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Sexual (dys)function and the quality of sexual life in patients with colorectal cancer: a systematic review

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Background: To determine (i) the prevalence of sexual (dys)function in patients with colorectal cancer and (ii) treatment-related and sociodemographic aspects in relation to sexual (dys)function and the quality of sexual life. Recommendations for future studies are provided.

Methods: A systematic search was conducted during the period 1990 to July 2010 that used the databases PubMed, PsychINFO, The Cochrane Library, EMBASE, and OVID Medline.

Results: Eighty-two studies were included. The mean quality score was 7.2. The percentage of preoperatively potent men that experienced sexual dysfunction postoperatively varied from 5% to 88%. Approximately half of the women reported sexual dysfunction. Preoperative radiotherapy, a stoma, complications during or after surgery, and a higher age predicted more sexual dysfunction with a strong level of evidence. Type of surgery and a lower tumor location predicted more sexual dysfunction with a moderate level of evidence. Insufficient evidence existed for predictors of the quality of sexual life. Current studies mainly focus on biological aspects of sexual (dys)function. Furthermore, existing studies suffer from methodological shortcomings such as a cross-sectional design, a small sample size, and the use of nonstandardized measurements.

Conclusion: Sexuality should be investigated prospectively from a biopsychosocial model, hereby including the quality of sexual life.

Key words: colorectal cancer, quality of sexual life, sexual dysfunction, sexual functioning, sexuality, systematic review

Introduction

Worldwide, colorectal cancer is the third most common cancer in men (10%), after lung cancer (17%) and prostate cancer (14%), and the second most common cancer in women (9%) after breast cancer (22%) (www.globocan.iarc.fr).

Despite improvements in the multimodality treatment of colorectal cancer, surgery remains the only treatment offering a chance of cure. For colon cancer, surgery is aimed at total resection of the tumor with adequate margins and lymphadenectomy (i.e. colectomy) [1]. In general, the remaining parts of the colon are anastomosed together to create a functioning colon; however, sometimes a temporary colostomy may be constructed [2]. For rectal cancer, different surgical approaches are warranted. An anterior resection (AR), with preservation of the sphincter function, is carried out for tumors located in the middle or upper part of the rectum. For very low tumors, an abdominal perineal resection (APR) is carried out, hereby resecting the anal sphincter and forming a permanent colostomy [1]. In general, surgery that includes total

mesorectal excision (TME) offers the best results [3]. Colon cancer can be safely treated by open or laparoscopic surgery [4]; however, laparoscopic rectal cancer surgery is in the experimental phase [5]. Preoperative radiation therapy (PRT) or preoperative chemoradiation therapy (PCRT) leads to an additional reduction of local recurrence rates [6, 7].

Although oncologic cure and overall survival are the main goals of treatment, functional results such as fecal incontinence, urinary functioning, and sexual functioning are also important. Furthermore, patient-centered outcomes, such as quality of life, are regarded as key measurements in assessing outcomes of interventions [8]. Quality of life is a multidimensional construct, incorporating at least physical, psychological, and social well-being [9]. Sexuality and intimacy are considered central to a person's well-being and are, as such, important aspects of quality of life [10]. Poor sexual functioning and a lower sexual satisfaction are risk factors for a worse quality of life [11]. Sexual functioning refers to the normal performance standards of the sexual response cycle [12], which consists of four phases: desire, excitement, orgasm, and resolution [13]. A sexual dysfunction is characterized by a disturbance in this sexual response cycle or by pain associated with intercourse [14]. In line with the distinction between health status (i.e. the impact of disease on functioning) and quality of life (i.e. the

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subjective evaluation of this functioning) [15–17], a similar distinction can be made between sexual (dys)function and the quality of sexual life. Sexual (dys)function refers mainly to the biological aspects of sexuality (e.g. ‘When you had sexual stimulation or intercourse, how often did you reach orgasm?’), while the quality of sexual life takes into account the person’s subjective evaluation of his/her sexual functioning (e.g. ‘How satisfied were you with your ability to reach orgasm during sexual activity or intercourse?’).

