

Original Research

Health-Related Quality of Life with Cervical Cancer and Precancer: A Cross-Sectional Study in Yunnan Province, China

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Abstract

Background: Cervical cancer is the fourth most common cancer in women, with an estimated 600,000 new cases and 340,000 deaths worldwide in 2020. However, there remains limited understanding of the association between individual socioeconomic status, clinical characteristics, and health-related quality of life (HRQoL) of women with cervical precancerous lesions. This study investigates socioeconomic and clinical variations in HRQoL of women with cervical precancerous lesions and cervical cancer in Yunnan Province, China. **Methods:** The present study employed a cross-sectional survey design. An EuroQol Five Dimensions Five Level (EQ-5D-5L) questionnaire was used to assess HRQoL of 400 patients with cervical precancerous lesions and cervical cancer in Yunnan Province, China, from 2019 to 2020. Analysis of variance (ANOVA) and independent samples *t*-tests were performed to identify the independent variables associated with EQ-5D-5L utility scores and visual analogue scale (VAS) scores. Predictors of utility scores were confirmed using a Tobit regression model. **Results:** The mean EQ-5D-5L utility scores of cervical precancerous lesions and cervical cancer patients was 0.939 (standard deviation (SD), 0.104), and the mean VAS score was 80.84 (SD, 16.551). Patients aged 40–59 years ($\beta = -0.037$, $p = 0.005$), patients who were not aware of the human papillomavirus (HPV) vaccine ($\beta = -0.032$, $p = 0.004$), and patients who underwent radical hysterectomy ($\beta = -0.036$, $p = 0.006$) had significantly lower utility scores, whereas having high monthly household income ($\beta = 0.023$, $p = 0.033$) was significantly associated with higher EQ-5D-5L utility scores. Age ($p = 0.023$) was statistically significant in differences in patients' VAS scores. Anxiety/depression was the most frequently reported issue (35.75%) among participants. **Conclusions:** Future cervical cancer prevention and treatment guidelines should focus on low-income women, women aged 40–59 years, and those lacking knowledge about cervical cancer prevention.

Keywords: cervical precancerous lesions and cancer; health-related quality of life; China; EQ-5D-5L

1. Introduction

Cervical cancer is the second most common female malignant cancer worldwide [1] and is a serious threat to women's health [2]: the International Agency for Research on Cancer's latest estimates on the global burden of cancer found cervical cancer is the most common cancer in women, with an estimated 600,000 new cases and 340,000 deaths worldwide in 2020 [3]. Persistent infection with specific types of human papillomavirus (HPV) is a necessary factor in the development of cervical cancer, and cervical intraepithelial neoplasia (CIN) is a precancerous lesion for development of invasive cervical cancer. In China, there were 106,400 new cervical cancer cases in 2018 [4], an incidence rate of 17.69 per 100,000 people, and a mortality rate of 5.52 per 100,000 people, which made it the 8th highest cause of female cancer mortality [5].

Women diagnosed with cervical cancer can experience both significant physical and psychological trauma as

the diagnosis leads to financial burden on their families, changing body image, altered relationships with partners, as well as other major life changes. These many changes can adversely impact health-related quality of life (HRQoL) of patients and their families.

HRQoL is a patient-reported outcome that refers to individuals' subjective assessment of well-being and ability to perform social roles. It is used as a health indicator in medical settings, including clinical interventions, treatments, and health surveys [6]. Evaluation of HRQoL in cervical cancer patients can help determine the burden of disease and provide essential information for planning interventions. Thus, it is important to understand the HRQoL of patients with precancerous lesions or cervical cancer, and to explore the factors that affect it.

Based on Casper Tax's study in 2017, which provided an overview of the HRQoL tools used to measure cervical cancer patients [7], these tools were categorized as



generic, cancer-specific, and cervical cancer-specific. At present, research on HRQoL of cervical cancer patients has been conducted in numerous countries [8–10]. However, in China, there have been few studies on HRQoL of patients with cervical cancer [11–13], and even fewer among Chinese ethnic minority populations of cervical cancer survivors.

