Nutritional Status of Hospitalized Nonsurgery Patients at A Nationwide Referral Hospital in Indonesia

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Abstract

This study investigated the prevalence of malnutrition and its risk factors in hospitalized adult nonsurgery patients at Dr. Cipto Mangunkusumo General Hospital, Jakarta, Indonesia. A total of 210 patients were hospitalized from June to November 2013. Sociodemographic characteristics were collected at admission. Nutritional status was assessed at admission and discharge using subjective global assessment, anthropometric (body mass index, hand grip, and subcutaneous fat) and body impedance analyses, and albumin level. Only 176 patients completed the study. Prevalence of malnutrition was 65.5% and 70.1% at admission and discharge, respectively, and 65.9% of patients had no improvement in nutritional condition. Female patients or those with anemia or tuberculosis were at risk for nutritional worsening. Male patients or those with dyslipidemia had more improvement than others. The nutritional intake target was met in 89.3% patients, but their nutritional status did not change significantly. Nutritional status did not influence length of hospitalization, but patients with worsening nutritional status had an insignificantly longer hospitalization. It can be concluded that prevalence of hospital malnutrition is high at Dr. Cipto Mangunkusumo National General Hospital. Although the nutritional intake improved, the nutritional status at discharge did not change significantly from that at admission.

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Introduction

Malnutrition is defined as a medical condition caused by nutrient deficiency due to an increase in losses, diminished intake, or increased requirements. Malnutrition can occur because of changes in eating habits or disease. In hospitalized patients, these problems are common and often put them at risk for malnutrition. Although the risk of malnutrition in the hospital is high, comprehensive nutritional care in the hospital is inadequate.[1] This leads to the high prevalence of malnutrition in hospitalized patients in developing and developed countries.[2–7]

Malnutrition has a great impact on morbidity, mortality, and quality of life. Malnourished patients experience longer hospitalization and higher cost.[3,8] Hence, it is important to identify risk factors for early identification of malnutrition. In patients with medium or high-risk malnutrition, nutritional interventions, such as oral nutritional supplementation, are associated with reduced hospital stay and bed-day and complication costs compared with those of patients who receive no oral nutritional supplementation.[9]

Few reports on hospital malnutrition in adults exist in Indonesia. One study in children reported a 1.8% prevalence of severe malnutrition.[10] This study determined the prevalence of hospital malnutrition in adult nonsurgery patients at Dr. Cipto Mangunkusumo National General Hospital, Jakarta, Indonesia.

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Methodology

Study design and sample- This horizontal study was performed on 176 nonsurgical patients admitted to the internal medicine ward of Dr. Cipto Mangunkusumo National General Hospital, a tertiary health care facility in Indonesia, from June to November 2013. The study was approved by the Health Research Ethics Committee, Faculty of Medicine, Universitas Indonesia.

Patients were eligible if they were 18 years or older and recruited within 48 hours after admission. All adult alert patients provided written informed consent to participate in this study. Patients with unstable medical conditions, or who were pregnant or hospitalized with a diagnostic indication were excluded from this study.

Data collected in this study included subject characteristics, anthropometric data, body composition, hand grip, food intake, subjective global assessment (SGA), plasma albumin, and medical conditions or diagnosis. Except for patient characteristics, all data were collected twice at admission and before discharge.

Nutritional status assessment- Body mass index (BMI) and SGA were used to define malnutrition in this study. According to SGA, nutritional status is classified as severely undernourished, mild-to-moderately undernourished, and well-nourished.[11] We combined severely and mild-to-moderately undernourished into the undernourished category to simplify risk factor analysis. In this study, the BMI cutoff point according to the World Health Organization was used to define nutritional status classification[12].

Body composition and biochemical nutritional assessment

Body composition was assessed using anthropometric measurements and body impedance analysis (BIA). Body fat mass was assessed using BIA and indirect measurements according to the average of four skinfold sites (triceps, biceps, subscapular, and suprailiac). This average was converted to the percentage of body fat according to the method of Durnin and Womersley[13]. Protein body mass was assessed using BIA and hand grip. The biochemical status was measured by plasma albumin. BIA was measured using GAIA 359 PLUS (Jawon Medical, Kung san City, South Korea).

