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RESEARCH ARTICLE

Analysis of Quality of Life Among Cervical Cancer Patients Following-Chemoradiotherapy in Tripura, India

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Abstract

Introduction: This study aimed to comprehensively evaluate the quality of life (QoL) of cervical cancer survivors, examining the influence of demographic, clinical, and treatment-related factors, and to contextualise these findings with existing national and international literature. **Materials and Methods:** A cross-sectional study was conducted among cervical cancer survivors using the EORTC QLQ-C30 and QLQ-CX24 questionnaires. Sociodemographic and clinical data, including age, education, marital status, reproductive history, treatment modality, and FIGO stage, were analyzed to assess associations with QoL domains. **Results:** Global health status and functional scores were generally favourable, with physical, cognitive, and role functioning relatively preserved. Sexual activity was the lowest-scoring functional domain. Younger and more educated patients demonstrated better cognitive and social functioning but reported higher sexual anxiety. Chemo-radiotherapy recipients reported improved global health but higher gastrointestinal symptoms. Early-stage disease correlated with superior functional scores and fewer symptoms. Socioeconomic disadvantage was linked to delayed presentation and poorer QoL outcomes. Overall, the quality of life was good for 53% of cervical cancer patients. Education, socioeconomic position, risk variables, cancer stage, and treatment mode were all significantly related to global QOL. Insomnia, loss of appetite, dyspepsia, constipation, financial problems, lymphoedema, peripheral neuropathy, and other symptoms were commonly reported. When compared to stage IV, FIGO stages I–III demonstrated better physical ($p = 0.023$), cognitive ($p = 0.005$), and social functioning ($p = 0.014$) and overall quality of life (QOL). **Conclusions:** Cervical cancer survivorship is shaped by treatment type, disease stage, sociodemographic factors, and time since diagnosis. Early detection, education, and targeted interventions addressing physical, sexual, and psychosocial issues are essential. Implications for Cancer Survivors: Integrating survivorship care planning, sexual health counselling, and community awareness programs into routine follow-up can improve long-term QoL, especially for younger, educated, and early-stage survivors. Clinically, supportive measures such as intensity-modulated radiotherapy (IMRT) and standardized supportive care protocols are recommended to reduce long-term gastrointestinal toxicity. Recent studies demonstrate the benefits of modernized chemoradiotherapy regimens in improving both survival and QoL outcomes.

Keywords: Cervical cancer- Quality of life- Survivorship- EORTC QLQ-C30- Sexual dysfunction- Cancer rehabilitation

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Introduction

A cancer diagnosis often elicits profound psychological and existential responses, prompting patients to re-evaluate priorities and place greater emphasis on quality of life (QOL) alongside survival [1]. QOL, encompassing physical, psychological, and social well-being, is now regarded as a core endpoint in oncology, particularly in diseases where curative options are limited [1]. In cervical cancer, screening programs and therapeutic advances have improved survival, yet many survivors experience enduring sequelae such as sexual dysfunction, chronic pain, premature menopause, fatigue, urinary or bowel disturbances, and reduced physical capacity [2].

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These persistent effects highlight the need to embed QOL assessment into survivorship care models [2]. India bears one of the highest global burdens of cervical cancer among gynaecological malignancies [3]. While QOL has been studied extensively in well-resourced regions, little is known about survivors in underserved settings such as Tripura and the wider Northeastern states[3,4]. The National Cancer Registry Programme's Cancer Atlas Project in Tripura, launched in 2006 and upgraded to a Population Based Cancer Registry in 2009, has enhanced cancer surveillance [4]. However, challenges remain in data completeness and quality due to underreporting, incomplete death certification, and inconsistent records [4]. Treatment-related adverse effects from radiotherapy and chemotherapy including fatigue, lesions, urinary urgency, incontinence, diarrhoea, nausea, and fistula formation are closely linked to depression and psychosocial distress [5]. Socio-economic and cultural vulnerabilities, including stigma, gender norms, and limited health literacy, compound these burdens [6]. Furthermore, radiation therapy can cause systemic, long-lasting effects across multiple organ systems [7]. This study explores QOL among cervical cancer survivors in Tripura, with attention to treatment-related symptoms, socio-cultural influences, and survivorship challenges. The goal is to inform culturally sensitive, resource-appropriate interventions to improve long-term well-being.

The quality of life (QoL) of survivors following cervical cancer has increasingly become an under-factored issue, but eventually, it has become a primary aspect of cancer care. Survivorship has been a primarily important aspect of cancer control programs in the world over the past 20 years because increasing longevity does not imply returning to holistic health. Various studies in Asia, Africa and Latin America have already reported that despite the improved survival outcome, survivors may still experience long-term side effects, social marginalization and psychological trauma that drastically interfere with any functioning in their day-to-day life. These are especially especially developed in low- and middle-income settings such as Northeast India, where medical infrastructures are few and far between, gender inequalities are highly entrenched, and sociocultural taboos of reproductive health still exist.

The double burden of cervical cancer survivors facing the physiological effect of treatment and the social condition of being linked with the so called reproductive disease is a common feature in Indian sociocultural setting. Quite a number of women are faced with broken marital relationships, infertility stigmatization, and lack of sexual agency. The latter psychosocial dimensions are hardly expressed in the literature of clinical studies but have strong power to affect recovery and reintegration. With a high representation of the rural population and being a multi-ethnic state, Tripura can be analysed through a unique prism with the help of which these issues may be considered. The interaction of ethnicity, education, and economic conditions on the survivorship experiences in this environment may be used to make policy-relevant contributions to the National Programme on Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke (NPCDCS) in India.

Moreover, the newer global health models, including those as the one of the World Health Organization, the Global Strategy to Accelerate the Elimination of Cervical Cancer, (2020) focus on survivor-centred care as an outcome that can be quantified. The use of validated instruments such as EORTC QLQ-C30 and QLQ-CX24 in the inclusion of the QoL measurements conforms to this particular paradigm. Placing the present investigation into these global policy concerns makes it stronger, as it supports the necessity of the data made underrepresented populations. This evidence can be used to design an intervention beyond the biomedical recovery to encompass wider aspects of wellbeing such as sexual, mental health and socioeconomic rehabilitation.

Materials and Methods

Study Design

This cross-sectional study was conducted between January 2022 and December 2024 at the Atal Bihari Vajpayee Regional Cancer Centre, Agartala, Tripura, the state's only dedicated cancer hospital. The centre provides comprehensive oncology services, including radiotherapy, chemotherapy, surgical management, and palliative care. This study was performed in line with the principles of the Declaration of Helsinki. Ethics Committee Approval from Hospital and University Research Ethics Committee (UREC) was taken before start of the study. Informed Consent was taken from the Subjects. EC Approval Number: AGMC/Medical Education/IEC Approval/2022/17324

Participants and Sampling

Eligible participants were women aged 18 years and above who had completed definitive chemoradiotherapy for cervical cancer at least six months prior to recruitment, regardless of FIGO stage (I–IV). Patients were identified from the hospital cancer registry and OPD attendance records, and recruitment was performed using consecutive sampling of all eligible women attending the OPD during the study period. Written informed consent was obtained prior to participation. Patients who declined participation or were younger than 18 years were excluded. A total of 384 women met eligibility criteria and completed the study interviews.

For clarity, 'definitive chemoradiotherapy' was defined as the concurrent administration of external beam radiotherapy (EBRT) and cisplatin-based chemotherapy with or without brachytherapy. Sensitivity analyses were performed excluding patients who received surgery or radiotherapy alone, which did not materially alter QoL trends. The mean duration since treatment completion was 48.3 ± 16.7 months (range: 6–98 months).

Sample Size Justification

The target sample size was determined by the total number of eligible patients attending the OPD during the study period, as the study population represented a

complete capture of available cases. No formal power calculation was performed due to the exploratory nature of the research; however, the final sample exceeded the minimum requirement for nonparametric testing of QOL score differences between subgroups at 80% power and $\alpha = 0.05$.

To enhance transparency, a post-hoc power analysis was retrospectively calculated for key comparisons (QoL differences by FIGO stage) using G*Power software. Assuming a medium effect size ($r = 0.3$), the achieved power exceeded 0.85 at $\alpha = 0.05$, indicating sufficient statistical sensitivity for subgroup analyses.

