Original Article

Prevalence and associated risk factors of malnutrition among hospitalized adults in a multisite study in Ho Chi Minh city Viet Nam

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Background and Objectives: This study aims to assess the prevalence and associated risk factors of malnutrition in adults in acute care settings. **Methods and Study Design:** A cross-sectional study among 883 participants from 6 representative general public hospitals was conducted during April and May 2016. Participants were considered malnourished if they were classified using Subjective Global Assessment (SGA) as malnourished (B or C) or with BMI < 18.5kg/m^2. Demographic and socio-economic status characteristics were measured using interviewer-administered questionnaires. Sampling weights for the number of participants in each hospital were calculated to account for the difference in the stratified cluster sampling design. Logistic regression was used to examine the association of malnutrition with potential risk factors. **Results:** The prevalence of underweight (BMI <18.5 kg/m^2) and hospital malnutrition (B/C on SGA or BMI <18.5 kg/m^2) in acute care setting was 14.0% and 34.1%. The prevalence was higher in participants over 80 years old (49.7%), attending a Level 1 hospital (37.1%), with an oncology (46.5%) or pulmonary (43.6%) diagnosis. The risk of being malnourished was statistically significantly higher among participants who were living in poverty (OR: 1.6), were living in marginal poverty (OR: 1.3), did not work in the last six months (OR: 1.7), had a length of stay over 10 days (OR: 1.6) and were admitted via emergency (OR: 1.5). **Conclusions:** Hospital malnutrition is a significant health problem in Ho Chi Minh City. Socio-economic status and pre-admission underweight were significant risk factors besides other clinical risk factors. Improvement of nutrition and dietetics services is crucial to optimize patient outcomes.

Key Words: malnutrition, hospital, SGA, Viet Nam, prevalence

INTRODUCTION

In the last two decades, there have been numerous population surveys in Viet Nam that regularly assess the nutritional status and related risk factors of most age groups, including children under five-years, school-aged children, women of child-bearing age and adults.[1-4] Viet Nam has recently transitioned economically, moving from a low income to a low-middle income country. As a result, relative wealth of individuals is beginning to increase with concomitant changes in eating patterns and physical activity levels. The focus is moving from reducing population-wide malnutrition, stunting and micronutrient deficiencies to the management of an ever-increasing burden of non-communicable diseases (NCDs). This shift in focus has increased the number of hospital admissions for NCDs and has required expansion of the health infrastructure, including hospitals.[5,6] There has, to date, however, been no national or city survey on the nutritional status or determinants of nutritional status of individuals in hospitals in Viet Nam.

Malnutrition in hospitalized patients is a common problem worldwide especially among those with chronic or severe diseases.[7] Malnutrition in hospitalized patients has been associated with higher rates of hospital infection;[8] medically-related complications;[9] muscle and fat loss;[10] pressure ulcers;[11,12] impaired wound healing,[13] longer length of hospital stays; and mortality.[14-16] Malnutrition can be caused by a range of factors including a low dietary intake;[17] poor nutrient absorption; excessive nutrient losses; disease-related metabolic alterations; or a combination of the above factors.[18] The prevalence of malnutrition in these patients varies from 20% to 50%, depending on the geographic setting, patient population, medical discipline, medical treatment and the criteria used for diagnosis.[7]

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In Ho Chi Minh City (HCMC), preliminary data in one hospital showed a prevalence of malnutrition in hospitalized patients (using Subjective Global Assessment (SGA) criteria) of 34.6%.[19] However this figure is not representative of HCMC or Viet Nam as being undertaken in a single hospital with the possibility of selection bias. In order to improve the nutritional status of patients in hospitals, the health authorities of HCMC need to understand the magnitude of the problem as well as associated risk factors. This information will help in the development of an emerging dietetic profession as well as of policies related not only to screening for malnutrition but also assessment and treatment for hospitalized patients in HCMC. Nationally, there are similarities with respect to healthcare systems, culture, beliefs, socioeconomic status, and population prevalence of malnutrition in most large cities in Viet Nam. It is anticipated, therefore, that the results from this project will be able to be extrapolated and applied across Viet Nam.

METHODS

Study design

A cross-sectional study of a representative sample of hospitalized adults in acute care settings in HCMC Viet Nam over a period of 2 months from April to May 2016.

