

# Quality of Life after Radical Surgery with Adjuvant Radiation in Early Stage Cervical Cancer Patients

Borisut P, Chauyin N

Department of Obstetrics and Gynecology, Trang Hospital, Thapthiang, MueangTrang, Trang, 92000  
(E-mail:Ppurepraw@hotmail.com)

## บทคัดย่อ: คุณภาพชีวิตภายหลังการผ่าตัดมดลูกแบบถอนรากถอนโคนอย่างเดียว เปรียบเทียบกับการผ่าตัดร่วมกับรังสีรักษาในผู้ป่วยมะเร็งปากมดลูกระยะแรก

เพ็ญว บรีสุทร์ พ.บ., นิตยา ช่วยอินทร์ พ.บ.

กลุ่มงานสูติเวชศาสตร์ โรงพยาบาลตรัง ตำบลทับเที่ยง อำเภอเมือง จังหวัดตรัง 9200

**วัตถุประสงค์:** เพื่อเปรียบเทียบคุณภาพชีวิตของผู้ป่วยมะเร็งปากมดลูกระยะแรกภายหลังการผ่าตัดมดลูกแบบถอนรากถอนโคนเพียงอย่างเดียว กับผู้ป่วยมะเร็งปากมดลูกระยะแรกภายหลังการผ่าตัดมดลูกแบบถอนรากถอนโคนร่วมกับรังสีรักษา และหาปัจจัยอื่นที่อาจส่งผลกระทบต่อคุณภาพชีวิตร่วมด้วย  
**วิธีการ:** สัมภาษณ์ผู้ป่วยมะเร็งปากมดลูกระยะแรก (ระยะ IA2, IB1, IB2 และ IIA1) ในโรงพยาบาลตรัง ที่ถูกส่งต่อไปรักษาที่โรงพยาบาลสงขลานครินทร์ เพื่อรับการผ่าตัดมดลูกแบบถอนรากถอนโคน ระหว่างวันที่ 1 มกราคม พ.ศ. 2550 ถึง 31 ธันวาคม 2560 ทางโทรศัพท์ โดยใช้แบบสอบถามคุณภาพชีวิตของผู้ป่วยมะเร็งปากมดลูก FACT-Cx (Functional Assessment of Cancer Therapy-Cervix) **ผล:** มีผู้ป่วยมะเร็งปากมดลูกระยะแรก 236 ราย เข้าร่วมการศึกษา โดยมี 185 รายอยู่ในกลุ่มผ่าตัดมดลูกแบบถอนรากถอนโคนอย่างเดียว และ 51 รายอยู่ในกลุ่มผ่าตัดมดลูกแบบถอนรากถอนโคนร่วมกับรังสีรักษา คะแนนคุณภาพชีวิตโดยรวมระหว่างสองกลุ่มแตกต่างกันอย่างมีนัยสำคัญ คือ กลุ่มที่ผ่าตัดมดลูกแบบถอนรากถอนโคนร่วมกับรังสีรักษา มีคุณภาพชีวิตต่ำกว่ากลุ่มที่ผ่าตัดมดลูกแบบถอนรากถอนโคนอย่างเดียว ( $128.59 \pm 17.08$  กับ  $132.79 \pm 10.77$ ;  $p = 0.033$ ) ส่วนปัจจัยศึกษาอื่นๆ ที่ส่งผลกระทบต่อคุณภาพชีวิตโดยรวมอย่างมีนัยสำคัญ ได้แก่ อายุที่มากกว่า การมีโรคประจำตัว ระดับศึกษาที่ต่ำกว่า การไม่ได้ประกอบอาชีพ และรายได้ที่น้อยกว่า **สรุป :** การได้รับรังสีรักษาหลังการผ่าตัดมดลูกแบบถอนรากถอนโคนในผู้ป่วยมะเร็งปากมดลูกระยะแรกมีผลกระทบต่อคุณภาพชีวิตของผู้ป่วย ดังนั้นผู้ให้บริการทางการแพทย์มีบทบาทสำคัญในการค้นหาภาวะแทรกซ้อน และรักษาภาวะแทรกซ้อนที่เกิดจากรังสีรักษา เพื่อคุณภาพชีวิตของผู้ป่วยที่ดีขึ้น

