

## Hospitalized Geriatric Malnutrition: A Perspective of Prevalence, Identification and Implications to Patient and Healthcare Cost

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**ABSTRACT:** Issues on malnutrition among geriatric in hospital setting are never ending although various studies reported the negative implications on patient and the healthcare system. We review the literature on hospitalized geriatric malnutrition from the perspective of its prevalence, identification and implication on patients and healthcare cost. As reported in the worldwide studies, its prevalence ranges from 12% to 75% and Malaysia is reaching 48% to 55%. Poor clinical prognosis, impaired functional status, longer hospitalization, increased in morbidity and mortality had been identified as significant implications which associated with malnutrition among hospitalized geriatric. Due to the disease ageing factors, the golden age group is especially prone to the negative impacts from nutritional depletion. The identification hospitalised geriatric malnutrition remains poor and no standard procedure is available for proper documentation due to the lack of awareness among healthcare professionals although malnutrition is reported to be closely associated to higher total hospitalization cost charges compared to well nourished patient. Malnutrition remains a hidden cost factor unaccounted for in the costing analysis for the total geriatric care in the hospital care setting. It is therefore, crucial to highlight on nutritional screening issue and emphasise on the early assessment of patient at risk prior to introduce appropriate intervention and documentation. This could prevent nutritional deterioration and improve the clinical condition while minimising financial burden due to malnutrition.

**Keywords:** Hospitalized geriatric, identification, implications, health care cost, malnutrition, prevalence.

### Introduction

Worldwide prevalence of hospital malnutrition among geriatric patients is undeniable remaining high which ranges from 12% to 75 % (Consvisky *et al.*, 1999; Murphy *et al.*, 2000; Perrson *et al.*, 2002; Suzana *et al.*, 2002; Shum *et al.*, 2005; Coelho *et al.*, 2006; Stratton *et al.*, 2006; Saka *et al.*, 2010; Vanderwee *et al.*, 2010; Sakinah *et al.*, 2010). Malnutrition has significant associations in poor clinical prognosis, decrease functional status, increase length of hospitalization, morbidity and mortality rate. However, despite the high prevalence and well documented impact of this situation, malnutrition remains poorly identified and no intervention was taken in the vulnerable group (Correria and Campos, 2003). As a result, it increased the complication of clinical condition and impaired the convalescence period. The health care system could also be affected by malnutrition as prolonged hospitalization causes huge financial burden (Raja *et al.*, 2004). A huge standard nutritional screening and assessment shall be established to identify those at risk or having malnutrition at admission level and during hospitalization to ensure a prompt intervention is taken. This helps to prevent further deterioration of nutritional status which may affect clinical condition of the patient. This paper reviews malnutrition and its implication among hospitalized geriatrics.

### *Geriatric*

Ageing is a biological process of individual and it is a universal phenomenon. Elderly people are increasing as reported by World Health Organization (WHO, 2012) with an estimation of 605 million globally. By 2025, the proportion of the population aged 60 years and above is expected to reach 11% in South and Central Asia (WHO, 2002). Like many other developing countries, Malaysia has been experiencing a change in the demographic profile as the life expectancy is increasing with the average of 72.6 years in 2000. Using the chronological age with the cut off point of 60 years and above (definition stated by United Nation in World Assembly on Ageing 1982, Vienna) geriatric population in Malaysia 745.2 thousand (5.7%) in 1980 and increased to 1.5 million (6.2%) in 2000, and are estimated to 3.4 million (10%) in 2020 (National Health Policy for Older Person, 1997).

Attributable factors such as increased life expectancy, decline in birth rate and advanced in medical technologies have contribute to rapid demographic transition. However, instead of the increasing in their number, attention must be given to ensure the golden age population is recognized as a healthy and productive group. Action must therefore be taken including taking early prevention strategies, identifying high risk individual and giving appropriate intervention where necessary.