Ethics

The protocol was approved by the Human Research Ethics Committee of Queensland University of Technology, Australia (Approval number 1500001156). The protocol was also approved by Health Department HCMC Viet Nam with approval number 2157/SYT-NVY.

Setting and population

HCMC is divided into three geographical zones. In zone 1 (urban), there are 13 districts with the highest population density and 50% of the city's population. In zone 2 (semi-urban), there are 6 districts with a medium population density and comprises 30% of the city's population. In zone 3 (rural), there are 5 districts representing with lowest population density and 20% of city's population.[20,21]

There are 101 hospitals in HCMC including private (46) and public (55) facilities. In general, public hospitals in HCMC and across Vietnam have higher number of patients bed and are more heavily used compared to private hospitals due to the superior technical qualifications of staff, and lower costs associated with care. Therefore, only public hospitals were included in this study (see Figure 1). Public hospitals can be further divided into two groups: general (33) and specialist hospitals (22). Specialist hospitals can be categorized by their specialties. According to national hospital regulations, general hospitals must contain all specialties that are available in specialist hospitals. Some specialist hospitals are out of scope of this study such as those who specialize in pediatrics, gynecology and obstetrics. Therefore, only general hospitals were included in this study. General hospitals can be further divided into three levels (one, two or three), based on the technical qualifications of medical staff, specialties catered for (all specialties in Level 1 hospitals, most specialties in Level 2 hospitals and some specialties in Level

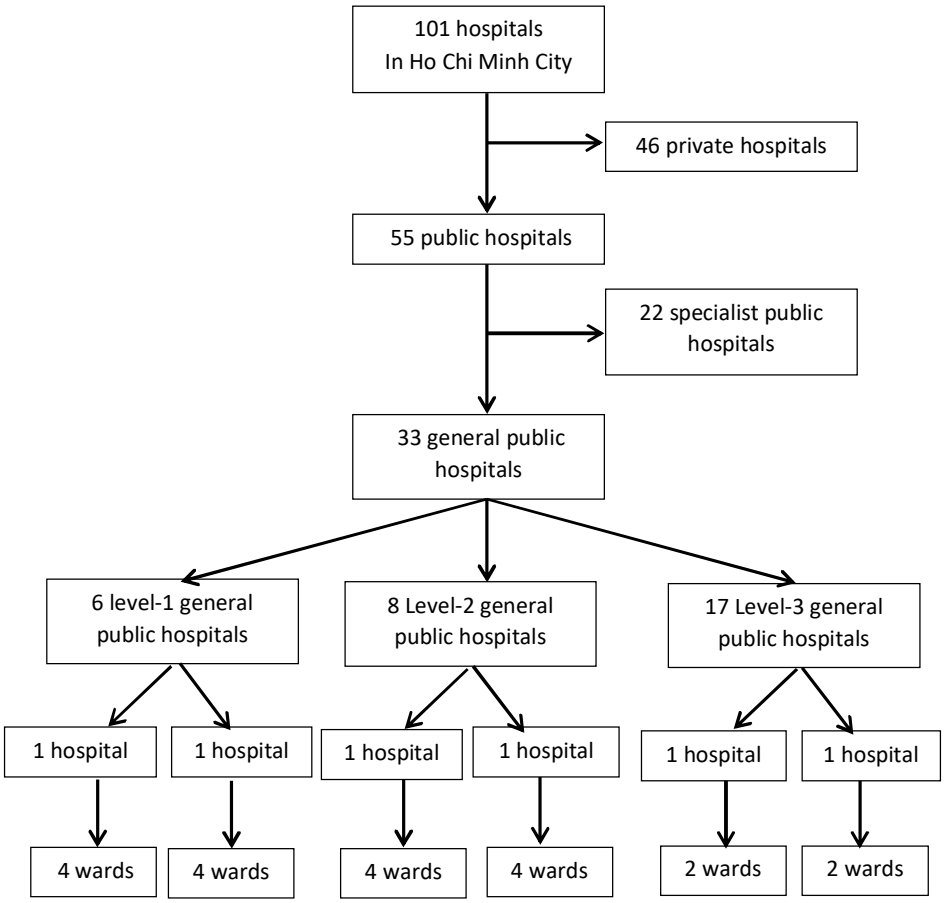

Figure 1. Sampling flowchart.