Yunnan Province, a high altitude region located on the Yunnan-Guizhou Plateau in southwestern China, has the largest concentration of ethnic minorities in China. According to a 2017 study, the incidence of cervical cancer in Yunnan Province was 11.51 per 100,000 people and the mortality rate was 5.94 per 100,000 people [14], substantially higher than the national average. The mean age of onset of patients with cervical cancer in Yunnan Province has also gradually risen in the past five years [15]. However, few studies have evaluated HRQoL among precancerous or cervical cancer patients in Yunnan. In turn, it remains unclear what effect cervical lesions and cervical cancer have on HRQoL of women, independent of age, socio-economic status, and other confounders such as clinical stage, therapeutic regimen, and degree of tumor differentiation.

This study thus examined HRQoL of women with cervical precancerous lesions and cervical cancer along with its socio-demographic and clinical determinants in order to guide cervical cancer prevention and treatment efforts in Yunnan Province, China.

2. Methods

2.1 Instruments

Internationally, several instruments have been developed to evaluate the HRQoL of patients with cervical precancerous lesions and cervical cancer, including the EuroQol Five Dimensions (EQ-5D) [10], the Medical Outcomes Study 36-Item Short Form (SF-36) [13], the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire Cervical Cancer Module (EORTC QLQ-CX24) [16,17], and the Functional Assessment of Cancer Therapy-Cervix (FACT-Cx) [11,18]. Of these, EQ-5D is one of the most commonly used instruments to describe and assess HRQoL [19]. This instrument has been translated into Chinese and has been shown to have satisfactory psychometric properties [20]. The simplified Chinese version of the EQ-5D-5L questionnaire consists of two key components: the EQ-5D descriptive system and the EQ visual analogue scale (EQ-VAS). The EQ-5D-5L descriptive system is a preference-based HRQoL measure with one question for each of the five dimensions: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression [18]. In this study, each of these five dimensions had five scoring levels: no problems, slight problems, moderate problems, severe problems, and extreme problems. Each health status can be assigned a weighted utility score based on different scoring systems. In this study, we used the Chinese EQ-5D-5L value set to calcu-

late the quality of life utility score of individual health status, which ranged from -0.391 (the worst state) to 1.000 (the second-best state) [20]. We also leveraged EQ-VAS, a 20 cm vertical line with clearly defined endpoints within which respondents can report their present health status with a grade ranging from 0 (the worst possible health status) to 100 (the best possible health status). The simplified Chinese version of the EQ-5D-5L questionnaire employed in this study can be downloaded from the EQ-5D website (<https://euroqol.org/>).

2.2 Participants and Procedures

The Third Affiliated Hospital of Kunming Medical University (Yunnan Cancer Hospital, Yunnan Cancer Center) in Kunming, the capital of Yunnan Province in southwest China, was selected through a convenience sampling method. It is a cancer hospital in Yunnan with integrated medical services, scientific research, teaching, and cancer prevention programs. The patients admitted to the hospital mainly come from the 16 states/cities of Yunnan Province, as well as other surrounding provinces and countries (Vietnam, Laos, Myanmar, etc.). All patients with cervical precancerous lesions and cervical cancer who previously received or are currently receiving treatment at this hospital were considered eligible for participation in this study. The following inclusion criteria were used to select participants among this population: age ≥ 18 years, a positive cervical tissue biopsy diagnosis of cervical precancerous lesions or cervical cancer (diagnosed by a gynecologist), not having received any treatment from another hospital, being able to read, write and speak Mandarin Chinese, and being willing and able to give informed consent to participate in the study. All diagnoses and treatment of cervical cancer were carried out in accordance with the cervical cancer clinical practice guidelines put forth by the National Comprehensive Cancer Network of the United States (NCCN) [21]. The following criteria led to exclusion from the study: having severe co-morbidities (including mental illness or cognitive impairment), the presence of other non-cervical cancer malignant tumors, and contraindications prior to radiotherapy, chemotherapy, and surgery. The survey was conducted through face-to-face interviews in a private office during participants' hospital stays. The Third Affiliated Hospital of Kunming Medical University Ethics Committee approved this study prior to initiating the project (KYCS202016).

2.3 Data Collection and Measurement

The cross-sectional survey was performed from 2019 through 2020. All participants who consented to participate signed informed consent forms and were individually interviewed by trained interviewers using a simplified Chinese version of the EQ-5D-5L questionnaire. Demographic data was collected along with the questionnaire survey, including age, sex, ethnicity (e.g., Han majority or ethnic minor-

ity), occupation (e.g., farmer), level of education (primary school or below, junior high school, senior high school, or college or above), marital status (unmarried, married, widowed, divorced, or separated), monthly household income, health insurance type (e.g., basic medical insurance for urban employees, basic medical insurance for urban and rural residents), and awareness of the HPV vaccine (yes or no). Monthly household income was separated into two classifications (low and high), with the median value as the cutoff point. Low income referred to a monthly household income <\$US 500, while high income referred to a monthly household income \geq \$US 500.

