



**ORIGINAL RESEARCH PAPER**

**General Surgery**

**A REVIEW ON THE EFFECT PRE OPERATIVE NUTRITIONAL STATUS IN POST OPERATIVE OUTCOMES OF EMERGENCY LAPAROTOMY**

**KEY WORDS:**

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**ABSTRACT**

Responses to the surgery cause many hormonal and biochemical changes. When there is a defective immune status and malnutrition, there could be many post-operative complications like surgical site infection, increased length of hospital stays etc

**AIM:** The aim of the study is to correlate pre-operative nutritional status on post-operative outcomes in patients undergoing emergency laparotomy and to assess the relationship between the various parameters. **METHODOLOGY:** This was a cross sectional study conducted among the patients admitted for emergency laparotomy in the department of general surgery, Mahatma Gandhi Medical College and Research Institute, Pondicherry for a period of 18 months.

**RESULTS:** The mean age of the participants is 37.47 ± 16.81. Among the different risk factors, hypoalbuminemia and Nutritional risk Index was significantly associated with the post-operative complications like surgical site infections, re exploration etc.

**CONCLUSION:** Nutritional Risk Index and Hypoalbuminemia could be an independent predictor for post-operative complications.

**INTRODUCTION**

According to WHO, malnutrition is defined "as a state of deficiencies, excesses or imbalances in a person's intake of energy and/or nutrients. Malnutrition encompasses two conditions.

Malnutrition is a broad term, caused by multitude of factors like decreased food intake, increased requirement or a combination of both. At one end there is undernutrition, encompassing wasting, stunting and underweight and at the other end there lies overweight and obesity.<sup>1</sup> According to a statement released by World Health Organisation, the prevalence of overweight in adults is around 1.9 billion and the underweight prevalence is around 462 million.<sup>2</sup> According to National Family Health Survey 4, in India the prevalence of underweight is 22.9% and 20.2% in women and men respectively, Likewise the prevalence of overweight is 23% and 15% in women and men respectively.<sup>3</sup> On looking at the Pondicherry data, NFHS 4 showed that 13.3% and 11.8% of the women and men respectively are underweight. 33.7% and 30.8% of the women and men respectively are overweight.<sup>4</sup>

Nutritional status has an enormous impact on the immune status.<sup>5</sup> Many studies have documented the relationship between the nutritional status of an individual and the host responses.<sup>6,7</sup> Many theories have been put forth for the association of nutritional deficiencies and the immune status of an individual. It has been found that nutritional deficiencies in the individual are associated with impairment of cell mediated immunity in the way of reduction in the number of circulating T- Lymphocytes. It affects predominantly CD4+ helper T-cells, CD3+, CD 25+ T cells. These have the receptors for interleukin-2; It decreases response of lymphocytes to antigens thereby decreasing the production of cytokines. The malnutrition has also shown to affect humoral immunity by decreasing the antibody affinity and dysfunction of phagocytes.<sup>8</sup>

Defective immune response has also been documented in the individuals with micronutrient deficiencies like deficiency of protein, essential fatty acids, vitamin A, E etc.<sup>9, 10, 11</sup> Since the

inflammatory activity is crucial for the metabolic response post injury, malnutrition having an impact on both the cellular and humoral immunity, henceforth impairing the neutrophil chemotaxis, reduced bacterial clearance etc. These in turn influences the tolerance of the patient to the surgical stress, post-surgical recovery, delayed wound healing and infection in the surgical sites. There also occurs an alteration in the protein metabolism in the post-surgery period, noticeable by the blood amino acid pattern changes and negative nitrogen balance. This will be an added disadvantage in those who are already in the state of malnutrition.<sup>12</sup>

In the recent years, there has been increasing evidence that nutritional screening is an important adjunct in the surgical care.<sup>13</sup> Malnourished patients have a higher morbidity and mortality post operatively than the well-nourished patients. In addition, there is also increased length of stay in hospital and thereby hospital costs, increased re-admission.<sup>14</sup>

Many studies have showed that nutritional support can improve the post operative outcome and in turn reduce the infectious complications after major surgeries in the malnourished patients. Elective patients can be adequately prepared preoperatively to withstand the metabolic stress of injury. However, this is not possible in emergency surgery. These patients also have several unfavourable antecedent factors like sepsis, hypotension etc.

