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# Quality of life among cervical cancer patients following completion of chemoradiotherapy at Ocean Road Cancer Institute (ORCI) in Tanzania

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## Abstract

**Objective:** Effective cancer treatment involves aggressive chemo-radiotherapy protocols that alter survivors' quality of life (QOL). This has recently aroused the attention not only to focus on clinical care but rather to be holistic and client-centered, looking beyond morbidity and mortality. The study assessed the QOL and associated factors among patients with cervical cancer (CC) after the completion of chemoradiotherapy.

**Methods:** A cross-sectional analytical study was conducted at Ocean Road Cancer Institute (ORCI) from September to November 2020. A total of 323 CC patients were interviewed with a structured questionnaire of QOL, the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire (EORTC QLQ-C30), and its cervical cancer module (EORTC QLQ-CX24). The QOL domains, socio-demographic and clinical variables were analyzed with Mann–Whitney and Kruskal–Wallis on SPSS version 23, and a  $P < 0.05$  was considered significant.

**Results:** More than half (54.8%) of the CC patients had a good overall QOL. Overall, QOL was affected by education ( $P = 0.019$ ), smoking (0.044), sexual partner ( $P = 0.000$ ), treatment modality ( $P = 0.018$ ), and time since completion of treatment ( $P = 0.021$ ). Patients who underwent external beam radiation suffered from significant side effect symptoms ( $P < 0.05$ ) while those who underwent combined external beam radiation and brachytherapy had higher functioning in most domains ( $P < 0.05$ ).

**Conclusions:** A significant improvement in QOL was observed after chemoradiotherapy and was affected by socio-demographic and clinical variables. Thus, calls for individualized care in addressing these distressing symptoms.

**Keywords:** Quality of life, Cervical cancer survival, Cross-sectional analytical study, Ocean Road Cancer Institute

## Background

Cervical cancer (CC) is a significant cause of morbidity and mortality especially in developing regions [1]. In Sub-Saharan Africa, the incidence of CC has tremendously increased and continues to grow over that of the developed world [1, 2]. For example, in Tanzania, CC ranks as the commonest cancer among women aged 15–44 years [3].

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Advances in diagnosis and treatment of CC have offered some survival benefits and have increased the life expectancy of cancer survivors [4], and thus addressing the quality of life (QOL) is paramount [5]. However, effective cancer treatment options come with grave side-effects or body dysfunctions among the cancer survivors that will ultimately alter their QOL [6].

The current approach in cancer management focuses on clinical care and is holistic, looking beyond morbidity and mortality, hence the need to assess QOL to individualize treatment and improve the QOL. Therefore, the WHO has defined QOL as the subjective perception of the impact of disease and treatment on an individual's health status as regards physical, psychological, social, and functional well-being [7]. As a result, QOL has gained attention among various countries [8–10].

In the developed world, QOL assessment tools have been developed and have remained routine practices in managing grievous diseases like cancer [10]. For example, the European Organization for Research and Treatment of Cancer (EORTC) has developed Health-Related Quality of Life (HRQOL) measurements: the generic tool for all cancers (QLQ-C30) and the specific assessment tool for cervical cancer (QLQ-CX24).

Assessing QOL is potentially valuable in identifying patients' problems and addressing them to improve treatment and better life [10]. However, to date in Tanzania, notwithstanding the global focus on holistic cancer management, studies on the QOL of CC survivors are yet to be elucidated, despite the increasing number of CC survivors. The present study aims to fill this gap by assessing the QOL and associated factors among CC patients after completing chemo-radiotherapy to provide a basis for improving comprehensive clinical care.

## Materials and methods

### Study design, area and participants

A cross-sectional analytical study was conducted at ORCI after ethical approval by the Muhimbili University of Health and Allied Sciences (MUHAS) institutional review board and ORCI, Dar es salaam, Tanzania. The study center has in-patient service with a bed capacity of 258 patients and outpatient services. Written informed consent was obtained from all participants before enrolment. A total of 323 CC patients attending follow-up clinic from 1st September to 31st November 2020 were enrolled in the study. All patients who had completed the initial chemoradiotherapy within three months and with any CC stage (FIGO stage I, II, III, and IV) provided were willing to participate in the study were included. The initial chemoradiotherapy includes cisplatin 40 mg/m<sup>2</sup> weekly concurrently with external beam radiation of 2 Gy in 25 fractions and brachytherapy 8 Gy weekly in 3

sessions. All patients unable to speak, who were critically ill, had a recurrence, or had comorbidities except for HIV were excluded.

### Data collection tools

An interviewer-administered structured questionnaire consisting of three sections was utilized. The first and second sections were author generated and were composed of demographic and disease-related variables, respectively. The first section was obtained from interviews with participants, while section two was mined from patient clinical files. The third section analyzed the QOL and was composed of the EORTC questionnaire modules QLQ-C30 and QLQ-CX24, i.e., English or Swahili translated versions. These questionnaires have been extensively tested and validated in multicultural settings [11], including Tanzania [12]. Data obtained from QOL modules was scored as previously reported [8] and converted to a raw score which was linearly transformed to a range between 0 and 100, as directed by the EORTC scoring manuals [13, 14]. A higher score in global health score (GHS) and functional domains equates to a better level of functioning, while in symptom scales, it indicates poor functioning or more problems.

### Statistical analysis

Statistical analyses using SPSS software (IBM, Armonk, NY, USA) and the graphing software Excel (Microsoft, USA) were employed to analyze all data. These scores from QLQ-C30 and QLQ-CX24 were divided into three groups: good, moderate, or poor if the score was  $\geq 66.7\%$ , 33.4–66.6%, or  $\leq 33.3\%$ , respectively, based on the scoring as previously reported [8]. Data were not normally distributed, and thus we employed non-parametric tests: Mann Whitney U test and Kruskal Wallis test for analysis. A value of  $P < 0.05$  was considered statistically significant. All values were reported as the mean  $\pm$  S.D.

## Results

### Socio-demographic and clinical characteristics

A total of 323 patients with a median age of 52 years participated in the study. The majority of the patients were treated with chemoradiotherapy 298 (92.3%), which employed both external beam and brachytherapy 295 (91.3%) or external beam only 28 (8.7%) as described in Table 1.

### Quality of Life of Cervical Cancer Patients after Chemoradiotherapy

QOL scores were classified as good, moderate, or poor if the score was  $\geq 66.7$ , 33.4–66.6, or  $< 33.3$ , respectively. The overall QOL/global health status of CC patients was  $64.4 \pm 1.9$ , which is moderately good. More than half

**Table 1** Socio-demographic and clinical characteristics of the participants N = 323

| Variables                                 | Frequency (%) |
|---|---------------|
| <i>Age (years)</i>                        |               |
| ≤ 52                                      | 164 (50.8)    |
| ≥ 53                                      | 159 (49.2)    |
| Median age [range]                        | 52 [30–90]    |
| <i>Parity</i>                             |               |
| ≤ 4                                       | 167 (51.7)    |
| ≥ 5                                       | 156 (48.3)    |
| <i>Education status</i>                   |               |
| No formal education                       | 52 (16.1)     |
| Formal education                          | 271 (83.9)    |
| <i>Marital status</i>                     |               |
| Married                                   | 182 (56.3)    |
| Single                                    | 141 (43.7)    |
| <i>Smoking history</i>                    |               |
| Smokers                                   | 18 (5.6)      |
| Non-smokers                               | 305 (94.4)    |
| <i>Residence</i>                          |               |
| Urban                                     | 121 (37.5)    |
| Rural                                     | 202 (62.5)    |
| <i>Sexual Debut</i>                       |               |
| ≤ 12 years                                | 10 (3.1)      |
| ≥ 13 years                                | 313 (96.9)    |
| <i>Sexual Partner</i>                     |               |
| Yes                                       | 160 (49.5)    |
| No  | 163 (50.5)    |
| <i>Co-morbidity (HIV)</i>                 |               |
| Positive                                  | 72 (22.3)     |
| Negative                                  | 238 (73.7)    |
| Unknown                                   | 13 (4.0)      |
| <i>Stage of Cancer</i>                    |               |
| Stage I                                   | 33 (10.2)     |
| Stage II                                  | 195 (60.4)    |
| Stage III                                 | 47 (14.6)     |
| Stage IV                                  | 10 (3.1)      |
| Unclassified/unknown                      | 38 (11.8)     |
| <i>Treatment</i>                          |               |
| Radiotherapy only                         | 19 (5.8)      |
| Chemo-radiotherapy                        | 298 (92.3)    |
| Surgery + Chemo-radiotherapy              | 6 (1.9)       |
| <i>Radiation method employed</i>          |               |
| External beam only                        | 28 (8.7)      |
| External beam + brachytherapy             | 295 (91.3)    |
| <i>Time since completion of treatment</i> |               |
| 3–12 months                               | 237 (73.4)    |
| > 12 months                               | 86 (26.6)     |