### *Malnutrition: Definitions*

Malnutrition is a broad term which refers to several definitions used to describe the nutritional status. Malnutrition is defined as “pathological state resulting from a relative or absolute deficiency or excess of one or more essential nutrients” (Derrick, 1966). It consists of several components i.e. under nutrition resulting from insufficient food intake, over nutrition caused by excessive food intake, specific nutrient deficiencies and imbalance because of disproportionate intake (Keller, 1993). Chen et al., (2001) defined malnutrition as faulty or inadequate nutritional status; undernourishment characterized by insufficient dietary intake, poor appetite, muscle wasting and weight loss. Under certain medical conditions which impaired digestion, absorption, metabolism, excretion and alterations in the metabolic requirements leads to deficiency in dietary intake consequently contribute to the development of malnutrition (Isaia *et al.*, 2011). In brief, it is the term used to describe any disorder of nutrition resulting primarily from imbalance intake.

### *Prevalence of Malnutrition*

Malnutrition is very common among hospitalized geriatric and it has been a worldwide challenge. Reported in several studies, the prevalence ranges from 12% to 75%. **Table 1** and **Table 2** tabulate the studies determining the prevalence of malnutrition in hospital setting. The variance in the prevalence is related to the methods of the study, setting, definition of malnutrition, criteria used for the diagnosis of malnutrition, laboratory references of biochemical data and sample size.

**Table 1:** Prevalence studies of hospitalized geriatric malnutrition.

Reference	Sample size, n	Criteria for malnutrition	Findings
Consvisky <i>et al.</i> , 1999 US	369	SGA	Moderately malnourished: 24.4% Severely malnourished: 16.3%
(Murphy <i>et al.</i> , 2000) UK	49	MNA Malnourished scored (<17) At risk (scored 17.5 ± 23.5) Well nourished (scored>23.5).	Malnourished: 16% At risk of malnutrition: 47%
(Perrson <i>et al.</i> , 2002) Sweden	83	SGA  MNA	PEM : 18% Moderate PEM: 43% PEM : 26% At risk for PEM: 56%
(Shum <i>et al.</i> , 2005) Hong Kong	120	BMI < 18.5 kg/m <sup>2</sup> and Albumin < 35g/L Chinese MNA	16.7% 16.9%
Coelho <i>et al.</i> , 2006 Brazil	197	BMI (WHO) < 18.5 kg/m <sup>2</sup> BMI ( Nutrition Screening Initiative, NSI) <22.0 kg/m <sup>2</sup> Calf circumference ,CC ≤ 31 cm Hypoalbuminemia (< 28 g/L) Lymphopenia (< 1200/mm <sup>3</sup> ) Hypocholesterolemia (< 3.36 mmol/L)	Undernutrition: 29.7% 54.7%  57% 75.6% 71.1% 46.1%

SGA; Subjective Global Assessment, MNA, Mini Nutritional Assessment; PEM, Protein Energy Malnutrition; BMI, Body Mass Index, BMI (NSI), body mass index cutoff points recommended by the Nutrition Screening Initiative; BMI (WHO), body mass index cutoff points recommended by the World Health Organization; MUST, Malnutrition Universal Screening Tool; TLC, Total Lymphocyte Count; MUAC, Mid Upper Arm Circumference.

**Table 2:** Prevalence studies of hospitalized geriatric malnutrition in Malaysia

Reference	Sample size, n	Criteria for Malnutrition	Findings
(Suzana <i>et al.</i> , 2002) Malaysia	92	BMI < 18.5 or > 24.9 kg/m <sup>2</sup>  MUAC [<23.0 cm (men), <22.0 cm (women)] Hypoalbuminaemia (Albumin < 44g/L) Anaemia [Hb< 14g/L (men), < 12g/L (women)]	Chronic Energy Deficiency (CED) I, II or III: 12% Preobese, obese I or obese II: 38% Muscle wasting : 7%  71.4% 39.6%

