Assessing pre-operative nutritional status in geriatric inpatients, and associating it with post-operative clinical outcomes'; in a tertiary care hospital of central India

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Abstract

Introduction: Malnutrition though prevalent during hospitalization is often unrecognized in geriatric population. The study aimed to determine the prevalence of malnutrition among hospitalized geriatric patients undergoing elective surgery using a standardized nutritional tool and to find association between the pre-operative nutritional status and post-operative clinical outcomes.

Materials and Methods: This observational follow up study was conducted at a tertiary care hospital of Central India. Total 90 patients were included. Each patient's nutritional status was determined by MNA (Mini Nutritional Assessment) scale within 24 hours of admission and required anthropometric and biochemical parameters were also collected preoperatively. Patients were followed with respect to surgical wound healing and length of hospital stay.

Results: MNA tool detected the prevalence of malnutrition (under-nutrition) at 60%, and at risk of Malnourishment at 24%. These patients experienced significantly prolonged hospital stay after surgery ($p<0.01$). The MNA based nutritional grading showed high level of sensitivity (91% - 94%) specificity (92%-95%), predictive value (91% - 94%) and concordance coefficient (70%-90%).

Conclusion: Large number of geriatric surgical patients are malnourished or at risk for malnutrition. MNA, a simple low skilled tool that can be conducted by paramedics can identify this with good accuracy and help in nutritional planning and lowering postoperative complications.

Keywords: Nutritional status. Surgical geriatric in patients, MNA.

Introduction

Aging is a constant, irreversible and an inescapable process involving changes from birth to senescence. The wave of greying in terms of number and proportion is seen all over the world.[1] The geriatric population which is growing at a rate of about 3 percent per year presently constitutes 13 percent of the global population and this number is expected to double by 2050.[2] India's geriatric profile stands at 77 million (7.5%) elderly in 2001 to 104 million (8.6%) in 2011 and the number is forecasted to triple by 2050.[3-4] Their increasing number brings cheers and challenges that needs pragmatic approaches to ensure their health and wellbeing. One such area is geriatric under-nutrition.[5-11] This issue gets further compounded when surgical procedures which themselves are nutritionally demanding situations are considered at an increased rate in this venerable populace.[12-16] Timely address of this issue can be a cost and recovery effective approach.

Aim and Objectives

The present study was designed to evaluate pre-operative nutritional status and its association with postoperative clinical outcomes in geriatric inpatients of a tertiary care hospital of Central India with the following objectives:

1. To estimate the prevalence of under nutrition / at risk of malnutrition in geriatric inpatients admitted to Surgery Wards.
2. To study post-operative clinical outcome in terms of surgical wound healing and length of hospital stay with reference to nutritional status.
3. To determine the feasibility of adopting MNA (Mini Nutritional Assessment) scale as an assessment tool to identify patients with malnutrition or at risk of malnutrition for geriatric in patients.

Materials and Methods

A prospective Observational study was carried out in Surgical Units of C. R. Gardi Hospital of R.D. Gardi Medical College, Ujjain, Madhya Pradesh from 15th May 2018 to 15th July 2018. Patients above 60 years of age undergoing elective surgery formed the study population.

Sample size was calculated by using the formula $n=z^2p(1-p)/d^2$, where n is the sample size, z the confidence coefficient, p is the prevalence and d is the allowable error. Considering the value of z at 95%, confidence level to be 1.96, and prevalence of malnutrition and at risk of nutritional among geriatric inpatients to be 60%[31] and maximum allowable error at 10% the calculation yielded a required sample of 92 that was rounded off to 90.

Selection Criteria: Consenting patients above 60 years of age admitted for elective surgery who were able to understand and answer the question were assessed for their nutritional status within 24 hours of admission by MNA, relevant anthropometric, and biochemical markers. Patients with terminal illness like cancers, confided to bed, on steroid therapy and with a habit of smoking and alcohol and unable to communicate were kept out.

The outcome variables like wound infections and length of hospital stay was also recorded from the patient's bed side files and discharge records.

The study had permission from Institutional Ethics Committee- of R.D. Gardi Medical College.