Several authors have emphasized the assessment of sexual (dys)function from a biopsychosocial perspective [12, 18]. Hereby, are not only treatment-related aspects important (e.g. the type of surgery and (neo)adjuvant treatments) but also psychosocial factors (e.g. mood, the partner relationship, and the subjective evaluation of the current functioning). These factors may have a direct or indirect effect on sexual (dys)function or the quality of sexual life. For instance, sexual function can not only be directly affected by surgical treatment [19] or by PRT or PCRT [20–22] but can also be indirectly affected due to the potential loss of sphincter function, accompanied with a stoma [20, 23].

Published research focused on several aspects associated with sexual dysfunction in patients with colorectal cancer. To our knowledge, an overview of these studies has not yet been published. Knowledge of how colorectal cancer and its treatment affect patients will give health professionals opportunities to adequately support this patient group. The objective of this qualitative systematic review was to provide an overview of studies that addressed sexual (dys)function and/or the quality of sexual life in colorectal cancer with regard to (i) the prevalence of sexual (dys)function and (ii) treatment-related and sociodemographic aspects in relation to sexual (dys)function and/or the quality of sexual life.

methods

search strategy

A search of the literature was carried out in PubMed (196 hits), Ovid Medline (328 hits), PsychINFO (7 hits), The Cochrane Library (67 hits), and EMBASE (534 hits). The databases were searched with combinations of colorectal cancer* (colon cancer*, colonic cancer*, rectal cancer*, colorectal cancer*, rectum cancer*, colon tumo*, colonic tumo*, rectal tumo*, colorectal tumo*, rectum tumo*, colon neoplas*, colonic neoplas*, rectal neoplas*, colorectal neoplas*, rectum neoplas*) and combinations of sexual funct* (sexual behav*, sex behav*, sexual funct*, sex funct*, ‘sexual and gender disorders’, sexual disorder*, sex disorder*, sexual dysfunct*, sex dysfunct*, dyspareun*, erect*, coit*, ‘quality of sexual life’, ‘sexual quality of life’). The search was restricted to studies published from 1990 to July 2010 in English or Dutch journals. Only original reports were included. Subsequently, the reference lists of included studies were checked in order to identify studies that were not found in the computerized database searches.

selection criteria

Studies that met the following criteria were included: (i) the studies investigated sexual (dys)function and/or the quality of sexual life as a primary or secondary objective; (ii) the study population exclusively concerned patients with colon and/or rectal cancer; (iii) sexual (dys)function and/or the quality of sexual life were measured by self-report or an interview; (iv) the studies were original full reports published in English or Dutch; (v) studies were published in peer-reviewed journals; (vi)

studies reported on patient populations recruited after 1989 since in the past two decades substantial improvements in surgical techniques have taken place, such as the introduction of TME [24].

data extraction

Combining the search results and removing duplicates resulted in 698 hits. Two authors (MJT and BLDO) applied the described inclusion criteria independently in a standardized manner. Disagreements between the two reviewers (<5%) were resolved in a consensus meeting. Altogether, 590 articles were excluded based on title and abstract. Hard copies were obtained of 108 studies, of which 81 met the selection criteria. With regard to multiple reports on the same study, only one article was included based on the highest quality score. If studies were of equal quality, only the most recent study was included. Six articles were excluded based on this criterion. Through a hand search, seven additional articles were found that met the selection criteria. Thus, a total of 82 articles remained. The flow chart of study selection is shown in Figure 1.

quality assessment

The methodological quality of the selected studies was independently assessed by two reviewers (MJT and BLDO) using a criteria list (Table 1). This checklist was based on established criteria lists for systematic reviews that have been previously published [25, 26]. The maximum attainable score is 15. If a criterion is not sufficiently fulfilled or not explicitly mentioned, a 0 is scored. Studies scoring $\geq 70\%$ of the maximum attainable score (i.e. ≥ 11 points) were considered to be of a ‘high quality’. Studies of a ‘moderate quality’ scored between 50% and 70%, while studies scoring <50% (i.e. ≤ 7 points) were considered as ‘low quality’.

