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Original Research Article

A Prospective Study on the Effect of Major Orthopaedic Surgery on the Nutritional Status of the Patients

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ABSTRACT

BACKGROUND

Orthopedic disorders are surgical cases that involve hundreds of millions of people globally that are often related to dislocations, fracture. In orthopedic patients, prevention and correction of malnutrition has major impact in preventing operative and post-op complications, particularly in the geriatric age group.

Objectives

1. To study the effect of major elective orthopaedic surgery on the nutritional status of patients.
2. To analyse how the nutritional markers behave pre op, post op and at 3 months follow up in patients undergoing major elective orthopaedic surgery.

MATERIAL &METHODS

Study Design: Hospital based prospective descriptional study.

Study Area: The study was done at department of Orthopaedics, in a tertiary care hospital.

Study Period: 1 year.

Study Population: Patients undergoing major elective orthopaedic surgery. Major orthopaedic surgery includes hip and knee joint replacement surgeries.

Sample Size: 199 cases were included in our study.

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Ethical Consideration: Institutional Ethical committee permission was taken prior to the commencement of the study.

Study tools and Data collection procedure: The nutritional assessment was done by both anthropometry (BMI) and biochemical markers (Prealbumin and Transferrin). Since MUAC and TSF were found to be highly observer dependent and inaccurate, they were not used for analysis. Similarly since prealbumin and transferrin were better predictors of the nutritional status, other biochemical markers (albumin and total lymphocyte count) were not analyzed.

RESULTS

The pre albumin values at pre op, post op and follow up of the Osteosynthesispatients shows a significant difference between all three values (p value 0.000). There was significant difference in the pattern of values in diabetics (p value 0.001) and when comparing the age groups (p value 0.004).

CONCLUSION

Age > 40is the main patient related factor that affect the nutritional status of patients undergoing major elective orthopaedic surgery. Among the comorbidities, diabetes mellitus affects the nutritional status of the patients undergoing major elective orthopaedic surgery.

KEYWORDS

Nutritional Status, Elective Orthopaedic Surgery, Pre Albumin.

INTRODUCTION

Orthopedic disorders are surgical cases that involve hundreds of millions of people globally that are often related to dislocations, fracture. In orthopedic patients, prevention and correction of malnutrition has major impact in preventing operative and post-op complications, particularly in the geriatric age group. A dietary state of pre-operative patients indicates the safety status and immune system that also impacts patients' resistance to surgical pain, post-operative physical rehabilitation, and local wound healing and surgical site infection.

Immunological shifts arise quickly with malnutrition of protein calories combined with extended convalescence, decreased susceptibility to illness, anemia, edema, and skeletal muscle fatigue, both attributable to body protein deficiency. Often impacting immunity is undernourishment of trace substances such as magnesium, zinc, vitamins. Post-operational adverse effects may arise due to age factor, the patient's nutritional condition as well as related co-morbidities.

Elderly people are considered to have low immune reserves and are unable to adapt well to surgical injuries. Protein-energy malnutrition (PEM) is a chronic or acute lean body protein loss that leads to a state of specific nutrient deficiency that produces a measurable change in body function[1].

PEM is associated with increased mortality[2-3]. 30-60% hospitalized for acute Illness are malnourished and nutritional status has been shown to detoriate during hospitalisation[4]. furthermore patients admitted to the hospital may already be malnourished or at risk of malnutrition[5].

Trauma and surgery induce extensive physiological changes, commonly denominated the acute phase reaction (APR). This APR is activated by various kinds of stimuli, namely

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nociceptive stimulations, tissue injury, tissue ischemia and reperfusion as well as by hemodynamic disturbances which occur commonly in such patients.

There is a resistance to the nutritional support. In patients with non-complicated surgery and low or moderate severity trauma, the metabolic changes are minor and self-limited conversely, in patients with complicated surgery or major trauma; there is an extensive APR, which can be very prolonged. This results in important and sustained metabolic changes, leading to extensive catabolism and progressive loss of body cell mass. The latter is amplified by the decreased body ability to adapt to starvation and by the resistance to the nutritional support that typically occur in complicated postoperative and trauma patients[6]. Malnutrition causes loss of both body fat and lean body mass including muscles[7]. However factors such as trauma, ageing nd chronic diseases that are not directly related to malnutrition lso results in body wasting[7-9].