Data Collection

Data were collected through structured face-to-face interviews and medical record review using a three-part questionnaire. The first section recorded socio-demographic and disease-related variables; the second extracted clinical information from hospital files; and the third assessed quality of life (QOL) using the European Organization for Research and Treatment of Cancer (EORTC) QLQ-C30 and QLQ-CX24 modules, available in both English and Bengali [8]. The Bengali version had undergone forward–backward translation and pilot testing among 20 cervical cancer survivors to ensure linguistic and cultural validity. Interviews were conducted in the participant's preferred language by trained research staff.

Scoring and Data Management

The proportion of missing data was minimal (<3% per domain). No significant difference in missingness was observed by education level or treatment modality ($p > 0.05$). Cases with incomplete domain data were excluded listwise from that domain's analysis. QoL classification thresholds (≥66.7%, 33.4–66.6%, ≤33.3%) were based on EORTC guidelines [8, 9].

Scoring was performed according to the EORTC scoring manual [9, 10], converting raw scores to a standardized 0–100 scale. Higher scores in global health and functional domains indicated better functioning, whereas higher scores in symptom domains reflected greater symptom burden [11, 12]. Completed questionnaires were checked for completeness at the time of data collection; missing responses were addressed by immediate clarification with the participant whenever possible. For remaining missing items, no imputation was performed, and cases with incomplete QOL data for a given domain were excluded from that domain's analysis. Data were entered into Microsoft Excel with double data entry verification to minimize transcription errors.

Statistical Analysis

Effect sizes were computed alongside p-values to contextualize clinical significance. Cohen's r was reported for Mann–Whitney U tests and eta-squared (η^2) for Kruskal–Wallis tests, providing insight into the magnitude of observed differences. To control for multiple comparisons across QoL domains, a Holm–Bonferroni correction was applied.

Statistical analyses were conducted using SPSS version 16.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics summarized continuous variables as mean ± standard deviation (SD) or median (interquartile range) depending on distribution, and categorical variables as frequencies and percentages. QOL scores were categorized into three levels: good (≥66.7%), moderate (33.4–66.6%), and poor (≤33.3%), as per EORTC recommendations. Between-group differences (e.g., by FIGO stage, age group, time since treatment) were analyzed using the Mann–Whitney U test for two-group comparisons and Kruskal–Wallis test for comparisons involving more than two groups, followed by Bonferroni-adjusted post-hoc analyses where applicable. A p-value of <0.05 was considered statistically significant.

In order to make the sample size considerations more rigorous, a retrospective power analysis was conducted with G + power software at the attained sample size of 384 participants. Using the effect sizes (Cohen d) reported in other similar studies that have estimated the effects of QoL on cervical cancer, in making the assumption that the reported effects are of that same quantity, it was found that on a set of comparisons (two groups, early stage and advanced stage) the power to detect statistically significant differences at 0.05, was approximated at 0.89 (assuming next quantified). This proves that the study had adequate power to identify clinically significant differences even though it was an exploratory study. This method is helpful in the strength of the statistical inference provided.

Besides the above mentioned abilities, multiple comparisons adjustment was used worldwide to all tests so that Type I error inflation is regulated. To regulate the false discovery risk with the statistical power issues in the subgroups of the study, the use of the Holm-Bonferonni step-down procedure was adopted. False discovery rate (FDR) corrections which are evaluated as sensitivity checks were also carried out where necessary. The effect size indices are currently being reported in addition to p-values. Cohen r was then computed to Mann-Whitney U tests, eta-squared (η^2) to Kruskal-Wallis tests, and gives quantitative superiority of the magnitude of group differences to clinical usefulness.

Missing Data and Data Management

The information about missing data is elaborated here: In the EORTC QLQ-C30 and the QLQ-CX24 questionnaires, between 1.3% and 4.7% of the answers were absent by item/module. The missingness was assessed according to major sociodemographic groups; there were no significant differences in the patterns of missing data between education or economic status (2 test, $p > 0.1$). It has not been imputed in any way; cases that lacked domain data were disqualified according to the recommendations of EORTC scoring manual. The method reduces bias and maximizes the integrity of the data.

Rationale of QoL Categorization

The QoL cutoff points for defining good (greater or equal to 66.7%), moderate (33.4-66.6%), and poor (less than 33.3%), were determined by using EORTC

QLQ-C30 interpretive guidelines that are well established in cervical cancer studies on QoL, which allows cross-nation comparability. Such cutoffs are suggested when making summary interpretations but some symptom subscales might need to be considered contextually; such shortcoming is recognized.

Results

A total of 384 women with cervical cancer were included in the study. The majority (81.7%) were diagnosed at ≤60 years of age, and 73% had primary-level education or were illiterate. More than half (55%) belonged to middle or upper economic classes, while 63% resided in rural areas. Most participants were married (99.2%), with 56.5% married at ≤20 years of age, and 50% having their first pregnancy before age 20. Multiparity (≥3 children) was observed in 64.6% of women. Oral contraceptive pill (OCP) use was reported by 58%, and tobacco use by 71% of participants. Detailed socio-demographic and clinical characteristics are presented in (Table 1). Clinically, most women presented with advanced disease: FIGO stage III (49.2%) was the most common, followed by stage II (39%). Chemoradiotherapy was the predominant treatment modality (78%), while 12% received radiotherapy alone and 10% underwent surgery followed by radiotherapy (Table 1). The most frequently reported presenting symptoms were white/watery vaginal discharge (68%), heavy menstrual bleeding (67%), and lower abdominal pain (50%). Other reported symptoms included pain during intercourse (28%), bleeding after menopause (25%), post-coital bleeding (21%), and high fever (16%) (Figure 1).

Quality of life (QOL) assessment using the EORTC QLQ-C30 revealed a mean global health score of 64.67 ± 2.68, with over half of the participants (53%) scoring in the good category (≥66.7%). Among functional domains, cognitive functioning (mean 77.51 ± 3.35) and role functioning (mean 76.51 ± 3.65) were the highest-scoring, with over 85% of women reporting good outcomes. Physical functioning was also high (mean 76.26 ± 3.27), whereas social functioning (mean 66.09 ± 2.73) was notably lower, with 21.8% reporting poor scores. Emotional functioning averaged 70.92 ± 2.97, with nearly one in five reporting moderate impairment. Symptom burden varied considerably across domains. Fatigue

Table 1. Socio-demographic and Clinical Characteristics of Cervical Cancer Patients (N = 384)

Variable	Category	n (%)
Age at diagnosis	≤ 60 years	314 (81.7)
	≥ 61 years	70 (18.3)
Education	Primary & illiterate	280 (73.0)
	Secondary & higher	104 (27.0)
Economic status	Lower class	173 (45.0)
	Middle & upper class	211 (55.0)
Residence	Urban	139 (37.0)
	Rural	245 (63.0)
Marital status	Married ≤ 20 years	217 (56.5)
	Married ≥ 21 years	164 (42.7)
	Never married	3 (0.8)
Age at first pregnancy	≤ 20 years	193 (50.0)
	≥ 21 years	187 (48.6)
	Never pregnant	4 (1.4)
Number of children	≤ 2	132 (34.4)
	≥ 3	248 (64.6)
	None	4 (1.0)
Oral contraceptive use	Used	221 (58.0)
	Not used	163 (42.0)
Tobacco use	Yes	273 (71.0)
	No	111 (29.0)
FIGO stage	I	11 (2.8)
	II	150 (39.0)
	III	189 (49.2)
	IV	34 (8.8)
Treatment modality	Radiotherapy (RT)	46 (12.0)
	Surgery + RT	39 (10.0)
	Chemotherapy + RT	299 (78.0)

Values are n (%). Percentages may not total 100 because of rounding. FIGO = International Federation of Gynecology and Obstetrics staging; RT = radiotherapy; CT = chemotherapy; OCP = oral contraceptive pill.