Results

General socio-demographic profile was recorded and nutritional assessment done by MNA (sensitivity 96%, and specificity 98%) which has four domains i.e. dietary, subjective, psychological and anthropometric measurements. Nutritional biomarkers like haemoglobin and serum albumin values were collected from the bedside admission files and anthropometric measurements like height, weight, and mid-upper arm and calf circumferences were recorded by the investigator by standardized equipments established guidelines. Literature supported MNA as a preferred tool especially for geriatric surgical population.[17] It has a screening and assessment part. Those who scored less than 17 were classified as undernourished, who scored between 17 and 23.5 as at risk of malnutrition and who scored 24 to 30 were classified to have normal nutritional status. The Biuret and BCG methods were employed in the assessment of Serum albumin. Haemoglobin estimation was done by Cyanmetheamoglobin method. Subjects having s. albumin below 3.5 gm/dL and haemoglobin levels below 12 gm/dL were considered as undernourished.[32,33]

Different outcome measures like would status was recorded at 3rd postoperative day. Impaired wound healing was defined as presence of any evidence of wound infection such as expanding redness, pus discharge, increased swelling, tenderness, or pain around the wound. Wound status was recorded regularly till the discharge of the patient.[34]

Length of hospital stay (LOHS), the most important proxy indicator of recovery was recorded.[35] The standard policy at the hospital is to discharge patients within 7 days of routine surgery providing there are no complications.

Data Analysis

All data were entered into a Microsoft Excel (Microsoft Corporation, Redmond, WA, USA) spreadsheet and statistically analysed using SPSS version 23.0 (SPSS Inc., Troy, NY, USA). Descriptive data were presented in frequencies and percentages or means and standard deviations. Inferential analysis was done for study of association between nutritional status as per MNA and outcome variables. Utility of MNA as an assessment tool was reported via sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and concordance.

Descriptive Analysis

The age, gender, education and livening status of studied participants are presented in table 1.

Majority patients underwent abdominal 32 (37%) and gynaecological 30(33.3%) surgery. Urogenital and other surgeries were performed on 11(12%) and 17(19%) participants respectively.

Nutritional status evaluation by MNA showed that 54 (60%) of the subjects as malnourished (having MNA score of less than 17), 22(24%) at risk of malnutrition (MNA score between 17 and 23.5) and 14 (15.6%) were having adequate nutritional status (MNA score above 23.5). This is depicted in figure number 2 by pie-chart.

Post-operative clinical outcome was assessed in terms of wound healing and LOHS. Wound infection was present in 14 patients (15.6%) and 42(46.7%) patients reported longer LOHS. These data are shown in table 2.

Table 1: Demographic characteristics of the study participants

Variables		N=90	Percentage
Age (years)	<70	52	57.7%
	70-80	28	31.1%
	>80	10	11.11%
Gender	Male	47	52%
	Female	43	48%
Residence	Rural	85	94%
	Urban	5	6%
Education	Unable to read and write	80	87%
	Able to read and write	10	11%
Living Status	Living alone	39	43%
	Living with family/others Others	51	57%

Inferential Analysis

On demographic parameters increasing age was found significantly associated with mal-nutrition ($p < 0.05$). Other parameters reported statistical non-significance. The chi square analysis is shown in table 3.

Table 2: Descriptive analysis of post-operative clinical outcomes

Variables		N=90	Percentage
Surgical wound status	Normal healing	76	84.4%
	Delayed healing	14	15.6%
Length of stay	Normal	48	53.3%
	Increased	42	46.7%

Table 3: Study of association of nutritional status with demographic variables

Variable	Malnourished	Risk of malnutrition	Well Nourished	p-value
Age				
<=70 years (n=52)	32 (61.53%)	11 (21.15%)	9 (1%)	0.04
70-80 years (n= 28)	14 (50.00%)	9 (32.14%)	5 (17.85%)	
>80 years (n=10)	8(80.00%)	2(20.00%)	0(0.00%)	
Sex				0.71
Females (n=43)	30 (69.76%)	10(23.25%)	3(6.98%)	
Males(n=47)	24 (51.06%)	12 (25.53%)	11 (23.40%)	
Education				
Illiterate(n=80)	46 (57.5%)	20 (25%)	14 (77.77%)	
Literate(n=10)	8 (80.0%)	2 (20.0%)	0 (0.0%)	0.27
Address				
Rural (n=85)	52 (61.17%)	21 (24.7%)	12 (14.1%)	0.29
Urban (n=5)	2 (40.0%)	1 (20.0%)	2 (40.0%)	
Living Status				0.48
Living alone(n=38)	25(65.78%)	9(23.68%)	4(10.52%)	
Living with others (n=52)	29(55.76%)	13(25%)	10(19.23%)	

