

ORIGINAL ARTICLE

Lower urinary symptoms, resilience, and post-traumatic stress symptoms among rectal cancer patients after surgery

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Funding information

Funding for this study was received from the Ministry of Science and Technology (MOST) of Taiwan (NSC 102-2628-B-214-001-MY3).

Abstract

Aim: Disturbance of urinary function is a common complication after rectal cancer surgery, and it may affect patients' psychological well-being, consequently may develop post-traumatic stress disorder. Personal resilience might increase people's ability to manage life's challenges. However, limited study to explore their relationships. This study examined the relationships among lower urinary symptoms, resilience, and post-traumatic stress symptoms (PTSS) in post-surgery patients with rectal cancer.

Methods: A cross-sectional study design was used and included 188 patients with diagnosed rectal cancer who had undergone surgery over 24 months and were recruited from a hospital in southern Taiwan. The outcome measurements included a resilience scale, International Prostate Symptom Score (IPSS), the Chinese Davidson Trauma Scale, personal characteristics, and disease-related variables.

Results: There were significant relationships among age at diagnosed, self-reported physical status, perceived satisfied with recovery, urinary tract symptoms, resilience, and overall PTSS. The stepwise regression demonstrated that five factors, self-reported physical status, resilience, urinary tract symptoms, age at diagnosed and gender, and together explained 27.7% of overall PTSS variance (10.7, 6.7, 3.7, 4.8 and 1.8% of variance, respectively).

Conclusion: The study demonstrates that patients with diagnosed rectal cancers long-term outcomes of PTSS, urinary tract symptoms, and resilience after surgery; in addition, self-reported physical status, resilience, urinary tract symptoms, age at diagnosed and gender are the major predictors of PTSS. A better understanding of the long-term outcomes of post-surgery in rectal cancer patients and its related factors may help to decreasing the PTSS after surviving cancer.

KEYWORDS

lower urinary symptom, post-traumatic stress symptoms, rectal cancer, resilience

1 | INTRODUCTION

Rectal cancer was the most diagnosed cancer and the third leading cause of cancer-related deaths in Taiwan

from 2001 to 2016 (Ministry of Health and Welfare, 2017). A curative surgical procedure is the first-priority treatment for localized rectal cancer. Disturbance of urinary function is a common complication after rectal

cancer surgery (Beraldo et al., 2015; Brown, Fenech, & McLeod, 2008; Calpista, Lai, Agostini, Mancini, & Artibani, 2007; Kim et al., 2011; Lange et al., 2008; Lange & van de Velde, 2011).

Developing cancer can be a traumatic event that is eligible for a post-traumatic stress disorder (PTSD) diagnosis, because of the life-threatening nature of the cancer. The trajectory of living with cancer, the disease-related symptoms, and the side effects and complications of treatment (such as lower urinary symptoms) may threaten patients' physical function and affect their psychological well-being (Goker, Guvenal, Yanikkerem, Turhan, & Koyuncu, 2011; Lerman, Jarski, Rea, Gellish, & Vicini, 2012); consequently, they may develop post-traumatic stress disorder (Bush, 2009; Jahn, Herman, Schuster, Naik, & Moye, 2012; Mehnert & Koch, 2007; Palgi et al., 2011; Sukantarat, Greer, Brett, & Williamson, 2007). Previous studies demonstrated that self-reliance is a crucial predictor and has a positive influence on the psychological distress and side effects experienced by cancer patients (Corboy, Meier, & McLaren, 2019; Tian & Hong, 2014), but the influence on post-traumatic stress symptoms (PTSS) remains unknown. Several studies confirmed that colorectal cancer survivors experience post-traumatic symptoms after receiving a cancer diagnosis and treatment (Rinaldis, Pakenham, Lynch, & Aitken, 2009; Salsman, Segerstrom, Brechting, Carlson, & Andrykowski, 2009), which was influenced by physical symptom distress (Ristvedt & Trinkaus, 2009), and cancer-related treatment symptoms (Tung, Lin, Kao, & Wu, 2018), such as lower urinary symptom, and personal positive cognition (Salsman et al., 2009), such as resilience. The literature has explored post-traumatic stress syndrome (or disorder) in cancer survivors (Kangas, Henry, & Bryant, 2002; Koutrouli, Anagnostopoulos, & Potamianos, 2012; Shand, Brooker, Burney, Fletcher, & Ricciardelli, 2015; Tung et al., 2018). Ristvedt and Trinkaus (2009) explore the PTSS in rectal cancer survivor at least 2 years after first initial treatment, and found about half of these patients had experience different level scores on the PTSS scale; however, the long-term outcomes of the relationships among urinary dysfunction symptoms, resilience, and PTSS in rectal cancer patients who undergo surgery have rarely been examined, and the impact of PTSS may diverge in different cultures and countries, requiring more exploration. Patient personal features and disease-related factors may impact the level of PTSS, particularly in patients with cancer (Koutrouli et al., 2012; Salsman et al., 2009; Tung et al., 2018). To address this knowledge gap, the goal of this study was to examine the relationship of urinary dysfunction symptoms and resilience on PTSS in patients diagnosed with rectal cancer post-surgery.

