

Undernutrition as a Predictor of Post-Operative Morbidity, An Institutional Study

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Author Details
Dr. Jason Andrade ¹ , Dr. Leo F Tauro ² , Dr. Reshmina Chandni Clara Dsouza ³ and Dr. Shubha N Rao ³
Authors Affiliations
¹ Department of General Surgery, Father Muller Medical College, Mangalore, India ² Professor and Unit Chief Department Of General Surgery, Father Muller Medical College, Mangalore, India ³ Associate Professor Department of General Surgery, Father Muller Medical College, Mangalore, India
Corresponding Author*
Dr. Jason Andrade
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Abstract: Background and objective: In view of all the above, we at a tertiary care teaching hospital decided to evaluate the role of Body Mass Index as predictors of postoperative morbidity and mortality both in elective and emergency major surgeries. **Materials and Methods:** Descriptive Analytical Observational Study was conducted on 164 patients chosen by Convenience sampling. Who had undergone laparotomy at the Father Medical College Hospital, Mangalore who were admitted in any of the surgical departments during the period of October 2018 to October 2020. Details of cases were recorded including demography co-morbidities, blood transfusion post-operative complication, mortality and BMI status. **Data tabulation and statistical analysis to be employed:** All data was analyzed using Statistical Package for the Social Sciences (SPSS) for Windows, Version 23.0. Continuous variables were expressed as mean±SD. Percentages were used to express categorical variables. **Results And Analysis:** In the present study the most common age was 31-40 years with 40 cases, 24.39% followed by 41-50 years with 36 cases, 21.95%, 51-60 years with 32 cases, 19.51%, and 61-70 years with 20 cases, 12.20%. More than 70 years with 16 cases, 9.76%, and less than 20 years with 4 cases, 2.44%. The mean age was 43.06 years with SD 8.04 years. We had 62 cases, 37.80% were females and 102 cases, 62.20% were males. Co Morbidities were in 82.93%, the most common was Diabetes Mellitus in 68 cases, 41.46%, Hypertension in cases, 15.85%, COPD in 12 cases, 14.63%, IHD in 9 cases, 10.98%.

Keywords: Post-Operative Morbidity, Body Mass Index, SPSS, Diabetes.

BACKGROUND AND OBJECTIVE

One of the important roles played by adequate nutrition is in helping to maintain the immunity status of the individual to the optimum.

Patients who are severely malnourished demonstrate impaired wound healing and predisposition to infection, most of as a result of abnormality or deficiency of the various immune mechanisms that under act as a protective defense mechanism (Haydock, D. A., & Hill, G. L. 1986; Norman, K. et al 2008; & Badac V. J., & Stephen, F).

Research has proved beyond doubt that by supplying adequate nutrition it is possible not only to prevent the complications that arise from a catabolic state, but also when intervened at the right time it is possible to reverse the effect that have already occurred as a result of catabolic effects of disease or injury can be reversed by adequate nutritional support by adequately correcting the degree of malnutrition

that has occurred (Barker, L. A. et al 2011).

In order to assess the degree to which the patient has suffered malnutrition it is necessary to evaluate the patient as a whole including a history of the amount of weight that is lost over the past six months, a thorough clinical examination for any physical evidence of malnutrition and a biochemical assessment of nutrients and plasma proteins.,

It is well known that the basic cellular and molecular mechanisms that result in wound healing involve cell adhesion, migration, proliferation, differentiation, and apoptosis are impaired in certain disorders (Haydock, D. A., & Hill, G. L. 1986).

The process of healing of the wounds is a multifaceted biological mechanism that has a influence by variety of factors that either directly or indirectly contribute in the process like the insulin-like growth factor and human acidic fibroblast growth factor. In vivo studies have shown that IGF can stimulate the proliferation and differentiation of endothelial cells and fibroblasts and promote granulation tissue regeneration to contribute to healing of the wounds' (Haydock, D. A., & Hill, G. L. 1986).

The outcome of the patient can be easily predicted and also the risk can be stratified so that the various groups of patients can be effectively compared objectively with precision. For this there are a number of nutritional indices that are available, yet there is no agreement between the researchers also which parameters is the most useful or sensitive especially when a single parameter is used (Norman, K. et al 2008; & Badac V. J., & Stephen, F). BMI when below their normal levels herald the occurrence of a surgical complication potentially.

One of the most important goals of providing adequate nutritional support to the surgical patient is to reduce the post operative morbidity that occurs as a result of inadequate nutrition like intra abdominal abscess, paralytic ileus and leakage from the anastomotic site (Mullen, J. L. et al 1980; Huckleberry, Y. 2004; & Ward, N. 2003).

