Research Article

Hospital Associated Variation in Nutritional Status and Dietary Compliance of Elderly Patients

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Abstract

Background: Malnutrition is associated with detrimental aftermaths for patients including increased infections, complications, exacerbated muscle loss, prolonged hospital stay, and is often underdiagnosed.

Objective: The study was carried out to determine the hospital associated variability of nutritional status, impact of length of stay on malnutrition in geriatrics.

Methods: A sample of 100 participants was selected for a single group pretest posttest quasi experimental study. Interviewer administered questionnaire and Subjective Global Assessment (SGA) tool were used to collect data both at the time of admission and discharge. Within group pre-admission and post-discharge outcomes including nutrition practices, dietary compliance and nutritional status assessed by SGA were compared.

Results: The BMI of the participants decreased at the time of discharge (22.89±4.44 kg/m2 pretest vs. 22.25±4.46 kg/m2 posttest) and more adults were categorized undernourished (13% in pretest vs.17% in posttest). A significant decrease in well-nourished participants (45.0% pretest vs. 32.0% posttest), and increased malnourished individuals (12.0% pretest vs. 25.0% posttest) was observed.

Conclusion: Length of stay along with dietary constraints in geriatrics affects the nutritional status drastically. Targeted dietetic interventions can decrease hospital associated malnourishment. Dietary compliance of hospitalized patients can be ensured by educating the patient/caregiver to reduce the risk of malnutrition and hospital readmission. Patients already malnourished at admission are more prone to have deteriorating health.

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Keywords | Malnutrition, nutritional status, length of stay, Subjective Global Assessment (SGA), dietary compliance, Body Mass Index (BMI)

Introduction

Nutrition is significant determinant of health in elderly people especially those suffering from chronic illnesses. According to the WHO, malnutrition refers to inadequacies, excess, or imbalances in a person's intake of energy and/or essential nutrients.[1] Malnutrition is associated with detrimental aftermaths for patients including increased infections, complications, exacerbated muscle loss and fatigue, prolonged stay in the hospital, and consequential increase in morbidity and mortality rates.[2] Elderly patients aged >65years use two thirds of hospital beds. Elderly population is more susceptible to malnutrition; about 16% of elderly population >65years and 2% of those >85years are categorized

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as malnourished. These rates are anticipated to increase substantially in about 30 years. As by 2030, people born in between 1946 and 1964 that is the baby boomer generation, will all be aged 65 and older and thus will fall within the older adult age group. It has been predicted that working number of adults between 18 and 64 years of age, between 2020 and 2060 is significantly less than the predicted increase in the number of older adults during this same timeframe. This shift poses a significant issue that is whether the older adult generation in 2030 will have access to the care and resources they may need for a safe and healthy lifestyle.[3] Studies from developed countries have reported that about 15% of elderly people who are home bound, 23%-62% hospitalized patients and about 85% old age home residents develop malnutrition.[4]

Over time, the significance of nutritional status in various morbidities including cancer, heart disease, and dementia in people >65years has gained interest.[5] An association has been observed between impoverished nutritional status and prolonged hospital stay, reduced quality of life and increased rates of morbidity and mortality.[6] Malnutrition in elderly patients is often underdiagnosed, and various health professionals have declared their requirement for advanced nutrition education concerning health in geriatrics.[7] For example, physicians may not be able to identify decreased weight in the elderly as an indicator of malnutrition because some weight loss might be related with age-associated muscle loss.[8] A number of screening and assessment tools can be used to identify risk factors and to diagnose malnutrition for example Subjective Global Assessment (SGA), as its subjective nature allows health personnel to identify subtle changed patterns in clinical variables.[9]

In Pakistan, 6% of the people are >60years of age, which is predicted to be doubled by 2025.[10] A balanced diet is beneficial in innumerable ways; especially it can improve the management of comorbid health disorders or dysfunctions. Dependency due to reduced functional capacity, financial dependence and deputize food related decisions to someone else may pose difficulty to geriatric patients in getting access to sufficient nutrition.[11]

The first challenge in Pakistan is that limited data is available to identify the dietary patterns and problems faced by patients in getting adequate nutrition.[12] Secondly little concern is shown regarding the risk factors of reduced functional capabilities and the hospital- associated complications linked to malnutrition.[13] The current study was carried out to determine the hospital associated variability of nutritional status, impact of length of stay (LOS) on malnutrition in elderly patients. Also, it reports the dietary compliance of recommended patterns compared with actual intakes and hints on the factors which might be linked to compliance or non-compliance. This research can significantly help in planning interventions for malnourished elderly patients in future.