1.1 | Research questions

The two research questions were as follows: (a) What is the the relationship among low urinary symptoms, resilience, and PTSS in rectal cancer patients underwent surgery? and (b) What is the determined factors that are related to PTSS in rectal cancer patients underwent surgery?

2 | METHODS

2.1 | Sample and settings

A cross-sectional design was used for the study following approval by the participants' hospital institutional review board (EMRP_101_077). The inclusion criteria included patients' age was older than 20 years, diagnosed with rectal cancer and underwent a surgical procedure, and searched patients' data from the medical and screening records of patients treated at 1170 beds in hospitals in southern Taiwan. The population comprised 573 patients who were diagnosed with rectal cancer and underwent surgery over 24 months between May 2004 and April 2013. The exclusion criteria included patients expired, lost to follow up, and was diagnosed with an emotional and mental disorder before rectal cancer diagnosed. We totally excluded 213 patients: 161 died, 36 were lost to follow up during the study period, and 16 had an emotional and mental disorder. A structured questionnaire was mailed to 360 patients. The questionnaire response required 15 to 20 min to complete. Data were collected between August 2014 and July 2015. A total of 188 patients returned and completed the questionnaire (52.2% response rate) and were included in the statistical analysis.

2.2 | Outcome measurements

2.2.1 | Low urinary symptoms

The international prostate symptom score (IPSS) was used in this study to measure lower urinary symptoms. The IPSS was developed by American Urological Association, aimed to assess the urinary function of patients with benign prostate hypertrophy (Barry et al., 1992) and rectal cancer (Beraldo et al., 2015). However, several studies also applied it to assess the lower urinary symptoms of women, with positive validity and reliability (Okamura, Nojiri, Osuga, & Tange, 2009; Shim, Kim, Choi, Park, & Bae, 2016; Yu, Chen, Lai, Chan, & Chie, 1998). The IPSS scale included eight questions, with the first seven

questions concerning urinary symptoms with a total of six points for each item (0–5) and a total possible score ranging from 0 to 35 (asymptomatic to very symptomatic); the total score categorizes symptoms as mild (0–7), moderate (8–19), or severe (20–35). In addition, the eighth question concerns quality of life due to urinary symptoms, with a seven-point scale ranging from 0 (delighted) to 6 (terrible). The reliability of Cronbach's alpha coefficients in this study was .87 for the first seven items.

2.2.2 | Resilience scale (RS)

The RS instrument was developed by Wagnild and Young (1993), with 25 items composing five crucial characteristics: meaningful life (purpose), perseverance, self-reliance, equanimity and existential aloneness (i.e., coming home to yourself). The first of these characteristics is recognized as the most important that places the basis for the other four. The RS response scoring uses seven points for each item (1–7), with a total possible score ranging from 25 to 175, and categorizes the resilience level as low (scores under 121), moderate (121–146), and high (scores above 147). The original RS has good validity and reliability (Wagnild, 2009) and was also approved in several studies (Abiola & Udofia, 2011). Yang, Bao, Huang, Guo, and Smith (2015) measured resilience in Chinese older people and demonstrated a Cronbach's α for the overall RS of 0.95, with a range of 0.85–0.89 for the sub-scales and a test–retest reliability of 0.80. Yang (2009) measured the resilience of Chinese cancer patients; Cronbach's alpha was 0.91, and the test–retest was $r = .71$. The Cronbach's alpha coefficient in this study was 0.94 and ranged from 0.88–0.91 for the subscales.

