

**Original article****Risk factors for surgical treatment in gastric and colorectal cancer patients with low socioeconomic status****K. Bahadır^{a,*}, E. Zafer^b, A. Melih^c, K. Hakan^d**^aMD FACS, General Surgeon, Turkey.^bMD, General Surgeon, Turkey^cMD, General Surgeon, Turkey.^dMD FACS, General Surgeon, Turkey.

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ABSTRACT

Surgery is the only potentially curative treatment option for gastric and colorectal cancer patients. Stage at diagnosis is the most important prognostic factor and closely related with socioeconomic status. Authors aimed to compare the risk factors influencing presentation and outcomes of surgical treatment of gastric and colorectal cancer patients with low socioeconomic status. Clinicopathologic characteristics of 112 consecutive patients in low socioeconomic area and outcomes of their surgical treatments were compared to identify the risk factors for each type of cancer. Clinicopathologic characteristics were similar in both groups. Elderly patients had comprised 30% of all patients. Advanced stage diseases were noted in 82% of gastric cancer patients and 78.6% of colorectal cancer patients. Curative resection rates were 19.6% for gastric cancers and 51.8% for colorectal cancers. Emergency surgical procedures were performed in 35% of patients with colorectal cancer. Postoperative morbidity rates were 18% and 23%, mortality rates were 5.4% and 10.7% in gastric and colorectal cancer patients, respectively. Advanced age and advanced stage at diagnosis significantly influence the results of surgical treatment of gastric and colorectal cancer patients. Morbidity and mortality rates are also significant correlated with high ASA scores, emergency procedures and curative resections in colorectal cancer patients. Optimal

balance should be established between the goals of surgical treatment and acceptable risks of surgery for a good quality of life. Improvement of socioeconomic status may make considerable contribution to surgical treatment.

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1. Introduction

Despite encouraging advances in screening tools, adjuvant chemotherapy and surgical techniques, gastric cancer and colorectal cancer are still continuing to be among the major causes of cancer related mortality. Currently, the principal treatment options for gastric cancer and colorectal cancer are surgical treatment and/or fluoropyrimidine based chemotherapy regimens. Surgical resection is the only potentially curative treatment for both cancers in early stage diseases. Unfortunately, only a small proportion of patients with gastric or colorectal cancer are eligible for curative surgical treatment. Approximately half of patients with gastric cancer are diagnosed beyond early stage disease and require postoperative adjuvant chemotherapy on the other hand only seventy percent of colorectal tumors are resectable, of which seventy-five percent are curable at the time of diagnosis (Nakajima, 2002; Emmons et al., 2008; Huerta et al., 2006; Thompson et al., Br J Surg 2007; Kawaguchi, 2009).

Factors influencing presentation and outcomes are similar in many respects for gastric and colorectal cancers (La Vecchia et al., 1992). Of all factors involved, the most important factor predicting survival is the stage of tumor at the time of presentation (Nakamura et al., 1992). When considered together, there seems to be a clear association between the stage of disease at diagnosis and socioeconomic differences particularly for gastric and colorectal cancers (Auvinen et al., 1997). Besides socioeconomic differences, a series of tumor and patient related factors have an effect on prognosis and outcomes of curative or palliative surgery (Nakamura et al., 1992; Auvinen et al., 1997; Krieger and Karjalainen, 2005; Siewert et al., 2005).

In the present study, we compared the clinicopathological characteristics and surgical outcomes of gastric and colorectal cancer patients. The ultimate aim of this study was to compare the factors influencing presentation and outcomes of two different groups of patients have same socioeconomic conditions.

2. Materials and methods

The hospital records of 112 consecutive patients underwent surgical treatment for primary gastric cancer or colorectal cancers in our surgical clinic during the period 2007-2010 were reviewed. Almost all of the patients were living in rural areas. There were no significant differences in terms of socioeconomic status and education level among the patients. Social Solidarity Fund was the unique health care provider.

