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# QUALITY OF LIFE OUTCOMES IN BLADDER CANCER PATIENTS AFTER TRANSURETHRAL RESECTION OF BLADDER TUMOR

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*bladder cancer, quality of life (qol), trans urethral resection of bladder tumor (turbt), non-muscle invasive bladder cancer, eortc qlq-c30 questionnaire.*

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**Abstract**

***Background.*** *Bladder cancer is one of the most commonly diagnosed malignancies worldwide, with Transurethral Resection of Bladder Tumor (TURBT) serving as the cornerstone treatment for non-muscle-invasive bladder cancer (NMIBC). While TURBT is minimally invasive and effective, its long-term effects on patients' quality of life (QoL) are often overlooked.*

***Objective.*** *In this study, we looked at how TURBT affects patients' quality of life using reliable questionnaires and explored how factors like tumor focality, gender, and previous TURBT procedures might be linked to their well-being.*

***Method.*** *A cross-sectional, quantitative study was conducted at the Sindh Institute of Urology and Transplantation (SIUT), involving 71 adult patients within six months post-TURBT. Patients visiting the urology outpatient clinic were enrolled consecutively. To measure their quality of life, we used two well-known questionnaires from the EORTC: the general QLQ-C30 and the bladder cancerspecific QLQ-BLM30. We analyzed the data using SPSS version 26, applying descriptive statistics, independent t-tests, and either Pearson or Spearman correlation tests. A p-value of less than 0.05 was considered statistically significant.*

***Result.*** *The study population had an approximately equal gender distribution and was predominantly aged over 60. A history of prior TURBT was present in 62% of patients. Independent samples t-tests showed a significant difference in urinary symptoms between patients with and without a prior TURBT (p=0.022), with more symptoms reported in the former group. However, no significant differences were found in QoL domains based on gender or tumor focality ($p > 0.05$). Some significant trends were found by correlation analysis. Social interaction was more*

*challenging for patients with lower physical functioning (r = -0.291, p = 0.014). People who experienced cognitive issues were also more likely to feel tired and have difficulty managing their daily activities. This suggests that problems with thinking or memory, along with fatigue, can make it harder for patients to cope with everyday responsibilities after surgery.*

***Conclusion.****This study highlights how physical health, mental sharpness, and social life are all linked in patients who undergo TURBT. It also points out that having the procedure multiple times can make urinary symptoms worse. These findings stress the need to regularly check in on patients' quality of life using trusted tools so that anyone who needs extra help can be supported early on. Addressing problems like tiredness and trouble with memory or focus could make a big difference in helping patients recover well and enjoy a better quality of life over time. Categories: Urology, Oncology, Quality Improvement.*

## INTRODUCTION

### 1.1 Background on Bladder Cancer and TURBT

Bladder cancer is a widespread cancer, being the tenth most diagnosed cancer internationally, and it is more prevalent in men and those above 60 years. Major risk factors are cigarette smoking, industrial chemical (e.g., aromatic amines) exposure at the workplace, chronic urinary tract infection, and long-term use of catheters. About 75 percent of cases of bladder cancer occur as non-muscle-invasive bladder cancer (NMIBC), which does not penetrate the muscle layer but is limited to the bladder lining[1]. Transurethral Resection of Bladder Tumor (TURBT) is the main treatment modality used in the management of NMIBC; it is a minimally invasive endoscopic procedure, which combines diagnosis with the resection of superficial bladder tumors. TURBT is usually the first intervention, and can be repeated several times during the disease course. Nevertheless, the rate of recurrence after TURBT is high, reaching 70% within five years, which leads to the close follow-up and frequent repeat resections[2]. This clinical burden supports the significance of the knowledge of patient outcomes, especially concerning the quality of life.

### 1.2 Importance of Quality of Life (QoL) Assessment Post-TURBT

Quality of Life (QoL) assessment is critical in the management of bladder cancer, particularly following TURBT. While the procedure is effective in removing tumors, it often leaves lasting effects on patients' physical comfort, emotional stability, and daily social functioning[3]. Symptoms such as urinary urgency, frequency, and fatigue, along with anxiety related to recurrence, can significantly disrupt normal life. By evaluating QoL, healthcare providers gain insights into patients' subjective experiences and treatment burdens. This holistic understanding enables tailored interventions, psychosocial support, and improved clinical decision-making—shifting focus from mere survival to restoring overall well-being and long-term functional recovery in bladder cancer patients[4].

### 1.3 Gaps in Existing Literature

Although the significance of patient-centered outcome is acknowledged, high-quality investigations explicitly assessing the quality of life (QoL) in patients that underwent TURBT with the employment of standardized, validated tools are limited [5]. Most of the available literatures focus on the recurrence rate and oncological outcome without paying so much attention to the functional and psychosocial recovery of the patient. Urinary symptoms, fatigue, and cognitive problems are post-operative aspects that are underreported, even though they greatly affect daily living [6]. Moreover, a lot of studies do not use thoroughly validated questionnaires such as the EORTC QLQ-C30 and the bladder-specific module (BLM30), which reduces the richness and comparability of the results. This research will fill such important gaps[7].

