



Diagnosis and Management of Colorectal Cancer- An Experience from Tertiary Care Hospital of Chhattisgarh

KEYWORDS

Colorectal carcinoma, Chhattisgarh, Proctocolonoscopy, Raipur

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ABSTRACT *Introduction-* Colorectal cancer remains a major health problem especially in developed countries where it ranks as the third most common cause of cancer in both men and women. Surgical management is primary treatment modality for treatment of colorectal carcinoma and pathologic assessment of resected specimen is essential for patient management. Therefore, the present study was conducted on management of colorectal carcinoma cases with reference to patients attending a tertiary care hospital of Raipur city (C.G.), India.

Material and Methods- The present retro prospective study was carried out in the Department of Surgery of Pt. J. N. M. Medical College and associated Dr. B.R.A.M. Hospital, Raipur (CG) during study period January 2007 to September 2014. After the proper selection of patients according to the inclusion and exclusion criteria, 240 patients of colorectal carcinoma were found in department of surgery and regional cancer centre. Out of these 65 patients were of colon carcinoma and 175 patients were of rectal carcinoma. Ethical considerations were met through institutional ethical committee.

Results- Majority of the patients were found in 5th and 6th decade. Mean age of presentation was 43.79 years. Males were found to be more susceptible to colorectal carcinoma. Average male to female ratio was 3.44:1. Out of 240 cases, 32.5% underwent definitive surgery, 40.42% underwent palliative surgery and 64.58% underwent chemo radiotherapy. 27 cases (11.25%) did not take any treatment.

Conclusion- As most of the cases are presenting in late stage in the current study area and thus, definitive surgery is not possible hence, steps need to be taken for early detection of colorectal carcinoma.

INTRODUCTION

Colorectal cancer remains a major health problem especially in developed countries where it ranks as the third most common cause of cancer in both men and women. Though incidence of colorectal cancer is low in developing countries, outcome of treatment remains poor due largely to late presentation, ignorance, poverty and superstition. Globally nearly 800,000 colorectal cancer cases are believed to occur each year, which account for approximately 10 % of all incident cancers.

Carcinoma of the large bowel is common in northwest Europe, North America and low in Asia, Africa and parts of South America.

Surgical management is primary treatment modality for treatment of colorectal carcinoma and pathologic assessment of resected specimen is essential for patient management.

In recent years, we have observed an increased incidence of colorectal cancers in our region. We retrospectively reviewed and prospectively observed the records to testify this observation. Although exact prevalence rate cannot be provided by a hospital-based study, the information would be useful in showing patterns of malignancies in our region. Therefore, the present study was conducted on management of colorectal carcinoma cases with reference to patients presenting to Dr B.R.A.M. Hospital, Raipur (C.G.), and India.

MATERIAL AND METHODS

The present retro prospective study was carried out in the Department of Surgery of Pt. J. N. M. Medical College and associated Dr. B.R.A.M. Hospital, Raipur (CG) during study period January 2007 to September 2014. The hospital caters to all emergencies and has fully functioning casualty, Radiology section, Regional Cancer Centre and Operative facilities.

The retrospective duration of study was from January 2007 to December 2012. The prospective duration of study was from January 2013 to September 2014. After the proper selection of patients according to the inclusion and exclusion criteria, 240 patients of colorectal carcinoma were found in department of surgery and regional cancer centre. Out of these 65 patients were of colon carcinoma and 175 patients were of rectal carcinoma. Ethical considerations were met through institutional ethical committee.

Criteria for Inclusion

All the symptomatic patients of proved colorectal carcinoma who came in Surgery OPD and Regional Cancer Centre and patients admitted in Surgery ward or Cancer ward in the above mentioned duration are included in the study.

Criteria for Exclusion

- All the cases of colonic or rectal growth which are not proved in histopathological examination as colorectal carcinoma
- All the cases which were asymptomatic

- All the patients in the prospective study who did not give consent to become a part of study

The history was elucidated as per predesigned proforma and the presenting chief complaints were noted in chronological order. Complete haemogram, blood bio-chemistry and radiological investigations like Ultrasonography and computed tomographic scanning was done. Fine needle aspiration cytology and biopsy were also performed. Treatment modalities were given as relevant and finding of the outcome were noted.