(Sakinah <i>et al.</i> , 2010) Malaysia	181	BMI < 18.5 or > 24.9 kg/m <sup>2</sup> TLC (<1200 x 10 <sup>6</sup> L) Anemia [Hb < 13g/L (men), < 12g/L (women)] Hypoalbuminemia (Albumin < 35g/L) CC [ <30.1 cm (men), <27.3cm (women)] MUAC [<23.0 cm (men), <22.0 cm (women)]	55.2% 23.4% 39.4% 41.4% 26% 16%
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SGA; Subjective Global Assessment, MNA, Mini Nutritional Assessment; PEM, Protein Energy Malnutrition; BMI, Body Mass Index, BMI (NSI), body mass index cutoff points recommended by the Nutrition Screening Initiative; BMI (WHO), body mass index cutoff points recommended by the World Health Organization; MUST, Malnutrition Universal Screening Tool; TLC, Total Lymphocyte Count; CC, Calf Circumference; MUAC, Mid Upper Arm Circumference.

When compared, Malaysian studies show similar findings to studies conducted abroad. The prevalence of malnutrition among geriatric was reported to be 55.2% using the cut-off point Body Mass Index (BMI) 18.0% were categorized as having Chronic Energy Deficiency; CED I, II or III (BMI < 18.5kg/m<sup>2</sup>); and 37.3% were either pre-obese, obese I or obese II (BMI > 24.9kg/m<sup>2</sup>) (Sakinah *et al.*, 2010) . The prevalence is almost similar with previous study conducted by Suzana *et al.* (2002), **Table 2**.

With growing number of elderly population there will be an increase the prevalence of malnutrition among this group if actions are not taken immediately. Screening should therefore be routinely undertaken in hospitalized patients to identify those likely to benefit from nutritional intervention.

#### *Etiology of Malnutrition*

In the presents of either acute or chronic diseases, malabsorption and anorexia may be resulted which further lead to malnutrition (Norman *et al.*, 2008). Common diseases such as cancer, cardiac failure, chronic obstructive pulmonary disease (COPD), renal failure and rheumatoid arthritis (Sridhar, 2003), stroke and hip fracture (Kyle *et al.*, 2004), liver cirrhosis (Pirlich *et al.*, 2000) were associated significantly with higher prevalence of malnutrition. Decline in physiological function associated with ageing affects nutritional status among elderly. Delirium, dementia, depression, having difficulties in taste, swallowing and chewing, digestion problem, pain, mouth infection, longer hospitalization (Vanderwee *et al.*, 2010) and poor dentition (Morley, 1997) increased the risk for malnutrition among geriatric patients. The presence of multiple chronic illnesses causes multiple medications being prescribed to elderly. It is well known that polypharmacy is one of the causes of malnutrition (Pirlich *et al.*, 2006). Elderly therefore are at greater risk for adverse drug reactions and drug-induced malnutrition (Varma 1994; Lyder *et al.*, 2001).

#### *Identification*

Failure to recognise and lack of awareness have resulted in the prevalence of malnutrition to remain high. It is one of the main factors which also contribute to the malnutrition in clinical setting. Several studies had been conducted to investigate both factors. Lack of awareness and recognition of the problem leads to poor identification, documentation and intervention in combating the malnutrition making a hidden cause of prolonged hospitalization due to delay recovery phase of the patient.

Among the studies conducted, Lazarus and Hamlyn (2005) reported that the prevalence of malnutrition is found to be 42.3%. Unfortunately, only one of the malnourished patients was documented as malnourished in the medical records and only 15.3% were referred for nutritional intervention. Kelly *et al.*, (2000) found that weight had not been recorded for 47% patients with BMI <18.5kg/m<sup>2</sup>, 67% of those with BMI between 18.5–20kg/m<sup>2</sup> and who reported having lost >3kg in the last 3 months, and 67% patients with a BMI >30kg/m<sup>2</sup> during their hospital stay. In addition, none of the malnourished patients had a biochemical nutritional screen performed and only five (18%) of the malnourished patients had mentioned of the nutritional status in their referral or medical discharge letters.

A Canadian study has demonstrated a high prevalence of malnutrition in recently hospitalized medical patients with 69% using the SGA. However, on review of the hospital charts, only one patient was identified as being malnourished, references to nutritional status were recorded in two patient charts and history of weight loss, appetite status, current oral intake, and functional status were recorded for fewer than 33% of patients (Singh *et al.*, 2006).

