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Evaluation of Early Post-Operative Morbidity and Mortality Following Resectional Surgery of Colorectal Cancer

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Abstract

Background: Colorectal cancer is one of the most occurring malignancies all over the world. The only curative option is surgery and post-operative morbidity and mortality should be minimized to improve outcome. Surgical resection is still the principal treatment for colorectal cancer. To evaluate early post-operative morbidity and mortality following resectional surgery of colorectal cancer. **Material & Methods:** This longitudinal type of descriptive study was conducted at the department of Surgery, Rangpur Medical College Hospital after ethical approval between July' 2019 to June '2020. Informed written consent was obtained from the participants after explanation of the nature and purpose of the study. A total 33 patients were taken as study population. Meticulous history taking and thorough physical examination were done of all patients. Thirty day's postoperative mortality and morbidity was evaluated on the basis of pre-existing co-morbidities and surgical procedure with attendant complications. Appropriate statistical test was performed. Data was analyzed through SPSS version 22.0. **Results:** More than one third (35.3%) patients belonged to age >50 years in group I and 25.0% in group II. More than half (58.8%) patients were female in group I and 5(31.2%) in group II. Diabetes mellitus were found in 41.2% patients, 47.05% patients were active smoker in group I and 6.25% in group II. Hypertension was found in 52.9% patients. More than half (52.9%) patients had stage II in group I and 68.8% in group II. By ASA, 23.5% patients had normal healthy in group I and 68.8% in group II. 47.1% patients had mild systemic disease in group I and 31.2% in group II, 27.4% patients had severe systemic disease in group I. By intra-operative time, majority (82.4%) patients had more than 2 hours in group I and 5(31.2%) in group II. More than half (52.9%) patients had intra operative blood loss in group I and 6(37.5%) in group II. 47.1% patients developed wound infection in first follow up, 23.5% in second follow-up and 29.4% in third follow-up. Majority (78.6%) patients belonged to serum albumin ≤3.5 in patients with morbidity and 33.3% in mortality. **Conclusion:** Diabetes mellitus and hypertension were predominant comorbidities and associated with poor surgical outcome. Active smoking had also negative impact on post-operative complications. Majority patients showed low preoperative serum albumin ≤3.5 with increased morbidity and mortality. It could be reasonably imparting an insight for convincing that hard data should supplant much of the foregoing speculation by colorectal cancer surveillance program.

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INTRODUCTION

Like other parts of the world, cancer is predicted to be an increasingly important cause of morbidity and mortality in Bangladesh in the next few decades. Among them Colorectal cancer (CRC) is the second most common malignancy in the developed world and some parts of Asia, but it is relatively common in South Asia, particularly the Indian subcontinent.[1] The global burden of colorectal carcinoma is expected to increase by 60% to more than 2.2 million new cases and 1.1 million cancer deaths by 2030.[2] Overall mortality rates following colorectal surgery range from 1% to 16.4% with morbidity rates as high as 35% following colorectal surgery. Patients require the need for a second operation 2 to 5.8% of the time.[3] The age range of colorectal cancer is 19-84 years with male and female ration of 1.4: 1. Peak incidence of colorectal cancer in Bangladesh is 50-59 years which is lower than that of Western and other countries.[4] The incidence of colorectal cancer i Macroscopically the four common varieties of colorectal carcinoma are annular, tubular, ulcerative and cauliflower. The annular variety tends to give rise to obstructive symptoms whereas the others present more commonly with bleeding. Most large bowel cancers arise from the left colon, notably the rectum (38%), sigmoid (21%), and descending colon (4%). Cancer of the caecum (12%) and ascending colon (5%) are less common. Cancer of the transverse colon (5.5%), flexures (2-3%) and appendix (0.5%) are relatively uncommon. Microscopically, the neoplasm is a columnar cell adenocarcinoma.[5] However, cross sectional study reported that without any bowel preparation colorectal cancer surgery can be done safely.[6] The diagnosis of colonic cancer in early stage, potentially curative by means of radical surgical treatment followed by adjuvant oncologic therapy.[7] Surgical resections is the ultimate treatment for the patient with non-metastatic colorectal carcinoma. About 90% of patient with colorectal cancer require surgery, which is usually carried out with a curative intent. Total Mesorectal Excision (TME) is the treatment of lower and mid rectal carcinoma and associated with an increased risk of anastomotic leak.[8] Postoperative complications occur in up to one third of patient undergoing colorectal procedure. The most common complications are infection or organ space infection/anastomotic leakage (AL) and gastrointestinal (GI) motility complications including ileus and bowel obstruction. Anastomotic leak (AL) is the most fearful complication and reported rate of colonic anastomotic leak is in the range from 1.5% up to 16%, with mortality ranging between 10% and 20% and leakage occurring within the third and nine days after surgery.[8] Interestingly, in two recent studies anastomotic leakage (AL) were often diagnosed late in the postoperative period and more often after hospital discharge or 12 days postoperatively.[9] Multiple studies have evaluated predictors of overall morbidity following colorectal surgery. Patient factors include older age, co-morbidities, and low preoperative albumin. ASA Score > 2 is independent risk factors for postoperative morbidity.[10] Recent studies reveals, poor outcome of surgery is related to the severity of the complications and cancer stage of the patient.[11] In the study of Eegien et al 23 out of 333 patients (6.9%) with colon cancer and 6 out of 112(5.3%) with rectal cancer died in postoperative period. The study concluded that