Clinical characteristics including age, gender, presentation complaints, duration of symptoms, location of tumor, ASA class, coexisting medical illness, type of surgery, duration of the hospital stay, and hospital morbidity and mortality were analyzed and compared between gastric and colorectal cancer patients. Elderly patients were defined as those aged 75 or above.

Preoperative evaluation consisted of physical examination, laboratory tests including tumor markers, abdominal and chest X-rays, abdominal ultrasonography, and endoscopic examination and computed tomography scan. Determination of the extent of tumor spread and presence of metastasis were based on findings at preoperative evaluation and at time of surgical exploration. The disease was staged according to the TNM system.

Surgical resection was considered curative when all grossly visible tumors were completely removed and the margins of resection specimens were free of tumor on microscopic examination. Patients were admitted to surgical intensive care unit and antibiotic therapy included drugs against both aerobic and anaerobic bacteria were administered if necessary. Postoperative morbidity was defined as any complication that occurred in 30-day postoperative period. Postoperative mortality was defined as deaths within 30 days after the surgery.

Statistical analysis was performed using SPSS software (SPSS, Chicago, IL). Patient's characteristics were compared using the chi-square test with Yate's correction and t-test was used in comparisons of the factors likely to be responsible for unfavorable outcomes. $P < 0.05$ values were accepted as significant.

3. Results

Our study included consecutive 56 gastric cancer and 56 colorectal cancer patients underwent surgical treatment. Seventy-three patients (65%) were men and 39 (35%) were women. The mean age was 60.3 years, ranging from 31 to 85 years and about 30% of the patients aged 75 years and older. Serious coexisting diseases were noted in 31 men and 17 women. Of the 48 patients, 38% had chronic obstructive pulmonary disease, 35% had coronary artery disease, and 27% had diabetes mellitus and hypertension. The most common presenting complaints abdominal pain (55%) and weight loss (34%) which were present in 89% of patients with gastric cancer whereas 23 (41%) of the patients with colorectal cancer were hospitalized for mechanic bowel obstruction. Presenting complaints were detailed in Table 1.

Table 1

Presenting complaints.

Presenting complaints	Gastric cancers	Colorectal cancers
Abdominal pain, nausea and vomiting	19(34%)	11(19%)
Weight loss	31(55%)	10(17%)
Bleeding	3(5%)	11(19%)
Jaundice	1	-
Dysphasia	2	-
Changes in bowel habits	-	23(41%)
Mass in rectum		1

Advanced stage disease was observed in 46 (82.1%) of patients with gastric cancer and 48 (78.6%) of patients with colorectal cancer patients. Emergency procedures were significantly ($p=0.001$) more common in patients with colorectal cancer. In comparing two group patients, patients with colorectal cancer had a significantly higher ASA scores ($p=0.042$). Comparisons of the patients' characteristics were listed in Table 2.

Table 2

Comparison of clinicopathologic characters of the patients.

Characteristics	Gastric Cancer (n=56)	Colorectal cancer (n=56)	P value
Mean Age (years)	59.43	61.25	NS
Sex ratio (M.F)	39/17	34/22	NS
Advanced Age	11(20%)	9(16%)	NS
Coexisting disease	21(35%)	27(48%)	NS
Mean duration of Symptoms (days)	43.48	46.30	NS
ASA III-IV	18(32%)	28(50%)	0.042
Advanced Stage	46(82%)	44(79%)	NS

An 89% of gastric cancer lesions were diagnosed by using endoscopic biopsy procedure. Abdominal CT examination was performed in 39 patients with gastric cancer and positive findings were noted in 28 (71%) of the patients. Tumors were located in the upper third of stomach in 13 (23%) patients, in the middle third in 7 (12.5%), and in the lower third in 32 (57%). Of 56 patients, 27 (48%) underwent total gastrectomy and 17 (30%) underwent distal mastectomy. Gastric resection was combined with D2 lymphadenectomy in 7 (12.5%) patients and splenectomy in 5 (9%) patients. Extended gastric resection included transverse colon and/or hepatic segment was necessary in 5 (9%) patients to obtain clear resection margins. Curative resections could be performed in 11 (19.6%) patients. Unresectable tumors or peritoneal metastasis were found in 11 (19.6%) patients with gastric cancer whereas widespread tumor growth was observed only in 3 (5%) patients with colorectal cancer.

