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A Prospective Study on Malnutrition and Duration of Hospitalisation among Hospitalised Geriatric Patients Admitted to Surgical and Medical Wards of Hospital Universiti Kebangsaan Malaysia

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ABSTRACT

Elderly people are known to be at a greater risk of malnutrition, particularly those having diseases or illnesses. A prospective study was undertaken on 92 hospitalised geriatric patients (45.6% males), aged 60 to 89 years old, admitted to surgical and medical wards at Hospital Universiti Kebangsaan Malaysia (HUKM). The study aimed to assess malnutrition at admission, day 3 and day 7 of hospitalisation, and its relation with length of stay in the wards. Malnutrition was assessed using anthropometrics and biochemical indicators. Although the majority of subjects had a normal Body Mass Index (BMI), 10.9% had Chronic Energy Deficiency (CED) and 38% were overweight. A total of 10% subjects had muscle wasting as assessed by Mid-upper Arm Circumference (MUAC). Biochemical tests indicated that women subjects were more likely to have hypoalbuminaemia ($p < 0.05$) whilst, men were at risk of anaemia ($p < 0.05$). Throughout hospitalisation, there was a significant reduction in body weight, biceps skinfold thickness, calf circumference, MUAC, percentage of body fat and body mass index (BMI) in both males and females ($p < 0.05$ for all parameters). Biochemical tests on a sub sample of subjects indicated that 71.4% had hypoalbuminaemia and 39.6% were anaemic. Subjects diagnosed with cancer, had loss of appetite or had poor nutritional status as assessed by BMI or MUAC on admission were more likely to be hospitalised longer than or equal to *7* days ($p < 0.05$ for all parameters). Serum albumin levels at admission correlated positively with MUAC values both on admission ($r = 0.608$, $p < 0.01$) and at clay seven of hospitalisation ($r = 0.906$, $p < 0.05$). There is a need to screen elderly patients at high risk of malnutrition at admission in order to reduce the length of stay and increase their health and nutritional status.

INTRODUCTION

Elderly people are at a greater risk of malnutrition due to several physiological, physical and psychosocial changes with ageing (Suzana, Dixon & Earland, 1999). Studies on food intakes and habits among Malaysian elderly living in rural areas (Suzana, Earland & Suriah, 2000; Suriah *et al.,* 1996) report that although the subjects had a regular meal pattern, dietary intake was inadequate. Most studies conducted among hospitalised elderly people (Asplund *et al.,* 1985; Constan *et al.,* 1992; Williams & Boyce 1989) report that malnutrition, as assessed using anthropometric and biochemical indicators is, common.

According to Asplund *et al.* (1985), hospitalised geriatric patients on oral feeding may be at risk of malnutrition due to several factors such as lack of screening effort; delay of nutrition intervention; restriction in frequency and duration of eating; hospital menu does not take food choices and cultural beliefs into consideration; and disease process that may increase nutrient requirement and limit food intake. Malnourished geriatric patients were at a higher risk of dying after 18 months of hospitalisation (Volkert *et al.,* 1992), being infected and staying longer in wards (Williams & Boyce, 1989). As yet, there is no data highlighting the problems of malnutrition among hospitalised geriatric patients in Malaysia. Therefore, the study aimed to determine the magnitude of malnutrition among hospitalised geriatric patients using anthropometric and biochemical indicators. The prospective changes in anthropometric values on admission and on the third and seventh days of hospitalisation were examined. Factors associated with malnutrition and the lengths of stay in the wards were also investigated.