2.2.3 | Posttraumatic stress symptoms (PTSS)

The Chinese version of Davidson Trauma Scale (C-DTS) was used to measure PTSS in this study. The 17-item questionnaire included two parts: the frequency and severity of symptoms experienced during the previous week. The self-rating response had a total of five points for each item (0–4) and a total possible score ranging from 0 to 136. For a diagnostic accuracy of 0.85, a score of 44 was used as the cut-off point to categorize patients with or without PTSD (Chen, Lin, Tang, Shen, & Lu, 2001). Previous studies demonstrated positive validity and reliability (Chen et al., 2001; Davidson et al., 1997). Tung et al. (2018) used the C-DTS to assess Taiwanese female-specific cancer survivors and showed that the internal reliability of Cronbach's alpha was .91 for the

frequency items and .93 for the severity items. The Cronbach's alpha coefficients in this study were .92 for the frequency of PTSS and .93 for the severity of PTSS.

2.2.4 | Personal characteristics and disease-related variables were also collected for data analysis

Personal characteristics were obtained from the participants, including age at diagnosis, gender, education level, marital status, religious belief, and employment status. Disease-related variables were collected from the patients' medical records, including cancer stage, receipt of surgery, with ostomy or not, period since diagnosis, received chemotherapy after surgery, self-reported physical status (response rating was 1–5, 1 = complete non-recovery, 5 = 100% recovery), and perceived satisfaction with recovery (response rating was 0–5, 0 = extremely unsatisfied, 5 = extremely satisfied).

2.3 | Statistics analysis

All data were analyzed using IBM SPSS statistics software (version 24.0). Descriptive analysis was used to determine the levels of resilience, IPSS, and PTSS (means, standard deviations [SD], frequencies, and percentages [%]). The student t-tests and ANOVAs were used to examine the demographic variables differences in PTSS. Pearson correlations were used to examine the relationships among PTSS, IPSS, and resilience. Stepwise regression was used to explore the predictors and explain PTSS. In this regression model, the significant variables were added to the model as independent variables to predict PTSS (dependent variable). Statistical significance was set at a p-value < .05.

An a-priori sample size calculator of multiple regression software was used to evaluate the sample size (Soper 2015). The statistical test used multiple regression (R^2 deviation from zero), and an anticipated effect size (f^2) was set to .15 with a statistical power level of .95, $\alpha = .05$, and number of predictors of 13; the required sample size was 189.

2.4 | Results

2.4.1 | Participants' demographic and medical characteristics

The study included 188 participants, with 126 males (67%) and 62 females (99%). The mean age at diagnosis was 58.7 years ($SD = 9.9$), with a range from 27 to

78 years old. The mean period since diagnosis and surgical procedure was 50.3 (SD = 17.9) months with a range from 24 to 88 months, and most of the participants were in the range of 37 to 60 months. The majority of participants were married (89.4%) and with a relatively low level of education (53.7%). Most of the participants (69.1%) had received chemotherapy after surgery. The mean score of the self-reported physical status was 4.06 (SD = 0.81), and the perceived satisfaction with recovery mean score was 3.69 (SD = 1.05) (Table 1).

