

# Malnutrition among patients admitted to the subacute geriatric ward during the COVID-19 pandemic era: A cross-sectional study in a tertiary hospital in Malaysia

Chiann Ni Thiam, MB Bch BAO<sup>1</sup>, Shoban Mathavan, MD<sup>1</sup>, Aimy Abdullah, MB Bch BAO<sup>2</sup>, Elizabeth Gar Mit Chong, MBBS<sup>1</sup>

<sup>1</sup>Department of General Medicine, Hospital Kuala Lumpur, Ministry of Health, Jalan Pahang, Kuala Lumpur 50586, Malaysia,

<sup>2</sup>Faculty of Medicine, Universiti Teknologi MARA, Sungai Buloh Campus, Jalan Hospital, Sungai Buloh, Malaysia

## ABSTRACT

**Background:** Acute illness and hospitalisation detriment the nutritional status of older patients. This study aimed to describe the prevalence of malnutrition, characteristics and in-hospital outcomes associated with malnutrition, and nutritional management among patients who were admitted to the Subacute Geriatric Ward.

**Methods:** This is a retrospective study of older patients (age  $\geq 60$ ) who were admitted to the Subacute Geriatric Ward of Kuala Lumpur Hospital from 1 March 2021 to 31 May 2021. Malnutrition was identified using the Mini Nutritional Assessment-Short Form (MNA-SF). The in-hospital outcomes evaluated were hospital-associated complications, namely delirium, functional decline, incontinence, inpatient falls, inpatient pressure injuries, hospital-acquired infection, institutionalisation, and inpatient mortality.

**Results:** Seventy-three patients were included (mean age 74.7, female 58.9%), of which 28 (38.4%) and 27 (37.0%) were malnourished and at risk of malnutrition, respectively. Poorer nutritional status was associated with increased age, comorbidity burden, frailty, immobility, impaired basic activities of daily living, history of falls, cognitive impairment, incontinence, and arthritis. About 71.2% and 60.3% of patients were offered dietitian review and oral nutritional supplements, respectively. The in-hospital outcome rates were higher among malnourished patients, but the differences were not statistically significant. However, multiple hospital-associated complications were more common with poorer nutritional status ( $p = 0.018$ ).

**Conclusion:** Hospital malnutrition is prevalent among older patients, and unidentified malnutrition is not justified due to its association with multiple adverse outcomes.

## KEYWORDS:

*Malnutrition; Geriatrics; Inpatients*

## INTRODUCTION

Malnutrition prevails with age. The complex interaction between physiological changes in aging, comorbidities, and psychosocial factors has posed challenges to maintaining

good nutritional status in older adults.<sup>1</sup> The existing condition becomes more profound amid the Coronavirus Disease 2019 (COVID-19) pandemic due to social distancing and isolation.<sup>2</sup> Malnutrition can be acute or chronic, with variable degrees of severity. Associations between malnutrition and a wide range of unfavourable clinical, functional, and economic outcomes, namely prolonged hospitalisation, recurrent hospitalisation, institutionalisation, mortality, and increased healthcare cost, have been frequently reported.<sup>3-6</sup> Therefore, screening for malnutrition merits equal attention as other notable geriatric giants.

In Malaysia, the National Health and Morbidity Survey (NHMS) 2018 revealed that 30% of Malaysian older adults were malnourished.<sup>7</sup> Existing local studies on malnutrition in hospitalised older patients reported a prevalence of 21.0–34.7%, which was similar to the population-based survey.<sup>8,9</sup> Acute illness and hospitalisation are known to have greater detrimental effects on nutritional status among older adults.<sup>10</sup> Similar prevalence between those who were hospitalised and living in the community indicates that local hospital settings were not exempted from under-recognition of malnutrition.

To date, most local hospital-based studies on malnutrition had been concentrated on the description of the nutritional screening and assessment conducted. Apart from post-surgery complications,<sup>11</sup> limited data exist on in-hospital outcomes associated with hospital malnutrition among older patients in Malaysia. Data specific to this context may fill the information gaps and drive the implementation of policies that meet the healthcare issues of the target group. This study aimed to describe the prevalence of malnutrition, characteristics and in-hospital outcomes associated with malnutrition, and nutritional management among older patients who were admitted to the Subacute Geriatric Ward of a tertiary hospital in Malaysia.

## MATERIALS AND METHODS

### Study Participants and Data Collection

This is a retrospective study including patients aged 60 years and above admitted to the Subacute Geriatric Ward of Kuala Lumpur Hospital from 1 March 2021 to 31 May 2021. The

*This article was accepted: 08 April 2022*

*Corresponding Author: Chiann Ni Thiam*

*Email: cnthiam617@gmail.com*

study setting is a 22-bedded ward that uses an integrated team approach to provide the following services to older patients: (1) continued medical treatment when acute hospital care is no longer required such as titration of medication, completion of intravenous antibiotics therapy, pain management, and delirium care; (2) rehabilitation for patients who suffer from functional decline after an acute medical illness, including post-COVID rehabilitation; and (3) elective admission from the outpatient clinic for rehabilitation, treatment, or investigation. Although we do not receive direct admission from the emergency department, we manage new or changing health conditions of our existing patients, including emerging acute medical illnesses, unless they required mechanical ventilation or intensive care. We excluded patients with recurrent admission to the same subacute ward within the study period, i.e., only the first admission will be included.