Table 1. Information about the hospitals in the survey

Hospital	1	2	3	4	5	6
Hospital level	1	1	2	2	3	3
Number of bed	2000	780	340	120	250	120
Food services	-Hospital food service -Hospital canteen	-Hospital food service -Hospital canteen	-Hospital canteen	-Hospital canteen	-Hospital food service -Hospital canteen	-Hospital food service -Hospital canteen
Location	Urban	Semi-urban	Rural	Urban	Semi-urban	Urban

3 hospitals), equipment and infrastructure, with Level 1 the highest.

Sampling

Stratified multistage cluster sampling strategy was used. Firstly, hospitals were divided into three strata: Level 1 general hospitals, Level 2 general hospitals and Level 3 general hospitals (Figure 1). Secondly, in each stratum, two hospitals were selected on a convenience basis with hospitals distributed across three zones (3 hospitals in urban districts, 2 hospitals in semi-urban districts and 1 hospital in rural districts). Information on hospital level, location, number of patient beds, and foodservices available of six hospitals in the survey are presented in Table 1. Thirdly, in each of the selected hospitals, two internal medicine and two surgical wards (in level 1 and level 2 hospitals) or one internal and one surgical ward (in level 3 hospitals) were selected on a convenience basis to cover wards from different medical specialties using proportionate to population size method (PPS) based on the data of hospital bed numbers from the HCMC Health Department. Finally, in each of the selected wards, all patients were approached to participate. Each hospital ward in Viet Nam usually contains on average, 45 patients. A sample size of 840 patients was needed to estimate the prevalence of hospital malnutrition with a precision of 3.5%.

Since this study is focused on malnutrition prevalence among non-pregnant hospitalized adults in acute care settings, the following wards were excluded; pediatric, gynecology and obstetrics, outpatients and rehabilitation. Since the diagnostic criteria for malnutrition for patients in intensive care (ICU), and emergency and resuscitation can be different from general patients[22] these wards were also not included in this study. Due to the scope of this study, all patients were included except those who were critically ill, palliative, pregnant, or unable to give informed consent. In selected wards, the written information sheet and consent forms were given to all eligible patients one day before data collection by researchers to inform and invite them to participate in the study. On the next day (data collection day), researchers spent time reading the information sheet for patients (if required) and provided further explanation and clarification of all questions and concerns until patients fully understood and were satisfied. Data collection was commenced only after written consent was provided by each participant.

Measurements

An interviewer-administered questionnaire was used to document demographics and socio-economic status characteristics of participants including year of birth, gender, poverty/marginal poverty household status, marital status, highest education level and occupation in the last six months. The poverty and marginal poverty household status were self-reported based on the classifications from the Government, of which households are aware. Medical information was collected from the medical records of patients and included date of admission, ward, main diagnosis, number of prescribed medications, pre-survey length of stay, admission status and admission type. Medical conditions were classified using International Classification of Diseases (ICD-10) Vietnamese version 2015.[23]

Body weight was measured using Tanita™ electronic scales to the nearest 100g and body height were measured using a portable World Health Organization recommended standard height scale to the nearest 0.1cm. All measurements were taken using standard procedures according to World Health Organization guidelines.[24] If height or weight were not measurable, they were estimated by patients, their relatives or trained researchers.

Nutritional status of participants was measured using the assessment tool SGA.[25] A cross-cultural adaption process was used comprising six steps, including translation, synthesis, back translation, expert committee review, and the committee appraisal was used to translate all nutrition screening questionnaires used in this study into Vietnamese.[26] Data was collected by medical doctors, nurses, dietitians and Bachelor of Public Health staff of the Nutrition Centre HCMC Viet Nam. SGA was assessed by the principal researcher who is a medical doctor from the Nutrition Centre HCMC.

According to the diagnostic criteria from the American Society for Parenteral and Enteral Nutrition (ASPEN), patients were diagnosed with malnutrition if they had two or more of the following six characteristics including: insufficient dietary intake; weight loss; loss of muscle mass; loss of subcutaneous fat; fluid accumulation; and diminished functional status.[27] These diagnostic criteria align with elements in the SGA; therefore, SGA was used as the diagnostic tool. In addition, according to the diagnostic criteria from the European Society for Parenteral and Enteral Nutrition (ESPEN), patients are diagnosed with malnutrition if they also have a BMI <18.5 kg/m^2.[28] Therefore, participants were defined as malnourished if they were classified as a "B" or "C" on SGA or they had a BMI less than 18.5 kg/m^2.