Methods

The aim was to assess hospital associated variation in nutritional status and dietary compliance of elderly patients. Single group pretest posttest quasi experimental study design was adopted. Three hospitals with high turnover rate, centrally located in Lahore, Punjab, Pakistan were selected for data collection. Written permission from hospital authorities was taken before collecting data. Patients admitted in hospital aged ≥ 65years were considered eligible for the study. As after 65 years, due to aging, both genders become more prone to malnutrition. The possible changes include loss of lean mass tissue, loss of height about 1cm/10years, varied bone mineral density.[13] Pregnant women and those in gynecology and obstetrics ward were excluded. A sample of 110 participants which is the minimum required sample was selected to be sufficient for reaching statistical inferences using the convenience sampling. Oral consent for participation in study to provide follow-up were sought before selecting participants in the sample.

Interviewer administered questionnaire and SGA were used to collect data.[14] Data regarding patient demographics, anthropometric measurements (weight nearest to 0.1kg, height nearest to 0.1cm), current health problem (aggravating and relieving factors), lifestyle practices, dietary practices, usual daily intake (type, amount and cooking method), dietary recommendations by dietitian, and actual dietary intake in hospital (24-hour recall) was taken using a pre-structured interview schedule. Patients themselves or their attendants acted as respondents for study. Hospital records were consulted for collecting secondary data on anthropometry, LOS in hospital (date of discharge and admission) and diet advised by dietitian.

History of weight change in past six months was gathered through interview with patients or their caregivers. Body Mass Index (BMI) was calculated using metric formula Weight (kg)/Height (m^2). Asian BMI cut off values were used to categorize each case into normal weight (18.5-22.9kg/m^2), underweight (<18.5kg/m^2), overweight (23-24.9kg/m^2), pre-obese (25-29.9kg/m^2) and obese (≥30kg/m^2).15

Dietary compliance of the patient was analyzed by comparing dietitian's recommendations with patient's intake, to investigate to which extent both recommendation and intake are similar or different to each other. A predetermined consensus was made among the researchers regarding self-scoring of dietary compliance. Dietary analysis of patient's intake compared to recommendation was quantified on a 10 point scale score. 0–10 scale (0 = no compliance at all, 4 = somewhat compliant, and 10 = recommendation and dietary intake is completely compliant). Dietary compliance was analyzed and scored both pre and post hospital stay. Dietary constraints in following recommended diet were asked from patients and categorized into one of the following categories: lack of knowledge, psychological issue, financial issues, and hindrance in meal preparation, time management, altered taste, food allergy, food intolerance and lack of interest.

Nutritional assessment of each patient was performed within 48 hours of admission using SGA. SGA is commonly used for assessing nutritional status via a questionnaire that comprises of items on weight change, dietary analysis, gastrointestinal symptoms, and changes in functional capacity in relation to malnutrition, also assessment of fat and muscle stores and edema. It was used to classify patients as either: A—well-nourished; B—mildly/moderately malnourished; or C—severely malnourished.

We followed up each patient on telephone and calculated the total hospital LOS of all the patients.

Out of 110 patients, 4 patients withdrew from the study and 6 patients were lost during follow up. Consequently, the final sample after a dropout of 9% individuals comprised 100 patients who continued for the study. At the time of discharge, same questionnaire and SGA form were used to collect data again from these patients. Within group pre admission and post discharge outcomes including nutrition practices, dietary compliance and nutritional status assessed by SGA were compared.

