ISSN- O: 2458 - 868X, ISSN–P: 2458 – 8687
Index Copernicus Value: 49. 23
PubMed - National Library of Medicine - ID: 101731606

International Journal of Medical Science and Innovative Research (IJMSIR)
IJMSIR : A Medical Publication Hub
Available Online at: www.ijmsir.com
Volume – 4, Issue – 2, April - 2019, Page No. : 48 - 54

To evaluate the outcome of patients with perforation peritonitis by identification of high risk patient using serum albumin and serum cholesterol level at tertiary care hospital Ajmer, Rajasthan

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Type of Publication: Original Research Paper

Conflicts of Interest: Nil

Abstract

Background: Surgical site infection is a serious problem affecting about 2% of all surgical procedure. Advances in surgical sciences and care has not reduced the prevalence to such an extent. Various risk factors like Age, nutritional status, diabetes, smoking, obesity, altered immune status were reported in literature.

Methods: We conducted this prospective cohort study in patients who underwent various surgeries in our institution after getting informed consent. Apart from the basic demographic profile, preoperative levels of albumin and cholesterol were measured along with preoperative, anesthetic and perioperative details. All statistical analysis was done in Epi-info statistical software.

Results: Low level of serum albumin and serum total cholesterol may point to Death, SSIs and Increase length of hospital stay.In present study Serum albumin level less than 3.5 gm/dl was associated with increased postoperative death, SSIs, remote infection, delayed recovery,more hospital stay and the results are statistically significant also. There was an inverse relationship between them i.e. lower level of albumin, increases the chances of adverse outcome. Incidence of Death, SSIs, Duration of hospital stay in Patient with blood cholesterol levels (160-199) was less while it was higher in both low (<159)and high (≥200 mg/dl) cholesterol.

Conclusion: Routine measurement of serum albumin and cholesterol at the time of admission will help in proper optimization of surgical patients so that potential SSI, Hospital stay and mortality could be reduced.

Keywords: Death, SSIs,Albumin, Cholesterol, Hospital Stay.

Introduction : Despite the surgical treatment, sophisticated intensive care units new generation antibiotics and better understanding of pathophysiology, the mortality rate of perforation peritonitis is still high. It also depends on the exact recognition of seriousness of the diseases, an accurate assessment and the classification of the patient's risks. Early prognostics evaluation of peritonitis is desirable to selects high risk patients for more aggressive therapeutics procedures such as radical debridement, levage systems, open management and planned relaparotomy.

Low total serum cholesterol may contribute to the development of infection. Circulating cholesterol-rich lipoproteins and triglyceride-rich lipoproteins have the

capacity to bind and detoxify bacterial LPS. Cholesterol is the precursor of five major classes of steroid hormones. Cholesterol affects gluconeogenesis and immune function; its transport form, the lipoproteins, also serves as vehicles for fat soluble vitamins, antioxidants, drugs and toxins. Cholesterol need for membrane biogenesis, maintenance of membrane fluidity, cell signalling and a beneficial influence on the immune system. Preoperative hypoalbuminemia is well known to be significantly associated with the development of and is an independent risk factor for the development of postoperative SSI[1]. The serum albumin is the most readily and clinically useful parameter. It predicts perioperative morbidity and mortality. The mechanism of increase in infectious etiologies in hypo-albuminemia are multifactorial and likely include impairment of tissue healing decreased collagen synthesis and granuloma formation. The immune response in hypoalbuminemia is also compromised through impairment of macrophage activity and induction of macrophage apoptosis[2,3]. These factors together could explain the higher risk of surgical site infections in hypoalbuminia patients[4].

Materials and Methods: The study was done in 100 patients with peritonitis due to hollow viscous perforation who were admitted in Surgery Department at J.L.N. Medical College and Associated Group of Hospital, Ajmer.

Our study is a prospective, observational and open study for evaluation of prognosis in patient's with peritonitis using Mannheims Peritonitis Index, Serum albumin and Serum cholesterol level and conducted during the period of January 2017 to January 2019.

Selection of Cases

From cases attending our institute in whom diagnosis of peritonitis was established by clinical and operative findings or surgical interventions during management. Therefore nonrandomized sampling technique was used.

Inclusion Criteria

Patients with clinical suspicious and investigatory support for the diagnosis of peritonitis due to hollow viscous perforation and above 12 years to 80 years of age, who were later confirmed by intra-operative findings.

Exclusion Criteria

1. Patients with hollow viscous perforation due to trauma, associated injuries to other organs, associated vascular and neurogenic injuries.
2. Patients absconded or discharged against medical advice (DAMA) during hospital admission.
3. All patients with primary peritonitis (Spontaneous bacterial peritonitis).
4. All patients with peritonitis due to anastomotic dehiscence or leak.
5. Patients with acute appendicitis (without perforation).
6. Patients below 12 years and above 80 years of age.