177 (54.8%) had good global health status. Constipation 50 (15.5%) and insomnia 38 (11.8%) were the most experienced symptoms in QLQ-C30 and sexual worry 57 (17.7%) in QLQ-CX24. A good sexual enjoyment functioning 33 (46.5%) was observed in QLQ-CX24 (Table 2).

### Factors Associated with Quality of Life Among Cervical Cancer Patients

#### Age

Patients 52 years and below had a significantly better role and cognitive functioning than those 53 years and above ( $P < 0.050$ ). In addition, insomnia, lymphedema, and peripheral neuropathy were significantly problematic among patients aged 53 years and above, while body image and sexual worry among those 52 years and below ( $P < 0.050$ ). However, the latter had significantly good sexual activity functioning ( $P < 0.050$ ) (Table 3).

#### Education

Surprisingly, lack of formal education significantly led to a good overall QOL/global health status and emotional functioning ( $P < 0.05$ ) (Table 3).

#### Parity

Parity of 4 and below was significantly associated with good physical, role, and cognitive functioning ( $P < 0.05$ ). However, grand multiparity (para  $\geq 5$ ) had more significant problems like nausea and vomiting, dyspnea, appetite loss, symptom experience, and lymphedema ( $P < 0.05$ ). In addition, grand multiparity was associated with less sexual activity than parity of 4 and below, but the association was borderline ( $P = 0.051$ ) (Table 3).

#### Marital status

A significantly good social functioning and problematic symptoms of dyspnea and peripheral neuropathy were noted among single patients ( $P < 0.05$ ). Married patients experienced a significant symptom preponderance of body image and sexual worry ( $P < 0.05$ ) (Table 4).

#### Sexual partner

Patients without a sexual partner had a significantly good overall QOL/global health status, social functioning, and problematic dyspnea ( $P < 0.05$ ). Patients with a sexual partner reported significantly good sexual activity functioning and troubling symptoms of constipation, body image, and sexual worry ( $P < 0.05$ ) (Table 4).

**Table 2** QLQ-C30 & CX24 unadjusted scale scores, the percentage of patients with problems & in good condition (N = 323)

| Variables                                  | Mean Score $\pm$ SD | 95% C. I    | Scoring $\leq$ 33.3 (%) <sup>a</sup> | Scoring 33.4–66.6 (%) | Scoring $\geq$ 66.7 (%) <sup>b</sup> |
|--|---------------------|-------------|--------------------------------------|-----------------------|--------------------------------------|
| <i>QLQ-C30 Functional scales*</i>          |                     |             |                                      |                       |                                      |
| Global Health Status/QOL                   | 64.4 $\pm$ 1.9      | 62.50–66.35 | 6.2                                  | 39.0                  | 54.8                                 |
| Physical Functioning                       | 85.8 $\pm$ 1.6      | 84.17–87.35 | 0.6                                  | 10.2                  | 89.2                                 |
| Role Functioning                           | 90.1 $\pm$ 2.0      | 88.14–92.15 | 3.7                                  | 4.0                   | 92.3                                 |
| Emotional Functioning                      | 80.3 $\pm$ 2.5      | 77.84–82.80 | 6.2                                  | 13.9                  | 79.9                                 |
| Cognitive Functioning                      | 81.4 $\pm$ 2.6      | 78.82–84.03 | 6.8                                  | 15.2                  | 78.0                                 |
| Social Functioning                         | 75.3 $\pm$ 3.3      | 72.02–78.65 | 23.8                                 | 6.2                   | 70.0                                 |
| <i>QLQ-C30 Symptom scales<sup>#</sup></i>  |                     |             |                                      |                       |                                      |
| Fatigue                                    | 16.2 $\pm$ 2.1      | 14.12–18.22 | 88.9                                 | 8.4                   | 2.8                                  |
| Nausea & Vomiting                          | 5.1 $\pm$ 1.7       | 3.45–6.76   | 96.3                                 | 1.2                   | 2.5                                  |
| Pain                                       | 19.8 $\pm$ 2.5      | 17.32–22.31 | 83.3                                 | 9.9                   | 6.8                                  |
| Dyspnea                                    | 4.0 $\pm$ 1.5       | 2.48–5.57   | 97.5                                 | 0                     | 2.5                                  |
| Insomnia                                   | 12.9 $\pm$ 2.8      | 10.15–15.65 | 88.2                                 | 0                     | 11.8                                 |
| Appetite loss                              | 8.9 $\pm$ 2.4       | 6.59–11.30  | 93.8                                 | 0                     | 6.2                                  |
| Constipation                               | 19.0 $\pm$ 3.0      | 15.99–21.99 | 84.5                                 | 0                     | 15.5                                 |
| Diarrhea                                   | 3.8 $\pm$ 1.7       | 2.09–5.55   | 96.6                                 | 0                     | 3.4                                  |
| Financial difficulties                     | 63.7 $\pm$ 4.0      | 59.68–67.67 | 29.7                                 | 0                     | 70.3                                 |
| <i>QLQ-CX24 Symptom scales<sup>#</sup></i> |                     |             |                                      |                       |                                      |
| Symptom Experience                         | 14.1 $\pm$ 1.3      | 12.88–15.38 | 95.3                                 | 4.4                   | 0.3                                  |
| Body Image                                 | 19.6 $\pm$ 2.9      | 16.75–22.51 | 77.4                                 | 10.0                  | 12.5                                 |
| Sexual/Vaginal Functioning                 | 29.5 $\pm$ 2.4      | 27.10–31.92 | 72.0                                 | 25.3                  | 6.7                                  |
| Lymphoedema                                | 7.8 $\pm$ 1.9       | 5.85–9.70   | 96.9                                 | 0                     | 3.1                                  |
| Peripheral Neuropathy                      | 22.8 $\pm$ 3.1      | 19.63–25.93 | 84.5                                 | 0                     | 15.5                                 |
| Menopausal Symptoms                        | 17.3 $\pm$ 3.3      | 13.98–20.60 | 83.1                                 | 0                     | 16.9                                 |
| Sexual worry                               | 45.6 $\pm$ 4.8      | 40.82–50.35 | 52.2                                 | 0                     | 17.7                                 |
| <i>QLQ-CX24 Functional scales*</i>         |                     |             |                                      |                       |                                      |
| Sexual Activity                            | 9.1 $\pm$ 2.1       | 7.07–11.21  | 94.4                                 | 0                     | 5.6                                  |
| Sexual Enjoyment                           | 43.8 $\pm$ 3.3      | 40.50–47.12 | 52.1                                 | 0                     | 46.5                                 |

In functional scales\*, mean scores<sup>a</sup> < 33.3 have problems, while mean scores<sup>b</sup> > 66.7 (higher scores) have good functioning. In symptoms scales<sup>#</sup>, higher scores > 66.7 indicate poor functioning

### Residence

Urban residents experienced good sexual activity functioning ( $P=0.002$ ) and problematic menopausal symptoms ( $P=0.018$ ) (Table 5).