**คำสำคัญ:** มะเร็งปากมดลูก คุณภาพชีวิต การผ่าตัดมดลูกแบบถอนรากถอนโคน รังสีรักษาภายหลังการผ่าตัดมดลูกแบบถอนรากถอนโคน

### Abstract

**Objective:** To compare the quality of life of early stage cervical cancer patients after radical surgery alone, and after radical surgery with adjuvant radiation. In addition, the factors that may contribute to quality of life were also examined.  
**Methods:** Patients with early stage cervical cancer (stages IA2, IB1, IB2 and IIA1) in Trang Hospital referred to Songklanakarin hospital for radical surgery between January 2004 and December 2012 had been enrolled in a questionnaire-based study. Patients were classified into 2 groups: radical surgery alone and radical surgery with adjuvant radiation. Quality of life was evaluated with the Functional Assessment of Cancer Therapy-Cervix (FACT-Cx) Questionnaire. Data were collected by phone interview according to the number from hospital database. **Results:** The sample comprised 236 patients, comprising 185 patients in radical surgery alone, and 51 patients in radical surgery with adjuvant radiation. Overall, the quality of life score from the FACT-Cx questionnaire differed significantly between the two groups. The radical surgery with adjuvant radiation group showed a significantly worse score when compared to the radical surgery alone group ( $128.59 \pm 17.08$

$VS 132.79 \pm 10.77$ ;  $p = 0.033$ ). Others factors which negatively impacted overall FACT-Cx score significantly were old age, presence of underlying disease, lower educational level, unemployment and lower income. **Conclusion:** Adjuvant radiation therapy has negative effects on quality of life. Health care providers play a role in the identification and treatment of the complications of radiation therapy.

**Keywords:** Cervical cancer, Quality of life, Radical surgery, Adjuvant radiation therapy

### Introduction

Cervical cancer is the second most common cancer among women around the world, after breast cancer. However, in term of the cause of death of women it is ranked third of cancer deaths among women worldwide, after breast cancer and lung cancer. The International Agency for Research on Cancer of the World Health Organization reported that there are approximately 530,000 new cases per year of patients with cervical cancer, of which about 85% are in developing countries<sup>1</sup>.

In Thailand cervical cancer is second to breast cancer, and remains a major public health problem in the country. The incidence standardized by age was 24.5 per 100,000 female population each year, with the incidence of cervical cancer at approximately 10,000 cases per year, and a 52% mortality rate. Cervical cancer is a secondary cancer arising from liver cancer<sup>1</sup>.

Treatment of cervical cancer in general, depends on the stage of disease, age, physical condition of the patient, fertility requirements, the availability of institutions and medical care. Radical hysterectomy is a popular method for the treatment of patients with early stage cervical cancer (IA2 - IIA1)<sup>1</sup>.

The survival of patients with early stage cervical cancer after radical hysterectomy and pelvic lymphadenectomy depends on the presence or absence of several intermediate and high-risk pathological factors.

Intermediate risk factors for recurrent disease are:

- Large size of tumor
- Cervical stromal invasion to the middle or deep one-third
- Lymph-vascular space invasion

High risk factors for recurrent disease are:

- Positive or close margins
- Positive lymph nodes
- Microscopic parametrial involvement

Patients treated with radical hysterectomy who have intermediate or high risk factors have a 30% and 40% risk, respectively, of recurrence within 3 years. Therefore, patients who exhibit intermediate- or high-risk pathological factors, adjuvant radiation or chemoradiation therapy should be considered<sup>2</sup>.

After surgery, there may be complications from infection, bleeding and injury to pelvic organs such as the bladder, ureter and rectum. This may cause the dysfunction of the bladder, vesicovaginal fistula, ureteric obstruction and hydronephrosis. It may also cause lymphocyst and deep vein thrombosis.<sup>1</sup> Chronic complications of radiation therapy included intestinal and urinary stricture and fistula, stenosed and fibrozed vagina and destroyed ovaries<sup>2</sup>. These complications affect the quality of life of patients.

Currently, holistic treatment for cancer patients dose not intended to prolong life only, but to also give patients a better quality of life. Therefore, a study on the quality of life of cancer patients should be performed, regarding the physical, social, emotional, and functional aspects.

A study conducted by Ditto et al in 2009<sup>3</sup>, compared the quality of life of cervical cancer patients after class III nerve-sparing radical hysterectomy with class II radical hysterectomy. Physical, social, emotional and functional well-being did not differ significantly. However, the quality of life as a result of the symptoms of cervical cancer and its treatment differed significantly. However, when evaluating multivariate analysis found no difference was found. However, exposure to radiation

treatment had a significantly negative effect on quality of life.