In a surgical patient the most important aim is providing an adequate nutritional supplement to the patient who is undergoing a major surgery. This is done so as to avoid or reverse the catabolic effects that have occurred in the patient and the result of the disease or the injury the patient has sustained (Cheng, H.Q. 2010; & Engelman, D. T. et al 1999).

The efficiency of various nutritional regimens is based on various biological parameters but; the ultimate goal of nutritional support in a surgical patient is the outcome (Rapp-Kesek, D. et al 2004; & Sungurtekin, H. et al 2004). Hence it is important to note the improvement of the patient in terms of clinical outcome and restoration of function whenever nutritional support is provided in surgical patients (Rapp-Kesek, D. et al 2004; & Sungurtekin, H. et al 2004).

Most of the surgical patients fall in the mild-or -moderate nutritional groups and do not require any additional nutritional supplement during the peri-operative period. It is those minor percentage of patients who fall in the severe malnutrition group are the ones who require nutritional assistance; especially in the peri-operative period to avoid high morbidity associated with inadequate nutrition (Abunnaja, S. et al 2013).

Among all the factors that are responsible for wound healing; the tissue proteins is the one which has a very

important role. The depletion of proteins within the human body can result in a delay of wound healing or impaired wound healing. As a result of the abnormal wound healing the tensile strength of the wound may not be adequate and lead to variety of complications (Rolandelli, R. H., & Ullrich, J. R. 1994; & Guo, S. A., & DiPietro, L. A. 2010; & Martin, P., & Nunan, R. 2015).

The outcome of protein energy malnutrition as the immediate effect is seen as reduction in the total muscle mass, alteration of respiration, impairment of the immune system and intestinal atrophy (Cederholm, T. et al 1995). These changes are known to cause an increase in the postoperative morbidity not only as a result of impaired wound healing but also as they predispose to infection (Boby, P. J. et al 2005; & ANDERSON, C. F. et al 1984, July).

With an increase in the number of surgeries being performed for complicated abdominal conditions , including for bad prognostic patients who present at a late stage as a result of better available medical care like TPN and the higher antibiotic cover, it has become mandatory to grade a patient for not only mortality but also for the complications and morbidity.

This holds good in the present pandemic era when the unseen complications and disorders are emerging at a higher rate. Studies have shown booth over nutrition and under nutrition to adversely affect the post-operative outcome.

In view of all the above, we at a tertiary care teaching hospital decided to evaluate the role of Body Mass Index as predictors of postoperative morbidity and mortality both in elective and emergency major surgeries.

MATERIALS AND METHODS

Descriptive Analytical Observational Study was conducted on 164 patients chosen by Convenience sampling. Who had undergone laparotomy at the Father Medical College Hospital, Mangalore who were admitted in any of the surgical departments during the period of October 2018 to October 2020 Details of cases were recorded including demography co-morbidities , blood transfusion post-operative complication, mortality.

BMI	Nutritional status
Below 16.5	Underweight
16.5–24.9	Normal weight
25.0–29.9	Pre-obesity
30.0–34.9	Obesity class I
35.0–39.9	Obesity class II
Above 40	Obesity class III

Figure 1: Classification of BMI Who
Data tabulation and statistical analysis to be employed

All data was analyzed using Statistical Package for the Social Sciences (SPSS) for Windows, Version 17.0. Continuous variables were expressed as mean±SD. Percentages were used to express categorical variables.

RESULTS AND ANALYSIS

In the present study the most common age was 31-40

Table of correlations

Table.1

BMI of 18.5	Value	95% CI
Sensitivity	96.6%	65.09% to 98.09%
Specificity	94.21%	85.69% to 99.98%
Positive Likelihood Ratio	109.68	15.46 to 778.14
Negative Likelihood Ratio	0.14	0.05 to 0.39
Disease prevalence	14.77%	9.49% to 21.50%
Positive Predictive Value	95.00%	72.81% to 99.26%
Negative Predictive Value	97.67%	93.62% to 99.18%
Accuracy	97.32%	93.27% to 99.26%

Table.2

Paired Samples Correlations		Correlation	P value
Pair 1	ICU DAYS and BMI LEVELS	-0.21	
Pair 3	BMI and COMPLICATONS	-0.286	
Pair 4	DURATION OF WARD STAY DAYS and BMI LEVELS	-0.121	

DISCUSSION

With an increase in the number of surgeries being performed for complicated abdominal conditions, including for bad prognostic patients who present at a late stage as a result of better available medical care like TPN and the higher antibiotic cover, it has become mandatory to grade a patient for not only mortality but also for the complications and morbidity (Burnham, W. R. 1982; & Norman, K. et al 2008).