### Smoking habits

Prior history of smoking cigarettes contributed to a good global health status and social functioning ( $P<0.05$ ), whereas non-smokers had more symptomatology ( $P=0.050$ ) (Table 5).

### Occupation

Patients who were employed had a good sexual enjoyment functioning ( $P=0.011$ ) (Table 5).

### Time after treatment completion

Patients who completed treatment above one year had a good overall QOL/global health status, physical, role, cognitive, and social functioning ( $P<0.05$ ). Patients who completed treatment below one year experienced more problematic symptoms of fatigue, constipation ( $P<0.05$ ) (Table 6).

### Stage of cancer (FIGO)

A better emotional functioning was observed in patients diagnosed with stage I ( $P<0.05$ ), while more problems were experienced in patients with stage IV ( $P<0.05$ ) (Table 6).

**Table 3** Quality of life score according to Age, Education, and Parity of the CC patients

| QLQ Items                         | Age         |             | P            | Education   |             | P            | Parity      |             | P            |
|-----------------------------------|-------------|-------------|--------------|-------------|-------------|--------------|-------------|-------------|--------------|
|                                   | ≤52         | ≥53         |              | No formal   | Formal      |              | Para ≤4     | Para ≥5     |              |
|                                   | n=164       | n=159       |              | n=52        | n=271       |              | n=167       | n=156       |              |
| <i>QLQ-C30 Functional scales</i>  |             |             |              |             |             |              |             |             |              |
| Global Health Status/QOL          | 63.9 ± 18.0 | 65.0 ± 17.3 | 0.454        | 69.5 ± 18.3 | 63.5 ± 17.4 | <b>0.019</b> | 65.2 ± 18.0 | 63.6 ± 17.3 | 0.300        |
| Physical Functioning              | 87.2 ± 13.5 | 84.3 ± 15.5 | 0.146        | 87.3 ± 13.4 | 85.6 ± 14.8 | 0.629        | 87.8 ± 14.1 | 83.5 ± 14.8 | <b>0.003</b> |
| Role Functioning                  | 92.5 ± 17.3 | 87.7 ± 19.2 | <b>0.001</b> | 89.3 ± 21.2 | 90.5 ± 17.6 | 0.886        | 93.2 ± 15.3 | 86.9 ± 20.7 | <b>0.000</b> |
| Emotional Functioning             | 80.2 ± 23.8 | 80.5 ± 21.5 | 0.676        | 85.5 ± 22.8 | 79.6 ± 22.1 | 0.022        | 81.0 ± 23.7 | 79.6 ± 21.6 | 0.244        |
| Cognitive Functioning             | 84.2 ± 22.2 | 78.5 ± 25.3 | <b>0.021</b> | 83.0 ± 26.0 | 81.2 ± 23.4 | 0.482        | 87.1 ± 20.1 | 75.3 ± 26.1 | <b>0.000</b> |
| Social Functioning                | 73.2 ± 31.1 | 77.6 ± 29.6 | 0.227        | 81.7 ± 28.2 | 74.2 ± 30.7 | 0.096        | 78.8 ± 28.4 | 71.6 ± 32.0 | 0.054        |
| <i>QLQ-C30 Symptom scales</i>     |             |             |              |             |             |              |             |             |              |
| Fatigue                           | 14.5 ± 18.2 | 17.9 ± 19.3 | 0.103        | 17.6 ± 21.7 | 15.7 ± 18.1 | 0.582        | 5.3 ± 15.4  | 4.9 ± 14.9  | 0.919        |
| Nausea & Vomiting                 | 4.9 ± 15.4  | 5.3 ± 14.9  | 0.483        | 6.3 ± 18.7  | 4.9 ± 14.5  | 0.886        | 17.7 ± 23.1 | 22.1 ± 22.5 | <b>0.023</b> |
| Pain                              | 18.5 ± 23.4 | 21.2 ± 22.4 | 0.144        | 18.7 ± 23.5 | 19.9 ± 22.8 | 0.812        | 3.6 ± 12.2  | 4.5 ± 16.1  | 0.964        |
| Dyspnea                           | 2.8 ± 11.3  | 5.2 ± 16.6  | 0.146        | 6.7 ± 22.3  | 3.6 ± 12.2  | 0.789        | 10.0 ± 23.3 | 16 ± 26.9   | <b>0.019</b> |
| Insomnia                          | 9.6 ± 21.8  | 16.4 ± 28.0 | 0.023        | 16.0 ± 31.0 | 12.3 ± 24.1 | 0.567        | 7.4 ± 19.9  | 10.5 ± 23.3 | 0.152        |
| Appetite Loss                     | 8.6 ± 21.1  | 9.3 ± 22.2  | 0.861        | 8.0 ± 20.8  | 9.2 ± 21.9  | 0.593        | 15.8 ± 25.6 | 22.4 ± 29.1 | <b>0.032</b> |
| Constipation                      | 19.7 ± 26.6 | 18.2 ± 28.5 | 0.293        | 12.7 ± 26.0 | 20.0 ± 27.6 | <b>0.039</b> | 2.4 ± 10.7  | 5.3 ± 19.9  | 0.271        |
| Diarrhea                          | 3.0 ± 13.2  | 4.6 ± 18.2  | 0.585        | 5.3 ± 19.5  | 3.6 ± 15.2  | 0.754        | 61.7 ± 35.8 | 65.8 ± 37.5 | 0.103        |
| Financial difficulties            | 64.0 ± 37.3 | 63.3 ± 36.0 | 0.981        | 51.3 ± 42.7 | 65.8 ± 35.1 | 0.066        | 5.3 ± 15.4  | 4.9 ± 14.9  | 0.919        |
| <i>QLQ-CX24 Symptom scales</i>    |             |             |              |             |             |              |             |             |              |
| Symptom Experience                | 13.8 ± 12.0 | 14.5 ± 11.0 | 0.265        | 12.5 ± 11.3 | 14.4 ± 11.5 | 0.215        | 12.8 ± 11.9 | 15.5 ± 10.9 | <b>0.005</b> |
| Body Image                        | 23.8 ± 28.5 | 15.5 ± 23.5 | <b>0.013</b> | 16.7 ± 22.6 | 20.2 ± 27.1 | 0.549        | 16.9 ± 25.8 | 22.6 ± 26.8 | <b>0.050</b> |
| Sexual/Vaginal Functioning        | 29.9 ± 21.7 | 28.0 ± 24.4 | 0.852        | 36.1 ± 31.5 | 29.2 ± 21.8 | 0.542        | 31.6 ± 23.1 | 26.2 ± 20.4 | 0.422        |
| Lymphoedema                       | 6.0 ± 18.3  | 9.6 ± 16.9  | <b>0.004</b> | 3.9 ± 12.7  | 8.5 ± 18.4  | 0.065        | 5.5 ± 17.0  | 10.2 ± 18.0 | <b>0.001</b> |
| Peripheral Neuropathy             | 19.0 ± 27.0 | 26.6 ± 30.3 | <b>0.012</b> | 21.2 ± 28.0 | 23.1 ± 29.1 | 0.799        | 24.0 ± 30.3 | 21.5 ± 27.2 | 0.585        |
| Menopausal Symptoms               | 19.0 ± 31.9 | 15.6 ± 28.8 | 0.342        | 14.1 ± 25.0 | 17.9 ± 31.3 | 0.869        | 18.8 ± 30.4 | 15.7 ± 30.4 | 0.227        |
| Sexual Worry                      | 51.1 ± 42.3 | 39.9 ± 44.4 | <b>0.018</b> | 40.4 ± 46.4 | 46.6 ± 43.1 | 0.324        | 43.4 ± 43.0 | 48.0 ± 44.3 | 0.386        |
| <i>QLQ-CX24 Functional scales</i> |             |             |              |             |             |              |             |             |              |
| Sexual Activity                   | 14.3 ± 21.6 | 3.8 ± 14.1  | 0.000        | 2.6 ± 11.1  | 10.4 ± 19.9 | 0.324        | 10.8 ± 19.8 | 7.3 ± 17.9  | 0.051        |
| Sexual Enjoyment                  | 45.0 ± 29.2 | 38.5 ± 35.6 | 0.529        | 33.3 ± 0.0  | 44.1 ± 30.7 | 0.527        | 46.2 ± 32.3 | 39.7 ± 26.7 | 0.422        |

Values are in mean score ± SD. Significance  $P < 0.005$  by Mann Whitney U test and significant values are bolded

### Treatment modalities

Patients who received both surgery and chemo-radiotherapy had a better overall QOL ( $P = 0.018$ ) (Table 7).