2.4 Statistical Analysis

Descriptive analyses were used to calculate absolute and relative frequencies (%). Counts and percentages were used to present categorical variables. Mean values of EQ-5D-5L utility scores and VAS scores were expressed as mean \pm standard deviation (SD). *T*-tests and ANOVA were used to determine differences in utility and VAS scores of the respondents with different characteristics. Regarding censored data for outcome variables, as health utility scores ranged from -0.391 to 1.000 in this study, a Tobit regression model was used to examine the associations between EQ-5D-5L utility score and other independent variables. All data analyses were conducted using SPSS 22.0 software (IBM Corp., Chicago, IL, USA) and STATA V.12.0 (Stata-Corp LP, College Station, TX, USA). All statistical significance decisions were based on two-tailed *p* value of less than 0.05.

2.5 Quality Control

First, all researchers had been involved in specific trainings and got familiar with a detailed training document (on the study purpose, interview procedure, questionnaire interviewing, data collection and data input). Second, face-to-face interviews were administered by trained interviewers who could answer any doubts the patients had about the interview. The completed questionnaires were checked carefully at the end of each day. Furthermore, data input and data logistical checks were conducted by well-trained researchers.

3. Results

Overall, this study examined HRQoL of women with cervical precancerous lesions and cervical cancer and its socio-demographic and clinical determinants in Yunnan Province. The analysis included 400 patients. Participants were classified as having CIN ($n = 136$) or cervical cancer ($n = 264$). The demographic and clinical characteristics of the study population are described in Table 1. Participant ages ranged from 23 years to 75 years, with the majority of participants between the ages of 40 to 59 years. The percentage of Han ethnicity participants was 76%. The majority of participants were farmers (64%). More than half of the par-

ticipants had a low education level (primary school or below). Greater than 90% of patients were married, while 1% were single. All participants were covered by some form of social health insurance. Data revealed that 54% of participants were low-income (monthly household income <\$US 500).

Regarding degree of tumor differentiation, the proportions of patients in the undifferentiated, well differentiated, moderately differentiated, and poorly differentiated categories were 43.00%, 5.00%, 25.75%, and 26.25%, respectively. Most participants were at clinical stages CIN or I (136 and 133, respectively). The most common intervention received by participants was radical hysterectomy (35.25%), followed by loop electrosurgical excision procedure (LEEP) (29.5%), concurrent chemoradiotherapy (26.25%), and surgery followed by adjuvant therapy (9.00%).

Table 2 compares the summary statistics for participants' EQ-5D-5L utility and VAS scores based on their socio-demographic and clinical characteristics. The mean EQ-5D-5L utility scores of cervical precancerous lesions and cervical cancer patients was 0.939, and VAS score was 80.84. Han ethnicity patients had significantly lower EQ-5D-5L utility scores than other ethnic minorities ($p = 0.027$). Patients aged 40–59 years had the lowest EQ-5D-5L utility scores ($p = 0.012$). Low monthly household income also correlated with lower utility scores ($p = 0.013$). Patients with cervical cancer had lower utility scores than patients with CIN ($p = 0.047$). Participants who were aware of the HPV vaccine had higher utility scores ($p = 0.001$). The difference in utility scores was statistically significant among different therapeutic regimens ($p = 0.038$). The characteristic of age ($p = 0.023$) was statistically significant in patients' VAS scores. No statistical significance was found among the other variables with utility scores and VAS scores ($p > 0.05$).

As shown in Table 3, among the patients studied, the most frequently reported problem was anxiety/depression (35.75%), followed by pain/discomfort (24.0%), mobility challenges (9.25%), restrictions in usual activity (7.75%), and challenges to maintaining self-care (7.25%). Data revealed that 53.65% ($n = 228$) of patients reported no problems in all five of these dimensions.

The factors associated with patients' EQ-5D-5L utility scores extracted through a Tobit regression model are shown in Table 4. The model indicates that being aged 40–59 years ($\beta = -0.037$, $p = 0.005$), lacking awareness of the HPV vaccine ($\beta = -0.032$, $p = 0.004$), and having undergone radical hysterectomy ($\beta = -0.036$, $p = 0.006$) are significantly associated with lower utility scores, whereas having high monthly household income ($\beta = 0.023$, $p = 0.033$) is significantly associated with higher EQ-5D-5L utility scores.