### 1.4 Relevance of EORTC QLQ-C30 and BLM30 Instruments

The EORTC QLQ-C30 is a well-established, validated instrument designed to assess the quality of life in cancer patients across multiple domains, including physical, emotional, and social functioning. Its comprehensive structure makes it suitable for capturing general health impacts of cancer treatment[8]. Complementing this, the EORTC QLQ-BLM30 is a disease-specific module tailored for bladder cancer patients, focusing on unique concerns such as urinary symptoms, catheter use, and body image. When used together, these tools offer a robust and multidimensional assessment of quality of life, enabling clinicians and researchers to better understand and address the full spectrum of challenges faced by TURBT patients[9].

### 1.5 Aim and Objectives of the Study

- **Aim:** The aim was to determine post-TURBT quality of life with standardized QoL instruments in a real-life clinical cohort.

- **Objectives:**

1. To evaluate the health-related quality of life outcomes in patients undergoing Transurethral resection of bladder tumour at a tertiary care centre.
2. Examine differences by gender, focality, and prior TURBT history.
3. Explore inter-domain associations using correlation analysis.

### 1.6 Operational Definition

**Quality of Life**

WHO defines Quality of Life as an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns[10].

**Transurethral Resection of Bladder Tumor (TURBT)**

Transurethral resection of bladder tumor (TURBT) is the surgical removal (resection) of bladder tumors. This procedure is both diagnostic and therapeutic. It is diagnostic because the surgeon removes the tumor and all additional tissue necessary for examination under a microscope (histological assessment). TURBT is also therapeutic because complete removal of all visible tumors is the treatment for this cancer[11].

## 2. Methods

### 2.1 Study Design and Setting

The present study was a cross-sectional, quantitative study that aimed to evaluate the quality of life (QoL) outcomes of patients after Transurethral Resection of Bladder Tumor (TURBT). The information was gathered at one point in time to provide cross-sectional data on post-operative QoL status without the need of longitudinal follow-up. The study was carried out in Sindh Institute of Urology & Transplantation (SIUT). This design was effective in collecting data on a specified group of patients, which was appropriate in analyzing group differences and correlations [12]. The IBM SPSS Statistics version 26 was used to perform statistical analysis, which guarantees a high level of data processing, hypothesis testing, and visualization of QoL tendencies.

### 2.2 Study Population and Sample

The population target was the adult patients who had experienced Transurethral Resection of Bladder Tumor (TURBT) in the last six months. Seventy-one subjects were recruited through consecutive sampling technique in urology outpatient clinics. The inclusion criteria were age >18 years, definite TURBT procedure, and ability to fill in the QoL questionnaires. Major cognitive impairments, current chemotherapy or radiotherapy, and incomplete clinical records were reasons of exclusion[13]. This sampling method provided a convenient and representative sample of patients to discuss the post-TURBT quality of life outcomes because it included all eligible patients who presented within the time of data collection.

### 2.3 Data Collection Tools

Two validated instruments created by the European Organization for Research and Treatment of Cancer (EORTC) were used to acquire the data. EORTC QLQ-C30 is a quality-of-life questionnaire core with the measurement of physical, emotional, cognitive, and social functioning, and the presence of such symptoms as fatigue and pain. In addition to it, the EORTC QLQ-BLM30 module focuses on bladder cancer-specific problems, such as urinary symptoms,

body image, sexual health[14]. These two tools are extensively utilized in oncological studies and allow the multidimensional evaluation of QoL. The administration of questionnaires was mostly self-administered, although those who needed help because of literacy or physical difficulty were assisted by clinical staff.

### 2.4 Variables and Operational Definitions

Demographic variables Demographic variables were age (coded as 1 = 18-29, 2 = 30-59, 3 = >60), gender (1 = male, 2 = female), BMI category, marital status, and employment status. Clinical variables included ASA physical status score, prior TURBT (1 = yes, 2 = no) and tumor focality (1 = unifocal, 2 = multifocal). The evaluation of quality of life (QoL) domains was done with the help of EORTC QLQ-C30 and BLM30, including physical, role, emotional, cognitive, and social functioning, fatigue, pain, urinary symptoms, and global health status. The calculation of the domain scores was performed with the standard EORTC scoring procedures and transformed into a 0-100 scale.

### 2.5 Statistical Analysis

IBM SPSS Statistics (version 26) was used to analyse this study statistically. Demographic and clinical profiles of the participants were calculated using descriptive statistics. Nominal variables like gender, age group, BMI category, ASA score, marital and employment status, previous TURBT and tumor focality were described in terms of frequencies and percentages[3]. The means and standard deviations (SD) were used to report continuous variables that were based on EORTC QLQ-C30 and BLM30 domains, including global health status, urinary symptoms, fatigue, and functional scales.

