



Original Article

Quality of life patterns and its association with predictors among non-muscle invasive bladder cancer survivors: A latent profile analysis



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ABSTRACT

Objective: This study identified group patterns in the quality of life (QOL), as well as examining factors associated with group membership, among non-muscle invasive bladder cancer (NMIBC) survivors.

Methods: This was a cross-sectional study involving 278 participating NMIBC survivors. Mplus version 7.2 was used to perform the latent profile analysis of QOL using the EORTC QLQ-NMIBC-24. The participants' social support, self-efficacy, knowledge level, depression, perceived severity of and susceptibility of cancer recurrence, and their demographic and clinical characteristics were compared between the subgroups, with a logistic regression analysis being adopted to examine the factors associated with the QOL subgroups.

Results: The NMIBC survivors based on the QOL were classified into two subgroups: "QOL-high" (81.3%) and "QOL-low" (18.7%). Having ≥ 3 disease recurrences, perceived susceptibility toward and severity of cancer recurrence, and having depressive symptoms were significantly associated with the "QOL-low" group.

Conclusions: Participants with frequent recurrences of NMIBC, higher perceived susceptibility and severity levels, and depressive symptoms had lower QOL. Therefore, it is necessary to develop intervention programs targeting participants with these characteristics to improve their QOL.

Introduction

Bladder cancer is the tenth most common cancer internationally, with its incidence steadily rising.¹ Most cases (75%–80%) of bladder cancer patients are diagnosed with non-muscle-invasive bladder cancer (NMIBC),² with around 70% of NMIBC cases typically recurring and 25% progressing to a muscle-invasive disease.³ NMIBC is the most expensive malignancy compared with other types of cancer—from diagnosis to death—because its survivors often require lifelong surveillance due to its high recurrence rate.^{4,5}

Nevertheless, the quality of life (QOL) of NMIBC survivors has been under researched because they tend to undergo a relatively less severe non-cystectomy treatment (such as transurethral resection of bladder

tumor [TURB]) or adjuvant therapy (such as intravesical chemotherapy),⁶ compared with muscle-invasive bladder cancer (MIBC) survivors, who are more negatively affected by their required treatment.^{7–9} However, the chronic burden of NMIBC survivors is still relatively high during all phases of their treatment and surveillance processes owing to the repeated recurrence and uncertain prognosis of this disease.¹⁰ Additionally, NMIBC survivors often find it difficult to perform physical labor where there is exposure to substances causing bladder cancer during their recovery period due to the repeated medical procedures involved or the suffering arising from the resulting complications, making their lives more difficult and negatively affecting their QOL.^{11,12}

According to extant literature, the health-related QOL (HRQOL) of cancer survivors is positively affected by social support (including that

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from their family, peers, and healthcare providers)^{13,14} and knowledge about their treatment options.¹⁵ Additionally, psychosocial problems, like those arising from the awareness concerning the severity of the disease,^{16,17} depression,^{18,19} and a fear of recurrence and death,^{14,20} also negatively impact cancer patients' HRQOL. In Korea, the HRQOL of adult cancer survivors was found to be significantly associated with being of a younger age, being male, having a higher income, experiencing fewer depressive symptoms, and possessing a subjectively positive perceived health status.^{21,22}

Although psychosocial variables are known to have a large influence on the HRQOL of cancer survivors, most studies on the HRQOL of NMIBC survivors, specifically, have focused on their physical and functional QOL using symptom-specific instruments, including those recording urinary, bowel, and sexual problems. Moreover, commonly used evaluation methods for measuring patients' QOL involve examining participant groups' average responses across each subdomain, thereby ignoring potential heterogeneity across different individual responses.²³ With a focus on constructing more personalized strategies for improving QOL, the latent profile analysis (LPA) is a more suitable approach to examine NMIBC patients' QOL because it assumes that any observed variables are indicators of an unobserved latent variable, with it then attempting to explain this relationship in terms of a small number of subgroups or classes.²⁴ LPA has helped researchers to conduct in-depth analyses of subgroups' characteristics; as such, identifying distinct QOL classes through this technique will help to inform the development of effective methods for the identification and treatment of NMIBC subgroups with different symptom/problem profiles.

Therefore, this study aimed to, first, classify patterns of QOL and examine differences in the social support, self-efficacy, knowledge levels, depression, perceived severity of and susceptibility toward cancer recurrence, and demographic and clinical characteristics among various NMIBC subgroups. Second, we examined the factors associated with each of the identified subgroups among the participating NMIBC survivors.

Methods

Study design

This was a cross-sectional study. Participants were recruited at the urological clinic of a tertiary teaching hospital in Korea.

