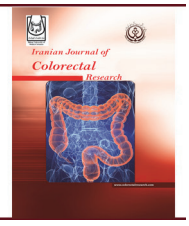
Original Article

Iran J Colorectal Res 2022;10(2):49-54.

Iranian Journal of Colorectal Research



Postoperative Quality of Life of Patients with Colon Cancer According to the Extent of Curative Colon Resection

Mohammad Naeem Bangash*[1,2], *MD; Mohammad Reza Keramati*[1,2], *MD; Amir Sina Sahrifi*[1], *MD; Mohammad Sadegh Fazeli*[1,2], *MD; Seyed Mohsen Ahmadi-Tafti*[1,2], *MD; Alireza Kazemeini*[1,2], *MD; Amir Keshvari*[1,2], *MD; Aidin Yaghoobi Notash*[3], *MD; Behnam Behboudi*[1,2*], *MD

[1]*Department of Surgery, Imam Khomeini Hospital Complex, Tehran University of Medical Sciences, Tehran, Iran*
[2]*Colorectal Research Center, Tehran University of Medical Sciences, Tehran, Iran*
[3]*Department of Surgery, Shariati Hospital Complex, Tehran University of Medical Sciences, Tehran, Iran*

Corresponding authors:
Behnam Behboudi, MD;
Department of Surgery, Imam Khomeini Hospital Complex, Keshavarz Blvd, Tehran P.O. Box: 14197-33141, Iran. **Tel/Fax:** +98 21 66581657
Email: behnam.behboudi@gmail.com

Received: 24-05-2022
Revised: 01-06-2022
Accepted: 07-06-2022

Abstract

Background: Surgery is the mainstay of treatment for colorectal cancers. However, the effect of resection extent on patients' function and quality of life (QoL) should be clarified before surgery. We aimed to assess the postoperative QoL of patients with colon cancer according to the extent of curative colon resection.
Methods: A retrospective study was conducted on all consecutive patients with stage I-III colon cancer who underwent surgery at the Department of Colorectal Surgery from June 2013 to March 2019. The EORTC QLQ-C30 was completed to assess functional capacity and quality of life in all patients free of recurrence.
Results: A total of 128 patients were included, with a mean age of 57.7±13.2 years. Fifty-seven patients were male (n=45%). Most patients (54%) underwent total colectomy. The mean interval between the operation date and filling questionnaire date was 41.8±6.9. There was no statistically significant difference between this interval period and the type of surgery (P=0.76). However, as this period got longer, the global health status score became higher (α: 2.3, CI: 2.1–3.9, P=0.001). Multivariate analysis showed that after adjusting for T and N stage, age, and gender, the type of surgical resection was an independent risk factor of having lower global health status (OR:3.2, CI:2.9–7.6, P=0.03), increased financial difficulties (OR:1.4, CI:1.1–3.6, P=0.022), and higher rates of fatigue (OR:2.4, CI:1.8–4.6, P=0.006).
Conclusion: Global health status worsens with larger resections of the colon. Postoperative challenges in coping with the QoL and functional capacity of the resected bowel should be discussed with the patient prior to surgery.

Keywords: Subtotal colectomy, Total colectomy, Colon cancer, Functional outcomes, Quality of life

Please cite this paper as:
Bangash MN, Keramati MR, Sahrifi AS, Fazeli MS, Ahmadi-Tafti SM, Kazemeini AR, Keshvari A, Yaghoobi Notash A, Behboudi B. Postoperative Quality of Life of Patients with Colon Cancer According to the Extent of Curative Colon Resection. *Iran J Colorectal Res*. 2022;10(2):49-54. doi: 10.30476/ACRR.2022.95935.1148.

Introduction

Colorectal cancer accounts for the second leading cause of cancer deaths in the United States (1). The cornerstone of the treatment of non-metastatic colon cancer is surgery (2). However, the extent of bowel resection can greatly influence not only the postoperative period but also the upcoming years of patients' lives (3). The enhanced survival rate of colon cancer means that more patients are experiencing psychological and physical disturbances in their everyday lives (4-6). The inevitable anatomical disturbances during surgical resection of the tumor and the effect of chemotherapy can influence psychological health in different ways, including the emotional burden of cancer, the economic burden of treatment, the everlasting fear of dying due to metastasis, and the lack of social support (7).