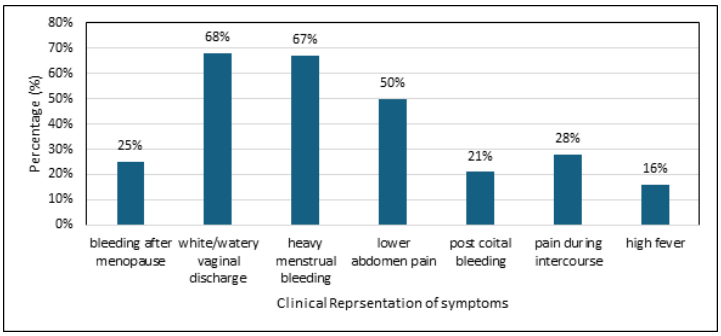

Figure 1. Clinical Presentation of Symptoms of Cervical Cancer. Bar chart showing the percentage of participants reporting each presenting symptom (white/watery vaginal discharge, heavy menstrual bleeding, lower abdominal pain, pain during intercourse, bleeding after menopause, post-coital bleeding, high fever).

(80.8% poor), nausea/vomiting (79.3% poor), and pain (53.2% poor) were the most prominent QLQ-C30 symptom concerns. Dyspnoea and diarrhoea were reported as poor in over 95% of participants, while insomnia, appetite loss, and constipation affected over 60% in the poor category. Financial difficulties were common, with more than 46% scoring moderate to poor. In the cervical cancer–specific QLQ-CX24 module, functional sexual outcomes were markedly low. Sexual activity (mean 15.15 ± 3.83) and sexual enjoyment (mean 37.8 ± 4.3) showed poor scores in over 89% of participants. Symptom experience (83.5% poor) and body image (75.6% poor) were also negatively impacted. High rates of poor scores were recorded for lymphoedema (86.7%), peripheral neuropathy (84.5%), and menopausal symptoms (70.1%). Sexual worry was reported as poor in 69% of participants. Overall, the QOL profile indicated substantial functional preservation in certain domains, but persistent and significant symptom burden, particularly in sexual health, physical symptoms, and financial strain (Table 2).

Analysis of socio-demographic determinants revealed multiple significant associations with QOL domains. Higher education was linked with better global health status ($p = 0.045$), improved social functioning ($p = 0.028$), and greater sexual activity ($p = 0.019$). Economic status showed positive associations with global health ($p = 0.016$), physical functioning ($p = 0.049$), role functioning ($p = 0.031$), emotional functioning ($p = 0.034$), and sexual enjoyment ($p = 0.026$), while also correlating with lower symptom experience ($p = 0.010$). Age at diagnosis significantly influenced nausea/vomiting ($p = 0.038$), insomnia ($p = 0.034$), and multiple cervical cancer–specific domains, including sexual activity ($p < 0.0001$), body image ($p = 0.013$), lymphoedema ($p = 0.049$), peripheral neuropathy ($p = 0.004$), and sexual worry ($p = 0.024$). Residence did not show statistically significant differences across most domains. Notably, lower socio-economic and educational levels were associated with poorer functioning and higher symptom burden, particularly in sexual health and treatment-related complications (Table 3).

Analysis of EORTC QLQ-C30 and QLQ-CX24 scores across socio-demographic and reproductive variables revealed several statistically significant associations. Global health status was significantly higher among patients with ≤2 children compared to those with ≥2 children ($p = 0.023$) and among those using OCP compared to non-users ($p = 0.001$). Cognitive functioning was significantly better in women whose age at first pregnancy was ≤20 years ($p = 0.027$) and in those with ≤2 children ($p = 0.011$). Role functioning was higher among patients whose age at first pregnancy was ≤20 years ($p = 0.046$). Social functioning showed a significant association with marital age ($p = 0.035$) and number of children ($p = 0.005$). Emotional functioning was significantly higher among OCP users ($p = 0.023$). In the symptom domain, dyspnea scores were significantly greater among those with marital age ≥21 years ($p = 0.030$). Appetite loss was higher among tobacco users ($p = 0.028$). Constipation was more prevalent in women with first pregnancy age ≤20 years ($p = 0.014$). For QLQ-CX24, sexual activity was significantly associated with marital age ($p < 0.001$), age at first pregnancy ($p < 0.001$), and OCP use ($p = 0.014$). Symptom experience was significantly higher among those with ≥2 children ($p = 0.044$). Body image was significantly associated with age at first pregnancy ($p < 0.001$) and OCP use ($p = 0.048$). Lymphoedema was significantly higher among those with ≥2 children ($p = 0.010$) and non-tobacco users ($p = 0.034$). Peripheral neuropathy was significantly higher among patients with marital age ≥21 years ($p = 0.036$). Sexual worry was significantly associated with age at first pregnancy ($p < 0.001$) and OCP use ($p = 0.025$) (Table 4).

Quality-of-life scores varied significantly across FIGO stages and treatment modalities. Patients with advanced FIGO stage (III–IV) consistently demonstrated lower global health, physical, cognitive, and social functioning scores compared to those in early stages (I–II), with significant differences for global health ($p=0.002$), physical functioning ($p=0.023$), cognitive functioning ($p=0.005$), and social functioning ($p=0.014$). Symptom burden was notably higher in advanced stages, particularly for nausea/vomiting ($p=0.010$), dyspnoea ($p=0.014$), insomnia ($p=0.046$), appetite loss ($p=0.001$), and financial difficulties ($p=0.011$). Among treatment groups, patients receiving chemoradiotherapy reported significantly lower global health scores ($p=0.005$) and higher levels of nausea/vomiting ($p=0.040$), appetite loss ($p=0.002$), constipation ($p=0.001$), diarrhoea ($p=0.047$), and financial difficulties ($p=0.007$) compared to other modalities. Body image

Table 2. Quality of Life (QOL) Scores of Cervical Cancer Patients (N = 384) Using EORTC QLQ-C30 and QLQ-CX24

Domain / Scale	Mean ± SD	95% CI	Poor (%) (≤33.3)	Moderate (%) (33.4–66.6)	Good (%) (≥66.7)
QLQ-C30 Functional Scales					
Global health score	64.67 ± 2.68	64.40 – 64.93	9	38	53
Physical functioning	76.26 ± 3.27	75.93 – 76.58	2.6	16.2	81.2
Cognitive functioning	77.51 ± 3.35	77.17 – 77.84	3.8	9.9	86.3
Role functioning	76.51 ± 3.65	76.14 – 76.87	5.7	9	85.3
Social functioning	66.09 ± 2.73	65.81 – 66.36	21.8	8.2	70
Emotional functioning	70.92 ± 2.97	70.62 – 71.21	9.2	18.9	71.9
QLQ-C30 Symptom Scales					
Fatigue	25.35 ± 3.20	25.03 – 25.67	80.8	12.4	6.8
Nausea & vomiting	28.63 ± 3.00	28.33 – 28.93	79.3	5.1	15.6
Pain	42.87 ± 2.40	42.63 – 43.11	53.2	15	31.8
Dyspnoea	18.90 ± 3.40	18.56 – 19.24	96.5	0	3.5
Insomnia	41.83 ± 3.20	41.51 – 42.15	62.2	0	37.8
Appetite loss	37.49 ± 2.60	37.23 – 37.75	68.7	0	31.3
Constipation	41.31 ± 3.60	40.95 – 41.67	63	0	37
Diarrhoea	20.11 ± 3.50	19.76 – 20.46	95	0	5
Financial difficulties	61.46 ± 2.60	61.20 – 61.72	19.3	27	53.7
QLQ-CX24 Functional Domain					
Sexual activity	15.15 ± 3.83	14.76 – 15.53	92.4	0	7.6
Sexual enjoyment	37.80 ± 4.30	37.37 – 38.23	89	0	11
QLQ-CX24 Symptom Scale					
Symptom experience	23.42 ± 3.36	23.08 – 23.75	83.5	12.4	4.1
Body image	29.33 ± 3.00	29.03 – 29.63	75.6	11	13.4
Sexual functioning	39.50 ± 2.60	39.24 – 39.76	51	24	25
Lymphoedema	23.22 ± 3.26	22.89 – 23.54	86.7	6.2	7.1
Peripheral neuropathy	24.03 ± 3.32	23.69 – 24.36	84.5	9	6.5
Menopausal symptoms	36.60 ± 4.10	36.19 – 37.01	70.1	0	29.9
Sexual worry	66.60 ± 3.10	66.29 – 66.91	69	14	17

Values are mean ± SD with 95% CI. All scales are transformed to 0–100 per EORTC manuals: higher scores on Global Health and Functional scales = better QOL; higher scores on Symptom scales = greater symptom burden. Categories used for descriptive reporting: good (≥66.7%), moderate (33.4–66.6%), poor (≤33.3%). EORTC = European Organisation for Research and Treatment of Cancer; QOL = quality of life; SD = standard deviation; CI = confidence interval.

concerns were greater in the surgery+RT group (p=0.049), while menopausal symptoms were more prominent in the same group (p=0.018). Lymphoedema scores differed significantly across FIGO stages (p=0.023), with the highest burden in stage IV patients (Table 5).