The majority of colorectal cancers (79%) were diagnosed by colonoscopy and biopsy. Computed tomography scans were obtained in 29 patients and positive findings were reported in 25 (86%) of the results. Obstructive signs such as dilated colons on abdominal x-ray films were reported in seventeen patients. Thirty-five patients (62.5%) had a cancer in the proximal colon and twenty-one (37.5%) patients had a cancer at or distal to splenic flexure. Resection and primary anastomosis was the most common surgical procedure and performed in 43 (76%) patients

with colorectal cancer. Other procedures used were Hartmann's procedure in 5 (9%) patients and abdominoperineal resection in 5 (9%) patients. Compared with gastric cancers, colorectal cancers were significantly ($p=0.0219$) more resectable and have a significantly ($p<0.001$) higher curative resection rates (51.8%). Iatrogenic bowel perforation was the most common intraoperative complication which occurred in 8 (14%) patients with gastric cancer and in 4 (7%) patients with colorectal cancer, followed by splenic injury in two patients with gastric cancer and iatrogenic tumor perforation in one patient with colorectal cancer. Comparisons of outcomes of surgical treatment were shown in Table 3.

Table 3

Comparison of outcomes of surgical treatment.

Types of resection and outcomes of surgical treatment	Gastric Cancer	Colorectal cancer	P value
Emergency Treatment	5(9%)	20(35%)	0.001
Tumor resection	45(80%)	53(94%)	0.022
Extended resection	5(9%)	8(14%)	0.394
Curative resection	11(19%)	29(51%)	<0.001
Intraoperative complication	10(18%)	5(9%)	0.133
Necessity of ICU treatment	23(41%)	19(34%)	0.279
Length of hospital stay (> 7 days)	34(53%)	30(47%)	0.283
Postoperative 30-day Morbidity	10(18%)	13(23%)	0.320
Postoperative 30-day Mortality	3(5.4%)	6(10.7%)	0.245

About 42 patients admitted to the intensive care unit (ICU) postoperatively. The most frequent reasons for admission to the ICU were respiratory failure (42%) and congestive heart failure (33%). There was no significant difference in necessity of ICU treatment and in length of ICU stay between the two patient groups. The postoperative morbidity was observed in 10 (18%) patients with gastric cancer and in 13(23%) patients with colorectal cancer. Postoperative pulmonary infections and adult respiratory distress syndrome were more frequently encountered complications. The distribution of postoperative complications was detailed in Table 4. The mean duration of hospital stay was 8.6 ± 3.9 days in patients with gastric cancer and 8.6 ± 4.6 days in patients with colorectal cancer. The 30-day postoperative mortality rate was 5.4% in patients with gastric cancer and 10.7% in patients with colorectal cancer. There was no significant difference in length of hospital stay, morbidity and mortality rates between the gastric and colorectal cancer patients.

Patients with advanced staged gastric cancer required significantly longer hospitalization and more intensive care and had a significantly higher mortality risk ($P=0.037$).

Table 4

The distribution of postoperative complications.

Postoperative Complications	Gastric Cancers	Colorectal Cancers
Acute respiratory distress	2 (3.5%)	3(5%)
Pulmonary infections	4(7%)	2(3.5%)
Cardiac failure	-	3(5%)
Wound infection	3(5%)	2(3.5)
Neurological dysfunction	-	1(1.7%)
Postoperative ileus	-	1(1.7%)
Anastomotic structure	1(1.7%)	1(1.7%)

Elderly patients with gastric cancer have also a significantly higher morbidity risk ($P=0.009$). The presence of coexisting disease, high ASA score and the extent of gastric resection have no significant influence on the risk of postoperative morbidity and mortality (Table 5).

Advanced age, advanced stage and emergency surgical treatment were associated with a significantly increased risk of morbidity ($P=0.037$, $P<0.001$ and $P=0.001$ respectively) and mortality ($P=0.05$, $P=0.001$ and $P=0.038$ respectively)) in patients with colorectal cancer. High ASA score and curative resection were also

associated with a significantly ($P=0.007$ and $P=0.015$ respectively) increased mortality risk in this group patients (Table 5).