Among the most common symptoms reported during the follow-up period are pain and fatigue, causing deteriorated social functioning and depression. Hence, the psychological health of a patient affected with colon cancer is as important as other parts of the treatment (8). Better functional capacity and physical well-being are not completely equivalent to a better quality of life (QoL), mandating a through evaluation of psychological health in follow-up sessions (9). Theodoropoulos et al. (10) showed that the deterioration in health-related QoL after surgical resection of the colon is temporary (3–6 months); thus, early intervention and enhanced management may impact the patient's psychological health. Persisting functional abdominal complaints, sexual dysfunction, pain, fatigue, irritability, etc., have been reported in the postoperative period of all types of colonic resection (9, 11, 12).

A debate exists on the optimum point of the oncological safe resection margin and the least complication rate caused by colon resection (13-15). Some surgeons propose adequate lymphadenectomy and preserved function via segmental colectomy, while others prefer more aggressive resection because of the lower risk of leakage through a well-vascularized and tension-free anastomosis (16, 17). However, the QoL after each type of resection is not vivid, with previous studies primarily emphasizing the oncological aspect of colon resection rather than its functional aspect and effect on QoL (18). Here, we used the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire Core 30 (EORTC QLQ-C30) to compare the effect of different extents of colonic resection on patients' QoL. Hence, this study aimed to assess the postoperative quality of life of patients with colon cancer according to the extent of curative colon resection.

Materials and Methods

This was a retrospective study conducted on all consecutive patients with stage I-III colon cancer who underwent surgery at the Department of Colorectal Surgery, Imam Khomeini Hospital Complex, Tehran University of Medical Sciences, Tehran, Iran, from June 2013 to March 2019. The Ethics Committee and Institutional Review Board of Tehran University of Medical Sciences approved the study protocol (IR.TUMS.IKHC.REC.1399.366). Patients were excluded from the study if one of the following characteristics was present: deceased, age below 16 years, disseminated or recurrent disease, inadequate Persian language skills, intellectual disability or dementia, having inflammatory bowel disease or celiac disease, radiation to the pelvis, neoadjuvant chemotherapy, previous surgery on the rectum or anal channel, and history of gas/fecal incontinency. Clinical and histologic data of eligible patients were extracted from electronic patient files. These patients were approached via a phone call and were invited to attend a colorectal disease clinic as a part of their follow-up. At the follow-up sessions, a trained nurse completely explained the purpose of the study and obtained written consent. Then, the EORTC QLQ-C30 (19) questionnaire was completed. This questionnaire consists of 30 questions translated to global health status, functional scales, and symptom scales. A high functional score means a high level of function, while a high symptom score shows a high level of symptoms. This questionnaire was translated to Persian and validated (20). Manual scoring and reference values provided by EORTC were used (21).

Categorical variables are shown as numbers and relative frequencies. Also, continuous variables are shown as mean±SD. Collected data for categorical variables were compared using the chi-squared test. An independent student t-test was used to compare the means between the two groups. ANOVA and post hoc tests were used to assess the difference between each group of surgical resections. All analyses were performed via the two-sided method using Statistical Package of Social Science software (SPSS version 22; SPSS, Inc., Chicago, IL). P-values < 0.05 were considered statistically significant.

Results

A total of 158 patients were recruited in the study period, and 140 were eligible to participate. Finally, 128 patients completed the study. Exclusions were due to patients' death (n=5), recurrence or metastatic disease (n=5), intellectual disability or dementia (n=1), having inflammatory bowel disease or celiac disease (n=2), neoadjuvant chemotherapy (n=4), and previous surgery on the rectum or anal channel and history of gas/fecal incontinency (n=3).

The mean age was 57.7±13.2. Fifty-seven patients were male (n=45%). The most common type of surgery performed in the study period was total colectomy (n=54, 42%) followed by sigmoidectomy (n=49, 38%), left hemicolectomy (n=18, 14.3%),

Table 1: Postoperative quality of life according to the EORTC QLQ-C30 questionnaire items in different study groups. Data are presented as mean±standard deviation