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postoperative mortality very often is the direct result of pre-existing co-morbidity and not always the direct result of the surgical procedure.[12] Another study reveals resection of the cancer involving the middle or lower rectum with sphincter saving procedures was associated with 2.5% mortality and 43% morbidity.[13] Nearly all prospective randomized studies comparing a laparoscopic with open approach reported longer operations in the laparoscopic group without an increase postoperative complications and with similar mortality and morbidity rates.[9] A recent study observes that stapled anastomosis though not overall but at least to some extent is safer than hand-sewn anastomosis and in user perspective, it is superior to hand-sewn technique in colorectal surgery.[14] Since, there is scarcity of data among our population, the aim of our study is to evaluate early postoperative morbidity and mortality following resectional surgery of colorectal cancer on the basis of co-morbidities and surgical risk factors.

Objectives

General objective

To evaluate early postoperative morbidity and mortality following resectional surgery of colorectal cancer.

Specific objectives

- To find out the morbidity following resectional surgery of colorectal cancer patients.
- To find out the mortality following resectional surgery of colorectal cancer patients.
- To asses' co-morbidity of the patients.
- To find out associated risk factors of the patients.
- To assess operative and anastomotic technique.
- To find out the socio-demographic characteristics of the patients.

MATERIAL AND METHODS

This was a longitudinal type of descriptive study. A total 33 patient admitted into department of Surgery, Rangpur Medical College Hospital, Rangpur who fulfilled the inclusion and exclusion criteria was enrolled into the study. After proper assessment and management, colorectal carcinoma patients who were within 18 years up to 59 years was included in this study and divided into two groups. Group I included patients with morbidity and mortality and group II included patients without morbidity. After informing about the study aim, objectives and procedures, informed written consent was taken from each participants. Each patient was interviewed face to face by using a structured questionnaire at the time of admission. History taking focusing clinical features, disease duration along with socio-demographic characteristics. The study was designed to collect the following data's-comorbidities, stages of cancer, ASA scoring, type of surgery performed, location of tumor, operative duration as well as complications in early postoperative period. Morbidity and mortality were evaluated at early postoperative period. Total three follow-ups were given in this period. First follow-up was given within 7th POD, second follow-up was given within 7th to 14th POD, third follow-up was given within 14th to 30th POD. After data checking they were inputted into Microsoft excel sheet and they transcribed into statistical software. Data was

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entered in the computer using SPSS version 22.0. Calculation of percentage resistance was set within 95% confidence interval (CI) and level of significance was considered as 'P' value less than 0.05 and double checked before analysis. Appropriate statistical test (Chi-square, Fisher exact test and ANOVA test) was performed. Result was presented through tables and diagrams. Ethical clearance had been taken from the Ethical Committee of the concerned hospital.

RESULTS

[Table 1] showed the distribution of the study population by demographic profile. It was observed that more than one third (35.3%) patients belonged to age >50 years in group I and 4(25.0%) in group II. More than two third (70.5%) patients were normal BMI in group I and 14(87.5%) in group II.