Objectives

1. To study the effect of major elective orthopaedic surgery on the nutritional status of patients.
2. To analyse how the nutritional markers behave pre op, post op and at 3 months follow up in patients undergoing major elective orthopaedic surgery.
3. To analyse the effect of nutritional status on the wound related complications and other post op complications.
4. To evaluate the time taken for the nutritional parameters to normalize.

MATERIAL & METHODS

Study Design

Hospital based prospective descriptional study.

Study Area

The study was done at department of Orthopaedics, in a tertiary care hospital.

Study Period

1 year.

Study Population

Patients undergoing major elective orthopaedic surgery. Major orthopaedic surgery includes hip and knee joint replacement surgeries.

Sample Size

199 cases were included in our study.

Sample size for a descriptive prospective study

$$= \frac{Z\alpha^2 \times PQ}{d^2}$$

$Z\alpha = 1.96$ for p value of 0.05

d = precision which is taken as 7

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P = 40.According to literature around 40 % of Orthopaedicinpatients are malnourished.
Q = 100-P = 60
Therefore calculated sample size is approximately 199.

Sampling Method
Simple random sampling method.

Inclusion Criteria
All patients undergoing major elective orthopaedic surgery. Major orthopaedic surgery includes hip and knee joint replacement surgeries.

Exclusion Criteria
1. Spine injury patients.
2. Patients admitted for tumour surgeries.

Ethical Consideration
Institutional Ethical committee permission was taken prior to the commencement of the study.

Study Tools and Data Collection Procedure:
The nutritional assessment was done by both anthropometry (BMI) and biochemical markers (Prealbumin and Transferrin). Since MUAC and TSF were found to be highly observer dependent and inaccurate, they were not used for analysis. Similarly since prealbumin and transferrin were better predictors of the nutritional status, other biochemical markers (albumin and total lymphocyte count) were not analyzed.The patients were evaluated pre op, post op (at suture removal) and at three months follow up. The Performa was filled up for each patient which included demographic details, diagnosis, surgery done, comorbiditiesand the nutritional parameters.

Urinary Tract Infection (UTI) referred to in our study is defined as the bacterial infection of any part of the urinary tract (urethra, bladder or kidney) confirmed with urine culture. Females are more at risk for UTI due to the anatomical differences. In symptomatic patients, the diagnostic criteria are-

1. Women: Presence of at least 100,000 colony- forming units (cfu)/mL in a pure culture of voided clean-catch urine.
2. Men: Presence of just 1,000 cfu/mL indicates urinary tract infection.

In asymptomatic patients the diagnostic criteria are -

1. Women: 2 consecutive voided urine samples with isolation of same strain in >100,000 cfu/mL.
2. Men: single, clean-catch specimen with bacterial species isolated in >100,000 cfu/mL.

Single catheterized urine specimen in both men and women with 1 bacterial species isolated in a count of > 1,000 cfu/mL.

The wound related complications in our study are described as either superficial wound infection or deep wound infection.

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Superficial wound infection is defined as the wound infection in which infection has not breached the deep fascia and when no surgical intervention is needed for the control of infection. It responds to dressings and antibiotic therapy. Deep infection is defined as the wound infection in which the infection has breached the deep fascia and when surgical intervention (wash out and drainage) along with antibiotic therapy is needed for the control of infection. We have divided our patients in to two age groups for comparison -age more than 40 yrs. and less than 40 yrs. The statistical analysis was done using SPSS software version 20.The statistical tests used were Chi square test and repeated variable Anova test.

OBSERVATIONS & RESULTS

Total number of patients assessed during the above mentioned time period was 199. Total number of cases followed up was 113 (56.78% follow up).

SURGERYDONE	PatientsSeen	PatientsFollowedUp
NON REPLACEMENTSURGERIES	92	51
1.OSTEOSYNTHESIS	64	33
2.AMPUTATIONS	28	18
UNILATERALREPLACEMENT	76	46
3.THRUNILATERAL	50	31
4.TKRUNILATERAL	26	15
BILATERALREPLACEMENT	31	16
5.TKRBILATERAL	20	11
6.THRBILATERAL	8	4
7.HIP + KNEE REPLACEMENT	3	1
TOTAL	199	113

Table 1. Surgeries done and follow up done in the study population

The analysis was done on the 113 patients evaluated at the three months follow up.

