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EVALUATING THE EFFECTIVENESS OF PERI-OPERATIVE NUTRITIONAL INTERVENTIONS IN ENHANCING SURGICAL RECOVERY IN GENERAL SURGERY PATIENTS

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ABSTRACT

Background: The efficacy of peri-operative nutritional interventions in enhancing surgical recovery is a subject of considerable medical interest and significance.

Objectives: This prospective, randomized, controlled trial examined the influence of an enhanced recovery after surgery (ERAS) nutritional support regimen on perioperative nutritional status and patient outcomes in a tertiary hospital in KPK.

Methods: 246 participants were designated randomly to either the intervention group or control. The intervention group was given perioperatively-tailored nutritional interventions, and the group serving as control received standard perioperative care and their comparative clinical outcomes were studied.

Results: Intervention group experienced significant reduction in post-operative complications (18.7% vs. 39.8%, p=0.0101) and a shorter average length of hospitalization (3.11$\pm$1.24 days vs. 5.52$\pm$2.40 days, p=0.0411). Postoperatively, the intervention group had substantially higher levels of major clinical and biochemical parameters than the control group.

Practical implications: The study highlighted implementing the ERAS nutritional support regimen, can result in fewer post-operative complications, shortened hospital stays, increased patient satisfaction, and the need for comprehensive nutritional assessments to ensure optimal perioperative care.

Conclusion: Enhanced recovery after surgery protocol demonstrated significant improvements in the postoperative clinical and biochemical parameters of patients, as well as reduction in hospital duration of stay and increase in patient satisfaction upon discharge.

Keywords: Dietary supplements; General surgery; Micronutrients; Nutritional intervention; Wound healing.

INTRODUCTION

In the discipline of general surgery, understanding the significance of nutrition in surgical recovery is crucial. The physical and metabolic stressors associated with surgical procedures can result in significant nutritional and metabolic imbalances [1-2]. In the absence of proper management, these imbalances can substantially impede patient recovery [3].

The peri-operative phase, which encompasses the pre-operative, intra-operative, and post-operative stages, provides an opportunity to implement nutritional interventions that can substantially influence patient outcomes [4]. Malnutrition, a prevalent condition among surgical patients, is increasingly recognized by the medical community as a potential detriment to surgical outcomes, contributing to protracted hospital stays, an increased risk of post-operative complications, and even increased mortality [5]. Consequently, nutritional risk assessments and timely nutritional supplementation are now essential components of pre-operative care. These interventions seek to optimize the nutritional status of patients, strengthen their metabolic resilience, and improve surgical outcomes [6].

It is also essential to maintain optimal nutrition during the postoperative period. It has a direct impact on wound healing and recovery, prevents infections and complications, and reduces the length of hospitalization [2, 7]. Researches indicate that particular dietary components, such as proteins, immune-enhancing nutrients, and micronutrients, are potent determinants of surgical outcomes and recovery trajectories for patients [8-9]. However, the efficacy of peri-operative nutritional interventions continues to be a contentious issue, necessitating additional rigorous scientific research [10]. This study evaluated the available evidence regarding the efficacy of peri-operative nutritional interventions in enhancing surgical recovery in patients undergoing general surgery. In doing so, the study seeks to provide clinicians and healthcare professionals with actionable insights and recommendations that can help them adopt effective nutritional strategies, thereby enhancing patient care standards.

Despite the extensive research on the function of peri-operative nutritional interventions in surgical recovery, there are still several knowledge gaps. There is a dearth of comprehensive research investigating the peri-operative period as a continuous whole, as the majority of current studies tend to independently focus on pre-operative and post-operative stages [11-12]. This void obscures our comprehension of the interaction between these stages and their cumulative impact on patient outcomes. There is an urgent need to determine the precise mechanisms by which these nutritional elements influence metabolic processes during the perioperative period. In addition, existing research does not adequately consider patient-centered outcomes. Although clinical outcomes such as surgical complications, duration of hospital stay, and mortality rates are essential, patient-reported outcomes such as quality of life, comfort, and satisfaction are equally important and should be incorporated into future research to provide a holistic view of recovery [13-14].