Participants and setting

The inclusion criteria were as follows: (1) having an NMIBC diagnosis and currently undergoing treatment or monitoring for it and (2) having an understanding of the Korean language. The exclusion criteria were as follows: (1) being diagnosed with any other cancer besides NMIBC during their lifetime, (2) those whose cancer has metastasized to other organs over the past five years, and (3) those who were taking any psychiatric medications.

After conducting face-to-face interviews using a structured questionnaire for the data collection, the participants' electronic medical records were reviewed by trained researchers from June to December 2020. The participants voluntarily agreed to take part in this study after receiving sufficient explanations about its purpose, as well as information around confidentiality and other related matters.

European organization for research and treatment of cancer quality of life questionnaire (EORTC QLQ-C30)

The Korean version of the EORTC QLQ-C30 was used to assess the QOL of the participants. This scale, which has been verified for use among Korean cancer survivors by Yun et al.,²⁵ consists of 30 questions

classified into functional scales (15 questions across five sub-domains), symptom scales (13 questions across nine sub-domains), and global health status (two questions in one sub-domain). Each answer is rated on a 4-point Likert scale (0 = not at all, 1 = sometimes, 2 = quite often, 3 = very frequently) and is graded according to the EORTC QLQ-C30's scoring manual.²⁶ Higher scores on the functional scales and in the global health status section, as well as lower scores on the symptom scales, signify better QOL. The Cronbach's α was 0.7 in the original study²⁷ and 0.84 in this study.

European organization for research and treatment of cancer quality of life questionnaire-non-muscle-invasive bladder cancer (EORTC QLQ-NMIBC-24)

The Korean version of the EORTC QLQ-NMIBC-24 was also used to assess the QOL of the participants.²⁸ This scale consists of 24 questions across 11 sub-domains, including urinary symptoms (seven questions), malaise (two questions), future worries (four questions), bloating/flatulence (two questions), sexual function (two questions), male sexual problems (two questions), intravesical treatment issues (one question), sexual intimacy (one question), risk of contaminating one's partner (one question), sexual enjoyment (one question), and female sexual problems (one question). Each question is answered via a 4-point Likert scale (0 = not at all, 1 = sometimes, 2 = quite often, 3 = very frequently). Higher scores in the sexual function and enjoyment domains, and lower scores in all the others, signify higher overall QOL. The Cronbach's α was 0.57–0.90 in the original study²⁹ and 0.81 in this study.

Patient Health Questionnaire (PHQ-9)

The Korean version of the PHQ-9 was used to assess participants' depressive symptoms. This scale consists of nine questions, with each being answerable via a 4-point Likert scale (0 = not at all, 1 = sometimes, 2 = quite often, 3 = very frequently). Higher scores indicate more severe depressive symptoms, with a total score of 5 or greater indicating the possibility of a depressive disorder. Cronbach's α was found to be 0.86 in the original study³⁰ and 0.86 in this study.

Knowledge of NMIBC

To assess the participants' knowledge about NMIBC, we developed the Knowledge of NMIBC Scale. When developing this scale, its initial constructs and items were conceptualized and established using information from the Bladder Cancer Advocacy Network,³¹ Urology Care Foundation,³² The Urology Foundation,³³ the American Society of Clinical Oncology,³⁴ and the UK National Health Service's guidelines.³⁵ First, 40 questions across seven domains (including an overview of NMIBC, causes and risk factors of NMIBC, as well as symptoms, diagnosis, treatment, follow-up, and life observation) were selected. Then, eight experts, including urologists, nursing professors, and registered nurses from a urological clinic, evaluated the validity of the preliminary questions. Following this validation process, we adopted 32 questions that were found to have a content validity score of 0.80 or higher, with us then modifying some of the questions' wording to make them more understandable to respondents' after considering some comments received from the experts. Finally, we confirmed the practical applicability of the questions by conducting a preliminary survey of six NMIBC survivors. The developed Knowledge of NMIBC Scale consists of the following responses: "correct," "incorrect," "unknown." The responses are scored as 1 point for correct ones and 0 points for wrong or unknown responses. The possible range of the total score for this scale is from 0 to 32, with a higher total score indicating a higher level of knowledge regarding NMIBC. The Kuder Richardson 20 of this scale was found to be 0.90.

Social support

The Social Supportiveness Scale, as developed by Kim,³⁶ was used to measure the level of social support experienced by the participants.³⁷ This scale contains 24 questions, which can be divided into the following sub-domains: supportiveness from family (12 questions) and supportiveness from health care providers (12 questions). Responses are measured on a 5-point Likert scale (1 = very likely, 2 = likely, 3 = normal, 4 = unlikely, 5 = very unlikely), with them then being scored backwards. Thus, higher scores indicate a higher level of social support. The Cronbach's α was found to be 0.91 for health care providers and 0.95 for family in the original study³⁷ and 0.95 in this study.