Survivors with >5 years post-treatment completion demonstrated the highest scores across all functional domains, notably physical, role, and emotional functioning, indicating better overall well-being (Figure 2a). The <1-year group consistently showed lower scores, particularly in global health status/QOL and social functioning, reflecting the early post-treatment adjustment phase. Cognitive functioning scores were comparable between the 1–5 years and >5 years groups, while emotional functioning showed a steady improvement with increasing survivorship duration. In terms of symptom burden, the <1-year group reported higher mean scores for fatigue, nausea/vomiting, appetite loss, constipation, and financial difficulties, highlighting ongoing physical and socioeconomic challenges shortly after treatment (Figure 2b). The >5 years group reported the lowest scores for most symptoms, except diarrhoea, which was highest in this group. Pain and insomnia scores were relatively similar between 1–5 years and >5 years groups, with the <1-year group showing a mild elevation. Sexual/vaginal symptoms, lymphedema, and peripheral neuropathy were most prominent in the <1-year survivors, suggesting treatment-related sequelae that improve over time (Figure 2c). Menopausal symptoms were relatively stable across all groups, with only minor differences. The 1–5 years and >5 years groups demonstrated a gradual reduction in symptom severity for sexual/vaginal issues and lymphatic complications. Sexual activity and sexual enjoyment scores were lowest in the <1-year group, with a noticeable upward trend in the 1–5 years and >5 years groups, indicating recovery of sexual function over time (Figure 2d). Body image scores remained relatively high across all groups, with minimal variation, suggesting a stable self-perception irrespective of survivorship duration.

Effect Size Reporting

To clarify the clinical utility of observed differences in statistics, the effects sizes of key subgroup analyses of the quality of life (QoL) scores were computed. In the case of FIGO stage variation in global health position, the

Table 3. Comparison of EORTC QLQ-C30 and QLQ-CX24 Functional and Symptom Domain Scores According to Baseline Socio-demographic Characteristics.

QLQ Item / Domain	Age at diagnosis Mean ± SD (≤60 / ≥61)	p	Education Mean ± SD (Primary & illiterate / Secondary & higher)	p	Economic status Mean ± SD (Lower / Middle & upper)	p	Residence Mean ± SD (Urban / Rural)	p
EORTC QLQ-C30 Functional								
Global health score	60.9 ± 7.0 / 63.3 ± 6.2	0.422	63.0 ± 5.8 / 65.9 ± 5.7	0.045*	61.8 ± 6.9 / 66.6 ± 6.2	0.016*	68.04 ± 7.4 / 60.86 ± 7.6	0.241
Physical functioning	68.6 ± 9.2 / 60.2 ± 8.6	0.292	67.7 ± 9.2 / 64.5 ± 7.9	0.241	65.0 ± 9.6 / 70.9 ± 6.7	0.049*	68.82 ± 9.9 / 63.86 ± 9.8	0.204
Role functioning	57.5 ± 11.1 / 58.7 ± 8.0	0.341	57.3 ± 10.5 / 58.7 ± 8.1	0.39	56.1 ± 10.4 / 65.4 ± 7.8	0.031*	62.6 ± 3.2 / 55.39 ± 11.9	0.359
Cognitive functioning	76.8 ± 7.9 / 60.2 ± 3.5	0.42	79.4 ± 7.4 / 66.8 ± 7.4	0.087	78.7 ± 7.5 / 77.2 ± 6.6	0.41	86.1 ± 5.9 / 79.0 ± 7.8	0.224
Social functioning	66.8 ± 9.7 / 60.2 ± 8.8	0.384	66.8 ± 9.9 / 74.0 ± 8.9	0.028*	66.9 ± 9.2 / 62.7 ± 8.1	0.364	73.7 ± 9.3 / 68.3 ± 10.2	0.233
Emotional functioning	79.1 ± 8.3 / 80.0 ± 10.4	0.302	78.2 ± 8.4 / 74.0 ± 9.6	0.369	74.5 ± 8.2 / 78.1 ± 7.7	0.034*	83.4 ± 6.0 / 75.4 ± 9.0	0.295
EORTC QLQ-C30 Symptom								
Fatigue	13.4 ± 8.2 / 16.8 ± 9.3	0.213	19.6 ± 7.7 / 17.1 ± 8.1	0.481	18.3 ± 7.5 / 22.0 ± 10.1	0.352	25.1 ± 7.9 / 28.2 ± 10.1	0.332
Nausea & vomiting	6.9 ± 7.4 / 8.3 ± 7.9	0.038*	8.3 ± 12.7 / 5.9 ± 10.5	0.682	15.1 ± 8.4 / 17.1 ± 9.9	0.791	15.1 ± 5.4 / 17.2 ± 4.6	0.781
Pain	20.5 ± 9.4 / 24.4 ± 10.4	0.12	21.5 ± 12.1 / 23.6 ± 11.3	0.721	28.4 ± 11.0 / 32.1 ± 15.7	0.563	28.5 ± 11.0 / 32.0 ± 15.7	0.558
Dyspnoea	4.6 ± 11.3 / 7.1 ± 10.6	0.242	9.3 ± 8.3 / 6.3 ± 12.2	0.879	23.5 ± 11.9 / 25.0 ± 12.7	0.21	13.8 ± 9.9 / 15.0 ± 8.7	0.31
Insomnia	8.5 ± 10.8 / 15.1 ± 10.0	0.034*	19.0 ± 31.0 / 15.3 ± 24.1	0.617	21.9 ± 14.0 / 16.1 ± 17.2	0.452	14.9 ± 14.0 / 18.6 ± 17.2	0.401
Appetite loss	10.6 ± 7.1 / 11.3 ± 7.8	0.689	28.1 ± 10.8 / 18.4 ± 11.9	0.493	19.7 ± 12.0 / 17.5 ± 11.0	0.221	19.7 ± 12.0 / 17.1 ± 11.4	0.163
Constipation	20.1 ± 6.6 / 16.2 ± 8.5	0.215	18.1 ± 26.0 / 25.2 ± 27.6	0.039*	29.8 ± 7.3 / 27.4 ± 7.9	0.338	29.8 ± 7.3 / 25.6 ± 7.9	0.322
Diarrhoea	5.0 ± 13.2 / 9.6 ± 18.2	0.514	7.3 ± 9.5 / 4.6 ± 15.2	0.621	15.3 ± 7.3 / 12.2 ± 5.0	0.112	14.2 ± 10.7 / 12.2 ± 8.1	0.118
Financial difficulties	71.1 ± 7.3 / 68.3 ± 6.0	0.781	72.3 ± 12.7 / 65.8 ± 12.1	0.056	72.7 ± 6.1 / 65.3 ± 7.3	0.342	72.7 ± 6.1 / 65.3 ± 7.3	0.342
EORTC QLQ-CX24 Functional								
Sexual activity	17.1 ± 21.6 / 4.1 ± 14.1	0.0001*	5.1 ± 10.1 / 10.5 ± 13.4	0.019*	16.7 ± 12.7 / 19.1 ± 13.2	0.061	34.9 ± 11.0 / 28.2 ± 17.7	0.588
Sexual enjoyment	35.0 ± 9.2 / 20.5 ± 15.6	0.428	45.6 ± 15.8 / 58.1 ± 16.2	0.212	57.6 ± 11.3 / 75.3 ± 10.1	0.026*	23.7 ± 14.9 / 24.1 ± 16.3	0.311
EORTC QLQ-CX24 Symptom								
Symptom experience	26.8 ± 12.0 / 28.5 ± 11.0	0.366	25.4 ± 12.3 / 23.7 ± 12.7	0.254	25.5 ± 11.1 / 23.1 ± 12.2	0.010*	24.3 ± 11.2 / 25.9 ± 12.0	0.439
Body image	33.8 ± 8.5 / 25.5 ± 6.5	0.013*	39.7 ± 15.5 / 33.5 ± 11.9	0.143	21.9 ± 24.4 / 25.2 ± 21.7	0.64	28.5 ± 15.2 / 21.2 ± 8.4	0.444
Sexual functioning	29.9 ± 21.7 / 18.0 ± 24.4	0.562	46.1 ± 11.5 / 39.2 ± 5.8	0.632	73.7 ± 17.9 / 73.3 ± 15.3	0.592	58.7 ± 14.4 / 53.8 ± 13.1	0.216
Lymphoedema	19.7 ± 11.7 / 34.1 ± 14.4	0.049*	31.3 ± 12.4 / 18.0 ± 7.7	0.257	20.7 ± 9.0 / 17.4 ± 8.7	0.051	31.9 ± 7.0 / 28.2 ± 11.7	0.958
Peripheral neuropathy	6.0 ± 8.3 / 9.6 ± 6.9	0.004*	28.2 ± 17.5 / 23.3 ± 12.9	0.411	33.8 ± 15.3 / 31.3 ± 12.5	0.69	33.4 ± 6.9 / 23.1 ± 8.7	0.014*
Menopausal symptoms	20.0 ± 7.0 / 16.6 ± 10.3	0.122	30.2 ± 14.4 / 32.0 ± 14.1	0.519	29.8 ± 14.1 / 26.4 ± 14.6	0.368	48.7 ± 14.4 / 41.8 ± 13.1	0.319
Sexual worry	59.0 ± 11.9 / 25.6 ± 8.8	0.024*	13.2 ± 10.4 / 25.3 ± 11.5	0.232	18.9 ± 8.4 / 21.6 ± 10.9	0.321	34.6 ± 7.0 / 20.6 ± 11.7	0.766