This study, therefore, investigated the effectiveness of peri-operative nutritional interventions in enhancing surgical recovery in patients undergoing general surgery to determine the effect of peri-operative nutritional interventions on post-operative complications, hospital length of stay, and mortality rates.

MATERIAL AND METHODS

This was a prospective, randomized, controlled trial at a tertiary care hospital in KPK. Participating patients were adults who underwent elective general surgery from January 2022 to April 2023.

Patients 18 and older who underwent elective general surgery were included in the study. Emergency surgery, inability to provide informed consent, pregnancy, preexisting chronic diseases affecting nutritional status (such as chronic renal failure, liver diseases, etc.), known allergies or intolerances to the nutritional supplements used in the study, and refusal to participate were our exclusion criteria.

Using a computer-generated random sequence, eligible participants were randomly assigned to two groups - the intervention group and control. The intervention group received nutritional interventions perioperatively, whereas the control group received standard routine care.

To assure objectivity, the study was conducted under double-blind conditions. Participants and outcome evaluators remained oblivious of group assignments to minimize the bias.

The intervention group received a perioperatively-tailored nutritional intervention regimen. This included the administration of high-protein nutritional supplements, immune-enhancing nutrients, and micronutrients pre- and post-operatively. While, control group received standard perioperative care including general dietary advice, in accordance with hospital guidelines in effect at the time. The intervention group was adhered to a preconception, intraoperative and postoperative nutrition management protocol. Prior to surgery, patients abstained from substantial food for six hours, consumed no more than 400ml of carbohydrates orally two hours beforehand, and had their fasting and preoperative blood glucose monitored. Before surgery, malnourished patients received enteral nutrition (EN) support for 7 to 10 days. Intraoperatively, a standard procedure was followed. Postoperatively, they received parenteral and enteral nutrition based on the gastrointestinal conditions of each individual. Six hours after surgery, they began with a liquid diet and progressed to semi-liquid and solid foods based on their gastrointestinal tolerance. In contrast, control group adhered to the standard protocol, abstaining from water for 4 hours and fasting for 8 hours prior to surgery. After a day on a liquid diet, they progressively resumed their normal diet. Postoperative care included monitoring of vital signs, nebulization of the airway, management of sleep, and establishment of discharge criteria [15].

The primary outcomes were measured accordingly, of which the most important were postoperative complications, hospital length of stay, mortality rates, recovery rate and patients satisfaction rate. Using hospital approved questionnaires, secondary outcomes included patient-reported outcomes like life quality, comfort, and overall satisfaction were recorded and statistically analyzed.

At baseline (pre-operative), immediately post-operative, and during follow-ups one month and three months post-operative, data was collected for complete assessment. Demographic information, medical history, surgical details, nutritional status, clinical outcomes, and patient-reported outcomes were also collected.

SPSS was utilized to analyze the data. Comparisons between the intervention and control were conducted using Chi-square test for categorical variables. A p-value less than 0.05 was statistically significant.

The study protocol was established for evaluation and approval by Institutional Evaluation Board. Prior to enrollment, all participants were provided written informed consent. The confidentiality of participants was maintained throughout the study.

RESULTS

Demographic characteristics of both intervention and control groups of patients indicated that each group had identical number of patients (n=123), having average age of 57.36 ± 10.98 and 60.12 ± 11.33 years in intervention and control, respectively. In terms of gender distribution, males comprised 55.28 percent (n=68) of the intervention group and 52.03 percent (n=64) of the control group, whereas females comprised 44.72% (n=55) of the intervention group and 47.97 percent (n=59) of the control group. There were no statistically significant differences between the demographic characteristics of both groups ($p>0.05$). Baseline parameters were also recorded and there were no statistically significant differences ($p>0.05$) between intervention and control groups (Table 1).