Pre-existing malnutrition is likely to compound the effect of these factors. It therefore becomes important to assess the nutritional status of such patients in order to anticipate post-operative problems. Nutritional status of an individual can be assessed through various factors. Broadly the nutritional assessment can be dealt under following methods. Clinical Examination, Anthropometric measurements, Laboratory and biochemical examination, Dietary surveys, Study of vital statistics and assessment of ecological factors.<sup>15</sup>

Emergency laparotomy encompasses many non-elective abdominal surgical procedures.<sup>16</sup> The first documented exploratory laparotomy was performed in 1842 by Frank

Zurflay on a patient with peritoneal haemorrhage.<sup>17</sup> Hence the patients undergoing such surgeries are from a diverse group. These patients may be from patients with serious emergent cases like those with life threatening haemorrhage, peritonitis, intra-abdominal sepsis or expedited cases like those with adhesional bowel obstruction etc.<sup>18</sup>

Surgical patients come from a heterogeneous population. In spite of the differences, the responses to the stress from the surgical intervention remain similar. There occurs a series of complex reactions, which involves both the inflammatory and endocrine system. These reactions are responsible for the metabolic changes occurring post-surgery.

**METHODS :**

Relevant articles from 10 consecutive years, 1998–2017 were identified by using the electronic databases PubMed, Cochrane, and EMBASE. Search terms used were *nutrition status, preop- erative assessment, postoperative outcome,* and *surgery,* including their synonyms.

**PAST LITERATURE REVIEWING THE ASSOCIATION OF NUTRITIONAL STATUS WITH THE POST OPERATIVE COMPLICATIONS IN THE ELECTIVE SURGERY PATIENTS:**

**Kudsk KA et al (2003),**<sup>41</sup> did a retrospective cohort study among 526 surgical patients. The study showed that prevalence of hypoalbuminemia in patients undergoing surgery results in varying complications after the surgery.

**Sangurtekin H et al (2004)**<sup>42</sup> did a study titled “Influence of nutritional status on complications after major intra abdominal study”. The study showed that 44% of the participants was malnourished. Higher death rates were found in the malnourished group. On looking at the association between malnutrition and complications, the odds ration varied from 1.926 to 9.854. The study concluded that malnutrition is a predictor of bad outcomes following surgery.

**Kuzu MA et al (2006)**<sup>37</sup>, organised a study among 460 patients who had major elective surgery, to assess the nutritional status of these patients and to determine the post-operative complications. The results showed that 20 patients died and 42 patients had 2 or more complications during the post-operative period. The results concluded that morbidity rates were significantly greater among the malnourished patients. There occurred both infectious and non-infectious complications. The study concluded that use of various nutritional risk screening can be used as a predictor for the outcome.

**Bozzetti F et al (2007)**<sup>43</sup>, conducted a study among 1410 abdominal surgery patients. The study showed that some of the independent risk factors for the development of post-operative complications were advanced age, weight loss, low serum albumin etc. The study also stated that nutritional support significantly reduced morbidity in the post-operative period.

**Jain G et al (2007),**<sup>44</sup> conducted a study with an aim to evaluate the association of pre-operative nutritional status on the outcome of patients undergoing shunt surgery. The results showed that post-operative complications like shunt infection, revision and mortality was greater among the undernourished patients with the significant p value of 0.002, 0.007 and 0.0003 respectively. The study concluded that serum albumin as an independent predictor for post-operative mortality.

**Schiesser M et al (2008)**<sup>45</sup>, did a study in Switzerland among 608 surgery patients with an aim to assess the nutritional risk screening in predicting the post-operative complications incidence and severity. The results showed that nutritional

risk was found in among 14% of the participants. The complications were higher among those with nutritional risk (54%). The odds ratio was for the development of complications was 2.8. The median hospital stay length was also increased in the nutritional risk patients.

