

Mohamad Amin Pourhoseingholi, PhD, Series Editor

## An overview of colorectal cancer survival rates and prognosis in Asia

Bijan Moghimi-Dehkordi, Azadeh Safaee

Bijan Moghimi-Dehkordi, Azadeh Safaee, Research Center for Gastroenterology and Liver Diseases, Shahid Beheshti University of Medical Science, Tehran 1985711151, Iran

Author contributions: Safaee A and Moghimi-Dehkordi B contributed to this paper.

Correspondence to: Azadeh Safaee, MSc, Research Center for Gastroenterology and Liver Diseases, Shahid Beheshti University of Medical Science, Tehran 1985711151,

Iran. [azadesafaee@yahoo.com](mailto:azadesafaee@yahoo.com)

Telephone: +98-21-22432515 Fax: +98-21-22432517

Received: May 18, 2011 Revised: March 3, 2012

Accepted: March 10, 2012

Published online: April 15, 2012

### Abstract

Colorectal cancer is a rapidly rising trend in Asia. The incidence in many Asian countries is on par with the West. Several studies have provided data regarding the survival of patients with colorectal cancer. In Asia, the overall cure rate of colorectal cancer has not improved dramatically in the last decade, 5-year survival remaining at approximately 60%. Colorectal cancer survival time has increased in recent years, but mortality rate remains high. Although studies have determined a number of factors that can predict survival of patients after diagnosis, life expectancy has not been increased dramatically. It seems that among the prognostic factors explored so far, the most important are those that relate to early diagnosis of cancer. Primary detection is feasible since efficient screening modalities are available. Colonoscopic surveillance is needed, especially in subjects at higher risk.

© 2012 Baishideng. All rights reserved.

**Key words:** Colorectal cancer; Survival rate; Prognosis; Asia**Peer reviewer:** Xiao-Chun Xu, Associate Professor, Department

of Clinical Cancer Prevention, The University of Texas M. D. Anderson Cancer Center, 1515 Holcombe Boulevard, Unit 1360, Houston, TX 77030, United States

Moghimi-Dehkordi B, Safaee A. An overview of colorectal cancer survival rates and prognosis in Asia. *World J Gastrointest Oncol* 2012; 4(4): 71-75 Available from: URL: <http://www.wjgnet.com/1948-5204/full/v4/i4/71.htm> DOI: <http://dx.doi.org/10.4251/wjgo.v4.i4.71>

### INTRODUCTION

Colorectal cancer is the fourth most common cancer in men and the third most common in women worldwide. It accounts for an estimated 1.2 million new cancer cases and over 630 000 cancer deaths per year, almost 8% of all cancer deaths<sup>[1,2]</sup>. Colorectal cancer has become an important problem in Asian countries<sup>[3-7]</sup>. Reports from the World Health Organization (WHO) data set and from individual countries or cities in Asia show that the incidence of CRC is rising rapidly in regions within countries such as China, Japan, South Korea and Singapore<sup>[7-10]</sup>. These countries, have experienced a 2-4-fold increase in the incidence of colorectal cancer during the past few decades<sup>[11]</sup>. The overall prevalence of advanced colorectal neoplasm in asymptomatic Asians was also found to be comparable with other developed countries<sup>[12]</sup>.

In recent decades, claims have been made of numerous variables being related to survival. The extent of bowel wall penetration, lymph node metastases, distant metastases, tumor differentiation and tumor stage have been regarded as factors of the utmost prognostic importance; and they have been the basis of most staging systems<sup>[13-27]</sup>. Despite numerous attempts to detect cancer at an early stage, the overall long-term outcome of patients curatively resected has not significantly changed in the last decade, the 5-year survival rate being approximately 60 percent. More than half of colorectal adenocarcino-

mas are still diagnosed only when the disease involves regional or distant structures<sup>[22]</sup>.

Many studies have been performed, using univariate and multivariate methods to define the prognostic significance of various clinical and pathologic factors<sup>[13-21,23-33]</sup>. However, the accurate determination of prognostic factors for colorectal cancer remains a problem. The present study considered a number of clinical studies on significant factors that can predict patient outcome. We report the results of some previous studies focused on colorectal cancer and review the literature concerning estimation of survival rates and evaluation of clinical and pathologic prognostic parameters, with an emphasis on Asian countries. Relevant articles, in which univariate and multivariate analyses were used, were selected, and results are discussed.