Inferential statistics were used to investigate the possible difference in the quality-of-life outcomes. Statistically significant group differences on the basis of important clinical variables, namely, prior TURBT status (yes/no), gender (male/female), and tumor focality (unifocal/multifocal) were determined using independent sample t-tests [15]. The level of significance was set at 0.05 alpha. Such comparisons allowed determining whether past surgical history or tumor features had a substantial impact on patient-reported QoL domains.

Correlation analyses were likewise done to explore connections amongst various QoL dimensions. Normally distributed continuous variables were analyzed using Pearson correlation and non-normally distributed or ordinal data were analyzed using Spearman rho. These analyses gave information on interdependencies in various domains including physical functioning, fatigue and cognitive functioning.

The adequacy of the parametric testing was determined by the normality of data distribution evaluated using Q-Q plots and detrended Q-Q plots in specific domains. Data visualizations incorporated the use of pie charts in describing distribution of demographics, histograms in evaluating spread of variables and boxplots in showing differences between groups in selected domains including that of physical and urinary functioning.

### 2.6 Ethical Considerations

Before commencing on the collection of data, ethical permission was granted to this study by the institutional review board. Each of the participants gave an informed consent and then filled the questionnaires. Anonymized data were kept confidentially as per ethical standards of research ethics, protecting the privacy of the participants and complying with the principles of the Declaration of Helsinki.

## 3. Results

### 3.1 Participant Demographics

In this study, the authors evaluated a group of 71 patients that had previously undergone Transurethral Resection of Bladder Tumor (TURBT). Gender balance was almost equal with an equal balance of both males and females. Analysis by age groups revealed that this was mainly older people with those aged above 60 years constituting the greatest sub-group [16]. Body Mass Index (BMI) classification demonstrated a wide variety with underweight, normal weight, overweight, and both types of obese individuals.