Medical records were reviewed to collect data on routine clinical information of hospital admission; patient's characteristics including their demographics, residential status, and ability to perform all basic activities of daily living (ambulating, feeding, dressing, personal hygiene, continence, toileting); frailty assessed by Clinical Frailty Scale;<sup>12</sup> comorbidity burden expressed as age-adjusted Charlson Comorbidity Index (CCI);<sup>13</sup> pre-existing geriatric syndromes (cognitive impairment, previous falls, immobility, iatrogenicity/polypharmacy, incontinence); and presence of hearing/visual impairment, referring to hearing/vision loss that was identified from history and examination. The admission diagnosis was defined as the initial working diagnosis documented by the attending physician who judged that inpatient care was required, which could be to an acute hospital or a subacute unit, whichever came first.

#### Assessment of Nutritional Status

Mini Nutritional Assessment-Short Form (MNA-SF) was performed on admission to identify patients who were malnourished or at risk of malnutrition.<sup>14</sup> MNA-SF, which consists of anthropometry data, general status, dietary habits, self-perceived health, and nutrition states, is a validated nutritional assessment tool in older patients, including elderly acute medical patients and the local older population.<sup>15-17</sup> It categorises patients to be malnourished, at risk of malnutrition, and normal if they score 0-7, 8-11, 12-14, respectively.<sup>14</sup> It is done by the clinician in charge during admission to the ward, and it is usually performed in conjunction with comprehensive geriatric assessment (CGA). CGA is defined as a multidimensional interdisciplinary diagnostic process focused on determining a frail older person's medical, psychological, and functional capability to develop a coordinated and integrated plan for treatment and long-term follow-up.<sup>18</sup> The components of CGA are shown in Figure 1. Existing literature had demonstrated the efficacy of performing CGA on admission in reducing mortality and care home discharge at 3-12 months of follow-up.<sup>19</sup>

#### Nutritional Management and In-Hospital Outcomes

The nutritional management report included dietitian review, prescription of oral nutritional supplements (ONS), and multivitamins. Decisions on nutritional management were dependent on the clinician's judgement and dietitian review. The in-hospital outcomes investigated were hospital-associated complications (delirium, functional decline, new

onset of incontinence, inpatient falls, inpatient pressure injuries),<sup>20</sup> hospital-acquired infection, institutionalisation, and inpatient mortality.

#### Statistical Analysis

Analyses were performed using SPSS version 26. Continuous data were expressed as mean and standard deviation (SD) or median and interquartile range (IQR) depending on their distribution. Categorical data were expressed as frequencies and percentages. Multiple hospital-associated complications referred to the development of two or more of the following complications: delirium, functional decline, new onset of incontinence, inpatient falls, inpatient pressure injury, and hospital-acquired infection. Associations between categorical variables were assessed using Pearson's chi-squared test, while the associations between continuous variables were assessed using the one-way ANOVA test or Kruskal-Wallis test depending on the distribution. The significance level of all the statistical tests was set at  $p < 0.05$ . Analyses were only performed on available data.

#### Ethics Statement

This study was conducted following the ethical principles outlined in the Declaration of Helsinki and Malaysian Good Clinical Practice Guideline. The research protocol was approved by the Medical Research Ethics Committee (MREC), Ministry of Health Malaysia (NMRR ID: NMRR-21-655-59132- IIR).

#### RESULTS

During the 3-month study period, 94 patients were admitted to the Subacute Geriatric Ward of Kuala Lumpur Hospital. After excluding patients who were aged below 60 ( $n=19$ ) and recurrent admission ( $n=2$ ), 73 patients were included in the analysis. The mean age was 74.4 (7.6). Majority were women (43/73, 58.9%). Patient baseline characteristics are shown in Table I. Twenty-eight (38.4%) and 27 (37.0%) patients were identified to be malnourished and at risk of malnutrition, respectively. The mean MNA-SF score was 8.6 (3.9).

COVID-19 pneumonia (21/73, 28.8%) was the commonest admission diagnosis followed by other infections, falls or fractures, and neurological disorders (Table I). A lower rate of malnutrition was reported among patients admitted for COVID-19 pneumonia. There was no association between worsening nutritional status with other admission diagnoses (Table 1).