Age	16 to 76 yrs.
Average age	48.8 yrs.
Median age	49.5 yrs.
Males	59 pts. (52.2 %)
Females	54 pts. (47.8 %)
Age > 40 yrs.	86 pts. (76.1%)

Comorbidities

Diabetes – 21 pts. (18.6%)

Hypertension –19 pts,

The bilateral THR and hip + knee replacement groups were not analyzed separately because of the small number of patients followed up.They are included in the analysis under

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bilateral replacement group. The number of patients with BMI less than 20(Undernourished) was only 5 (4.42 %). Prealbumin were less than 20 in 4 out of these 5 patients.There was no patient with transferrin value less than 200.The number of patients with BM I more than 25 (overweight) was 38 (33.62 %).Prealbumin and transferrin values has been analyzed separately for the different surgical groups.

Complications

15 patients had wound related complications (13.3 %)
11 superficialinfection and 4 deep infection.
10 patients had urinary tract infection post op (8.8 %).

Osteosynthesis

The number of patients followed up – 33
1. Age – 23 to 75 yrs.
2. Average age – 50.3 yrs.
3.> 40 yrs age group – 29 pts. (87.9%)
4. Females – 19 pts. (57.6%)
5. Males – 14 pts. (42.4%)

Comorbidities

DM –8 pts. (24.2 %)
HT – 4 pts. (12.1 %)

BMI

BMI < 20 – 2 pts. (7.1 %)BMI > 25 - 13 pts.(38.4 %)
There was no association of BMI with the incidence of wound infection.

(I) PA	(J) PA	Mean Difference(I-J)	Std. Error	Sig.[a]	95% Confidence Interval forDifference[a]	
					Lower Bound	Upper Bound
1	2	3.364*	.178	.000	2.913	3.815
	3	.667*	.135	.000	.325	1.009
2	1	-3.364*	.178	.000	-3.815	-2.913
	3	-2.697*	.127	.000	-3.017	-2.377
3	1	-.667*	.135	.000	-1.009	-.325
	2	2.697*	.127	.000	2.377	3.017

Table 2. Analysis of Prealbumin in Osteosynthesis Group

The pre albumin values at pre op, post op and follow up of the OSTEOSYNTHESIS patients shows a significant difference between all three values (p value 0.000). There was significant difference in the pattern of values in diabetics (p value 0.001) and when comparing the age groups (p value 0.004). Patients with wound infection showed significant

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difference in the pattern of values but were not statistically significant (p value 0.077). HT and gender did not reveal any significant difference in the pattern of values.

(I) TF	(J) TF	Mean Difference(I-J)	Std. Error	Sig.[a]	95% Confidence Interval forDifference[a]	
					Lower Bound	Upper Bound
1	2	23.485*	1.823	.000	18.880	28.090
	3	3.303*	1.084	.014	.564	6.042
2	1	-23.485*	1.823	.000	-28.090	-18.880
	3	-20.182*	1.452	.000	-23.851	-16.513
3	1	-3.303*	1.084	.014	-6.042	-.564
	2	20.182*	1.452	.000	16.513	23.851

Table 3. Analysis of transferrin in OSTEOSYNTHESIS group

The transferrin values at pre op, post op and follow up of the OSTEOSYNTHESIS patients shows a significant difference between all three values (p value 0.000). There was significant difference in the pattern of values in diabetics (p value 0.000), when comparing between the age groups (p value 0.012) andin patients with wound infection (p value – 0.033). HT and gender did not reveal any significant difference in the pattern of values.

Amputations

The number of patients followed up	-	18
Age	-	16 to 72 yrs.
Average age	-	40.55 yrs.
< 40 yrs age group	-	11 pts. (61.1%)
Females	-	5 pts. (27.8%)
Males	-	13 pts. (72.2%)
The Number of paraplegics	-	10 pts. (55.56%)

Comorbidities

DM – 4 pts. (22.2 %)
HT – 3pts. (16.7 %)
BMI
BMI < 20 – 2 pts. (11.1 %)
BMI > 25 – 2 pts. (11.1%)
There was no association of BMI with the incidence of UTI and woundinfection.

Analysis of prealbumin in Amputations group

The prealbumin values at pre op, post op and follow up of theAmputations patients shows a significant difference between all three values (p value 0.000). No statistically significant difference was observed in the pattern ofprealbumin values between the variables for comparison (age group,gender, DM, HT). Patients with wound infection showed significant difference in the pattern ofvalues but was not statistically significant (p value 0.147).