Data was compiled in MS excel and checked for its completeness, correctness and then it was analyzed.

OBSERVATION

Table No. 1 -Proportion of Colorectal carcinoma among all cancers

Year	Total Cancers	Colorectal Cancers	Percentage
2007	2645	39	1.47%
2008	2721	47	1.72%
2009	2862	28	0.98%
2010	3119	37	1.19%
2011	3033	32	1.05%
2012	3135	38	1.21%
2013	3337	12	0.35%
2014	2636	7	0.26%
Total	23528	240	1.02%

Among all cancer cases, the proportion of colorectal carcinoma was found to be **1.02%**. [Table-1]

Table No. 2 -Age and sex wise distribution of study subjects

Age Group (in years)	Patients	Percentage
0 To 9	0	0%
10 To 19	7	2.92%
20 To 29	38	15.83%
30 To 39	34	14.17%
40 To 49	50	20.83%
50 To 59	49	20.41%
60 To 69	33	13.75%
>70	12	5%
Total	240	100%

Years	Male	Female	Total	M/F Ratio
2007	30	9	39	3.33
2008	35	12	47	2.91
2009	19	9	28	2.11
2010	28	9	37	3.22
2011	24	8	32	3
2012	33	5	38	6.6
2013	11	1	12	11
2014	6	1	7	6
Total	186	54	240	3.44

The youngest patient was of 17 years age male patient and the oldest patient was of 90 years age male patient. Majority of the patients were found in 5th and 6th decade i.e. 41.24 % of patients. Only 2.92% of patients were younger than 20 years of age. No patient was found of <10 years. Mean age of presentation was 43.79 years. Males were found to be more susceptible to colorectal carcinoma. Average male to female ratio was 3.44:1. [Table-2]

Table No. 3- Various histological types of colorectal carcinoma

Histological Type	No. Of Cases	Percentage
Adenocarcinoma	237	98.75%
Others (Signet Ring Cell Carcinoma)	3	1.25%
Total	240	100%

Out of 240 cases, 237 cases (98.75%) had adenocarcinoma and 3 cases (1.25%) had Signet ring cell carcinoma. [Table-3]

Table No. 4- Investigational and Diagnostic findings of colorectal carcinoma

Diagnostic findings	No. Of Cases	Percentage (%)
Haemoglobin (gm %)		
<5	14	5.83%
5-7.9	57	23.75%
8-9.9	76	31.67%
>10	93	38.75%
Ultrasonography		
Growth + liver secondaries	53	22.08%
Growth + Ascities	57	23.75%
Growth only	64	26.67%
No Abnormality Detected	66	27.5%
Computed Tomography (CT)		
Ascities	66	36.67%
Growth	177	98.33%
Liver Metastasis	77	42.78%
Nodal Metastasis	118	65.55%
Computed Tomography (CT)		
All 4 findings	42	23.33%
Growth + Liver secondaries (LS) + nodal metastasis	32	17.78%
growth + nodal metastasis + ascities	21	11.67%
Growth + nodal metastasis	20	11.11%
Growth	62	34.44%
Liver secondaries + nodal metastasis + ascities	03	1.67%
Liver Enzyme (LE) Levels		
Normal	182	75.83%
Deranged	58	24.17%
Comparison of liver secondaries with deranged liver enzymes		
Deranged LE+ LS	51	21.25%
Deranged LE Without LS	7	2.92%
Normal Enzyme+ LS	38	15.83%
Normal Enzyme Without LS	144	60%
Proctocolonoscopy		
Done	217	90.42%
Not Done	23	9.58%
FNAC/Biopsy		
Biopsy	217	90.42%
FNAC	23	9.58%
Total	240	100%

31.67% of cases had haemoglobin levels between 8-10 Gm% and 93 cases (38.75%) had haemoglobin levels >10 Gm%. Mean haemoglobin was found to be 9.3Gm%.

In abdominal USG, Growth with ascities was present in 57 cases (23.75%), Growth with Liver secondaries was present in 53 cases (22.08%) and only Growth was present in 64 cases (26.67%). USG did not demonstrate any abnormality in 66 cases (27.5%).