The nutritional management of patients with different nutritional statuses during hospitalisation is shown in Figure 2. Majority were reviewed by dietitians (52; 71.2%) and given ONS prescriptions (44; 60.3%). Prescription of multivitamins (21; 28.8%) was less common. Two out of 28 malnourished patients and 8/27 patients at risk of malnutrition did not receive any of the specified nutritional management. All patients who had dysphagia and required enteral tube feeding during their hospitalisation (17; 23.3%) were reviewed by dietitians. There was no difference in the rate of malnutrition between patients who had dysphagia and those who did not (38.5% versus 38.3%). Three patients had been on enteral tube feeding before admission, and they were all malnourished.

Table I: Characteristics of patients who were admitted to the Subacute Geriatric Ward

	All (N=73) n(%)	Normal (N=18) n(%)	At risk of malnutrition (N=27)	Malnourished (N=28) n(%)	p
Age(year) <sup>a</sup>	74.7±7.6	68.6±5.8	76.5±7.1	77.0±7.2	<0.001
Female	43(58.9)	10(55.6)	15(55.6)	18(64.3)	0.762
Ethnicity					
Malay	23(31.5)	5(27.8)	8(29.6)	10(35.7)	
Chinese	34(46.6)	9(50.0)	14(51.9)	11(39.3)	
Indian	15(20.5)	3(16.7)	5(18.5)	7(25.0)	
Others	1(1.4)	1(5.6)	0	0	
Nursing Home Resident	6(8.2)	0	4(14.8)	2(7.1)	-
BADL independent	47(64.4)	18(100.0)	19(70.4)	10(35.7)	<0.001
Ambulation					<0.001
Independent	34(46.6)	17(94.4)	10(37.0)	7(25.0)	
Walking stick/frame	18(24.7)	1(5.6)	10(37.0)	7(25.0)	
Chair or bedbound	21(28.8)	0	7(25.9)	14(50.0)	
Geriatric Syndromes					
Previous falls	40(54.8)	5(27.8)	18(66.7)	17(60.7)	0.027
Cognitive impairment	30(41.1)	1(5.6)	11(40.7)	18(64.3)	<0.001
Incontinence	19(26.0)	2(11.1)	5(18.5)	12(42.9)	0.030
Immobility	18(24.7)	0	5(18.5)	13(46.4)	0.001
Iatrogenicity/polypharmacy	12(16.4)	1(5.6)	14(8.5)	7(25.0)	-
Comorbidities					
Hypertension	60(82.2)	11(61.1)	26(96.3)	23(82.1)	-
Diabetes mellitus	54(74.0)	12(66.7)	20(74.1)	22(78.6)	0.668
Stroke	28(38.4)	5(27.8)	14(51.9)	9(32.1)	0.184
Ischaemic heart disease	22(30.1)	6(33.3)	8(29.6)	8(28.6)	0.940
Arthritis	21(28.8)	1(5.6)	12(44.4)	8(28.6)	0.019
Dementia	18(24.7)	0	10(37.0)	8(28.6)	0.015
Chronic kidney disease	17(23.3)	2(11.1)	8(29.6)	7(25.0)	0.342
Congestive cardiac failure	10(13.7)	3(16.7)	4(14.8)	3(10.7)	-
Depression	8(11.0)	1(5.6)	2(7.4)	5(17.9)	-
Malignancy	5(6.8)	2(11.5)	1(3.7)	2(7.1)	-
Charlson Comorbidity Index <sup>b</sup>	6.0(4.0 —7.0)	4.0(3.0 —5.0)	7.0(4.0 —8.0)	6.0(4.0 —8.0)	0.001
Clinical Frailty Scale <sup>b</sup>	5.0(4.0 —6.0)	4.0(3.0 —4.0)	6.0(4.0 —6.0)	6.0(5.0 —7.0)	<0.001
Visual impairment	28(38.4)	4(22.2)	12(44.4)	12(42.9)	0.266
Hearing impairment	7(9.6)	2(11.1)	2(7.4)	3(10.7)	-
Admission Diagnosis					
COVID-19 pneumonia	21(28.8)	11(61.1)	5(18.5)	5(17.9)	0.002
Other infections	16(21.9)	2(11.1)	7(25.9)	7(25.0)	0.441
Falls or fracture	10(13.7)	1(5.6)	3(11.1)	6(21.4)	-
Neurological disorders	10(13.7)	1(5.6)	6(22.2)	3(10.7)	-
Cardiac events	6(8.2)	1(5.6)	3(11.1)	2(7.1)	-
Gastrointestinal bleeding	5(6.8)	1(5.6)	1(3.7)	3(10.7)	-
Others	5(6.8)	1(5.6)	2(7.4)	2(7.1)	-
Length of stay <sup>b</sup>	17.0(11.5 —26.5)	20.0(13.0 —27.3)	20.0(6.0 —34.0)	17.0(11.0 —24.8)	0.754

BADL, Basic activities of daily living

<sup>a</sup>Mean(SD)<sup>b</sup>Median(IQR)

p-values obtained using the one-way ANOVA test, Pearson's chi-squares test, and Kruskal-Wallis test