levels of evidence

After the individual quality of the studies was assessed, the level of evidence was determined for predictors of sexual dysfunction and the quality of sexual life. Findings were considered consistent if $\geq 75\%$ of the studies that investigated a particular predictor showed the same direction of association. Table 2 provides an overview of the four levels of evidence.

data synthesis

The included studies investigated diverse outcomes (i.e. different phases and aspects of the sexual response cycle) in various patient populations, using different study designs. Therefore, a quantitative approach (i.e. a meta-analysis) was not possible. The information extracted from the individual reports is summarized in the supplemental Table S1 (available at *Annals of Oncology* online). As said, various biopsychosocial factors may have an effect on sexual (dys)function and the quality of sexual life. Unfortunately, most of the current studies focus on treatment-related or sociodemographic aspects of sexual dysfunction, hereby neglecting psychosocial factors that may influence sexual (dys)function and/or the quality of sexual life. In addition, in the current studies, it is difficult to identify the contribution of each aspect in the development of sexual dysfunction or changes in the quality of sexual life.

In this review, the prevalence of sexual dysfunction is described for both men and women. Subsequently, treatment-related predictors and sociodemographic predictors of sexual dysfunction and the quality of sexual life are discussed. The main results of the prospective and cross-sectional studies are presented, which are specified for men and women when applicable.

results

methodological quality

There was <5% disagreement between the two reviewers when scoring the articles. These disagreements were mainly due to

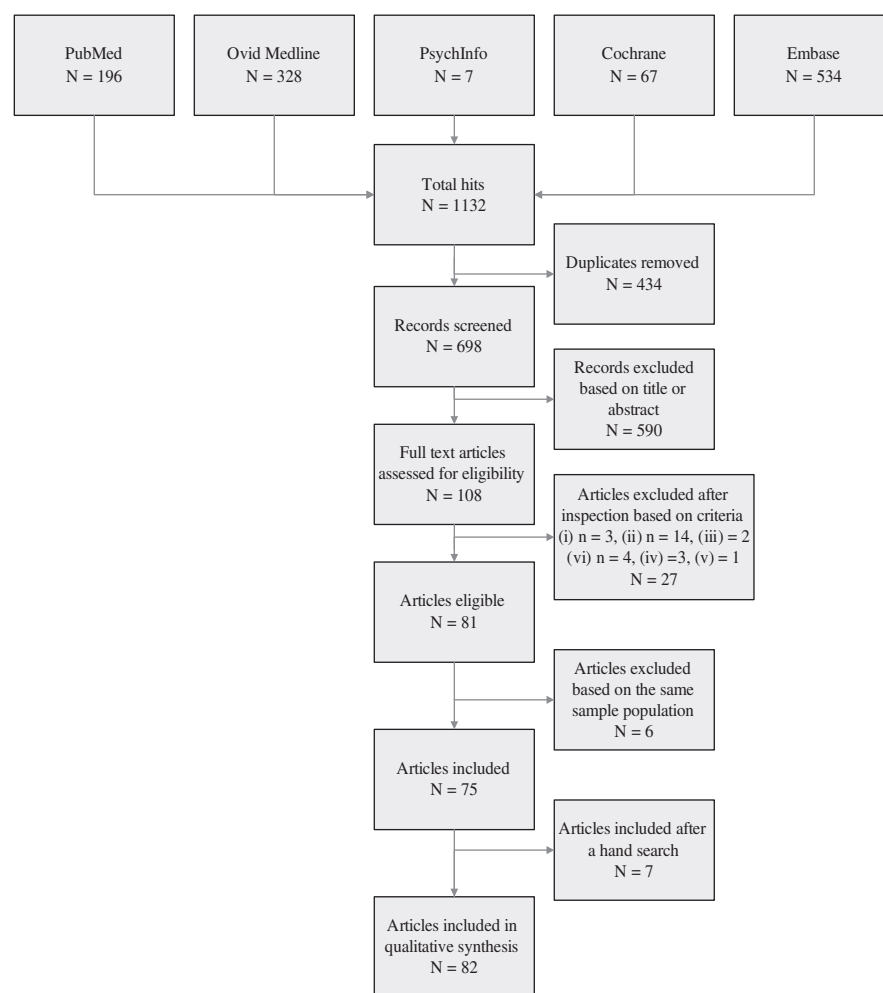


Figure 1. Study selection process.

