Original Article

The Proportion of Hospital-Associated Deconditioning Among Hospitalised Older Adults at Hospital Pakar Universiti Sains Malaysia

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Abstract

Background: **Hospital-associated deconditioning (HAD), defined as the loss of independence in activities of daily living following acute hospitalisation, is observed among older adults. Multiple factors are associated with HAD, and knowing these factors allows us to identify high-risk patients and intervene both during and after hospitalisation to maintain patient functioning. This study aims to determine the proportion of HAD among elderly patients admitted to the general medical wards at Hospital Pakar Universiti Sains Malaysia and to identify associated factors.**

Methods: **A cross-sectional study involving 242 patients aged 60 years or older who were admitted to the hospital's general medical wards was conducted. Demographic data were collected using a proforma. Functional status was assessed using the Katz Index at both admission and discharge. Simple and multiple logistic regression analyses were performed to identify factors associated with HAD.**

Results: **A total of 242 older adults (mean age 70.8 ± 7.3 years; 52.9% female) were included. Most were Malay (92.1%) and had hypertension (81.4%), hyperlipidaemia (57.4%) and diabetes mellitus (56.6%). The proportion of HAD was 17.8%. Factors significantly associated with HAD included hypoalbuminaemia (adjusted OR: 14.5; 95% CI: 2.15, 97.94; $P = 0.006$), malnutrition (adjusted OR: 9.5; 95% CI: 3.06, 29.31; $P < 0.001$) and delirium (adjusted OR: 9.9; 95% CI: 4.32, 22.89; $P < 0.001$).**

Conclusion: **HAD is prevalent among hospitalised elderly patients with malnutrition and is significantly associated with hypoalbuminaemia and delirium. Early interventions, including nutritional support, mobility programmes and delirium-prevention strategies, are essential for mitigating HAD and improving patient outcomes.**

Keywords: *hospital-associated deconditioning, elderly, malnutrition, hypoalbuminaemia, delirium, functional decline*

Introduction

Hospital-associated deconditioning (HAD) is a prevalent yet frequently under-recognised complication of hospitalisation, particularly among geriatric patients (1). It is characterised by a progressive decline in functional capacity, reduced mobility and increased dependence on caregivers, all of which contribute to prolonged hospital stays, elevated healthcare expenditure and diminished quality of life (2–4). Given the rising global burden of an ageing population, the need to understand, prevent and manage HAD has become increasingly imperative.

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HAD arises from a multifactorial interplay of physiological and environmental determinants, including prolonged immobility (5), inadequate nutritional intake, pre-existing comorbidities and cognitive dysfunction (1, 6). The cumulative effects of these factors precipitate muscle atrophy (5), cardiovascular deconditioning and reduced physiological reserves, complicating post-hospitalisation recovery (6). Empirical evidence has shown that HAD is strongly associated with adverse clinical outcomes, including increased mortality, prolonged rehabilitation periods and a heightened risk of institutionalisation (6). Consequently, patients who recover from the primary medical condition may experience substantial, and in some cases irreversible, deterioration in physical and cognitive abilities (7). These findings underscore the necessity for early identification and the implementation of targeted preventive strategies.

Addressing this issue requires a paradigm shift in hospital care by integrating mobility-enhancing interventions, individualised nutritional support and cognitive preservation strategies into routine medical practice. The primary objective of this study was to determine the proportion of HAD among elderly patients admitted to general medical wards and to identify its associated factors. By clarifying the factors associated with HAD, this study aims to improve understanding of HAD and inform those involved in its prevention. The findings are expected to provide valuable insights for clinicians, healthcare policymakers and researchers, thereby improving patient outcomes and optimising hospital-based care models.