Food intake analysis- Dietary intake was evaluated using a 24-hour food recall. Food quantities were explained using household measurements (plates, glass, slice, cups, spoons, and so forth) and a sample food record was given as an example. Individual records were reviewed and the nutrient calculations were performed using NutriSurvey for Windows (Dr. Juergen Erhardt, SEAMEO-TROPMED RCCN, Indonesia, available at www.nutrisurvey.de).

Statistical analysis- Mean with standard deviation or median with minimum and maximum value were chosen to describe quantitative variables. The frequency and percentage of patients in each category were used to describe qualitative variables. The Wilcoxon test was used to determine a significant change in SGA and BMI at admission and discharge. The Mann–Whitney *U* test was used to compare the difference in nutritional parameter changes between patients with unimproved and improved nutritional status. χ^2 or Fisher's exact test was applied in a bivariate analysis of clinically relevant parameters with nutritional status changes. All factors with $P<.250$ were included into a binary logistic regression model to analyze which variables affected prevalence of malnutrition. Statistical significance was established at $P<.05$ or 95% confidence interval (CI).

Results

Of 210 patients initially enrolled, 34 did not complete the study (24 were retracted, 5 died, and 5 had worsened medical conditions), leaving 176 available for analysis.

Variable	Undernourished		P-value	Crude OR (95% CI)	Adjusted OR (95% CI)
	Yes	No			
Male	87 (75.0%)	50 (83.3%)	0.207	0.60 (0.27–1.33)	Not significant
Age					
≥60	15 (12.9%)	9 (15.0%)	0.804	1.14 (0.42–3.10)	Not significant
40–59	63 (54.3%)	31 (51.7%)	0.676	1.15 (0.58–2.29)	Not significant
18–39	38 (32.8%)	20 (33.3%)	Ref		
No employment	67 (57.8%)	32 (53.3%)	0.575	1.20 (0.64–2.24)	Not significant
High schooler/lower	88 (75.9%)	37 (61.7%)	0.049	1.95 (1.00–3.83)	2.55 (1.22–5.33)*
Medical condition					
Infection	77 (66.4%)	42 (70.0%)	0.627	0.85 (0.43–1.66)	Not significant
Viral hepatitis	22 (20.7%)	16 (26.7%)	0.370	0.72 (0.35–1.49)	Not significant
Cirrhosis	21 (18.1%)	18 (30.0%)	0.072	0.52 (0.25–1.07)	0.42 (0.19–0.94)*
Diabetes	20 (17.2%)	15 (25.0%)	0.222	0.63 (0.29–1.33)	Not significant
Bile stone	23 (19.8%)	11 (18.3%)	0.812	1.10 (0.50–2.45)	Not significant
Cancer	18 (15.5%)	8 (13.3%)	0.699	1.19 (0.49–2.93)	Not significant
Hypertension	15 (12.9%)	11 (18.3%)	0.338	0.66 (0.28–1.55)	Not significant
Anemia	16 (13.8%)	5 (8.3%)	0.290	1.76 (0.61–5.06)	Not significant
CKD	13 (11.2%)	8 (13.3%)	0.680	0.82 (0.32–2.10)	Not significant
Dyslipidemia	9 (7.8%)	8 (13.3%)	0.235	0.55 (0.20–1.50)	Not significant
Tuberculosis	16 (13.8%)	1 (1.7%)	0.010	9.44 (1.22–73.02)	7.70 (0.93–60.93)*
Albumin <3.5 g/dL	86 (74.1%)	35 (58.3%)	0.032	2.05 (1.06–3.96)	2.87 (1.35–6.11)*

Table 1. Baseline and patient characteristics according to nutritional status at admission.
CKD: chronic kidney disease; ∗statistically significant, P < .05.