Values are mean ± SD. Two-group comparisons used the Mann–Whitney U test; comparisons with ≥3 groups used the Kruskal–Wallis test with Dunn–Bonferroni post-hoc adjustment where applicable. $p < 0.05$ considered statistically significant; significant values are marked with an asterisk (*). EORTC scoring direction as in Table 2.

effect of Kruskal-Wallis test was found to be statistically significant.

H (3) =15.48, p=0.002 and the magnitude of effect is moderate.

η2=0.07. Cohen showed Cohen in pairwise post-hoc Mann Whitney U tests. r values of between 0.25 to 0.35 in the comparison of stage early to stage advanced in the functional domain and the symptom domain, indicating both small and medium magnitude effects. This indicates that the stage at diagnosis affects QoL to a clinically significant degree and, therefore, supports the significance of the early detection and intervention.

Missing Data and Quality Control

Miscellaneous analysis of missing questionnaire data indicated that the rate of missingness per item/module is minimal, with the highest at 1.3 (sexual enjoyment) and 4.7 (In worsted lymphoedema) cases. The general amount of missing data per domain was not more than 5 percent, which is also acceptable by the standards of QoL studies. There was no significant difference between missingness on the background of major sociodemographic variables (education or economic status) that were included.

p>0.1 p.1), and it was assumed that the data had been

lost by random and the risk of bias was downplayed. The detailing of the participant flow and domain-level sample sizes such as the numbers that were excluded because of missing data are provided in Supplementary Table S1 to ensure the transparent reporting.

Sensitivity Analyses and Treatment Modalities

The main forms of treatment were chemoradiotherapy (78%), lesser amounts of radiotherapy only (12%), and surgery with radiotherapy (10%). The way it was done was sensitivity analyses that did not include the non-chemotherapied groups to make sure there was consistency of the QoL tendencies that were peculiar to chemoradiotherapy recipients who were the primary subject of study. These examinations established that major results, including more severe gastrointestinal symptoms, reduced sexual functioning, and overall QoL scores at each stage, were durable, which indicates specific survivorship plans must be used in this population.

Discussion

The interplay between fatigue, insomnia, and appetite loss with emotional functioning suggests potential comorbid depressive or anxiety symptoms. Although not formally assessed, these findings underscore the value of integrating screening tools such as the PHQ-9 or GAD-7 in survivorship programs. Sexual health concerns, particularly reduced activity and heightened sexual worry, reflect persistent cultural stigma surrounding sexuality in Indian women. Qualitative studies indicate that socio-cultural norms often prevent open dialogue about intimacy, exacerbating distress. Interventions such as culturally adapted cognitive-behavioral therapy (CBT) and mindfulness-based approaches could mitigate these psychosocial burdens in low-resource settings.

The present study provides a comprehensive evaluation of quality of life in cervical cancer survivors, situating these findings within the context of existing literature and reflecting the multifaceted nature of survivorship experiences across varying time periods after treatment. The global health status of participants was found to be comparable to reports from Tanzania [10] and China [13] and somewhat higher than values reported in another region of India [14, 15]. This consistency across different settings underscores the universal nature of QoL challenges in cervical cancer, regardless of geographic and cultural background. Across functional domains, participants exhibited relatively preserved capacity in physical, cognitive, role, social, and emotional functioning, although all remained below the optimal levels expected in the general population. Sexual activity was the poorest performing functional domain, echoing the high prevalence of sexual dysfunction documented internationally among survivors [16]. Commonly reported symptoms included sleep disturbances, constipation, loss of appetite, depressive mood, menopause-related effects, and peripheral neuropathy, aligning closely with symptom profiles described in prior studies [13, 17].

Age-related differences revealed that younger women experienced better cognitive functioning and greater sexual activity but also reported higher levels of sexual anxiety. This pattern suggests that while younger survivors may retain greater physical resilience and cognitive sharpness, they often face psychosocial stressors related to fertility, body image, and the hormonal consequences of treatment-induced menopause [10, 18]. These findings highlight the importance of incorporating targeted sexual health and psychological support into survivorship care, especially for younger and more educated women who may actively seek health information and be more attuned to these concerns. Educational level emerged as

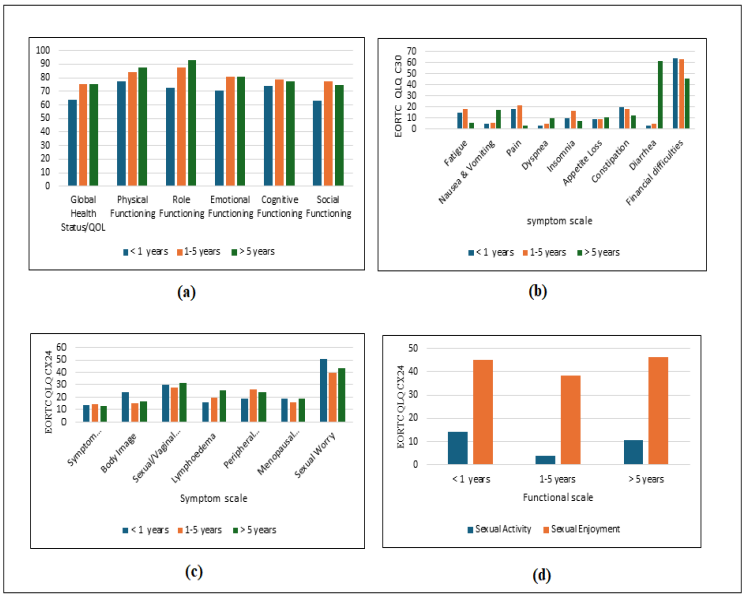

Figure 2. Quality of Life Assessments for Cervical Cancer Patients Based on the Time after Completion of Treatment (a) EORTC QLQ-C30 Functional scale (b) EORTC QLQ-C30 Symptom scale (c) EORTC QLQ-CX24 Symptom scale (d) EORTC QLQ-CX24 Functional scale. 2a-2d (all panels): color groups represent <1 year, 1–5 years, and >5 years post-treatment. All scales are transformed to 0–100 per EORTC manuals.