Table 1. Demographic and clinical characteristics of the study population.

Characteristics	n	%
Age (years)		
≤39	83	20.75
40–59	267	66.75
≥60	50	12.5
Ethnicity		
Han ethnicity	304	76.00
Ethnic minorities	96	24.00
Occupation		
Farmer	256	64.00
Other	144	36.00
Level of education		
Primary school or below	217	54.25
Junior high school	107	26.75
Senior high school	36	9.00
College or above	40	10.00
Monthly household income (\$US)		
Low	217	54.2
High	183	45.8
Marital status		
Unmarried	5	1.25
Married	362	90.5
Widowed	22	5.5
Divorced or separated	11	2.75
Type of health insurance		
Basic medical insurance for urban employees	67	16.75
Basic medical insurance for urban and rural residents	333	83.25
Awareness of the human papilloma virus (HPV) vaccine		
Aware	131	32.75
Unaware	269	67.25
Degree of tumor differentiation		
Undifferentiated	172	43.00
Well differentiated	20	5.00
Moderately differentiated	103	25.75
Poorly differentiated	105	26.25
Clinical stages		
CIN	136	34.00
I	133	33.25
II	88	22.00
III	32	8.00
IV	11	2.75
Type of disease		
CIN	136	34.00
Cervical cancer	264	66.00
Therapeutic regimen		
Loop electrosurgical excision procedure (LEEP)	118	29.5
Radical hysterectomy	141	35.25
Concurrent chemoradiotherapy	105	26.25
Surgery followed by adjuvant therapy	36	9.00

Abbreviation: CIN, cervical intraepithelial neoplasia.

4. Discussion

This cross-sectional study revealed a relatively high score of HRQoL in patients with cervical precancerous lesions and cervical cancer in Yunnan Province, China, with HRQoL significantly associated with patients' socio-demographics, clinical characteristics, and awareness of cervical cancer prevention.

The mean EQ-5D-5L utility and VAS scores (0.939 and 80.84, respectively) among patients with cervical precancerous lesions and cervical cancer in the present study were higher than in India (0.64 and 67.6, respectively) [10], Indonesia (0.76 and 75.8, respectively) [8], and Ethiopia (0.77 and 65.7, respectively) [22], while utility scores were similar to those found in Italy (0.93) [23] and higher than in Taiwan (0.84) [12]. These differences may be related to the percentage of participants in each cancer stage: most patients in the present study were at the cervical precancerous lesion or earlier stages (67.25% in stages CIN and I), and CIN patients have little physical discomfort, few clinical symptoms, and do not need radical surgery or chemoradiotherapy, possibly explaining the overall comparatively high utility score. Moreover, the difference may also be partially attributed to the use of different HRQoL questionnaires: the use of different value sets would yield different utility scores [24], which could also explain differences in utility scores across studies.

Our study found that patients with cervical precursor lesions and cervical cancer aged 40–59 years had the lowest HRQoL utility and VAS scores. Previous research indicates that the incidence of cervical cancer is highest in those aged 40–59 years [18]. This finding thus underscores an urgent need to perform early screening, diagnosis, and treatment of cervical cancer, particularly in those aged 40–59 years, in order to improve their quality of life.

The present study indicated that level of education, marital status, and occupation were not associated with utility scores, a finding consistent with studies in India [10], but differing from other study results [11,25] that have found that higher education levels and marital status are associated with higher HRQoL scores. The reasons for this discrepancy are currently unclear.

Our findings indicate that low household income is associated with lower HRQoL utility scores, a finding consistent with study results from Thailand [26]. This association of household income with HRQoL of patients with cervical precursor lesions and cervical cancer suggests wealthier patients may be more conscious of and have the financial ability to promote their health. Previous research [18] has demonstrated that patients with cervical cancer often have serious economic problems and that medical expenses contribute to the stress and negative feelings brought upon by the disease, therefore negatively impacting quality of life.

This study found that EQ-5D utility scores were higher in patients who were aware of the HPV vaccine. The awareness of HPV vaccine is low among women with cer-

Table 2. EQ-5D five-level utility scores and VAS scores across different characteristics.