	Total colectomy	Right hemicolectomy	Left hemicolectomy	Sigmoidectomy	P value
Global health status	83.9±19.3	41.6±35.3	92.1±12.2	79.3±21.5	0.003
Functional scale					
Physical functioning	76.3±30.1	81.9±5.8	88.7±22.3	73.2±32.5	0.31
Role functioning	77.4±38.1	100±0	88.8±32.3	78.9±37.2	0.58
Emotional functioning	76.6±35.6	96.6±4.7	90.1±27.1	80.5±33.1	0.45
Cognitive functioning	72.6±40.9	100	87.9±7.1	77.1±40.1	0.43
Social functioning	73.2±40.4	87.9±32.3	100	77.2±40.6	0.46
Symptom Scale					
Fatigue	13.1±17.2	38.8±54.9	2.4±6.2	23.1±23.6	0.001
Nausea and vomiting	4.7±11.9	6.9±8.3	3.7±10.7	11.5±16.7	0.047
Pain	9.11±16.2	5.9±1.8	7.6±9.8	22.3±3.1	0.11
Dyspnea	6.2±14.7	6.1±2.5	5.5±12.7	6.8±13.5	0.91
Insomnia	7.5±22.3	8.1±2.3	4.1±7.9	10.8±20.8	0.24
Appetite loss	8.8±23.7	19.6±15.8	1.8±7.8	10.2±23.7	0.53
Constipation	1.2±0.5	1.8±2.8	1.2±0.6	1.5±0.7	0.32
Diarrhea	10.2±19.2	5.6±4.1	7.6±17.1	1.8±7.8	0.03
Financial difficulties	34.5±29.2	33.3±2.8	18.5±17.2	80.5±33.1	0.019

and right hemicolectomy (n=7, 5%). Regarding the T stage of the tumor, 11 (8.5%), 16 (12.5%), 41(32%), and 60 (47%) patients were in the T1, T2, T3, and T4 stages, respectively. Also, 65 (50%), 33 (26%), and 30 (24%) patients were in the N0, N1, and N2 stages, respectively. The mean time interval between the operation date and the filing questionnaire date was 41.8±6.9 months, called the adaptation period. There was no statistically significant difference between the adaptation period and type of surgery (P=0.76). However, an interesting finding was the relationship between the adaptation period and global health status score: as the adaptation period got longer, the score became higher (α: 2.3, CI: 2.1–3.9, P=0.001).

The ANOVA test was used to assess the difference between operation types. Also, a post hoc test was used to assess one-by-one differences, revealing a difference in financial difficulties between the total colectomy and left hemicolectomy (P=0.025), and left hemicolectomy and sigmoidectomy (P=0.002). In terms of global health, total colectomy and right hemicolectomy (P=0.003), sigmoidectomy and left hemicolectomy (P=0.02), sigmoidectomy and right hemicolectomy (P=0.009), and left hemicolectomy and right hemicolectomy (P=0.001) had significant differences. The difference observed in ANOVA test regarding diarrhea was between total colectomy and sigmoidectomy (P=0.005). The score for fatigue was significantly different between these two pairs: total colectomy and sigmoidectomy (P=0.012), total colectomy and left hemicolectomy (P=0.049), sigmoidectomy and left hemicolectomy (P<0.0001), and left and right hemicolectomy (P=0.015). Total colectomy and sigmoidectomy (P=0.014) and sigmoidectomy and left hemicolectomy (P=0.043) significantly differed regarding nausea and vomiting. Table 1 provides a summary of the EORTC QLQ-C30 questionnaire scores.

Multivariate analysis showed that after adjusting for T and N stage, age, and gender, the type of surgical resection was an independent risk factor of having lower global health status (OR:3.2, CI:2.9–7.6, P=0.03), financial difficulties (OR:1.4, CI:1.1–3.6, P=0.022), and higher rates of fatigue (OR:2.4, CI:1.8–4.6, P=0.006). This means worsening symptoms and QoL with a greater extent of colon resection.

Discussion

The impact of surgical intervention on postoperative bowel complaints has been described using the EORTC questionnaires (22). Previous studies indicate significantly more abdominal complaints after right colectomy than left colectomy and sigmoidectomy (23). A multifactorial etiology has been proposed to address these types of symptoms (24). One critical factor is that absorptive capacity may change greatly in right-sided resections, where water and electrolyte absorption disturbances occur. Thus, these changes lead to more liquid stool, increased bowel frequency, and a higher risk of fecal incontinence (25). In a study by Heinsbergen et al. (26), low anterior resection syndrome (LARS)-like symptoms including frequency or urgency of stool, clustering of stool, fecal incontinence, and abdominal pain was related to the site of colonic resection, with the highest prevalence of symptoms occurring after sigmoid and right colon resection. The authors rationalized that the higher prevalence of functional bowel complaints in patients who underwent a sigmoid resection is a consequence of a reduced reservoir function of the sigmoid; still, in patients with right-sided colonic resections, the loss of the ileocecal valve function can contribute to impaired bowel function (27).