differences in applying criterion I. The disagreements were solved through discussion in a consensus meeting. The quality scores ranged from 3 (low quality) [27–30] to 12 (high quality) [20, 31]. The mean quality score was 7.2 (3–12; standard deviation = 2.2). Methodological shortcomings mainly concerned the following items: describing potential prognostic factors by using multivariate analyses or structural equation modeling (criterion G; 81%); participation rates for patient groups are described and these rates are exceeding 75% (criterion H; 73%); information is given about the ratio nonresponders versus responders (criterion I; 95%); the design is longitudinal (criterion L; 82%); and the loss to follow-up is described and is <20% (criterion N; 90%).

study characteristics

Sample sizes ranged from 4 [32] to 1437 [33]. In total, 39 (48%) studies investigated sexual (dys)function as a secondary objective (as part of clinical outcome studies or as part of studies on health-related quality of life/health status) [23, 29, 33–69]. The majority of studies were cross-sectional, except for 36 (44%) studies [5, 20, 21, 23, 27, 30, 31, 35, 37, 38, 41, 44, 46, 48, 50, 54, 57, 60, 61, 66, 67, 70–80]. Of the prospective studies, seven studies failed to define the exact postoperative

measurement point [48, 71, 73, 76, 79, 81, 82]. Six studies investigated the results of a randomized trial [20, 35, 37, 44, 46, 66]. The study duration ranged from 3 months [30, 54] up to 5 years [21]. Four studies used a healthy population as a control group [32, 42, 63, 73]; one study investigated both patients and their caregivers [64]. Postoperative sexual (dys)function in men was investigated in 28 (34%) studies [5, 22, 27, 29, 30, 35, 45, 54, 62, 67, 70–72, 74–76, 79, 80, 83–92], 7 (9%) studies investigated women [21, 28, 32, 93–96], and 47 (57%) studies investigated both men and women [20, 23, 31, 33, 34, 36, 38–44, 46, 48–53, 55–61, 63–66, 68, 69, 73, 77, 78, 81, 82, 97–102]. The results were mainly presented for sexually active patients; however, not all patients were sexually active or willing to answer questions concerning sexual (dys)function and/or the quality of sexual life.

Six different standardized self-report instruments were applied. The colorectal cancer-specific European Organization for Research and Treatment of Cancer Quality of Life Questionnaire (EORTC QLQ-CR38) [104] was most used in 23 (28%) studies [23, 33–36, 39–43, 47, 48, 50–52, 57, 58, 63–66, 99]. Regarding sexual (dys)function and the quality of sexual life, the EORTC QLQ-CR38 measures sexual functioning, sexual enjoyment, and sexual dysfunction in men and women with five questions. For men, the International Index of Erectile

Table 1. List of criteria for assessing the methodological quality of studies on sexual (dys)function and/or the quality of sexual life in patients with colorectal cancer