(Chi square analysis, p-value significant at <0.05)

Nutritional score/category of MNA was evaluated against anthropometric and biochemical variables. BMI (body mass index), haemoglobin and serum albumin levels demonstrated strong association with MNA nutritional grades (p<0.01). The chi square analysis is presented in table 4.

Post-operative clinical outcome was studied in terms of surgical wound healing and length of stay. Increased hospital stay was highly associated with patient's nutritional status (p, 0.00). This data is shown in Table 5.

MNA showed a sensitivity of 67% with BMI, 70% with MAC and 72% with CC. When biochemical parameters were taken as gold standard, MNA showed a sensitivity of 95% with S. albumin and 89% with haemoglobin. On using MAC, specificity of MNA was average (48%) but it was high (92%) when S. albumin and haemoglobin were used. Predictive values of MNA i.e. probability to accurately identify truly malnourished was quite high 91% and 94% with biochemical indices. On concordance coefficient analysis, MNA had 70% inter-observer reliability with S. albumin and 90% with haemoglobin. Details are presented in in Fig. 1.

Table 4: Study of association of anthropometric and biochemical measurements with nutritional status as per MNA

Study Variable	Malnourished	Risk of malnutrition	Well Nourished	p-value
BMI (kg/m^2)				
<19 (n=21)	21(0.0%)	0 (0.0%)	0(0.0%)	0.01
19-21(n=57)	30(65.4%)	15(19.2%)	12 (15.4%)	
21-23(n=11)	2(18.2%)	7(63.6%)	2 (18.2%)	
>23(n=1)	1(100.0%)	0(0.0%)	0(0.0%)	
MAC (in cm)				
<21(n=45)	26 (57.8%)	11 (24.4%)	8 (17.8%)	0.07
21-22(n=30)	23 (76.7%)	4 (13.3%)	3 (10.0%)	
>22(n=15)	5 (33.3%)	7 (47.7%)	3 (20.0%)	
CC (in cm)				
<31(n=82)	49 (59.8%)	20 (24.4%)	13 (15.9%)	0.96
>31(n=8)	5 (62.5%)	2 (25.0%)	1 (12.5%)	
S. Albumin (gm/dl)				
Low (n=33)	30 (90.9%)	3 (9.1%)	0 (0.0%)	0.00
Normal (n=57)	24 (42.1%)	19 (33.3%)	14 (24.6%)	
Haemoglobin (gm/dl)				
Low (n=51)	48 (94.1%)	3 (5.9%)	0 (0.0%)	0.00
Normal (n=39)	6 (15.4%)	19 (48.7%)	14 (35.9%)	

(Chi square analysis, p-value significant at <0.05.)