Table 1 presents baseline characteristics of undernourished and nutritionally normal patients at admission. After multivariate analysis, factors significantly related to nutritional status at admission were educational background, cirrhotic liver disease, and plasma albumin level <3.5 g/dL. Patients with lower educational background or plasma albumin level <3.5 g/dL had a higher risk of undernutrition (odds ratio [OR], 2.55 and 2.87, respectively), whereas the risk was lower in patients with cirrhotic disease (OR, 0.42).

The proportion of nutritional status according to BMI is presented in Figure 1. Most subjects had normal nutritional status either at admission or discharge according to BMI. Conversely, according to SGA, the undernourished subjects were predominant (prevalence 65.5%, with 13.6% severely and 51.9% mildly-to-moderately undernourished). At discharge, the prevalence increased to 70.1% (10.2% severely and 59.9% mildly-to-moderately undernourished). According to BMI, the prevalence of undernourished patients also increased after hospitalization. Although nutritional status was worsening, there was no statistically significant nutritional change during hospitalization. The Wilcoxon test was used to analyze nutritional change according to SGA ($Z = -.333$, $P = .739$) and BMI ($Z = -.894$, $P = .371$). The incidence of newly diagnosed malnutrition in this study was 4.5% (8/176).

Table 2 presents factors related to severe undernourishment according to SGA. After multivariate analysis, only male sex was significantly related to higher prevalence of undernutrition (OR, 10.06).

Variable	Severe (*n* = 24)	Undernourished Mild-to-moderate (*n* = 92)	*P* value	Crude OR (95% CI)	Adjusted OR (95% CI)
Male	23 (95.8%)	64 (69.6%)	0.008	10.06 (1.29–78.22)	11.17 (1.32–94.65)*
Age					
≥60	0 (0.0%)	15 (16.3%)	0.998	0.00 (0.00–NA)	Not significant
40–59	9 (37.5%)	54 (58.7%)	0.005	0.26 (0.10–0.67)	0.33 (0.10–1.15)
18–39	15 (62.5%)	23 (25.0%)	Ref		
No employment	10 (41.7%)	57 (62.0%)	0.073	0.44 (0.18–1.09)	Not significant
High schooler/lower	18 (75.0%)	70 (76.1%)	0.912	0.94 (0.33–2.67)	Not significant
Medical conditions					
Infection	15 (62.5%)	62 (67.4%)	0.651	0.81 (0.32–2.05)	Not significant
Viral hepatitis	3 (12.5%)	21 (22.8%)	0.397	0.48 (0.13–1.78)	Not significant
Cirrhosis	1 (4.2%)	20 (21.7%)	0.071	0.16 (0.02–1.23)	0.22 (0.02–2.44)
Diabetes	1 (4.2%)	19 (20.7%)	0.070	0.17 (0.02–1.32)	0.47 (0.04–5.10)
Bile stone	4 (16.7%)	19 (20.7%)	0.790	0.77 (0.24–2.52)	Not significant
Cancer	5 (20.8%)	13 (14.1%)	0.526	1.60 (0.51–5.03)	Not significant
Hypertension	1 (4.2%)	14 (15.2%)	0.191	0.24 (0.03–1.94)	0.28 (0.03–2.88)
Anemia	7 (29.2%)	9 (12.7%)	0.022	3.80 (1.24–11.60)	3.99 (0.97–16.42)
CKD	13 (11.2%)	8 (13.3%)	0.730	1.17 (0.30–4.64)	Not significant
Dyslipidemia	2 (8.3%)	7 (7.6%)	>0.999	1.10 (0.21–5.69)	Not significant
Tuberculosis	7 (29.2%)	9 (9.8%)	0.022	3.80 (1.24–11.60)	2.86 (0.71–11.54)
Albumin <3.5 g/dL	16 (66.7%)	70 (76.1%)	0.348	0.63 (2.34–1.67)	Not significant

Table 2. Subgroup analysis of factors related to severely undernourished patients.
CKD, chronic kidney disease; NA, not applicable; NS, not significant; Ref, reference; ∗statistically significant, P<.05.