Statistical methods

Descriptive data were presented as percent, median or mean with their standard deviation. Prevalence of malnutrition was presented as percent with 95% confident in-

tervals. Data were analyzed using statistical package STATA version 10.0 (2007, Stata corporation, TX, US) and weighted for the strata and cluster sampling design using the "svy" commands in STATA. Sampling weights for the number of participants in each hospital were calculated to account for the difference in stratified cluster sampling design. The weights were calculated by using W1 x W2 where W1 is the weight of hospital in each hospital level stratum and W2 is the weight of patients in each selected hospital. Logistic regression was used to examine the association of malnutrition with potential associated risk factors. A stepwise approach was used in selecting the best variables for the final model. Only variables which had *p*-values <0.5 or variables of established biological importance remained in the final model. Odds ratios from the univariate analysis (crude odds ratio) and from the logistic model (adjusted odds ratio) are presented with 95 % confidence intervals. Survey commands in STATA were used in this analysis to account for the strata and cluster survey design used in this study.

RESULTS

Of the 900 participants approached, 888 participants agreed to participate and complete the study (98.7%). After excluding records with incomplete information, 883 participants were included in the final analysis (99.4%).

Demographic and anthropometric characteristics

Demographic characteristics of hospitalized adults are presented in Table 2. There were more women than men among hospitalized adults (60.5%), and the mean age of participants was 58.5±19.2 years. Participants had low socio-economic status with a majority having completed primary school or below (63.4%), and over half had not worked in the last six months (56.3%) mainly due to being of retirement age or for medical reasons. With respect to living standards, approximately one-quarter (24.5%) of participants were reported to belong to households experiencing poverty or marginal poverty; and 17.3% of participants had to cover their own medical costs as they did not have medical insurance.

Clinical characteristics

Clinical characteristics of participants are presented in Table 3. The average weight of men and women participants was 57.9±11.3 kg and 53.0±9.9 kg respectively and the mean of BMI was 21.7±3.9 kg/m^2 and 22.9±4.0 kg/m^2 for men and women respectively. Participants were more likely to be admitted to the hospital through the emergency department (61.6%), be treated in medical wards (69.5%), and stay for median of 3 days on average (minimum of 1 day and maximum of 22 days). The most common medical condition categories using ICD10 classification were Cardiology (20.7%), Gastroenterology (17.0%), Pulmonary (16.4%), Traumatology (12.3%), Infectious diseases (6.0%), Endocrinology (5.6%), Otorhinolaryngology (5.6%) and Oncology (5.0%). Participants were prescribed 5.0± 2.3 different medications on average per day.

Nutritional status

According to Body Mass Index (BMI), the weighted prevalence of underweight (BMI <18.5 kg/m^2), overweight (BMI >25 kg/m^2) and obesity (BMI >30 kg/m^2) among hospitalized adults were 14.0% (95% CI 11.5–16.9), 20.2% (95% CI 17.9–22.7) and 3.6% (95% CI 1.8–6.8) respectively (Table 4).

According to SGA and BMI, the weighted prevalence

Table 2. Demographic characteristics of hospitalized adults (n=883)

Characteristics	N	Mean±SD or %
Age (years)	883	58.5±19.2
Gender		
Men	349	39.5
Women	534	60.5
Marital status		
Unmarried	110	12.6
Married	587	67.3
Widowed/ Divorce/Separated	175	20.1
Education		
Primary	550	63.4
Completed secondary	159	18.3
Completed high school/ vocational	126	14.5
Completed college/University	33	3.8
Living standard		
Poverty	109	12.6
Marginal poverty	103	11.9
Average or above	656	75.5
Occupation		
Manual workers	222	25.0
Do not work (retirement age or medical reasons)	499	56.3
Elementary occupations	45	5.1
Office workers	121	13.6
Medical insurance cover		
Yes	727	82.7
No	152	17.3

SD: standard deviation.