MATERIALS AND METHODS

This study was conducted from August to November 1999 among geriatric patients aged 60 and above, newly admitted to the medical or surgical wards at HUKM. The exclusion criteria were subjects who had been hospitalised at least a month prior to admission, had deformation of body parts, who were on ventilator, and were mentally disturbed or critically ill. Eligible subjects were identified from the patient admission list at the admission counter and the accident and emergency office daily. Identified subjects were then visited in the wards to obtain their consent to participate in the study. Table 1 presents the data collection process and the variables for which data was obtained from day 1 of admission, day 3 and day 7. A trained clinical nutritionist interviewed the subjects to obtain social and health data. Some of the data such as diagnosis and medications were obtained from medical records. The clinical nutritionist also took anthropometric measurements on the subjects using standard procedures (Chumlea, Roche & Mukherjee 1986). Measurement of standing height was not possible in some subjects who were had severe kyphosis or were unable to stand straight. In these cases, knee height was used to estimate height using a derivation equation developed by Chumlea *et al.,* (1986). The estimated height from knee height and body weight were used to calculate BMI. Biochemical values of serum albumin and haemoglobin on admission were obtained from medical records on a subsample of 14 and 58 subjects, respectively. These data were not available for all subjects because this study relied on the tests carried out by the medical professionals on a few patients but not as routine assessment of all hospitalised patients. Anthropometric measurements of weight and height were measured prospectively at day 1, day 2 and day 3 of hospitalisation. The MUAC, TSF and calf circumference were measured at day 1 and day 7 of hospitalisation. Data were analysed using SPSS version 9.0. Parametric test such as the independent sample t-test was used to examine differences between continuous data. Non-parametric tests were used for data that did not distribute according to the normal curve. Pearson correlation analysis was used to investigate the association between anthropometric values with number of days of hospitalisation. The Chi square test was carried out to determine the association between malnutrition risk factors at admission (eg. muscle wasting, hypoalbuminaemia and chewing difficulty) and duration of hospitalization of less and more/equal to 7 days. The level of significance used was $p > 0.05$ for all of the statistical tests.

RESULTS AND DISCUSSION

A total of 97 patients met the eligibility criteria but 92 participated (response rate 95%). The reasons for non-response were "too tired" (n = 3) and were "unable to communicate" (n = 2). Of the subjects, 45.6% were males; 47.6% were Chinese, followed by 38.1% Malays and 14.3% Indians. The age ranged from 60 to 89 years (mean ±SD of 68.1±6.1 years). Table 2 presents the anthropometric and biochemistry characteristics of the patients at admission. Results indicated that women were lighter ($p < 0.05$), shorter ($p < 0.05$), had lower MUAC ($p < 0.05$) and serum albumin ($p < 0.05$) compared to men. Figure 1 presents the prevalence of malnutrition on admission according to BMI as calculated using weight and knee height. Table 3 presents the association between duration of hospitalization with malnutrition risk factor on admission. Although the majority of subjects had a normal BMI, 12% were categorised as having CED I, II or III; and 38% were either preobese, obese I or obese II. In addition, 7.6% had muscle wasting as assessed by MUAC (Table 3). Biochemical tests indicated that 71.4% (from subsample of 14) had hypoalbuminaemia (albumin <44 g/L) and 39.6% (from sub sample of 58) were anaemic (haemoglobin <14 g/dL for males, haemoglobin < 12 g/dL for females).

Table 1. Data collection, study measurements and variables at day 1, day 2 and day 3 of hospitalisation

Data Collection	Measurements	Variables
1st Day (Admission)	Questionnaire Medical record	Personal data, diagnosis, medical history, social and health information.
	Anthropometry	Weight, knee height, MUAC, tricep skinfold thickness (TSF), calf circumference.
	Biochemical	Serum albumin Haemoglobin
3rd Day	Anthropometry	Weight
7th Day	Anthropometry	Weight, MUAC, skinfold thickness

Table 2. Anthropometric characteristics and biochemical measurements of subjects (mean ± SD) on admission Parameters (unit)

Parameters (unit)	Males (n=42)	Females (n=50)	Total (n=92)
Weight (kg)	63.4 ± 10.4	55.2 ± 12.6[a]	58.9 ± 12.3
Estimated height from knee height (cm)	162.7 ± 6.2	153.3 ± 4.8[a]	157.6 ± 7.2
Midupper arm circumference (cm)	28.5 ± 3.0	28.3 ± 4.9[a]	28.4 ± 4.1
Tricep skinfold thickness (mm)	14.1 ± 4.5	18.3 ± 6.5	16.4 ± 6.0
Calf circumference (cm)	34.9 ± 3.5	33.0 ± 4.3	33.8 ± 4.0
Body mass index (kgm^{-2})	23.9 ± 3.5	23.3 ± 4.1	23.6 ± 3.8
% body fat (%)	26.2 ± 4.6	36.3 ± 4.7	31.7 ± 6.9
Serum albumin (g/l)	41.9 ± 3.4	37.3 ± 4.0[b]	39.9 ± 4.2
Haemoglobin (g/dL)	13.5 ± 1.8	11.8 ± 2.6	12.7 ± 2.3