Variable	Unimproved Yes (*n* = 116)	Unimproved No (*n* = 60)	*P Value*	Crude OR (95% CI)	Adjusted OR (95% CI)
Age					
≥60	16 (13.8%)	8 (13.3%)	0.804	1.14 (0.42–3.10)	Not significant
40–59	63 (54.3%)	31 (51.7%)	0.684	1.15 (0.58–2.29)	Not significant
18–39	37 (31.9%)	21 (35.0%)	Ref		
Male	85 (73.3%)	52 (86.7%)	0.043	0.42 (0.18–0.99)	0.59 (0.18–1.93)
None to high schooler	85 (73.3%)	40 (66.7%)	0.360	1.37 (0.70–2.70)	Not significant
Unemployed	66 (56.9%)	33 (55.0%)	0.810	1.08 (0.58–2.02)	Not significant
Medical condition					
Infection	75 (64.7%)	44 (73.3%)	0.244	0.67 (0.34–1.32)	Not significant
Viral hepatitis	26 (22.4%)	14 (23.3%)	0.890	0.95 (0.45–1.99)	Not significant
Cirrhosis	23 (19.8%)	16 (26.7%)	0.300	0.68 (0.33–1.41)	Not significant
Diabetes	22 (19.0%)	13 (21.7%)	0.670	0.85 (0.39–1.83)	Not significant
Bile stone	18 (15.5%)	16 (26.7%)	0.076	0.51 (0.24–1.08)	Not significant
Cancer	20 (17.2%)	6 (10.0%)	0.199	1.88 (0.71–4.95)	1.94 (0.52–7.27)
Hypertension	15 (12.9%)	11 (18.3%)	0.338	0.66 (0.28–1.55)	Not significant
CKD	14 (12.1%)	7 (11.7%)	0.938	1.04 (0.40–2.73)	Not significant
Anemia	18 (15.5%)	3 (5.0%)	0.041	3.49 (0.99–12.37)	2.68 (0.60–11.97)
Dyslipidemia	5 (4.3%)	12 (20.0%)	0.001	0.18 (0.06–0.54)	0.21 (0.05–0.93)*
Tuberculosis	15 (12.9%)	2 (3.3%)	0.041	4.31 (0.95–19.50)	1.70 (0.30–9.81)
Unimproved intake	16 (13.8%)	3 (5.0%)	0.075	3.04 (0.85–10.88)	2.52 (0.48–13.22)
SGA at admission					
Severe	16 (13.8%)	8 (13.3%)	0.001	5.50 (1.98–15.31)	3.50 (0.98–12.50)
Mild-to-moderate	84 (72.4%)	8 (13.3%)	<0.001	28.88 (11.46–72.73)	32.83 (11.46–94.05)*
Well nourished	16 (13.8%)	44 (73.3%)	Ref		
Unimproved albumin	77 (66.4%)	36 (60.0%)	0.403	1.32 (0.69–2.51)	Not significant
Albumin <3.5 g/dL	89 (76.7%)	32 (53.3%)	0.002	2.88 (1.48–5.61)	2.25 (0.84–6.04)

Table 3. Risk factors related to unimproved nutritional status during hospitalization.
SGA: Subjective Global Assessment; CKD: Chronic Kidney Disease; LBM: Lean Body Mass; NS: not significant; Ref: reference; ∗statistically significant, P<.05.

The risk factors related to unimproved nutritional status according to SGA during hospitalization are presented in Table 3. Of the patients, 65.9% had unimproved nutritional status. From multivariate analysis, patients with dyslipidemia (adjusted OR, 0.21) were less likely to have unimproved nutritional status during hospitalization. Mild-to-moderate undernutrition at admission was the most influential factor related to unimproved nutritional status (OR, 32.83). Nevertheless, severe undernutrition did not appear to be a significant factor related to unimproved nutritional status.