Table 3. Clinical characteristics of malnutrition among hospitalized adults (n=883)

Characteristics	N	%
Admission status		
Elective	42	4.9
Emergency	530	61.6
Direct admission	174	20.2
Transfer	114	13.3
Ward type		
Medical	614	69.5
Surgical	269	30.5
Hospital location		
Urban, Semi-urban	740	83.8
Rural	143	16.2
Hospital level		
Level 1	455	51.5
Level 2	250	28.3
Level 3	178	20.2
Medical condition categories (ICD10)		
Infection diseases	53	6.0
Oncology	44	5.0
Endocrinology	49	5.6
Otorhinolaryngology	49	5.6
Cardiology	182	20.7
Pulmonary	144	16.4
Gastroenterology	149	17.0
Traumatology	108	12.3
Other	100	11.4
		Mean±SD
Body weight in men (kg)	338	57.9±11.3
Body weight in women (kg)	521	53.0±9.9
Body height in men (cm)	340	163.1±6.2
Body height in women (cm)	522	151.9±6.3
Body mass index in men (kg/m^2)	340	21.7±3.9
Body mass index in women (kg/m^2)	518	22.9±4.0
Number of medications prescribed	853	5.0±2.3
		Median (min, max)
Length of hospital stay (day)	883	3 (1, 22)

ICD10: International Classification of Diseases 10; BMI: body mass index; SD: standard deviation.

of malnutrition (B or C on SGA or BMI <18.5 kg/m^2) was 34.1% (95% CI 28.8–39.8) (Table 4).

The prevalence of malnutrition increased by age, with those aged 80 years or over having the highest prevalence (49.7%). The prevalence of malnutrition was also higher in Level one hospitals (37.1%) compared to Level two or Level three hospitals.

Patients with primary oncology and pulmonary diagnoses were among the specialties with higher malnutrition prevalence (over 40%) while otorhinolaryngology and other (mainly hematology, ophthalmology, nephrology, skeletology and other symptoms or signs not elsewhere classified) were the specialties with the lowest prevalence (approximately 25%).

There was no difference in the prevalence of malnutrition between men and women, between medical or surgical wards, of between hospitals in urban, semi-urban or rural areas.

Associated risk factors of malnutrition

The association between malnutrition and fourteen different potential risk factors was assessed. Only risk factors with statistical significance associated in univariate analyses were kept and presented (Table 5). There were seven variables that remained in the final logistic regression model. The odds ratios from univariate and multivariate analyses are presented in columns two and three of Table 5. Age and education were significant at univariate analysis but did not stay significant at multivariate analyses. Living standards, occupation, length of stay, admission status and medical condition were found to be significantly associated with malnutrition among hospitalized adults at both univariate and multivariate analyses.

Participants with low socio-economic status (living with poverty or marginal poverty, did not work in the last six months) were more likely to be malnourished compared to participants with higher socio-economic status (Adjusted Odds Ratios from 1.3 to 1.7). The risk of malnutrition was double in patients diagnosed under ICD10 classifications including traumatology and pulmonary (Adjusted Odds Ratios is 2.0).

DISCUSSION

From this first multicenter study in Viet Nam, malnutrition among hospitalized adults in acute care settings in HCMC Viet Nam is a significant health problem with a prevalence of 34.1%. This prevalence does not vary significantly from the prevalence in high income countries such as Australia (31.4%-34.7%, 20 hospitals, SGA),[29] New Zealand (32.0%, 56 hospitals, SGA+BMI),[17] and the US and European countries (weighted mean 31.4%).[7] When comparing to other Asian countries the prevalence

Table 4. Weighted prevalence of malnutrition by demographic and clinical characteristics using (SGA+BMI)† as diagnostic criteria

Characteristics	n	Weighted % of malnutrition (95% CI)
Gender		
Men	350	37.5 (32.8–41.5)
Women	533	33.5 (22.9–39.2)
Age group		
<60 years	435	28.5 (20.1–38.8)
60–<80 years	315	35.6 (27.8–44.3)
≥80 years	133	49.7 (29.0–70.5)
Ward type		
Medical	614	33.2 (26.4–40.0)
Surgical	269	33.5 (16.3–50.8)
Hospital location		
Urban	740	33.4 (28.4–38.5)
Rural	143	31.5 (N/A)
Hospital level		
Level 1	457	37.1 (49.7–76.2)
Level 2	250	27.7 (16.8–38.7)
Level 3	176	31.0 (16.8–45.1)
Medical condition categories (ICD10)		
Infection diseases	53	35.5 (17.8–58.3)
Oncology	44	46.5 (22.4–72.4)
Endocrinology	49	36.0 (19.4–56.8)
Otorhinolaryngology	49	22.7 (10.8–41.4)
Cardiology	182	30.1 (12.9–55.6)
Pulmonary	144	43.6 (35.7–51.9)
Gastroenterology	149	31.5 (13.1–58.2)
Traumatology	108	34.5 (30.6–38.5)
Other	100	25.2 (16.1–37.2)
BMI categories		
Underweight (<18.5 kg/m^2)	118	14.0 (11.5–16.9)
Normal (18.5–25.9 kg/m^2)	531	62.3 (57.7–66.7)
Overweight (25–29.9 kg/m^2)	174	20.2 (17.9–22.7)
Obesity (≥30 kg/m^2)	34	3.6 (1.8–6.8)
Subjective Global Assessment (SGA)		
Well-nourished (A)	626	72.0 (63.1–77.5)
Moderate malnourished (B)	222	23.8 (17.3–31.8)
Severe malnourished (C)	39	4.2 (2.9–6.1)
Malnourished (B+C)	261	28.0 (20.5–36.9)
Subjective Global Assessment (SGA) + BMI		
Well-nourished (A on SGA and BMI ≥18.5 kg/m^2)	576	65.9 (60.2–71.2)
Malnourished (B/C on SGA or BMI <18.5 kg/m^2)	311	34.1 (28.8–39.8)