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(I) TF	(J) TF	Mean Difference(I-J)	Std. Error	Sig.[a]	95% Confidence Interval forDifference[a]	
					Lower Bound	Upper Bound
1	2	22.056*	1.697	.000	17.551	26.560
	3	4.444*	1.469	.023	.544	8.345
2	1	-22.056*	1.697	.000	-26.560	-17.551
	3	-17.611*	2.144	.000	-23.303	-11.919
3	1	-4.444*	1.469	.023	-8.345	-.544
	2	17.611*	2.144	.000	11.919	23.303

Table 4. Analysis of transferrin in Amputations group

The transferrin values at pre op, post op and follow up of the infectivespondylitis patients shows a significant difference between all three values (p value 0.000). No statistically significant difference was observed in the pattern oftransferrin values between the variables for comparison (age group, gender,DM, HT).

Unilateral THR

The number of patients followed up – 31.
Age – 21 to 74 yrs.
Avg age – 47.54 yrs.
>40 yrs age group – 21pts. (67.7%)
Females – 11 pts.(35.5%)
Males – 20 pts. (64.5%)

Comorbidities

DM – 2 pts. (6.5 %)
HT – 5 pts. (16.12%)

BMI

BMI < 20 – 1 pt (3.2 %).
BMI > 25 - 8 pts. (26.9%).
No assocation of BMI with incidence of wound infection.(Annexure – tables 103,104).

(I) TF	(J) TF	Mean Difference(I-J)	Std. Error	Sig.[a]	95% Confidence Interval forDifference[a]	
					Lower Bound	Upper Bound
1	2	35.226*	1.918	.000	30.362	40.090
	3	11.581*	1.760	.000	7.119	16.043
2	1	-35.226*	1.918	.000	-40.090	-30.362
	3	-23.645*	1.786	.000	-28.173	-19.117
3	1	-11.581*	1.760	.000	-16.043	-7.119
	2	23.645*	1.786	.000	19.117	28.173

Table 5: Analysis of prealbumin in Unilateral THR group.

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The prealbumin values at pre op, post op and follow up of the unilateral THR patients shows a significant difference between all threevalues (p value 0.000). Statistically significant difference was observed in the pattern of prealbuminvalues in hypertensives (p value 0.014)and when comparing the age groups(p value 0.000). Patients with wound infection showed significant difference in the pattern ofvalues but was not statistically significant (p value – 0.154).

Analysis of transferrin in Unilateral THR group

The transferrin values at pre op, post op and follow up of theunilateral THR patients shows a significant difference between all threevalues (p value 0.000). Statistically significant difference was observed in the pattern of transferrinvalues in hypertensives (p value 0.009) and when comparing the age groups(p value 0.000). Patients with wound infection showed significant difference in the pattern ofvalues but was not statistically significant (p value – 0.171).

Complications

Wound infection – 4 pts.(16.2%).

2 of them were deep infection and 2 superficial infection.

Comparison between unilateral TKR and THR

There was no statistically significant difference between the groups in thepattern of both Prealbumin and Transferrin values.

DISCUSSION

This prospective study was designed to analyze the effect of majororthopaedic surgery on the nutritional status of the patients. The results ofthe study shows significant difference in the pre op, post op and the followup values of biochemical marker – Prealbumin and transferrin, in all groupsof patients. This indicate that the trauma of hospitalisation, surgery andanaesthesia does affect the nutritional status of the patient, as described invarious other studies[10-14].

The incidence of undernutrition in this study was found to be4.42%, whereas the literature quotes values around 40% in orthopaedicinpatients. This may be due to the patient selection criteria. We included only those patients who were undergoing planned elective major orthopaedicsurgery. We excluded the patients admitted for surgery for trauma and tumours. More over many of them were overnourished (BMI > 25 –33.62%). Most of the literature on malnutrition in orthopaedics are on trauma, especially hip trauma in the elderly. These might be reasons for the gross difference in the incidence of malnutrition in our study.

The biochemical parameters, even though are much better at follow upcompared to the post op level, do not come back to the pre op level even at 3 months. This indicate that these patients need to be followed up further to know when actually the parameters come back to the pre op level.

Diabetes and age > 40 yrs. are the two important factors that affect the nutritional recovery of the patients undergoing major orthopaedic traumain our study. The relationship between

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age and the nutritional status inorthopaedic patients have been extensively studied especially in hip fracturesin elderly42-45.