Out of 240 cases, CT scan was done in 180 cases (75%). Out of 180 cases submitted for CT scan, growth was detected in 177 cases (98.33%), ascities was detected in 66 cases (36.67%), liver metastasis was detected in 77 cases (42.78%) and nodal metastasis was detected in 118 cases (65.55%).

Out of these 180 cases 42 cases (23.33%) had the entire four findings positive in their CT scan. 32 patients (17.78%) had growth, liver secondaries and nodal metastasis, but not ascities. 20 patients (11.11%) had nodal metastasis and growth. 62 patients (34.44%) had only growth. 21 patients (11.67%) had growth, nodal metastasis and ascities but not liver secondaries.

Liver enzymes were deranged in 58 cases (24.17%) and normal in 182 cases (75.83%).

Liver enzymes were deranged in 58 cases (24.17%). Out of these, 51 cases (21.25%) had deranged liver enzymes with liver secondaries, 7 cases (2.92%) had deranged liver enzymes without liver metastasis.

Out of 240 cases, Proctocolonoscopy was done in 217 cases (90.42%) of colorectal carcinoma, and growth was identified in all the cases. Rest 23 cases (9.58%) were having colonic growth with nodal metastasis or liver metastasis in CECT, and they were proved as colorectal carcinoma in FNAC from liver metastasis or metastatic lymph nodes.

All the 240 cases were confirmed as colorectal carcinoma, either through biopsy or FNAC from liver metastasis or metastatic lymph node. Out of 240 cases, FNAC was done from Liver/ Nodal metastasis detected in CECT in 23 cases (9.58%) and Biopsy was done by proctocolonoscopy in 217 cases (90.42%). [Table-4]

Table No. 5 -Treatment modalities use for the management of Colorectal cancer

Treatment Given	No. Of Cases	Percentage
Definitive Surgery Alone	6	2.5%
Definitive Surgery+ Chemo radiation	72	30%
Palliative Surgery Alone	52	21.67%
Palliative Surgery+ Chemo radiation	45	18.75%
Chemo radiation Alone	38	15.83%
No Treatment	27	11.25%
Total	240	100%

Out of 240 cases, 78 cases (32.5%) underwent definitive surgery, 97 cases (40.42%) underwent palliative surgery and 155 cases (64.58%) underwent chemo radiotherapy. 27 cases (11.25%) did not take any treatment. [Table-5]

Table No. 6 –Outcome after management of Colorectal cancer

Outcome	No. Of Cases	Percentage
Improved	108	45%
Death	84	35%
Lama	48	20%
Total	240	100%

Out of 240 cases, 108 cases (45%) were improved and discharged, 84 cases (35%) died and 48 cases (20%) left hospital against medical advice. [Table-6]

DISCUSSION

Colorectal carcinoma constituted 1.02% of all the cancers in the present population. There were total 23,528 patients of cancer registered in our hospital in the above mentioned duration, and there were 240 patients of colorectal carcinoma. Parkin DM et al in their study stated that prevalence of colorectal carcinoma among all cancers was 1.47% in Ahembdabad, 2.76% in Barshi, 3.66% in Bhopal and Delhi.

Mean age of the presentation was 43.79 years. This is almost same as was observed by Sudarshan V et al which was 43.27 years. There were about 32.92% patients of young age (<40 years). This data is almost similar to the study of Sudarshan V et al⁴ in which there was 39.04% patients <40 years of age. There were 2.92% patients below 20 years of age in contrast to 4.29% observed by Sudarshan V et al⁴. This difference may be due to small sample size and duration in study in both studies. Majority of the cases were in 5th and 6th decade. This is almost same as observed by cormen et al who observed it in 7th decade, and Sudarshan V et al⁴ also observed it to occur in 5th and 6th decade. Eltinay OF et al in their study found that the mean age of diagnosis of colorectal carcinoma was 42.7 years, which is almost similar to the present study.

Males were more prevalent for colorectal carcinoma as compared to females (3.44:1). This is higher to as observed by Sudarshan V et al⁴ who observed it in 1.35:1 as male to female ratio. This difference might be due to the fact that the time period in which study done by Sudarshan V et al⁴ is 2003-2010, and present study was done in time period 2007-2014. Eltinay OF et al (2006)⁶ in their study found that the sex ratio of diagnosis of colorectal carcinoma was 3.3:1, which is almost similar to the present study.