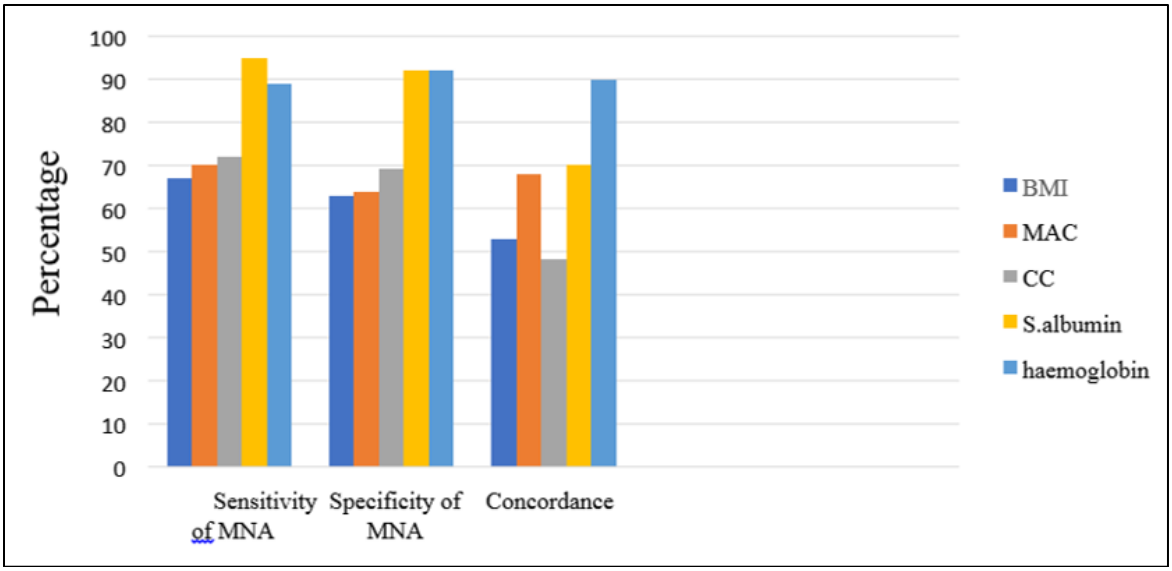

Fig. 1: Graph showing sensitivity, specificity and concordance of MNA

Discussion

Malnutrition is a concerning issue in geriatrics more so those seeking operative interventions as surgical conditions and surgical procedures in themselves are major stress factors thereby emphasising on good nutritional status which allows the body to recover in a faster and more efficient manner.[36]

The reported study focuses on the prevalence of malnutrition among geriatric surgical patients, its association with post-operative clinical outcomes and validation of MNA as a locally contextual tool in this regard.

It was observed that 60% of the geriatric patients were malnourished and 24% were at risk of it. Study done by Vivek Nagar et al, showed the general prevalence of malnutrition among the patients at 36% and those at risk at 38%.[37] Chandrashekhar C. et al found the prevalence in surgical patients to be 49% and at risk of malnutrition at 45%.[38] Both these studies did not have geriatric population in focus. The reason for higher figure in present study may be attributed to the hospitalized geriatric patients seeking surgery.

The study pointed out at age as an independent risk factor for malnutrition in surgical geriatric inpatients (p value= 0.04). This result was congruent to the other studies where age was also found as an independent risk factor for malnutrition.[31,39] Higher prevalence was also observed in females (46%) compared to males (7%) though this difference could not achieve statistical significance. Literature review shows studies reporting significantly higher mal (under) nutrition in females than males using MNA tool.[40,41] Rural vs. urban and educated vs. illiterate line could not be toed.

In establishing MNA as an efficient screening tool the anthropometric scale of BMI showed significant accusation and MAC a near significant (p-0.07) one. A look into CC cut-off of 31 cm needs to be revaluated specially for the studied population. On biochemical parameters MNA had ample support as a 'screening tool' for study population (p value=0.00). The sensitivity, predictive value and inter-observer concordance coefficients of MNA were all in acceptable limit.

A significant association was observed between nutritional status (under-nutrition) and LOHS.LOHS is considered as an important proxy indicator for surgical complications. Similar results were given by Stratton et al in the U.K. where malnutrition was common in 58% of patients and was associated with longer hospital stays and poor outcomes.[43] It highlights the importance of diagnosing and treating malnutrition prior, during and after surgery.

Conclusion

Nutritional assessment for geriatric population in general and hospitalized ones in particular is of vital significance. If geriatric surgical inpatients are routinely evaluated for their nutritional status and corrective measures initiated in time this can be of immense value to the care seekers and givers. A simple and reliable tool like MNA can be advocated for this purpose which needs less technical expertise and can be administered by nursing and other paramedics.

Strengths and Limitations

According to the best of our knowledge, this was the first study conducted in Central India which used MNA to identify malnutrition in geriatric patients undergoing surgery and tried to find association between the MNA scores and post-operative clinical outcomes. We used a pre-validated standardized nutritional tool for a specific subgroup of population. The involvement of a single investigator is also an added advantage as it might have reduced observer bias. Limitations of our study was its

seeming low sample, and interaction with individuals available on the scheduled dates and the study being single centred.

Conflict of Interest: None.

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