[Table 2] showed the distribution of the study population by comorbid conditions. It was observed that nearly almost half (41.2%) patients had diabetes mellitus in group I. Eight (47.05%) patients had active smoker in group I and 1(6.25%) in group II. 3(17.6%) patients had chronic onstructive pulmonary disease in group I. 1(5.9%) patient had congestive heart failure in group I. 9(52.9%) patients had hypertension in group I. 1(5.9%) patient had others in group I. The difference of diabetes mellitus, hypertension and smoking were statistically significant ($p<0.05$) between two groups.

[Table 3] showed the distribution of the study population by stage of cancer. It was observed that more than half (52.9%) patients had stage II in group I and 11(68.8%) in group II. The difference was statistically not significant ($p>0.05$) between two groups.

[Table 4] showed the distribution of the study population by location of tumour. It was observed that almost two third (64.7%) patients had rectal carcinoma in group I and 9(56.2%) in group II. The difference was statistically not significant ($p>0.05$) between two groups.

[Table 5] showed the distribution of the study population by ASA physical status classification. It was observed that four (23.5%) patients were normal healthy in group I and 11(68.8%) in group II. Almost half (47.1%) patients had mild systemic disease in group I and 5(31.2%) in group II. Nearly almost one third (29.4%) patients had severe systemic disease in group I. The difference of normal healthy patients and severe systemic disease were statistically significant ($p<0.05$) between two groups.

[Table 6] showed the distribution of the study population by pre-operative bowel preparation. It was observed that majority (82.4%) patients had pre-operative bowel preparation in group I and 15 (93.8%) in group II. The difference was statistically not significant ($p>0.05$) between two groups.

[Table 7] showed the distribution of the study population by intra-operative time. It was observed that majority (82.4%) patients required more than 2 hours in group I and 5(31.2%) in group II. The difference was statistically significant ($p<0.05$) between two groups.

[Table 8] showed the distribution of the study population by intra-operative iatrogenic injury, blood transfusion and blood loss. It was observed that all (100.0%) patients had intra-operative transfused blood in group I and 13(81.3%) in group II. More than half (52.9%) patients had intra operative blood loss in group I and 6(37.5%) in group II. The difference was

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statistically not significant (p>0.05) between two groups.

[Table 9] showed the relation of peritoneal contamination with morbidity and mortality status. It was observed that two third (66.7%) patients had morbidity and mortality in presence of peritoneal contamination and 13(48.1%) in absence of peritoneal contamination. The difference was statistically not significant (p>0.05) between two groups.

[Table 10] showed the distribution of the study population morbidity and mortality status in different follow up. It was observed that majority (82.4%) patients had complication in first follow up, 8(47.1%) in second follow up and 9(60.0%) in third follow up. Two (11.8%) patients had mortality in second follow up and 1(6.7%) in third follow up. Most complications developed in first follow up but the difference was statistically not significant.

[Table 11] showed the distribution of the study population morbidity status in different follow up. It was observed that 8(47.1%) patients had developed wound infection in first follow up, 4(23.5%) in second follow-up and 5(29.4%) in third follow-up. Wound infection mostly developed in first follow up but the difference was statistically not significant. Four (23.5%) patients had developed pneumonia in first follow up and not found in second and third follow up. Anastomotic leakage was not found in first follow up, 2(11.8%) developed in second follow up and 6(35.3%) in third follow up and other complication were statistically not significant in different follow up.

Table 1: Distribution of the study population by demographic profile (N=33)

	Group I (n=17)		**Group II (n=16)**		**P value**
	n	**%**	**n**	**%**	
Age (in years)					
≤20 yrs.	1	5.9	4	25.0	0.359^{ns}
21-30 yrs.	1	5.9	3	18.8	
31-40 yrs.	3	17.6	2	12.4	
41-50 yrs.	6	35.3	3	18.8	
>50 yrs.	6	35.3	4	25.0	
Sex					
Male	7	41.2	11	68.8	0.112^{ns}
Female	10	58.8	5	31.2	
BMI					
Underweight	2	11.8	2	12.5	0.373^{ns}
Normal	12	70.5	14	87.5	
Overweight	2	11.8	0	0.0	
Obese	1	5.9	0	0.0	

Table 2: Distribution of the study population by comorbid conditions (N=33)

Comorbid conditions	**Group I (n=17)**		**Group II (n=16)**		**P value**
	n	**%**	**n**	**%**	
Diabetes mellitus					