Data was assessed and analyzed using IBM SPSS Statistics 21, Version 21.0.0.0. Data of continuous and categorical variables were presented as Mean±SD and as frequency and percentages respectively. Chi-square test, Paired samples T test and Risk Indicator (Odds Ratio) were used for inferential analysis. Analysis was run at 95% confidence interval (CI) with $p<0.05$ considered significant.

Results

Socio-demographic data and health problems of study participants were collected from a total of 100 participants who fell into criteria. Socio-demographic characteristics of the sample have been shown in Table-1. Mean age of the sample was found to be 78.67±12.795 years. Majority (96%) of the sample lived with their family and had a sedentary lifestyle (71%). About quarter of the sample (28%) reported to be smokers with an average of 3 cigarettes smoked/day. The average LOS of patients at hospital was 14.63±15.76days (Table 1). About a quarter of the sample was hospitalized because of gastrointestinal problems (24%). After GI problems, neurological disorders were the most frequently observed issue (12%). Anthropometric measurements that is height and weight of the participants was recorded at time of admission as well as before their discharge from hospital (Table-2). Mean height of sample was found to be 167.90±10.58cm while mean weight was found to be 64.48 ±13.01kg and 62.37±12.34kg at pre and post-test respectively. These measurements were indexed to calculate BMI. Mean BMI was found to be 22.89± 4.44kg/m^2 (pretest) and 22.25±4.46 kg/m^2 (posttest). According to BMI categories, a trend of slight decrease in weight for height was observed after discharge as evident from the decreased number of participants who fell in underweight category in posttest (13% pretest to 17% posttest). The number of participants in normal BMI category increased slightly (43% to 47%), probably because of the decrease in number of overweight (22% to 17%) and pre obese (14% to 11%) individuals who were classified as normal weight during post-test.

Subjective Global Assessment of study participants was carried out to evaluate the nourishment status, the patients were given SGA rating both at admission (pre)

Table 1: *Sociodemographic characteristics, underlying health condition, barriers to dietary compliance and anthropometric measurements of the study participants.*

Variables		F(%)	Mean±SD(Range)
Socio-demographic			
Age			78.67±12.795 (65-90)
Gender	Male	46(46.0%)	
	Female	54(54.0%)	
Lives with	Family	96(96.0%)	
	Friends	2(2.0%)	
	Alone	2(2.0%)	
Lifestyle			
Smoking	Yes	28(28.0%)	
	No	72(72.0%)	
No. of cigarettes smoked/day			3.19±6.58 (0-32)
Physical activity	Sedentary	71(71.0%)	
	Active	29(29.0%)	
Health			
Length of stay in hospital(days)			14.63±15.76 (3-120)
Health condition	Diabetes mellitus	3(3.0%)	
	Respiratory disorders	8(8.0%)	
	Cardiac disorders	7(7.0%)	
	Gastrointestinal disorders	24(24.0%)	
	Liver disorders	9(9.0%)	
	Kidney disorders	10(10.0%)	
	Oro-facial disorders	3(3.0%)	
	Neurological disorders	12(12.0%)	
	Others	24(24.0%)	
Barriers to dietary compliance			
Constraints	Lack of knowledge	37(37.0%)	
	Financial status	19(19.0%)	
	Hindrance in meal preparation	25(25.0%)	
	Altered taste	29(29.0%)	
	Food allergies	2(2.0%)	
	Food intolerance	33(33.0%)	
	Psychological issues	29(29.0%)	
	Religious/cultural issues	2(2.0%)	

Anthropometric measurement

Variables		Pre-test		Post-test	
		F(%)	Mean±SD	F(%)	Mean±SD
Height(cm)			167.90±10.58		167.90 ± 10.58
Weight(kg)			64.48±13.01		62.37 ± 12.43
BMI(kg/m^2)			22.89±4.44		22.25 ± 4.46
BMI categories	Underweight(<18.5kg/m^2)	13(13%)		17(17%)	
	Normal(18.5-22.9kg/m^2)	43(43%)		47(47%)	
	Overweight(23-24.9 kg/m^2)	22(22%)		17(17%)	
	Pre obese(25-29.9kg/m^2)	14(14%)		11(11%)	
	Obese(≥30kg/m^2)	8(8%)		8(8%)	