Hypertension was clearly the most prevalent comorbidity, afflicting 27% of the study's patients. 18% of patients are diagnosed with diabetes, making it the second most prevalent comorbidity. Approximately 15% and 13% of patients, respectively, suffer from gastrointestinal disorders and respiratory problems (Figure 1). In intervention group, 58 patients underwent abdominal surgery, followed by 17 patients undergoing trauma surgery, 23 patients undergoing hepatobiliary surgery,

and 16 patients undergoing oncology surgery. 66 patients in the control group underwent abdominal surgery, followed by 25 patients undergoing hepatobiliary surgery, 12 patients undergoing trauma surgery, and 15 patients undergoing oncology surgery. There was no statistically significant difference in the distribution of surgery types between the two groups ($p>0.49$ for all categories) (Table 2).

In intervention group, 18.7% of patients experienced post-operative complications, compared to 39.8% of patients in the control group, statistically significant difference ($p<0.05$). The average length of hospitalization was reduced in intervention group. Concerning patient satisfaction, a greater proportion of patients in the intervention group reported moderate satisfaction (78 patients), followed by high satisfaction (30 patients) and low satisfaction (15 patients). In contrast, the majority of patients in the control group reported moderate satisfaction (65 patients), while more patients reported low satisfaction (30 patients) and slightly fewer reported high satisfaction (28 patients) ($p<0.05$) (Table 3). In control group, incidence of venous thromboembolism was 13%, whereas it was only 6% in the intervention group. The incidence of sepsis was also higher in the control group, at 11%, compared to 5% in the intervention group. Additionally, intervention group had a lower rate of readmission within 30 days of discharge than the control group (Figure 2).

Table 1: Patients demographic and baseline characteristics

S. No	Demographic and baseline characteristics	Intervention group	Control group	Chi-square value	p-value
1	No. of patients	123	123	0.0061	1.00
2	Age (Mean±SD) years	57.36±10.98	60.12±11.33	0.0063	0.9366
3	Sex n(%) Male Female	 68 (55.28) 55 (44.72)	 64 (52.03) 59 (47.97)	 0.0299 0.0386	 0.8626 0.8442
4	BMI (Mean±SD)	22.03±3.98	21.10±3.47	0.007	0.9335
5	Nutritional status score Low (0-2) Medium (3-5) High (>5)	 31 77 15	 39 71 13	 0.5019 0.0816 0.0252	 0.4786 0.7750 0.8739
6	Pre-operative blood glucose level (Mean±SD) mmol/L	6.4±1.45	6.7±1.67	0.0083	0.9272
7	Blood hemoglobin level (Mean±SD) g/dL	12.78±1.03	12.55±0.98	0.0003	0.9854