Few studies have quantified patient-related outcomes after different types of colonic resection. Manceau et al. (28) evaluated bowel function and QoL

after elective subtotal colectomy with ileosigmoid anastomosis. The results of the EORTC QLQ-C30 questionnaires for fifty responders showed that in comparison to the reference group, even though diarrhea was more prevalent in patients with subtotal colectomy and ileosigmoid anastomosis, this group had a significantly better global health status and less pain. In that study, 24% of the study population had to maintain dietary restrictions or routinely use anti-diarrheal medications to establish normal bowel function. Stool urgency and anal seepage were other common complaints. An interesting finding of this study was that the length of the remaining sigmoid colon significantly impacted the number of stools per 24 h, with a cut-off value of 15 cm. Finally, the authors believed that the ileosigmoid anastomosis is associated with preserved function and quality of life besides good oncologic results (28).

A contrary result was reported by You et al. (29). They showed that the complication rate was higher after subtotal colectomy and ileosigmoid anastomosis than after segmental colectomy with colocolic anastomosis, although the difference was not statistically significant. However, bowel function was better after subtotal colectomy and ileosigmoid anastomosis than after total colectomy and ileorectal anastomosis. So, in agreement with Papa et al. (30), if technical variables make it possible, the preservation of a certain length of the sigmoid colon—about 15 cm, i.e., more than 10 cm above the peritoneal reflection—results in preserved bowel function.

Urso et al. (31) evaluated QoL and bowel function in patients who underwent total colectomy with ileorectal anastomosis (TC-IRA) for tumors located 8 to 15 cm from the anal verge. The study group was matched one-to-one by baseline and clinical characteristics with a control group of right hemicolectomy (RH) and left hemicolectomy/sigmoidectomy (LH/SI). The EORTC QLQ-C30 and CR29 questionnaires were sent to 96 patients, and 81% answered. The median follow-up after surgery to questionnaire completion was 60 months. Post-hoc tests revealed that the TC-IRA group had a lower score in constipation and a higher score in diarrhea compared with the other groups. The sore skin score was higher in TC-IRA than LH/SI but similar to RH. Also, the stool frequency score was higher for TC-IRA than for the other groups.

Haanstra et al. (32) enrolled 104 patients: 51 underwent segmental resection, and 53 had TC-IRA. QoL was assessed using the SF-36 and EORTC QLQ-C30 questionnaires, and bowel function was evaluated with the COREFO questionnaire. The result was indicative that even though worse bowel function and social impact were described for TC-IRA, no differences in global health status and overall QoL were observed

Elective colectomies might impact patients' QoL less than expected. These unexpectedly good results in patients who have experienced cancer may originate from the positive changes in their expectations and anxiety (33). Bernhard et al. called this adaptive process in the perception of what constitutes a good QoL, a 'response shift'. In this process, patients reframe their internal standards of health (34). We reported another aspect of this response shift, meaning that the patient's ability to cope with new bowel function may increase over time, leading to enhanced QoL.

Our study has several inherent limitations that should be considered when interpreting our results. The first limitation is the small study population, which limits the generalizability of the results. Another important limitation is the questionnaire used, as it is naturally unable to detect psychological aspects such as anxiety and depression. Hence, more specific questionnaires should be used to assess such matters.

Conclusion

Total colectomy is associated with compromised quality of life and complications which might be difficult for patients to cope with. Hence, there is an everlasting challenge between function preservation and oncologic resection. In this regard, patient-surgeon meetings are mandatory to discuss each resection's postoperative advantages and disadvantages.

Acknowledgment

Authors acknowledge receipt of confirmation of acceptance.

Authors' Contribution

M.N.B, M.R.K, A.S.S Contributed to Conceptualization; and M.S.F Contributed to Methodology; S.M.A and A.K: Contributed to Data acquisition; A.Y and A.K and B.B: Contributed to Formal analysis. All of the authors read the final draft for important intellectual content, approve it to be published, and agree with all aspects of the work for integrity and accuracy.

Consent to Participate

Informed consent to participate in the study was taken from all participants.

Conflicts of interest: None declared.