<p>Positive if</p> <p>Sexual (dys)function and/or the quality of sexual life assessment</p> <p>A. A psychometrically sound questionnaire is used</p> <p>B. Examining sexual (dys)function and/or the quality of sexual life was a primary objective of the study</p> <p>Study population concerning sexual (dys)function and/or the quality of sexual life</p> <p>C. Examining both men and women</p> <p>D. A description is included of at least two sociodemographic variables (e.g. age, sex, employment status, educational status, etc.)</p> <p>E. A description is present of at least two clinical variables (e.g. TNM or Dukes classification, type of surgery, tumor location, etc.)</p> <p>F. Inclusion and/or exclusion criteria are provided</p> <p>G. The study describes potential prognostic factors by using multivariate analyses or structural equation modeling</p> <p>H. Participation rates for patient groups are described (defined as the percentage of eligible patients who gave their informed consent) and these rates are >75%</p> <p>I. The ratio nonresponders versus responders is given (defined as the ratio of patients who withdrew their initial informed consent), including reasons for withdrawal</p> <p>Study design concerning sexual (dys)function and/or the quality of sexual life</p> <p>J. The study sample includes at least 75 patients (arbitrarily chosen).</p> <p>K. The collection of data is prospectively gathered with at least two assessment points</p> <p>L. The design is longitudinal (>1 year)</p> <p>M. The process of data collection is described (e.g. interview or self-report, etc.)</p> <p>N. The loss to follow-up is described and is <20%</p> <p>Results</p> <p>O. The results are compared between two groups or more (e.g. healthy population, groups with different disease stages or treatment types)</p>
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TNM, tumor–node–metastasis.

Function (IIEF) [105] was most assessed in 13 (16%) studies [5, 22, 45, 66, 68, 70, 73, 74, 76, 87, 98–100]. The IIEF is a 15-item questionnaire that evaluates men’s sexual functioning, including erectile function, orgasmic function, sexual desire, intercourse satisfaction, and overall satisfaction. The most used female counterpart was the Female Sexual Function Index (FSFI) [106], which was used in 3 (4%) studies [66, 68, 95, 99]. The FSFI is a 19-item questionnaire addressing six domains of women’s sexual function: arousal, lubrication, orgasmic function, sexual desire, intercourse satisfaction, and sexual pain.

Several studies used a combination of instruments; however, 43 (52%) studies used nonstandardized assessments [20, 21, 27–31, 37, 38, 44, 46, 49, 53–56, 60–62, 67, 69, 72, 75, 77–83, 85, 86, 88–94, 96, 97, 101–103]. One study investigated sexual (dys)function based on a single question: ‘Did your health status and/or treatment cause your sexual life to decline?’ [46]. Most studies described at least 2 demographic and clinical variables of interest. The most reported demographic variables were age and sex; frequently represented clinical variables were type of surgery, tumor–node–metastasis stage, distance of the tumor from the anal verge, and (neo)adjuvant therapies. Patients with rectal cancer were investigated in 66 (81%) studies [5, 20–22, 27, 29–31, 34–54, 57–62, 70, 71, 73–81, 83, 85, 87–89, 91, 93, 96, 97, 98–100, 102, 103], 2 (2%) studies concerned patients with colon cancer [68, 69], and 14 (17%) studies investigated patients with colon or rectal cancer [23, 28, 33, 63–67, 82, 84, 86, 92, 94, 95]. Therefore, results presented will concern patients with rectal cancer unless explicitly mentioned.

the prevalence of sexual (dys)function in patients with colorectal cancer

Preoperatively, the percentage of sexually active men varied from 37% [78] to 79% [20] across studies. The percentage of preoperatively potent men that experienced sexual dysfunction postoperatively varied from 5% [98] to 88% [88]. Compared with preoperative scores, a postoperative increase in erectile dysfunction [5, 20, 27, 30, 71, 72, 78, 80, 82, 98] and/or ejaculatory dysfunction [20, 22, 30, 54, 78, 80] was most reported. In addition, sexual desire decreased postoperative [5, 22, 76].

The percentage of preoperatively sexually active women ranged from 27% [78] to 78% [68]. Women who were sexually active preoperatively remained sexually active postoperative [77, 96]. Women reported sexual dysfunction such as dyspareunia [20, 21, 82] and vaginal dryness [20, 99]. Twelve months after treatment, sexual desire remained unchanged in women [77].