Characteristics	n	EQ-5D utility values	p value	VAS scores	p value
		mean ± SD		mean ± SD	
Age (years)			0.012		0.023
≤39	83	0.965 ± .0601		80.57 ± 14.354	
40–59	267	0.929 ± 0.116		79.81 ± 17.538	
≥60	50	0.953 ± 0.088		86.78 ± 13.196	
Ethnicity			0.027		0.436
Han ethnicity	304	0.934 ± 0.112		80.48 ± 17.254	
Ethnic minorities	96	0.956 ± 0.076		81.99 ± 14.115	
Occupation			0.115		0.945
Farmer	256	0.933 ± 0.115		80.88 ± 16.924	
Other	144	0.949 ± 0.082		80.76 ± 15.923	
Level of education			0.191		0.51
Primary school or below	217	0.931 ± 0.114		81.48 ± 16.736	
Junior high school	107	0.948 ± 0.102		78.93 ± 17.582	
Senior high school	36	0.938 ± 0.085		80.47 ± 14.858	
College or above	40	0.966 ± 0.059		82.80 ± 14.026	
Monthly household income (\$US)			0.013		0.311
Low	217	0.935 ± 0.111		80.08 ± 18.017	
High	183	0.958 ± 0.068		81.74 ± 14.622	
Marital status			0.944		0.198
Unmarried	5	0.959 ± 0.444		81.00 ± 12.450	
Married	362	0.940 ± 0.105		80.99 ± 16.561	
Widowed	22	0.930 ± 0.120		83.41 ± 14.751	
Divorced or separated	11	0.944 ± 0.075		70.73 ± 19.540	
Type of health insurance			0.118		0.706
Basic medical insurance for urban employees	67	0.956 ± 0.900		81.54 ± 14.830	
Basic medical insurance for urban and rural residents	333	0.936 ± 0.107		80.70 ± 16.893	
Awareness of the human papillomavirus (HPV) vaccine			0.001		0.728
Aware	131	0.961 ± 0.714		80.43 ± 15.300	
Unaware	269	0.929 ± 0.116		81.04 ± 17.151	
Degree of tumor differentiation			0.066		0.259
Undifferentiated	172	0.955 ± 0.095		81.440 ± 16.434	
Well differentiated	20	0.932 ± 0.082		79.400 ± 17.795	
Moderately differentiated	103	0.927 ± 0.107		78.300 ± 17.602	
Poorly differentiated	105	0.927 ± 0.117		82.630 ± 15.315	
Clinical stages			0.406		0.281
CIN	136	0.954 ± 0.102		81.47 ± 16.332	
I	133	0.934 ± 0.097		81.63 ± 15.254	
II	88	0.931 ± 0.122		78.28 ± 18.762	
III	32	0.929 ± 0.103		83.91 ± 15.038	
IV	11	0.927 ± 0.070		75.00 ± 18.841	
Type of disease			0.047		0.585
CIN	136	0.954 ± 0.102		81.47 ± 16.332	
cervical cancer	264	0.932 ± 0.105		80.52 ± 16.684	
Therapeutic regimen			0.038		0.187
Loop electrosurgical excision procedure (LEEP)	118	0.962 ± 0.087		82.53 ± 14.957	
Radical hysterectomy	141	0.926 ± 0.112		80.60 ± 16.134	
Concurrent chemoradiotherapy	105	0.936 ± 0.101		81.03 ± 17.991	
surgery followed by adjuvant therapy	36	0.926 ± 0.128		75.67 ± 18.291	
Total	400	0.939 ± 0.104		80.84 ± 16.551	

Abbreviations: VAS, visual analogue scale; SD, standard deviation; CIN, cervical intraepithelial neoplasia; EQ-5D, EuroQol Five Dimensions.

Table 3. Challenges reported by respondents in different dimensions of EQ-5D.

	Mobility	Self-care	Usual activities	Pain/discomfort	Anxiety/depression
	n (%)	n (%)	n (%)	n (%)	n (%)
No problem	363 (90.75)	371 (92.75)	369 (92.25)	304 (76.0)	257 (64.25)
Slight problem	31 (7.75)	25 (6.25)	28 (7.0)	71 (17.75)	116 (29.0)
Moderate problem	4 (1.0)	4 (1.0)	3 (0.75)	18 (4.5)	22 (5.5)
Severe problem	2 (0.5)	0 (0.0)	0 (0.0)	7 (1.75)	5 (1.25)
Extreme problem	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)

Abbreviations: EQ-5D, EuroQol Five Dimensions.