2.4.2 | Low urinary symptoms, resilience, and PTSS

The mean score for the I-PSS was 7.46 (SD = 6.74), with scores ranging from 0 to 28, and rates of 61.7% mild, 30.3% moderate, and 8.0% severe lower urinary symptoms. The mean resilience score was 130.85 (SD = 19.43), with scores ranging from 86 to 175, and rates of 27.7% for low, 50.5% for moderate, and 21.8% for high resilience. The overall PTSS scores ranged from 0 to 111, with a

Variables (n, %)	Mean	SD	t/F	p
Age at diagnosed (years) range: 27–78; Mean 58.73 (SD = 9.85)			3.05	.003
< 65 (53, 28.2)	10.06	14.28		
> =65 (135, 71.8)	18.29	21.42		
Gender			2.46	.015
Female (62, 33.0)	21.05	21.80		
Male (126, 67.0)	13.49	18.61		
Educational level			0.25	.805
≤9 years (101, 53.7)	15.62	20.43		
>9 years (87, 46.3)	16.35	19.53		
Marital status			0.83	.409
Single (20, 10.6)	19.45	29.20		
Married (168, 89.4)	15.54	18.64		
Religious belief			−0.34	.731
No (16, 8.5)	14.31	19.71		
Yes (172, 91.5)	16.11	20.04		
Employment status			−0.44	.685
No (73, 38.8)	15.28	18.32		
Yes (115, 61.2)	16.38	21.00		
With ostomy			0.68	.497
No (123, 65.4)	16.67	18.61		
Yes (65, 34.6)	14.58	22.44		
Period since diagnosis range: 24–88; mean (SD) 50.27 (17.89)			0.74	.477
≤36 months (51, 27.1)	13.08	17.61		
37–60 months (88, 46.8)	16.81	20.53		
>60 months (49, 26.1)	17.46	21.34		
Cancer staging			0.63	.596
I (42, 22.3)	13.10	18.62		
II (66, 35.1)	16.14	20.57		
III (67, 35.6)	18.10	20.97		
IV (13, 6.9)	13.00	15.82		
Chemotherapy after surgery			−2.52	.013
Yes (130, 69.1)	18.16	20.92		
No (58, 30.9)	10.93	16.71		

TABLE 1 Demographic data and factors related to PTSS (N = 188)

Note: Test by Student *t*-test (t), and One-way ANOVA (F).
Abbreviations: PTSS, posttraumatic stress symptoms.

mean score of 29.86 (SD = 16.94), and the prevalence of PTSD was 11.2% (Table 2).

2.4.3 | Bivariate relationships

The results indicated a significant difference between age at diagnosis, gender, receipt of chemotherapy after surgery and PTSS (Table 1). There was a significant positive correlation between the IPSS and PTSS score, indicated that the higher lower urinary symptoms the higher PTSS experienced. There were significant negative correlations among resilience, physical status, satisfaction with recovery and overall PTSS (all $p < .001$), indicated that patients perceived the higher resilience, physical status, and satisfied with recovery the lower PTSS experienced (Table 3).

2.4.4 | Predictors of PTSS

Stepwise multiple regression was conducted to determine independent variables (IPSS, resilience, physical status, satisfied with recovery, and demographic characteristics, such as age at diagnosis, gender, and chemotherapy received after surgery) able to significantly predict PTSS (Table 4). Five factors including physical status, resilience, IPSS, age at diagnosis and gender were included in the regression model, and together they explained 27.7% of overall PTSS variance (10.7, 6.7, 3.7, 4.8 and 1.8% of variance, respectively). The other variables, including marital status, education level, cancer stage, and receipt of chemotherapy, were not entered into the equation.

TABLE 2 Participants' PTSS, IPSS, and resilience descriptive data (N = 188)

Variables	Range	Mean (SD)	N (%)
Overall PTSS	0–111	29.86 (16.94)	
Score < 44			167 (88.8)
Score ≥ 44			21 (11.2)
IPSS	0–28	7.46 (6.74)	
Mild (1–7)			116 (61.7)
Moderate (8–19)			57 (30.3)
Severe (20–35)			15 (8.0)
IPSS quality of life	0–6	2.16 (1.12)	
Resilience	86–175	130.85 (19.43)	
Low (<121)			52 (27.7)
Moderate (121–146)			95 (50.5)
High(>147)			41 (21.8)

Abbreviations: IPSS, international prostate symptom score; PTSS, posttraumatic stress symptoms.