Present study is also different from the western population as observed by Jemal et al who found it to be lower in males in United States and almost similar male and female ratio in Canada. This shows the difference in sex related prevalence in Indian population in which males are more affected compared to western population in which there is almost equal prevalence.⁵

It is clear from the observation that adenocarcinoma constitutes 98.75% of total colorectal carcinoma, which is almost similar to what observed by Osmine et al which was 96.05% and Abdul Kareem FB et al which was 96.40%.

In the present study most of the cases had nearly 10 gm% of hemoglobin. Out of 240 cases, 93 cases (38.75%) had haemoglobin level greater than 10 Gm%. 76 cases (31.67%) were having haemoglobin level of 8-10 Gm%. 57 cases (23.75%) were having haemoglobin level between 5-8 Gm%. 14 cases (5.83%) were severely anaemic and having haemoglobin level of <5Gm%. Mean haemoglobin

was found to be 9.3Gm%. Chronic blood loss from the growth may be the main cause of lower level of haemoglobin. Moreover, most of the patients in the study belong to low socioeconomic group and they were not taking proper nutrition and also having loss of appetite, which may be responsible for lower levels of haemoglobin.

Abdominal Ultrasonography was done in all the cases in the current study. In abdominal USG, Growth with ascities was present in 57 cases (23.75%), Growth with Liver secondaries was present in 53 cases (22.08%) and only Growth was present in 64 cases (26.67%). USG did not demonstrated nodal metastasis in any case.

Out of 240 cases, 66 cases (27.5%) of colorectal carcinoma were diagnosed as having no significant finding in USG. Thus, the sensitivity of USG to detect colorectal carcinoma was found to be 72.5% in present study. This is nearly similar to what observed by following author. Rafaelsen et al. compared diagnostic accuracies of measuring liver enzymes, preoperative ultrasonography, manual palpation and intraoperative Ultrasonography for detection of colorectal carcinoma in 295 consecutive patients. The sensitivity of intraoperative ultrasonography (84%) was significantly superior to that of manual palpation (52%) and preoperative ultrasonography (64%). The lowest sensitivity was presented by the measurement of liver enzymes.

Out of 240 cases, CT scan was done in 180 cases (75%). Rest of the 60 cases (25%) were either not fit for CECT due to Renal failure or they were cases of complicated and advanced carcinoma taken for palliative procedure, or they died before CECT, or they left hospital against medical advice before submitting for CECT. Out of 180 cases submitted for CT scan, growth was detected in 177 cases (98.33%), ascities was detected in 66 cases (36.67%), liver metastasis was detected in 77 cases (42.78%) and nodal metastasis was detected in 118 cases (65.55%).

Out of these 180 cases submitted for CT scan, 42 cases (23.33%) had the entire four findings positive in their CT scan, 32 patients (17.78%) had growth, liver secondaries and nodal metastasis, but no ascities, 20 patients (11.11%) had nodal metastasis and growth, 62 patients (34.44%) had only growth, 21 patients (11.67%) had growth, nodal metastasis and ascities but no liver secondaries. In 3 patients (1.67%) growth was not detected in CECT, but had nodal metastasis, ascities and liver secondaries. Thus, CT has been observed to be a useful investigation for diagnosing and staging colorectal carcinoma. Balthazar et al did a preoperative evaluation of 90 proved cases of colon carcinoma to know the detection rate and role of CT in the preoperative evaluation. In this study, the overall detection rate was 84%. Their study shows that CT had a sensitivity of 55% for local invasion, 73% for regional nodes, and 79% for liver metastases. Kerner et al in their study concluded that CT is useful in examining patients suspected of having extensive disease. Mauchley et al also concluded that CT scan alters the treatment in number of cases and is cost effective.

Liver enzymes were deranged in 58 cases (24.17%). Out of these, 51 cases (21.25%) had deranged liver enzymes with liver secondaries, 7 cases (2.92%) had deranged liver enzymes without liver metastasis.

Liver enzymes were found to be normal in 182 cases (75.83%). Out of these, 38 cases (15.83%) had normal enzymes with liver secondaries and 144 cases (60%) had nor-

mal enzymes without liver secondaries.