The aim of this study was to compare the quality of life of early stage cervical cancer patients between after radical hysterectomy alone and radical hysterectomy with adjuvant radiation. In addition, we studied other factors which may impact quality of life.

## Materials and Method

The present study was a cross-sectional description approved by the Research Ethics Committee of Trang Hospital. We requested the copyright from the owner to use the FACT-Cx (Functional Assessment of Cancer Therapy-Cervix) questionnaire. We interviewed patients with early stage cervical cancer (stage IA2, IB1, IB2 and IIA1) in Trang Hospital referred to Songklanakarin hospital for radical hysterectomy between January 1<sup>st</sup>, 2007 and December 31<sup>st</sup>, 2017, using FACT-Cx (Functional Assessment of Cancer Therapy-Cervix) to evaluate quality of life. The exclusion criteria comprised the following: recurrence of cervical cancer, received radiation therapy before surgery, treated with chemotherapy before and after surgery, patients with a severe underlying disease and/or unable to cooperate in response to a query. The statistical analysis was performed using SPSS software, common descriptive statistics (distribution of frequencies, means, standard deviation, min-max) were used to describe the demographic data and the quality of life of the sample enrolled in the study. Quality of life scores between the two groups were compared using independent t-test in the case of the normal distribution of data; if the data was not normally distributed, the Mann-Whitney U-test was used. For the comparison of the quality of life of more than 2, One-way ANOVA was used in normal distribution; if the data was not normally distributed, the Kruskal-Wallis test was used.

## Results

A total of 236 patients with cervical cancer were included in the study (23 patients were excluded). Of this number, 185 patients (78.4%) were treated with radical hysterectomy alone, and 51 patients (21.6%) with radical hysterectomy with adjuvant radiation. The demographic and clinical characteristics of patients are listed in Table 1. No significant difference existed between the 2 groups for mean age at study entry, body mass index, presence of underlying diseases, marital status, number of children, educational level, working status, income, type of operation and histologic type of cancer. However, FIGO staging was significantly higher in the radical hysterectomy with adjuvant radiation group.

Table 1 Demographic and clinical characteristics of early stage cervical cancer patients

Characteristics	Total (n = 236 )		Treatment				p-value
			Surgery alone (n = 185)		Surgery + RT (n = 51)		
<b>Age (years)</b>							
Mean ± SD	53.21 ± 9.47		53.58 ± 9.56		51.86 ± 9.11		NS
min-max	35 - 75		35 - 78		37 - 77		
<b>BMI (Kg/m<sup>2</sup>)</b>							
Mean ± SD	24.82 ± 4.41		24.90 ± 4.43		24.51 ± 4.34		NS
min-max	14.84 - 41.78		14.84 - 41.78		17.01 - 36.20		
<b>Marital status</b>							
Single	9	3.8%	7	3.8%	2	3.9%	NS
Married	184	78.0%	142	76.8%	42	82.4%	
Widow/separated	43	18.2%	36	19.5%	7	13.7%	
<b>Number of children</b>							
none	19	8.1%	14	7.6%	5	9.8%	*
1	41	17.4%	27	14.6%	14	27.5%	
2	78	33.1%	59	31.9%	19	37.3%	
≥ 3	98	41.5%	85	45.9%	13	25.5%	
Mode (min-max)	2 (1 - 8)		2 (1 - 8)		2 (1 - 5)		
<b>Educational level</b>							
Primary education or less	161	68.2%	126	68.1%	35	68.6%	NS
Secondary education	44	18.6%	38	20.5%	6	11.8%	
Diploma/bachelor or more	31	13.1%	21	11.4%	10	19.6%	
<b>Working status</b>							
Working	167	70.8%	130	70.3%	37	72.5%	NS
<b>Monthly income (baht)</b>							
Median (min-max)	8,000 (600 - 60,000)		8,000 (600 - 40,000)		10,000 (700 - 60,000)		NS
<b>Underlying disease</b>							
Presence	96	40.7%	80	43.2%	16	31.4%	NS
Absence	140	59.3%	105	56.8%	35	68.6%	
<b>Staging</b>							
IA2	31	13.1%	27	14.6%	4	7.8%	*
IB1	172	72.9%	138	74.6%	34	66.7%	
IB2	12	5.1%	8	4.3%	4	7.8%	
IIA1	21	8.9%	12	6.5%	9	17.6%	