An Australian study conducted by Bavelaar *et al.*, (2008) cites lack of awareness among health professionals to recognize malnutrition among their patients. They studied current practice of medical doctors, medical students and nurses in diagnosis and intervention of malnutrition. Results from this study show that medical students has a higher percentage (52.8%) in performing the nutritional assessment followed by nurses (29.9%) and medical doctors (15.3%).

Another study conducted in Latin America shows that 50.2% of total patients were diagnosed with malnutrition. Despite its high prevalence, the reference to the nutrition status of the patients was registered in only 23.1% of the medical records (Correria and Campos, 2003). Thus, majority of the malnourished subjects did not receive appropriate intervention as nutritional related issues was neglected in routine clinical care.

In brief, these studies demonstrate a critical finding on the identification and documentation of hospital malnutrition and it is still lacking despite the overwhelming evidences of its existence. However, there is no standard guideline in documentation of nutritional status and its evaluation, leading to improper evaluation due to poor identification and formal diagnosis of those patients. As a result, malnourished patients remain untreated and nutritional deterioration may worsen.

Several validated nutritional screening and assessment tools have been developed and validated for clinical use such as Nutritional Risk Index (NRI), Geriatric Nutritional Risk Index (GNRI), Subjective Global Assessment (SGA), Mini Nutritional Assessment (MNA), Mini Nutritional Assessment-Short Form (MNA-SF), Malnutrition Universal Screening Tool (MUST) and Nutritional Risk Screening 2002 (NRS 2002) (Poulia *et al.*, 2012). These tools are easy, quick to perform and not time consuming with good reproducibility and validity. Nonetheless, this form must be keep in the medical folder for referral of multidisciplinary health care professional and diagnosis can be generated based on the findings from these tools.

It should be mandatory to identify malnourished patients with a structured assessment and documentation of nutritional status in order to ensure sufficient attention and nutritional care is given (Ockenga *et al.*, 2005). Nutritional screening and assessment should be part of medical examination and carried out systematically prior to admission as recommended by

European Society of Parenteral Enteral Nutrition (ESPEN). Furthermore, increase awareness for appropriate and organized documentation of its existence should be highlighted for the effective and efficient health care delivery. Failure to adequately recognize and document its existence would not only increase the risk of adverse complications for patients but also financial consequences to the hospital (Carmel and Jenny, 2005)

### **Implications**

The implications due to malnutrition in clinical setting can be classified into patient and the health care system. Malnourished hospitalized elderly patients had been associated with higher morbidity and higher mortality rates especially among undernourished. Consequently there would be an increase in hospital length of stay decrease in physical function resulted from the continuous interaction of the diseases and nutritional depletion. From the aspects of health care system, malnutrition contributes to significant hospitalization cost due to intensive use of resources and longer hospitalization and cost.

#### *Morbidity*

The presence of malnutrition is likely to cause the malfunctioning of multiple organs and weakness because of the combined effect on the muscles and on the respiratory and cardiovascular system (Norman *et al.*, 2008). For example, with loss of diaphragm contractility and inspiratory muscle strength, lead to breathing difficulty or even hypoxia. As a result, the malnourished patients need ventilation support and long-term home oxygenation (Cano *et al.*, 2002)

Malnutrition might also accelerate the fatal outcome of chronic diseases and places malnourished patients at risk for delayed recovery and causes functional decline following hospitalization and worsening of existing medical problems (Covinsky *et al.*, 1999; Meydani, 2001). This condition increases the risk in developing multiple complications such as pressure ulcers (Horn *et al.*, 2004; Baumgarten *et al.*, 2006; Iizaka *et al.*, 2010), impaired immune system (Kaiser and Morley, 1994) and delay wound healing (Wissing *et al.*, 2001). Weaker immune system will increase the risk of developing infections among malnourished geriatrics. A study evaluating the association of malnutrition with nosocomial infections reported that an altered nutritional status might facilitate the occurrence of nosocomial infections among hospitalized geriatric (Paillaud *et al.*, 2005)

Geriatric patients who underwent major elective surgery, prealbumin protein, retinol-binding protein, and transferrin levels below normal values represented a significant risk for postoperative infectious complications (Junqueira *et al.*, 2005). Impaired immune system might suppress body responses to post-operative complication such as infection and if this failed, high risk patient may have a prolonged recovery phase and additional intensive treatment is then required. This interaction between the illness state and nutritional status further exacerbate the effects of malnutrition (Corish and Kennedy, 2000).