### Radiation method

Combined external beam radiation and brachytherapy had a good functioning ( $P < 0.05$ ) while external beam radiation had more symptomatology ( $P < 0.05$ ) (Table 7).

### Multiple linear regressions

Having a sexual partner negatively affected the overall QOL (Additional file 1: Table 1).

### Discussion

The study showed more than half of CC patients had a good global health status/overall QOL, in line with an earlier report [8]. A wealth of studies in Ethiopia, Iran,

India, and China, have reported the overall QOL to be 48.3, 46.9, 59.52, and 65.3, respectively [8, 9, 15, 16], similar to our finding of  $64.4 \pm 1.9$ . However, the present study's exclusion criteria excluded most advanced CC patients hence the moderately good QOL, a limitation that should be considered.

A good functioning of  $75.3 \pm 3.3$ ,  $80.3 \pm 2.5$ ,  $81.4 \pm 2.6$ ,  $85.8 \pm 1.6$ , and  $90.1 \pm 2.0$  was reported in social, emotional, cognitive, physical, and role functioning respectively, and poor functioning in sexual activity and sexual enjoyment. A finding that mirrors an earlier report [8]. In line with a previous publication [8], financial difficulties and other symptoms like constipation, pain, insomnia, and fatigue were concerning issues in the present study. Our results showed good functioning after chemo-radiotherapy, which can be explained from earlier definitions of these domains [16], that is, the patients were able to

**Table 4** Quality of life score according to the Marital Status, Sexual Partner, and Sexual Debut of the CC patients

| QLQ Items                         | Marital Status |             | P            | Sexual Partner |             | P            | Sexual Debut (years) |             | P            |
|-----------------------------------|----------------|-------------|--------------|----------------|-------------|--------------|----------------------|-------------|--------------|
|                                   | Married        | Single      |              | With           | Without     |              | ≤12                  | ≥13         |              |
|                                   | n = 182        | n = 141     | n = 160      | n = 163        | n = 10      | n = 313      |                      |             |              |
| <i>QLQ-C30 Functional scales</i>  |                |             |              |                |             |              |                      |             |              |
| Global Health Status/QOL          | 63.8 ± 17.6    | 65.2 ± 17.8 | 0.284        | 60.5 ± 16.1    | 68.5 ± 18.1 | <b>0.000</b> | 62.5 ± 13.7          | 64.5 ± 17.8 | 0.896        |
| Physical Functioning              | 85.2 ± 14.5    | 86.5 ± 14.7 | 0.243        | 85.0 ± 14.6    | 86.7 ± 14.6 | 0.122        | 82.0 ± 14.1          | 85.9 ± 14.6 | 0.282        |
| Role Functioning                  | 90.2 ± 18.3    | 90.1 ± 18.6 | 0.936        | 90.1 ± 18.6    | 90.1 ± 18.3 | 0.916        | 88.3 ± 13.7          | 90.2 ± 18.5 | 0.273        |
| Emotional Functioning             | 79.6 ± 22.9    | 81.3 ± 22.6 | 0.942        | 78.2 ± 24.2    | 82.8 ± 20.8 | 0.132        | 85.8 ± 18.9          | 80.1 ± 22.8 | 0.525        |
| Cognitive Functioning             | 80.7 ± 25.2    | 82.4 ± 22.2 | 0.512        | 78.5 ± 25.5    | 84.4 ± 21.9 | 0.085        | 88.3 ± 13.7          | 81.2 ± 24.1 | 0.616        |
| Social Functioning                | 71.6 ± 30.9    | 80.1 ± 29.1 | <b>0.020</b> | 68.2 ± 31.7    | 83.1 ± 26.5 | <b>0.000</b> | 86.7 ± 21.9          | 75.0 ± 30.6 | 0.340        |
| <i>QLQ-C30 Symptom scales</i>     |                |             |              |                |             |              |                      |             |              |
| Fatigue                           | 16.1 ± 18.4    | 16.2 ± 19.4 | 0.887        | 16.3 ± 19.1    | 15.9 ± 18.5 | 0.877        | 8.3 ± 21.2           | 5.0 ± 15.0  | 0.623        |
| Nausea & Vomiting                 | 4.3 ± 12.8     | 6.1 ± 17.8  | 0.495        | 4.6 ± 13.7     | 5.6 ± 16.6  | 0.840        | 16.7 ± 13.6          | 19.9 ± 23.1 | 0.941        |
| Pain                              | 20.3 ± 22.9    | 19.1 ± 23.0 | 0.633        | 20.1 ± 22.5    | 19.2 ± 22.9 | 0.587        | 6.7 ± 14.1           | 3.9 ± 14.2  | 0.238        |
| Dyspnea                           | 2.2 ± 9.0      | 6.4 ± 18.7  | <b>0.030</b> | 2.1 ± 9.7      | 5.8 ± 17.3  | <b>0.018</b> | 23.3 ± 31.6          | 12.6 ± 25.0 | 0.089        |
| Insomnia                          | 11.5 ± 23.1    | 14.7 ± 27.7 | 0.433        | 11.0 ± 22.7    | 14.9 ± 27.6 | 0.296        | 6.7 ± 14.1           | 9.0 ± 21.9  | 0.955        |
| Appetite Loss                     | 7.6 ± 18.5     | 10.7 ± 25.1 | 0.510        | 8.0 ± 18.9     | 10.0 ± 24.2 | 0.884        | 23.3 ± 31.6          | 18.8 ± 27.4 | 0.700        |
| Constipation                      | 20.1 ± 27.3    | 17.5 ± 27.8 | 0.256        | 21.5 ± 26.5    | 16.6 ± 28.4 | <b>0.014</b> | 6.7 ± 21.1           | 3.7 ± 15.7  | 0.665        |
| Diarrhea                          | 2.9 ± 14.1     | 5.0 ± 17.8  | 0.137        | 2.3 ± 11.9     | 5.4 ± 19.0  | 0.078        | 36.7 ± 36.7          | 64.5 ± 36.3 | <b>0.020</b> |
| Financial difficulties            | 65.4 ± 37.5    | 61.5 ± 35.5 | 0.297        | 66.7 ± 35.9    | 60.5 ± 37.3 | 0.205        | 8.3 ± 21.2           | 5.0 ± 15.0  | 0.623        |
| <i>QLQ-CX24 Symptom scales</i>    |                |             |              |                |             |              |                      |             |              |
| Symptom Experience                | 14.0 ± 11.2    | 14.3 ± 11.9 | 0.867        | 14.6 ± 11.7    | 13.5 ± 11.2 | 0.492        | 13.6 ± 9.9           | 14.1 ± 11.5 | 0.897        |
| Body Image                        | 23.3 ± 27.3    | 15.1 ± 24.6 | <b>0.003</b> | 26.8 ± 28.6    | 12.0 ± 21.1 | <b>0.000</b> | 4.4 ± 10.7           | 20.1 ± 26.6 | 0.060        |
| Sexual/Vaginal Functioning        | 30.4 ± 21.9    | 23.1 ± 23.5 | 0.307        | 28.6 ± 18.5    | 36.1 ± 40.2 | 0.891        | 41.7 ± 52            | 29.0 ± 20.5 | 0.966        |
| Lymphoedema                       | 7.2 ± 17.1     | 8.5 ± 18.4  | 0.552        | 6.5 ± 16.2     | 9.1 ± 19.0  | 0.169        | 0 ± 0                | 8.0 ± 17.9  | 0.118        |
| Peripheral Neuropathy             | 20.1 ± 28.3    | 26.2 ± 29.3 | <b>0.035</b> | 20.6 ± 28.3    | 25.2 ± 29.4 | 0.126        | 40 ± 26.3            | 22.2 ± 28.8 | <b>0.024</b> |
| Menopausal Symptoms               | 17.5 ± 31.4    | 17.0 ± 29.2 | 0.883        | 16.3 ± 30.2    | 18.4 ± 30.7 | 0.458        | 23.3 ± 38.7          | 17.1 ± 30.1 | 0.751        |
| Sexual Worry                      | 52.8 ± 42.7    | 36.4 ± 43.3 | <b>0.001</b> | 54.6 ± 41.6    | 36.6 ± 43.8 | <b>0.000</b> | 26.7 ± 37.8          | 46.2 ± 43.7 | 0.156        |
| <i>QLQ-CX24 Functional scales</i> |                |             |              |                |             |              |                      |             |              |
| Sexual Activity                   | 14.3 ± 21.7    | 2.6 ± 12.0  | <b>0.000</b> | 16.5 ± 22.5    | 2.1 ± 11.0  | <b>0.000</b> | 13.3 ± 23.3          | 9.0 ± 18.9  | 0.488        |
| Sexual Enjoyment                  | 44.4 ± 29.3    | 38.1 ± 40.5 | 0.605        | 44.4 ± 29.3    | 38.1 ± 40.5 | 0.605        | 77.8 ± 38.5          | 42.3 ± 29.3 | 0.084        |