BMI (Body Mass Index), SD (Standard Deviation)

and discharge (post) (Table 3). At the time of admission 45% were rated as A-Well-nourished/normal, 43% patients were rated B-Moderately malnourished whereas 12% patients were rated as C-Severely malnourished. At the time of discharge 32% were rated as A-Well-nourished/normal, 43% patients were rated B-Moderately malnourished whereas 25% patients were rated as C-Severely malnourished. As shown in Table-3, a statistically significant association between hospital stay and SGA was found. The percentage of participants who scored well nourished on SGA decreased at time of discharge compared with those at time of admission. Also, the percentage of those who were severely malnourished increased significantly after hospital stay from 12% at time of admission to 25% at time of discharge (Table-2).

The dietary compliance was evaluated and it was seen that at the time of admission of the patients there was a difference between dietitian's recommendations and patient's dietary intake in hospital in 62% patient. This reduced to 43% at time of discharge representing that a large number of patients were not compliant with dietitian's recommendations at discharge. (Figure-1) A number of dietary constraints were analyzed which were causing hindrance in dietary compliance. About 37% patients had the constraint of lack of knowledge, 34% had lack of interest in dietary intake, 33% had food intolerance, and 29% had altered taste and psychological issues each. About 25% patients faced hindrance in meal preparation while 19% were unable to show compliance due to unstable finances (Table-1).

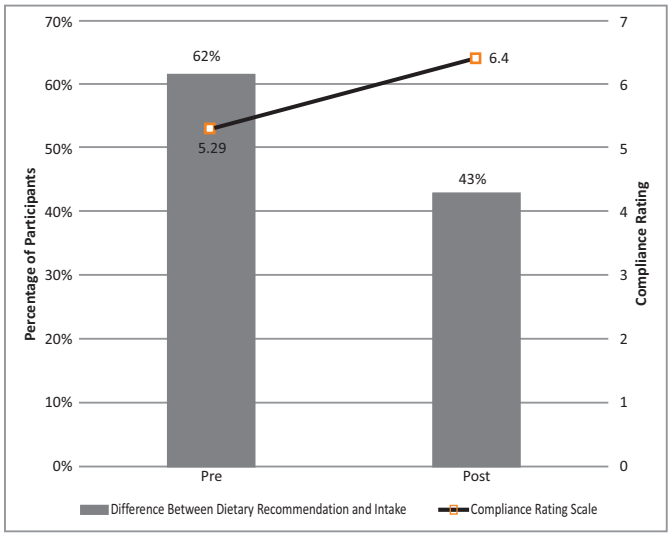

Figure 1: *Comparison of dietary recommendations of dietitians and current intake of participants*

Dietary compliance was analyzed on a scale 1 to 10 both pre and post. The average compliance rating pre was 5.29±2.82 whereas the average rating post was 6.40± 2.32, showing that dietary compliance at the time of discharge significantly increased than at the time of admission ($p<0.05$). Dietary compliance scores were not found to be significantly different among participants who were well nourished vs those who were undernourished according to SGA. But the LOS of under-

Table 2: *Comparison of pre and posttest SGA rating of the participants.*

Variables	Categories	Frequency(%)	Chi-square	P	CI 95%	
					Lower Bound	Upper Bound
SGA Rating (pre)	A- Well-nourished	45(45.0%)	85.70	.000	.000	.000
	B- Moderately malnourished	43(43.0%)				
	C- Severely malnourished	12(12.0%)				
SGA Rating (post)	A- Well-nourished	32(32.0%)				
	B- Moderately malnourished	43(43.0%)				
	C- Severely malnourished	25(25.0%)				

Table 3: *Dietary compliance and LOS of participants and their SGA ratings*

	SGA Well nourished Mean±SD	SGA malnourished Mean±SD	T-statistic	P	CI(95%)	
					Lower bound	Upper bound
Dietary compliance pretest	4.96±2.204	5.17±3-129	-0.608	0.545	-2.052	1.096
Dietary compliance posttest	6.16±1.85	6.24±2.37	-0.150	0.881	-1.203	1.036
Short LOS	9.74±5.93	11.67±9.50	-0.92	0.36	-6.45	2.40
Long LOS	8.00±5.10	22.56±18.19	-4.32	.000	-21.31	-7.81

nourished participants on SGA was significantly longer (22.56±18.19days) than those who were well-nourished (8.00±5.10 days) (p=0.000) (Table-3).