Methods

This cross-sectional study assessed HAD in elderly patients admitted to general medical wards. It focused on patients aged 60 years or older admitted to Hospital Pakar Universiti Sains Malaysia (HPUSM) for various acute medical illnesses. The study was conducted in four general medical wards, 7 Utara, 7 Selatan, 7 Timur, and 8 Selatan, over a three-month period from December 2024 to February 2025. Each ward had an average of 30 beds, with a mean monthly occupancy of 100%. The research was approved by the Ethics Commission of HPUSM (JEPeM code: USM/JEPeM/KK/24070626), and data were collected after consent was obtained from patients. This study followed the principles of the Declaration of Helsinki (1975, revised in 2013). The sample was a consecutive convenience sample.

The inclusion criteria were as follows: individuals aged ≥ 60 years who could understand and interpret the questionnaire—with informed consent obtained from the patient or, if this was not possible, from an informal caregiver or next of kin who answered the questionnaire—and who had a non-elective admission to a general medical ward from the emergency department. The exclusion criteria were as follows: patients or their next of kin who could not be interviewed at the time of hospital admission, those unable to provide written consent because of cognitive impairments or confusion or those admitted to intensive care units; elderly individuals with terminal or neurodegenerative diseases and patients who were totally dependent at baseline.

The required sample size was based on the study objective needing the largest sample. It was calculated using 80% power and a 95% confidence interval ($\alpha = 0.05$). For Objective 1 (determining the proportion of HAD at discharge), the calculation used a reported 17.1% rate of functional decline in elderly patients, defined as a five-point drop in the Barthel Index from admission to discharge. After adjusting for a 10% dropout rate, the required sample size was 242 participants. For Objective 2 (identifying factors associated with HAD, such as malnutrition, confusion, and low albumin levels [< 30 mmol/L]), the calculation assumed a 20% expected difference between groups. Using a two-proportion hypothesis test ($\alpha = 0.05$, power = 80%), the sample size, which was adjusted for a 10% dropout rate, came to 242 participants. Hence, the final sample size for this objective was also determined to be 242 participants, allowing for a 10% dropout rate.

Functional capacity was assessed using the Katz Index (KI) of Independence in Activities of Daily Living, which measures six basic activities of daily living through dichotomous responses (0 = dependent, 1 = independent). Older adults and/or caregivers were asked to describe their functional capacity prior to hospitalisation (baseline), focusing on the previous two weeks. HAD was defined as a decline of 1 or more points on the KI from baseline to discharge (8).

Nutritional status was assessed using the Mini Nutritional Assessment – Short Form (MNA-SF) questionnaire that asks about food intake decline, weight loss,

mobility, psychological stress/acute illness, neuropsychological problems, and body mass index (BMI) (or calf circumference if BMI cannot be measured). The interpretation of the questionnaire scores is as follows: i) 12 to 14 points (normal nutritional status); ii) 8 to 11 points (at risk of malnutrition); and iii) 0 to 7 points (malnourished) (9).

Data collection took place from December 2024 to February 2025. The researcher collected the data using proformas—preferably with the patient or, if this was not possible, with informal caregivers—and by consulting electronic medical records. Data were collected and analysed using SPSS version 27 (Chicago, USA). Descriptive statistics were used for the means and percentages of the demographic variables. A *P*-value analysis was used for the categorical variables to determine whether demographic factors were significantly associated with HAD. Finally, simple and multiple logistic regression analyses were used to identify factors associated with HAD.

Results

Descriptive Statistics

Baseline Characteristics of the Patients

Table 1 presents the baseline characteristics of 242 elderly patients aged 60 years or older who were admitted to the general medical wards at HPUSM between December 2024 and February 2025. There was a slightly higher proportion of females (n = 128, 52.9%) than males (n = 114, 47.1%), with a mean (SD) age of 70.76 (7.34) years. The majority were Malay (n = 223, 92.1%), with fewer Chinese (n = 14, 5.8%) and individuals of other ethnicities (n = 5, 2.1%). Common comorbidities included hypertension (n = 197, 81.4%), diabetes mellitus (n = 137, 56.6%) and hyperlipidaemia (n = 139, 57.4%). The most frequent reasons for admission were pneumonia (n = 50, 20.7%) and acute coronary syndrome (n = 36, 14.9%).