Values are in mean score ± SD. Significance  $P < 0.005$  by Mann Whitney U test and significant values are bolded

relate to society (social), had decreased fear of disease (emotional), we're able to perform some routine duties (physical) and were able to pursue their hobbies (role).

A good role and cognitive functioning were noted in younger patients, which could mean the younger patients were more actively involved in performing day-to-day activities and also could concentrate and remember things compared to the older patients. This is similar to earlier reports [16]. Interestingly, our results showed younger patients were primarily involved in sexual activities and experienced more sexual worry than older patients. The latter is contrary to an earlier finding that age had no impact on sexuality [17]; this could be explained by the fact that all the study population underwent surgery alone while in our study, we utilized chemo-radiotherapy. The present study mirrors an earlier

report [18] demonstrating that sexuality declines as age advances due to the body's physiological factors.

Contrary to other reports [8, 19], the present study showed patients with no formal education had a better overall QOL/global health status and emotional functioning. This finding requires more research to explain it, but we hypothesize that illiteracy could have contributed to misrepresentation of the symptoms, hence why they were seen to have better QOL. Thapa et al. showed education was a positive predictor of overall QOL since the patients who were educated obtained medical attention earlier compared to those with no education.

In the present study, marriage had no effect on global health status/overall QOL as was earlier reported [19], that single and widowed women were lonely and lacked reassurance from partners. Interestingly, our results

**Table 5** Quality of life score according to the Residence, Smoking, and Occupation in CC patients

| QLQ Items                         | Residence   |             | P            | Smoking     |             | P            | Occupation  |              | P            |
|-----------------------------------|-------------|-------------|--------------|-------------|-------------|--------------|-------------|--------------|--------------|
|                                   | Rural       | Urban       |              | Smokers     | Non-smokers |              | Employed    | Not employed |              |
|                                   | n = 202     | n = 121     |              | n = 18      | n = 305     |              | n = 8       | n = 315      |              |
| <i>QLQ-C30 Functional scales</i>  |             |             |              |             |             |              |             |              |              |
| Global Health Status/QOL          | 63.6 ± 16.7 | 65.8 ± 19.1 | 0.251        | 71.3 ± 19.6 | 64.0 ± 17.5 | <b>0.044</b> | 70.8 ± 16.1 | 64.3 ± 17.7  | 0.264        |
| Physical Functioning              | 86.7 ± 13.9 | 84.2 ± 15.6 | 0.255        | 87.4 ± 13.1 | 85.7 ± 14.7 | 0.764        | 90.8 ± 15.9 | 85.6 ± 14.5  | 0.162        |
| Role Functioning                  | 90.5 ± 17.3 | 89.5 ± 20.2 | 0.887        | 85.2 ± 27.3 | 90.4 ± 17.7 | 0.645        | 93.8 ± 12.4 | 90.1 ± 18.5  | 0.678        |
| Emotional Functioning             | 81.2 ± 21.2 | 78.8 ± 25.0 | 0.822        | 84.3 ± 19.4 | 80.1 ± 22.9 | 0.649        | 82.3 ± 26.5 | 80.3 ± 22.6  | 0.590        |
| Cognitive Functioning             | 79.8 ± 24.5 | 84.2 ± 22.7 | 0.096        | 81.5 ± 18.0 | 81.4 ± 24.2 | 0.580        | 89.6 ± 15.3 | 81.2 ± 24.1  | 0.406        |
| Social Functioning                | 76.8 ± 29.4 | 72.9 ± 32.0 | 0.338        | 91.7 ± 21.6 | 74.4 ± 30.6 | <b>0.011</b> | 79.2 ± 30.5 | 75.2 ± 30.4  | 0.668        |
| <i>QLQ-C30 Symptom scales</i>     |             |             |              |             |             |              |             |              |              |
| Fatigue                           | 15.1 ± 17.9 | 18.0 ± 20.1 | 0.253        | 17.3 ± 25.1 | 16.1 ± 18.4 | 0.792        | 5.6 ± 10.3  | 16.4 ± 18.9  | 0.073        |
| Nausea & Vomiting                 | 5.1 ± 15.4  | 5.1 ± 14.9  | 0.984        | 8.3 ± 25.7  | 4.9 ± 14.4  | 0.762        | 2.1 ± 5.9   | 5.2 ± 15.3   | 0.790        |
| Pain                              | 18.5 ± 21.0 | 22.0 ± 25.7 | 0.488        | 23.1 ± 30.3 | 19.6 ± 22.4 | 0.935        | 8.3 ± 17.8  | 20.1 ± 23    | 0.086        |
| Dyspnea                           | 3.5 ± 13.9  | 5.0 ± 14.7  | 0.210        | 7.4 ± 24.4  | 3.8 ± 13.4  | 0.752        | 4.2 ± 11.8  | 4.0 ± 14.3   | 0.748        |
| Insomnia                          | 11.9 ± 24.0 | 14.6 ± 27.2 | 0.452        | 14.8 ± 28.5 | 12.8 ± 25.1 | 0.470        | 4.2 ± 11.8  | 13.1 ± 25.5  | 0.377        |
| Appetite Loss                     | 9.7 ± 22.0  | 7.6 ± 21.0  | 0.201        | 18.5 ± 38.3 | 8.4 ± 20.2  | 0.378        | 8.3 ± 15.4  | 8.9 ± 21.8   | 0.691        |
| Constipation                      | 19.8 ± 27.3 | 17.6 ± 27.9 | 0.338        | 14.8 ± 28.5 | 19.2 ± 27.5 | 0.445        | 8.3 ± 15.4  | 19.3 ± 27.7  | 0.324        |
| Diarrhea                          | 4.8 ± 17.7  | 2.2 ± 12.0  | 0.138        | 7.4 ± 24.4  | 3.6 ± 15.2  | 0.344        | 0           | 3.9 ± 16.0   | 0.440        |
| Financial difficulties            | 65.7 ± 36.1 | 60.3 ± 37.3 | 0.282        | 51.9 ± 46.0 | 64.4 ± 35.9 | 0.181        | 50.0 ± 39.8 | 64.0 ± 36.5  | 0.295        |
| <i>QLQ-CX24 Symptom scales</i>    |             |             |              |             |             |              |             |              |              |
| Symptom Experience                | 14.3 ± 11.2 | 13.9 ± 12.0 | 0.394        | 10.3 ± 9.1  | 14.4 ± 11.6 | 0.445        | 11.7 ± 8.3  | 14.2 ± 11.6  | 0.652        |
| Body Image                        | 18.7 ± 25.2 | 21.2 ± 28.4 | 0.544        | 7.4 ± 15.2  | 20.4 ± 26.8 | <b>0.050</b> | 13.9 ± 20.4 | 19.8 ± 26.6  | 0.781        |
| Sexual/<br>Vaginal Functioning    | 25.7 ± 19.2 | 33.1 ± 24.2 | 0.252        | 27.8 ± 12.7 | 29.6 ± 22.4 | 0.989        | 50 ± 14.4   | 28.6 ± 22    | 0.071        |
| Lymphoedema                       | 8.2 ± 17.3  | 7.2 ± 18.4  | 0.362        | 11.1 ± 22.9 | 7.6 ± 17.3  | 0.634        | 0           | 8 ± 17.8     | 0.164        |
| Peripheral Neuropathy             | 21.9 ± 27.0 | 24.2 ± 31.7 | 0.988        | 22.2 ± 32.3 | 22.8 ± 28.7 | 0.711        | 25 ± 46.3   | 22.7 ± 28.4  | 0.515        |
| Menopausal Symptoms               | 13.7 ± 26.9 | 23.1 ± 34.7 | <b>0.018</b> | 22.2 ± 37.9 | 17.0 ± 29.9 | 0.821        | 20.8 ± 30.5 | 17.2 ± 30.4  | 0.622        |
| Sexual Worry                      | 43.7 ± 43.4 | 48.8 ± 44.1 | 0.319        | 40.7 ± 45.1 | 45.9 ± 43.6 | 0.597        | 45.8 ± 43.4 | 45.6 ± 43.7  | 0.997        |
| <i>QLQ-CX24 Functional scales</i> |             |             |              |             |             |              |             |              |              |
| Sexual Activity                   | 6.7 ± 16.7  | 13.2 ± 21.7 | <b>0.002</b> | 7.4 ± 18.3  | 9.2 ± 19.1  | 0.628        | 20.8 ± 30.5 | 8.8 ± 18.6   | 0.184        |
| Sexual Enjoyment                  | 41.4 ± 26.4 | 45.9 ± 33.7 | 0.598        | 44.4 ± 19.2 | 43.8 ± 30.8 | 0.978        | 88.9 ± 19.2 | 41.8 ± 29.2  | <b>0.011</b> |