Table 1 Demographic and clinical characteristics of early stage cervical cancer patients. (continued)

Characteristics	Total (n = 236)		Treatment				p-value
			Surgery alone (n = 185)		Surgery + RT (n = 51)		
<b>Type of operation</b>							NS
Modified radical hysterectomy	20	8.5%	17	9.2%	3	5.9%	
Radical hysterectomy	216	91.5%	168	90.8%	48	94.1%	
<b>Histologic type</b>							NS
Squamous cell carcinoma	141	59.7%	110	59.5%	31	60.8%	
Adenocarcinoma	79	33.5%	64	34.6%	15	29.4%	
Adenosquamous cell carcinoma	16	6.8%	11	5.9%	5	9.8%	
<b>Time after surgery (years)</b>							*
< 2	10	4.2	6	3.2%	4	7.8%	
2-5	113	47.9	96	51.9%	17	33.3%	
> 5	113	47.9	83	44.9%	30	58.8%	

Abbreviation: T = p-value from Independent t-test, C = p-value from Chi-Square test, F = p-value from Fisher’s Exact Test, M = p-value from Mann-Whitney, RT = radiation therapy, \* significant at the 0.05 level, NS = no significant

The mean scores of all patients for each aspect. The mean overall FACT-Cx score was 131.88. The minimum value was 68 and the maximum value was 157.

Figure 1 shows emotional well-being, cervical cancer subscale and overall FACT-Cx score differed significantly between the 2 groups, radical hysterectomy with the adjuvant radiation group showing a significantly worse score when compared with the radical surgery alone group (128.59±17.08 VS 132.79±10.77; p=0.033). For the other aspects, there was no significant difference.

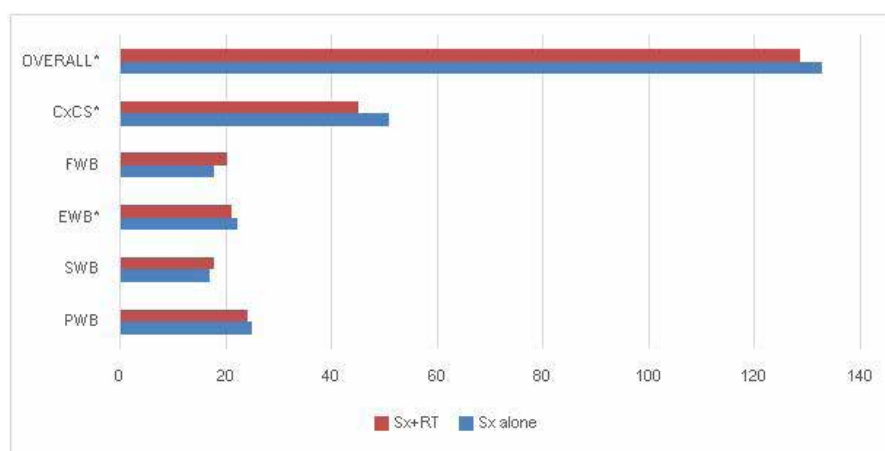


Figure 1 Comparison of FACT-Cx score between radical surgery alone and radical surgery with adjuvant radiation

Abbreviation: Sx alone = radical surgery alone, Sx+RT = radical surgery with adjuvant radiation, \* significant at the 0.05 level, PWB = physical well-being, SWB = social/family well-being, EWB = emotional well-being, FWB = functional well-being, CxCS = cervical cancer subscale

Table 2 shows the other factors which negatively and significantly impacted overall FACT-Cx score were old age, presence of underlying disease, lower educational level, unemployed, and lower income. Body mass index (BMI), marital status, number of children, stage and histologic type of cancer had no significant effect.