Table 1. Baseline characteristics of elderly patients more than 60 years old admitted to general medical wards in HPUSM for various acute medical illnesses from December 2024 to February 2025 (N = 242).

Variables	*n* (%)
Gender	
Male	114 (47.1)
Female	128 (52.9)
Age (years) in mean (SD)	70.76 (7.34)
Race	
Malay	223 (92.1)
Chinese	14 (5.8)
Indian	1 (0.4)
Others	4 (1.7)
Comorbidities	
Diabetes mellitus	137 (56.6)
Hypertension	197 (81.4)
Hyperlipidaemia	139 (57.4)
Ischaemic heart disease	62 (25.6)
Chronic kidney disease (CKD) Stage 1 to 5 (non-dialyse)	57 (23.6)
End-stage renal failure	9 (3.7)
Stroke	6 (2.5)
Reason for admission	
Infectious: pneumonia	50(20.7)
Infectious: urinary tract infection	4(1.7)

(*continued on next page*)

Table 1. (*continued*)

Variables	*n* (%)
Infectious: meningitis	0(0.0)
Infectious: intraabdominal sepsis	1(0.4)
Infectious: cellulitis	9(3.7)
Decompensated heart failure	10(4.1)
Acute coronary syndrome	36(14.9)
Fluid overload secondary to advanced CKD	7(2.9)
Symptomatic anaemia	4(1.7)
Serum albumin on admission	
> 25 mmol/L	235 (97.1)
< 25 mmol/L	6 (2.5)
Haemoglobin level	
> 10	189 (78.1)
< 10	53 (21.9)
Length of hospital stay (days)	
> 5 days	116 (47.9)
< 5 days	126 (52.1)
Nutritional status	
12 to 14 points (normal)	135 (55.8)
8 to 11 points (at risk of malnutrition)	80 (33.1)
0 to 7 points (malnourished)	27 (11.2)
Confusion (4AT score ≥ 4)	52 (21.5)
Presence of hospital-associated deconditioning	43 (17.8)

Table 2. Presence of hospital-associated deconditioning among elderly patients more than 60 years old admitted to general medical wards in Hospital Pakar USM for various acute medical illnesses from December 2024 to February 2025 (*n* = 43).

Presence of HAD	Estimate	95% CI
	0.178	0.132, 0.232

HAD = hospital-associated deconditioning

Most patients had normal serum albumin levels (*n* = 235, 97.1%) and haemoglobin (Hb) levels above 10g/dL (*n* = 189, 78.1%). In terms of length of stay, 116 patients (47.9%) were admitted for more than five days. In terms of nutritional status, 135 patients (55.8%) had a normal nutritional status, and 27 (11.2%) were malnourished. Confusion was observed in 21.5% of patients, and 17.8% met the criteria for HAD.

Presence of Hospital-Associated Deconditioning

Among elderly patients aged 60 years or older admitted to the general medical wards of HPUSM between December 2024 and February 2025, 17.8% (95% CI: 13.2, 23.2) experienced HAD (Table 2).

Table 3 compares factors associated with HAD in elderly patients admitted to the general medical wards at HPUSM. Among the 242 patients, 199 did not have HAD, whereas 43 did. The HAD group was older, with an average

Table 3. The descriptive statistics of factors associated with the presence of hospital-associated deconditioning among elderly patients aged more than 60 years old admitted to general medical wards in Hospital Pakar USM for various acute medical illnesses from December 2024 to February 2025 (N = 242).