**Kathiresan AS et al (2011),**<sup>46</sup> organised a study with the purpose to investigate if decreased nutritional status associate with post-operative complications in gynaecological cancer patients. Totally 300 patients participated in the study. The results showed that lower albumin level was significantly associated with post-operative complications, readmissions, reoperations and cancer recurrence with the p value of 0.001, 0.01, 0.03 and 0.001 respectively. The study concluded that preoperative albumin could be an important predictor for complications during the post-operative period.

**Kuppinger D et al (2012)**<sup>47</sup>, conducted a prospective observational study titled “Nutritional screening for risk prediction in patients scheduled for abdominal operations” among 653 patients. Among the participants, 20.2% had one or more post-operative complications and the majority of them had lower food intake before the admission.

**Jie B et al (2012),**<sup>48</sup> conducted a multicentric prospective cohort study among 1085 patients. Among them around 512 were at nutritional risk. The study concluded that complication rate was lower significantly in those who had preoperative nutrition support that those who did not, suggesting the malnutrition without the nutritional support could lead to complications after surgery.

**Sakurai K et al (2015)**<sup>49</sup> organised a study among 594 patients to assess the impact of preoperative nutritional status on the outcomes of patients undergoing gastrectomy for gastric cancer. The study revealed that the multivariate analysis of 5-year overall survival and disease specific survival was unfavourably associated with malnutrition.

**Bohl DD et al (2016)**<sup>50</sup> did a study to determine the association of preoperative hypoalbuminemia and the post-operative complications among 49,603 patients. The results showed that patients with lower albumin level had a greater risk if complications like surgical site infection, pneumonia, longer hospital stay and readmission.

**Oh TK et al (2018)**<sup>51</sup> steered a study among 80969 patients to assess the preoperative modified BMI as a predictor for postoperative mortality. Modified BMI (mBMI) encompasses conventional Body Mass Index (cBMI) and serum albumin levels. The results showed that the post-operative one-year mortality increases with the decrease in cBMI, mBMI and serum albumin. The study also concluded that low albumin level is the strongest independent predictor for the one-year postoperative mortality.

**PAST LITERATURE REVIEWING THE ASSOCIATION OF NUTRITIONAL STATUS WITH THE POST OPERATIVE COMPLICATIONS IN THE EMERGENCY SURGERY PATIENTS:**

**Putwatana P et al (2005)**<sup>52</sup>, conducted a study among 430 patients who had abdominal surgery. The patients who were malnourished by screening through Nutritional risk index classification showed significant association with the post-operative infections with the odds ratio of 2.92 and confidence interval of 1.62 to 5.26.

**Afzal S et al (2008)**<sup>53</sup> conducted a cross sectional study to find out the risk factors for wound dehiscence among 430 patients. The results showed that poor nutritional status was significantly (p value of less than 0.01) associated with wound dehiscence. Among those who have dehisced cases (32), 27 had hypoproteinaemia with the relative risk of 0.03 and p

value of 0.000

**Ramneesh G et al (2014)**<sup>54</sup> performed a prospective study on 50 patients to evaluate the risk factors that cause wound dehiscence in post-operative period. Among these patients, 13 had anaemia and 12 had lower serum albumin levels. The study stated that apart from other factors that could lead to complications, serum albumin should also be considered.

**Moon MS et al (2014)**<sup>24</sup> conducted a study in Jeju among 331 patients to assess the preoperative nutritional status and its relationship between the postoperative complications and recovery. The study concluded that nutritional status was poor among the non-elective surgery patients than the elective surgery patients. The study also states that around 50% of the patients with orthopaedic infections in the post-operative period had some degree of immunosuppression and malnutrition irrespective of the age.

**Bhuyan K et al (2016)**,<sup>55</sup> directed a retrospective study among 110 patients to evaluate the predictive value of preoperative albumin on postoperative complications following surgery in acute abdomen. The results showed that among the patients with serum albumin level of less than 3.2g/dl, 45.5% had complications. Mortality was also found to be higher among the low albumin level patients than those with the normal albumin levels. The study concluded that preoperative hypoalbuminemia as an independent predictor for postoperative complications following emergency laparotomy

**Talukdar M et al (2016)**<sup>56</sup> performed a study in Assam among 213 patients. the objective of the study is to assess the factors that contribute to the wound dehiscence in the emergency laparotomy patients. There were 27 patients who developed wound dehiscence. Among those 27 patients, 24 had pre-operative hypoalbuminemia and 27 had anaemia with the odds ratio of 0.000. The study concluded that along with the many putative risk factors, hypoalbuminemia and anaemia had significant association with the wound dehiscence following emergency laparotomy.