The strategies used by people to promote health

To measure the participants' self-efficacy, the scale entitled strategies used by people to promote health (SUPPH) was used. This scale was first developed by Lev and Owen³⁸ to measure individual beliefs about the strategies used by cancer patients to improve their overall health. This measure consisted of 36 questions at the time of development, with this number being revised to 29 in 2001. The scale can be divided into the following sub-domains: Stress reduction areas (10 questions), decision making areas (three questions), and positive attitude areas (16

questions). Each response is rated on a 5-point Likert scale (1 = very unlikely, 2 = unlikely, 3 = normal, 4 = likely, 5 = very likely). Higher scores indicate a higher level of self-efficacy, with the Cronbach's α coming to 0.94 in the original study.³⁸ To translate the original scale into Korean for this study, three bilingual experts were employed, who then translated and back-translated it. Then, a group of eight experts, including urologists, nursing professors, and registered nurses from a urological clinic, verified the validity of the Korean translation. The translated scale's Cronbach's α was found to be 0.97 in this study.

Perceived susceptibility towards and severity of cancer recurrence

We used the Perceived Susceptibility and Severity Scale to measure the participants' perceptions around their chances of cancer recurrence and its potential severity. This scale was first developed by Moon³⁹ with Oh,⁴⁰ then modifying and supplementing it. This scale contains six questions, which can be divided into the following sub-domains: perceived susceptibility (three questions) and perceived severity (three questions). Answers are rated on a 5-point Likert scale (1 = very unlikely, 2 = unlikely, 3 = normal, 4 = likely, 5 = very likely). A higher score indicates a higher level of perceived susceptibility toward and severity of any cancer recurrence. The Cronbach's α of this scale was 0.79 in the original study⁴⁰ and 0.90 in the current one.

Table 1
General characteristics of participants (n = 278).

Variables	Categories	Mean \pm SD (range)	n (%)
Age (years)	< 60	66.5 \pm 10.6 (33–92)	68 (23.5)
	60–69		84 (30.2)
	70–79		102 (36.7)
	\geq 80		24 (8.6)
Gender	Male		237 (85.3)
	Female		41 (14.8)
Education level	\leq Middle school		56 (20.1)
	High school		105 (37.8)
	\geq College		117 (42.1)
Monthly income (USD)	25% quantile (< 885)		90 (32.4)
	50% quantile (\leq 885, > 2525)		80 (28.8)
	75% quantile (\leq 2525)		108 (38.9)
Religion	No		104 (37.4)
	Yes		174 (62.6)
Smoking (n = 276)	Non-smoker		66 (23.9)
	Ex-smoker		171 (62.0)
	Current smoker		39 (14.1)
Caregiver (spouse)	No		66 (23.7)
	Yes		212 (76.3)
Private insurance	No		132 (47.5)
	Yes		146 (52.5)
Job experience exposed to high-risk factors	No		233 (83.8)
	Yes		45 (16.2)
Recurrence of disease	0		182 (65.5)
	1		47 (16.9)
	2		20 (7.2)
	\geq 3		29 (10.4)
Comorbidity	0		56 (20.1)
	1		65 (23.4)
	2		69 (24.8)
	\geq 3		88 (31.7)
Treatment	Operation only		71 (25.5)
	Operation + Intravesical treatment (mitomycin or BCG)		207 (74.5)
Depression score	0–4	3.4 \pm 4.1 (0–22)	194 (69.8)
	\geq 5		84 (30.2)
Knowledge of disease		20.3 \pm 7.2 (0–32)	
Supportiveness		102.9 \pm 14.6 (35–120)	
Family support		54.0 \pm 8.0 (12–60)	
Health care provider support		49.0 \pm 9.3 (12–60)	
Self-efficacy (n = 275)		92.9 \pm 27.6 (29–145)	
Stress reduction		28.3 \pm 10.8 (10–50)	
Making decisions		8.6 \pm 3.7 (3–15)	
Positive attitude		55.0 \pm 16.5 (16–8)	
Perceived susceptibility and severity		15.3 \pm 6.3 (6–30)	

BCG, bacillus Calmette-Guérin.

Sociodemographic and clinical characteristics

Participants' sociodemographic information was collected across the following categories: age, gender, education level, monthly income (USD), religion (or lack thereof), smoking history, presence of a caregiver (spouse), access to private insurance, and any job experience that has exposed them to any high-risk carcinogenic factors. The participants' clinical information included their number of disease recurrences, comorbidities, and treatment methods received.