Variables	No HAD (n = 199) n (%)	HAD (n = 43) n (%)	Total n (%)
Age (years)	70.05 (7.05)	74.07 (7.92)	
Comorbidities			
0 to 2	58 (29.1)	13 (30.2)	71 (29.3)
> 2	141 (70.9)	30 (69.8)	171 (70.7)
Albumin level			
> 25 mmol/L	197 (99.0)	38 (90.5)	235 (97.5)
< 25mmol/L	2 (1.0)	4 (9.5)	6 (2.5)
Haemoglobin level			
> 10	160 (80.4)	29 (67.4)	189 (78.1)
< 10	39 (19.6)	14 (32.6)	53 (21.9)
Nutritional status			
12 to 14 points (normal)	126 (63.3)	9 (20.9)	135 (55.8)
8 to 11 points (at risk of malnutrition)	59 (29.6)	21 (48.8)	80 (33.1)
0 to 7 points (malnourished)	14 (7.0)	13 (30.2)	27 (11.2)
Length of hospital stay			
> 5 days	89 (44.7)	27 (62.8)	116 (47.9)
< 5 days	110 (55.3)	16 (37.2)	126 (52.1)
Delirium			
No	175 (87.9)	17 (39.5)	192 (79.3)
Yes	24 (12.1)	26 (60.5)	50 (20.7)

HAD = hospital-associated deconditioning

age of 74.07 years compared with 70.05 years in the non-HAD group. Of six patients with abnormal albumin, four had HAD. Similarly, a higher proportion of HAD patients had Hb levels below 10g/dL (32.6%) compared with the non-HAD group (19.6%). In terms of nutritional status, a larger percentage of HAD patients were malnourished (30.2%) or at risk of malnutrition (48.8%), whereas the majority of non-HAD patients had a normal nutritional status (63.3%). Longer hospital stays (> 5 days) were more common in the HAD group (62.8%) than in the non-HAD group (44.7%). Delirium was significantly more prevalent in the HAD group (60.5%) than in the non-HAD group (12.1%).

Univariable and Multivariable Analyses

Table 4 presents the application of simple and multiple logistic regression analyses to identify factors associated with HAD. All variables with P < 0.25 in the simple logistic regression analysis, as well as those considered biologically or clinically important, were included in the multiple logistic regression analysis. Variable selection was performed using forward and backward selection. In the multiple logistic regression model, albumin level, nutritional status and delirium were significantly associated with HAD.

The final multiple logistic regression model of factors associated with HAD can be interpreted as follows: albumin level showed a significant association with HAD. Patients with an albumin level < 25 mmol/L had significantly higher odds of HAD than patients with an albumin level > 25 mmol/L (adjusted OR = 14.516; 95% CI: 2.151, 97.94; P = 0.006). Nutritional status was significantly associated with HAD. Patients with Mini Nutritional Assessment (MNA) scores of 8 to 11 (at risk of malnutrition) and 0 to 7 (malnourished) demonstrated significantly higher odds of HAD

Table 4. Associated factors of the presence of hospital-associated deconditioning among elderly patients aged more than 60 years old admitted to general medical wards in Hospital Pakar USM for various acute medical illnesses from December 2024 to February 2025 using simple and multiple logistic regression (N = 242).

Variables	Simple logistic regression		Multiple logistic regression	
	Crude odds ratio (95% CI)	*P*-value[a]	Adjusted odds ratio (95% CI)	*P*-value[b]
Age (years)	0.071 (1.028, 1.122)	0.002		
Comorbidities				
0 to 2	1			
> 2	1.053 (0.513, 2.162)	0.887		
Albumin level				
> 25 mmol/L	1	0.008	1	
< 25 mmol/L	10.368 (1.834, 58.633)		14.516 (2.151, 97.941)	0.006
Haemoglobin level				
> 10	1	0.066		
< 10	1.981 (0.957, 4.100)			
Nutritional status				
12 to 14 points (normal)	1		1	
8 to 11 points (at risk of malnutrition)	4.983 (2.152, 11.541)	< 0.001	2.763 (1.067, 7.156)	0.036
0 to 7 points (malnourished)	13.00 (4.718, 35.818)	< 0.001	9.465 (3.057, 29.310)	< 0.001
Length of hospital stay				
< 5 days	1			
> 5 days	2.086 (1.056, 4.11)	0.034		
Delirium				
No	1		1	
Yes	11.152 (5.292, 23.502)	< 0.001	9.939 (4.315, 22.892)	< 0.001

[a] Forward stepwise multiple logistic regression model was applied; [b] The overall fit of the model was checked and reported to be the Hosmer–Lemeshow test (P = 0.739), with an overall correctly classified percentage = 87.6%. The area under the curve (84.6%) was applied to check the model's fitness.

than patients with normal nutritional status (adjusted OR = 2.763; 95% CI: 1.067, 7.156; P = 0.036 and adjusted OR = 9.465; 95% CI: 3.057, 29.310; P < 0.001, respectively). Delirium was significantly associated with HAD, with patients experiencing delirium having higher odds of HAD than those without delirium (adjusted OR = 9.939; 95% CI: 4.315, 22.892; P < 0.001).