ICD10: International Classification of Diseases 10; 95%CI: 95% confident interval.
†SGA+BMI = classified as B/C on Subjective Global Assessment or Body Mass Index < 18.5.

of hospital malnutrition is more variable. The prevalence in Viet Nam is higher than the prevalence in China (27.3%, 3 hospitals, NRS-2002)[30] and Singapore (29%, 1 hospital, SGA)[31] but lower than the prevalence in Thailand (40.5%, 1 hospital, Nutrition Alert Form or NAF)[32] and India (39.6%, 1 hospital, SGA).[33] This may be due to a range of reasons including: sample size, with most samples drawn from a smaller number of hospitals (from 1 to 3 hospitals); variation in the number of total number of patients (from 210-1500 patients); differences in the prevalence of underweight (BMI <18.5 kg/m^2) in the community; variations in health infrastructure and policies; as well as the quality of health and nutritional care. In addition, a variety of diagnostic criteria were used (NRS-2002, NAF) and some of these are screening and not assessment tools.

Our study found that where the diagnostic criteria used to identify hospital malnutrition, of BMI <18.5 kg/m^2 was used alone, almost half of the malnourished cases would not have been identified compared to the use of SGA (14.0% vs 28.0%). However, if SGA was used alone, 6% of malnourished cases would also not have been identified. This is especially important in the population where the prevalence of underweight (BMI <18.5 kg/m^2) is high as in Viet Nam. Both BMI and individual parameters in the SGA have been used as diagnostic criteria for hospital malnutrition of ASPEN[27] and ESPEN.[28] Therefore, the combination of SGA and BMI as the diagnostic criteria is reasonable especially for low-middle income countries where the underlying prevalence of underweight is likely to be higher in the community.

Even though the prevalence of hospital malnutrition in Viet Nam is quite similar to the prevalence in high income countries, the factors contributing to these levels may not be the same. Socio-economic factors may be more important positive contributors in Viet Nam compared to high income countries. Indeed, 24.4% participants were living in poverty or marginal poverty households and were1.3 to 1.6 times more likely to be malnourished compared to participants from households with

Table 5. Associations between malnutrition (SGA+BMI) and potential correlates among hospitalized adults (n=883)