Method of Collection of Data: The study was done after obtaining a detailed history, complete general physical examination and systemic examination. The patients was subjected to relevant investigation like X-ray erect abdomen, Chest X-ray,USG (Ultrasonography) of abdomen and routine investigations like Hb, TLC (Total Leucocyte Count), Urea done. Serum Creatinine, Serum electrolytes done.Serum albumin and Serum cholesterol also measured. Local examination of abdomen was done and relevant finding was recorded. Rectal examination was done in all cases, per vaginal examination was also done in female patients.

Diagnosis was made by a combination of history, clinical examination and on the basis of reports of the radiological examinations after which the patients is posted for emergency laparotomy. Once the diagnosis of peritonitis

was confirmed by the operative finding of the patients, the patients were accepted for the study.

Data Analysis: To collect required information from eligible patients a pre-structured pre-tested Proforma will be used. For data analysis Microsoft excel and statistical software SPSS will be used and data will be analyzed with the help of frequencies, figures, proportions, measures of central tendency, appropriate statistical test.

Observation: In this study 100 cases of secondary peritonitis who attended surgical emergency J.L.N. Hospital Ajmer were selected over a period of two year from January 2017 to January 2019.In the study of 100 patients, 38% of the cases were above 50 year and 62% of patients were of 50 year or less. In the study of 100 patients, 66 (66%) patients were male and 34 (34%) patients were female.

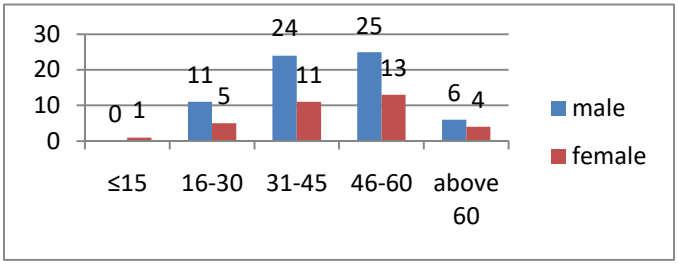

Figure 1 : Bar diagram showing of age and sex distribution of patients with perforation peritonitis.

Table 1 : Time of presentation since start of symptoms mortality and survival

S. No.	Duration of symptoms	Mortality (%)		Survival (%)		Total (%)	
		No.	%	No.	%	No.	%
1	One day	0	0%	17	100%	17	17%
2	2 to 5 days	9	12%	66	88%	75	75%
3	More than 5 days	6	75%	2	25%	8	8%
	Total	**15**	**15%**	**85**	**85%**	**100**	**100%**

Chi-square value- 3.90132 , p value- 0.048 (< 0.05)

In the study group of 100 patients, majority of patients (75% and 8% total 83) presented to the hospital after 24 hrs of onset of symptoms and the mortality of those patients who presented within 2 to 5 days and after 5 days was 12% and 75% respectively as compared to the mortality (0%) in patients who presented on the first day of onset of symptoms. The mortality was maximum 75% in patients who attended after more than 5 days of onset of disease.

Table 2: Correlation of serum albumin level with duration of hospital stay

Serum.albumin	Hospital stay				Total patients	p-value
	≤10 Day		>10 Days			
	No. of patients	%	No. of patients	%		
≤3.5	9	- 37.50%	15	62.50%	24	0.007
>3.5	59	- 79.73%	17	- 20.37%	76	
Total	68	- 68.00%	32	- 32.00%	100	

Out of total 100 patients, 68 patients hospital stay were ≤10 days and 32 patients hospital stay were >10 days. 76 patients albumin was more than 3.5 gm/dl and out of 76 patients 79.73% patients stay was less than 10 days and 20.37% patients stay was more than 10 days. 24 patients albumin was ≤3.5 gm/dl , out of 24 patients 37.5% patients stay was less than 10 days and 62.5% patients stay was more than 10 days. The association between albumin and hospital stay was found stastically significant.

Table 3: Correlation of serum cholesterol level with duration of hospital stay

Cholesterol (mg/dl)	Hospital stay				Total patients	p-value
	≤10 Day		>10 Days			
	No. of patients	%	No. of patients	%		
≤159	13	- 52.00%	12	12(48.00%)	25	0.0162
160-199	30	- 75.00%	10	10(25.00%)	40	
≥200	25	- 71.43%	10	10(28.57%)	35	
Total	68		32		100	

40 patients cholesterol was 160-199 mg/dl and out of 40 patients 75.00% patients stay was less than 10 days and 25.00% patients stay was more than 10 days. 35 patients cholesterol was ≥200 mg/dl, out of 35 patients 71.43% patients stay was less than 10 days and 28.57% patients stay was more than 10 days. 25 patients cholesterol was ≤159 mg/dl, out of 25 patients 52.00% patients stay was less than 10 days and 48.00% patients stay was more than 10 days. The association between cholesterol and hospital stay was found stastically significant.