The model's overall fit was assessed using the Hosmer–Lemeshow test, which showed a non-significant result (P = 0.739). This indicated that the model's predicted values were well aligned with the observed values, suggesting a good fit. The model correctly classified 87.6% of cases, indicating good classification performance. The area under the receiver operating characteristic curve was 84.6%, indicating a strong ability to discriminate between patients with and without HAD.

Discussion

This study showed that 17.8% of elderly patients admitted to the general medical wards at HPUSM developed HAD. This finding is consistent with prior research, which estimated the HAD prevalence among elderly patients in acute care settings to be 13% to 31% (10). Such variation across studies can be explained by differences in study design, HAD definition criteria and patient demographics. The

prevalence reported in this study underscores the pervasive nature of HAD in hospitalised elderly populations, highlighting the need for proactive measures to address this issue. Our study's HAD rate of 17.8% is lower than the 30% reported in older adults globally (11), possibly because of differences in assessment tools or patient demographics, such as the exclusion of intensive care unit patients.

Hospitalisation often exposes elderly individuals to immobility, insufficient nutritional intake and acute medical stressors, which can all contribute to deconditioning (3, 12). Functional decline in hospitalised older adults can result in prolonged rehabilitation needs, increased healthcare costs and a higher risk of institutionalisation (13). A 17.8% prevalence rate serves as a critical reminder for healthcare providers to prioritise the prevention and management of HAD.

Our cohort of 242 elderly patients (mean age 70.76 years) showed a slight female predominance (52.9%) and a high prevalence of hypertension (81.4%), diabetes (56.6%) and hyperlipidaemia (57.4%). These findings align with studies identifying older adults, particularly those with chronic conditions, as a high-risk group for HAD due to reduced physiological reserves and baseline frailty (13–15). For example, a systematic review of HAD risk factors emphasised that multimorbidity exacerbates functional decline during hospitalisation because chronic diseases, such as hypertension and diabetes, impair mobility and recovery (14). The female predominance contrasts with some studies showing no gender-specific risk but aligns with others, suggesting that women's longer life expectancy and higher prevalence of frailty increase susceptibility (6, 14, 16). The predominance of Malay patients (92.1%) in our study contrasts with Western-focused research, which often focuses on Caucasian populations. This underscores the need for region-specific studies to address cultural, socioeconomic and genetic factors that influence HAD outcomes (17). The lack of diversity in HAD research limits generalisability (6). The Malay-majority cohort highlights the need for culturally tailored interventions because socioeconomic factors, such as caregiving practices, may influence HAD outcomes (6).

Pneumonia (20.7%) and acute coronary syndrome (14.9%) were the most common admission diagnoses. Acute infections and cardiovascular events are well-documented triggers for HAD because they often necessitate bed rest, sedation or invasive interventions that accelerate muscle atrophy and cognitive decline (15). A meta-analysis of HAD interventions noted that patients with acute illnesses experience a 5% to 10% loss of muscle mass per week during hospitalisation, which compounds functional deficits (6).

Most patients in our cohort had normal serum albumin (97.1%) and haemoglobin levels (78.1% with Hb > 10), yet 11.2% were malnourished. While hypoalbuminaemia is a known predictor of HAD (18, 19), our findings suggest that even patients with normal biomarkers may experience nutritional deficits contributing to deconditioning. This aligns with studies linking undernutrition to sarcopenia and delayed recovery, even without severe biochemical abnormalities (6, 14, 18, 20).