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Yes	7	41.2	0	0.0	0.005[s]
No	10	58.8	16	100.0	
Active smoker					
Yes	8	47.1	1	6.3	0.016[s]
No	9	52.9	15	93.7	
Chronic obstructive pulmonary disease					
Yes	3	17.6	0	0.0	0.125[ns]
No	14	82.4	16	100.0	
Congestive heart failure					
Yes	1	5.9	0	0.0	0.515[ns]
No	16	94.1	16	100.0	
Hypertension					
Yes	9	52.9	0	0.0	0.001[s]
No	8	47.1	16	100.0	
End-stage renal disease					
Yes	0	0.0	0	0.0	-
No	17	100.0	16	100.0	
Disseminated cancer					
Yes	0	0.0	0	0.0	-
No	17	100.0	16	100.0	
Others					
Yes	1	5.9	0	0.0	0.515[ns]
No	16	94.1	16	100.0	

Table 3: Distribution of the study population by stage of cancer (N=33)

Stage of cancer	**Group I (n=17)**		**Group II (n=16)**		**P value**
	n	**%**	**n**	**%**	
Stage II	9	52.9	11	68.8	0.353[ns]
Stage III	8	47.1	5	31.2	

Table 4: Distribution of the study population by location of tumors (N=33)

Location of tumors	**Group I (n=17)**		**Group II (n=16)**		**P value**
	n	**%**	**n**	**%**	
Right colon	3	17.6	4	25.0	0.855[ns]
Left colon	3	17.6	3	18.8	
Rectum	11	64.8	9	56.2	

Table 5: Distribution of the study population by ASA physical status classification (N=33)

ASA physical status classification	**Group I (n=17)**		**Group II (n=16)**		**P value**
	n	**%**	**n**	**%**	
Normal healthy patient					

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Yes	4	23.5	11	68.8	a0.009[s]
No	13	76.5	5	31.2	
Mild systemic disease					
Yes	8	47.1	5	31.2	a0.353[ns]
No	9	52.9	11	68.8	
Severe systemic disease					
Yes	5	29.4	0	0.0	b0.026[s]
No	12	70.6	16	100.0	
Severe systemic disease that is a constant threat to life					
Yes	0	0.0	0	0.0	-
No	17	100.0	16	100.0	
Moribund patient who is not expected to survive without the operation					
Yes	0	0.0	0	0.0	-
No	17	100.0	16	100.0	

Table 6: Distribution of the study population by pre-operative bowel preparation (N=33)

Pre-operative bowel preparation	**Group I (n=17)**		**Group II (n=16)**		**P value**
	n	**%**	**n**	**%**	
Yes	14	82.4	15	93.8	0.316[ns]
No	3	17.6	1	6.2	

Table 7: Distribution of the study population by intra-operative time (N=33)

Intra-operative time	**Group I (n=17)**		**Group II (n=16)**		**P value**
	N	**%**	**n**	**%**	
More than 2 hours	14	82.4	5	31.2	0.003[s]
Less than 2 hours	3	17.6	11	68.8	

Table 8: Distribution of the study population by intra-operative iatrogenic injury, blood transfusion and blood loss (N=33).

Intra-operative	**Group I (n=17)**		**Group II (n=16)**		**P value**
	n	**%**	**n**	**%**	
Iatrogenic injury					
Yes	0	0	0	0.0	-
No	17	100	16	100	
Intra-operative transfused blood					
Yes	17	100	13	81.2	b0.103[ns]
No	0	0	3	18.8	
Intra operative blood loss					
Yes	9	52.9	6	37.5	a0.373[ns]

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No	8	47.1	10	62.5	

Table 9: Relation of peritoneal contamination with morbidity and mortality (N=33)

Morbidity and mortality	**Peritoneal contamination**				**P value**
	Present (n=6)		**Absent (n=27)**		
	n	**%**	**n**	**%**	
Present	4	66.7	13	48.1	0.412^{ns}
Absent	2	33.3	14	51.9	

Table 10: Distribution of the study population morbidity and mortality status in different follow up (N=17)