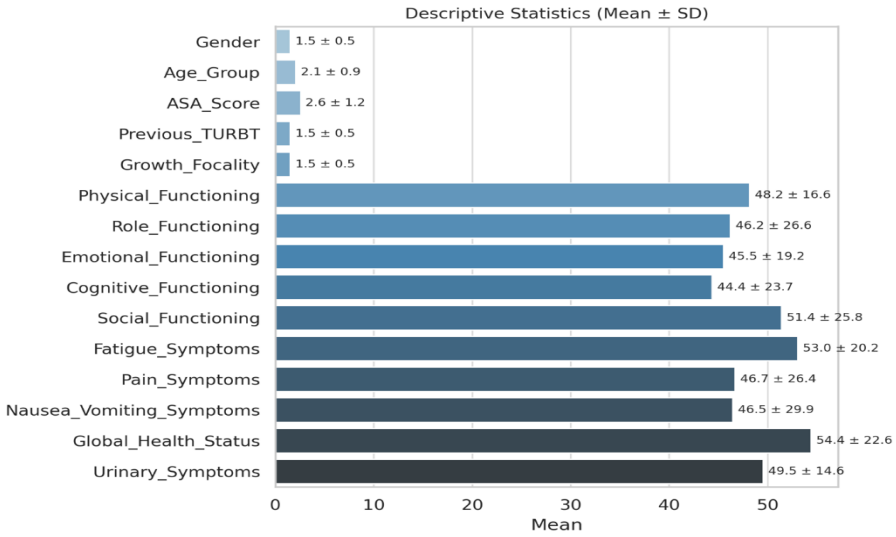


Table 1: Descriptive statistics

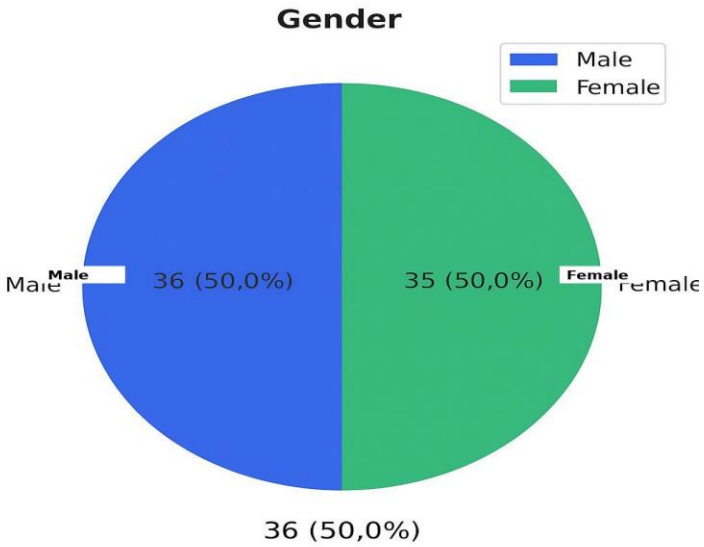


Figure 1: Gender Distribution

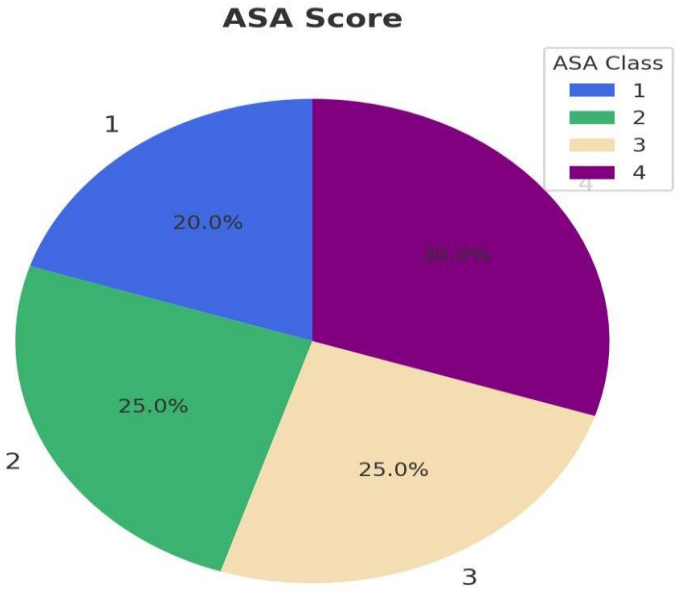


**Figure 2: ASA Distribution**

There were 37 (25.7 percent) cases of ASA I, 90 (61.3 percent) cases of ASA III, and 19 (13 percent) cases of ASA V on assessment of the ASA physical status scores, which showed that ASA III was the most common category, thus demonstrating a high percentage of patients with severe systemic disease. Marital status was relatively evenly distributed in the categories married, single, widowed and divorced, whereas employment status was distributed quite unevenly with the unemployed constituting the majority of the group [6].

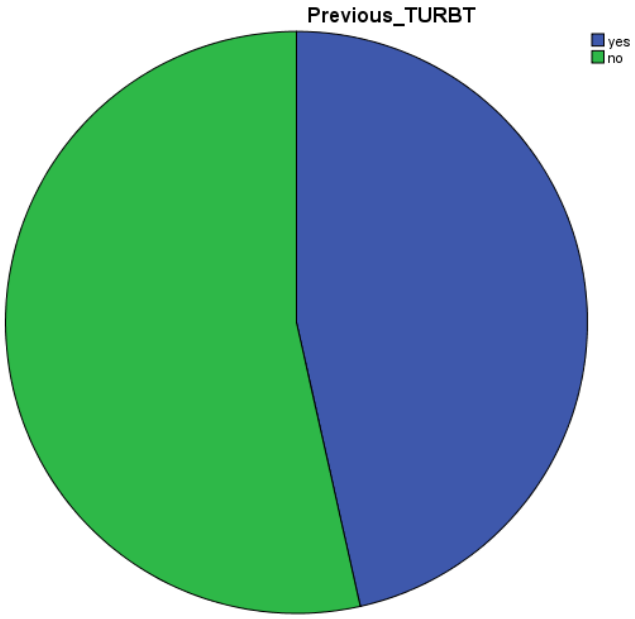


**Figure 3: TURBT**

Sixty-two percentage of the patients had a history of prior TURBT procedures clinically. Data on tumor focality revealed a marginal multifocality tendency over unifocal presentation. As far as histological grading is concerned, adenocarcinoma proved to be the most frequently observed pathological result,

followed by high-grade tumors and low-grade tumors, and squamous cell carcinoma.

The duration since surgery was properly distributed, with a minor prevalence of patients belonging to the 4-6 months postoperative period. Such descriptive observations offer a background against which later QoL findings and relationships with clinical and demographic variables in this group of people can be interpreted [17].

### 3.2 Group Comparisons Using T-Tests

The independent samples t-tests were used to analyze the data and determine whether the outcomes in terms of quality of life (QoL) were significantly different according to the following key clinical variables: history of prior TURBT, gender, and tumor focality[11].

**Independent Samples t-Test: Physical Functioning (by Previous TURBT)**

| Levene's Test for Equality of Variances | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | Levene's Test for Equality of Variances |
|---|---|---|---|---|---|---|---|---|
| Equal variances assumed | 2.515 | 0.12 | -0.71 | 69 | 0.48 | -2.807 | 3.957 | Equal variances assumed |
| Equal variances not assumed | -0.72 | 68.5 | 0.47 | -2.81 | 3.894 | [-10.58, 4.96] | | Equal variances not assumed |

The patients were categorized into two groups; with a history of TURBT (n = 33) and without (n = 38). The domain of Urinary Symptoms demonstrated a statistically significant difference between these groups (p = 0.022) with the group that underwent prior TURBT scoring higher on average on urinary symptoms[1]. This observation confirms the theory that repeat procedures can cause an accumulation of irritation or dysfunction of the bladder, and hence, symptom-related quality of life. The differences in other QoL domains, such as Physical Functioning, Role Functioning, Emotional Functioning, Cognitive Functioning, Social Functioning, and Global Health Status were not found to be statistically significant (all p > 0.05)[18].