This study found that low serum albumin (< 25 mmol/L) was significantly associated with HAD. Serum albumin is a well-known biomarker of nutritional status and systemic inflammation (21). In a study by Brock et al. (22), the prevalence of hypoalbuminaemia was high, at approximately 9 in 10 older adults, and nutritional status and length of stay were associated with decreased serum albumin levels. Therefore, it is recommended that albumin levels should be monitored to assess patients' risk of malnutrition and other complications during hospitalisation. The strong association between hypoalbuminaemia and HAD emphasises the role of nutritional assessment upon admission. Strategies to address hypoalbuminaemia, such as individualised protein supplementation and early dietary interventions, could mitigate the risk of deconditioning. In addition, routine monitoring of albumin levels during hospitalisation may help in the identification of patients at risk of functional decline and enable timely interventions.

Malnutrition was another key factor linked to HAD. Malnutrition and the risk of malnutrition were significantly associated with higher odds of HAD. This finding aligns with prior studies demonstrating that malnutrition exacerbates muscle wasting, delays recovery and increases the risk of adverse health outcomes (23, 24). The role of nutrition in preventing deconditioning cannot be overstated. Inadequate caloric and protein intake during hospitalisation is a critical contributor to muscle atrophy and reduced physical capacity (25). Implementing standardised nutritional screening tools, such as

the MNA, can help in the early identification of at-risk patients. Multidisciplinary approaches involving dietitians, physiotherapists and medical teams are crucial to optimising nutritional intake and promoting recovery. Given the strong association between malnutrition and HAD, nutritional interventions should be a cornerstone of prevention strategies. Routine nutritional screening and timely dietary supplementation upon admission can address deficiencies before they lead to deconditioning. Enteral or parenteral nutrition may be necessary for high-risk patients to meet their caloric and protein needs.

Confusion or delirium was observed in 21.5% of patients. Cognitive decline during hospitalisation is increasingly recognised as a component of HAD, with delirium and delayed mental processing contributing to functional deterioration (15). Delirium, characterised by acute cognitive impairment, is a common complication in elderly hospitalised patients and is frequently associated with immobility and reduced participation in rehabilitation (26, 27). For instance, a scoping review highlighted that cognitive deconditioning often coexisted with physical decline; however, interventions focus disproportionately on physical rehabilitation (14). Our data reinforce the need for integrated cognitive–physical strategies, such as the frailty care bundle, which combines early mobilisation with cognitive stimulation (28). The prevention and management of delirium have far-reaching implications beyond cognitive outcomes. Strategies such as the Hospital Elder Life Programme, which focuses on early mobilisation, orientation protocols and sleep hygiene, have effectively reduced the incidence of delirium. Integrating such interventions into routine clinical practice could reduce the burden of delirium and, by extension, HAD. Efforts to prevent delirium should be integrated into standard care protocols for elderly patients. Multicomponent interventions targeting hydration, pain management and sleep hygiene have effectively reduced the incidence of delirium. Early identification and management of delirium may reduce the occurrence of HAD by maintaining patients' engagement in their care and rehabilitation.

Nearly half of our cohort (47.9%) had a stay of more than five days; however, in the multiple logistic regression analysis, duration of stay was not associated with the occurrence of HAD. This finding suggests that HAD may occur even among patients with shorter hospital stays. A meta-analysis of the prevalence of HAD in older adults found that hospitalisation in acute care poses a significant risk to the functional independence of older adults. This risk is unchanged despite shorter lengths of stay, as seen in our study (29). A systematic review found that enhanced inpatient programmes, such as early mobilisation protocols, reduced HAD incidence by 4% compared with usual care, despite low-quality evidence (6). Our findings support the urgency of implementing such interventions in resource-limited settings. Early mobilisation has consistently reduced the risk of functional decline in hospitalised patients (30). Simple measures, such as encouraging patients to sit up for meals or ambulate short distances daily, can significantly reduce the risk of deconditioning (28). Multidisciplinary mobility teams can be pivotal in designing and implementing these interventions (31).