Values are in mean score ± SD. Significance  $P < 0.005$  by Mann Whitney U test and significant values are bolded

showed that married patients undertook more sexual activities than unmarried patients. Furthermore, these married patients who were sexually active were more concerned with their body images and sexually worried, a finding similar to an earlier report [20], which demonstrated that married women were finding reasons to avoid sexual activity because of various reasons. An earlier study explained that younger patients were more sexually active and were at a higher chance of contracting sexually transmitted infection (STI) and could easily blame their partners thus causing them to be sexually worried [8]. On the same note, patients without a sexual partner had a good overall QOL and were sexually active compared to those with a sexual partner who experienced problems of sexual worry and body image as

demonstrated by our regression model. We hypothesize that the patients with sexual partners were concerned about their appearance since they thought partners could critique on their appearance, causing them to be sexually worried and hence lack sexual enjoyment.

Place of residence did not affect most of QOL domains in our study, contrary to other reports [8]. In addition, sexual enjoyment was noted among the employed patients. This meant that the employed urban residents were more sexually active and enjoyed the sexual activity.

There was a noted good overall QOL/global health status and good functioning domains (physical, role, cognitive and social) except emotional functioning one year after completing CC treatment. As anticipated, patients who completed treatment less than one-year experience

**Table 6** Quality of life score according to the Time after completion of treatment (months) and cervical cancer stage (FIGO) of the CC patients

| QLQ Items                         | Time after treatment completion (months) |             | P*           | Figo Stage  |             |             |             | P#           |
|-----------------------------------|--|-------------|--------------|-------------|-------------|-------------|-------------|--------------|
|                                   | 3–12                                     | ≥ 13        |              | I           | II          | III         | IV          |              |
|                                   | n = 237                                  | n = 86      |              | n = 33      | n = 195     | n = 47      | n = 10      |              |
| <i>QLQ-C30 Functional scales</i>  |  |             |              |             |             |             |             |              |
| Global Health Status/QOL          | 63 ± 16.8                                | 68.2 ± 19.4 | <b>0.021</b> | 64.6 ± 17.7 | 62.9 ± 17.8 | 68.3 ± 18.0 | 61.7 ± 13.5 | 0.238        |
| Physical Functioning              | 85 ± 14.1                                | 87.8 ± 15.8 | <b>0.016</b> | 86.7 ± 14.2 | 85.1 ± 14.3 | 84.1 ± 15.0 | 79.3 ± 11.6 | 0.393        |
| Role Functioning                  | 88.9 ± 19.1                              | 93.6 ± 16.0 | <b>0.007</b> | 90.4 ± 15.6 | 90.6 ± 19.0 | 83.0 ± 19.9 | 90.0 ± 11.8 | 0.054        |
| Emotional Functioning             | 81.2 ± 22.3                              | 77.8 ± 23.8 | 0.289        | 86.4 ± 23.7 | 80.7 ± 23.0 | 75.0 ± 23.2 | 82.5 ± 21.8 | <b>0.035</b> |
| Cognitive Functioning             | 79.0 ± 25                                | 88.2 ± 19.3 | <b>0.003</b> | 82.8 ± 22.2 | 80.9 ± 23.7 | 78.7 ± 24.8 | 88.3 ± 28.6 | 0.582        |
| Social Functioning                | 71.7 ± 31.1                              | 85.3 ± 25.9 | <b>0.000</b> | 73.2 ± 27.6 | 73.1 ± 32.0 | 78.4 ± 31.5 | 81.7 ± 28.2 | 0.749        |
| <i>QLQ-C30 Symptom scales</i>     |  |             |              |             |             |             |             |              |
| Fatigue                           | 17.3 ± 18.6                              | 13 ± 19.2   | <b>0.010</b> | 14.8 ± 16.8 | 16.3 ± 19.3 | 21.3 ± 19.6 | 31.1 ± 18.4 | <b>0.025</b> |
| Nausea & Vomiting                 | 4.9 ± 14.2                               | 5.8 ± 17.7  | 0.865        | 2.0 ± 6.9   | 5.0 ± 15.9  | 8.2 ± 16.5  | 6.7 ± 12.1  | 0.319        |
| Pain                              | 20.1 ± 22.1                              | 19 ± 25.1   | 0.248        | 17.7 ± 19.1 | 20 ± 23.2   | 25.9 ± 23.6 | 26.7 ± 24.7 | 0.354        |
| Dyspnea                           | 3.4 ± 14                                 | 5.8 ± 14.6  | <b>0.024</b> | 3.0 ± 12.8  | 3.2 ± 12.9  | 6.4 ± 14.5  | 16.7 ± 29.4 | <b>0.034</b> |
| Insomnia                          | 12.7 ± 23.8                              | 13.6 ± 29.1 | 0.577        | 9.1 ± 20.9  | 13 ± 25.1   | 20.6 ± 26.3 | 0           | <b>0.038</b> |
| Appetite Loss                     | 8.8 ± 20.9                               | 9.3 ± 23.8  | 0.712        | 7.1 ± 16.2  | 7.9 ± 21.4  | 13.5 ± 21.7 | 10.0 ± 16.7 | 0.128        |
| Constipation                      | 21.7 ± 28.1                              | 11.6 ± 24.4 | <b>0.001</b> | 13.1 ± 24.9 | 20.2 ± 27.6 | 24.1 ± 28.7 | 6.7 ± 22.2  | 0.114        |
| Diarrhea                          | 2.5 ± 12.4                               | 7.4 ± 22.5  | <b>0.034</b> | 3 ± 17.4    | 3.9 ± 15.6  | 2.1 ± 15.6  | 10.0 ± 33.3 | 0.807        |
| Financial difficulties            | 63.2 ± 35.4                              | 65.1 ± 39.9 | 0.661        | 55.6 ± 37   | 64.6 ± 37.2 | 63.8 ± 36.7 | 56.7 ± 44.4 | 0.600        |
| <i>QLQ-CX24 Symptom scales</i>    |  |             |              |             |             |             |             |              |
| Symptom Experience                | 13.8 ± 10.9                              | 15.1 ± 12.9 | 0.533        | 13.8 ± 11.3 | 14.2 ± 11.9 | 14.9 ± 11.7 | 13.5 ± 11.7 | 0.906        |
| Body Image                        | 21.1 ± 27.3                              | 15.8 ± 23.6 | 0.212        | 19.2 ± 24.1 | 22.3 ± 27.0 | 16.8 ± 27.1 | 10.0 ± 29.4 | 0.078        |
| Sexual/Vaginal Functioning        | 28.8 ± 21                                | 31.9 ± 25.9 | 0.748        | 36.5 ± 15.4 | 30.2 ± 23.1 | 20.2 ± 22.5 | 0           | 0.288        |
| Lymphoedema                       | 8.1 ± 16.8                               | 7 ± 19.9    | 0.188        | 5.7 ± 15.6  | 7.6 ± 18.0  | 10.6 ± 17.8 | 16.7 ± 33.8 | 0.239        |
| Peripheral Neuropathy             | 21.3 ± 26                                | 26.7 ± 35.4 | 0.670        | 27.6 ± 33.4 | 22.8 ± 30.0 | 26.1 ± 29.9 | 23.3 ± 22.2 | 0.618        |
| Menopausal Symptoms               | 14.5 ± 28.5                              | 24.8 ± 34   | <b>0.004</b> | 5.7 ± 15.6  | 15.5 ± 29.2 | 26.2 ± 30.4 | 23.3 ± 37.7 | <b>0.018</b> |
| Sexual Worry                      | 46.2 ± 43.7                              | 43.8 ± 43.8 | 0.591        | 44.1 ± 45   | 47 ± 43.6   | 46.8 ± 43.5 | 50.0 ± 47.5 | 0.986        |
| <i>QLQ-CX24 Functional scales</i> |  |             |              |             |             |             |             |              |
| Sexual Activity                   | 9.5 ± 19                                 | 8.1 ± 19.1  | 0.352        | 11.8 ± 22   | 10.8 ± 20.1 | 6.4 ± 19.7  | 0           | 0.137        |
| Sexual Enjoyment                  | 44 ± 28.3                                | 43.1 ± 36.8 | 0.977        | 37.5 ± 37.5 | 43.8 ± 30.2 | 47.6 ± 29.8 | 0           | 0.763        |

