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Nutritional Status of Hospitalized Patients and Its Impact on Morbidity, Mortality and Length of Stay

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Abstract: The **o**bjective of this study is to assess the nutritional status of hospitalized patients and its effect on morbidity, mortality and length of hospital stay. Prospectively, 177 adult patients, admitted to units of Internal Medicine Department and ICU of Kasr Al-Aini Hospitals during the period from October, 2006 to March, 2007 were evaluated using the Subjective Global Assessment (SGA) questionnaire. Patients were followed to determine length of hospital stay, complications and in-hospital mortality. The sample consisted of 100 men and 77 women. The mean age was 50.01±10.37 years, with 29.9% over 60 years. Overall 87.6% were admitted to general wards and 12.4% were admitted to the ICU. According to the SGA, 41.8% of patients had moderate malnutrition or were at-risk of malnutrition and there were no severely malnourished patients. Men had increased risk of being malnourished compared with women (p= 0.002). A tendency to malnutrition was observed in older individuals, especially those 60 years and older (p<0.001). Complications were significantly more frequent among those at-risk of malnutrition (group B) as there was 32.2% of patients versus 20.3% of complication in patients of group A that were normonourished (p< 0.001 and, Relative Risk RR=2.20). Overall mortality was 15.3% of which 11.3% belonged to group B and only 4.0% were of group A (p=0.04). The average length of hospital stay was higher for the malnourished group, 25±14 days versus 14 days±8 days in group A (with p< 0.001). The study concluded that Malnutrition is frequent in hospitalized patients at Internal Medicine Department on admission, and is a risk factor for morbidity, mortality, and prolongs the length of hospitalization. Efforts should be made to quickly assess the nutritional status of these patients with early initiation of nutritional interventions.

Key Words: Malnutrition; Nutritional assessment; Mortality; Hospital stay.

INTRODUCTION:

Malnutrition is defined as a state of nutritional deficiency, excess or imbalance of energy, proteins and other nutrients [1]. Several surveys are reported to find malnourishment, or more specifically under nutrition, among 20% of patients in general hospitals (Body Mass Index < 18.5 kg/m^2) with some of them thin or loosing weight or both [2]. In hospitalized patients, malnutrition continues as an extensive

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problem despite significant achievements in medicine [3]. In acute or chronically ill patients, malnutrition negatively impacts clinical outcomes by affecting function and recovery, increasing risk of infection, lengthening hospital stay or making re-admission more likely. It is usually a common cause and/or sequence of their illness [4].

The prevalence of malnutrition among hospitalized patients was found to range between 20% to as high as 70 % [4 – 6]. In one of these studies, 40% of patients were found to be malnourished at entry, but at the time of discharge 75% of all patients were found to have deteriorated in nutritional status during their hospitalization[5]. Although malnutrition is a common problem it usually passes undiagnosed as symptoms are unnoticed or mistaken for those of the patient's main illness. However, such situations lead to poor prognosis, increase length of stay, and the patient is less able to respond to medications with increased risk of therapeutic failure and complications [7].

Several strategies and methods have been developed to help assess nutritional status of hospitalized patients. Nutritional screening can help clinicians identify patients who are malnourished or at risk of malnutrition for early interventions that can greatly improve outcomes [5]. Hence this study was conducted to assess nutritional status of hospitalized patients and its effect on patient morbidity, mortality and hospital length of stay.

Subjects and Methods:

Study design and population:

This longitudinal prospective cohort study included 177 patients admitted to the Internal Medicine Department and ICU of Kasr Al-Aini teaching hospitals, from October, 2006 to March, 2007. Adult patients (>20 years), who were purposively identified, as admitted from the ER within 48 hours were included. Exclusion criteria were; Pregnant women, patients who were known to be hospitalized for less than 48

hours, and those with neurologic or psychiatric disorders that impaired their ability to answer the questionnaire, patients admitted from the outpatient clinic and those less than 20 years of age.

Patient assessments:

The following methods for evaluating patients were used;

1- ***Subjective Global Assessment (SGA):*** The SGA screens patients in 2 broad areas; medical history and physical examination[8,9]. This approach combines key components of dietary history (such as weight change, dietary intake, gastrointestinal symptoms, and relation of illness with metabolic stress), with physical examination by looking at presence of wasting or edema. Each parameter is rated as A, B or C on the SGA scoring sheet. Based on this scoring, an overall SGA classification is given such that patients are divided into Normal nourished, Moderate malnourished (or at risk of malnutrition), and severe malnourished (or poor nutrition status).

2- ***Physical examination:*** Admitted patients were examined by the admitting physician and patients were classified into groups according to the affected system. Additionally, during the interviews, attending physician also examined for presence of ankle and sacral edema, and ascites.