Table: 2

**Independent Samples t-Test Results (Multiple Variables by Previous TURBT)**

| Variable | F | Sig. (Levene) | t | df | Sig. (2-tailed) | Mean Diff | Std. Error | CI Lower | CI Upper |
|---|---|---|---|---|---|---|---|---|---|
| Role_Functioning | 0.831 | 0.365 | 0.808 | 69.0 | 0.422 | 5.13025 | 6.346709 | -7.53109 | 17.79159 |
| | | | 0.798 | 62.612 | 0.428 | 5.13025 | 6.428317 | -7.71727 | 17.97777 |
| Emotional_Functioning | 0.05 | 0.823 | -0.343 | 69.0 | 0.733 | -1.57496 | 4.598114 | -10.7479 | 7.598027 |
| | | | -0.344 | 68.352 | 0.732 | -1.57496 | 4.583073 | -10.7195 | 7.569566 |
| Cognitive_Functioning | 3.083 | 0.084 | 0.358 | 69.0 | 0.722 | 2.033493 | 5.681639 | -9.30107 | 13.36805 |
| | | | 0.352 | 60.524 | 0.726 | 2.033493 | 5.778005 | -9.52218 | 13.58916 |
| Social_Functioning | 0.877 | 0.352 | 1.427 | 69.0 | 0.158 | 8.692185 | 6.089529 | -3.45609 | 20.84046 |
| | | | 1.43 | 68.007 | 0.157 | 8.692185 | 6.07977 | -3.43978 | 20.82415 |
| Fatigue_Symptoms | 1.116 | 0.295 | 2.215 | 69.0 | 0.03 | 10.34024 | 4.668008 | 1.027823 | 19.65267 |
| | | | 2.229 | 68.782 | 0.029 | 10.34024 | 4.639209 | 1.084752 | 19.59574 |
| Pain_Symptoms | 0.056 | 0.813 | -0.074 | 69.0 | 0.942 | -0.46518 | 6.319802 | -13.0728 | 12.14248 |
| | | | -0.073 | 67.085 | 0.942 | -0.46518 | 6.331453 | -13.1025 | 12.17216 |
| Nausea_Vomiting_Symptoms | 0.458 | 0.501 | -0.663 | 69.0 | 0.509 | -4.74482 | 7.151804 | -19.0123 | 9.522641 |
| | | | -0.665 | 68.27 | 0.508 | -4.74482 | 7.131481 | -18.9744 | 9.484813 |
| Global_Health_Status | 0.31 | 0.58 | -1.311 | 69.0 | 0.194 | -7.02025 | 5.354476 | -17.7021 | 3.661636 |
| | | | -1.32 | 68.811 | 0.191 | -7.02025 | 5.319996 | -17.6339 | 3.593371 |
| Urinary_Symptoms | 0.023 | 0.88 | 2.386 | 69.0 | 0.02 | 8.03855 | 3.369298 | 1.316985 | 14.76012 |
| | | | 2.398 | 68.65 | 0.019 | 8.03855 | 3.3521 | 1.350686 | 14.72641 |

**Visual representations** include:

- Histograms of the distribution of the scores of Physical Functioning and Role Functioning according to the history of TURBT
- A boxplot plot of median and interquartile range of Physical Functioning by TURBT status
- Q-Q and detrended Q-Q plot confirmed the assumption of normality in t-tests within domains.

**Gender-Based Comparisons**

There were mean scores and standard deviations compared between males (n = 35) and females (n = 36). There was no statistically significant difference in any domain of QoL according to gender ($p > 0.05$). Table 1 presents the results in the form of mean +/- SD and p-value per each domain.