Variable	*n*	Unimproved Median (min, max)	*n*	Improved Median (min, max)	*P* value
Albumin, g/dL	116	−0.08 (−1.24, 1.02)	60	0.00 (−1.24, 0.80)	0.294
BMI, kg/m^2	116	−0.03 (−3.99, 4.81)	60	−0.21 (−2.94, 1.26)	0.014
Body composition					
Body fat, kg	93	0.00 (−4.70, 3.30)	54	0.00 (−2.10, 4.80)	0.503
Protein mass, kg	93	0.00 (−2.40, 1.00)	53	−0.10 (−2.10, 5.80)	0.213
Body water, kg	93	−0.10 (−16.10, 12.80)	53	−1.00 (−9.70, 3.00)	0.018
Fat thickness, cm	114	0.00 (−13.10, 11.10)	58	0.00 (−8.70, 8.00)	0.503
Hand grip, cm	116	0.00 (−13.00, 13.00)	60	0.00 (−17.80, 8.00)	0.545

Table 4. Nutritional parameter changes comparison between patients with unimproved and improved nutritional status during hospitalization. BMI: Body Mass Index

Albumin, BMI, body composition (body fat, protein mass, and body water), calorie intake, and hand grip changes during hospitalization were compared (Table 4). The number of subjects included in the analyses of BIA (body fat, lean body mass, and protein mass) and fat thickness was fewer than the total number of subjects (*n* = 148, 147, 147, and 173 respectively) because of null results given by these measurements, which were not included in the statistical analysis. Patients with improved nutritional status during hospitalization had greater BMI and body water decreases than patients with unimproved nutritional status. The percentage of body water was significantly higher in patients with worse nutritional status.

Subgroup analysis of factors related to severe undernutrition was conducted the percentage of body water according to SGA status at admission showed that Kruskal–Wallis test between P<.001. Moreover, Mann–Whitney U test severe vs mild-to-moderate undernutrition P =0.001; severe undernutrition vs well-nourished, P < 0.001; mild-to-moderate undernutrition vs well-nourished, P = 0.026. Further at discharge. One-way ANOVA was used to analyze with P = 0.004. Post-hoc analysis with Bonferroni between resulted in severe vs. mild-to-moderate undernutrition, P = 0.026; severe undernutrition vs. well-nourished. P = 0.003; mild-to-moderate undernutrition vs. well-nourished, P = 0.295.

The length of hospitalization among patients with worsened and improved nutritional status and according to their SGA status at admission is presented in Figure 3. Neither condition significantly influenced length of hospitalization.

Further analysis was conducted regarding length of hospitalization according to the nutritional status change and SGA at admission. Comparison of length of hospitalization in patients with worsened/unimproved and improved nutritional status was further analysis length of stay was not significantly different (X2 = 3.069; degrees of freedom [df] = 2; P = .216). Length of hospitalization according to nutritional status and SGA status at admission should that length of stay was not significantly different (X2 = 6.460; df = 4; P = .167).

Discussion

We studied a representative Indonesian population hospitalized in the internal medicine ward (including infection and noninfection wards) of Dr. Cipto Mangunkusumo Hospital, a national referral hospital in Indonesia. The prevalence of malnutrition according to SGA was 65.5%, which was higher than that found in several studies from other countries. In general, malnutrition prevalence is reported at 20%–50%[14] generally, 17.2%–53% in developed countries,[3,6,15,16] and 17.8%–48.7% in developing countries.[17–20] The wide range of the malnutrition prevalence is caused by the variety of methods to define malnutrition.[4] The higher prevalence in our study may be because of the characteristics of the sample. Because ours is a tertiary care hospital, patients generally have more serious medical conditions. In general, the prevalence of malnutrition in our study was comparable with that of another study conducted at a tertiary health care facility in developing countries, but higher compared with that found at tertiary health care facilities in developed countries. For example, studies in developing countries have reported the prevalence of malnutrition in the hospital, defined by BMI <18.5 kg/m^2 in adults, to be 9.9%[17] and 33.3%.[20] We reported a 22.7% prevalence of undernutrition according to BMI, and this prevalence was lower compared with that found according to SGA. Studies in Ecuador and Mexico also reported that malnutrition prevalence is higher according to SGA than to BMI.[17,19]