**Table 2** Association between factors and FACT-Cx score

Variable	No.	Mean (SD)					
		PWB	SWB	EWB	FWB	CxCs	Overall FACT-Cx
<b>Age(years)</b>		*	NS	NS	NS	*	*
<40	12	26.50 (1.62)	18.33 (3.42)	22.50 (1.45)	20.42 (4.27)	52.08 (3.29)	139.83 (9.41)
40-60	172	24.83 (2.92)	17.25 (3.32)	22.10 (2.28)	18.30 (4.29)	49.78 (4.04)	132.26 (11.70)
>60	52	24.13 (3.52)	16.96 (3.72)	21.52 (2.09)	17.58 (4.58)	48.60 (5.08)	128.79 (14.68)
<b>BMI (Kg/m<sup>2</sup>)</b>		NS	NS	NS	NS	NS	NS
< 18.5	13	23.85 (4.12)	16.69 (4.09)	21.62 (2.63)	18.15 (4.79)	49.54 (5.22)	129.85 (16.37)
18.5-25.0	115	25.01 (2.84)	17.63 (3.69)	21.90 (2.51)	18.04 (4.61)	49.08 (4.44)	131.66 (12.36)
> 25	108	24.61 (3.11)	16.90 (2.98)	22.13 (2.38)	18.47 (4.09)	50.25 (4.00)	132.36 (12.20)
<b>Educational level</b>		*	*	NS	*	NS	*
≤ Primary	161	24.63 (2.97)	16.9 (3.15)	21.91 (2.47)	17.91 (4.28)	49.24 (4.43)	130.60 (12.34)
Secondary	44	24.75 (2.21)	17.34 (3.94)	22.09 (2.35)	18.39 (4.05)	50.91 (3.18)	133.48 (11.14)
≥ Diploma	31	25.48 (4.23)	18.87 (3.54)	22.26 (2.54)	19.77 (5.06)	49.90 (4.78)	136.29 (14.09)
<b>Working status</b>		NS	NS	NS	*	NS	*
Working	167	25.11 (2.61)	17.43 (3.48)	22.14 (2.07)	18.77 (4.04)	49.87 (4.19)	133.31 (10.74)
Non-working	69	23.93 (3.78)	16.78 (3.22)	21.64 (3.18)	16.99 (4.91)	49.09 (4.56)	128.42 (15.50)
<b>Monthly income (baht)</b>		*	*	NS	*	NS	*
< 10,000	153	24.48 (3.18)	16.82 (3.14)	21.89 (2.53)	17.52 (4.16)	49.59 (4.30)	130.29 (12.53)
10,001-20,000	64	25.00 (2.83)	17.25 (3.24)	22.02 (2.41)	18.97 (4.18)	50.03 (3.78)	133.27 (11.76)
>20,000	19	26.26 (2.00)	20.63 (4.25)	22.74 (1.82)	21.68 (4.93)	48.68 (5.86)	140.00 (11.26)
<b>Underlying disease</b>		*	*	*	*	*	*
Presence	96	23.92 (3.54)	16.60 (3.22)	21.57 (2.93)	17.24 (4.69)	48.99 (4.46)	128.32 (14.05)
Absence	140	25.34 (2.50)	17.68 (3.48)	22.28 (2.02)	18.94 (4.02)	50.09 (4.16)	134.32 (10.67)
<b>Staging</b>		NS	NS	NS	NS	NS	NS
IA2	31	24.81 (2.87)	17.00 (3.64)	22.26 (1.93)	18.23 (4.77)	50.45 (4.00)	132.74 (12.78)
IB1	172	24.94 (2.95)	17.21 (3.11)	22.10 (2.23)	18.37 (4.19)	49.81 (4.25)	132.43 (11.78)
IB2	12	25.17 (1.75)	17.83 (4.24)	22.67 (1.23)	18.00 (3.67)	49.33 (2.02)	133.00 (5.24)
IIA1	21	23.00 (4.09)	17.52 (4.91)	20.33 (4.28)	17.38 (5.70)	47.24 (5.46)	125.48 (18.36)
<b>Histologic type</b>		NS	NS	NS	NS	NS	NS
SCC	141	24.74 (3.18)	17.19 (3.44)	22.06 (2.49)	18.18 (4.27)	49.68 (4.28)	131.86 (12.59)
Adenocarcinoma	79	24.71 (2.91)	17.18 (3.29)	21.76 (2.42)	18.01 (4.23)	49.77 (4.31)	131.43 (11.99)
Adenosquamous carcinoma	16	25.25 (2.49)	18.00 (3.86)	22.50 (2.25)	19.94 (5.78)	48.62 (4.63)	134.31 (14.37)
<b>Time after surgery (years)</b>		NS	*	NS	*	*	NS
< 2	10	25.30 (2.58)	17.50 (2.01)	22.00 (2.36)	19.30 (4.47)	48.50 (4.53)	132.60 (12.41)
2-5	113	24.57 (3.10)	16.51 (3.22)	21.93 (2.40)	17.42 (4.32)	50.39 (3.86)	130.81 (12.31)
> 5	113	24.91 (3.03)	17.95 (3.56)	22.05 (2.52)	18.98 (4.31)	48.99 (4.61)	132.88 (12.69)