2.5 | Discussion

2.5.1 | The prevalence of PTSD

A literature review reported that 4–19% of patients with cancer experience symptoms of PTSD (Kwekkeboom & Seng, 2002). Other studies reported that there is substantial variation in the incidence of PTSD among different cancer-diagnosed survivors: 2.4 to 25.4% for women with breast cancer (Koutrouli et al., 2012; Mosher, Danoff-Burg, & Brunner, 2005), 11.9% for those with head and neck cancer (Posluszny et al., 2015), 27.6% for those with gastric cancer (Palgi et al., 2011), and 9.0% for those with prostate cancer (Jahn et al., 2012). The prevalence rate of PTSD in the rectal cancer patients in this study (11.2%) is within the literature-reported range, and these results indicate that several rectal cancer patients suffered from PTSS even after 24 months had passed following cancer-related treatments.

2.5.2 | Low urinary symptoms and PTSS

Patients who experience physical symptom distress were positively correlated with PTSS, indicating that cancer patients who suffered more from lower urinary symptoms experienced a greater rate of PTSS. A total of 38.3% of rectal cancer patients experienced moderate to severe lower urinary symptoms in this study, this results is similar with Lange and van de Velde (2011) study showed one-third of patients' urinary dysfunction after surgery, and main caused by surgical nerve damage. This study showed both lower urinary symptoms and self-reported physical status positively correlated with PTSS, and the stepwise regression analysis results found that these two factors were the major predictors of PTSS. This result is in support of a previous study (Pérez et al., 2014), and represents PTSS remaining persistent across all phases of treatment accompanied with treatment complications. Pérez et al. (2014) examined PTSS at three time points (during treatment, at the end of treatment, and at a 6–12 months of follow-up), and participants from this study were examined at 24 months after surgical treatment; however, the treatment-related complications and symptoms still affected patients' physical status and PTSS. This study's results support the contention that lower urinary symptoms and physical status are important contributing factors to PTSS in patients diagnosed with rectal cancer who are receiving surgical treatment.

2.5.3 | Resilience and PTSS

A previous study used the same scale to examine the resilience score among 70 clinical students after a major

TABLE 3 The relationship between PTSS, age, IPSS, and resilience (N = 188)

Variables	Age	IPSS	IPSS_QoL	Resilience	Physical status	Satisfied with recovery
PTSS	-.16*	.29**	.29**	-.32**	-.33**	-.28**

Note: * $p < .05$; ** $p < .001$.

Abbreviations: IPSS, international prostate symptom score; PTSS, posttraumatic stress symptoms; QoL, quality of life.

Variable	β	SE	t	p	R ²	R ² change	95% C.I.
Physical status	-5.58	1.63	-3.43	<.001	.107	.107	-8.78~-2.37
Resilience	-0.24	0.07	-3.65	<.001	.174	.067	-0.37~-0.11
IPSS	0.74	0.19	3.76	.004	.210	.036	0.35~1.13
Age	-0.41	0.13	-3.19	.001	.259	.048	-0.67~-0.15
Gender	-5.84	2.71	-2.15	.033	.278	.019	-11.18~-0.49

Abbreviation: IPSS, international prostate symptom score; PTSS, posttraumatic stress symptoms.

TABLE 4 Stepwise regression predicting PTSS (N = 188)

professional examination, and the mean score of resilience was 130.23 (SD = 17.08) (Abiola & Udofia, 2011). The mean score of resilience in the rectal cancer patients in this study (130.85, SD = 19.43) is similar to that in the literatures, indicating that the moderate resilience of the participants in this study is similar to that of individual in a stressful situation (Abiola & Udofia, 2011), and in patients with breast cancer underwent chemotherapy (131.90, SD = 16.20) (Wu, Chen, Huang, Chang, & Hsu, 2018). The resilience scores were negatively correlated with PTSS, indicating that rectal cancer patients with higher resilience experienced a lower rate of PTSS, and these results support a previous study (Ha, Jung, & Choi, 2014). Stepwise regression analysis demonstrated that resilience was an important predictor of PTSS. These results are consistent with those of previous study indicating that resilience is a strong predictor of cancer-related traumatic stress in patients with cancer (Ha et al., 2014; Liu, Zhang, Jiang, & Wu, 2017), they support that higher resilience levels lower emotional distress (Cohen, Baziliansky, & Beny, 2014; Salsman et al., 2009), and these results also support that resilience may recognize as a mechanism for increasing positive psychosocial functioning, and against psychological distress during cancer treatment (Wu et al., 2018).