Figure 1: Comorbidities associated with the subjects

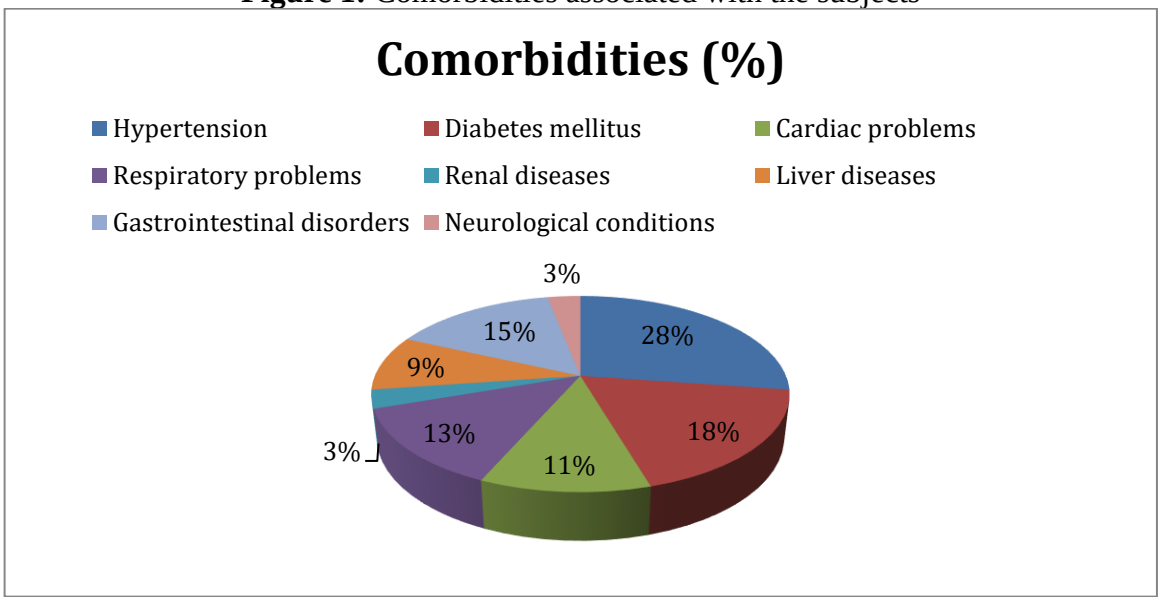


Table 2: Type of surgeries the patients underwent

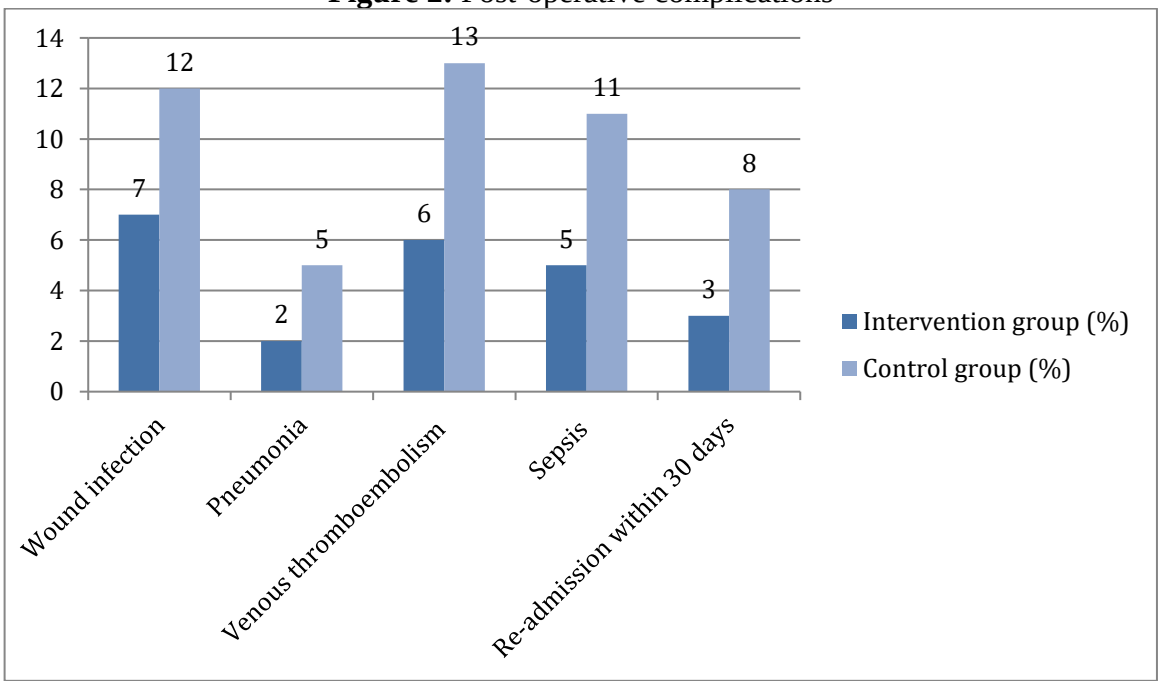
S. No	Type of surgery	Intervention group (n=123)	Control group (n=123)	Chi-square value	p-value
1	Abdominal surgery	58	66	0.2264	0.6342
2	Hepatobiliary surgery	23	25	0.0113	0.9153
3	Breast surgery	02	04	0.1549	0.6939
4	Oncology surgery	16	15	0.0005	0.9829
5	Trauma surgery	17	12	0.465	0.4952
6	Others	07	01	2.989	0.8383