Data analysis

A descriptive statistical analysis was conducted using SPSS (version 21.0; IBM, Armonk, NY, USA) to explore the sociodemographic and clinical characteristics of the participants and their QOL. Then, with Mplus version 7.2 (Muthen & Muthen, Los Angeles, CA, USA), an LPA was performed to classify the latent classes of the participants' QOL. Among the 11 subdomains of the EORTC QLQ-NMIBC-24, only 6 domains including urinary symptoms, malaise, future worries, bloating/flatulence, sexual function, and intravesical treatment issues were used for the LPA. The domains of male sexual problem and female sexual problem are for only men and women, respectively. Additionally, the other 3 domains including sexual intimacy, risk of contaminating a partner, and sexual enjoyment are for participants who had been sexually active during the prior 4 weeks, and thus, only 203 participants answered these 3 domains. Therefore, only 6 domains that were answered by all the participants were used for the LPA. A one-way analysis of variance (ANOVA) was also performed to check for any significant differences between the main variables within the identified QOL subgroups. Chi-square and t-tests were used to examine any differences in the participants' socio-demographic and clinical characteristics between the latent classes. Finally, a logistic regression analysis was used to examine the factors associated with the identified latent classes after adjusting for any covariates.

Ethical considerations

This study was approved by the Institutional Review Board (IRB No. 2019-3192-007). All participants received sufficient explanation about the study and voluntarily participated in the study. Informed consent was provided to all participants included in the study.

Results

General characteristics

Table 1 presents the general characteristics of the participants. The mean age of our sample was 66.5 years (SD = 10.6). Around 85% of the participants were men, with 42% of them having a college/university or higher education level qualification. Regarding smoking status, approximately 14% and 62% of the participants were either current or ex-smokers, respectively. Approximately three-fourths of the participants had a spouse as their primary caregiver, with about 53% of them having access to a private insurance besides the Korean national health insurance. About 16% of the participants had prior job experiences wherein they were exposed to high-risk factors for bladder cancer. For NMIBC recurrences, 65.5% had never experienced any, while 16.9%, 7.2%, and 10.4% of them had one, two, and three or more recurrences, respectively.

Approximately three-fourths of the sample had undergone combined intravesical treatment (mitomycin or BCG) via surgery. The mean scores of the participants' depression and NMIBC knowledge levels were 3.4 (SD = 4.1) and 20.3 (SD = 7.2), respectively. The mean score for social support was found to be 102.9 (SD = 14.6). The means of the participants' self-efficacy and their perceived susceptibility towards and severity of cancer recurrence were 92.9 (SD = 27.6) and 15.3 (SD = 6.3), respectively.

Quality of life

Table 2 presents the QOL scores of the participants. Regarding the EORTC QLQ-C30, the mean score for the global health status sub-domain came to 66.1 (SD = 19.9). The mean scores of the functional scales ranged from 82.4 (SD = 18.0) for emotional functioning to 86.9 (SD = 19.1) for role functioning. The mean scores of the symptom scales ranged from 3.8 (SD = 9.2) for nausea and vomiting to 25.1 (SD = 21.6) for fatigue. In the EORTC QLQ-NMIBC-24, the mean scores for the future worries and sexual enjoyment sub-domains were 32.1 (SD = 25.4) and 33.3 (SD = 28.3), respectively.

Latent profile analysis of NMIBC survivors on quality of life

Using the EORTC-QLQ-NMIBC-24, an LPA was performed to classify the participating NMIBC survivors to find an optimal number of latent profile classes based on their QOL.

Table 3 shows the model fit indices for each latent class group. The AIC, BIC, aBIC, entropy, H0 likelihood value, and p-values of both the LMRT and the BLRT were considered to determine the best latent class model. It is known that the smaller the values of AIC, BIC, and aBIC, the better the fit of the model⁴¹ and additionally, the BLRT and LMRT tests are also mainly considered for determining the number of profile classes in latent profile analysis.⁴² In the current study, the values for AIC, and aBIC in the three-class model were the lowest among the fitted models, however, the p-value of LMRT was not significant in the three-class model, suggesting the two-class model fitted better than the three-class model. Furthermore, the interpretability of the two-class model was better than the three-class model, and thus the two-class model was selected in this study.

Table 2

The results of quality of life (n = 278).