#### *Mortality*

Mortality becomes one of the major concerned among malnourished patient since various studies had found a strong relationship between malnutrition and the mortality rate. Persson *et al.* (2002) conducted a study with the aim to evaluate nutritional status and the mortality rate among geriatric patients using SGA and MNA as assessment tools. The authors found that 1

year mortality rate was higher among malnourished group (50%) compared to well nourished group (20%). Mortality among malnourished subjects increased from 65% after 2 years to 80% in the third year as compared to normal group of 30% for 2 years and 40% after 3 years.

A study conducted in United States examined the relationship between nutritional status indicated that among 369 geriatric patients, those classified as malnourished were more likely to die within one year after discharged compared to well nourished group [OR=2.81, 95% C.I (1.06,7.46) ], (Convisky *et al.*, 1999). These findings show significant implication of malnutrition that decreases the survival rate following continuous cycle of the malnutrition and the disease state. Malnutrition impaired the overall clinical condition and lead to poor prognosis if left untreated for a longer time.

#### *Poor Physical Function*

A major implication of malnutrition is decreased physical function. A study conducted by Neumann *et al.* (2005), shows that elderly subjects classified as at risk of malnutrition and malnourished assessed by MNA have poorer physical function [on admission ( $p < 0.001$ ) and 90 days ( $p = 0.002$ )] and quality of life (QOL) [on admission ( $p = 0.008$ ) and 90 days ( $p = 0.001$ )]. It was found that decreased in muscle strength resulted from malnutrition ultimately causes functional impairment and further increased dependency in daily living activities among malnourished group.

#### *Length of Stay (LOS)*

Increased in morbidity and longer treatment duration directly put malnourished patients at longer hospital stay. Several studies had demonstrated a close relationship between malnutrition and the length of hospitalization. Those diagnosed with cancer, had loss of appetite or had poor nutritional status on admission have longer hospitalization of not less than 7 days (Suzana *et al.*, 2002).

A study in Sweden found that malnourished geriatrics patients are likely to have longer hospitalization (43 days) compared to normal group (18 days) (Cederholm *et al.*, 1995). LOS had also being found to increase progressively with malnourished elderly patients according to the risk category, low-risk (15 days), medium risk (24 days) and high risk (28 days) (Stratton *et al.*, 2005). A study among Belgian elderly hospitals warded showed that malnourished group had longer hospitalization compared to normal group, with mean of LOS of 23.7 days and 18.7 days, respectively (Vanderwee *et al.*, 2010). Malnourished patients are more prone to experiencing complications during hospitalization and this causes them to have longer LOS compare to well-nourished patients (Braunschweig, 2000).

The significant impact of proper and effective treatment will improve the overall clinical progress of the patient, reduced the length of hospital stay and the burden of managing the patient. Therefore, the bed occupancy rate will be reduced and simultaneously increase the priority to those in critical condition whom required extra inpatient care.

#### *Healthcare Cost*

Since the high prevalence rates of malnutrition in the hospital setting leads to various negative outcomes to the patient, it is not surprising that the related malnutrition cases exhibit a significant secondary effects to health care provision. The malnutrition condition can either

presence during admission or developed as complication which both contribute to a significant impact to health care cost. Managing patients with malnutrition condition demand good nutritional cares which is associated to a few cost factors including costly supplements, equipments, length of stay, poor clinical progression and multiple complications (Gallagher *et al.*, 1996, Chima *et al.*, 1997, Raja *et al.*, 2004). However, due to the poor identification and documentation of this condition, important cost factors are hidden and always failed to be recognized.