Table 3: Post-operative clinical outcomes of the study groups

S. No	Clinical outcomes	Intervention group (n=123)	Control group (n=123)	Chi-square value	p-value
1	Post-operative complications (%)	23	49	6.603	**0.0101***
2	Duration of hospital stay (Mean±SD) days	3.1±1.24	5.5±2.30	4.1716	**0.0411***
3	Patients satisfaction (n) Low Moderate High	 15 78 30	 30 65 28	 4.2381 0.5773 0.6729	 **0.0395*** 0.4473 0.3880
4	Mortality (n)	5	9	0.3003	0.5836

***indicated that the value is significant at p<0.05**

Figure 2: Post-operative complications



DISCUSSION

We evaluated the efficacy of peri-operative nutritional interventions on surgical recovery in patients undergoing general surgery. Our findings implied that nutritional support during the peri-operative period, as outlined in intervention protocol, can have a significant impact on post-operative outcomes, thereby improving recovery and patient satisfaction.

Patients in the intervention group experienced fewer post-operative complications (23%) than those in the control group (49%), a finding consistent with a growing body of research indicating that nutritional optimization can reduce the incidence of complications such as wound infections, pneumonia, sepsis, and venous thromboembolism [16-17]. These complications can lengthen hospital stays, have a negative impact on patient satisfaction and overall quality of life, and increase healthcare costs; therefore, their reduction is of great clinical significance. The average length of hospitalization was considerably shorter in the intervention group, at 3.1 days compared to 5.5 days in the control group. This suggested that the intervention not only reduced post-operative complications but also accelerated recovery. Higher patient satisfaction in the intervention group could be attributed to fewer complications, a shorter hospital stay, and potentially a better overall hospitalization experience.

Our findings were consistent with the study revealing that nutritional status of surgical patients had substantial influence on their immune response and tissue recovery and also influenced the clinical outcomes. Additionally, patients suffering from severe malnutrition had prolonged median hospital stay and a greater incidence of postoperative complications [12]. Multiple perioperative interventions bear the potential to accelerate patient recovery and improve cost effectiveness. The National Institute of Health Research commissioned the evidence synthesis to investigate the effectiveness of various types of multifaceted interventions for older adults undergoing elective inpatient surgery [18-19]. Another study supported our findings and advocated for the implementation of a new enhanced recovery after surgery (ERAS) nutritional support protocol in carotid endarterectomy (CEA), which was capable of substantially improving the nutritional status of patients during the perioperative period. The postoperative levels of albumin, hemoglobin, creatinine, calcium, and magnesium were significantly higher in the ERAS group than control. In addition, the ERAS group had substantially shorter postoperative stays and higher average discharge satisfaction scores. This development of the neurosurgical ERAS nutritional support regimen has the potential to efficiently improve perioperative nutritional status and significantly reduce postoperative hospital stays [15]. It was also reported that enteral formulations and supplementations revealed reduction in postoperative infections and length of hospital stay [20].

CONCLUSION

Our research demonstrated the possible advantages of implementing enhanced recovery after surgery (ERAS) nutritional protocol in surgical patients. The ERAS protocol demonstrated significant improvements in the postoperative clinical and biochemical parameters of patients, as well as a reduction in hospital duration of stay and increase in patient satisfaction upon discharge. In addition, the protocol did not increase the incidence of postoperative complications, demonstrating its safety. This suggested that ERAS nutritional program may be an effective intervention for optimizing perioperative nutritional status, improving patient outcomes, and enhancing healthcare efficiency.

CONFLICT OF INTEREST

None.

REFERENCES

1. Fukatsu K. Role of nutrition in gastroenterological surgery. Ann Gastroenterol Surg. 2019 Feb 25;3(2):160-168.
2. Hirsch KR, Wolfe RR, Ferrando AA. Pre- and Post-Surgical Nutrition for Preservation of Muscle Mass, Strength, and Functionality Following Orthopedic Surgery. Nutrients. 2021 May 15;13(5):1675.
3. Breuing J, Könsgen N, Doni K, et al. Information needs of patients undergoing bariatric surgery in Germany: a qualitative study. BMC Health Serv Res. 2022;22:515.