Variables	Mean ± SD
EORTC-QLQ-C30* (possible range: 0–100)	
Global health status/QOL	66.1 ± 19.9
Functional scales	
Physical functioning	85.9 ± 15.6
Role functioning	86.9 ± 19.1
Emotional functioning	82.4 ± 18.0
Cognitive functioning	83.0 ± 17.3
Social functioning	86.1 ± 23.6
Symptom scales	
Fatigue	25.1 ± 21.6
Nausea and vomiting	3.8 ± 9.2
Pain	12.3 ± 19.6
Dyspnea	13.7 ± 18.9
Constipation	18.6 ± 24.4
Diarrhea	13.8 ± 21.9
Sleep disturbance	21.3 ± 26.7
Appetite loss	12.7 ± 19.6
Financial difficulties	13.2 ± 20.5
EORTC-QLQ-NMIBC-24 (possible range: 0–100)	
Urinary symptoms	21.5 ± 18.1
Malaise	6.8 ± 13.6
Future worries	32.1 ± 25.4
Bloating/flatulence	13.3 ± 20.3
Sexual function	26.0 ± 25.2
Male sexual problems	24.9 ± 27.6
Intravesical treatment issues	13.0 ± 22.7
Sexual intimacy ^a (n = 203)	17.6 ± 25.5
Risk of contaminating partner ^a (n = 203)	24.0 ± 30.5
Sexual enjoyment ^a (n = 203)	33.3 ± 28.3
Female sexual problems ^a (n = 24)	25.0 ± 34.4

The range of EORTC QLQ-C30 and NMIBC-24 is 0–100; a higher score represents a higher level of quality of life; a higher score represents a higher level of functioning; a higher score represents a greater degree of symptoms, P < 0.05.

^a Response for patients who are sexually active last 4 weeks. EORTC QLQ-NMIBC-24, European organization for research and treatment of cancer quality of life questionnaire-non-muscle-invasive bladder cancer

The proportion of the number of profile classes in each group was 81.3% and 18.7% in the 2-class group; 70.5%, 7.6%, and 21.9% in the 3-class group; 69.1%, 21.9%, 1.4%, and 7.6% in the 4-class group; and 0.4%, 69.1%, 21.6%, 1.4%, and 7.6% in the 5-class group. Thus, in the case of the 4- and 5-class groups, it was found that they did not meet the minimum requirement of 3%⁴³ for the class classification rate. Therefore, the group with the highest explanatory power was selected as the final model after considering an entropy index of 0.80 or higher, the ratio of the number of cases by profile class, and the simplicity of interpretation.⁴⁴ About 81.3% and 18.7% of the participants were classified into Class 1 (labeled “QOL-high”) and Class 2 (labeled “QOL-low”), respectively (Fig. 1).

Differences in the main variables between the participant QOL subgroups

Among the main variables, having a spouse as one's primary caregiver ($\chi^2 = 6.3, P = 0.017$), the number of disease recurrences ($\chi^2 = 19.2, P < 0.001$), the presence of depressive symptoms ($\chi^2 = 31.3, P < 0.001$), level of supportiveness from family ($t = 6.1, P = 0.014$), level of supportiveness from healthcare providers ($t = 15.4, P < 0.001$), having a positive attitude towards one's own self-efficacy ($t = 2.2, P = 0.030$), and one's perceived susceptibility towards and severity of cancer recurrence ($t = -8.0, P < 0.001$) were all found to be significantly different between the participant QOL subgroups (Table 4).

Table 3
Model fit indices for latent class groups about quality of life ($n = 278$).

Classes	AIC	aBIC	Entropy	H0 likelihood value	LMRT (P-value)	BLRT P-value
2	2837.7	2846.4	0.893	-1399.9	286.2 ($P = 0.023$)	< 0.001
3	2384.8	2396.6	1.000	-1166.4	455.4 ($P = 0.416$)	< 0.001
4	2316.7	2331.8	0.999	-1125.3	80.5 ($P = 0.329$)	< 0.001
5	2291.5	2309.8	0.999	-1105.8	38.5 ($P = 0.173$)	< 0.001

AIC, Akaike information criterion; aBIC, sample size-adjusted Bayesian information criterion; LMRT, Lo-Mendell-Rubin adjusted likelihood ratio tests; BLRT, bootstrap likelihood ratio tests

Factors associated with the participant QOL subgroups

Table 5 presents the results of the multiple logistic regression for the study subgroups. Having three or more disease recurrences (OR = 4.00; 95% CI, 1.46–10.98), a higher score of severity based on the perceived susceptibility toward and severity of cancer recurrence sub-domain (OR = 1.17; 95% CI, 1.10–1.25), and having depressive symptoms (OR = 2.29; 95% CI, 1.05–4.97) were all associated with the “QOL-low” class.

Discussion

This study aimed to classify NMIBC survivors in Korea based on their QOL and to examine the factors associated with their class membership. The QOL of the participating NMIBC survivors were classified into two subgroups: “QOL-high” and “QOL-low.”