Support systems, particularly family involvement, are pivotal in mitigating the risk and impact of HAD among older adults. Evidence suggests that family caregivers provide physical assistance and emotional motivation that promotes patient engagement in mobility and rehabilitation efforts during hospital stays (32). In Malaysia, social support has been shown to significantly influence hospitalised older adults' psychological and functional outcomes, reinforcing the importance of culturally sensitive family-centred care (33). In addition, comfort-promoting interventions in hospitals that integrate family support have been associated with improved recovery trajectories and reduced functional decline (34). These findings underscore the value of incorporating family and caregiver engagement into hospital care plans to improve patient outcomes and reduce the incidence of HAD.

Addressing HAD requires a collaborative effort across multiple disciplines. Physicians, nurses, dietitians and physiotherapists should work together to develop individualised care plans that address each patient's specific needs. Regular team meetings to discuss patients' progress and adapt interventions as necessary can enhance the effectiveness of preventive measures. Our study's findings align closely with global research on the predictors and consequences of HAD. Zisberg et al. (35) highlighted that immobility, malnutrition and delirium are among the most significant contributors to functional decline in hospitalised elderly populations.

Limitations and Future Directions

While this study provides valuable insights into the prevalence and associated factors of HAD, several limitations exist. The first is its single-centre design, as the study was conducted at a single institution and predominantly involved Malay patients. This limits the generalisability of the findings to other settings and ethnic groups. Different institutions may vary in care protocols, patient demographics and resource availability, which can influence the prevalence and associated factors of HAD (36). For example, hospitals with more advanced rehabilitation facilities or structured early-mobilisation programmes may report lower HAD rates (37, 38). In addition, the predominance of Malay patients in this study means the findings may not be entirely applicable to ethnically diverse populations in which cultural practices and health beliefs may differ. Future multicentre studies encompassing a broader range of healthcare settings and patient populations should validate and extend these findings.

A second limitation is the short follow-up period. Our study focused on in-hospital factors and did not assess post-discharge outcomes. The limited follow-up period restricted the understanding of long-term recovery trajectories and the potential persistence of HAD beyond discharge. Future studies could incorporate longitudinal designs to track patients' functional recovery and quality of life. Such an approach would provide insights into whether interventions implemented during hospitalisation have sustained benefits and identify critical periods for additional support post-discharge.

Furthermore, examining post-discharge complications, such as readmission rates and institutionalisation, could illuminate the broader impact of HAD. Including these factors in future analyses could provide a more comprehensive understanding of HAD. Future research should validate these findings in larger multicentre cohorts and explore the effectiveness of targeted interventions in reducing HAD. Studies examining the role of technology, such as wearable devices, to monitor activity levels could also provide innovative solutions to address this growing concern.

Conclusion

This study highlights the significant prevalence of HAD and its strong associations with hypoalbuminaemia, malnutrition and delirium in hospitalised elderly patients. Given their significant association with HAD, these factors may represent important targets for preventive interventions. By prioritising the prevention and management of HAD, healthcare systems can better meet the needs of an ageing population.

Our demographic data provide valuable insights into HAD-associated factors in a non-Western population and emphasise the interplay of hypoalbuminaemia, malnutrition and delirium. Future research should prioritise multidisciplinary interventions and standardised diagnostic criteria to mitigate this preventable harm.

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Ethics of Study

The research was approved by the Ethics Commission of HPUSM (JEPeM code: USM/JEPeM/KK/24070626), and data were collected after consent was obtained from patients. This study followed the principles of the Declaration of Helsinki (1975, revised in 2013).

Conflict of Interest

None.

Funds

None.

Authors' Contributions

Conception and design: NAB, SNMN
Analysis and interpretation of the data: NAB
Drafting of the article: NAB, SNMN, WSWG, WMIWM
Critical revision of the article for important intellectual content: NAB, SNMN, WSWG, WMIWM
Final approval of the article: SNMN, WSWG, WMIWM
Provision of study materials or patients: SNMN, NAB, WSWG
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