Discussion

Current study was carried out to determine the presence of malnutrition in hospitalized adults through SGA. A number of researches have been done to find out the effect of malnutrition on length of hospital stay but there have been very limited studies on how LOS can influence the nutrition status of adult hospitalized patients. The influence of dietary compliance and LOS at hospital on the degree of malnutrition was the main objective of this research.

In this research BMI of the participants decreased at the time of discharge (22.89±4.44 kg/m2 in pretest vs. 22.25±4.46 kg/m2 posttest) and more adults fell in the category of undernutrition (13% in pretest vs.17% in posttest) (Table-1). These results are comparable to another study in which prevalence of undernutrition in hospitalized patients was 14% and it significantly increased with the LOS.[16] In another study by Bellanti et al., it was stated that the prevalence of malnutrition among hospitalized patients varies between 20% and 50%, according to the utilization of diverse diagnostic criteria and screening techniques.[17] Eating disorders, food intolerance and dependency on others for eating are the notable reasons for low BMI18, as these are the major dietary constraints (Table-1). Hospitalization is known to have a significant impact on individuals' normal nutritional intake due to many circumstances. These variables include restricted time of food availability, decreased appetite, critical effects of medicine, and mandated periods of fasting.[19] Early screening and targeted interventions can reduce the weight loss and hospital malnutrition in adults and improve life quality.

SGA helps to predict the hospital stay and nutrition related complications. It not only identifies malnutrition but also distinguishes it from diseased state.[20] Prevalence of malnutrition in elderly has increased from 20%-50%[21] to 29%-61% and it varies in different settings. It is an independent risk factor for poor prognosis and increased mortality in older adults.[22] This study found significant (p-value=0.00) decrease in the number of well-nourished participants (45.0% pretest vs. 32.0% posttest), and increase in the percentage of severely-malnourished individuals (12.0% pretest vs. 25.0% posttest) on SGA at the time of discharge (Table-2), the findings of a prospective observational research revealed a strong correlation between a decrease in nutritional status and weight loss, and a prolonged length of stay (LOS).[23] The results are in contrast to the randomized control trial conducted by Sharma et al. in which with the SGA scores in both control and intervention group reduced after hospital stay, suggesting improved nutrition.[24] The possible explanation for this discrepancy is the higher mean hospital LOS and low levels of dietary compliance in our study.

Dietary compliance describes the degree to which a patient accurately follows the dietary recommendations. An interesting finding of this research is that, although the percentage of patients with the difference in dietary recommendations and intake decreased (62.0% pretest vs. 43.0% posttest) and the mean dietary compliance rate increased (5.29±2.82 pretest vs. 6.40±2.32 posttest), yet large number of patients were non complaint to dietary recommendations at the end of treatment. Our results are in agreement with a compliance behavior study, in which the mean dietary compliance score of elderly heart failure patient was 76.79±17.19 (on scale of 1-100) and 37% patients reported difficulty following the dietary regime.[25] According to Tirfie et al., the most commonly cited factors contributing to non-compliance with dietary guidelines are insufficient self-control, limited access to information, and financial limitations. The primary cause for non-compliance to diet among individuals was usually attributed to a dearth of information, provided by healthcare personnel.[26] It is evident from a pre-post quality improvement program that early initiation of nutrition intervention and educating the patient/caregiver significantly lowered the risk of malnutrition and hospital readmission.[27] In the present study, mixed dietary constraints were faced by the patients including either the lack of proper knowledge regarding the importance of diet therapy (37.0%) or the lack of self interest in eating (34.0%) (Table 1). Food intolerance is another major factor leading to hindrance in following dietary recommendations, as experienced by 33.0% of the patients. We posit that one reason could be the highest percentage of patients (24.0%) suffering from the gastrointestinal disorders at the time of admission, which makes it difficult for them to tolerate dietitian's recommendations.