## SURVIVAL ANALYSIS

Several studies have provided data regarding the survival of patients with colorectal cancer. In Asia, the overall cure rate of colorectal cancer has not improved dramatically in the last decade in Asia, 5-year survival remaining at approximately 60%. While the highest survival rates were found in China, the lowest rate was reported in India (Figure 1)<sup>[21,24,34-40]</sup>. The 5-year survival for persons with colorectal cancer is 64% in the United States. If the disease is detected at an early stage, the 5-year survival rate increases to 90%. However, because of lack of screening programs in many countries, only 39% of colorectal cancers are diagnosed at this stage. From 1982 to 1992, relative survival rates for patients diagnosed with colorectal cancer in five developing countries, comprising China, Cuba, India, the Philippines, and Thailand, was estimated at between 28 to 42%<sup>[1]</sup>. A report from Korea indicated that the 5-year survival rates were 62.1%<sup>[41]</sup>. In China, the overall 5-year post-operative survival rate was 60.8% in colorectal cancer patients, 62.3% in colonic cancer and 59.3% in rectal cancer. Another Chinese study reported an overall 5-year survival rate of 66.3%<sup>[34]</sup>. Various research studies from Iran have indicated the 5-year survival rates of colorectal cancer were 47%<sup>[35]</sup>, 41%<sup>[36]</sup> and 61%<sup>[21]</sup>, respectively.

According to one Japanese study, the overall 5-year survival rate was 61.4%<sup>[42]</sup>. The overall 5-year survival rate for colorectal cancer patients was 34.3%, lower than in either other Asian or Western countries<sup>[24]</sup>. However, results from Bombay, India indicated the lowest overall 5-year survival rates for colon and rectal cancer (31.2%)<sup>[43,44]</sup>. Data on this issue are scant in countries including Indonesia, Malaysia, Taiwan, and in Arab countries. In total, it seems that 5-year overall survival rates of colorectal cancer patients differ between Eastern and Western Asia. While the overall survival rates for colorectal cancer in South-West Asia were relatively lower than in US and European countries, in East Asia, rates are similar to those of Western communities. The main reason for the lack of progress is that currently a significant propor-

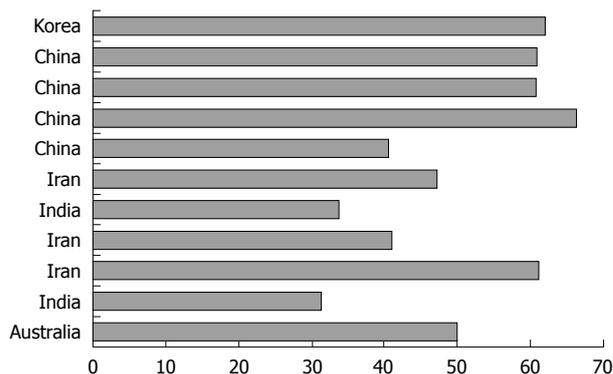


Figure 1 Overall 5-year survival of colorectal cancer in Asian countries<sup>[21,24,34-40]</sup>.

tion of patients are diagnosed at later stages of disease or patients with seemingly localized tumor already have undetectable metastasis, mostly in the liver. To improve survival rates, in addition to earlier detection, more aggressive (adjuvant) treatment of high risk patients would be a rational strategy. This requires development of new therapeutic procedures, as well as reliable stratification of patients according to high risk or low risk for recurrent disease. In recent years, many attempts have been made to improve the prediction of final outcome.

## PROGNOSTIC FACTORS

The prognostic factors for colorectal cancer were determined in various studies by both univariate (Kaplan-Meier) and multivariate (Cox proportional hazards model) methods. The most important independent prognostic factors related to survival of patients was determined by Cox models. Prognostic factors could be categorized as either demographic factors or pathological and clinical factors. In order to better compare the findings of various studies from different areas, the most important results are shown in Table 1<sup>[21,24,35,36,41-43,45,46]</sup>.