The QOL of NMIBC patients in this study was similar to that of NMIBC survivors in a study by Jung et al.,⁴⁵ which utilized the same QLQ-NMIBC-24 tool. As compared to study findings on the QOL of muscle invasive bladder cancer (MIBC) patients, NMIBC patients in this study had a better quality of life.^{46,47}

Our findings verify that the frequency of disease recurrences, the presence of depressive symptoms, and each patients' level of perceived susceptibility towards and severity of cancer recurrence are all significant factors associated with the identified QOL subgroups. Specifically, when

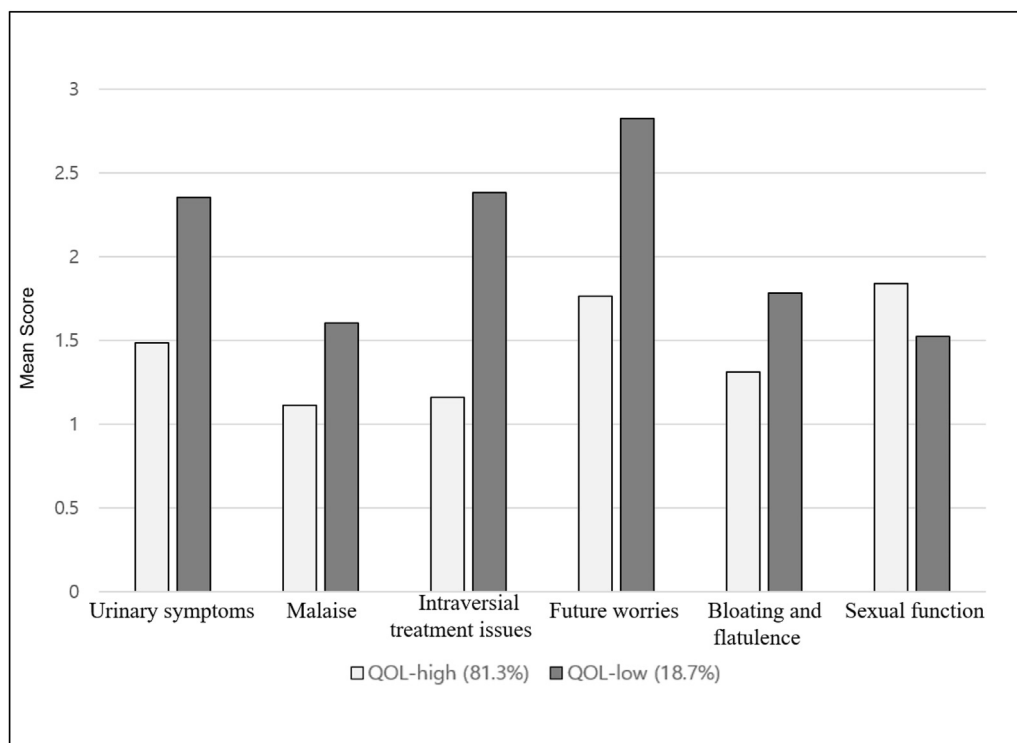


Fig. 1. Distribution of the mean of each of the subdomain of QLQ-NMIBC-24 for by subgroups. QLQ-NMIBC-24, quality of life questionnaire-non-muscle-invasive bladder cancer

Table 4
Differences in participants' characteristics between the subgroups of quality of life.