Table 4. Results of Tobit regression model on EQ-5D five-level utility scores of respondents.

Variables	Regression coefficient	95% CI	<i>p</i> value
Age (Reference: ≤39 years)			
40–59 years	–0.037	–0.062–0.011	0.005**
≥60 years	–0.012	–0.049–0.024	0.502
Monthly household income (\$US) (Reference: Low)			
High	0.023	0.002–0.044	0.033*
Awareness of human papillomavirus (HPV) vaccine (Reference: aware)			
Unaware	–0.032	–0.053–0.010	0.004**
Therapeutic regimen (Reference: LEEP)			
Radical hysterectomy	–0.036	–0.061–0.010	0.006**
Concurrent chemoradiotherapy	–0.026	–0.053–0.002	0.065
Surgery followed by adjuvant therapy	–0.036	–0.075–0.003	0.072

* $p < 0.05$, ** $p < 0.01$.

Abbreviations: EQ-5D, EuroQol Five Dimensions; LEEP, loop electrosurgical excision procedure; CI, confidence interval.

vical precancerous lesions and cervical cancer in Yunnan Province, with most women having never been screened. Andrea Giannini's study suggested that the use of HPV vaccination did not improve the outcomes of the high-risk group [27]. So, it is necessary for the health providers and health-related departments to invest more resources including health and financial resources to expand the awareness and participation of national screening projects. It could be helpful to strengthen the awareness of HPV vaccine so that the targeted population can pay more attention to health. Patients can benefit from disease prevention and early-diagnosis and get higher HRQoL.

The association between HRQoL and stage of cervical precursor lesions and cervical cancer also merits further exploration. We found a decreasing trend in HRQoL as the disease progressed, consistent with findings in India [10] and Ghana [25]. However, one study found utility score in stage IV cancer was actually higher than that found in stages II and III [8]. This may be explained by the fact that late stage cervical cancer patients cannot be treated so treatment complications are avoided, leading to higher quality of life scores during this stage.

Different treatments led to different outcomes of HRQoL in this study, which was consistent with the results of Ma Li's study [28]. The present study found that

patients with cervical precursor lesions and cervical cancer undergoing radical hysterectomy were more likely to have lower utility scores. However, no significant difference in utility scores was found between surgical treatment and concurrent chemoradiotherapy in our study, in contrast to other studies [25,29], including one in Brazil that found women who had undergone hysterectomy presented better QoL scores than those in the chemoradiotherapy treatment group [30]. Furthermore, in our study utility scores of patients undergoing cervical conization were higher than those undergoing surgical treatment and concurrent chemoradiotherapy.

Anxiety and depression commonly occur in cancer patients who are facing multiple biological and psychosocial stressors [31]. The EQ-5D health states of patients in our study showed anxiety/depression as the most frequently reported problem of respondents (35.75%, all levels inclusive), differing from findings in India [10] and Indonesia [8]. However, a survey of eight low- and middle-income countries in Southeast Asia revealed the proportion of patients with anxiety/depression was highest among cervical cancer patients [32], consistent with our findings. We also found that 24% of cervical precursor lesions and cervical cancer patients face pain/discomfort. However, problems of mobility, self-care, and engaging in usual daily activities

were reported by less than 10% of participants, consistent with findings in Taiwan [12]. These results together indicate that cervical precursor lesions and cervical cancer patients have some degree of psychological and physical discomfort that can affect their quality of life. Thus, further efforts should be made to improve the management of anxiety/depression and pain/discomfort, and early assessments of anxiety, depression, and social support of women with gynecologic cancer should be conducted.

The following limitations of the present study should be noted: first, the sample size of this study is relatively small, especially for patients with stage IV cervical cancer, and all of the participants were selected from one hospital in Yunnan Province, China. Second, as this is a cross-sectional study, causal conclusions should be made with caution. Future studies should focus on longitudinal evaluation and assessment of HRQoL of patients at different stages of cervical cancer treatment.

5. Conclusions

In conclusion, the present study indicates that patients with cervical precancerous lesions and cervical cancer in Yunnan Province, China, had higher HRQoL than in other countries. The results suggest that future implementation of prevention and treatment guidelines in cervical cancer should focus on low-income patients, patients aged 40–59 years, and patients lacking knowledge about cervical cancer prevention.