This is similar to what observed by Fantini and De loose (1990) who also found that liver enzyme is a non specific predictor of liver involvement in colorectal neoplasm.

Out of 240 cases, Proctocolonoscopy was done in 217 cases (90.42%) of colorectal carcinoma, and growth was identified in all the cases. Rest 23 cases (9.58%) were having colonic growth with nodal metastasis or liver metastasis in CECT, and they were proved as colorectal carcinoma in FNAC from liver metastasis or metastatic lymph nodes. Finan PJ et al suggested that preoperative colonoscopy alters the operative procedure in one third of patients.

In all the 240 cases, histocytological conformation had been done by FNAC, or by biopsy.

Out of 240 cases, FNAC was done from Liver/ Nodal metastasis detected in CECT in 23 cases (9.58%) and Biopsy was done by proctocolonoscopy in 217 cases (90.42%).

Out of 240 cases, 175 cases (72.92%) underwent operative intervention. Out of these, 78 cases (32.5%) underwent definitive surgery, 97 cases (40.42%) underwent palliative surgery. Out of 240 cases, 65 cases (27.08%) did not undergo any operative intervention, because either because of advanced disease, or they died before any surgery, or they left hospital against medical advice.

Out of 240 cases, 155 cases (64.58%) underwent chemo radiotherapy. 85 cases (35.42%) did not take chemo radiotherapy, as some of them died before taking any treatment, some did not take chemo radiotherapy after surgery and some left hospital against medical advice. 27 cases (1.25%) did not receive any treatment.

Read et al. reviewed 191 consecutive patients undergoing abdominal surgical procedures for primary rectal carcinoma, 89% of whom were treated with postoperative chemo radiotherapy.

Minsk BD reviewed the literature on the use of chemo radiotherapy for resectable colon carcinoma. Combined results revealed an in-field failure rate of 12% to 50%. Significant toxicity varied from 5% to 38%. With a median follow-up of 5 years, the 5-year disease-free and overall survival rates were 58% and 67%, respectively.

Out of 240 cases, 108 cases (45%) were improved and discharged, 84 cases (35%) died and 48 cases (20%) left hospital against medical advice. Eltinay OF et al (2006)⁶ found that there was 17.95% overall mortality including definitive and palliative procedures in their study. In the present study it was 10.42%. Masturba N et al in their study in Japan involving 16695 patients found that operative mortality for definitive treatment of colorectal surgery was overall 2.9%. Kuo LJ et al found operative mortality to be 5.6% in their study.

Patients of complicated colorectal carcinoma presented as Intestinal Obstruction or Perforation Peritonitis or both. Out of 240 cases, 46 cases (19.17%) presented as complicated carcinoma. 34 cases (14.17%) presented as Intestinal Obstruction, 9 cases (3.75%) presented as Perforation Peritonitis and 3 cases (1.25%) presented with both intestinal obstruction and perforation peritonitis.

Runkel et al. in a review of 923 patients, found the presentation with insidious onset, obstruction, and perforation to occur in 92.0%, 6.0%, and 2.0% of patients, respectively, with a combination of obstruction and perforation occurring in 0.5% of patients.

In present study, 11 out of 34 cases (32.35%) of intestinal obstruction died. 6 out of 9 cases (66.67%) of Perforation Peritonitis died. All the cases who presented with both intestinal obstruction and perforation peritonitis died.

Jestin et al. stated that patients who had emergency surgery had more advanced carcinomas and a lower survival rate than those who had an elective procedure. Peregudov SI et al in their study stated that mortality reaches 30 to 40% in cases of intestinal obstruction in colorectal carcinoma. In cases of diastatic perforation, mortality is between 50% and 68%.

CONCLUSION

As most of the cases are presenting in late stage in the current study area and thus, definitive surgery was not possible hence, steps need to be taken for early detection of colorectal carcinoma, so that more patients can be given curative treatment. The finding of the present study will be useful for surgeons for priority setting and decision making during the management of these types of cases. The findings will be also useful for researchers in similar kind of study.