3- ***Anthropometry:*** Muscular mass was measured by the ***mid-thigh circumference*** **[10]**. This was measured in standing subjects at the midpoint between the inguinal region and the middle of the patella using a standard non-stretchable tailors' tape measure. ***Triceps skin fold thickness*** was measured at the level of the mid-point between the

acromiale (lateral edge of the acromial process, e.g. bony tip of shoulder) and the radiate (proximal and lateral border of the radius bone, approximately the elbow joint), on the mid-line of the posterior (back) surface of the arm (over the triceps muscle) using a standardized skin caliper [1].

4- ***Biochemical measurements:*** A blood sample was collected from all patients to measure serum albumin.

5- ***Complications, mortality and length of stay:*** All patients were followed and length of stay (LOS), rate of complications and mortality were recorded.

- Complications were defined as the appearance of a disease or condition, in addition to the pre-existing condition which initiated admission, without specific relation between the two. Complications were infectious or non-infectious in nature.
- LOS was measured in days, from day of admission to time of release or death.

Ethical considerations: Verbal consent to participate in the study was obtained from all subjects before recruitment. Initially, 200 patients were approached but only 177 (88.5%) agreed to participate in the study. Data confidentiality was preserved throughout the study.

Statistical analysis: Statistical analysis was done using SPSS 15 and included distributional frequencies for all study variables. Comparison of nominal variables was conduced using the χ^2 test, while for quantitative variables the student's *t* test was used. EpiInfo version 3.5.1 was used to compute the relative risk and 95% confidence intervals. Significance was determined at $P < 0.05$.

Results:

The study included 100 men and 77 women (56.5 % and 43.5 % respectively). The average age was 50.01 $\pm$ 10.37 years

and ranging between 23 to 69 years. No statistical significant difference was found between males and females regarding age (51.04 ± 10.82 versus 48.68 ± 9.64 respectively with P = 0.133). About a third of patients were over 60 years of age (29.9 %) and the majority was from rural areas (71.2 %). A total of 155 patients were admitted to internal medicine ward (87.6%) and only 12.4 % (n=22) to the ICU [Table 1]. The reason of admission to hospital is shown in [Table 2].

Results of application of SGA showed 58.2 % of patients (n=103) as normonourished (group A) and 41.8 % (n= 74) with malnutrition or are at risk of malnutrition (group B). None of our patients were severely malnourished (group C = 0). When comparing both SGA groups, it was found that a significantly higher proportion of males were malnourished or at risk of malnutrition than females (29.4 % and 12.4 % respectively) with P = 0.002. A tendency to malnutrition was observed in older patients, 60 years and above, (21.5%) with P < 0.001. On the other hand no statistical significant difference was found between groups as regards residence or admission to ward [Table 1]. The hospital length of stay (LOS) varied between groups. Group B showed a longer average LOS of 25 ± 14 days in comparison to 14 ± 8 days for patients in group A with P < 0.001 [Figure 1].

The overall complication rate was 52.5 % (n=93). Of these 61.3 % (n=57) were from group B and 38.7 % (n=36) were from group A. Analysis of risk factors that contributed to incidence of complications are shown in [Table 3]. Males showed a significantly higher risk for complications RR = 1.98 with 95 % CI = 1.41 – 2.79. Patients in group B who were malnourished or at risk of malnutrition had a significantly increased risk for complications than those who were normonourished with RR = 2.20 with 95%

CI = 1.65 – 2.95. Similarly patients who were older than 60 years of age and those with albumin levels < 3.4 gm/dl showed increased risk for complications (RR= 2.61; 95% CI = 2.03 – 3.34 & RR= 3.12; 95% CI = 2.10 – 4.64 respectively). Although admission to ICU increased risk of complications by 25 % yet this finding was statistically insignificant.

Overall mortality was 15.3% (n=27) of which 11.9% (n=21) belonged to group B and only 3.4% (n=6) were from group A. Males had double the risk for mortality than females (RR = 2.2; 95% CI = 0.98 – 4.93), however this finding was statistically insignificant. Increase age over 60 years had nearly a four fold increase in risk of mortality (RR = 3.98; 95 % CI = 1.95 – 8.10) and this finding was statistically significant (P < 0.001). Patients in SGA group B had nearly a five fold increase risk of mortality than those in group A (RR= 4.87; 95% CI = 2.07 – 11.47) and admission to ICU increased the risk of mortality to 7.5 times (95%CI = 4.13 – 13.95) and these findings were highly significant (P < 0.001). On the other hand, although albumin levels < 3.4gm/dl doubled the risk of mortality, yet this finding was statistically insignificant (RR= 2.00; 95% CI = 0.93 – 4.33 and P= 0.67) [Table 4].