### Demographic factors

For a long time, prediction of patient outcome was attempted either by identification of patient attributes (age and sex) or from macroscopically evident tumor features. More recently, studies using multivariate analysis have clarified the prognostic role of clinical parameters. Patient gender has been extensively evaluated although in the majority of studies this was of no significance in predicting survival independently of other factors<sup>[14,19-21,24,25,35,38]</sup>.

In the literature, results concerning patient age are even more diverse. In a number of studies<sup>[15,18,21,25,26]</sup>, this parameter was not found to be an independent prognostic variable. However, in other reports<sup>[14,20,35,36]</sup>, age did seem to play a role, predicting a poorer survival rate for older patients than younger ones.

### Pathologic and clinical factors

Pathological evaluation is a critical component in the

Table 1 Comparison of the results from different countries

Study	Population	Year	Prognostic factors (indicated by univariate method)	Independent prognostic factors (indicated by multivariate method)
Mehrkhani <i>et al</i> <sup>[35]</sup>	Iran	1999-2002	Age, TNM stage, T-status, nodal status, distant metastasis, grade, lymphatic and vascular invasion, presurgery CEA level > 5 ng/mL	Age, TNM stage, grade
Shiono <i>et al</i> <sup>[42]</sup>	Japan	1999-2002	Aerogenous spread with floating cancer cell clusters (ASFC) vascular invasion, lymphatic invasion, pleural invasion	Vascular invasion, aerogenous spread with floating cancer cell clusters (ASFC)
Moghimi-Dehkordi <i>et al</i> <sup>[21]</sup>	Iran	2002-2007	Type of first treatment, body mass index, marital status, tumor grade, extent of wall penetration, distant metastasis, regional lymph nodes metastasis, and pathologic stage of tumor	Tumor size, metastasis of tumor, body mass index, marital status, and grade of tumor
Al-Shamsi <i>et al</i> <sup>[45]</sup>	United Arab Emirates	1985-1998	Age, Type of operation, Type of resection, lymph node status, peritoneal spread, liver metastasis, Dukes' staging, Lateral margins, Proximal and distal margins	Presence of lymph nodes and Duke staging
Moradi <i>et al</i> <sup>[36]</sup> Park <i>et al</i> <sup>[41]</sup>	Iran Korea	2000-2005 1974-1993	Age, sex, site of tumor, Type of tumor Dukes' stage, extent of bowel wall invasion, lymph node metastasis and number of involved lymph nodes, preoperative CEA level, histologic grade, and gross morphology of the tumor	- Dukes' stage, number of lymph node metastasis, CEA level, tumor location, gross morphology of tumor, depth of bowel wall invasion
Yeole <i>et al</i> <sup>[43]</sup>	India	1987-1991	Age, marital status, education, site (colon versus rectum), clinical extent of disease and treatment modality	Age group, site and clinical extent of disease emerged
Ghazali <i>et al</i> <sup>[24]</sup>	Malaysia	1996-2005	Age, sex, race, working status, smoking status, per rectal bleeding, liver metastasis, site of tumour, Dukes staging, preoperative CEA level and treatment modalities	Liver metastasis status, Dukes staging and treatment modalities
Goh <i>et al</i> <sup>[46]</sup>	Singapore	1987	Age, abdominal distension, Dukes' stage, tumour grade	Dukes' stage

management of patients with colorectal cancer. From initial diagnosis through definitive treatment, pathological assessment of a resected colorectal cancer is still considered the most accurate method of assessing the tumor-related features that determine postoperative outcome.

Different clinico-pathological prognostic factors have been proposed: location of the tumor<sup>[21,22,26,27,35,38]</sup>, depth of tumor invasion<sup>[32,37,40]</sup>, tumor stage<sup>[32,47]</sup>, differentiation of tumor<sup>[20,21,48]</sup>, surgical procedure<sup>[15,25]</sup>, pathological type<sup>[25,48]</sup>, tumor size<sup>[21,48-50]</sup>, lymph node metastasis<sup>[21,51,52]</sup> and distant metastasis<sup>[15,25,48]</sup>. The site of the tumor has been investigated as a possible prognostic factor. Patients with colon cancer are considered to have a better survival than those with rectal cancer. In previous studies distal location and advanced stage of tumor were determined as independent prognostic factors for survival of patients with colorectal cancer. Several analyses confirmed the vital importance of tumor stage, as reflected in Dukes or TNM classification, in predicting survival. However, in the vast majority of studies documenting the prognostic power of tumor grade the number of grades has been reduced.