This holds good in the present pandemic era when the unseen complications and disorders are emerging at a higher rate. Also when considering the fact that medico legal cases are in rise more so in the southern part of India, and the ones taught to us as complications are considered as medical negligence by legal experts.

A point to be noted that even the look of the patient can be a prognostic marker, a term used as intuition, but in the evidence based medicine where facts are based on results and not merely understanding.

One of the most important markers of the patients status used routinely are BMI and the albumin and in the post-operative set up also this holds good.

Nutritional assessment is a very essential in order to recognize patients who are at an increased risk of

years with 40 cases, 24.39% followed by 41-50 years with 36 cases, 21.95%, 51-60 years with 32 cases, 19.51%, and 61-70 years with 20 cases, 12.20%, More than 70 years with 16 cases, 9.76%, and less than 20 years with 4 cases, 2.44%. The mean age was 43.06 years with SD 8.04 years. We had 62 cases, 37.80% were females and 102 cases, 62.20% were males. Co Morbidities were in 82.93%, the most common was Diabetes Mellitus in 68 cases, 41.46%, Hypertension in cases, 15.85%, COPD in 12 cases, 14.63%, IHD in 9 cases, 10.98%.

developing post-operative complications.

BMI is a maker that can be done in every set up and does not require any significant tools and is almost free of charge. It can also be used to help the patient party to decide on choosing the management if prognosis is explained even prior to admission.

In view of all the above said, we decided to do the study to evaluate the peri operative outcome with respect to BMI status and albumin.

Calculation of body mass index was introduced by a Belgian mathematician by the name Lambert Adolphe Jacques Quetelet and hence the name of Quetelet index.

This formula of calculating body mass index was introduced with an intention to calculate the degree of obesity of the general population in a quick and easy manner so that it could help the government to allocate the resources that were available.

BMI is an indicator of the nutritional status and those who have high BMI it is understood that they are obese and often are over nourished. Obesity is considered as one of the risk factors for the variety of diseases all of which are showing increasing trend. Some of the associated diseases with high BMI hypertension,

respiratory problems, obstructive sleep apnea and type 2 Diabetes mellitus coronary artery disease, cerebrovascular disease, osteoarthritis of the joints malignancies and they may not be as healthy as the values suggest

On the other hand undernutrition is also not good as it itself has associations with diseases those that are associated with efficiencies of micronutrients and vitamins.

Obesity Paradox states that being overweight or obese actually is associated with an improved survival.

The World Health Organisation has defined the various regions of body mass index to classify a person as underweight, normal, overweight, grade 1 obese, Grade 2 obese and morbid obese according to this classification BMI of above 30 is considered to be obese but in the year 2004 World Health Organisation suggested that in the Indian population it is better to define Obesity at a level above 25 kg / meter 2 because, the Indians have a higher waist circumference and excess body fat as compared to the population in the rest of the world.

Engelman et al observed that a BMI less than 20 kg/m² was associated with increased post-operative complications (Mullen, J. L. et al 1980).

In our study the post-operative complications increased with patients with underweight measuring less than 18.5 kg/m².

Similar results were also put forward by a prospective cohort study done by Ward, N. (2003) on impact of Body Mass Index on perioperative outcomes in patients undergoing major intra-abdominal surgeries where they concluded that patients who were underweight had a increase in post-operative mortality, perhaps as a consequence of their underlying nutritional status.

In a study on malnutrition, outcome and nutritional support suggest pre-operative nutritional risk indications like BMI < 18.5 kg/m² and serum albumin < 2.1 g/dl have an impact on surgical outcome, have longer hospital stays and experience a 40 -60% greater frequency of complications in response to medical / surgical treatment (Norman, K. et al 2008).

Anderson et al (ANDERSON, C. F. et al 1984, July) observed that low albumin had a sensitivity of 22% and a specificity of 91% in predicting hospitalization lasting more than 10 days and a sensitivity of 10% and specificity of 86% for complications.

CONCLUSION

We concluded low BMI was related well with the morbidity and mortality

- A higher incidence of electrolyte abnormalities

- Post-operative infections and other complications like DVT.
- We also noted that those with a BMI of less than 18 had a higher rate of post-operative infections and hypoalbuminemia.
At a level of BMI of 18.5 the sensitivity was 96.6 % as a predictor of post-operative complications

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