For both men and women, the prevalences of sexual (dys)function found in cross-sectional studies did not deviate significantly from the results of the above-mentioned prospective studies.

treatment-related aspects in relation to sexual (dys)function

(P)RT predicted sexual dysfunction with a strong level of evidence [20–22, 75, 99]. Radiation therapy (RT) predicted less sexual activity in both men and women [75, 99] and erectile

Table 2. Levels of evidence

Level of evidence	Criteria
Strong	Consistent findings ($\geq 75\%$) in at least two high-quality studies or one high-quality study and at least three moderate studies
Moderate	Consistent findings ($\geq 75\%$) in one high-quality study and at least one low-quality study or at least three moderate studies
Weak	Findings of two moderate studies or consistent findings ($\geq 75\%$) in at least three or more low-quality studies
Inconclusive	Inconsistent findings irrespective of study quality or less than three low-quality studies available

and orgasmic dysfunction in men [75]. PRT predicted ejaculatory dysfunction in men [20, 75] and dyspareunia in women [21]. (Neo)adjuvant chemoradiation predicted erectile dysfunction [22] and sexual desire [76] in men. Compared with scores before PRT, sexual dysfunction was higher at 12 months follow-up [20, 50, 71]. Cross-sectional studies revealed the same direction of association; more sexual (dys)function was reported by patients who received PRT [52, 53, 90].

Having a stoma was a predictor of sexual dysfunction with a strong level of evidence [20, 23]. Sexual dysfunction was more often present in stoma patients compared with nonstoma patients up to 24 months after surgery [20, 23, 63, 87].

Perioperative or postoperative complications predicted sexual dysfunction with a strong level of evidence [20, 21, 66]. Excessive perioperative blood loss (>1500 ml) and anastomotic leakage predicted erectile dysfunction, while anastomotic leakage also predicted ejaculatory problems [20]. Patients with intra-abdominal sepsis were less likely to achieve excitement postoperatively [21]. Conversion from laparoscopic to open surgery predicted postoperative sexual dysfunction in men [66].

Type of surgery predicted sexual dysfunction with a moderate level of evidence [21, 22, 66, 97, 99, 102]. Patients in a colonic resection group reported more sexual desire and sexual activity at 3 months follow-up compared with a rectal resection group, although levels were similar at 6 months [66]. Cross-sectional studies also found less sexual dysfunction after a colonic versus rectal cancer surgery [65, 95]. In rectal cancer surgery, APR predicted less sexual activity [99], more erectile dysfunction in men [97], and more dyspareunia in women [97]. Less sexual dysfunction was reported in patients who underwent AR compared with patients who underwent APR up to 12 months after surgery [5, 21, 22, 41, 102]. In concordance, cross-sectional studies ruled in favor of AR [34, 51, 52, 97, 99]. Mixed results were found regarding laparoscopic versus open surgery for rectal cancer; some studies rule in favor of laparoscopic surgery [85, 98], others for open surgery [22, 100], and some remain inconclusive [5, 41]. Finally, pelvic autonomic nerve preservation (PANP) yielded good results in terms of sexual (dys)function [68, 70, 77]. The degree of sexual dysfunction depended on the degree of PANP [72]. Cross-sectional studies confirm these results [62, 83].

A lower tumor location predicted sexual dysfunction with a moderate level of evidence [22, 76, 84]. A smaller distance between the tumor and the anal verge predicted erectile dysfunction [22, 76, 84], intercourse satisfaction [76], and orgasmic functioning [76].

Inconclusive evidence was found for tumor stage [75] and time since surgery [75, 76].

sociodemographic aspects in relation to sexual dysfunction

An elderly age predicted sexual dysfunction with a strong level of evidence [20, 21, 75, 76, 81, 97, 99]. Cross-sectional studies revealed a similar association [29, 84, 93, 97, 99, 103, 107]. An increasing age predicted a loss of sexual activity [20, 21, 75, 81, 97, 99] and worse orgasmic functioning [21, 75, 81]. For women, an increasing age predicted worse arousal, less dyspareunia, and less intercourse per month [21]. For men, a higher age predicted lower sexual desire [76] and worse erectile functioning [75, 84].