Although various studies have determined a number of factors that could predict survival of patients after diagnosis, life expectancy has not increased drastically. The review of the results from different reports shown in Table 1 supports the thesis that the pathological and clinical features of the disease may be better determinants for prognosis in colorectal cancer patients. It seems that among all the prognostic factors explored to date, the most important are those related to early diagnosis. Early detection or secondary prevention of cancer is increasingly important for the control of certain malignant dis-

eases like colorectal cancer. CRC is more common in the elderly, although approximately 43 percent of colorectal cancer in Iran occurs before 50 years of age<sup>[53]</sup>. It is well established that colorectal cancer is one of those cancers that can largely be prevented by the early detection and removal of adenomatous polyps<sup>[54,55]</sup>, and survival is therefore significantly better when colorectal cancer is diagnosed while still localized. Screening strategies are needed for early detection of colon adenomas and colorectal cancer.

## CONCLUSION

In summary, colorectal cancer is a rapidly rising trend in Asia. The incidence in many Asian countries is in fact on a par with the West. Colorectal cancer survival time has increased in the past decades, but mortality rate remains high. Primary detection is feasible since efficient screening modalities are available. Colonoscopic surveillance is needed, especially in subjects at higher risk.

## REFERENCES

- 1 **American Cancer Society.** Cancer Facts and Figures 2007. Atlanta, GA: American Cancer Society, 2007. Available from: URL: <http://www.cancer.org/Research/CancerFactsFigures/CancerFactsFigures/caff2007pwsecured-pdf>
- 2 **Kamangar F, Dores GM, Anderson WF.** Patterns of cancer incidence, mortality, and prevalence across five continents: defining priorities to reduce cancer disparities in different geographic regions of the world. *J Clin Oncol* 2006; **24**: 2137-2150
- 3 **Cheung DY, Kim TH, Kim CW, Kim JI, Cho SH, Park SH, Han JY, Kim JK.** The anatomical distribution of colorectal