Table 5

Comparisons of factors influencing surgical outcomes.

Factors influencing outcomes	ICU requirement	Hospital stay >7 days	Morbidity	Mortality	Type of Cancer
Advanced age >75 years	$P<0.001$	$P=0.66$	$P=0.009$	$P=0.27$	Gastric C
High ASA score (III or IV)	$P<0.001$	$P=0.009$	$P=0.037$	$P=0.05$	CRC
Advanced Stage (III or IV)	$P=0.002$	$P=0.13$	$P=0.14$	$P=0.83$	Gastric C
Emergency procedure	$P=0.046$	$P=0.01$	$P=0.093$	$P=0.007$	CRC
Curative resection	$P=0.01$	$P<0.001$	$P=0.12$	$P=0.037$	Gastric C
Extended resection	$P<0.001$	$P<0.001$	$P<0.001$	$P<0.001$	CRC
Coexisting disease	$P=0.07$	$P=0.060$	$P=0.80$	$P=0.22$	Gastric C
	$P=0.002$	$P=0.042$	$P=0.001$	$P=0.038$	CRC
	$P=0.052$	$P=0.001$	$P=1.21$	$P=0.34$	Gastric C
	$P=0.040$	$P<0.001$	$P=0.832$	$P=0.015$	CRC
	$P=0.001$	$P=0.060$	$P=0.80$	$P=0.22$	Gastric C
	$P=0.030$	$P=0.878$	$P=0.360$	$P=0.206$	CRC
	$P=0.05$	$P=0.77$	$P=0.24$	$P=0.85$	Gastric C
	$P=0.480$	$P=0.146$	$P=0.073$	$P=0.859$	CRC

Gastric C: Gastric cancer CRC: Colorectal cancer

4. Discussion

Although declining in incidence and mortality, gastric cancer and colorectal cancer are still continuing to be among the leading causes of death in the world (Emmons et al., 2008; Huerta et al., 2006; Kawaguchi, 2009). Due to aging population and population growth, the expected number of new cases will increase in forthcoming years (Santoro et al., 2007; Sessa et al., 2008). Currently it is well known that, a great majority of the patients are diagnosed with advanced stage disease and prognosis remains poor (Huerta et al., 2006; Santoro et al., 2007; Sessa et al., 2008; Green et al., 2002; Sun et al., 2009). In present study, advanced stage cancers had comprised nearly eighty percent of all cases in both patient groups. This rate was considerably higher than in other reports (Huerta et al., 2006; Green et al., 2002; Sun et al., 2009; Dicken et al., 2005; Evans et al., 2009). Delayed admission in patients with gastric cancer is usually attributed to the lack of the screening programs in western countries. Owing to low incidence, a screening program seems to be not cost effective in those populations. The lack of early pathognomonic symptoms particularly for gastric cancers also delays the diagnosis (Dicken et al., 2005, Hartgrink et al., 2002). Advanced stage of presentations in our patients seemed to be related with low socioeconomic status. All patients included the study had come from rural area and less accessed to health care. Thus they were more likely to have a longer period of symptomatic disease.

A great proportion of the patients with colorectal cancer carry a high risk of complicated presentation requiring emergency surgery. Obstructions due to colorectal cancer tend to be at a more advanced stage at presentation. It has long been recognized that emergency colorectal surgery have a increased risk of mortality, a higher incidence of lymph node metastasis and a lower curative resection rate. The reported incidence of bowel obstruction due to colorectal cancer ranges from 8% to 29% (Biondo et al., 2005; Biondo et al., 2008; Sjövall et al., 2007; Serpell et al., 1989; Crozier et al., 2009; McArdle et al., 2006). The incidence of bowel obstruction due to colorectal cancer in the present study is higher than that of reported by others. Increased risk of complicated presentations could be attributed to delayed admission and low awareness of symptoms such as changes in bowel habits, weakness and weight loss in patients with colorectal cancer. Our results revealed that emergency surgical treatment was one of the factors related with unfavorable outcomes in patients with colorectal cancer.