Characteristics	Crude odds ratio (95% CI)	Adjusted odds ratio (95% CI)
Age group		
<60 years	1	1
60–<80 years	1.4 (0.6–3.0)	1.3 (0.4–4.1)
≥80 years	2.5* (0.9–6.5)	2.3 (0.8–6.3)
Education		
Primary	1	1
Completed secondary	1.1 (0.6–2.0)	1.5 (0.9–2.6)
Completed high school/ vocational	0.7 (0.4–1.1)	0.9 (0.4– 2.2)
Completed college/University	0.5* (0.4–0.8)	0.7 (0.3–1.7)
Living standard		
Average or above	1	1
Marginal Poverty	1.3 (0.6–2.5)	1.3* (1.0–1.5)
Poverty	1.9* (1.4–2.5)	1.6* (1.0–2.4)
Occupation		
Office workers	1	1
Manual workers	1.5* (1.1–2.0)	1.4 (0.7–2.8)
Do not work (retired, medical reasons)	2.3* (1.6–3.3)	1.7* (1.0–2.9)
Elementary occupations	2.8* (1.0–8.0)	1.9 (0.6–6.0)
Admission status		
Elective	1	1
Emergency	1.9* (1.4–2.6)	1.5* (1.0–2.4)
Direct admission	2.0* (1.0–3.7)	1.9 (0.6–5.7)
Transfer	2.2* (1.9–2.5)	1.7 (0.5–5.4)
Length of hospital stay		
<5 days	1	1
From 5 to <10 day	1.5 (0.7–2.9)	1.2 (0.6–2.4)
≥10 days	2.1* (1.2–3.9)	1.6* (1.1–2.2)
Medical condition categories (ICD10)		
Otorhinolaryngology	1	1
Cardiology	1.5 (0.4–5.3)	1.0 (0.3–3.8)
Gastroenterology	1.6 (0.4–5.8)	1.4 (0.3–7.4)
Traumatology	1.8* (1.0–3.6)	2.0* (1.0–4.5)
Infection diseases	1.9 (0.5–7.1)	2.0 (0.5–7.9)
Endocrinology	1.9 (0.6–6.6)	1.5 (0.4–5.6)
Pulmonary	2.6* (1.3–5.4)	2.0* (1.0–4.6)
Oncology	2.9 (0.7–12.5)	2.7 (0.8–9.2)
Other	1.2 (0.4–3.4)	0.8 (0.3–2.5)

95% CI: 95% confident interval; SGA: Subjective Global Assessment; BMI: Body Mass Index; ICD10: International Classification of Diseases 10.
*Statistically significant ($p<0.05$).

average or above average incomes after controlling for other factors. In addition, 56.3% of participants did not work in the last six months and they were 1.7 times more likely to be malnourished compared to office workers. Fourteen per cent (14%) of participants were underweight (BMI <18.5 kg/m^2) in our study compared to 8.0% in Australia and New Zealand,[17] 4.1% in a study in Germany,[34] 6.0% in studies in other European countries.[35] This could indicate the contribution of chronic pre-admission underweight (20.9% of adults aged 25-64 years in 2008) as a strong contributory factor to the prevalence of hospital malnutrition in Viet Nam compared to high income countries.[36] The association between socio-economic status (income and educational level) and hospital malnutrition in this study is similar to studies from other middle income countries such as Cuba,[37] Brazil,[38] and Ecuador.[39]

Patients admitted under traumatology and pulmonary specialties in our study were more likely to experience hospital malnutrition (12.3% and 16.4% respectively). Patients with these ICD10 classifications were two times more likely to be malnourished compared to those admitted under the ear-nose-throat classification. The high prevalence of smoking (approximately 40%, mostly in men) and chronic obstructive pulmonary diseases (COPD) in the Vietnamese community (6.7% in 2003, highest among Asia Pacific countries),[40] as well as the high incidence of road traffic injuries[41] in Viet Nam may explain for the higher numbers of participants admitted under these two classifications in hospitals. Both trauma and COPD are diseases with high metabolic demand, potentially reduced intake of food and fluids and therefore these patients are at higher risk of malnutrition.[42] Similarly, although an oncology diagnosis is a significant risk factor for hospital malnutrition, it may contribute less to the prevalence of hospital malnutrition in Viet Nam compared to high income countries. The prevalence of malnutrition among oncology participants is generally high worldwide (46.5%).[42] However, the total number of oncology participants in our study was low (5%) compared to 9.5% in Australia,[17] 25.2% in Germany.[34] This may reflect the relative lower rate of cancers in low-middle income countries like Viet Nam compared to high income countries,[43] which is a trend that is rapidly changing. Alternatively it may reflect relatively lower admission rates

for cancer and/or lower rates of diagnosis, compared to other medical problems in general hospitals in Viet Nam.

Our study found that participants with hospital stays over 10 days were 1.6 times more likely to be malnourished compared to participants with shorter hospital stays (less than 5 days). Longer hospital length of stay is both a cause and consequence of hospital malnutrition and this trend is comparable to many other studies.[17,31,37,38,44,45] This is of particular concern in Viet Nam where patient-care including nutritional care during hospitalization is not provided totally by hospital staff but also from the patient's family members. Therefore, the longer the hospital stay, the higher the risk of inappropriate nutritional care. Participants admitted via emergency (61.6%) had a 1.5 times statistically significant higher risk of malnutrition compared to participants with elective admissions. This risk is also comparable with studies in Spain. [46]This may be due to patients admitted via emergency having a higher likelihood of suffering from severe acute medical conditions or exacerbations of chronic medical conditions with high metabolic demand and poor dietary intake.