4. Lakananurak N, Gramlich L. The Role of Preoperative Parenteral Nutrition. Nutrients. 2020 May 6;12(5):1320.
5. Venianaki M, Andreou A, Nikolouzakis TK, Chrysos E, Chalkiadakis G, Lasithiotakis K. Factors Associated with Malnutrition and Its Impact on Postoperative Outcomes in Older Patients. J Clin Med. 2021 Jun 9;10(12):2550.
6. Evans DC, Martindale RG, Kiraly LN, Jones CM. Nutrition optimization prior to surgery. Nutr Clin Pract. 2014 Feb;29(1):10-21.
7. Tappenden KA, Quatrara B, Parkhurst ML, Malone AM, Fanjiang G, ZieglerTR. Critical Role of Nutrition in Improving Quality of Care: An Interdisciplinary Call to Action to Address Adult Hospital Malnutrition. J Academy Nutr Dietetics. 2013;113(9):1219-1237.
8. Tourkochristou E, Triantos C, Mouzaki A. The Influence of Nutritional Factors on Immunological Outcomes. Front Immunol. 2021 May 31;12:665968.
9. Pollock GR, Van Way CW 3rd. Immune-enhancing nutrition in surgical critical care. Mo Med. 2012 Sep-Oct;109(5):388-92.
10. A'zim AZA, Zaid ZA, Yusof BNM, Jabar MF, Shahar ASM. Effectiveness of intensive perioperative nutrition therapy among adults undergoing gastrointestinal and oncological surgery in a public hospital: study protocol for a pragmatic randomized control trial. Trials. 2022 Nov 26;23(1):961.
11. Ford KL, Prado CM, Weimann A, Schuetz P, Lobo DN. Unresolved issues in perioperative nutrition: A narrative review. Clin Nutr. 2022 Jul;41(7):1578-1590.
12. Katundu KG, Mutafya TW, Lozani NC, Nyirongo PM, Uebele ME. An observational study of perioperative nutrition and postoperative outcomes in patients undergoing laparotomy at Queen Elizabeth Central Hospital in Blantyre, Malawi. Malawi Med J. 2018 Jun;30(2):79-85.
13. Chen Y, Michalak M, Agellon LB. Importance of Nutrients and Nutrient Metabolism on Human Health. Yale J Biol Med. 2018 Jun 28;91(2):95-103.
14. Raiten DJ, Ashour FAS, Ross AC, Meydani SN, Dawson HD, Stephensen CB, Brabin BJ, Suchdev PS, van Ommen B. Inflammation and Nutritional Science for Programs/Policies and Interpretation of Research Evidence (INSPIRE)1, 2, 2, 3, 4, 5. J Nutr. 2015;145(5):1039S-1108S.
15. Li YQ, Qu XP, Peng LW, An JY, Liu XW, Zhang Y, Wang C, Jiang X, Gao L, Li G, Wang DL, Zhao DC, Qu Y, Liu B.Targeted nutritional intervention with enhanced recovery after surgery for carotid endarterectomy: A prospective clinical trial. Front Nutr. 2023;10:951174.
16. Hotchkiss RS, Moldawer LL, Opal SM, Reinhart K, Turnbull IR, Vincent JL. Sepsis and septic shock. Nat Rev Dis Primers. 2016 Jun 30;2:16045.
17. Ma X, Xu Y, Qian J, Dai B. Analysis of influencing factors of community-acquired pneumonia with deep venous thrombosis in elderly communities. Ann Palliat Med. 2022 Jun;11(6):1997-2006.
18. Nunns M, John JB, McGrath JS, Shaw L, Briscoe S, Thompson Coon J, Hemsley A, Lovegrove CJ, Thomas D, Mythen MG, Anderson R. Evaluating enhanced recovery after surgery: time to cover new ground and discover the missing patient voice. Perioper Med (Lond). 2020 Sep 14;9:27.
19. Saunders J, Smith T. Malnutrition: causes and consequences. Clin Med (Lond). 2010 Dec;10(6):624-7.
20. Klek S, Sierzega M, Szybinski P, Szczepanek K, Scislo L, Walewska E, Kulig J. The Immunomodulating Enteral Nutrition in Malnourished Surgical Patients—A Prospective, Randomized, Double-Blind Clinical Trial. Clin Nutr. 2011;30:282–288.