References

1. Knudsen AB, Rutter CM, Peterse EFP, Lietz AP, Seguin CL, Meester RGS, et al. Colorectal cancer screening: an updated modeling study for the US Preventive Services Task Force. JAMA. 2021;325(19):1998-2011.
2. Manceau G, Benoist S, Panis Y, Rault A, Mathonnet M, Goere D, et al. Elective surgery for tumours of the splenic flexure: a French intergroup (AFC, SFCD, FRENCH, GRECCAR) survey. Tech Coloproctol. 2020;24(2):191-8.
3. Yde J, Larsen HM, Laurberg S, Krogh K, Moeller HB. Chronic diarrhoea following surgery for colon cancer—frequency, causes and treatment options. Int J Colorectal Dis. 2018;33(6):683-94.
4. Thong MSY, Jansen L, Chang-Claude J, Hoffmeister M, Brenner H, Arndt V. Association of laparoscopic colectomy versus open colectomy on the long-term health-related quality of life of colon cancer survivors. Surg Endosc. 2020;34(12):5593-603.
5. Møller P, Seppälä TT, Bernstein I, Holinski-Feder E, Sala P, Evans DG, et al. Cancer risk and survival in path_MMR carriers by gene and gender up to 75 years of age: a report from the Prospective Lynch Syndrome Database. Gut. 2018;67(7):1306-16.
6. Aoyama T, Kashiwabara K, Oba K, Honda M, Sadahiro S, Hamada C, et al. Clinical impact of tumor location on the colon cancer survival and recurrence: analyses of pooled data from three large phase III randomized clinical trials. Cancer medicine. 2017;6(11):2523-30.
7. Hope C, Reilly J, Lund J, Andreyev HJN. Systematic review: the effect of right hemicolectomy for cancer on postoperative bowel function. Support Care Cancer. 2020;28:4549-59.
8. Wrenn SM, Cepeda-Benito A, Ramos-Valadez DI, Cataldo PA. Patient perceptions and quality of life after colon and rectal surgery: what do patients really want? Dis Colon Rectum. 2018;61(8):971-8.
9. Pedrazzani C, Turri G, Park SY, Hida K, Fukui Y, Crippa J, et al. Clinical–Pathologic Characteristics and Long-term Outcomes of Left Flexure Colonic Cancer: A Retrospective Analysis of an International Multicenter Cohort. Dis Colon Rectum. 2020;63(12):1593-601.
10. Theodoropoulos GE, Karantanos T, Stamopoulos P, Zografos G. Prospective evaluation of health-related quality of life after laparoscopic colectomy for cancer. Tech Coloproctol. 2013;17(1):27-38.
11. Martínez-Pérez A, Brunetti F, Vitali GC, Abdalla S, Ris F, de'Angelis N. Surgical treatment of colon cancer of the splenic flexure: a systematic review and meta-analysis. Surg Laparosc Endosc Percutan Tech. 2017;27(5):318-27.
12. Yamaguchi S, Tashiro J, Araki R, Okuda J, Hanai T, Otsuka K, et al. Laparoscopic versus open resection for transverse and descending colon cancer: Short□term and long□term outcomes of a multicenter retrospective study of 1830 patients. Asian journal of endoscopic surgery. 2017;10(3):268-75.
13. Reali C, Bocca G, Lindsey I, Jones O, Cunningham C, Guy R, et al. Influence of incorrect staging of colorectal carcinoma on oncological outcome: are we playing safely? Updates Surg. 2021:1-7.
14. Baloyiannis I, Perivoliotis K, Ntellas P, Dadouli K, Tzovaras G. Comparing the safety, efficacy, and oncological outcomes of laparoscopic and open colectomy in transverse colon cancer: a meta-analysis. Int J Colorectal Dis. 2020;35(3):373-86.
15. De Simoni O, Barina A, Sommariva A, Tonello M, Gruppo M, Mattara G, et al. Complete mesocolic excision versus conventional hemicolectomy in patients with right colon cancer: a systematic review and meta-analysis. Int J Colorectal Dis. 2021;36(5):881-92.
16. Crippa J, Grass F, Achilli P, Behm KT, Mathis KL, Day CN, et al. Surgical Approach to Transverse Colon Cancer: Analysis of Current Practice and Oncological Outcomes Using the National Cancer Database. Dis Colon Rectum. 2021;64(3):284-92.
17. Park Hm, Lee J, Lee SY, Kim CH, Kim HR. Distribution of lymph node metastasis and oncological outcomes of mid□transverse colon cancer: extended versus transverse colectomy. Colorectal Dis. 2021.
18. Clouth FJ, Moncada□Torres A, Geleijnse G, Mols F, van Erning FN, de Hingh IHJT, et al. Heterogeneity in quality of life of long□term colon cancer survivors: a latent class analysis of the population□based PROFILES registry. The oncologist. 2021;26(3):e492-e9.
19. Aaronson NK, Ahmedzai S, Bergman B, Bullinger M, Cull A, Duez NJ, et al. The European Organization for Research and Treatment of Cancer QLQ-C30: a quality-of-life instrument for use in international clinical trials in oncology. JNCI: Journal of the National Cancer Institute. 1993;85(5):365-76.
20. Ameri H, Yousefi M, Yaseri M, Nahvijou A, Arab M, Sari AA. Mapping EORTC-QLQ-C30 and QLQ-CR29 onto EQ-5D-5L in colorectal cancer patients. Journal of gastrointestinal cancer. 2020;51(1):196-203.
21. Fayers P, Bottomley A, Group EQoL. Quality of life research within the EORTC—the EORTC QLQ-C30. European Journal of Cancer. 2002;38:125-33.
22. Theodoropoulos GE, Papanikolaou IG, Karantanos T, Zografos G. Post-colectomy assessment of gastrointestinal function: a prospective study on colorectal cancer patients. Tech Coloproctol. 2013;17(5):525-36.
23. Ohigashi S, Hoshino Y, Ohde S, Onodera H. Functional outcome, quality of life, and efficacy of probiotics in postoperative patients with colorectal cancer. Surg Today. 2011;41(9):1200-6.
24. Vather R, O'Grady G, Arkwright JW, Rowbotham DS, Cheng LK, Dinning PG, et al. Restoration of normal colonic motor patterns and meal responses after distal colorectal resection. Journal of British Surgery. 2016;103(4):451-61.
25. Emmertsen KJ, Laurberg S, Jess P, Madsen MR, Nielsen HJ, Ovesen AU, et al. Impact of bowel dysfunction on quality of life after sphincter-preserving resection for rectal cancer. Journal of British Surgery. 2013;100(10):1377-87.
26. Van Heinsbergen M, den Haan N, Maaskant□Braat AJ, Melenhorst J, Belgers EH, Leijtens JW, et al. Functional bowel complaints and quality of life after surgery for colon cancer: prevalence and predictive factors. Colorectal Dis. 2020;22(2):136-45.
27. Ekkarat P, Boonpipattanapong T, Tantiphlachiva K, Sangkhathat S. Factors determining low anterior resection syndrome after rectal cancer resection: a study in Thai patients. Asian J Surg. 2016;39(4):225-31.
28. Manceau G, d'Annunzio E, Karoui M, Breton S, Rousseau G, Blanchet AS, et al. Elective subtotal colectomy with ileosigmoid anastomosis for colon cancer preserves bowel function and quality of life. Colorectal Dis.