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REFERENCE

- Aldred Scott Warthin. Heredity with reference to carcinoma as shown by the study of the cases examined in the pathological laboratory of the University of Michigan, 1895-1913. *CA Cancer J Clin.* 1985 Nov-Dec; 35(6):348-59. | Boyle P, Langman J S. ABC of colorectal cancer: Epidemiology. *BMJ.* 2000;321(7264):805-808 | Parkin DM, Whelan SL, Ferlay L, Young RJ. Cancer Incidence in Five Continents (IARC Sci.Publ.No. 143) Series. Vol. 143. Lyon: International Agency for Research on Cancer; 1997. p. 566-7. | Sudarshan V, Hussain N1, Gahine R, Mourya J. Colorectal cancer in young adults in a tertiary care hospital in Chhattisgarh, Raipur. *Sudarshan V, Hussain N1, Gahine R, Mourya J. Indian J Cancer.* 2013 Oct-Dec;50(4):337-40 | Corman ML, Veidenheimer MC, Coller JA. Colorectal carcinoma: a decade of experience at the Lahey Clinic. *Dis Colon Rectum* 1979; 22:477-479. | Eltinay OF et al: Colorectal carcinoma: clinicopathological pattern and outcome of surgical management. *Saudi J Gastroenterol.* 2006 Apr-Jun; 12(2):83-6. | Jemal A, Murray T, Ward E, et al. *MS Cancer Statistics* 2005, *CA* 55:10-30. | Osime U, Morgon A, Guirguis M. Colorectal cancer in Africans. *J Indian Med Assoc* 1998; 86:270-272. | Abdulkareem FB, Abudu EK, Awolola NA, Elesha SO, Rotimi U, Akinde OR et al. Colorectal carcinoma in Lagos and Sagamu, Southwest Nigeria : A histopathological review. *World J Gastroenterol* 2008; 14(42):6531 -6535. | Machi J, Isomoto H, Kurohiji T, et al. Accuracy of intraoperative ultrasonography in diagnosing liver metastases from colorectal cancer: evaluation with postoperative follow up results. *World J Surg* 1991; 15: 551-557. | Balthazar EJ, Megibow AJ, Hulnick D, Naidich DP. Carcinoma of the colon: Detection and preoperative staging by CT. *AJR* 1988; 150:301-306. | Kerner BA, Oliver GC, Eisenstat TE, et al. Is preoperative computerized tomography useful in assessing patients with colorectal carcinoma? *Dis Colon Rectum* 1993; 36:1050-1053. | Mauchley DC, Lyngre DC, Langdale LA, Stelzner MG, Mock CN, Billingsley KG. Clinical utility and cost-effectiveness of routine preoperative computed tomography scanning in patients with colon cancer. *Am J Surg* 2005; 189(5):512-517. | Fantini et al: surveillance strategies after resection of carcinoma of colon and rectum *Surg* 1990; 74:267-271. | Finan PJ, Ritchie JK, Hawley PR. Synchronous and early metachronous carcinomas of the colon and rectum. *Br J Surg* 1987; 74:945-947. | Read TE, Ogunbiyi OA, Flesham JW, et al. Neoadjuvant external beam radiation and proctectomy for adenocarcinoma of the rectum. *Dis Colon Rectum* 2001; 44:1778-1790. | Minsky BD. Adjuvant radiation therapy for colon cancer. *Cancer Treat Rev* 1995; 2:407-414. | Matsubara N et al: Mortality after common rectal surgery in Japan: a study on low anterior resection from a newly established nationwide large-scale clinical database. *Dis Colon Rectum.* 2014 Sep;57(9):1075-81 | Kuo LJ, Leu SY, Liu MC, Jian JJM, Cheng SH, Chen CM. How aggressive should we be in patients with stage IV colorectal cancer? *Dis Colon Rectum* 2003; 46:1646-1652. | Runkel NS, Schlag P, Schwarz V, et al. Outcome after emergency surgery for cancer of the large intestine. *Br J Surg* 1991; 78:183-188. | Jestin P, Nilsson J, Heurgren M, Pahlman L, Glimelius B, Gunnarsson U. Emergency surgery for colonic cancer in a defined population. *Br J Surg* 2005; 92:94-100. | Peregudov SI, Sinenchenko GI, Kurygin AA, Pirogov AV. Experience in surgery of diastatic ruptures of the colon. *Vestn Khir Im I I Grek.* 2008; 167(3):49-53. |