Values are in mean score ± SD. Significance  $P < 0.05$  by Kruskal Wallis test\* or Mann Whitney U test# as appropriate and significant values are bolded

symptoms like fatigue, peripheral neuropathy, and constipation. This finding was because the side effects of treatment were still present. Emotional functioning was poor because, after treatment, most patients are afraid of CC disease recurrence, causing them to be depressed and tense.

In the present study, when FIGO treatment stages were compared to the QOL domains, we noted good emotional functioning in CC patients at an earlier stage compared to those at advanced stages. As described, improvement in emotional functioning is due to decreased worry about cancer [16]. It is clear from our results; this improvement in emotional functioning occurred one year after completion of treatment, as shown in the previous paragraph.

Similar results were reported by [8]. Contrary to an earlier report [21], which showed a depreciated emotional functioning at five to six months after treatment than before treatment. Our time point could explain this for comparison being longer than the later report.

Furthermore, our results showed that the higher the CC stage, the worse the symptoms experience. For instance, patients with advanced CC stages experienced more problematic symptoms like fatigue, dyspnea, insomnia, and menopausal symptoms. These findings mirror a previous report [8]. Earlier reports showed that patients with early cancer stages had good overall QOL/global health and role functioning [8, 22]. Our results had no improvement in these domains, a finding that could



**Table 7** Quality of life score according to the Treatment modalities and Radiation method used in the CC patients

| QLQ Items                         | Treatment   |             |             | P <sup>#</sup> | Radiation Mode |             | P <sup>*</sup> |
|-----------------------------------|-------------|-------------|-------------|----------------|----------------|-------------|----------------|
|                                   | R           | C           | S + C + R   |                | E              | E + B       |                |
|                                   | n = 19      | n = 298     | n = 6       |                | n = 28         | n = 295     |                |
| <i>QLQ-C30 Functional scales</i>  |             |             |             |                |                |             |                |
| Global Health Status/QOL          | 71.5 ± 17.9 | 63.7 ± 17.5 | 79.2 ± 12.6 | <b>0.018</b>   | 59.2 ± 21.9    | 64.9 ± 17.1 | 0.136          |
| Physical Functioning              | 90.9 ± 10.5 | 85.4 ± 14.8 | 85.6 ± 14.9 | 0.340          | 75.7 ± 17.5    | 86.7 ± 13.9 | <b>0.001</b>   |
| Role Functioning                  | 93.0 ± 14   | 89.9 ± 18.6 | 91.7 ± 20.4 | 0.726          | 76.2 ± 26.6    | 91.5 ± 16.9 | <b>0.001</b>   |
| Emotional Functioning             | 83.8 ± 24.4 | 80.1 ± 22.6 | 77.8 ± 25.6 | 0.524          | 63.4 ± 27.5    | 81.9 ± 21.6 | <b>0.000</b>   |
| Cognitive Functioning             | 87.7 ± 22.8 | 81.1 ± 24.1 | 77.8 ± 20.2 | 0.322          | 64.3 ± 32.9    | 83.1 ± 22.3 | <b>0.003</b>   |
| Social Functioning                | 78.9 ± 31.3 | 74.8 ± 30.5 | 91.7 ± 20.4 | 0.300          | 55.4 ± 38.5    | 77.2 ± 28.8 | <b>0.002</b>   |
| <i>QLQ-C30 Symptom scales</i>     |             |             |             |                |                |             |                |
| Fatigue                           | 16.4 ± 16.7 | 16.3 ± 19.1 | 7.4 ± 9.1   | 0.581          | 28.6 ± 23.5    | 15 ± 17.9   | <b>0.001</b>   |
| Nausea & Vomiting                 | 3.5 ± 8.9   | 5.3 ± 15.6  | 2.8 ± 6.8   | 0.999          | 11.9 ± 26.8    | 4.5 ± 13.4  | 0.094          |
| Pain                              | 19.3 ± 19.5 | 19.6 ± 22.9 | 30.6 ± 32.3 | 0.664          | 29.2 ± 24.7    | 18.9 ± 22.5 | <b>0.018</b>   |
| Dyspnea                           | 1.8 ± 7.6   | 4.1 ± 14.5  | 5.6 ± 13.6  | 0.693          | 6 ± 15.9       | 3.8 ± 14.1  | 0.310          |
| Insomnia                          | 21.1 ± 31.8 | 12.1 ± 24.2 | 27.8 ± 44.3 | 0.270          | 26.2 ± 34.4    | 11.6 ± 23.9 | <b>0.004</b>   |
| Appetite Loss                     | 12.3 ± 19.9 | 8.9 ± 21.9  | 0           | 0.215          | 25 ± 33.5      | 7.4 ± 19.5  | <b>0.000</b>   |
| Constipation                      | 15.8 ± 28   | 19.2 ± 27.5 | 16.7 ± 27.9 | 0.716          | 40.5 ± 38.9    | 16.9 ± 25.3 | <b>0.001</b>   |
| Diarrhea                          | 3.5 ± 15.3  | 3.9 ± 16.1  | 0           | 0.770          | 3.6 ± 13.9     | 3.8 ± 16    | 0.948          |
| Financial difficulties            | 64.9 ± 42.3 | 63.6 ± 36.2 | 61.1 ± 44.3 | 0.868          | 82.1 ± 32.1    | 61.9 ± 36.6 | <b>0.001</b>   |
| <i>QLQ-CX24 Symptom scales</i>    |             |             |             |                |                |             |                |
| Symptom Experience                | 10.7 ± 9.4  | 14.4 ± 11.6 | 10.1 ± 6.5  | 0.315          | 21.4 ± 17.5    | 13.4 ± 10.5 | <b>0.029</b>   |
| Body Image                        | 15.8 ± 19.4 | 20.0 ± 27.0 | 14.8 ± 18.1 | 0.984          | 35.8 ± 32.5    | 18.1 ± 25.3 | <b>0.004</b>   |
| Sexual/Vaginal Functioning        | 58.3 ± 28.9 | 28.5 ± 21.3 | 20.8 ± 17.7 | 0.153          | 37.5 ± 17.7    | 29.3 ± 22.2 | 0.479          |
| Lymphoedema                       | 8.8 ± 24.4  | 7.6 ± 17.2  | 11.1 ± 17.2 | 0.688          | 21 ± 26.4      | 6.6 ± 16.1  | <b>0.000</b>   |
| Peripheral Neuropathy             | 21.1 ± 22.8 | 22.7 ± 29.2 | 33.3 ± 29.8 | 0.556          | 34.6 ± 32.7    | 21.7 ± 28.3 | <b>0.027</b>   |
| Menopausal Symptoms               | 19.3 ± 30.1 | 16.6 ± 29.9 | 44.4 ± 45.5 | 0.083          | 24.7 ± 32.8    | 16.6 ± 30.1 | 0.092          |
| Sexual Worry                      | 42.1 ± 48.2 | 45.5 ± 43.3 | 61.1 ± 49.1 | 0.666          | 78.6 ± 38.7    | 42.4 ± 42.8 | <b>0.000</b>   |
| <i>QLQ-CX24 Functional scales</i> |             |             |             |                |                |             |                |
| Sexual Activity                   | 8.8 ± 21.8  | 9 ± 18.7    | 16.7 ± 27.9 | 0.654          | 2.4 ± 8.7      | 9.8 ± 19.6  | <b>0.048</b>   |
| Sexual Enjoyment                  | 44.4 ± 50.9 | 43.1 ± 29.9 | 66.7 ± 0    | 0.491          | 16.7 ± 23.6    | 44.6 ± 30.3 | 0.186          |