Other infections: Non-COVID-19 pneumonia, urinary tract infections, skin and soft tissue infections

Neurological disorders: Ischaemic stroke, intracerebral haemorrhage, seizure, and dementia

Cardiac events: Acute coronary syndrome, acute heart failure, and arrhythmia

Others: Haematological disorders, endocrine emergencies, and electrolyte imbalance

The median (IQR) length of stay was 17.0 (11.5–26.5) days. The frequencies and rates of in-hospital outcomes are shown in Table II. Functional decline was the commonest hospital-associated complication followed by hospital-acquired infections and delirium (Table II). Forty-four (60.3%) patients had developed multiple hospital-associated complications, and the percentage of hospital-associated complications per patient is shown in Figure 3. The mortality rate was 13.7% (Table II). Despite the lack of association with individual outcomes, a higher rate of multiple hospital-associated complications was observed as nutritional status deteriorated

(Table II). Total number of hospital-associated complications was not demonstrated to be increased with worsened malnourished state (Table II).

## DISCUSSION

This is the first study looking at in-hospital outcomes of older patients with malnutrition in Malaysia. Three-quarters were either malnourished or at risk of malnutrition. Various associating factors of malnutrition were identified, namely increased age, inability to perform basic activities of daily

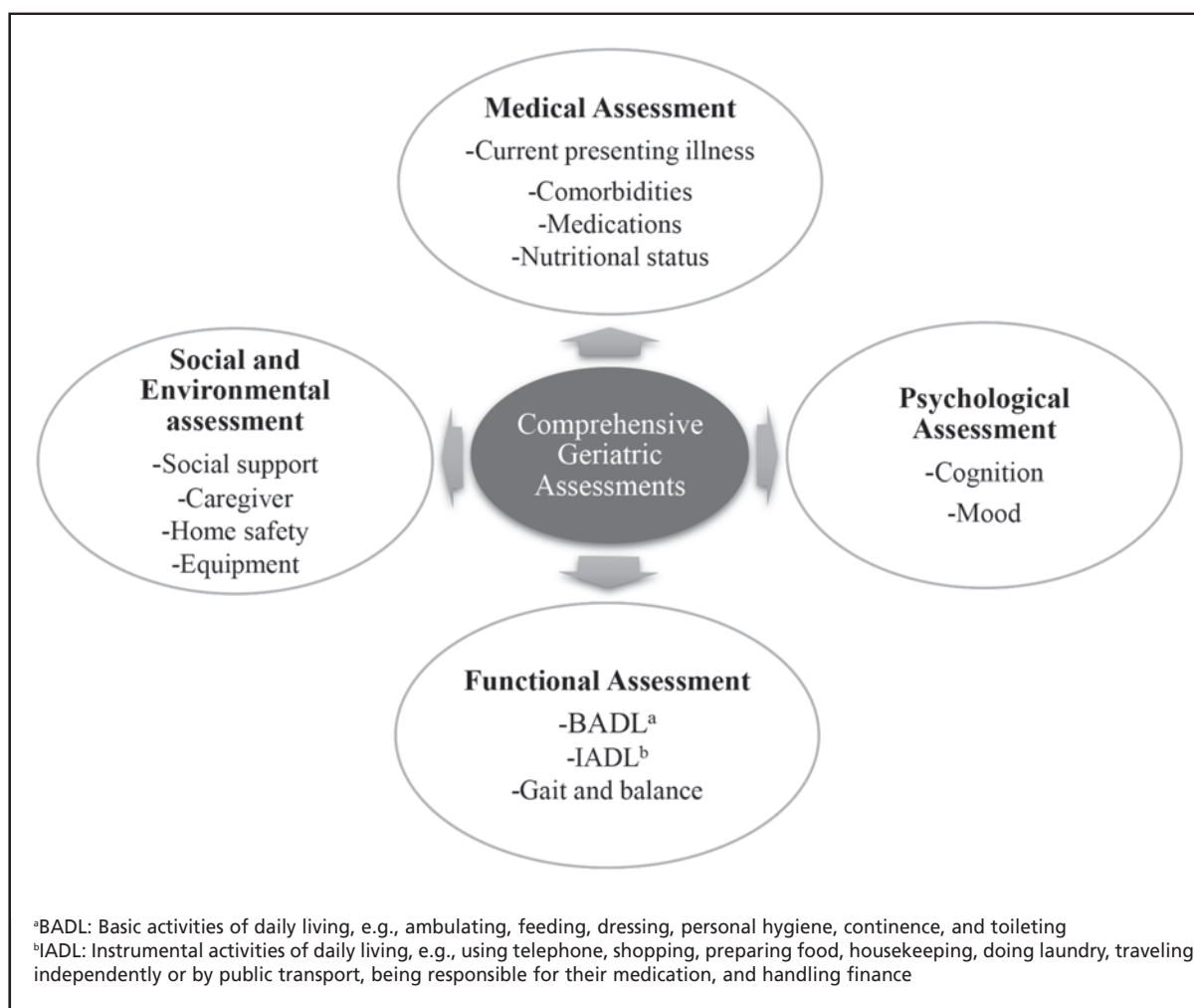
**Table II: In-hospital outcomes of patients who were admitted to the Subacute Geriatric Ward**