Some of the patient characteristics that contributed to PTSS have been reported in previous studies, such as a younger age (Koutrouli et al., 2012; Salsman et al., 2009), a lower education level (Koutrouli et al., 2012; Salsman et al., 2009), and receipt of chemotherapy (CT) (Hermelink et al., 2017). However, a literature showed diverse results, Ristvedt and Trinkaus (2009) study found rectal cancer patients' age, educational level, cancer stage, and with permanent ostomy were not predicted their PTSS. The finding that age at diagnosis, gender, and CT significantly

associated with PTSS scores and that the regression model represented age and gender as predictors of PTSS in this study is consistent with previous reports (Koutrouli et al., 2012; Salsman et al., 2009). However, receiving CT did not contribute to the development of PTSS in this study, which is also inconsistent with the literature; however, the reasons may be due to the different cancer diagnoses, use of different CTs, and variations in the side effects.

This study failure to identify significant differences in educational level, cancer stage, and with ostomy, with PTSS, these results are consistent with previous study (Ristvedt & Trinkaus, 2009), however inconsistent with other literatures (Koutrouli et al., 2012; Salsman et al., 2009), we suggest may need further researches to examine their relationship.

2.6 | Strengths and limitations

This study had three strengths. First, this study demonstrates the prevalence of PTSD among rectal cancer patients in Taiwan. Second, this study simultaneously examined long-term symptoms related to surgery, physical status, and PTSS in rectal cancer survivors, confirming that long-term symptoms related to surgery, physical status, low urinary symptoms, and resilience are the primary predictors of PTSS in Taiwanese patients. In addition, the results have indicated that age at diagnosed and gender are also the predictors of PTSS: Taiwanese rectal cancer patients with an older age and women who suffer from more severe PTSD than those who were at a young age and male.

The limitations of this study are as follows. First, recruiting participants from only one hospital limited the scope of the results. Second, PTSS was screened for using

a questionnaire and was not diagnosed by a psychiatrist. Third, the DSM-5 was released 5 years ago, however, the measurement scale still need to well development. We used the Davidson Trauma Scale leave a limitation of this study. Additionally, a cross-sectional design was conducted in this study. Thus, the result to a-cause-and-effect conclusion should take into caution, and the results cannot represent time changing patterns of lower urinary symptoms, resilience, and PTSS. Other important variables such as, sexual function, bowel function, body image issues, and perceived social support haven't been taken into consideration and could be assessed in next studies on this topic.

3 | CONCLUSION AND SUGGESTIONS

This study has demonstrated that rectal cancer patients might have experienced PTSD. Thus, routinely screening for the stressful adverse event-related PTSS among cancer patients is needed. This study has confirmed the negative relationship between resilience and PTSS among rectal cancer patients. In addition, physical status, lower urinary symptoms, age at diagnosed, and gender are predictors of PTSS, and the lower urinary symptom and resilience are two main predictors, oncology nurses should monitor rectal patients' lower urinary symptom progression and resilience status after surgery. The interventions and strategies to improve lower urinary symptom (such as pelvic muscle exercise) and resilience (such as social support) in rectal cancer patients after surgery are suggest for clinical implication and further study.

ACKNOWLEDGMENT

The investigators conducted the study independently, the content is solely the responsibility of the authors and does not necessarily represent the official views of the MOST. The authors appreciate the contribution and participation of all study participants.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

Y.H. was responsible for the study conception, design, and performed the data collection. Y.H., C.C., and I.J. performed data statistics analysis. Y.H. was responsible for the drafting of the manuscript. C.C., Y.-H., and I.J. made critical revisions to the paper for important intellectual content.

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How to cite this article: Lin Y-H, Kao C-C, Pan I, Liu Y-H. Lower urinary symptoms, resilience, and post-traumatic stress symptoms among rectal cancer patients after surgery. *Jpn J Nurs Sci*. 2020;17:e12320. <https://doi.org/10.1111/jjns.12320>