Characteristics	Class 1 QOL-high, n = 227 (81.3%)	Class 2 QOL-low, n = 51 (18.7%)	t/χ ² (P)
Age (years)	66.9 ± 10.7	65.1 ± 10.3	1.0 (0.296)
Gender			
Men	195 (85.9%)	42 (82.4%)	0.4 (0.516)
Women	32 (14.1%)	9 (17.6%)	
Education level			
≤ Middle school	49 (21.6%)	7 (13.7%)	1.6 (0.448)
High school	84 (37.0%)	21 (41.2%)	
≥ College	94 (41.4%)	23 (45.1%)	
Smoking (n = 276)			
Non-smoker	53 (23.5%)	13 (26.0%)	0.4 (0.854)
Ex-smoker	142 (62.8%)	29 (58.0%)	
Current smoker	31 (13.7%)	8 (16.0%)	
Caregiver (spouse)			
No	47 (20.7%)	19 (37.3%)	6.3 (0.017)
Yes	180 (79.3%)	32 (62.7%)	
Private insurance			
No	105 (46.3%)	27 (52.9%)	0.8 (0.439)
Yes	122 (53.7%)	24 (47.1%)	
Recurrence of disease			
0	159 (70.0%)	24 (47.1%)	19.2 (< 0.001)
1	34 (15.0%)	13 (25.5%)	
2	18 (7.9%)	1 (2.0%)	
≥ 3	16 (7.0%)	13 (25.5%)	
Comorbidity			
0	47 (20.7%)	9 (17.6%)	1.9 (0.608)
1	56 (24.7%)	9 (17.6%)	
2	54 (23.8%)	15 (29.4%)	
≥ 3	70 (30.8%)	18 (35.3%)	
Treatment			
Operation only	58 (25.6%)	13 (25.5%)	0.0 (1.000)
Operation + Intravesical treatment (mitomycin or BCG)	169 (74.4%)	38 (74.5%)	
Depression			
Low	175 (77.1%)	19 (37.3%)	31.3 (< 0.001)
High	52 (22.9%)	32 (62.7%)	
Knowledge of disease	20.4 ± 6.9	19.4 ± 8.1	1.0 (0.336)
Supportiveness			
Supportiveness from family	54.5 ± 7.5	51.5 ± 9.4	6.1 (0.014)
Supportiveness from health care provider	50.0 ± 8.5	44.5 ± 11.3	15.4 (< 0.001)
Self-efficacy (n = 275)			
Stress reduction	28.4 ± 11.2	27.6 ± 9.1	0.6 (0.560)
Making decisions	8.6 ± 3.7	8.6 ± 3.3	0.1 (0.908)
Positive attitude	56.1 ± 16.8	50.6 ± 13.9	2.2 (0.030)
Perceived susceptibility and severity	14.0 ± 5.7	21.0 ± 5.6	-8.0 (<0.001)

BCG, bacillus Calmette-Guérin; QOL, quality of life.

Table 5
Results of multiple logistic regressions for the subgroups of quality of life.

Factors	B	SE (B)	OR	95% CI	P
Caregiver (spouse)	Reference				
Caregiver (non-spouse)	0.26	0.42	1.30	0.57, 2.98	0.537
Recurrence of disease (n = 0)	Reference				
Recurrence of disease (n = 1)	0.70	0.46	2.01	0.82, 4.90	0.126
Recurrence of disease (n = 2)	-0.81	1.12	0.44	0.05, 3.97	0.467
Recurrence of disease (≥ 3)	1.39	0.51	4.00	1.46, 10.98	0.007
Depression score (0–4)	Reference				
Depression score (≥ 5)	0.83	0.40	2.29	1.05, 4.97	0.036
Supportiveness from family & health care provider	-0.01	0.01	0.99	0.96, 1.01	0.386
Self-efficacy	-0.01	0.01	0.99	0.98, 1.01	0.230
Perceived susceptibility and severity	0.16	0.03	1.17	1.10, 1.25	< 0.001

QOL-high group = reference group; CI, confidence interval

a participants' NMIBC had recurred three or more times, they were approximately four times more likely to belong to the "QOL-low" group. This is notable because NMIBC has a higher recurrence rate than other types of cancer, meaning that it then requires more frequent surveillance procedures.^{4,48} When cancer recurs, the prognosis is usually worse than that of the first diagnosis. Thus, most cancer survivors experience various negative emotions, including fear, anxiety, and worry, regarding any possible recurrences, as well as around any treatment-related physical discomfort that would likely deteriorate their QOL.^{49–51} This finding implies that the development and application of intervention programs that take into account the unique characteristics of NMIBC—in terms of its high recurrence rate and the fact that it requires lifelong surveillance—that aim to promote continuous symptom management and emotional support are necessary for NMIBC survivors.

Depression is the most common psychological symptom experienced by cancer survivors,⁵² with the depression rate among this population group coming to 44%–58% in previous studies.^{53–55} In the current study, depressive symptoms were found to be significantly associated with the "QOL-low" class. Furthermore, the "QOL-low" class was about two times more likely to have depressive symptoms compared with the "QOL-high" class. Various psychological symptoms, including depression and anxiety, as experienced by bladder cancer survivors, result in reductions in their ability to make rational decisions around the offered treatment methods, as well as in their overall compliance with treatment, resulting in a decrease in their QOL as well as a worsened prognosis.^{56,57}

Furthermore, the risk of suicide is much higher herein due to the continuous emotional pain that is experienced both during and after receiving treatment for bladder cancer.¹⁹ Schmidt et al.⁵⁸ report that the depression experienced by NMIBC patients is more severe than that of average people, with them then determining that it is important to take into account psychological problems, including depression and anxiety, even among NMIBC patients with a relatively favorable prognosis. Therefore, it is necessary to not only pay careful attention to the physical symptoms experienced by NMIBC patients before and after treatment, but to also design and apply active interventions aimed at addressing the psychological problems that they experience, as well as to identify and establish individualized nursing strategies for patients in need of help.