**Kumar RA et al (2016)**<sup>57</sup> conducted a retrospective observational study in Karnataka among 603 patients. The objective of this study is to assess the perioperative risk factors and the outcome following laparotomy. This study confirmed that preoperative low albumin level increases the risk of septic shock after surgery.

**Lalhruaizela S et al (2017)**<sup>58</sup> did a prospective cross-sectional study to find the association between serum albumin and surgical site infection in the patients who had undergone gastrointestinal surgeries in a rural hospitals in Central India. Totally 150 patients participated in the study. The mean and standard deviations of the age of the participants was 48.25 ± 15.16 years. The results showed that the complications were higher among those who had lower serum albumin levels. concluding it to be a strong predictor for surgical site infections.

**Agarwal A et al (2018)**<sup>59</sup> conducted a prospective study with an objective to assess the risk factors in the causation of surgical site infection among 952 cases. Among those who had lower serum albumin levels, 70 had surgical site infection and those who had lower haemoglobin levels, 20 had surgical site infections. The study stated that surgical site infections is higher among the emergency cases than the elective cases. Risk factors like lower albumin levels, haemoglobin was found to be significantly associated with surgical site infections.

**Silodia A et al (2018)**,<sup>60</sup> steered a prospective study in Jabalpur among 275 patients to find the association between BMI and surgical outcome. The mortality was 8.3% in the

underweight group, 9.7% in the overweight participants and 10% in the obese patients. The association between the Body mass Index and the post-operative outcome was found to be statistically significant. The study concluded that obesity as an independent predictor for post-operative wound infections.

**Kumar S et al (2019)**<sup>61</sup> did a prospective study in a tertiary care centre in a total of 190 patients who had emergency abdominal surgery. This study was conducted to correlate the association between hypoalbuminaemia and postoperative complications. Among those who had lower serum albumin levels, 45.8% suffered complications. All the mortality (14.2%) occurred only in those who had lower albumin levels. This study concluded that serum albumin as a predictor for post-operative complications.

#### **PAST LITERATURE REVIEWING THE ASSOCIATION OF NUTRITIONAL STATUS WITH THE MORBIDITY AND MORTALITY OF THE HOSPITALIZED PATIENTS:**

**Correia MI et al (2003)**,<sup>62</sup> directed a study to correlate the nutritional status with the morbidity, mortality, hospital stay and cost of the hospitalized patients. The mean age of the study participants was 50.6 ± 17.3 years. Majority of them were males (50.2%) The relative risk of complications in the malnourished patients was 27% with mortality in 12.4%. The study concluded that malnutrition is an independent risk factor for the development of increased morbidity, mortality and length of stay in hospitals.

**Pacelli F et al (2008)**<sup>63</sup>, steered a study among 196 patients with the aim to evaluate the incidence of morbidity and mortality in patients who had surgery for gastric cancer and correlate it with the weight loss, serum albumin and body mass index. The results showed that the major infectious complications occurred in 10.2% of the patients and major non-infectious complications in 9.2% and minor infections in 10.7%. The study showed that the weight loss and hypoalbuminemia showed little association with the increased risk of mortality and morbidity.

**Sorensen J et al (2008)**<sup>64</sup> conducted a multicentric prospective cohort study among 5051 participants to correlate the nutritional risk status and the clinical outcome. 32.6% was under the Nutritional Risk Screening-2002 'at risk' category. These at-risk group had higher mortality than those without risk.

