumiputera Sarawak	89 (43.0)
Marital Status	
Married	170 (82.1)
Single/ Divorced/ Widow	37 (17.9)
Educational status	
No education	32 (15.5)
Primary School	57 (27.5)
Secondary school	97 (46.9)
College/ University	21 (10.1)
Employment status	
Working	92 (44.4)
Unemployment	115 (55.6)
Living alone	
Yes	6 (2.9)
No	201 (97.1)
Body Mass Index	
Underweight (< 18.5 kg/m <sup>2</sup> )	38 (18.9)
Normal (18.5 - 24.9 kg/m <sup>2</sup> )	93 (46.3)
Overweight (25 - 29.9 kg/m <sup>2</sup> )	43 (21.4)
Obese (≥ 30 kg/m <sup>2</sup> )	27 (13.4)

(48.4%) followed by orthopaedic (21.0%) and medical (16.4%). The respondents with a high risk of malnutrition had significantly lower albumin ( $30.0 \pm 7.91$  g/L vs  $32.8 \pm 7.29$  g/L,  $p=0.010$ ) and haemoglobin level ( $10.6 \pm 2.13$  g/L vs  $11.4 \pm 2.41$  g/L,  $p=0.009$ ).

Figure 1 shows the comparison of malnutrition risk status using MST, BMI, serum albumin and haemoglobin level. According to MST, 61.3% of the respondent were at risk of malnutrition and 18.9% of respondents had a risk of undernutrition with BMI less than 18.5 kg/m<sup>2</sup>. Based on serum albumin and haemoglobin level, it is respectively shown that 59.6% and 76.3% of respondents were at risk of malnutrition.

The crude and multivariate adjusted odd ratios are presented in Table III. Age and BMI were strongly associated with a higher risk of malnutrition. Adult hospitalised respondents aged ≥50 years were 2.5 more likely to have a risk of malnutrition (OR = 2.56, CI: 1.242-5.669). Respondents with BMI < 18.5 kg/m<sup>2</sup> were 4.5 times more likely to be malnourished than those with BMI more than 18.5 kg/m<sup>2</sup> (OR= 4.45, CI: 1.508-13.129).

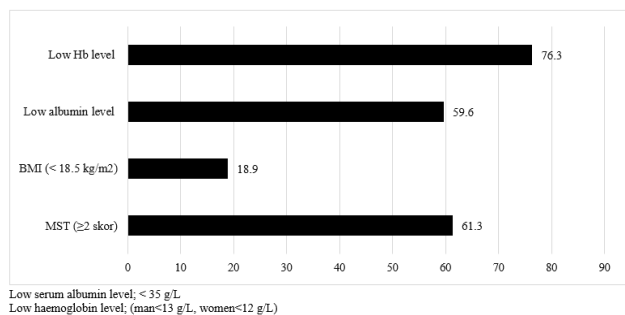
**Table II: Characteristic of respondents according to malnutrition risk**

Characteristic	No risk of malnutrition n (%)	At risk of malnutrition n (%)	p value
Age			
< 50 years	35 (44.3)	38 (29.7)	0.037*
≥50 years	44 (55.7)	90 (70.3)	
Gender			
Male	49 (62.0)	82 (64.1)	0.769
Female	30 (38.0)	46 (35.9)	
Ethnicity			
Malay	31 (39.2)	42 (32.8)	0.642
Chinese	16 (20.3)	29 (22.7)	
Bumiputera Sarawak	32 (40.5)	57 (44.5)	
Marital Status			
Married	69 (87.3)	101 (78.9)	0.139
Single/ Divorced/ Widow	10 (12.6)	27 (21.1)	
Educational status			
No education	14 (17.7)	18 (14.1)	0.757
Primary School	19 (24.1)	38 (29.7)	
Secondary school	37 (46.8)	60 (46.9)	
College/ University	9 (11.4)	12 (9.4)	
Employment status			
Working	36 (45.6)	56 (43.8)	0.886
Unemployment	43 (54.4)	72 (56.3)	
Smoking habit			
Yes	17 (21.5)	40 (31.2)	0.313
No /Ex smoker	51 (78.5)	72 (68.7)	
Alcohol consumption			
Yes	11 (13.9)	19 (16.2)	0.203
No /Ex drinker	66 (86.1)	98 (83.8)	
Clinical Discipline			
Medical	20 (25.3)	21 (16.4)	0.002*
Surgical	5 (6.3)	18 (14.1)	
Oncology	23 (29.1)	62 (48.4)	
Orthopaedic	31 (39.2)	27 (21.0)	
Number of medications			
Less than 5	40 (50.6)	55 (43.0)	0.316
5 and more	39 (49.4)	73 (57.0)	
Body Mass Index			
BMI <18.5 kg/ m <sup>2</sup>	6 (7.9)	32 (25.6)	0.002*
BMI ≥18.5 kg/m <sup>2</sup>	70 (92.1)	93 (74.4)	
*Biochemical			
Total protein (g/L)	69.9 (9.14)	65.6 (9.52)	0.002*
Albumin (g/L)	32.8 (7.29)	30.0 (7.91)	0.010*
Haemoglobin (g/L)	11.4 (2.44)	10.6 (2.13)	0.009*