Cancer in the elderly patients has become an increasingly common problem in the Western populations (Repetto et al., 2003; Kunisaki et al., 2006). According to epidemiologic data, the incidences of gastric cancer and colorectal cancer sharply rise with age and peak in the seventh decade of life. Colorectal cancer is the most common tumor in patients older than 75 years and more than half of the patients with gastric cancer are aged 70

years or more (Santoro et al., 2007; Lee et al., 2007; Cappell, 2008). Several authors have showed that advanced age is one of the poor prognostic factors for both gastric and colorectal cancer (Serpell et al., 1989; Lee et al., 2007; Lo et al., 2008; Msika et al., 2000). A statistically significant correlation has been found between survival and age in patients with gastric cancer (Braga et al., 1996). Other studies have reported that age is not a significant factor in poor outcomes after surgery but increasing co morbidities increase the risk of morbidity and mortality afterward. In the literature, the worse prognosis in patients 70 years of age and above could be attributed to the increased incidence and degree of comorbidities in the elderly (Lee et al., 2007; Msika et al., 2000; Braga et al., 1996). In the current study, the incidence of postoperative morbidity was significantly higher in elderly patients with gastric cancer whereas, contrary to previous reports the incidence of postoperative mortality was not influenced by advanced age in those patients. This favorable outcome seemed to be related with the extent of surgical procedures and better performance status in elderly patients with gastric cancer. In the current study, surgical procedures were more commonly elective and less invasive in elderly patients with gastric cancer. There was also significant correlation between the necessity of ICU treatment and advanced age.

Previous studies have shown that elderly patients underwent emergency surgery for complicated colorectal cancer had a significantly higher mortality and complication rates and an increased length of hospital stay (Serpell et al., 1989; Crozier et al., 2009; Lee et al., 2007). Our results are consistent with these findings. Advanced age seemed to be more influential factor in the patients with colorectal cancer for the risk of mortality in the present study. Compared with the elderly patients with gastric cancer, elderly patients with colorectal cancer had a poorer performance status and higher ASA scores. Complicated presentations requiring emergency surgical treatment were also more common in these group patients.

Surgical resection is usually the most promising option for early and advanced gastric and colorectal cancer. Siewert et al (Siewert et al., 2005) reported that curative resection could be achieved in seventy percent of the patients with gastric cancer. Shimada et al (Kunisaki et al., 2006) had performed curative resection in eighty-five percent of elderly patients (over 75 years old) and in ninety percent of middle-aged patients (between 45 and 65 years) with gastric cancer. Curative resection rates for gastric cancer have been reported between 30% and 40% in other series (Green et al., 2002). Advanced age is also one of the factors influencing surgical strategy in terms of curative and palliative surgery (Hartgrink et al., 2002). Shimada et al (Kunisaki et al., 2006) and Faivre et al (Msika et al., 2000) reported that elderly patients with gastric cancer have undergone less extensive lymph node dissection and more often noncurative resection. Increased frequency of noncurative surgery could be attributed to lack of symptoms in elderly patients or limited screening for gastric cancer. The influence of advanced age on curative surgery did not reach statistical significance in our patients with gastric cancer. In the present study curative resection rate was lower than those of reported in previous studies and also associated with increased demand for critical care in patients with gastric cancer. Lower curative resection rate seemed to be related with delayed diagnosis of advanced stage gastric carcinomas and poor performance status of the patients.