Morbidity and mortality	**Follow up**						
	First (n=17)		**Second (n=17)**		**Third (n=15)**		**P value**
	n	**%**	**n**	**%**	**n**	**%**	
Morbidity developed	14	82.4	8	47.1	9	60.0	0.264^{ns}
Mortality	0	0.0	2	11.7	1	6.7	
No Morbidity/ Mortality	3	17.6	7	41.2	5	33.3	

Table 11: Distribution of the study population by morbidity in different follow up (N=17)

Morbidity	**Follow up**						
	First (n=17)		**Second (n=17)**		**Third (n=15)**		**P value**
	n	**%**	**n**	**%**	**n**	**%**	
Wound infection	8	47.1	4	23.5	5	33.3	0.351^{ns}
Pneumonia	4	23.5	0	0.0	0	0.0	0.017^{s}
Anastomotic leakage	0	0.0	2	11.8	6	40.0	0.008^{s}
P/O ileus	2	11.8	0	0	0	0.0	0.141^{ns}
UTI	2	11.8	0	0	0	0.0	0.141^{ns}
Paralytic ileus	2	11.8	0	0	0	0.0	0.141^{ns}
Renal failure	2	11.8	0	0	0	0.0	0.141^{ns}
Cardiac arrest	1	5.9	0	0	0	0.0	0.382^{ns}
Confusion	1	5.9	0	0	0	0.0	0.382^{ns}
Stroke	1	5.9	0	0	0	0.0	0.382^{ns}
Dyselectrolytemia	1	5.9	0	0	0	0.0	0.382^{ns}
prolonged intubation	1	5.9	0	0	0	0.0	0.382^{ns}
Post-operative fever	1	5.9	0	0	0	0.0	0.382^{ns}
Deep vein thrombosis	1	5.9	0	0	0	0.0	0.382^{ns}
ARDS	0	0.0	1	5.9	0	0.0	0.382^{ns}
Wound ischaemia	0	0.0	1	5.9	1	6.7	0.571^{ns}
Bleeding from perineum	0	0.0	0	0.0	1	6.7	0.314^{ns}
Stomal abscess(mild)	0	0.0	0	0.0	1	6.7	0.314^{ns}

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Table 12: Distribution of the study population by serum albumin level (N=33)

Serum albumin	Morbidity (n=14)		Mortality (n=3)		No complication (n=16)		P value
	n	%	n	%	n	%	
≤3.5	11	78.6	1	33.3	13	81.3	
>3.5	3	21.4	2	66.7	3	18.7	
Mean ±SD	3.36±0.54		3.7±0.52		3.44±0.21		0.430ns
Range (min-max)	2.7- 4.5		3.1- 4		3.2- 3.8		