- cancer in Korea: evaluation of the incidence of proximal and distal lesions and synchronous adenomas. *Intern Med* 2008; **47**: 1649-1654
- 4 **Ji BT**, Devesa SS, Chow WH, Jin F, Gao YT. Colorectal cancer incidence trends by subsite in urban Shanghai, 1972-1994. *Cancer Epidemiol Biomarkers Prev* 1998; **7**: 661-666
  - 5 **Kuriki K**, Tajima K. The increasing incidence of colorectal cancer and the preventive strategy in Japan. *Asian Pac J Cancer Prev* 2006; **7**: 495-501
  - 6 **Yee YK**, Tan VP, Chan P, Hung IF, Pang R, Wong BC. Epidemiology of colorectal cancer in Asia. *J Gastroenterol Hepatol* 2009; **24**: 1810-1816
  - 7 **Yiu HY**, Whittemore AS, Shibata A. Increasing colorectal cancer incidence rates in Japan. *Int J Cancer* 2004; **109**: 777-781
  - 8 **Tamura K**, Ishiguro S, Munakata A, Yoshida Y, Nakaji S, Sugawara K. Annual changes in colorectal carcinoma incidence in Japan. Analysis of survey data on incidence in Aomori Prefecture. *Cancer* 1996; **78**: 1187-1194
  - 9 **Lu JB**, Sun XB, Dai DX, Zhu SK, Chang QL, Liu SZ, Duan WJ. Epidemiology of gastroenterologic cancer in Henan Province, China. *World J Gastroenterol* 2003; **9**: 2400-2403
  - 10 **Yang L**, Parkin DM, Li LD, Chen YD, Bray F. Estimation and projection of the national profile of cancer mortality in China: 1991-2005. *Br J Cancer* 2004; **90**: 2157-2166
  - 11 **Sung JJ**, Lau JY, Goh KL, Leung WK. Increasing incidence of colorectal cancer in Asia: implications for screening. *Lancet Oncol* 2005; **6**: 871-876
  - 12 **Byeon JS**, Yang SK, Kim TI, Kim WH, Lau JY, Leung WK, Fujita R, Makharia GK, Abdullah M, Hilmi I, Sollano J, Yeoh KG, Wu DC, Chen MH, Kongkam P, Sung JJ. Colorectal neoplasm in asymptomatic Asians: a prospective multinational multicenter colonoscopy survey. *Gastrointest Endosc* 2007; **65**: 1015-1022
  - 13 **Wang Y**, Liu YF, Cheng Y, Yi DH, Li P, Song WQ, Fu DZ, Wang X. Prognosis of colorectal cancer with liver metastasis: value of a prognostic index. *Braz J Med Biol Res* 2010; **43**: 1116-1122
  - 14 **Rosenberg R**, Friederichs J, Schuster T, Gertler R, Maak M, Becker K, Grebner A, Ulm K, Höfler H, Nekarda H, Siewert JR. Prognosis of patients with colorectal cancer is associated with lymph node ratio: a single-center analysis of 3,026 patients over a 25-year time period. *Ann Surg* 2008; **248**: 968-978
  - 15 **Fang H**, Wang XY, Feng FY, Wang JW. [Prognostic analysis of patients with liver metastases from colorectal cancer treated with different modes of therapy]. *Zhonghua Zhongliu Zazhi* 2010; **32**: 67-70
  - 16 **Zlobec I**, Lugli A. Prognostic and predictive factors in colorectal cancer. *Postgrad Med J* 2008; **84**: 403-411
  - 17 **Konopke R**, Kersting S, Distler M, Dietrich J, Gastmeier J, Heller A, Kulisch E, Saeger HD. Prognostic factors and evaluation of a clinical score for predicting survival after resection of colorectal liver metastases. *Liver Int* 2009; **29**: 89-102
  - 18 **Gharbi O**, Chabchoub I, Limam S, Hochlef M, Ben Fatma L, Landolsi A, Gahbiche S, Braham A, Mokni M, Ajmi S, Letaief R, Ben Hadj Hamida R, Ben Ahmed S. [Prognostic factors and survival of metastatic colorectal cancer in the Sousse University Hospital (Tunisia): comparative study of two treatment period of 200 patients]. *Bull Cancer* 2010; **97**: 445-451
  - 19 **Saha AK**, Smith KJ, Sue-Ling H, Sagar PM, Burke D, Finan PJ. Prognostic factors for survival after curative resection of Dukes' B colonic cancer. *Colorectal Dis* 2011; **13**: 1390-1394
  - 20 **Laohavinij S**, Maneechavakajorn J, Techatanol P. Prognostic factors for survival in colorectal cancer patients. *J Med Assoc Thai* 2010; **93**: 1156-1166
  - 21 **Moghimi-Dehkordi B**, Safaee A, Zali MR. Prognostic factors in 1,138 Iranian colorectal cancer patients. *Int J Colorectal Dis* 2008; **23**: 683-688
  - 22 **Ratto C**, Sofo L, Ippoliti M, Merico M, Doglietto GB, Crucitti F. Prognostic factors in colorectal cancer. Literature review for clinical application. *Dis Colon Rectum* 1998; **41**: 1033-1049