Discussion:

In the present study, it was found that there is a high prevalence of malnutrition or risk of malnourishment (41.8%). This observation calls attention because the majority of patients were primarily from rural areas. The frequency of malnutrition found in this study is similar to findings in a Spanish study that found a prevalence of 46% using the SGA[11]. Additionally, malnourishment has been reported among 70% to 80% of patients entering or leaving hospitals[12]. A *"Common illness"* is defined by some authors as one with 10% prevalence or more[13]. It is thus evident that malnutrition represents one of the most frequent illnesses in hospitalized

patients and this study confirms this situation in Kasr El Aini Hospitals. Furthermore, nutritional depletion has been reported to be progressive during hospital stay. In a study comparing nutritional risk at admission and later on during stay, it was found that patients assessed later on after their admission were more likely to be at moderate to severe risk of malnutrition than those patients assessed early at admission[14].

A tendency to malnutrition was found among older patients, 60 years and older, with increased risk of complications and mortality. Additionally, males had a significantly higher risk for malnourishment with increased risk of complications and mortality. These results match results of other studies that found men older than 60 years to have a higher tendency to malnutrition[9]. In another study that assessed the nutritional status of female patients admitted to the orthopedic department and compared them with age-matched home living group attending day care centers, it was found that malnutrition was more common in males and male sex was a significant independent risk factor for malnutrition[15].

Ample evidence exists of the unfavorable consequences of malnutrition[16]. Of all patients included in this study, 53% (n=93) had complications. Patients from group B had a significantly higher frequency of complications (61.3% - n=57) than those from Group A (38.7% - n=36) with $P < 0.001$. Additionally patients of group B had a doubled risk for complications (RR = 2.20). These findings are consistent with another study that found higher rates of functional disability among the malnourished group [17].

Patients at risk of malnutrition had a significantly higher rate of mortality. The overall mortality in this study was 15.3% of which the significant majority (11.9%) were patients in group B versus 3.5% from group A, with more than a four fold increased risk (RR = 4.87 with $P < 0.001$). These results are similar to another study that found that mortality in the malnourished patients was

12.4% versus 4.7% in the well nourished (RR = 2.63)[18]. In another study mortality was found to be significantly higher among malnourished group (29.7%) than among those patients who were well nourished (10.1%)[19]. It is thus evident that malnutrition increases the risk for hospital mortality.

Malnourished patients stayed in hospital for longer periods of time. The average LOS was reported to be 16.7 ± 24.5 days in a malnourished group versus 10.1 ± 11.7 days in the comparative well nourished group in a study that evaluated the impact of malnutrition on length of hospital stay[18]. These results are in line with the present study that found a longer average LOS of 25 ± 14 days for patients in group B in comparison to 14 ± 8 days for patients in group A with $P < 0.001$, although in the present study patients from group B had a longer average LOS.

Although previous studies have shown the reliability of SGA as a method of assessing the nutritional status of patients[7,20–21], we were faced with some limitations in using this method with the studied population. One of these limitations was that about 20 % of patients admitted were because of liver diseases and in those patients edema, ascites and low serum albumin were common and attributable to the liver disease rather than malnutrition itself. The same may be applied to some patients with kidney diseases and diabetes. However, the use of other anthropometric measures such as skin fold thickness was a useful index for malnutrition. Percent body fat estimated by bioelectrical impedance or DEXA may solve these problems in future studies. The other limitation was the use of SGA questions about the weight loss in the last 6 months as a good number of patients were illiterate.

Conclusions:

Malnutrition is one of several factors, associated with an unfavorable clinical outcome. Results of the study have shown that malnutrition is prevalent in Kasr El Aini Teaching hospitals and is a risk factor for morbidity, mortality and increase hospital

length of stay. It is therefore recommended to be diagnosed early on admission and it is wise to consider interventions that will help improve the nutritional status of patients.

Table (1): Basic characteristics of admitted patients according to nutrition status

Baseline Characteristics	Normonourished No. (%)†	Malnourished No. (%)†	Total No. (%)†	*P* – value
Sex				
Males	48 (27.1)	52 (29.4)	100 (56.5)	0.002
Females	55 (31.1)	22 (12.4)	77 (43.5)	
Age				
< 60	88 (49.7)	36 (20.3)	124 (70.1)	< 0.001
≥ 60	15 (8.5)	38 (21.5)	53 (29.9)	
Residence				
Urban	26 (14.7)	25 (14.1)	51 (28.8)	0.216
Rural	77 (43.5)	49 (27.7)	126 (71.2)	
Ward				
Internal Medicine	88 (49.7)	67 (37.9)	155 (87.6)	0.310
ICU	15 (8.5)	7 (4.0)	22 (12.4)	

† Percentages are of total number of patients (n=177).