R radiotherapy, C chemoradiotherapy, S + C + R surgery with adjuvant chemo-radiotherapy, E external beam radiotherapy, E + B combined external beam radiotherapy and brachytherapy. Values are in mean score ± SD. Significance  $P < 0.005$  by Kruskal Wallis test<sup>#</sup> or Mann Whitney U test<sup>\*</sup> as appropriate and significant values are bolded

have occurred because of few advanced CC patients for comparison. This limitation occurred due to the exclusion criteria.

The mainstays of CC treatment involve surgery, radiotherapy, and chemo-radiotherapy. To achieve an effective cure, patients receive multiple treatment modalities. The present study significantly demonstrated that patients who received chemo-radiotherapy as part of their treatment had a better overall QOL when compared to those who received either radiotherapy or chemotherapy as single therapy. Similarly, a previous report showed that patients had better QOL after concomitant chemo-radiotherapy than before [23]. Although, it did not affect other domains. This was contrary to a report by Thapa et al.,

whereby surgery as a single therapy improved overall QOL and different physical, role, and social functioning scales. In addition, patients who underwent chemo-radiotherapy had more problematic symptoms than those who had surgery alone or combined therapy. Also, an improved sexual function was reported to occur following a combination of surgery with other modes of treatment [24]; this was contrary to our findings. Although the present study showed that surgery combined with chemoradiotherapy had a better QOL. This result needs to be interpreted with caution since these patients underwent surgery (hysterectomy) as a treatment for an apparently benign condition. During the procedure or pathologic evaluation of the surgical specimen, CC was incidentally

detected, so they had to undergo chemoradiotherapy. The current CC treatment discourages triple modality due to the risk of toxicity; instead, surgery or radiotherapy is recommended with chemotherapy as a valuable adjunct [25].

When we further analyzed our results to identify specifically which mode of radiation employed had a favorable QOL outcome, the external beam and brachytherapy combination positively contributed to improved physical, role, emotional, cognitive, and social functioning. In addition, there was also a significant improvement in sexual functioning. Furthermore, combination therapy of external beam and brachytherapy was also seen to have fewer problematic symptoms when compared to those who received external beam radiation only. These findings mirror previous reports [26, 27], highlighting that brachytherapy enabled the delivery of a high dose of radiation to the tumor and reduced dose to the adjacent normal organs, improving the cure rate of cervical cancer and having fewer side effects as compared to external beam. A promising new way of treating CC using immunotherapy and booster vaccine, has been shown to be highly tolerable and potentially less toxic and hence QOL is not much affected [28].

One of the strengths of this study is the relatively large number of patients, however there are limitations to the study. First this was single center study hence the results cannot be generalized to the whole country. Secondly, this was a cross section study at only one time point. The lack of comparison before and after treatment is a limitation of this study.

In conclusion, the study demonstrated more than half of the CC patients with earlier stages had a good QOL and good levels of functioning after chemo-radiotherapy. The combination of external beam radiation and brachytherapy contributed to good functioning in most QOL domains. Furthermore, socio-demographic and clinical factors affected the overall QOL and its accompanying domains.

#### Abbreviations

CC: Cervical cancer; EORTC: European Organization for Research and Treatment of Cancer Quality of Life Questionnaire; GHS: Global health score; HRQOL: Health-related quality of life; MUHAS: Muhimbili University of Health and Allied Sciences; ORCI: Ocean Road Cancer Institute; QLQ-C30: Quality of life questionnaire-core questionnaire; QLQ-CX24: Quality of life questionnaire-cervical cancer module; QOL: Quality of life; WHO: World Health Organization.

#### Supplementary Information

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**Additional file 1:** Multiple Linear Regression of Overall QOL and the variables affecting it (Supplementary Table 1) and Questionnaire items forming QOL-(C30 & CX24) domains (Supplementary Table 2).

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#### Author contributions

DHM conceived the study idea and collected data. DHM, ND, and FA prepared the study proposal. DHM, MHM, and BMS performed data analysis and prepared the manuscript figures and tables. FA and ND helped supervise the study project and reviewed all study protocols. MN, PW, and HK advised on study procedures, study analysis and final review of the manuscript. All authors discussed the results, reviewed and contributed to the final manuscript.

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#### Availability of data and materials

The data that support the findings of this study are not publicly available but can be obtained upon a reasonable request to the corresponding author and with permission from Muhimbili University of Health and Allied Sciences.

#### Declarations

##### Ethics approval and consent to participate

This study was approved by the Muhimbili University of Health and Allied Sciences institutional review board and the Ocean Road Cancer Institute (ORCI). All methods of data collection were performed in accordance with the Declaration of Helsinki. All study participants provided informed consent prior to inclusion in the study.

##### Consent for publication

Not applicable.

##### Competing interests

The authors declare no conflicts of interest.

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