Table 4: Correlation of serum albumin level with ssi (surgical site infection)

Serum albumin (gm/dl)	SSI				Total patients	p-value
	PRESENT		ABSENT			
	No. of patients	%	No. of patients	%		
≤3.5	4	-15.38%	22	-84.62%	26	0.241
>3.5	6	-8.10%	68	-91.90%	74	
Total	10	-15.38%	90	-15.38%	100	

Out of total 100 patients, 10 patients developed SSI and 90 patients not developed SSI. 74 patients albumin was more than 3.5 gm/dl, out of 74 patients 8.10 % patients developed SSI and 91.90% patients not developed SSI. 21 patients albumin was ≤3.5 gm/dl, out of 21 patients 8.10% patients developed SSI and 91.90% patients not develop SSI. The association between albumin and SSI was found stastically Insignificant.

Table 5 : Correlation of serum cholesterol level with ssi (surgical site infection)

Cholesterol Level(mg/dl)	SSI				Total patients	p-value
	PRESENT		ABSENT			
	No. of patients	%	No. of patients	%		
≤159	5	(25.00%)	20	(75.00%)	25	0.137
160-199	2	(5.00%)	38	(95.00%)	40	
≥200	3	(8.57%)	32	(91.43%)	35	
Total	10	(10.00%)	90	(90.00%)	100	

40 patients cholesterol was 160-199 mg/dl, out of 40 patients 5.00% patients developed SSI and 95.00% patients not developed SSI. 35 patients cholesterol was ≥200 mg/dl, out of35 patients 8.75% patients developed SSI and 91.43%patients not developed SSI. 25 patients cholesterol was ≤159 mg/dl, out of 25 patients 25.00% patients developed SSI and 75.00% patients not developed SSI. The association between cholesterol and SSI was found stastically Insignificant.

Table 6: Correlation of serum albumin level with mortality

S.albumin	DEATH				Total patients	p-value
	PRESENT		ABSENT			
	No. of patients	%	No. of patients	%		
≤3.5	8	(30.77%)	18	(69.33%)	26	0.019
>3.5	8	(10.81%)	66	(89.19%)	74	
Total	16	(16.00%)	84	(84.00%)	100	

Out of total 100 patients, 16 patients died and 84 patients survived. 74 patients albumin was more than 3.5 gm/dl and out of 74 patients 89.19 % patients survived and 2%

patients died. 26 patients albumin was ≤3.5 gm/dl , out of 26 patients 69.33% patients survived and 30.77% patients died. The association between albumin and death was found stastically significant.

Table 7: Correlation of serum cholesterol level with mortality

Cholesterol	DEATH		SSI	p-value
	PRESENT	PRESENT		
≤159	7(28.00%)	18(72.00%)	25	0.0879
160-199	3(7.5%)	37(92.5%)	40	
≥200	6(17.14%)	29(82.86%)	35	
Total	16(16.00%)	84(84.00%)	100	

40 patients cholesterol was 160-199 mg/dl, out of 40 patients 7.5% patients died and 92.5% patients survived. 35 patients cholesterol was ≥200 mg/dl, out of35 patients 17.14% patients died and 82.86% patients survived. 25 patients cholesterol was ≤159 mg/dl, out of 25 patients 28.00% patients died and 72.00% patients survived. The association between cholesterol and death was found stastically Insignificant.

Discussion

Out of total 100 patients 74 patients had albumin more than 3.5 gm/dl and out of 74 patients 89.19 % patients survived and 10.81% patients died. 26 patients albumin was ≤3.5 gm/dl, out of 26 patients 69.33% patients survived and 30.77% patients died with p-value0.019 which is stastically significant.In the study by gibbs et al the morality in patients with low serum albumin< 3.5g/dl was 29% and in patients with >3.5g/dl was 5%.

In our study of 100 patients 40 patients cholesterol was 160-199 mg/dl, out of 40 patients 7.5% patients died and 92.5% patients survived. 35 patients cholesterol was ≥200 mg/dl, out of35 patients 17.14% patients died and 82.86% patients survived. 25 patients cholesterol was ≤159 mg/dl, out of 25 patients 28.00% patients died and 72.00% patients survived. The association between cholesterol and death was found stastically Insignificant.