Factors related to malnutrition at admission were less formal education, noncirrhotic disease, and lower plasma albumin level (<3.5 g/dL). In other studies, lower educational background was related to malnutrition in hospitalized patients.[19] It is possible that subjects with a lower educational background did not recognize the importance of nutrition. Low education levels also were related to lower incomes causing difficulties in accessing adequate foods and nutritional support therapies.[19]

We found that low albumin level was related to malnutrition. A study in Turkey also found that albumin and protein levels were significantly lower in malnourished patients compared with those with normal nutritional status.[21] Don et al. stated that hypoalbuminemia resulted from the combined effects of inflammation and inadequate protein and caloric intake in patients with chronic disease.[22] Inflammation and malnutrition can reduce albumin levels by decreasing albumin synthesis and increasing catabolic rate.[22]

Tuberculosis was related to malnutrition in our hospitalized patients. Similar to our study, Bhargava et al. also found that tuberculosis was related to undernutrition in India.[23] In other studies, medical conditions related to malnutrition were infection disease, cancer, sepsis, and chronic organ failure.[17,19]

Contrary to other studies,[3,16,19] our study demonstrated no relationship between nutritional status at admission nor improvement in nutritional status and length of hospitalization. Our hospital is a national referral hospital, so most patients have more serious medical conditions. Therefore, either well-nourished or undernourished patients may possibly show no significant differences in hospital stay.

Older age (>60 years) was significantly related to higher rate of undernutrition at admission in other studies.[3,6,17–19] Our study did not show a relationship between older age and undernutrition. In Table 1, the distribution of malnutrition was similar between the age groups. Interestingly, the distribution of severely undernourished patients was not equal. No malnourished elderly patient was severely undernourished, but the majority of younger malnourished patients were severely undernourished.

In our study, nutritional status was worsening after hospitalization, but this difference was not statistically significant. A study in Iran also found that the prevalence of undernutrition during hospitalization increased to 5.3%.[24] Factors possibly contributing to worsening malnutrition during hospitalization were poor food intake during hospitalization and health condition changes. Aspects that decreased food intake were loss of appetite, nausea, psychological problems, inability to chew or swallow, difficulties in digestion, treatment given to the patient, and limited mobility.[2]

In the analysis of undernourished patients, male sex was a significant factor related to severe undernourishment and was significantly related to the severity of undernutrition. Bauer et al.[25] also found that more male than female patients were severely undernourished, but this difference was not statistically significant[25]. Anemia was related to severity of malnutrition in our study. A study in Turkey also found a significant relationship between three nutritional status groups according to SGA and hemoglobin levels in patients <65 years old[21].

Factors related to unimproved nutritional status during hospitalization were dyslipidemia, anemia, lower albumin level (<3.5 g/dL), and mild-to-moderate undernutrition. In our study, patients with dyslipidemia were less likely to have unimproved nutritional status during hospitalization. Similar to our study, Demir et al. [21] found that cholesterol and low-density lipoprotein level in malnutrition patients were lower than in those with normal nutritional status.

The nutritional parameter changes between patients with unimproved and improved nutritional status during hospitalization were not significant except for BMI. Contrary to our study, Hosseini et al.[24] found a significant reduction in body protein mass from the body composition analysis (*P*<.001). Body water percentile decreased and body fat percentile increased, but not significantly, during hospitalization[24]. The decreasing BMI in our patients with improved nutritional status was higher than that in unimproved patients. This could be explained by the analysis of body composition changes. The BMI decrease in patients with improved nutritional status was caused by the loss of body water.

Conclusion

The prevalence of hospital malnutrition is high at Dr. Cipto Mangunkusumo National General Hospital. Although nutritional intake improved, nutritional status at discharge did not change significantly from that at the admission.

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