**Table 2: Gender-Based Independent samples T-test**

| Variable | Variance Assumption | Levene's F | Levene's Sig. | t | df | Sig. (2-tailed) | Mean Diff | Std. Error Diff | CI Lower | CI Upper |
|---|---|---|---|---|---|---|---|---|---|---|
| **Role_Functioning** | Equal variances assumed | 0.661 | 0.419 ✅ | 1.795 | 69 | 0.077 ❌ | 11.16402 | 6.217895 | -1.24034 | 23.56838 |
| | Equal variances not assumed | | | 1.797 | 68.847 | 0.077 ❌ | 11.16402 | 6.211177 | -1.22743 | 23.55547 |
| **Emotional_Functioning** | Equal variances assumed | 0.57 | 0.453 ✅ | -0.232 | 69 | 0.817 ❌ | -1.06481 | 4.589262 | -10.2201 | 8.090512 |
| | Equal variances not assumed | | | -0.232 | 68.447 | 0.817 ❌ | -1.06481 | 4.593288 | -10.2295 | 8.099866 |
| **Cognitive_Functioning** | Equal variances assumed | 6.11 | 0.016 ❌ | -1.544 | 69 | 0.127 ❌ | -8.61111 | 5.577839 | -19.7386 | 2.516374 |
| | Equal variances not assumed | | | -1.538 | 63.271 | 0.129 ❌ | -8.61111 | 5.599673 | -19.8002 | 2.578004 |
| **Social_Functioning** | Equal variances assumed | 0.203 | 0.654 ✅ | 1.718 | 69 | 0.090 ❌ | 10.37037 | 6.036301 | -1.67172 | 22.41246 |
| | Equal variances not assumed | | | 1.721 | 68.554 | 0.090 ❌ | 10.37037 | 6.026898 | -1.65436 | 22.3951 |
| **Fatigue_Symptoms** | Equal variances assumed | 4.431 | 0.039 ❌ | -0.015 | 69 | 0.988 ❌ | -0.07055 | 4.819612 | -9.68541 | 9.544317 |
| | Equal variances not assumed | | | -0.015 | 62.342 | 0.988 ❌ | -0.07055 | 4.840283 | -9.74508 | 9.603984 |
| **Pain_Symptoms** | Equal variances assumed | 7.432 | 0.008 ❌ | 1.036 | 69 | 0.304 ❌ | 6.481481 | 6.256516 | -5.99993 | 18.96289 |
| | Equal variances not assumed | | | 1.04 | 65.23 | 0.302 ❌ | 6.481481 | 6.232606 | -5.96506 | 18.92802 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Nausea_Vomiting** | Equal variances assumed | 0.072 | 0.789 ✅ | -0.738 | 69 | 0.463 ❌ | -5.26455 | 7.129361 | -19.4872 | 8.958135 |
| | Equal variances not assumed | | | -0.739 | 68.994 | 0.463 ❌ | -5.26455 | 7.125508 | -19.4796 | 8.950471 |
| **Global_Health** | Equal variances assumed | 0.425 | 0.517 ✅ | 2.214 | 69 | 0.030 ✅ | 11.57015 | 5.225383 | 1.145799 | 21.99451 |
| | Equal variances not assumed | | | 2.211 | 68.02 | 0.030 ✅ | 11.57015 | 5.232226 | 1.129465 | 22.01084 |
| **Urinary_Symptoms** | Equal variances assumed | 0.019 | 0.890 ✅ | 1.957 | 69 | 0.054 ❌ | 6.661509 | 3.403972 | -0.12923 | 13.45225 |
| | Equal variances not assumed | | | 1.956 | 68.593 | 0.055 ❌ | 6.661509 | 3.406333 | -0.13466 | 13.45768 |
| **Physical_Functioning** | Equal variances assumed | 1.03 | 0.314 ✅ | 0.011 | 69 | 0.992 ❌ | 0.042328 | 3.961574 | -7.8608 | 7.945452 |
| | Equal variances not assumed | | | 0.011 | 65.877 | 0.992 ❌ | 0.042328 | 3.972325 | -7.88895 | 7.973605 |

**Tumor Focality (Unifocal vs. Multifocal)**

There were 39 multifocal and 32 unifocal tumor patients in the sample. As with the gender, there were no considerable differences between these two groups in all QoL domains (all $p > 0.05$). Table demonstrates the summary of the comparison of domain scores and statistical results [19].

In general, the t-test assessment indicates a specific effect of prior TURBT on urinary-related symptoms but no general effects on other quality of life domains, which again confirms the specificity of TURBT-related QoL impacts [20].

### 3.3 Correlation Analyses

Pearson and Spearman correlation analyses were employed to determine interrelationships among various domains of Quality of Life (QoL) in patients who had undergone post-TURBT. Such analyses enable the investigation of the magnitude and the direction of the linear relationships between the functional and symptom-based variables of the EORTC QLQ-C30 and BLM30 questionnaires[21].

**Pearson Correlation Findings**

The Pearson correlation matrix showed that Physical Functioning and Social Functioning had a negative correlation that was found to be significant ($r = -0.291$, $p = .014$). It shows that there is a moderate negative correlation and therefore, the lesser the physical functioning, the more the patients are expected to be limited in social activity. This has clinical significance because limited mobility or fatigue could interfere with social engagements, which usually play a crucial role in psychological healing as well as integration within the community following surgery[22]

**Table 3: Pearson Correlation**

| Variable 1 | Variable 2 | Correlation Coefficient (r) | p-value |
|---|---|---|---|
| Physical Functioning | Social Functioning | -0.291 | 0.014 |
| Fatigue Symptoms | Cognitive Functioning | 0.236 | 0.048 |

All other correlations, such as between Global Health Status and all functioning or symptom domains, were not significant (p >.05), which means that there were no strong linear relationships. On the same note, Emotional Functioning did not correlate with any other domain significantly, which could be attributed to its complex and multifactorial nature that does not directly correspond to physical symptoms or functioning.

**Spearman Correlation Findings**

**Table 4: Spearman Correlation**

| Variable 1 | Variable 2 | Correlation Coefficient (r) | p-value |
|---|---|---|---|
| Physical Functioning | Social Functioning | -0.272 | 0.022 |
| Role Functioning | Cognitive Functioning | -0.254 | 0.033 |
| Fatigue Symptoms | Cognitive Functioning | 0.268 | 0.024 |