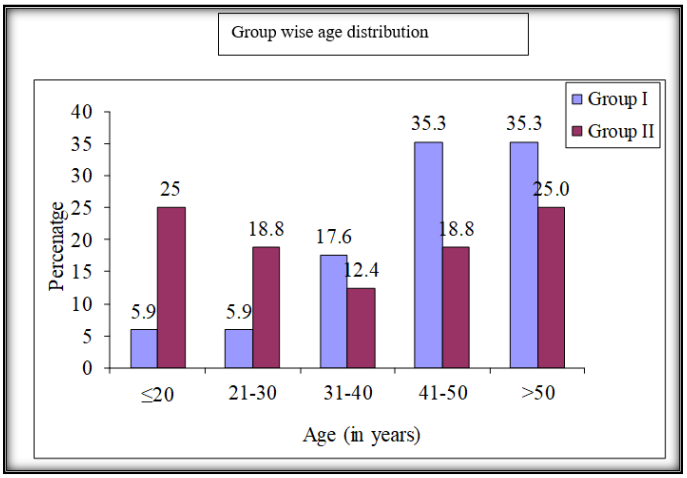

Figure 1: Bar diagram showing age distribution of the study population

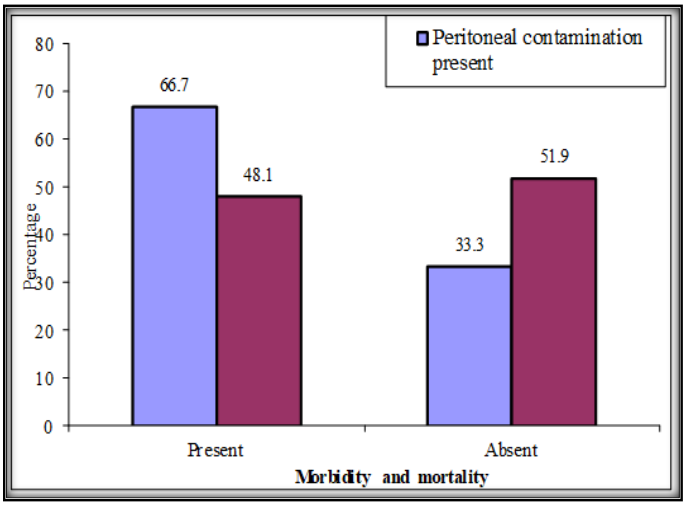

Figure 2: Bar diagram showing relation of peritoneal contamination with morbidity and mortality

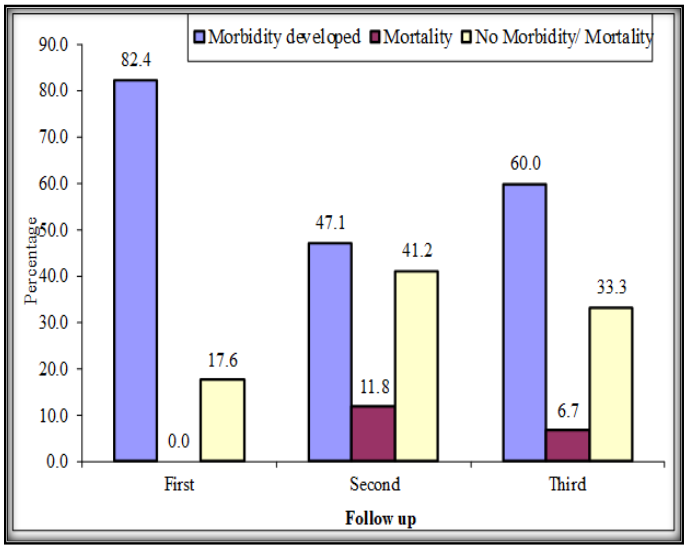

Figure 3: Bar diagram showing distribution of the study population morbidity and mortality status in different follow up

[Table 12] showed the distribution of the study of the patients by serum albumin level. It was observed that majority (78.6%) patients belonged to serum albumin ≤3.5 in patients with morbidity, 1(33.3%) in mortality and 13(81.3%) in patients having no complication. The mean serum albumin was 3.36±0.54 mg/dl in patients with morbidity, 3.7±0.52 mg/dl in mortality and 3.44±0.21 mg/dl in patients having no complication. The difference was statistically not significant (p>0.05) between two groups.

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DISCUSSION

In this study according to demographic profile, one third (35.3%) patients belonged to age >50 years in group I and 4(25.0%) in group II. over two third (70.5%) patients were normal BMI in group I and 14(87.5%) in group II. Niemeläinen et al. (2020),[15] reported that a complete of 386 patients were included. Male gender (46% vs 35%), higher BMI (51% vs 37%) which is admire our study. Quadir et al,[16] (2015) reported that maximum incidence was found within the people old group 51-60 years (28%) followed by 31-40 years, 41-50 years and 21-30 years (18%) respectively. Incidences of colorectal carcinoma within the 31-40 and 21-30 years were significantly above within the 61-70 and 71-80 year's age group. Chan et al,[17] (2019) reported that (64.9%) were female. In a US study the incidence rate for those under 50 years old has actually increased.[18] Nevertheless, while those over 50 years old have seen decreases in CRC incidence within the US over the past decades, those aged 20-49 years have actually seen a growing incidence.[19] The incidence rates of CRC for ages 20-49 years was 9.3 per 100,000 in 1975 and now could be up to 13.7 per 100,000 in 2015. Mortality rates have decreased overall, with the foremost significant decrease seen within the people of 75 years. Over age 80 and above, is a vital issue of post-operative mortality in cases of colorectal cancer.[20] Keating et al,[21] (2003) found equal gender distribution in their study. In the present study, regarding the others comorbid, it absolutely was observed that just about almost half (41.2%) patients had diabetes in group I. 8(47.05%) patients had active smoker in group I and 1(6.25%) in group II. 3(17.6%) patients had chronic obstructive pulmonary disease in group I. 1(5.9%) patient had congestive heart disease in group I. 9(52.9%) patients had hypertension in group I. 1(5.9%) patient had others comorbidities in group I. The difference of DM, hypertension and smoking were statistically significant between two groups. In accordance to a meta-analysis of 29 prospective cohort studies (62,924 cases) in China reported a 27% higher risk of CRC related to diabetes.[22] In a Chinese study of 0.5 million participants with diabetes, the adjusted HR of CRC was 1.18 (95% CI: 1.04-1.33). Pang et al,[23] (2018) stated that longer duration of diabetes was related to decreased HR. Diabetes is thought to predispose towards an enormous array of cancers and mostly. This increased risk is thanks to shared risk factors like obesity and a sedentary lifestyle.[24] Diabetics also present with abnormally high glucose levels, which may promote the carcinogenic shift to glycolysis by accelerating glucose metabolism. However, even after adjusting BMI, physical activity, and other shared factors type 2 diabetes have an increased risk of CRC.[23,24] Moreover, factors that negatively influence results of surgery are diabetes and pre-existing cardiac pathology. In in step with our findings, researchers concluded that smoking tobacco does indeed cause CRC.[25] Smoking is that the leading preventable reason behind cancer deaths, largely thanks to its impact on carcinoma. Smoking was found to predispose more towards rectal cancer and to be more likely to cause tumors related to common molecular abnormalities, like high microsatellite instability, CpG methylation, and BRAF mutation. The mutagens in tobacco smoke probably promote these and other carcinogenic mutations.[26] Ordóñez-Mena et al. (2018),[27] emphasized that smoking cessation was related to improved overall and CRC-