[a] $p < 0.05$, significant at 2 tail (independent sample t test)
[b] $p < 0.05$, significant at 2 tail (Mann-Whitney U test)

Table 3. Association between duration of hospitalisation with malnutrition risk factor at admission [data presented as n (%)]

Characteristics	Duration of hospitalisation		
	<7 days (N=75)	≥7 days (N=17)	Total (N=92)
Muscle wasting:			
MUAC <23.0cm(M);<22.0cm(W)	2 (2.7)	5 (29.4)[a]	7 (7.6)
Malnutrition: BMI <18.5kg/m^2	7 (9.3)	4 (23.5)[a]	11 (12.0)
No spouse	23 (30.7)	7 (41.2)	30 (32.6)
Living alone	5 (6.7)	3 (17.6)	8 (8.7)
No schooling	30 (40.0)	9 (52.9)	39 (42.4)
Insufficient money to buy food	13 (17.3)	1 (5.9)	14 (15.2)
Chewing difficulty	9 (12.0)	5 (29.4)	14 (15.2)
Swallowing difficulty	6 (8.0)	2 (11.8)	8(8.7)
Stomach discomfort	43 (57.3)	7 (41.2)	50 (54.3)
Loss of appetite	5 (6.7)	6 (35.3)[a]	11 (12.0)
Seeing & hearing difficulty	46 (61.3)	8 (47.1)	54 (59.3)
Insomnia	37 (49.3)	12 (70.6)	49 (53.8)
Loss of weight	20 (26.7)	7 (41.2)	27 (29.3)
Incontinence	7 (9.3)	2 (11.8)	9 (9.8)
Smoking	13 (17.3)	1 (5.9)	14 (15.2)

[a]p < 0.05, chi-square test; MUAC- Mid upper arm circumference; BMI- Body Mass Index; M-Men, W-Women

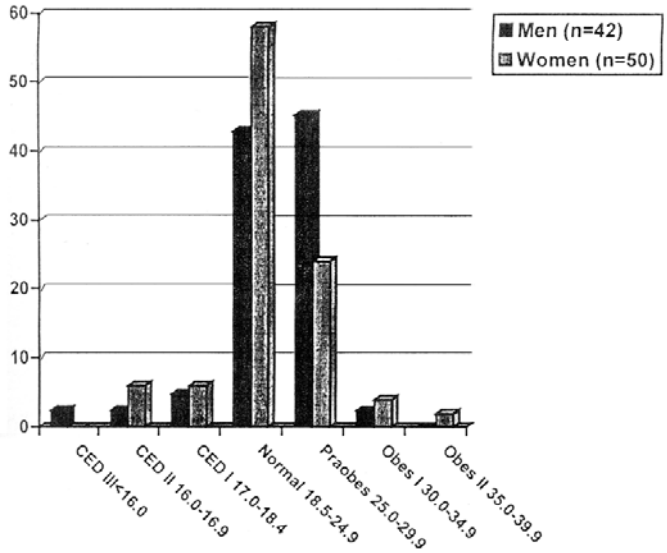

Figure 1: Prevalence of malnutrition on admission according to BMI categories

Table 4 presents the prospective measurements of anthropometric variables on admission, day 3 and day 7 of hospitalisation. Prospective measurements on 75 subjects indicated that the mean of body weight on the 3rd day of hospitalisation was significantly lower compared to the values on admission in both men and women subjects ($p < 0.05$). Seventeen subjects were followed prospectively to day 7. The mean weight and all skinfold thickness values were significantly lower at day 7 of hospitalisation compared to the measurements at admission ($p < 0.05$ for all

values). However, this study could not determine whether the reduction in body dimension, for example body weight, was the result of voluntary weight loss for health well being or involuntary weight loss due to hospital acquired malnutrition.