Another notable finding in this study was the fact that the “QOL-low” group had 1.17 times higher perceived susceptibility towards and severity of cancer recurrence compared with the “QOL-high” group. In the literature, there are inconsistent findings on the association between disease severity and QOL. The severity of a disease is significantly correlated with negative feelings, including uncertainty^{59,60} and unpleasant physical symptoms, such as urinary discomfort and changed sexual function, which could then lead to problems within one's interpersonal relationships, diminish their reasonable decision-making abilities around choosing treatment methods, and furthermore, it could affect their QOL or prognosis.^{57,58} In contrast, Javed et al.⁶¹ found that hemodialysis patients with a higher perception of the seriousness of their illness had a lower degree of depression and a higher QOL. They found that hemodialysis patients who had more sensitive perceptions around their health problems were able to better improve their QOL by following their therapeutic regimen and developing positive lifestyle changes.

However, instead of simply denying/ignoring a survivor's perceived disease severity, helping them to develop a more positive outlook would boost their motivation around educating themselves on preventing the recurrence or worsening of their bladder cancer and around employing methods of self-management. To help survivors improve their perception around their disease severity and prognosis, healthcare professionals should provide patients with information, in advance, on new symptoms that they may experience and make an effort to give consistent attention to their patients. In addition, instead of addressing only the physical symptoms, it is necessary for healthcare practitioners to actively address and manage any negative feelings that emerge as a part of the necessary interventions in order to improve patients' QOL.

Limitations

Our study does possess several limitations. First, it is difficult to generalize our findings to the wider target population because the sampled participants only included NMIBC patients who had visited a tertiary general hospital in Korea. Thus, more studies with larger samples are needed that seek to further classify NMIBC survivors based on their QOL.

Second, the questions under the sexual domains of the EORTC QLQ-NMIBC-24 were answered differently by men and women, meaning that these domains were excluded from the LPA. However, Jung et al.⁴⁵ found that NMIBC survivors had lower scores in the EORTC QLQ-NMIBC-24 for sexual function, sexual enjoyment, sexual problems, and sexual intimacy. In addition, women had worsened sexual function and enjoyment, while men experienced more discomfort with sexual intimacy. This means that sexual domains are important QOL-related factors for NMIBC survivors. Therefore, further studies are needed to confirm these findings using LPA, including sexual domains, as well as their gender-based differences. The low response rates to the sexual intimacy, the risk of contaminating one's partner, and the sexual enjoyment scales reflect the fact that many survivors are not actively engaged in sexual activity. This could be explained by the often older age of NMIBC survivors, as well as the resulting loss of sexual interest and fear of contaminating one's partner after receiving an NMIBC diagnosis and the experiences surrounding the early survivorship period after treatment. It was difficult for us to determine the true missing rate for these three sexual items because less than half of the patients reported that they had been

sexually active during the study period.

Third, although tumor stage (Ta, T1) and carcinoma in situ (yes, no), frequency of previous recurrences, tumor multiplicity, and size had been known factors associated with NMIBC recurrence,^{62,63} we did not include these variables for the study. In the current study, because NMIBC recurrence was a factor significantly associated with subgroups of QOL among NMIBC survivors, further research on the association between these variables, NMIBC recurrence, and QOL among NMIBC survivors will be needed.

Finally, the current study used a cross-sectional design, meaning that any causal relationships between variables could not be determined. Therefore, additional longitudinal studies that are able to identify causal relationships between the study variables are needed.

Conclusions

This study found that about 18% of NMIBC survivors belong to the “QOL-low” group. Participants in this group were more likely to have more frequent recurrences of NMIBC, a higher perceived susceptibility towards and severity of cancer recurrence, as well as depressive symptoms. Therefore, it is necessary to develop intervention programs that aim to improve NMIBC survivor's QOL, particularly those with similar characteristics as the members of the “QOL-low” group identified in this study.

Authors' contributions

Jeongok Park, Young Deuk Choi and Keum-hee Nam contributed to the study conception and design. Material preparation, data collection and analysis were performed by Kyungjin Lee, Miae Seo, Ahyoung Cho and Sejeong Lee. Interpretation of results and manuscript writing were performed by Jeongok Park, Kyungjin Lee, Miae Seo, Ahyoung Cho, Sejeong Lee and Keum-hee Nam. All authors read and approved the final manuscript.

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Declaration of competing interest

None declared.

Ethics statement

This study was approved by the Institutional Review Board (IRB No.2019-3192-007). All participants received sufficient explanation about the study and voluntarily participated in the study. Informed consent was provided to all participants included in the study.

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