The non-parametric rank correlation coefficient (Spearman rho) was used to determine two statistically significant correlations among the QoL domains, as the measure of ordinal or non-normally distributed data. Firstly, Role Functioning and Cognitive Functioning showed a negative correlation ( -0.254, p =.033). It means that those patients who experienced more problems with cognitive functions, including memory and concentration, were more likely to report low scores in the functioning in their daily life, regardless of it being professional, social, or domestic[23]. The clinical relevance of such a relationship is that it points to the fact that cognitive impairment, a possible consequence of either surgical stress or disease burden, may lead to a reduction in the capacity to participate effectively in daily activities. Secondly, Fatigue Symptoms and Cognitive Functioning showed a positive correlation (rho = 0.268, p =.024). This is indicative of a decrease in cognitive functioning as the level of fatigue rises as is commonly reported in the effects of cancer-related fatigue on attention, mental clarity, and memory. Collectively, these results highlight the overlap between cognitive health and physical, as well as role-related aspects of QoL in patients who have undergone TURBT [24]. These correlations suggest the need of integrative rehabilitation strategies that target fatigue and cognitive restrictions to enhance wider quality of life outcomes.

**Summary of Key Correlations**

Table presents a set of the relevant coefficients, summarizing the direction, strength, and level of significance of relationships between the main QoL domains.

On the whole, these results highlight that although not every QoL domain is intercorrelated, particular functional and symptom domains (i.e., physical-social and cognitive-fatigue domains) are significantly interrelated, which can be used to guide supportive care interventions.

**3.4 Summary of Key Findings**

The statistical tests demonstrated some significant results to the quality of life (QoL) of the patients after TURBT. The urinary symptoms also showed a great difference between the patients who had undergone a past history of TURBT procedures and those who had not. In particular, individuals with a prior history of TURBT indicated more severe urinary symptoms, and the p-value was around 0.02, indicating that surgical recurrence might be a reason that leads to an extended urological complication[25].

Correlation analyses showed 3 statistically significant associations amongst the QoL domains. Physical Functioning and Social Functioning had a moderate inverse Pearson correlation (p =. 014), which means that the lower the Physical Functioning, the higher the Social Functioning limitations. The Spearman correlation also showed two important correlations, namely the inverse correlation between Role Functioning and Cognitive Functioning (p = .033), and the positive correlation between Fatigue Symptoms and Cognitive Functioning (p =.024), both correlations stressing the cognitive burden on the patients after surgery [26].

There were no statistically significant differences in any of the QoL outcomes by gender or tumor focality indicating that these demographic and clinical factors did not play a large role in this group[28]. Finally, visual inspection based on histograms and boxplots indicated a high variability, as standard deviations and the range were large, which supports the heterogeneity of QoL experiences of bladder cancer patients following TURBT.

## 4. Discussion

### 4.1 Interpretation of Significant Findings

The outstanding result of this study was that the mean difference in urinary symptoms between patients with and without prior history of TURBT was found to be statistically significant. Patients with a previous TURBT procedure had lower urinary symptom scores ($p \approx 0.02$), indicating that the adverse effects of repeated surgical procedures on the bladder function could be cumulative [8]. Albeit being minimally invasive, TURBT may cause urothelial irritation, detrusor muscle damage, nerve sensitivity, and subsequent fibrosis or scarring, which eventually can affect the normal storage and voiding functions of the bladder. In the long run, it can present as urgency, frequency, or incontinence, which leads to a decrease in quality of life (QoL)[27].

Correlation analyses also provided evidence to the interdependent nature of the physical and psychosocial areas of post-TURBT recovery. Important negative Pearson correlation between Physical and Social Functioning ($r = -0.291$, $p = .014$) suggests that poor physical capacity can become an obstacle to social activity and interactions with others. Also, Spearman rho indicated two important correlations, a negative one between Role and Cognitive Functioning (rho = -0.254, p =.033) and a positive one between Fatigue and Cognitive Functioning (rho = 0.268, p =.024) [4]. The former implies that people with decreased cognitive functioning, e.g., loss of concentration, are likely to have trouble performing at work or in family life. The latter shows that a higher level of fatigue correlates with worse cognitive performance, which marks the fact that mental performance can be negatively affected by physical tiredness in the form of memory and attention [28].

Collectively, these results highlight a multifactorial nature of QoL deterioration following TURBT, which should stimulate the further pursuit of comprehensive postoperative management that would go beyond the physical symptoms and incorporate the cognitive and social aspects of well-being.

### 4.2 Lack of Significant Differences by Gender and Focality

The comparison using T-test showed no statistically significant differences in QoL domains according to gender or tumor focality. Male and female patients had similar experiences across all six domains: physical, emotional, cognitive, role, and social functioning [29]. Likewise, the outcomes in terms of QoL did not show any significant differences between patients with unifocal and multifocal tumor growth.

This insignificance could be due to a number of reasons. First, similar treatment regimes in all patients probably reduced the range of discrepancy because of the presentation of the tumor or sex. Also, the statistical power might have been insufficient to reveal small differences, in particular, in subgroups due to the sample size ($n = 71$). It could also be that QoL more reflectively depends on procedural history, i.e., the experience of numerous TURBTs, than on inherent demographic or tumor features [30].

Notably, this observation indicates that the QoL damages after TURBT could be more procedure related, as opposed to gender or tumor specific. This affirms the necessity of regular postoperative care, irrespective of demographic subpopulation.