The reported curative resection rates of colorectal cancers in the literature ranges from 70% to 85% (Sjövall et al., 2007; McArdle et al., 2006; Abir et al., 2006). The management of patients with surgically incurable bowel cancer at presentation is a challenging problem. Many authors suggest that curative surgeries for complicated cancer are acceptable in emergency conditions (Biondo et al., 2007; Serpell et al., 1989). Hughes et al (Serpell et al., 1989) have reported that curative resection could be performed in fifty percent of patients with complete obstruction and seventy percent of patients without obstruction. The ultimate aim of surgical treatment is to optimize quality of life and prolong survival. Palliative resection is necessary in order to avoid future complications such as obstruction and perforation (Evans et al., 2009). In our series, fifty percent of colorectal tumors have been found resectable for cure at exploration. Curative resection could be performed successfully in ninety percent of elderly patients. There were no differences in the rate of curative surgeries between emergency and elective patients compared with the gastric tumors, colorectal tumors were significantly more resectable in our series. Overall curative resection rates were lower than those of reported in the literature. The lower rate of curative resection in our study could be explained by delayed admission of patients with advanced stage colorectal cancer and poor performance status of the patients with high ASA score.

The optimum extent of surgical procedure for advanced gastric cancer remains controversy (La Vecchia et al., 1992; Sessa et al., 2008; Doglietto et al., 2000; Kulig et al., 2007; Díaz De Liaño et al., 2003). The extent of surgical procedure is usually determined by the extension of tumor during laparotomy. Some authors agree that radical surgery in selected patients or extended lymphadenectomies have a significant curative or palliative impact, improving survival and quality of life even in advanced stage gastric cancers (Sessa et al., 2008; Doglietto et al.,

2000; Kulig et al., 2007; Díaz De Liaño et al., 2003). Conversely, Dutch trial and Medical Research Council demonstrated no survival advantage with the classic Japanese extended resection (Dicken et al., 2005, Hartgrink et al., 2002). Diaz et al (Díaz De Liaño et al., 2003) reported that the quality of life of patients undergoing curative surgery was not significantly influenced by the type of mastectomy, or whether lymphadenectomy was performed. The extent of surgical procedures has been determined by the extent of tumor, performance status of the patients and individual preferences of surgeons in the current study. There was no significant correlation between the extent of surgical procedure and unfavorable outcomes.

Preoperative mortality is an important objective marker for the evaluation of the success of surgical treatment and medical quality of surgical institutions. The inpatient mortality rate and 30-day mortality rate are commonly used for this evaluation (Borch et al., 2000; Ren et al., 2009). Postoperative 30-day morbidity and mortality rates of our patients with gastric cancer were 18% and 5.4% respectively. Elderly patients have significantly increased morbidity risk and there was significant correlation between advanced stage disease and increased mortality risk. These findings were consistent with those of previous reports (Hartgrink et al., 2002; Doglietto et al., 2000; Kulig et al., 2007).

There are significant differences in perioperative mortality rates in colorectal cancer patients among different countries and institutions. Mortality rates range from 2.3% to 10.2% in the United Kingdom, 0.8% to 6% in other Western countries (Ren et al., 2009). We found that the postoperative mortality rate is 10.7 in colorectal cancer patients. Our results showed that advanced stage at presentation, advanced age, high ASA score, emergency surgical treatment and curative resection are seemed to be responsible for unfavorable outcomes.

Although our study is retrospective and includes a limited number of patients, we examined the factors influencing on presentation and outcomes in the light of a wide range of literature data. Our findings are consistent with those of other studies in the literature.

In conclusion, the results of present study showed that gastric and colorectal cancer patients have similar clinicopathological characteristics in presence of low socioeconomic conditions. Advanced stage admissions are significantly more common in these patient groups. Advanced stage disease and advanced age have a significant impact on outcomes of surgical treatment in both type of cancer. High ASA scores are more frequently encountered in patients with colorectal cancer. Emergency surgical treatment for colorectal cancer carries a higher morbidity and mortality risk. Colorectal cancer seems to be more resectable and more curable but curative resections carry a higher risk of mortality. These factors should be kept in mind when determining the surgical strategy. The goals of surgery should be balanced with acceptable surgical risk in surgical treatment of gastric and colorectal cancer patients. Elective procedures should be reserved in elderly patients with colorectal cancer. We also believe that improvement of socioeconomic conditions will make important contributions to outcomes of surgical treatment of these patient groups.

Conflict of interest

No support in the form of grants, equipment, and/or pharmaceutical items has been provided. All the authors declare that they have no competing or conflicts of interests.

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