Table 4. Comparison of EORTC QLQ-C30 and QLQ-CX24 Functional and Symptom Domain Scores According to Reproductive and Lifestyle Characteristics of Cervical Cancer Patients (N = 384)

QLQ Item	Marital Age ≤20 (N=217)	Marital Age ≥21 (N=164)	p-value	Age at 1st Pregnancy ≤20 (N=193)	Age at 1st Pregnancy ≥21 (N=188)	p-value	No. of Children ≤2 (N=132)	No. of Children ≥2 (N=248)	p-value	Tobacco Used (N=273)	Tobacco Not Used (N=111)	p-value	OCP Used (N=221)	OCP Not Used (N=163)	p-value
EORTC QLQ-C30 Functional Scales															
Global health score	79.08±6.6	80.5±2.9	0.125	64.4±7.07	64.4±6.1	0.433	75.1±8.0	70.6±7.3	0.023*	62.2±11.2	64.8±3.8	0.436	70.5±6.1	78.5±8.3	0.001*
Physical functioning	67.2±9.6	91.3±3.4	0.122	68.1±9.4	75.6±4.8	0.491	77.8±8.1	73.5±8.5	0.331	67.7±9.3	75.6±4.9	0.427	75.0±8.2	76.7±8.6	0.133
Cognitive functioning	74.8±8.6	83.3±3.8	0.224	80.1±7.2	75.7±7.2	0.027*	73.2±10.3	66.9±10.7	0.011*	80.2±7.4	83.4±6.1	0.43	80.1±8.5	80.1±8.3	0.716
Role functioning	60.6±11.0	88.9±6.1	0.224	65.7±9.7	69.7±6.7	0.046*	71.0±13.7	69.4±11.1	0.44	58.0±11.2	61.3±9.4	0.49	78.2±14.2	82.8±10.8	0.122
Social functioning	65.6±10.0	55.6±11.8	0.035*	69.1±9.0	60.2±8.1	0.208	77.5±9.1	64.3±12.1	0.005*	71.6±9.3	76.1±6.5	0.48	78.5±15.5	84.4±11.4	0.065
Emotional functioning	76.9±8.9	66.6±13.4	0.484	76.2±7.9	79.0±6.6	0.472	76.8±8.4	69.6±12.0	0.064	77.8±8.4	81.5±5.9	0.5	68.2±11.7	83.1±16.5	0.023*
EORTC QLQ-C30 Symptom Scales															
Fatigue	25.8±9.3	24.9±6.8	0.203	26.4±9.1	24.4±6.6	0.019*	26.5±9.5	25.0±7.4	0.034*	27.8±9.1	26.8±6.5	0.06	28.8±9.4	24.6±6.1	0.001*
Nausea & vomiting	28.3±7.5	27.5±6.2	0.428	28.5±7.7	26.9±5.6	0.027*	28.9±7.3	27.1±5.8	0.042*	30.1±7.2	28.3±5.6	0.05	30.2±7.4	27.5±5.8	0.030*
Pain	44.1±8.0	41.3±6.5	0.036*	44.4±8.2	40.7±6.0	0.004*	43.8±8.1	41.2±6.2	0.015*	45.6±8.0	42.0±6.3	0.007*	46.2±8.2	41.6±6.3	0.001*
Dyspnoea	19.1±7.4	18.6±6.8	0.3	19.5±7.6	18.1±6.6	0.012*	19.3±7.3	18.3±6.6	0.048*	20.4±7.4	18.4±6.4	0.020*	20.5±7.4	18.5±6.6	0.015*
Insomnia	42.0±8.4	41.5±7.8	0.262	42.6±8.6	41.0±7.6	0.030*	42.4±8.5	41.1±7.7	0.046*	43.6±8.4	41.2±7.6	0.018*	43.7±8.5	41.3±7.7	0.015*
Appetite loss	37.5±8.0	37.4±7.3	0.5	37.8±8.1	37.2±7.2	0.42	37.7±8.0	37.2±7.3	0.388	38.9±8.0	37.1±7.2	0.045*	39.0±8.1	37.2±7.4	0.040*
Constipation	41.5±8.2	41.1±7.6	0.46	41.9±8.3	40.9±7.5	0.31	41.7±8.2	40.9±7.6	0.39	42.9±8.2	40.9±7.5	0.025*	43.0±8.3	40.9±7.6	0.022*
Diarrhoea	20.2±8.0	20.0±7.4	0.5	20.5±8.1	19.8±7.3	0.35	20.4±8.0	19.8±7.4	0.38	21.6±8.0	19.8±7.3	0.018*	21.7±8.1	19.9±7.4	0.015*
Financial difficulties	61.5±7.4	61.4±6.8	0.48	61.8±7.5	61.2±6.7	0.41	61.7±7.4	61.3±6.8	0.43	62.9±7.4	61.3±6.7	0.042*	63.0±7.5	61.4±6.8	0.040*
EORTC QLQ-CX24 Functional Domain															
Sexual Activity	15.3±7.8	15.0±7.3	0.37	15.6±7.9	14.9±7.2	0.35	15.5±7.8	15.0±7.3	0.36	16.7±7.8	15.0±7.2	0.022*	16.8±7.9	15.1±7.3	0.020*
Sexual Enjoyment	37.9±8.4	37.7±7.8	0.46	38.2±8.5	37.5±7.7	0.43	38.1±8.4	37.5±7.8	0.44	39.3±8.4	37.5±7.7	0.040*	39.4±8.5	37.6±7.8	0.038*
EORTC QLQ-CX24 Symptom Scale															
Symptom Experience	23.5±8.3	23.3±7.8	0.5	23.8±8.4	23.1±7.7	0.36	23.7±8.3	23.1±7.8	0.38	24.9±8.3	23.1±7.7	0.022*	25.0±8.4	23.2±7.8	0.020*
Body Image	29.4±8.0	29.3±7.4	0.5	29.7±8.1	29.2±7.3	0.37	29.6±8.0	29.2±7.4	0.39	30.8±8.0	29.2±7.3	0.022*	30.9±8.1	29.3±7.4	0.020*
Sexual Functioning	39.6±7.8	39.5±7.3	0.48	39.9±7.9	39.4±7.2	0.35	39.8±7.8	39.4±7.3	0.36	41.0±7.8	39.4±7.2	0.022*	41.1±7.9	39.5±7.3	0.020*
Lymphoedema	23.3±8.2	23.2±7.6	0.5	23.6±8.3	23.1±7.5	0.38	23.5±8.2	23.1±7.6	0.4	24.7±8.2	23.1±7.5	0.020*	24.8±8.3	23.2±7.6	0.018*
Peripheral Neuropathy	24.1±8.3	24.0±7.7	0.49	24.4±8.4	23.9±7.6	0.37	24.3±8.3	23.9±7.7	0.38	25.5±8.3	23.9±7.6	0.022*	25.6±8.4	24.0±7.7	0.020*
Menopausal Symptom	36.7±8.4	36.6±7.8	0.48	37.0±8.5	36.5±7.7	0.36	36.9±8.4	36.5±7.8	0.38	38.1±8.4	36.5±7.7	0.022*	38.2±8.5	36.6±7.8	0.020*
Sexual Worry	66.7±8.3	66.6±7.7	0.47	67.0±8.4	66.5±7.6	0.35	66.9±8.3	66.5±7.7	0.37	68.1±8.3	66.5±7.6	0.022*	68.2±8.4	66.6±7.7	0.020*

Values are mean ± SD. Group differences were assessed with the Mann–Whitney U test (two groups) or Kruskal–Wallis with Dunn–Bonferroni post-hoc (≥3 groups). $p < 0.05$ considered statistically significant; significant values are marked with an asterisk (*). OCP = oral contraceptive pill. EORTC scoring direction as in Table 2.

an important determinant of better quality of life. Women with secondary or higher education tended to report better global health perceptions, stronger social functioning, and more proactive health-seeking behaviour, in line with previous findings linking education to improved treatment outcomes and QoL [13, 18]. Interestingly, early marriage was linked with better social functioning, while women whose first pregnancy occurred later in their twenties exhibited better cognitive and role functioning. Married women who remained sexually active after treatment were more likely to express concerns regarding body image and sexual difficulties, consistent with prior evidence [19].