Abbreviation: p-value from Kruskal-Wallis Test, p-value from Mann-Whitney U test, PWB = physical well-being, SWB = social/family well-being, EWB = emotional well-being, FWB = functional well-being, CxCs = cervical cancer subscale, \* significant at the 0.05 level, NS = no significant

## Discussion

The study compared the quality of life of early stage cervical cancer patients after radical hysterectomy alone with radical hysterectomy and radiation therapy. The mean age of participants in this study was 53±9 years. As seen in Table 1, the most common age of early stage cervical cancer patients was 40-60 years (72.9%), followed by more than 60 years (22%) and less than 40 years (5.1%).

The demographic data shows that the greater number of children associated with the stage of cervical cancer, which is consistent with previous studies that found that the those with more than 4 live births had a 2-3 times higher risk of cervical cancer<sup>4</sup>.

Regarding the staging of cervical cancer, we found that the higher stage of the disease has been significantly associated with more adjuvant radiotherapy. This is consistent with the finding that pathological risk factors like large size of tumor should be considered with adjuvant radiation therapy.

Figure 1 shows the mean overall quality of life score of the radical hysterectomy with radiation group was lower than radical hysterectomy alone at a statistically significant level. This is consistent with the finding of Ditto<sup>3</sup>, Frumovitz<sup>5</sup>, Vistad<sup>6</sup>, Barker<sup>7</sup>, and Kumbhaj<sup>8</sup>. Ditto<sup>3</sup> studied 127 patients with cervical cancer from the National Cancer Institute of Milan to compare the quality of life of class III nerve-sparing with class II radical hysterectomy. They concluded the quality of life of patients who underwent class III nerve-sparing radical hysterectomy was no worse than the those who underwent class II radical hysterectomy. Radiation therapy seems to be a factor impacting negatively on quality of life. Frumovitz et al interviewed 114 patients at least 5 years after initial treatment for cervical cancer. The female subjects had squamous cell tumors smaller than 6 cm at diagnosis, were currently disease-free, and had either undergone surgery or radiotherapy. The study found that radiation patients had significantly poorer scores on standardized questionnaires measuring health-related quality of life (physical and mental health)<sup>5,9</sup>. Barker et al studied changes in quality of life score in relation to radical radiotherapy before and after treatment up to 3 years. This was a prospective study involving 225 gynecologic cancer patients. They found that treatment with radiotherapy for gynecologic cancer has a negative effect on quality of life from immediate and late effect<sup>6</sup>. Kumbhaj<sup>8</sup> studied total 105 cervical cancer patients (35 surgeries, 35 radiotherapies, 35 controls). The female subjects had squamous cell tumor FIGO stage I&II and were currently disease free. The results showed that radiation patients had significant poorer score on standardized questionnaires measuring the health-related quality of life (physical and mental health) and sexual functioning.

Stage of disease did not significantly impact on quality of life. This is consistent with the results of a study by Taneepanichskul (2011) which investigated quality of life of 172 patients with cervical cancer and cervical intraepithelial neoplasia in Chulalongkorn Memorial hospital. They evaluated quality of life using the Functional Assessment of Cancer Therapy General (FACT-G) questionnaire with the results showing no significant differences between the stage of disease on quality of life. There were no significant differences between radical hysterectomy patients and controls on outcome measures<sup>3,10</sup>.

The factors related to age found that patients who were elderly had poorer overall quality of life, especially in terms of physical well-being. This is consistent with Taneepanichskul's study<sup>10</sup>, except no positive relationship with emotional well-being was identified.

Concerning the educational factor, it was found that patients with higher levels of education had better quality of life, in terms of physical, social, and functional well-being. This is consistent with the results of a study by Osann<sup>11</sup>. The social support buffered the effect of self-esteem on quality of life<sup>12</sup>. However, Taneepanichskul<sup>10</sup> found that people with lower education had better emotional well-being than those with higher education.