	All (N=73) n(%)	Normal (N=18) n(%)	At risk of malnutrition (N=27) n(%)	Malnourished (N=28) n(%)	p
Hospital-Associated Complications					
Functional decline	49(67.1)	11(61.1)	16(59.3)	22(78.6)	0.257
Hospital-acquired infection	36(49.3)	6(33.3)	14(51.9)	16(57.1)	0.273
Delirium	30(41.1)	4(22.2)	13(48.1)	13(46.4)	0.171
Inpatient pressure injury	20(27.4)	4(22.2)	10(37.0)	6(21.4)	0.367
New onset of incontinence	19(26.0)	3(16.7)	9(33.3)	7(25.0)	0.453
Inpatient falls	2(2.7)	0	1(3.7)	1(3.6)	-
Number of hospital-associated complications <sup>a</sup>	2.0(1.0 —3.0)	1.0(0 —2.0)	2.0(0 —3.0)	2(1.0 —4.0)	0.158
Multiple hospital-associated complications	44(60.3)	6(33.3)	17(63.0)	21(75.0)	0.018
Institutionalisation	8(11.0)	1(5.6)	4(14.8)	3(10.7)	-
Mortality	10(13.7)	1(5.6)	4(14.8)	5(17.9)	-

p-values obtained using Pearson’s chi-squares test and Kruskal-Wallis test

<sup>a</sup>Median(IQR)

Multiple hospital-associated complications: development of two or more of the following complications: delirium, functional decline, new onset of incontinence, inpatient falls, inpatient pressure injury, and hospital-acquired infection.



**Fig. 1: Components of comprehensive geriatric assessments.**

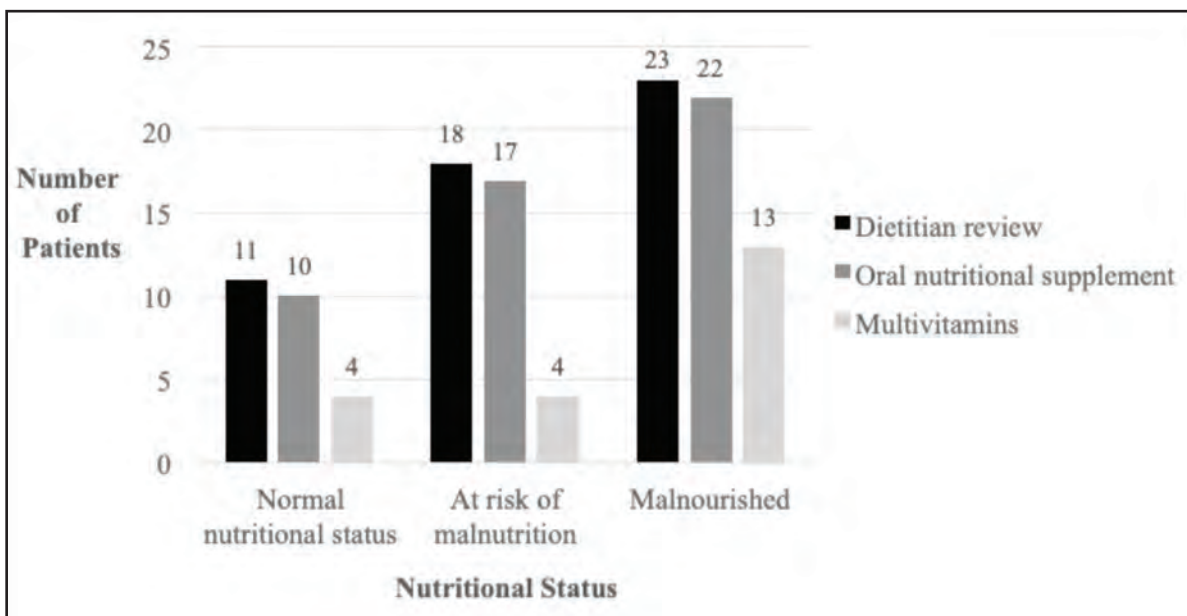


Fig. 2: Nutritional management provided according to nutritional status. N = 73. Normal nutritional status, n=18; At risk of malnutrition, n=27; Malnourished, n=28.