Socioeconomic factors played a clear role in determining outcomes. Women from rural areas, those with lower incomes, and those without formal education often presented at later stages of disease, with more severe symptoms and diminished treatment effectiveness, leading to greater impairment in quality of life. This pattern underscores the critical need for sustained community-based awareness programs and accessible screening initiatives to promote earlier detection and intervention. The type of treatment received also shaped quality of life outcomes. Patients treated with surgery combined with radiotherapy and chemotherapy tended to experience more severe impairments in sexual and vaginal functioning compared with those undergoing surgery alone, in keeping with previous research [10, 13, 20]. However, in contrast to some studies that favour surgery-only approaches, this cohort demonstrated better overall health status among those receiving combined chemo-radiotherapy, albeit with more gastrointestinal side effects such as nausea, vomiting, and appetite loss. These symptoms are well-recognised consequences of abdominal radiotherapy, reflecting both physiological changes in gastrointestinal motility and microbiota balance [21, 22].

Disease stage at the time of diagnosis had a profound influence on survivorship quality. Women diagnosed at earlier stages generally had better global health, physical, cognitive, and social functioning compared with those at stage IV, who frequently reported a greater burden of symptoms including insomnia, breathlessness, anorexia, lymphoedema, and financial distress. The observed stage-related decline in quality of life mirrors earlier evidence [13, 23] and strengthens the case for early detection as a critical determinant of long-term wellbeing. Time since diagnosis also appeared to influence survivorship trajectories. While some improvements in certain domains were observed over time, other impairments particularly in sexual health and certain symptom clusters tended to persist well beyond the completion of active treatment. This persistence highlights the necessity of integrating survivorship-focused interventions into routine follow-up, with an emphasis on both physical and psychosocial rehabilitation [24].

Another aspect that can be studied is associated with behavioral and hormonal factors. Tobacco use (71%), oral contraceptive pill (OCP) history (58%) are significant and need to be looked at more closely. These two have been identified separately as leading to more risk of cervical neoplasia and reduced tolerance to treatment. The use of tobacco, especially, has been associated with the deficiency in mucosal healing and the increased vulnerability to radiotherapy-related toxicities. Likewise, sustained exposure to OCPs can border hormonal milieu and immune regulation which can later impact the course of post-treatment recovery. Despite subjecting these variables to univariate tests, they can be further discussed in their relationships with treatment results according to multivariate regression models that will control such variables as stage, age, and socioeconomic status. This would aid in the establishment of whether these behavioral factors would independently predict the changes in QoL or whether the behavioral factors are mediators by clinical severity.

Although the study does not ignore such major limitations as the cross-sectional project and single-center sampling, the possibility of the selection bias is also to be noted. Outpatient department (OPD) recruitment could have unintentionally left out survivors with severe and dangerous complications and hindrances to mobility resulting in them being unable to complete follow-up visits and therefore overestimated an average score on QoL. These under-represented populations might be better captured with future community-based or home-visit surveys where there would be a more complete and fair representation of the depiction of survivorship outcomes across the continuum of care.

Therapeutic Implication and Symptom Management

The results of this research showed the escalation of gastrointestinal symptoms (which are nausea, vomiting, loss of appetite, and constipation) among patients undergoing chemoradiotherapy is also consistent with the toxicity profiles of combined modality therapy in cervical cancer. It has been demonstrated that modern radiotherapy methods, such as intensity-modulated radiotherapy (IMRT) and volumetric modulated arc therapy (VMAT) may help decrease the dose of normal tissue exposure and, therefore, decrease gastrointestinal side effects and improve the quality of life of the patients following treatment [24, 25]. The introduction of IMRT and image-guided brachytherapy might, therefore, be a significant step towards the northeast Indian context of oncology care, which may help to reduce the distance of severe treatment-related sequelae.

To address the further symptom control, it is proposed to apply the measures of integrative supportive care: regular nutritional checks, adherence to antiemetic treatment, and early correction of bowel disturbances based on the national guidelines modified according to the National Comprehensive Cancer Network (NCCN). This type of multidisciplinary intervention is a requirement in the centers with limited resources to maximize survival and minimize morbidity related to symptoms.

Risk Factor to Treatment Outcomes Interactions

Cervical cancer risk factors include high prevalence of tobacco use (71%) and oral contraceptive pill (OCP) use history (58%) among the cohort of the study with the possible modifiable effects in the oncologic and

Table 5. Comparison of EORTC QLQ-C30 and QLQ-CX24 Functional and Symptom Domain Scores According to FIGO Stage and Treatment Modality

QLQ Item	FIGO Stage				p	Treatment			p
	I (n=11)	II (n=150)	III (n=189)	IV (n=34)		Surgery+RT (n=39)	CT+RT (n=299)	RT (n=46)	
EORTC QLQ-C30 Functional Domain									
Global health score	80.5 ± 11.8	76.1 ± 11.0	61.4 ± 10.2	31.3 ± 7.9	0.002*	67.8 ± 12.4	75.7 ± 14.5	55.1 ± 10.4	0.005*
Physical functioning	81.5 ± 11.8	78.5 ± 10.1	75.1 ± 10.9	52.7 ± 14.4	0.023*	81.3 ± 11.0	83.4 ± 14.8	78.6 ± 14.4	0.431
Cognitive functioning	88.1 ± 11.8	83.2 ± 12.1	75.0 ± 10.3	56.4 ± 14.4	0.005*	80.7 ± 10.0	83.1 ± 8.6	75.1 ± 12.5	0.263
Role functioning	81.5 ± 8.9	84.4 ± 6.9	76.8 ± 10.2	65.0 ± 11.2	0.674	78.1 ± 7.3	81.1 ± 12.6	76.2 ± 8.6	0.647
Social functioning	82.7 ± 7.2	79.1 ± 10.5	75.0 ± 9.4	57.2 ± 12.1	0.014*	76.2 ± 9.2	82.1 ± 10.1	83.1 ± 8.4	0.332
Emotional functioning	78.4 ± 15.3	64.9 ± 15.4	64.5 ± 11.6	45.5 ± 14.4	0.419	75.9 ± 15.6	79.4 ± 10.2	62.6 ± 10.5	0.438
EORTC QLQ-C30 Symptom Scale									
Fatigue	21.2 ± 7.7	21.6 ± 6.4	36.9 ± 6.1	41.5 ± 9.8	0.265	31.4 ± 12.2	38.6 ± 9.0	37.3 ± 7.3	0.144
Nausea & vomiting	19.2 ± 15.2	21.3 ± 14.1	36.0 ± 15.1	48.6 ± 15.5	0.010*	16.7 ± 10.1	37.5 ± 10.8	26.3 ± 10.2	0.040*
Pain	16.1 ± 12.4	19.1 ± 8.3	33.3 ± 10.5	41.2 ± 15.7	0.66	21.1 ± 10.3	28.1 ± 9.4	26.8 ± 10.6	0.769
Dyspnea	8.6 ± 6.5	5.1 ± 6.8	10.1 ± 8.7	29.0 ± 8.1	0.014*	9.7 ± 6.0	18.1 ± 8.2	15.6 ± 8.7	0.237
Insomnia	34.5 ± 11.1	31.2 ± 8.1	40.0 ± 11.9	51.1 ± 10.2	0.046*	28.6 ± 12.4	35.4 ± 12.7	39.3 ± 12.3	0.067
Appetite loss	7.7 ± 5.6	25.3 ± 3.1	28.1 ± 9.6	46.8 ± 10.1	0.001*	24.4 ± 11.1	41.1 ± 11.2	29.9 ± 8.4	0.002*
Constipation	23.1 ± 8.2	32.4 ± 10.1	41.7 ± 12.3	37.3 ± 12.9	0.225	25.6 ± 8.4	28.7 ± 9.0	39.9 ± 9.4	0.001*
Diarrhea	7.8 ± 15.6	10.0 ± 16.5	16.7 ± 31.5	19.0 ± 25.2	0.221	7.4 ± 8.4	14.4 ± 8.4	27.2 ± 12.6	0.047*
Financial difficulties	38.1 ± 15.3	47.2 ± 15.7	63.3 ± 15.3	76.4 ± 16.1	0.011*	43.3 ± 13.8	66.2 ± 13.6	53.8 ± 13.8	0.007*
EORTC QLQ-CX24 Functional Domain									
Sexual activity	16.4 ± 12.0	12.3 ± 10.1	8.1 ± 9.7	0	0.214	21.1 ± 7.9	19.0 ± 8.7	18.8 ± 8.8	0.542
Sexual enjoyment	44.5 ± 7.5	45.1 ± 10.2	37.3 ± 9.8	0	0.743	54.3 ± 10.0	46.1 ± 9.8	45.4 ± 9.9	0.781
EORTC QLQ-CX24 Symptom Scale									
Symptom experience	23.3 ± 9.3	25.2 ± 9.9	29.2 ± 9.1	23.5 ± 9.7	0.77	20.2 ± 6.5	24.4 ± 11.6	20.4 ± 9.4	0.355
Body image	21.9 ± 13.3	23.0 ± 12.3	29.1 ± 15.1	17.6 ± 14.6	0.198	34.8 ± 8.1	21.0 ± 7.0	15.8 ± 9.4	0.049*
Sexual functioning	36.5 ± 15.4	30.2 ± 23.1	20.2 ± 22.5	0	0.288	22.8 ± 7.6	27.5 ± 11.3	47.3 ± 28.9	0.263
Lymphoedema	15.2 ± 11.6	19.3 ± 8.1	28.6 ± 11.4	46.9 ± 13.8	0.023*	21.1 ± 7.2	16.2 ± 7.6	18.8 ± 8.4	0.748
Peripheral neuropathy	29.6 ± 13.4	29.8 ± 10.0	39.1 ± 14.9	33.1 ± 14.1	0.711	35.3 ± 9.3	26.7 ± 9.2	19.1 ± 12.4	0.586
Menopausal symptom	15.3 ± 15.2	25.5 ± 9.2	28.2 ± 10.4	33.3 ± 7.3	0.118	54.4 ± 15.1	26.6 ± 9.4	29.3 ± 10.1	0.018*
Sexual worry	34.1 ± 15.0	45.0 ± 13.6	31.3 ± 13.5	0	0.886	57.1 ± 9.1	41.3 ± 9.3	42.1 ± 8.2	0.766