SSIs rate in study done by M.Morimoto et al [5]was 13.67% and 5.41% in S. albumin <3.5gm/dl and >3.5 gm/dl respectively while in present study it was 15.38% and 8.10%, which was slightly more in present study. SSIs rate in study done by M.Morimoto et al[5] was 13.4%, 6.1%, 4.2% and 5.9 % in S. cholesterol < 160, 161-199, 200-239 and ≥240 mg/dl respectively while in present study it was 25%, 5%, 8.75% in S.cholesterol<159,160-199,>200 , which shows similar pattern of SSIs. These findings also shows an inverse relationship between serum albumin and SSIs(i.e. when serum albumin level decreases SSIs incidence increases), and reverse J shape relationship between serum total cholesterol and SSIs(i.e. minimum incidence of SSIs in Patient with borderline blood cholesterol levels160-199 mg/dl).

Serum albumin is a good and simple predictor of surgical risk and has a close correlation with the degree of malnutrition. It has the highest predictive value of all the nutritional assessment methods for predicting associated complications and mortality[6].

Out of total 100 patients, in 76 patients albumin was more than 3.5 gm/dl and out of 76 patients 79.73% patients stay was less than 10 days and 20.37% patients stay was more than 10 days. 24 patients albumin was ≤3.5 gm/dl , out of 24 patients 37.5% patients stay was less than 10 days and 62.5% patients stay was more than 10 days. The association between albumin and hospital stay was found stastically significant. IN the study by Gibbs et al longer duration of hospital stay and morbidity was found in patients with low serum albumin level which was 65% in patients with S.Albumin <3.5gm/dl, and 10%in patients with >3.5gm/dl.

In our study of 40 patients cholesterol was 160-199 mg/dl and out of 40 patients 75.00% patients stay was less than 10 days and 25.00% patients stay was more than 10 days. 35 patients cholesterol was ≥200 mg/dl, out of 35 patients 71.43% patients stay was less than 10 days and 28.57% patients stay was more than 10 days. 25 patients cholesterol was ≤159 mg/dl, out of 25 patients 52.00% patients stay was less than 10 days and 48.00% patients stay was more than 10 days. The association between cholesterol and hospital stay was found stastically significant . in the study by Rumi shin et al [7]duration of hospital stay was more in patients with low S.Cholesterol <160mg/dl (30%) and patient with high cholesterol level >240mg/dl(20%).

Presence of secondary infections, malnutrition, delayed presentation contribute for longer period of hospital stay and associated increased morbidity in our study population.

Malnutrition also impair cell mediated immunity and resistance to infection[8]. In hypoalbuminemia, alteration in cytokine metabolism especially impairs IL-1 activity and defects in the complement system have also been detected. Therefore in the hypoalbuminemic group, SSIs and remote infections such as pneumonia were commonly found[9].

Hypoalbuminemia is associated with poor tissue healing, decrease collagen synthesis in surgical wounds or at anastomoses, and impairment of immune response, such as macrophage activation and granuloma formation. Therefore, wound infection, remote infections such as pneumonia, and anastomatic leakage are commonly observed in hypo-albminaemic patients[10].

Serum albumin level less than 3 g/dl was associated with increased postoperative morbidity and mortality according to studies done by Leite et al[11], Golub et al[12].

Gibbs et al[31] observed that a decrease in serum albumin from > 4.6 g/dl to <2.1 g/dl was associated with exponential increase in morbidity and mortality and tha t it was a good prognostic indicator.

Delgado-Rodrieguez et al.[14] have reported an association between nosocomial infection and HDL and total cholesterol level in surgical patients. Infection, inflammation and trauma induce marked changes in plasma levels of a wide variety of proteins, and these changes are mediated by cytokines. The host's response to surgical injury also results in dramatic alterations in lipid metabolism and circulating lipoprotein levels

The probability of SSIs are less in appropriate serum level of these particulars i.e. serum albumin >3.5 gm/dl and serum total cholesterol in between 160-199 mg/dl.

Preoperative nutritional status has been an important factor related to morbidity and mortality. Albumin, the body's predominant serum-binding protein,has several important functions .It maintains normal plasma colloid oncotic pressure. Albumin transports bilirubin, fatty acids, minerals, trace elements vitamins, hormones and drugs. It also affects platelets functions.

Normal albumin levels indicate adequate kidney and liver and immune functions. Low level of albumin is associated with increased risk of morbidity and mortality.

Cholesterol is important for cell membrane, lipoproteins (HDL,LDL),severalharmones,condition of vessel wall etc.

In general higher the cholesterol level, the higher the risk of coronary heart disease,angina,stroke,diabetes, atherosclerosis, condition of vessel wall, circulation in body and many other comorbid conditions, which affects body and play such an important role in prognosis.

Low cholesterol level also adversely affects the outcome in perforation peritonitis patients.

Conclusion

Routine measurement of serum albumin and cholesterol at the time of admission will help in proper optimization of surgical patients so that potential SSI, Hospital stay and mortality could be reduced.

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