  - 23 **Desolneux G**, Burtin P, Lermite E, Bergamaschi R, Hamy A, Arnaud JP. Prognostic factors in node-negative colorectal cancer: a retrospective study from a prospective database. *Int J Colorectal Dis* 2010; **25**: 829-834
  - 24 **Ghazali AK**, Musa KI, Naing NN, Mahmood Z. Prognostic factors in patients with colorectal cancer at Hospital Universiti Sains Malaysia. *Asian J Surg* 2010; **33**: 127-133
  - 25 **Zhang S**, Gao F, Luo J, Yang J. Prognostic factors in survival of colorectal cancer patients with synchronous liver metastasis. *Colorectal Dis* 2010; **12**: 754-761
  - 26 **Wang Z**, Zhou ZX, Liang JW, Bai XF, Bi JJ. [Prognostic factors of colorectal cancer patients with synchronous liver metastasis treated with simultaneous liver and colorectal resection]. *Zhonghua Zhongliu Zazhi* 2008; **30**: 372-375
  - 27 **Liang JW**, Bai XF, Zhou ZX, Zhao DB, Wang CF, Zhao P. [Prognostic factors of colorectal carcinoma in the elderly after radical surgery]. *Zhonghua Yixue Zazhi* 2008; **88**: 1467-1470
  - 28 **Vardakis N**, Messaritakis I, Papadaki C, Agoglossakis G, Sfakianaki M, Saridaki Z, Apostolaki S, Koutroubakis I, Perraki M, Hatzidaki D, Mavroudis D, Georgoulis V, Souglakos J. Prognostic significance of the detection of peripheral blood CEACAM5mRNA-positive cells by real-time polymerase chain reaction in operable colorectal cancer. *Clin Cancer Res* 2011; **17**: 165-173
  - 29 **Meyners T**, Heisterkamp C, Kueter JD, Veninga T, Stalpers LJ, Schild SE, Rades D. Prognostic factors for outcomes after whole-brain irradiation of brain metastases from relatively radioresistant tumors: a retrospective analysis. *BMC Cancer* 2010; **10**: 582
  - 30 **Uribarrena-Amezaga R**, Ortego J, Fuentes J, Raventós N, Parra P, Uribarrena-Echevarria R. Prognostic value of lymph node micrometastasis in patients with colorectal cancer in Dukes stages A and B (T1-T4, N0, M0). *Rev Esp Enferm Dig* 2010; **102**: 176-186
  - 31 **Mäkelä JT**, Kiviniemi H. Clinicopathological features of colorectal cancer in patients under 40 years of age. *Int J Colorectal Dis* 2010; **25**: 823-828
  - 32 **Stor Z**, Frković GS, Bracko M, Repse S. Prognostic value of clinical, pathological and immunohistochemical markers in stage II colon cancer patients. *Acta Chir Iugosl* 2008; **55**: 39-44
  - 33 **Mekenkamp LJ**, Koopman M, Teerenstra S, van Krieken JH, Mol L, Nagtegaal ID, Punt CJ. Clinicopathological features and outcome in advanced colorectal cancer patients with synchronous vs metachronous metastases. *Br J Cancer* 2010; **103**: 159-164
  - 34 **Cai SR**, Zheng S, Zhang SZ. [Multivariate analysis of prognostic factors in colorectal cancer patients with different ages]. *Zhonghua Zhongliu Zazhi* 2005; **27**: 483-485
  - 35 **Mehrkhani F**, Nasiri S, Donboli K, Meysamie A, Hedayat A. Prognostic factors in survival of colorectal cancer patients after surgery. *Colorectal Dis* 2009; **11**: 157-161
  - 36 **Moradi A**, Khayamzadeh M, Guya MM, Mirzaei HR, Salmanian R, Rakhsha A, Akbari ME. Survival of colorectal cancer in Iran. *Asian Pac J Cancer Prev* 2009; **10**: 583-586
  - 37 **Wang JP**, Yang ZL, Wang L, Dong WG, Huang YH, Qin JZ, Zhan WH. [Multi-variate regression analysis of clinicopathological characteristics and prognosis of colorectal cancer]. *Zhonghua Zhongliu Zazhi* 2003; **25**: 59-61
  - 38 **Nan KJ**, Qin HX, Yang G. Prognostic factors in 165 elderly colorectal cancer patients. *World J Gastroenterol* 2003; **9**: 2207-2210
  - 39 **Oh HS**, Chung HJ, Kim HK, Choi JS. Differences in overall survival when colorectal cancer patients are stratified into new TNM staging strategy. *Cancer Res Treat* 2007; **39**: 61-64
  - 40 **Yang Z**, Wang J, Wang L, Dong W, Huang Y, Qin J, Zhan W. Multivariate regression analysis of prognostic factors in colorectal cancer. *Chinese-German J Clin Oncol* 2003; **2**: 149-152
  - 41 **Park YJ**, Park KJ, Park JG, Lee KU, Choe KJ, Kim JP. Prognostic factors in 2230 Korean colorectal cancer patients:

- analysis of consecutively operated cases. *World J Surg* 1999; **23**: 721-726
- 42 **Shiono S**, Ishii G, Nagai K, Yoshida J, Nishimura M, Murata Y, Tsuta K, Nishiwaki Y, Kodama T, Ochiai A. Histopathologic prognostic factors in resected colorectal lung metastases. *Ann Thorac Surg* 2005; **79**: 278-282; discussion 283
- 43 **Yeole BB**, Sunny L, Swaminathan R, Sankaranarayanan R, Parkin DM. Population-based survival from colorectal cancer in Mumbai, (Bombay) India. *Eur J Cancer* 2001; **37**: 1402-1408
- 44 **Saito N**, Kameoka S. Serum laminin is an independent prognostic factor in colorectal cancer. *Int J Colorectal Dis* 2005; **20**: 238-244
- 45 **Al-Shamsi SR**, Bener A, Al-Sharhan M, Al-Mansoor TM, Azab IA, Rashed A, Kakil RI, Amiri KM. Clinicopathological pattern of colorectal cancer in the United Arab Emirates. *Saudi Med J* 2003; **24**: 518-522
- 46 **Goh HS**, Goh CR, Rauff A, Foong WC. Clinico-pathological prognostic factors of large bowel cancer in Singapore: a multivariate analysis. *Ann Acad Med Singapore* 1987; **16**: 437-440
- 47 **Halvorsen TB**, Seim E. Tumour site: a prognostic factor in colorectal cancer? A multivariate analysis. *Scand J Gastroenterol* 1987; **22**: 124-128
- 48 **Newland RC**, Dent OF, Lyttle MN, Chapuis PH, Bokey EL. Pathologic determinants of survival associated with colorectal cancer with lymph node metastases. A multivariate analysis of 579 patients. *Cancer* 1994; **73**: 2076-2082
- 49 **Chapuis PH**, Dent OF, Fisher R, Newland RC, Pheils MT, Smyth E, Colquhoun K. A multivariate analysis of clinical and pathological variables in prognosis after resection of large bowel cancer. *Br J Surg* 1985; **72**: 698-702
- 50 **Takahashi Y**, Tucker SL, Kitadai Y, Koura AN, Bucana CD, Cleary KR, Ellis LM. Vessel counts and expression of vascular endothelial growth factor as prognostic factors in node-negative colon cancer. *Arch Surg* 1997; **132**: 541-546
- 51 **Scott KW**, Grace RH. Detection of lymph node metastases in colorectal carcinoma before and after fat clearance. *Br J Surg* 1989; **76**: 1165-1167
- 52 **Jeffers MD**, O'Dowd GM, Mulcahy H, Stagg M, O'Donoghue DP, Toner M. The prognostic significance of immunohistochemically detected lymph node micrometastases in colorectal carcinoma. *J Pathol* 1994; **172**: 183-187
- 53 **Safae A**, Moghimi-Dehkordi B, Fatemi SR, Ghiasi S, Nemat-Malek F, Zali MR. Characteristics of colorectal mucinous adenocarcinoma in Iran. *Asian Pac J Cancer Prev* 2010; **11**: 1373-1375
- 54 **Levin B**, Lieberman DA, McFarland B, Smith RA, Brooks D, Andrews KS, Dash C, Giardiello FM, Glick S, Levin TR, Pickhardt P, Rex DK, Thorson A, Winawer SJ. Screening and surveillance for the early detection of colorectal cancer and adenomatous polyps, 2008: a joint guideline from the American Cancer Society, the US Multi-Society Task Force on Colorectal Cancer, and the American College of Radiology. *CA Cancer J Clin* 2008; **58**: 130-160
- 55 **Fatemi SR**, Shivarani S, Malek FN, Vahedi M, Maserat E, Iranpour Y, Zali MR. Colonoscopy screening results in at risk Iranian population. *Asian Pac J Cancer Prev* 2010; **11**: 1801-1804

S- Editor Wang JL L- Editor Hughes D E- Editor Zheng XM