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specific survival. In accordance with our study, Yu et al,[28] (2016) investigated the association between perioperative hypertension and long-term survival outcomes in patients with rectal cancer and concluded that hypertension is positively associated with cancer incidence, morbidity and mortality.[29] The world burden of CRC is anticipated to extend by 60%, to over 2.2 million new cases and 1.1 million annual deaths, by the year 2030. during this study, the distribution of the study population by stage of cancer, it had been observed that over half (52.9%) include older age, co-morbidity, and low preoperative albumin patients had stage II in group I and 11(68.8%) in group II. Besides, almost two third (64.7%) patients had rectal carcinoma in group I and 9(56.2%) in group II. Artinyan et al,[30] (2015) reported that patients with complications were also more likely to have rectal site of disease (21.6% vs 15.6%) and trended towards higher cancer stage (70.8% vs 67.9%, with stage ≥2). In current study, the distribution of the study population by ASA physical status classification, it was observed that four (23.5%) patients had normal healthy in group I and 11(68.8%) in group II. Almost half (47.1%) patients had mild systemic disease in group I and 5(31.2%) in group II. Nearly almost one third (27.4%) patients had severe systemic disease in group I. The difference of normal healthy patients and severe systemic disease were statistically significant between two groups. Bakker et al,[31] (2014) observed that higher ASA (American Society of Anesthesiologists) was associated with morbidity and mortality which is consistent with our study. Artinyan et al,[30] (2015) observed that other factors that were significantly associated with worse long-term survival included higher ASA classification, increasing stage, partial/complete functional dependence, lower preoperative albumin and increasing age. Patient factors include older age, co-morbidities, and low preoperative albumin. In this study, it was observed that majority (82.4%) patients had pre-operative bowel preparation in group I and 15(93.8%) in group II. Mechanical bowel preparation (MBP) has been the standard in surgical practice for over a century before elective colorectal surgery. It is believed that MBP decreases intraluminal fecal mass and presumably decreases bacterial load in the bowel.[32,33] It has been argued that bacterial contents reduce the rates of infectious postoperative complications this decrease in fecal load, such as anastomotic dehiscence. However, there has been mounting Level-I evidence indicating that MBP does not reduce the rate of postoperative complications, including anastomotic failure.[34] Mechanical bowel preparation is generally safe. But it has been associated with serious complications in patients with existing cardiac and renal disease as well as healthy patients previously. In the present study, regarding the distribution of the study population by intra-operative time, it was observed that majority (82.4%) patients had more than 2 hour's operative time in group I and 5(31.2%) in group II. de Silva et al,[35] (2011) outlined that the operative variables found to predict morbidity included emergent operation, longer operative time (>2 hours), and peritoneal contamination which is comparable to our study. In this study, it was observed that all (100.0%) patients had intra-operative transfused blood in group I and 13(81.3%) in group II. More than half (52.9%) patients had intra operative blood loss in group I and 6(37.5%) in group II. Artinyan et al,[30] (2015) found that a univariate comparison, patients