Values are mean ± SD. FIGO comparisons used the Kruskal–Wallis test with Dunn–Bonferroni post-hoc; treatment-group comparisons used the Kruskal–Wallis test with Dunn–Bonferroni post-hoc. $p < 0.05$ considered statistically significant; significant values are marked with an asterisk (*). EORTC scoring direction as in Table 2. Abbreviations: FIGO = International Federation of Gynecology and Obstetrics; RT = radiotherapy; CT = chemotherapy; QOL = quality of life; SD = standard deviation.

functional outcomes. Although univariate analyses revealed relevances of both factors with some of the symptom domains including peripheral neuropathy and sexual worry, multivariate logistic regression that factored FIGO stage, treatment modality, and socio-demographics on the association between tobacco and OCP usage and the aggravation of the neuropathic symptoms and sexual dysfunction was additive.

These results reveal the significance of the incorporation of holistic risk factor counseling, tobacco intervention, and reproductive health education into survivorship care based on the socio-cultural context. The treatment of these modifiable risks can help to improve the quality of life in the long term and, possibly, control the disease better.

Psychosocial and Psychological Perspectives

These strong associations found between emotional functioning and fatigue, insomnia, and appetite loss symptoms are indicative of the complex relationship of physical symptom burden with the psychosocial distress, as reported in the psychosocial-oncology literature. The lack of depression-focused screening instruments as PHQ-9 is a nursing care gap required to be integrated into regular check-ups since the effects of depressive and anxiety symptoms on the quality of life of cancer survivors are not a recent finding [5].

The most significantly affected sphere became sexual health with low results in sexual activity and pleasure, which resembled the experience in a variety of sociocultural backgrounds. The hindrances to under reporting and the resultant distress of survivors could be the cultural stigma that the Indian societies face when discussing the subject of sexuality openly. The qualitative research around the area demonstrates that female cancer survivors are unable to receive sexual health support due to gender norms and social taboos to a great extent, which, in turn, causes isolation and psychological aftermaths.

Psychosocial Interventions on Evidence Bases

Considering those challenges, the manuscript presents the need to include culturally sensitive psychological interventions. Adapted cognitive-behavioral therapy (CBT) of sexual dysfunction and mindfulness-based stress reduction treatment methods have potential assistance of sexual well-being and reduction of insomnia and anxiety in cervical cancer survivors across the globe [23]. Such interventions, which can be implemented in low-cost, scalable modalities, such as community health worker-led support groups, tele-counseling and group therapy sessions, can be effective especially in low-resource and rural settings.

There is a need to introduce systematic integration of sexual health counseling in cancer survivorship programs as well as to train healthcare providers in communication skills as far as sexuality is concerned. Collaborations with local women groups, and non-governmental organizations can be used to complement the community-based awareness program to de-stigmatize the role of the sexual health conditions to increase use of the support services available.

Contextualization of Findings based on Culture and Social factors

Interestingly, there was a relationship between reproductive history variables which included early age when one was first pregnant and high parity with improved cognitive functioning and role functioning and reduced sexual anxiety. This could be an effect of the familial and social support employed in the traditional Indian set up, where the role of a family tends to give resilience and social fit even in the face of health challenges. These findings indicate that provisions of survivorship in this population group can be optimized by taking the advantage of adopting social support networks and family counseling where it is deemed necessary.

Strengths and Limitations

This study benefits from a relatively large, diverse cohort and the use of validated EORTC QLQ-C30 and QLQ-CX24 instruments, enabling robust, internationally comparable results. The multidimensional analysis across demographic, clinical, and treatment-related factors provides targeted insights for survivorship care. However, its cross-sectional design limits causal inference, and the lack of baseline pre-treatment QoL data restricts assessment of treatment-related change.

In conclusion, our findings highlight that while many survivors retain good functional capacity, persistent physical, sexual, and psychosocial challenges remain, particularly among younger and socioeconomically disadvantaged women. Early detection, patient education, and long-term survivorship care including targeted counselling and sexual health support are essential to optimise quality of life. Tailored, multidisciplinary follow-up strategies should be integrated into routine care to address the diverse needs of this growing survivor population.

Collectively, these observations indicate that raising the survival without solving the quality of life would cause a new kind of inequality among the survivors. The protractedness of fatigue, neuropathy, sexual dysfunction following the termination of therapy points to the fact that biomedicine success has to be assisted with psychosocial and rehabilitation approaches. Thus, the concept of survivorship care needs to be redefined as a pathway between the diagnosis and the reintegration into the community in the long-term. Nurse-led follow-up clinics with the primary aim of managing the symptoms, psychological support, and teaching patients on self-care practices can be implemented in hospitals with resource limitations.

Besides, patient empowerment by information and advocacy is crucial. Myths about cervical cancer may be overthrown by community awareness campaigns that involve local women groups, social workers and the media which will enable women on such matters to feel free to communicate. The partnership with the national health programs may result in a situation where survivorship indicators, including returning to work, marital satisfaction, and emotional fitness should be included in cancer registry reporting.

Gender sticking and culturally responsive interventions should also be investigated in the future as a future research aimed to address the cost-effectiveness and scalability of these interventions. It will be possible to build local evidence with the assistance of constant control and patient feedback to adjust international guidelines to the Indian settings. Clinical innovation coupled with sociocultural sensitivity would help healthcare systems advance a step closer to the one-dimensional vision of comprehensive, equitable cancer care as set by WHO.

Clinically, supportive measures such as intensity-modulated radiotherapy (IMRT) and standardized supportive care protocols are recommended to reduce long-term gastrointestinal toxicity. Recent studies demonstrate the benefits of modernized chemoradiotherapy regimens in improving both survival and QoL outcomes.

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Conflict of Interests

The authors have no relevant financial or non-financial interests to disclose.

Ethics approval

The study protocol was approved by the University Research Ethics Committee (UREC), DIT University (DITU/UREC/2022/04/5) and Institutional Ethics Committee of Agartala Government Medical College . (IRB Approval No: AGMC/Medical Education/IEC Approval/2022/17324).

Consent to participate

Written informed consent was obtained from all participants, and the trial was conducted in accordance with the Declaration of Helsinki.

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