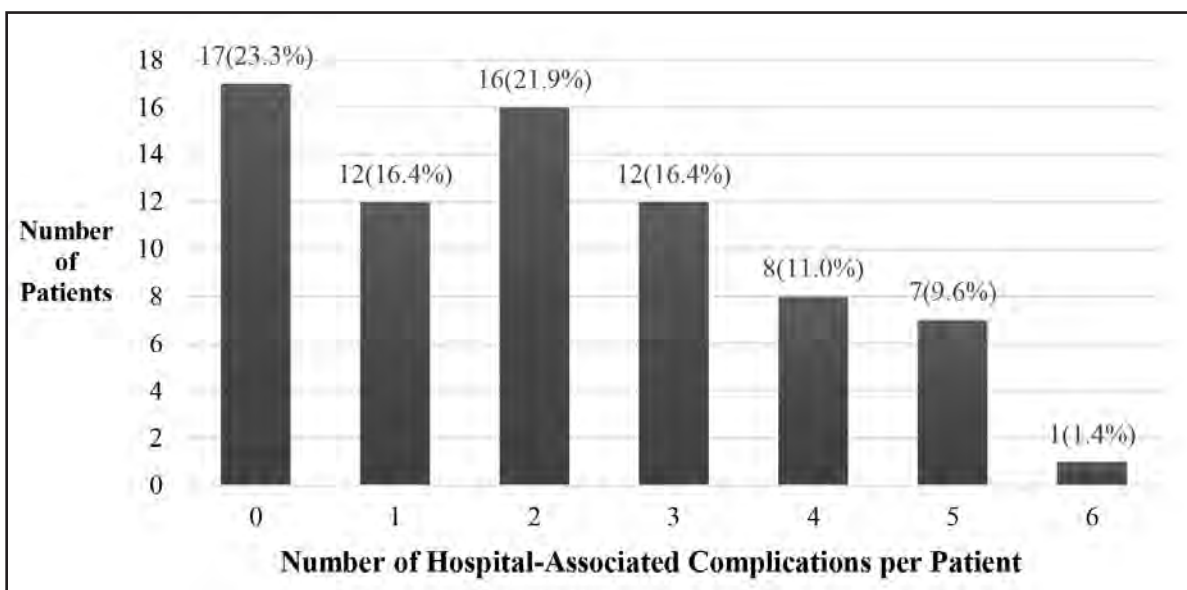


Fig. 3: Number of hospital-associated complications (delirium, functional decline, new onset of incontinence, inpatient falls, inpatient pressure injuries, and hospital-acquired infection) per patient.

living (BADL), immobility, cognitive impairment, comorbidity burden, and frailty. Its association with multiple hospital-associated complications was not unanticipated as a large majority of malnourished older patients were frail.

The reported prevalence of malnutrition was higher than prior local studies. This could be contributed by the discrepancy in patient characteristics as the patient admitted to the Subacute Geriatric Ward were more likely to have pre-existing geriatric syndromes compared to those admitted to the general medical ward. Our findings of associations between age<sup>21,22</sup> and pre-existing geriatric syndrome<sup>23</sup> with

malnutrition were consistent with existing literature. Length of stay was not included as an adverse outcome as it could be determined by rehabilitation progress in the study setting. The finding of a higher rate of complications among malnourished patients without statistically significant association could be contributed by a small number of participants. Nevertheless, similar findings had been reported in an earlier study.<sup>24</sup> Loss of protein, which is a common feature of malnutrition, renders older adults to be immunocompromised and sarcopenic, which in turn leads to delayed recovery, increased susceptibility to infection, instability, and immobility.<sup>25</sup> These detrimental effects of

malnutrition could have driven the development of hospital-associated complications. Although this study was unable to establish a causal link between malnutrition and hospital-associated complications, the MNA-SF assessment on admission might have reduced the likelihood that malnutrition was induced by complications during hospitalisation.

MNA is the most widely used screening tool and a shorter form of the MNA (MNA-SF) is designed exclusively for older patients.<sup>26</sup> It is a simple validated tool for assessing nutritional status among older acute medical patients.<sup>16</sup> Although there were concerns about its accuracy and reliability among patients who could not complete the questions themselves, particularly those who were cognitively impaired,<sup>27</sup> this can be overcome by acquiring collateral history from their family members or caregivers to complete the questions,<sup>28</sup> and this has been a common practice in the study setting. As MNA-SF was conducted on admission, the impact of dysphagia on nutritional status may not be imminent, especially because most patients did not have dysphagia before admission. This could explain our finding that a similar rate of malnutrition was found between patients with and without dysphagia. Regrettably, there were patients with malnutrition who did not receive any of the specified nutritional management. The explanations discussed included a recent dietitian's review before admission and a brief hospital stay. However, the precise reasons were unknown, and the clinician's oversight could not be excluded.

This study was limited by the small sample size and was a single-centre retrospective study. We could not rule out selection bias as the admission to the Subacute Geriatric Ward was determined based on bed availability and the clinician's judgment on the benefit or suitability of admission. Socioeconomic factors were not investigated in this study, and they had been comprehensively discussed in a large local community study.<sup>29</sup> The accuracy of data was dependent on clinicians' documentation as data were extracted from hospital medical records. Outcomes studied here, such as delirium and functional decline, may lack standardisations. The amount of data that could be extracted was limited to what had been recorded. We did not capture details on the nutritional management, such as frequency of dietitian reviews, compliance to dietary advice, and the types of oral nutritional supplements. Limited by the study design, we could not conclude the efficacy of nutritional management on patient outcomes. Instead, long-term outcomes such as readmission rate and 3- or 6-month mortality should be evaluated.