2013;15(9):1078-85.
29. You YN, Chua HK, Nelson H, Hassan I, Barnes SA, Harrington J. Segmental vs. extended colectomy: measurable differences in morbidity, function, and quality of life. Dis Colon Rectum. 2008;51(7):1036-43.
30. Papa MZ, Karni T, Koller M, Klein E, Scott D, Bersuk D, et al. Avoiding diarrhea after subtotal colectomy with primary anastomosis in the treatment of colon cancer. J Am Coll Surg. 1997;184(3):269-72.
31. Urso EDL, Celotto F, Giandomenico F, Gavaruzzi T, Del Bianco P, Lotto L, et al. Analysis of morbidity and mortality, quality of life and bowel function after total colectomy with ileorectal anastomosis versus right and left hemicolectomy: A study to optimise the treatment of lynch syndrome and attenuated polyposis coli. Eur J Surg Oncol. 2020;46(9):1613-9.
32. Haanstra JF, tot Nederveen WHdV, Gopie JP, Vecht J, Vanhoutvin SALW, Cats A, et al. Quality of life after surgery for colon cancer in patients with Lynch syndrome: partial versus subtotal colectomy. Dis Colon Rectum. 2012;55(6):653-9.
33. Quintana JM, González N, Bilbao A, Aizpuru F, Escobar A, Esteban C, et al. Predictors of patient satisfaction with hospital health care. BMC Health Serv Res. 2006;6(1):1-9.
34. Bernhard J, Hürny C, Maibach R, Herrmann R, Laffer U, Swiss Group for Clinical Cancer R. Quality of life as subjective experience: Reframing of perception in patients with colon cancer undergoing radical resection with or without adjuvant chemotherapy. Ann Oncol. 1999;10(7):775-82.