How being a man or a woman influences sexual (dys)function remains unclear. Women were found to be less sexually active [20]. Although both sexually active men and women suffered from sexual dysfunction, a trend notified of more sexual dysfunction in men compared with women up to 24 months after surgery [20, 69].

treatment-related and sociodemographic aspects in relation to quality of sexual life

Insufficient evidence was found for the predictive value of treatment-related or sociodemographic factors on the quality of sexual life. Type of operation (APR versus AR or a transanal excision) and RT predicted a positive answer on the statement 'surgery made my sexual life worse' [99]. Limited moderations were seen for sexual enjoyment in the first year after surgery [48, 50, 57]. Patients in the colonic resection group reported more sexual enjoyment compared with patients in the rectal resection group [66]. Compared with healthy controls, patients with rectal cancer reported lower scores on sexual enjoyment [63]. A worse quality of sexual life was found for stoma patients compared with nonstoma patients [64].

For men, sexual satisfaction decreased after surgery [5, 38, 76]. Cross-sectional studies revealed the same association [74, 86]. At a median follow-up period of 5 years, 64% of men reported to be unsatisfied with their current sexual functioning [88]. Few studies have examined sexual satisfaction/experiences in women. However, one qualitative study examined how women with permanent ostomies restructure their ideas of sexuality [94]. Some women did not present long-term challenges and were able to have intercourse with their husbands, while other women had to find other erotic activities, such as oral sex. Thus, these women were able to maintain a sexual relationship. Other women chose not to be sexually active anymore because of their age or because they were unable to reconcile their own experience of disgust or the potential reactions of a sexual partner to their ostomy. This study concluded that neither sexual nor intimate acts were essential to

the well-being of these women. Sexual satisfaction was lower for stoma than for nonstoma patients in one study [86] but not in another one [93].

No studies reported on the association between sociodemographic factors and the quality of sexual life.

discussion

The objective of this qualitative systematic review was to provide an overview of studies that addressed sexual (dys)function and/or the quality of sexual life in colorectal cancer, with regard to (i) the prevalence of sexual (dys)function and (ii) treatment-related and sociodemographic aspects in relation to sexual (dys)function and the quality of sexual life.

This review included 82 studies. However, measuring sexual (dys)function and/or the quality of sexual life was a secondary objective in 39 (48%) of the studies. Since the selected studies differed regarding the targeted study population, study design, and outcome measures, definite conclusions regarding the prevalence of sexual (dys)function and clinical and sociodemographic factors associated with sexual (dys)function and the quality of sexual life cannot be made.

Methodologically, there is room for improvement. Approximately half of the studies were cross-sectional. In order to detect short-term and long-term effects is necessary to use a prospective design with an assessment point before surgical treatment and measurement points up to at least 1 year postoperative. In addition, the sample sizes of most studies were rather small. Besides, more data are collected for men, perhaps partially due to the fact that women were more reluctant to answer questions concerning sexuality [43, 48, 101]. To draw meaningful conclusions on differences between men and women, future large sample studies should focus on both sexes.

Furthermore, most studies used nonstandardized measurements, which hampers comparisons across studies. Most studies measured sexual (dys)function and/or the quality of sexual life with a limited number of questions. Also, in several instruments (e.g. EORTC QLQ-CR38), questions are only completed if the person indicated to be sexually active. Furthermore, most questionnaires did not provide definitions for the concepts used such as 'sexual activity'. Some patients will interpret sexual activity as sexual intercourse, while others might feel that intimacy, touching, and kissing constitute sexual activity. It is therefore difficult to draw meaningful conclusions from the current data. In future studies, an explicit definition of the concept of interest is warranted. The selection of instruments should be based on systematic reasoning and will depend on how the objectives and the concepts of interest are conceptualized [25]. If the study objective is to measure sexual (dys)function after a colorectal cancer treatment, the use of more biomedical instruments (e.g. the FSFI for women, the IIEF for men, or physiological measurements) is satisfactory. If the objective is to describe the subjective evaluation of a patient's sexual (dys)function, then instruments measuring the quality of sexual life are needed, such as the Golombok Rust Inventory of Sexual Satisfaction [108]. However, as pointed out by Arrington et al. [109], the best way to measure sexual function remains uncertain. To

our knowledge, there are still no questionnaires available that are suitable for both sexes of all sexual preferences in both healthy and cancer populations. In this perspective, qualitative methodologies may be a good starting point in order to examine the experience and meaning of sexuality.