Table 4. Anthropometric measurements at day 1, day 2 and day 3 of hospitalisation (presented as mean ± SD)

Measurements	Men			Women		
	Day1 (n=42)	Day3 (n=32)	Day7 (n=3)	Day1 (n=50)	Day3 (n=43)	Day7 (n=7)
Weight (kg)	63.4±10.4	62.1±9.0[a]	63.0±2.4	55.2±12.6	54.4±1 0.9[a]	49.7±10.9[b]
MUAC (cm)	28.5±3.0	-	28.5±0.3	28.3±4.9	-	26.2±5.6[b]
Triceps (mm)	14.1±4.5	-	12.3±2.0[b]	18.3±6.5	-	17.0±8.4[b]
Biceps (mm)	7.1±2.9	-	5.1±1.8[b]	11.4±5.6	-	10.9±7.3[b]
Subscapular mm)	19.1±6.4	-	16.4±7.8[b]	19.2±7.2	-	18.7±10.5[b]
Suprailliac (mm)	12.0±5.0	-	9.1±7.9[b]	17.2±6.8	-	15.3±7.1[b]
Body fat (%)	26.2±4.6	-	23.5±5.1	36.3±4.7	-	35.5±6.9
BMI ($kg.m^2$)	23.9±3.9	23.7±3.0	23.1±4.0	23.3±4.1	23.0±3.7	21.0±4.0[b]

[a]$p < 0.05$, significant difference between values at admission and day 3 of hospitalisation within sex (Paired sample t-test).
[b]$p < 0.05$, significant difference between values at admission and day 7 of hospitalisation within sex (Wilcoxon rank test).
MUAC- Midupper arm circumference; BMI-Body mass index

Pearson correlation analysis showed a significant positive correlation between serum albumin and MUAC at admission ($r = 0.608$, $p < 0.05$) and day 7 of hospitalisation ($r = 0.906$, $p < 0.01$). Haemoglobin correlated positively with body weight at admission ($r = 0.320$, $p < 0.05$). It appears that simple anthropometric measurements such as body weight and MUAC are correlated with biochemical tests that usually are more expensive and complicated. However, it should be borne in mind that low levels of biochemical indicators such as serum albumin and haemoglobin could also be due to factors other than malnutrition such as chronic diseases and ageing itself (Lemonnier *et al.,* 1991).

Subjects who had low MUAC and BMI values as shown in Table 3 were significantly at a higher risk of being hospitalised 7 days or longer. Approximately 30% of subjects who were hospitalised 7 days or longer had muscle wasting as assessed by MUAC and CED as measured by BMI compared to only less than 10% of those who were in the ward for less than 7 days having muscle wasting or CED ($p < 0.05$ for both MUAC and BMI). This indicates that poor nutritional status on admission may increase the risk of longer hospitalisation, as supported by other studies (Incalzi *et al.,* 1996; Williams & Boyce 1989).

Data gathered from the medical records indicated that the most common diagnosis of the subjects were diseases of the nervous and sensory organ system (45.7%), followed by urogenitory disease (14.1%), cancer (14.1%), endocrine, malnutrition, metabolic and immunity diseases (7.6%), circulatory related diseases (6.5%), digestive system (6.5%) and others (5.5%) such as skin diseases and haematological disorders. Earlier studies had also indicated that cataracts (Srinivas, Poi & Ebrahim 1996) and cancer (Lim 1997) are among the most common reasons for admission

among elderly people. Approximately 41% of subjects who stayed for 7 days or longer in the wards were cancer patients ($p < 0.05$) (Table 3). Among the common complaints during hospitalisation were stomach discomfort, insomnia, difficulty in chewing, loss of appetite, dysphagia and incontinence as shown in Table 3. It has been reported that complaints of loss of appetitte and chewing problems are also quite common among rural elderly Malays (Suzana *et al.,* 2001).

Apparently a third of the subjects who had been hospitalised longer than 7 days also had complaints of loss of appetite, as compared to only 6.7% among those who were hospitalised for less than 7 days ($p < 0.05$) (Table 3). An earlier study among rural elderly Malays had also reported that loss of appetite was one of the major predictors of malnutrition (Suzana *et al.* 1999).

CONCLUSION

The study has elucidated issues related to malnutrition among hospitalised geriatric patients. Nutritional screening on admission such as the assessment of BMI, MUAC, symptoms of loss of appetite and diagnosis of cancer is necessary to identify patients in need of early dietary intervention which may reduce the duration of hospitalisation and health care cost as a consequence of untreated malnutrition. More studies are needed to examine the occurrence of hospital-acquired malnutrition among elderly patients.

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