Along with the dietary compliance, LOS also impacts the nutrition status of patients. The statistically significant (p-value=0.00) longer LOS at hospital (22.56± 18.19) in malnourished participants as compared to well-nourished individuals (8.00±5.10) is in line with the results of a German study[28], suggesting that malnutrition is associated with 43% increase in LOS. Similarly, in a prospective cohort study, median LOS was longer (5.2days) in patients at high risk of malnutrition than in low risk patients (4.9days).[29] Malnutrition at the time of hospitalization can influence treatment efficacy, disease complications, LOS and further deterioration of nutrition status.[30] Vong et al., state that the duration of a patient's hospitalization, commonly referred to as hospital length of stay (LOS), is a statistic that is associated with malnutrition and has implications for health economics. The malnutrition group exhibited a statistically significant longer median length of hospital stay compared to the group without malnutrition, with respective durations of 16.08 days and 5.63 days.[31] According to our study the LOS in malnourished patients was 22.56 days and 8.00 days in well-nourished patients. This indicates a similar pattern to the study by Vong et al.,.[31]

In a study conducted in Singapore at two teaching hospitals revealed a correlation between malnutrition and patients' health outcomes. Patients who are malnourished tend to have longer hospital stays (6.9 ± 7.3 days vs. 4.6 ±5.6 days) compared to those who are well-nourished.[32] The analysis is similar to the current research but the length of stay in hospital in developed countries is lower than our country due to innumerable reasons including potentially inadequate nutritional status in Pakistan, escalated healthcare expenses due to unstable economic conditions, hospital-acquired infections (HAIs) in patients due to inadequate management and hygiene in healthcare settings, admitting patients for treatment more than the available medical resources and physical capacities of hospitals.

This research highlights the influence of LOS at hospital on the nutrition status of geriatrics, facing multidimensional constraints in exhibiting compliance to the dietary regime. It calls for strict implementation of malnutrition screening at time of admission in hospital and provision of customized dietary support to patients individually, improvement of healthcare settings and infrastructure to cater patients, along with appropriate nutrition education to address the limitations.

Conclusion

This study illuminates the crucial relationship between hospital length of stay (LOS) and adult hospitalised patients' nutrition condition, especially in context of malnutrition. Our findings show that malnutrition worsens health and lengthens hospital stays, making it a major healthcare issue. The hospitalised patients' nutritional status declined and undernutrition increased. This drop was caused by food compliance concerns and hospitalisation challenges. Patients' reduced mealtimes, decreased appetite, and pharmaceutical effects led to their BMI and nutritional health decline.

The research also stressed the significance of dietary compliance, noting that while some patients improved, many remained non-compliant. Insufficient self-control, limited access to information, and dietary intolerance contributed to non-compliance. These findings emphasize the need for thorough patient education and assistance to improve hospital dietary compliance. The study found a strong link between malnutrition and hospital LOS. Malnourished patients stayed longer than well-nourished ones. Malnutrition's economic and healthcare effects are highlighted by extended hospital stays, which strain healthcare resources and raise expenditures. Healthcare infrastructure and resource distribution must be prioritized to enhance patient outcomes and minimise LOS.

Given these findings, early malnutrition screening upon hospital admission and individualized nutritional therapy are essential. Healthcare institutions must prioritize individualized dietary support, infrastructural improvements, and patient education to accommodate hospitalized adults' complex needs. By addressing malnutrition thoroughly, we can improve patient outcomes and reduce healthcare system strain, improving healthcare quality.

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Authors' Contribution:

FF: Data collection, data analysis and manuscript writing

SUJ: Data collection, data analysis & interpretation and manuscript writing

AT: Study design, survey design, data analysis, writing and critical review of manuscript

RK: Writing, critical review and revision of manuscript

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