The reviewed studies mostly evaluated sexual intercourse and/or the presence of a sexual dysfunction, while other aspects of sexuality (e.g. oral sex, hugging or kissing, and the quality of sexual life) were often omitted. Moreover, having a sexual dysfunction may lead to a diminished quality of sexual life, though this is not a necessity. Patients may have a sexual dysfunction (e.g. erectile dysfunction) without being bothered by it; in turn, they may also experience a diminished quality of sexual life (e.g. due to a low sexual desire) without having an apparent sexual dysfunction [12]. Furthermore, the current heteronormative vision of sexuality (i.e. the vision that sexual and marital relations are between a man and a woman) limits the way we think about sexuality and/or capturing its experience and meaning. For instance, questionnaires assessing sexuality can only be filled in by persons in a heterosexual relationship (e.g. 'Do you find your vagina is so tight that your partner's penis can't enter it?' for women and 'How often were you able to penetrate (enter) your partner?' for men). Sexuality should be seen from a biopsychosocial perspective, hereby taking into account the quality of sexual life. Moreover, the relationship between psychosocial factors (e.g. self-esteem, body image, fatigue, loss of independence, depressive symptoms, personality characteristics, and the partners' feelings about the patients' disease or appearance) and sexual (dys)function and/or the quality of sexual life in patients with colorectal cancer should be investigated more extensively. Though patients with colon cancer may have better functional results, it can be expected that they suffer from psychosocial problems to the same extent as patients with rectal cancer.

In addition, little is known on how partners of patients with colorectal cancer cope with the changed situation and on the interaction between partners and patients, even though it is known that a sexual dysfunction and the lack of affection are some of the most commonly identified marital problems in couples with an ill partner [110]. Furthermore, it would be interesting to investigate if there are nonsexual forms of intimacy that may replace sexual activity but still enable a couple to experience companionship and to maintain a satisfactory relationship. The partner relationship satisfaction is an important aspect of psychological well-being and thus quality of life. A diminished marital satisfaction may therefore diminish quality of life. Overall, knowledge on these topics is a prerequisite for providing adequate support for patients with colorectal cancer and their partners.

Finally, colorectal cancer is a disease that mostly affects the elderly. There has been an ongoing debate on whether or not sexual dysfunction in a higher age is normal or pathological [111]. A recent cross-sectional study reported lower sexual functioning for patients with colorectal cancer compared with an age-matched general population [112]. This may indicate that colorectal cancer causes an additional negative effect on sexual functioning. Future research should investigate the effect of sociodemographic variables, such as age and gender, more extensively.

There is an important task for researchers to provide more information on the potential effects of a colorectal cancer diagnosis and/or the effects of treatment to health professionals so that they in turn can inform patients on the possible outcomes of multimodality treatment. Information about the nature of treatment, including the side-effects (both biological and psychosocial) that can occur, gives patients the opportunity to include sexual issues in the decision-making process [113]. However, only 1 of 10 patients remembered discussing sexual effects of treatment before surgery [99]. If the professional initiates such a discussion, this may act in an empowering way to give license to patients to discuss these issues.

conclusions

Most studies on sexual (dys)function following colorectal cancer surgery suffer from methodological problems, such as a cross-sectional design, a small sample size, and the use of nonstandardized measurements. In future research, sexuality should be investigated prospectively from a biopsychosocial model. In this biopsychosocial model, the subjective evaluation of sexual (dys)function, hence the quality of sexual life, and psychological factors associated with or predictive of sexual (dys)function and the quality of sexual life should be taken into account.

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