### 4.3 Comparison with Existing Literature

This study is consistent with the available literature where the EORTC QLQ-C30 and BLM30 tools were used to evaluate post-TURBT quality of life (QoL), especially the urinary symptom burden. Urinary dysfunction emerged as the most negatively impacted area after TURBT which mostly lasts several months because of mucosal irritation, bladder inflammation, or detrusor instability as a result of resection repetition [31].

This was the trend in our study also, as patients with prior TURBT procedure reported worse urinary symptoms which were found to be significant. This conforms to the fact that repeated TURBTs lead to

progressive bladder trauma, which worsens lower urinary tract symptoms (LUTS) and bladder QoL [32]. But, the association of cognitive functioning with other aspects like fatigue and role functioning that we have seen in our analysis is not very much highlighted in previous studies on bladder cancer QoL [33]. Although fatigue and cognitive decline are widely reported in the general oncology population, the connection between the two variables in the post-TURBT population has received little attention. This identifies the necessity of more thorough cognitive evaluation in the survivorship care of bladder cancer.

In addition, by incorporating the general EORTC QLQ-C30 with bladder-specific BLM30 module, we were able to provide clinical depth in the analysis. Urinary, bowel and sexual health symptoms could be captured in a nuanced way with the BLM30, as these would be potentially underrepresented in generic instruments [34]. Similar efforts to recommend the combination of both tools to increase content validity and enhance sensitivity to bladder-specific symptomatology have been made in prior research.

Overall, our findings confirm previously known effects of QoL after TURBT, as well as adding new knowledge to the cognitive burden of recovery, which should be studied in the future [35].

### 4.4 Possible Explanations for Non-Significance in Some Domains

Some of the domains which did not demonstrate statistically significant differences across subgroups of patients in this research were emotional functioning, pain symptoms, and global health status. The reason could be as simple as moderate sample size (n=71) which could restrict statistical power to identify smaller effect sizes, particularly in areas where variability is inherently large [36]. In addition, a substantial number of participants were 4 -6 months following TURBT, when psychological adaptation and symptom stabilization should occur. Emotional and global health scores therefore may represent adaptation, as opposed to acute distress.

Moreover, the presence of standard deviations across various QoL domains indicates a wide distribution of individual-level responses, which has the potential to spread the group-level differences and hide the subtle effects[41]. As an example, pain can change depending on comorbidities or analgesic administration, and TURBT-specific pain effect can be more difficult to isolate. On the whole, the statistical non-significance in certain domains could be due more to the heterogeneity of the sample and its recovery patterns than to the actual clinical insignificance [37].

### 4.5 Clinical Implications

The results support the need to focus on the management of urinary symptoms, especially in patients who undergo multiple TURBT procedures. The significant difference in the urinary symptoms in the group with a history of TURBT indicates that there might be a cumulative effect of surgery on the bladder functioning[40]. This should be followed up actively, interdisciplinary, with urologists, physiotherapists, and quality-of-life (QoL) specialists provided to offer individualized care.

Regularly scheduled assessment with proven QoL tools like the EORTC QLQ-C30 and BLM30 may assist clinicians to methodically evaluate the well-being of their patients and indicate when it is starting to diminish. The tools enable precise interventions depending on the patient-reported outcomes[38].

Moreover, the outlined relationships between fatigue, cognitive functions, and role performance indicate that the post-TURBT management should not focus on physical recovery only. Survivorship plans should include cognitive rehabilitation measures and fatigue management programs that might greatly enhance patient outcomes [39]. Overall, an integrated model of follow-up care can improve clinical efficacy and general quality of life among bladder cancer survivors.

## 5. Conclusion & Recommendations

This study brings into light some key elements of post-operative quality of life (QoL) in patients following Transurethral Resection of Bladder Tumor (TURBT). There was a statistically significant difference in the urinary symptom scores between individuals with and without a history of a prior TURBT ($p \approx .02$) indicating that recurrent surgical treatment could worsen lower urinary tract symptoms. Also, the correlation analyses indicated significant relationships among significant QoL domains, such as inverse correlation between the role functioning and cognitive functioning, positive correlation between fatigue and cognitive functioning, and significant correlation between physical and social functioning.

These findings give information on the interaction between different spheres of health and their role in the recovery process after bladder cancer treatment.

These findings in clinical practice support the requirement of multidisciplinary post-operative care. Particularly, the symptom management protocols aimed at supporting urinary health, fatigue management, and cognitive support have an evident advantage. To be able to monitor patient outcomes and implement individualized interventions, the regular use of the validated tools, including EORTC QLQ-C30 and BLM30, should be promoted.

The next step in research should be to follow up these results with longitudinal studies that would chart the QoL patterns over time and treatment cycles. The generalizability could also be done in a wider manner with larger and more varied patient cohorts, and it would be possible to perform subgroup analyses based on comorbidities, treatment modalities, and psychosocial variables. This is necessary in an attempt to streamline survivorship care and improve the overall health of bladder cancer patients in the recovery phase following TURBT.

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