Table (2): Reasons for hospitalization by system or organ

System/Organ	Patients No. (%)
Liver	35 (19.8)
Cardiovascular	28 (15.8)
Kidney	27 (15.3)
Respiratory	20 (11.3)
Neurology	18 (10.2)
Rheumatology	15 (8.5)
Endocrinology	13 (7.3)
Hematology	9 (5.1)
Digestive	8 (4.5)
Others	4 (2.2)

Table (3): Contribution of various risk factors to increased risk of complications

Risk Factor	Complications		RR	95% CI	P – value
	Present No. (%)†	Absent No. (%)†			
Sex					
Males	67 (37.8)	33 (18.6)	1.98	1.41 – 2.79	< 0.001
Females	26 (14.6)	51 (28.8)			
Age					
≥ 60 Yrs	49 (27.7)	4 (2.3)	2.61	2.03 – 3.34	< 0.001
< 60 Yrs	44 (24.8)	80 (45.2)			
SGA					
Group B	57 (32.2)	17 (9.6)	2.20	1.65 – 2.95	< 0.001
Group A	36 (20.3)	67 (37.9)			
Ward					
ICU	14 (7.9)	8 (4.5)	1.25	0.88 – 1.77	0.27
Int. Med.	79 (44.6)	76 (42.9)			
Albumin					
< 3.4 g/dl	74 (41.8)	22 (12.4)	3.12	2.10 – 4.64	< 0.001
> 3.4 g/dl	20 (11.3)	61 (34.5)			

† Percentages are of total number of patients (n=177).

Table (4): Contribution of various risk factors to increased risk of mortality

Risk Factor	Survival		RR	95% CI	P – value
	Dead No. (%)†	Alive No. (%)†			
Sex					
Males	20 (11.3)	80 (45.2)	2.20	0.98 – 4.93	0.045
Females	7 (4.0)	70 (39.5)			
Age					
≥ 60 Yrs	17 (9.6)	36 (20.3)	3.98	1.95 – 8.10	< 0.001
< 60 Yrs	10 (5.6)	114 (64.4)			
SGA					
Group B	21 (11.9)	53 (29.9)	4.87	2.07– 11.47	< 0.001
Group A	6 (3.4)	97 (54.8)			
Ward					
ICU	14 (7.9)	8 (4.5)	7.59	4.13 – 13.95	< 0.001
Int. Med.	13 (7.3)	142 (80.2)			
Albumin					
< 3.4 g/dl	19 (10.7)	77 (65.8)	2.00	0.93 – 4.33	0.067
> 3.4 g/dl	8 (4.5)	73 (41.2)			

† Percentages are of total number of patients (n=177).

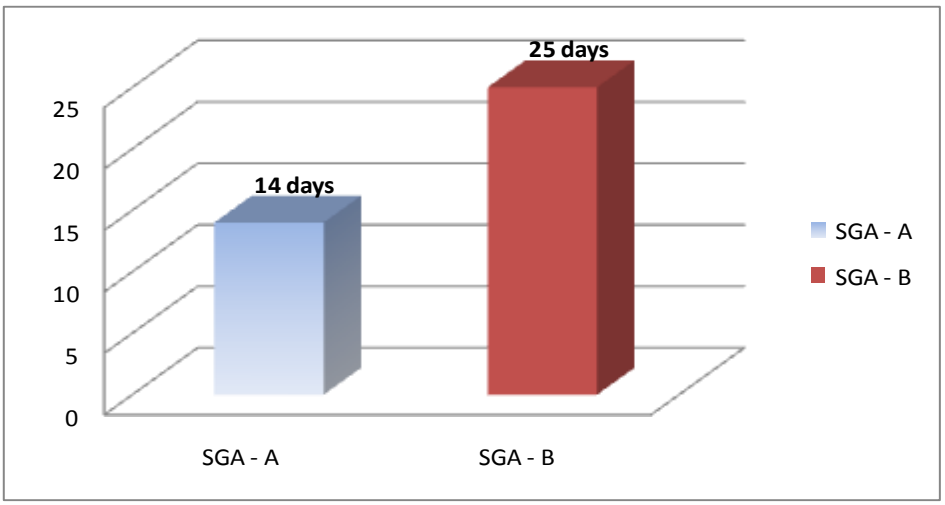

Figure 1: Comparison of average length of hospital stay among well nourished (SGA-A) and the malnourished group (SGA-B) of study patients

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