The optimal management strategy of malnutrition is characterised by an individualised nutritional care plan that involves screening and detailed assessment, multidisciplinary teamwork, and patient-centred care.<sup>30</sup> Nevertheless, assessment of malnutrition is not a mandatory process in Malaysian government hospitals. The management reported in this study (dietitian review, prescription of oral nutritional supplements, and oral multivitamins) should not be regarded as the sole management of malnutrition. The affordability of oral nutritional supplements limits their use, especially after

discharge from the hospital. Access to oral multivitamins is not a concern in many Malaysian government hospitals and subsequently becomes a common practice that lacks support from evidence. Injudicious use results not only in extra pill counts but also in unfavourable effects. Efforts should be given to addressing oral care, drug–drug interaction, or polypharmacy in addition to treating acute medical issues. Patients' preferences and cultural backgrounds should not be neglected in formulating dietary plans, especially in this multiracial and multicultural nation. As malnutrition is a multifactorial condition, service improvement projects on adherence to active identification of various factors of malnutrition merit consideration in the future. Barriers exist due to scarce resources in sustaining care delivered to tackle both personal and organisational factors contributing to malnutrition in hospitalised patients, which requires a multidisciplinary effort. In addition to an increased number of referrals to dietitians, re-evaluation of nutritional status and intervention are often required in vulnerable older patients with dynamic clinical conditions. We need a sufficient number of dietitians to meet these requirements, which is currently lacking in our service. Prioritising those who are malnourished or at risk of malnutrition as they are more prone to complications could be a sensible short-term strategy till more resources are available. This can be facilitated by the clinician's commitment to nutritional assessment upon admission and preferably periodic assessment during the hospital stay. Future research should be directed to the reassessment of nutritional status.

## CONCLUSION

Hospital malnutrition is prevalent among older patients in Malaysia. Unidentified malnutrition is not justified as it subjects older patients to multiple adverse outcomes. Management of malnutrition is a crucial element of geriatric care. The implementation of the Malaysian Diagnosis Related Group (DRG) case-mix system as a funding and reimbursement tool could only resolve the obstacles in sustaining nutritional care plans in hospital settings, provided that prompt and accurate documentation of malnutrition and its associated complications are in place. This study's findings will serve as the foundation for the change in the delivery of nutritional care to hospitalised older patients.

## ACKNOWLEDGEMENTS

The authors are grateful to the Director General of Health Malaysia for his permission to publish this manuscript. The authors would also like to thank the multidisciplinary team members of the Geriatric Medicine Unit Kuala Lumpur Hospital for their support.

## CONFLICTS OF INTEREST DISCLOSURES

The researchers claim no conflicts of interest.

## FUNDING

This research received no external funding.