Osteosynthesis patients tend to behave significantly different in their nutritionalstatus compared to Amputations patients. This may be due to the effect of infection, often chronic diseases like tuberculosis, on the nutritionalstatus and parameters. Unilateral replacement patients as a whole also tend to behave differently compared to their bilateral counter parts. There were no difference in the behaviour of nutritional parametersbetween unilateral and bilateral TKR patients. There were no difference in the behavior of nutritional parameters between unilateral THR and TKRpatients. In bilateral TKR patients, over weight patients were predisposed to wound infection.

Only in unilateral THR patients, hypertension gains significance as a factor affecting the pattern of changes in the nutritional marker levels Apresumed cause offered can be related to the blood loss during surgery.

The wound infections in the patients in our study did not correlate with their nutritional status even though literature quotes positivecorrelation between the two. This may be due to the fact thatundernutrition was detected only in 4.42% of the study population. The incidence of UTI was found to be correlating with presence ofurinary catheterin Amputations group.

In our study, Prealbumin correlate with the nutritional status betterthan transferrin. Even though studies have shown the effectiveness of transferrin as a nutritional marker, Prealbumin may be a better marker for the nutritional assessment.

CONCLUSION

Age > 40is the main patient related factor that affect the nutritionalstatus of patients undergoing major elective orthopaedic surgery. Among the comorbidities, diabetes mellitus affects the nutrtional status of the patients undergoing major elective orthopaedic surgery. This study also shows the effectiveness of prealbumin as a reliablenutritional marker. Prealbumin can be used routinely in patients at riskof malnutrition to assess and to take appropriate nutritional measuresto prevent complications. Possibly prealbumin is a better indicator of nutritional status thantransferrin.

REFERENCES

[1] Himes D. Protein Calorie Malnutrition and Involuntary Weight Loss: the role of aggressive nutritional intervention in wound healing; Ostomy /wound management 1999;45:46-55.

[2] Dempsey DT, Mullen JL, Buzby GP.The link between nutritional statusand clinical outcome; can nutritional intervention modify it? AmericanJournal of Clinical Nutrition 1988;47:352-356.

[3] Jeevanandam M, Petersen SR, Shamos RF. Protein and glucose fuelkinetics and hormonal changes in elderly trauma patients. Metabolism1993;42:1255-1262.

[4] Campbell AJ, Buchner DM. Unstable disability and the fluctuations of fragility. Age and ageing 1997;26:315-318.

[5] Rudman D. Protein calorie undernutrition in the nursing home. Journalof the American Geriatrics Society 1989;37:173-183.

ISSN:0975-3583,0976-2833 VOL13,ISSUE05,2022

[6] Lesourd BM. Nutrition and immunity in elderly; modification of immune responses with nutritional treatments. American Journal of ClinicalNutrition 1997;66:478S-484S.
[7] Sullivan D, Lipschitz D. Evaluating and treating nutritional problems inolder patients. Clinics in Geriatric Medicine 1997;13:753-768.
[8] Felgines C, Svanovitch C, Farges MC, etal. Protein metabolism in ratsduring long term dietary restriction: Influence of ageing. Journal of Parenteral and Enteral Nutrition 1999;23:32-37.
[9] Svanovitch C, Felgines C, Farges MC, etal. Severe dietary restrictioninitiated in aged rats: evidence of poor adaptation in terms of protein metabolism and intestinal functions. European Journal of ClinicalInvestigation 1999;29:504-511.
[10] Castenanda C, Charnley JM, Evans WJ, Crim MC. Protein turn over and energy metabolism of elderly women fed a low protein diet. AmericanJournal of Clinical Nutrition 1995;62:40-48.
[11] Castenanda C, Charnley JM, Evans WJ, Crim MC. Elderly women accomodate to a low protein diet with losses of body cell mass, musclefunction and immune function. American Journal of Clinical Nutrition1995;62:30-39.
[12] Lesourd B. Protein undernutrition as the major cause of decreasedimmune function in the elderly; clinical and functional implications.Nutrition Reviews 1995;53:S86-S91.
[13] Pillaud E, Bories PN, Le Parco JC, Campillo B. Nutritional status andenergy expenditure in elderly patients with recent hip fracture during a 2month follow up. British Journal of Nutrition 2000:83:97-103.
[14] Hedstrom M, Saaf M, Dalen N. Low IGF-1 levels in hip fracture patients; a comparison of 20 coxarthrotic and 23 hip fracture patients. ActaOrthopaedica Scandinavian 1999;70:145-148.