This study also found that patients who are not employed, of low-income status, and with a presence of underlying diseases were associated with a lower overall quality of life. These results are consistent with Yoo<sup>13</sup>.

The finding of this research show that early stage cervical cancer patients who underwent radical hysterectomy with adjuvant radiation therapy have poorer quality of life than patients who did not receive adjuvant radiation therapy. This will be a long-term side effect of radiation therapy. There are other factors that affect quality of life including age, education, occupation, income, and underlying diseases.

The limitations of this research included the study being at one point of time (a cross-sectional study), the participants were less than the calculated sample size and the different periods after treatment may affect quality of life score.

## Conclusion

The average overall quality of life (overall FACT-Cx) score between radical hysterectomy alone group and radical hysterectomy with adjuvant radiation group differed at a statistically significant level. The radical hysterectomy with adjuvant radiation group had a lower quality of life score than the radical hysterectomy alone. Other factors that impact negatively on the quality of life significantly, include old age, presence of underlying disease, lower educational level, unemployment, and lower income.

## References

1. Srisomboon J. Cervical cancer. In: Srisomboon J, Kietpeerakul C, editors. *Gynecologic Oncology*, Bangkok: Pimdee, 2011:124-46.
2. Miller C, Eklas JC. Cervical and Vaginal Cancer. In: Berek JS, editor. *Berek & Novak's Gynecology*. 15<sup>th</sup> ed. Philadelphia: Lippincott Williams & Wilkins, 2012: 1304-49.
3. Ditto A, Martinelli F, Borreani C, Kusamura S, Hanozet F, Brunelli C, et al. Quality of life and sexual, bladder, and intestinal dysfunctions after class III nerve-sparing and class II radical hysterectomies: a questionnaire – based study. *Int J Gynecol Cancer* 2009; 19: 953-7.
4. Eluf-Neto J, Booth M, Munoz N, Bosch FX, Meijer CJ, Walboomers JM. Human papillomavirus and invasive cervical cancer in Brazil. *Br J Cancer* 1994; 69: 114-9.
5. Frumovitz M, Sun CC, Schover LR, Munsell MF, Jhingran A, Wharton T, et al. Quality of life and sexual functioning in cervical cancer survivors. *J Clin Oncol* 2005; 23: 7428-36.
6. Vistad I, Fossa SD, Dahl AA. A critical review of patient-rated quality of life studies of long-term survivors of cervical cancer. *Gynecol Oncol*. 2006;102:563–72.
7. Barker CL, Routledge JA, Farnell DJ, Swindell R, Davidson SE. The impact of radiotherapy late effects on quality of life in gynaecological cancer patients. *Br J Cancer* 2009; 100: 1558-65.
8. Kumbhaj P, Sharma R, Bhatnagar A, Saini PK. Sexual functioning & quality of life in cervical cancer survivors after surgery and radiotherapy. *Natl J Med res* 2014; 4: 116-8.
9. Carter J, Sonoda Y, Baser RE, Raviv L, Chi DS, Barakat RR, et al. A 2-year prospective study assessing the emotion, sexual, and quality of life concerns of women undergoing radical trachelectomy versus radical hysterectomy for treatment of early-stage cervical cancer. *Gynecologic Oncology*. 2010; 119: 358–65.
10. Taneepanichskul S, Lertmaharit S, Pongpanich S, Termrungruanglert W, Havanond P, Khemapech N, et al. Quality of life among Thai women diagnosed with cervical cancer and cervical intraepithelial neoplasia at King Chulalongkorn Memorial Hospital. *J Med Assoc Thai* 2011; 94: 902-7.
11. Osann K, Hsieh S, Nelson EL, Monk BJ, Chase D, Cella D, et al. Factors associated with poor quality of life among cervical cancer survivors: implication for clinical care and clinical trials. *Gynecol Oncol* 2014; 135: 266-72.
12. Li CC, Chen ML, Chang TC, Chou HH, Chen MY. Social support buffers the effect of self-esteem on quality of life of early-stage cervical cancer survivors in Taiwan. *Eur J Oncol Nurs*. 2015; 19:486-94.
13. Yoo SH, Yun YH, Park S, Kim YA, Park SY, Bae DS, et al. The correlates of unemployment and its association with quality of life in cervical cancer survivors. *J Gynecol Oncol* 2013; 24: 367-75.