Age may contribute less to the prevalence of malnutrition in Viet Nam compared to high income countries. It is obvious that older age is strongly associated with the risk of malnutrition during hospitalization.[17,34,35] However, the mean age of participants from this study (58.5±19.2 years) is lower than the mean of age in studies from Australia (64.6±18 years),[17] Germany (62.2±17.4),[34] and other European countries (62.5±18 years).[35] This is explained by the lower life expectancy of Vietnamese (76 years old in 2014) compared to high income countries like Australia (82 years old in 2014), Germany (81 years old in 2014), United Kingdom (81 years old in 2014).[47] However, again this is likely to change in the ensuing years due to a rapidly ageing population in Viet Nam. Currently, 7% of the population are over the age of 65 and it is projected that 17% will be aged 65 and over in 2040.[48]

Nutritional care provision for patients identified as malnourished during hospitalization in Viet Nam is limited. This is due to a number of reasons including: the lack of infrastructure for food provisioning in a majority of hospitals in Viet Nam (patients have to buy meals from the hospital canteen, bring food from home or buy food for themselves from outside of the hospital); food is not currently provided as a part of care covered by medical insurance; there are a limited number of qualified staff in nutrition and dietetics departments in most hospitals, and medical doctors and nursing staff have limited expertise and interest about nutrition and dietetics. As a result, patients and their family members have to provide nutritional care including selection, buying, serving and storing of meals. The low social-economic status of a majority of the hospital patient population, as found in this study, means that food provisioning is a significant challenge for patients and their families.

This study has identified the prevalence of hospital malnutrition and contributing factors, and as a result provides evidence for appropriate strategies by the government and health authorities. Firstly, the prevalence of hospital malnutrition indicates the need for policies, guidelines and protocol on nutrition screening, assessment and intervention during hospitalization. Currently, policies and guidelines to identify and manage hospital malnutrition in Viet Nam exist but are in the preliminary stages of development and implementation. Implementation of interventions will require an input of funding to: increase the nutrition and dietetic workforce; adequately train this workforce and increase the expertise of other medical staff; develop foodservice infrastructure that works within the Vietnamese context; develop Vietnamese specific protocols for prevention and management of malnutrition using a food-first approach. Secondly, the socio-economic status (particularly the poverty status) of the hospital population needs to be taken into consideration and one of the key policy areas would be the implementation of universal medical insurance that included the cost of food as the first medicine.

The current study have some strengths, no hospitals declined to participate and there was a high response rate among participants, the study also included a representative sample of hospitals and patients in HCMC Viet Nam. There are, however, some limitations including the selection the hospitals on a convenience basis rather than random selection as well as the exclusion of private hospitals and patients admitted to ICU or emergency wards.

In conclusion, hospital malnutrition is a significant health problem in HCMC, Viet Nam. Socio-economic status and pre-admission underweight were significant risk factors besides other clinical risk factors. The prevalence and associated risk factors of hospital malnutrition are summarized in diagram in Figure 2. Improvement of nutrition and dietetics services in HCMC Viet Nam is

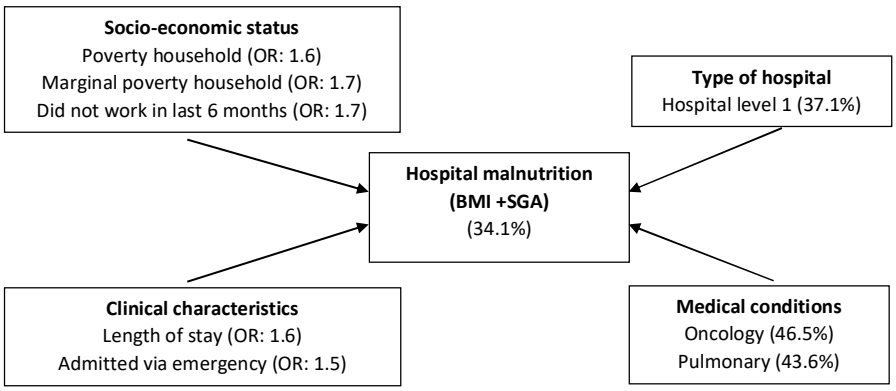

Figure 2. Diagrammatic summary of hospital malnutrition prevalence and associated risk factors.

crucial to optimize patient outcomes.

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AUTHOR DISCLOSURES

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