**Table 3** shows several costs analysis indicating that hospitalization cost was 20% to 61% higher in malnourished group compared to normal group (Chima *et al.*, 1997; Braunschweig *et al.*, 2000; Correia and Campos, 2003; Amaral *et al.*, 2007; Lim *et al.*, 2011). Costs differences could be due to the study methods, nutritional assessment used, clinical coding and the method of financial calculations (Burns *et al.*, 1995).

**Table 3:** Health care cost analysis study associated to malnutrition

Reference	Sample size and setting	Criteria for malnutrition	Findings	
			Prevalence Malnutrition	Healthcare cost analysis result
(Chima <i>et al.</i> , 1997) US	n= 173 Medical wards	-weight for height <75% Ideal Body Weight <b>Or</b> -admission serum albumin <30g/L <b>Or</b> -≥ 10% unintentional weight loss within 1 month before admission	At risk of malnutrition = 32%	-Mean cost for: a) At risk group = \$ 6196 b) Normal group = \$ 4563 -36% higher for malnourished
(Braunschweig <i>et al.</i> , 2000) US	n= 404 Multidiscipline wards	SGA	Malnourished at admission=54%  Malnourished at discharged= 59%	-Well nourished at admission and discharged = \$ 28,631 ± 1835 - Declined nutritional status = \$ 45,762 ± 4021 -60% higher for those had declined nutritional status
(Correia and Waitzberg, 2003) Brazil	n= 709 Multidiscipline wards	SGA	Severely malnourished = 7.9%  Moderately malnourished = 26.3%	-Mean daily expense: a) Malnourished = US\$ 228.00/patient b) Well nourished = US\$ 138.00/patient - 60.5% higher for malnourished

(Amaral <i>et al.</i> , 2007) Portugal	n= 469 Multidiscipline wards	Nutritional Risk Screening-NRS 2002	Nutritional at risk during admission = 42%	-Nutritional at risk patient = (4890.6 ± 8435.2) € -Well nourished patient = (2203.6 ± 2453.4) € - 20% higher for malnourished patient
(Lim <i>et al.</i> , 2011) Singapore	n= 978 Medical and surgical wards	SGA	Severely malnourished = 25%  Moderately malnourished = 16%	-Well nourished patient = (3707 ± 5541) S\$ -Malnourished patient = (4606 ± 6665) S\$ -24% higher for malnourished patient

The cost variation can be seen from the clinical pathways developed for diseases commonly related to malnourished geriatric patients. This standard clinical and care procedure is a kind of monitoring tool within the Casemix System that is able to explain the real cost committed to treat geriatric patient with malnourished condition at hospital setting. A proper and accurate documentation of patient's diagnosis, comorbidity or complication and other related procedures to treat these patients is arguable to be fulfilled because it will be reflected on the unit cost, DRG cost weight, the hospital base rate, hospital tariff and further, the hospital reimbursement (Raja *et al.*, 2004). Ockenga *et al.* (2005) found that malnutrition contributes to significant amount of reimbursement, as there is increase by 360€ per malnourished patient or an additional total reimbursement of €35,280. Therefore, the benefit of accurate and proper patient's documentation as well as correct coding for geriatric patient associated with malnutrition has recently been highlighted in many cost analysis studies because it is related to negative clinical outcomes and highly resource utilization at hospital setting.

### Conclusion and recommendations

Various studies have highlighted the implications of malnutrition on patient and the healthcare cost. However, the prevalence remains high since there is lack of action being taken to emphasize the important of treating malnutrition in clinical setting. There is no standard clinical pathway for screening, assessing and intervene for this underlying condition. Early identification particularly among the vulnerable geriatric population is vital. Effective actions should be applied to increase awareness among health care professional. Intervention such as nutritional counseling, dietary modification, dietary supplements, enteral or parenteral nutritional support should be given. Malnutrition should be documented in a standard medical record monitor and costing purpose.

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