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with complications were significantly likely to had a higher rate of intraoperative transfusion (19.3% vs 12.5%0. The effects of transfusion on the short and long term prognosis are becoming intriguing. Regarding the relation of peritoneal contamination with morbidity and mortality, it was observed that two third (66.7%) patients had morbidity and mortality in presence of peritoneal contamination and 13(48.1%) in absence of peritoneal contamination in this study. de Silva et al,[35] (2011) observed that among the operative variables, peritoneal contamination is associated with postoperative morbidity and mortality which influences surgical outcome. Yoo et al,[36] (2017) hypothesized that patients with retroperitoneal contamination would have a higher mortality rate than those without retroperitoneal contamination. Because due to the abundant lymphatic channels in the retro peritoneum, retroperitoneal contamination would influence septic status. In this study, regarding the distribution of the study population morbidity and mortality status in different follow up, it was observed that majority (82.4%) patients had complication in first follow up, 8(47.1%) in second follow up and 9(52.9%) in third follow up. Most complications developed in first follow up but the difference was statistically not significant. Majority of the cases mortality occurred in second follow up (11.8%), 1(6.7%) in third follow up. No mortality was found in first follow up. Overall mortality rate following colorectal surgery range from 1 to 16.4% with morbidity rate as high as 35%. Godhi et al,[37] (2017) stated that follow-up and surveillance form is an important aspect of care in patients with colorectal cancers (CRC). The objective of follow-up programmes is to identify early complications and recurrence of the disease. In the present study, regarding the morbidity status in different follow up, it was observed that 8(47.1%) patients had developed wound infection in first follow up, 4(23.5%) in second follow-up and 5(29.4%) in third follow-up. Wound infection mostly developed in first follow up but the difference was statistically not significant. 4(23.5%) patients had developed pneumonia in first follow up and not found in second and third follow up. Anastomotic leakage was not found in first follow up, 2(11.8%) developed in second follow up and 6(35.3%) in third follow up and other complications were statistically not significant in different follow up. It could be speculated from the observations of different studies that most of the surgery related complication will be detected at first follow up which is in agreement with our study.[38] The mean serum albumin was 3.36±0.54 mg/dl in patients with morbidity, 3.7±0.52 mg/dl in mortality and 3.44±0.21 mg/dl in patients having no complication. The difference was statistically not significant between groups. A recent study from the United states also reported that lower serum albumin is an independent risk factor for anastomotic leak after colorectal surgery. Novello et al,[39] (2019) studied that preoperative albumin ≥ 3.4gm/dl was associated with a protective effect on postoperative mortality. Serum albumin shown to be associated with poor tissue healing, decrease collagen synthesis in surgical wounds and the site of anastomosis and impairment of immune responses such as macrophage activation and granuloma formation. Serum albumin is a marker of circulating visceral protein and a direct measure of nutritional and immunological status. Therefore, hypoalbuminaemia predisposes patients not

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only to surgical complications such as SSI and poor anastomotic healing but also to remote infections like pneumonia.

CONCLUSIONS

The study revealed that diabetes mellitus and hypertension were predominant co-morbidity in colorectal cancer. Active smoking also affects the outcome following colorectal cancer surgery. The surgeries which required more per-operative time & blood loss was associated with comparatively high morbidity and mortality. Maximum patients with low preoperative serum albumin ≤3.5 and ASA score>2 were associated with complications. Two third of patients who had pertitoneal contamination developed morbidity and mortality. It can be inferred that proper patient selection and careful consideration of appropriate surgical candidates including preoperative optimization of medical co-morbidities, nutritional status and physical performance enables colorectal cancer surgery to be performed in order to reduce morbidity and mortality rates with improved survival. It could also be reasonably speculated that the way forward could involve prospective data collection and the development of cancer monitoring with pooling of the data from major oncological institutions in order to strengthen the existing colorectal cancer surveillance program to be effective.

Limitations of the Study

Study period was short. Small number of study population. The study population may not reflect the exact picture of the country. The present study lacks long term post-operative surveillance to find out complications leading to morbidity and mortality.

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