#### **PAST LITERATURE REVIEWING THE ASSOCIATION OF SERUM ALBUMIN LEVELS AS AN INDEPENDENT RISK FACTOR FOR POST OPERATIVE COMPLICATIONS:**

**Fu Mc et al (2016)**<sup>65</sup> directed a study to analyse the effect of pre-operative nutritional status on the outcome following cervical discectomy and fusion among 3671 participants. Nutritional status was assessed using serum albumin concentration. The study stated that hypoalbuminemia patients had greater post-operative complications like pulmonary, cardiac complications and even reoperation than with the patients who had normal albumin levels. By multivariable regression analysis, it was shown that preoperative hypoalbuminaemia was an independent predictor of major post-operative complications. The adjusted odds ratio for the same was 3.37

**Bhagvat VM et al (2016)**<sup>66</sup> steered a study among 100 patients to assess the role of serum albumin and BMI as predictors of post-operative morbidity and mortality in the post-operative period. The study stated that though there was association between Body Mass index and post-operative complications, serum albumin to be considered as a better prognostic indicator for the post-operative complications than the BMI.

**Sindgikar V et al (2017)**<sup>67</sup> conducted a study in Karnataka to assess the impact of serum albumin in the surgical outcomes. A total of 130 patients participated in the study. Among the 83

patients who had low serum albumin level of less than 3.5 g/dl, 24 had wound infection, 9 had wound dehiscence and 5 had anastomosis leak. The study concluded that serum albumin is a better indicator of post-operative complications.

**Sharma L et al (2017)**<sup>66</sup> organised a study among 50 patients in Jodhpur. The aim of the study was to study the serum albumin's correlation with the post-operative complications. Among those who had lower serum albumin of less than 3.5g/dl, 11 developed complications which is statistically significant. The study concluded that serum albumin is a good indicator for post-operative morbidity and mortality.

**Lohe Y et al (2019)**<sup>68</sup> did a study among 150 patients to show that malnourished patients have higher risk of post-operative complications than those their normal counterparts. Among those who had complications in the post-operative period, 27 had serum albumin less than 3.5 g/dl, 8 had BMI of more than 25. The patients in these group also showed increased duration of stay in hospital. The study concluded that serum albumin as a good indicator for post-operative complications.

**ASSOCIATION OF SERUM ALBUMIN LEVELS AS AN INDEPENDENT RISK FACTOR FOR POST-OPERATIVE**

**COMPLICATIONS:**

Fu Mc et al (2016)<sup>70</sup> directed a study to analyse the effect of pre-operative nutritional status on the outcome following cervical discectomy and fusion among 3671 participants. Nutritional status was assessed using serum albumin concentration. The study stated that hypoalbuminemia patients had greater post-operative complications like pulmonary, cardiac complications and even reoperation than with the patients who had normal albumin levels. By multivariable regression analysis, it was shown that preoperative hypalbuminaemia was an independent predictor of major post-operative complications. The adjusted odds ratio for the same was 3.37. Likewise, Bhagvat VM et al (2016)<sup>71</sup> steered a study among 100 patients to assess the role of serum albumin and BMI as predictors of post-operative morbidity and mortality in the post-operative period. The study stated that though 18 there was association between Body Mass index and post-operative complications, serum albumin to be considered as a better prognostic indicator for the post-operative complications than the BMI. Similarly, the studies done by Kudsk KA et al (2003),<sup>72</sup> Sindgikar V et al 73 74 75 (2017) , Sharma L et al (2017) , Lohe Y et al (2019) showed similar results. They conclude that serum albumin is a good indicator for post-operative morbidity and mortality.

**3.3.6 ASSOCIATION OF ANTHROPOMETRIC MEASURES LEVELS AS AN INDEPENDENT RISK FACTOR FOR POST-OPERATIVE COMPLICATIONS:**

Meijs AP et al<sup>76</sup> conducted a study with an objective to estimate the obesity as a risk factor for post-operative complications like surgical site infection. The study state that there was increasing incidence of surgical site infection with the Body mass 77 nutritional status in the post-operative outcome of the patients. The results showed that the mid arm circumference and the triceps skin fold thickness though had association with the post-operative complications, they were not statistically significant.

**CONCLUSION:**

Nutrition plays an important role in recovery of patients in terms of SSI , duration of hospital stay . Nutritional risk index and serum albumin are independent risk factors in post operative complication and recovery of patients .