\*Data are shown as mean ± standard deviation.  
\*Significant difference at  $p < 0.05$

## DISCUSSION

Hospital malnutrition is still a widespread problem and yet it is frequently underreported and subsequently untreated. This cross-sectional study showed that 61.3% of hospitalised patients had a risk of malnutrition using MST. This finding is consistent with the result of another



**Figure 1: Comparison malnutrition risk using MST, BMI, albumin and haemoglobin (%)**

local study using the same screening tools, which was 61.9% (8). However, our finding is high when compared with the result of another study conducted in Singapore, which observed among the studied patients, 11.9% were reported at risk of malnutrition and 4.6% at high malnutrition risk (19). A study conducted in 649 European hospitals found that 30% of patients were recognised with malnutrition risk with MST score ≥ 2 points (20).

Another study from Indonesia which used BMI below 18.5 kg/m<sup>2</sup> to indicate undernutrition reported prevalence of hospital malnutrition at admission was 26.7% which was slightly higher than the findings from this study (21). The variation in the prevalence rate of malnutrition was due to the different populations of the participants and the various screening/diagnostic tools used in the studies. Findings on similar studies on the matter across a wide range of population illustrates the global nature of malnutrition among hospitalised adults.

Our study also showed that malnutrition risk was significantly higher among older age, those admitted to the oncology discipline and had lower BMI and biochemical profile. The similar results were observed from a study conducted in Saudi Arabia that reported that malnutrition is highly prevalent in elderly, underweight patients and significantly lower serum albumin and

haemoglobin level than those who were well nourished (22). Patients with cancer often lose weight and have poor food intake which can be caused by the tumor itself or side effects of the treatment and physiological response to the tumor which can lead to malnutrition (23).

Findings from our study found that factors associated with the risk of malnutrition based on the bivariate analysis were age and BMI less than 18.5kg/m<sup>2</sup>. However, gender, marital status, education level and polypharmacy were found unrelated to the risk of malnutrition. The outcomes of this study support findings from other studies that showed age as a single risk factor for malnutrition (24). Older persons are more susceptible to malnutrition because of comorbid conditions, age-related physiological decline, and limited availability of nutrient-rich foods (3, 25). However, our findings were inconsistent with the results by Ethiopia that reported marital status, education level and weight status were the recognized factors affecting malnutrition among adult hospitalised patients (26).

Several limitations in this study should be mentioned. Firstly, nutritional status was evaluated with patients who were already hospitalised and were recruited using a convenience sampling that may limit the generalization of our findings. Children and patients with critical conditions who were more prone to have poor nutritional status were excluded in this study. Therefore, the present study may have underestimated the malnutrition rate of all the hospitalised patients. Secondly, the use of a cross sectional design in this study did not allow the exploration of the association between the identified factors and malnutrition risk and clinical outcome. Thirdly, a small sample size could potentially lead to insufficient statistical power that could further limit the ability to recognize the significant association of malnutrition risk. However, the samples provide useful baseline data for hospital to develop further interventional study to treat malnutrition and promote

**Table III: Logistic regression with risk of malnutrition (MST ≥2) as a dependent variable**

Variable	Crude OR (95%CI)	P value	Adjusted OR (95%CI)	P value
Age ≥50 years	1.88 (1.051-3.378)	0.033*	2.56 (1.242-5.669)	0.012*
Male	1.09 (0.611-1.950)	0.768	1.10 (0.536-2.275)	0.789
Single/divorced/widow	0.54 (0.247-1.192)	0.128	1.63 (0.621-4.347)	0.319
No education level	1.08 (0.615-1.912)	0.780	0.99 (0.483-2.034)	0.981
Medication ≥5	1.36 (0.751-2.390)	0.283	1.37 (0.672-2.813)	0.383
BMI <18.5 kg/m <sup>2</sup>	4.01 (1.591-10.126)	0.003*	4.45 (1.508-13.129)	0.007*
Low albumin level	1.62 (0.887-2.959)	0.116	1.68 (0.816-3.469)	0.158
Low haemoglobin level	2.01(1.114-4.4010)	0.023*	1.83 (0.821-4.122)	0.139

\*Significant difference at p<0.05, OR= Odds Ratio, CI= Confidence interval

the hospital nutritional support programs.

## CONCLUSION

The malnutrition risk among hospitalised patients in Sarawak General Hospital was highly prevalent. Older age and lower BMI status were found to be significant independent risk factors for being categorized as at malnutritional risk. Due to the fact that nutrition screening is not routinely done at hospital admission, it is unsurprising that malnutrition remains underreported and is often poorly documented. Hence, routine nutrition screening is advised especially for individuals who are at high risk of malnutrition, in order to prevent adverse clinical outcomes. This will provide a basis for dietetic referrals for prescribing appropriate medical nutrition therapy. It is also crucial to have a multidisciplinary nutritional support team which includes a dietitian to assess high-risk patients and provide suitable nutritional support.

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