## REFERENCES

1. Leslie W, Hankey C. Aging, nutritional status and health. *Healthcare (Basel, Switzerland)* 2015; 3(3): 648-58.
2. Lekamwasam R, Lekamwasam S. Effects of COVID-19 pandemic on health and wellbeing of older people: A comprehensive review. *Ann Geriatr Med Res* 2020; 24(3): 166-72.
3. Rasheed S, Woods RT. Malnutrition and associated clinical outcomes in hospitalized patients aged 60 and older: An observational study in rural Wales. *J Nutr Gerontol Geriatr* 2013; 32(1): 71-80.
4. Ruiz AJ, Buitrago G, Rodríguez N, Gómez G, Sulo S, Gómez C et al. Clinical and economic outcomes associated with malnutrition in hospitalized patients. *Clin Nutr* 2019; 38(3): 1310-6.
5. Correia MI, Waitzberg DL. The impact of malnutrition on morbidity, mortality, length of hospital stay and costs evaluated through a multivariate model analysis. *Clin Nutr* 2003; 22(3): 235-9.
6. Lim SL, Ong KC, Chan YH, Loke WC, Ferguson M, Daniels L. Malnutrition and its impact on cost of hospitalization, length of stay, readmission and 3-year mortality. *Clin Nutr* 2012; 31(3): 345-50.
7. Institutes of Public Health Ministry of Health Malaysia. National Health and Morbidity Survey (NHMS) 2018: Key Findings from the Elderly Health Survey; 2019 [cited March 2021]. Available from: <http://iku.moh.gov.my/images/IKU/Document/REPORT/NHMS2018/ReportNHMS2018.pdf>.
8. Sakinah H, Tan SL. Validity of a local nutritional screening tool in hospitalized Malaysian elderly patients. *Health Environ J* 2012; 3(3): 59-65.
9. Tan SL, Harith S, Abdullah H, Yusuf WN. Re-evaluation of malnutrition risk screening tool-hospital (MRST-H) for geriatric patients: A multicentre study in Peninsular Malaysia. *Sains Malaysiana* 2016; 45(9): 1311-7.
10. Krumholz HM. Post-hospital syndrome—an acquired, transient condition of generalized risk. *N Engl J Med* 2013; 368: 100-2.
11. Latiff NSMA, Ahmad N, Islahudin F. Complications associated with malnutrition in elective surgical patients in a Malaysian setting. *Trop J Pharm Res* 2016; 15: 1321-5.
12. Rockwood K, Theou O. Using the clinical frailty scale in allocating scarce health care resources. *Can Geriatr J* 2020; 23(3): 210-5.
13. Charlson M, Szatrowski TP, Peterson J, Gold J. Validation of a combined comorbidity index. *J Clin Epidemiol* 1994; 47(11): 1245-51.
14. Kaiser MJ, Bauer JM, Ramsch C, Uter W, Guigoz Y, Cederholm T et al. Validation of the Mini Nutritional Assessment Short-Form (MNA-SF): A practical tool for identification of nutritional status. *J Nutr Health Aging* 2009; 13(9): 782-8.
15. Rubenstein LZ, Harker JO, Salvà A, Guigoz Y, Vellas B. Screening for undernutrition in geriatric practice: Developing the Short-Form Mini-Nutritional Assessment (MNA-SF). *J Gerontol A Biol Sci Med Sci* 2001; 56(6): M366-72.
16. Ranhoff AH, Gjøen AU, Mowé M. Screening for malnutrition in elderly acute medical patients: The usefulness of MNA-SF. *J Nutr Health Aging* 2005; 9(4): 221-5.
17. Suzana S Jr, Siti Saifa H. Validation of nutritional screening tools against anthropometric and functional assessments among elderly people in Selangor. *Malays J Nutr* 2007; 13(1): 29-44.
18. Rubenstein LZ, Stuck AE, Siu AL, Wieland D. Impact of geriatric evaluation and management programs on defined outcomes: Overview of the evidence. *J Am Geriatr Soc* 1991; 39: 8S-16S.
19. Ellis G, Gardner M, Tsiachristas A, et al. Comprehensive geriatric assessment for older adults admitted to hospital. *Cochrane Database Syst Rev* 2017; 9(9): CD006211.
20. Mudge AM, McRae P, Hubbard RE, et al. Hospital-associated complications of older people: A proposed multicomponent outcome for acute care. *J Am Geriatr Soc* 2019; 67(2): 352-6.
21. Damayanthi HDWT, Moy FM, Abdullah KL, Dharmaratne SD. Prevalence of malnutrition and associated factors among community-dwelling older persons in Sri Lanka: A cross-sectional study. *BMC Geriatr* 2018; 18(1): 199.
22. Orlandoni P, Venturini C, Jukic Peladic N, Costantini A, Di Rosa M, Cola C et al. Malnutrition upon hospital admission in geriatric patients: Why assess it? *Front Nutr* 2017; 4: 50.
23. Saka B, Kaya O, Ozturk GB, Erten N, Karan MA. Malnutrition in the elderly and its relationship with other geriatric syndromes. *Clin Nutr* 2010; 29(6): 745-8.
24. Dominguez R. Burden of malnutrition in a tertiary care hospital in Baguio City. *SAGE Open* 2013; 3. doi: 10.1177/2158244013504936.
25. Volkert D, Beck AM, Cederholm T, Cereda E, Cruz-Jentoft A, Goisser S et al. Management of malnutrition in older patients – current approaches, evidence and open questions. *J Clin Med* 2019; 8(7): 974.
26. Morley JE. Assessment of malnutrition in older persons: A focus on the mini nutritional assessment. *J Nutr Health Aging* 2011; 15(2): 87-90.
27. Poulia KA, Yannakoulia M, Karageorgou D, Gamaletsou M, Panagiotakos DB, Sipsas NV et al. Evaluation of the efficacy of six nutritional screening tools to predict malnutrition in the elderly. *Clin Nutr* 2012; 31(3): 378-85.
28. Orsitto G. The mini-nutritional assessment and cognitive impairment in older people. In: Martin CR, Preedy V, Editors. *Diet and nutrition in dementia and cognitive decline*. Elsevier Inc; 2015: 1174-85.
29. Ahmad MH, Salleh R, Cheong SM, Pardi M, Che Abdul Rahim N, Shahri N et al. Malnutrition among the elderly in Malaysia and its associated factors: Findings from the National Health and Morbidity Survey 2018. *J Nutr Metab* 2021: 6639935.
30. Avelino-Silva T, Jaluul O. Malnutrition in hospitalized older patients: Management strategies to improve patient care and clinical outcomes. *Int. J. Gerontol* 2017; 11(2): 56-61.