Availability of Data and Materials

The datasets used during the current study are available from the corresponding author on reasonable request.

Author Contributions

MZ: study design and writing-original draft. MJZ: formal analysis and wrote the manuscript. LJH and CMZ: conducted the survey and collected data. SRD: performed the statistical analysis. ARG and LC contributed to data interpretation and the conceptualization of the study. LC revised the manuscript critically for important intellectual content. All authors commented on previous versions of the manuscript. All authors read and approved the final manuscript. All authors contributed to editorial changes in the manuscript. All authors have participated sufficiently in the work and agreed to be accountable for all aspects of the work.

Ethics Approval and Consent to Participate

The Third Affiliated Hospital of Kunming Medical University Ethics Committee approved this study prior to commencement of research (KYCS202016), and all patients signed informed consent forms.

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Conflict of Interest

The authors declare no conflict of interest.

References

- [1] Zhang S, Xu H, Zhang L, Qiao Y. Cervical cancer: Epidemiology, risk factors and screening. *Chinese Journal of Cancer Research*. 2020; 32: 720–728.
- [2] Hanprasertpong J, Geater A, Jiamset I, Padungkul L, Hirunkajonpan P, Songhong N. Fear of cancer recurrence and its predictors among cervical cancer survivors. *Journal of Gynecologic Oncology*. 2017; 28: e72.
- [3] International Agency for Research on Cancer. Latest Global Cancer Data: Cancer Burden Rises to 19.3 Million New Cases and 10.0 Million Cancer Deaths in 2020 Questions and Answers (Q&A). 2020. Available at: <https://www.iarc.who.int/faq/latest-global-cancer-data-2020-qa> (Accessed: 4 February 2021).
- [4] Lihui W. Facing the challenge of accelerating the elimination of cervical cancer. *Chinese Journal of Clinical Obstetrics and Gynecology*. 2021; 34: 1–2. (In Chinese)
- [5] Zheng RS, Zhang SW, Sun KX, Chen R, Wang SM, Li L, *et al.* Cancer statistics in China, 2016. *Zhonghua Zhong Liu Za Zhi*. 2023; 45: 212–220. (In Chinese)
- [6] Wang HM, Beyer M, Gensichen J, Gerlach FM. Health-related quality of life among general practice patients with differing chronic diseases in Germany: cross sectional survey. *BMC Public Health*. 2008; 8: 246.
- [7] Tax C, Steenbergen ME, Zusterzeel PLM, Bekkers RLM, Rovers MM. Measuring health-related quality of life in cervical cancer patients: a systematic review of the most used questionnaires and their validity. *BMC Medical Research Methodology*. 2017; 17: 15.
- [8] Endarti D, Riewpaiboon A, Thavorncharoensap M, Praditsithikorn N, Hutubessy R, Kristina SA. Evaluation of Health-Related Quality of Life among Patients with Cervical Cancer in Indonesia. *Asian Pacific Journal of Cancer Prevention*. 2015; 16: 3345–3350.
- [9] Dos Santos LN, Castaneda L, de Aguiar SS, Thuler LCS, Koifman RJ, Bergmann A. Health-related Quality of Life in Women with Cervical Cancer. *Revista Brasileira De Ginecologia E Obstetricia: Revista Da Federacao Brasileira Das Sociedades De Ginecologia E Obstetricia*. 2019; 41: 242–248.

- [10] Jyani G, Chauhan AS, Rai B, Ghoshal S, Srinivasan R, Prinja S. Health-related quality of life among cervical cancer patients in India. *International Journal of Gynecological Cancer*. 2020; 30: 1887–1892.
- [11] Zhou L, Meng Q, Yang Z, Li GF, Yang HY, Zhang HP. Analysis of factors influencing the health-related quality of life in patients with cervical cancer based on FACT-Cx (V4.0). *Chinese Journal of Disease Control and Prevention*. 2017; 21: 926–929, 938. (In Chinese)
- [12] Lang HC, Chuang L, Shun SC, Hsieh CL, Lan CF. Validation of EQ-5D in patients with cervical cancer in Taiwan. *Supportive Care in Cancer: Official Journal of the Multinational Association of Supportive Care in Cancer*. 2010; 18: 1279–1286.
- [13] Xie Y, Zhao FH, Lu SH, Huang H, Pan XF, Yang CX, *et al.* Assessment of quality of life for the patients with cervical cancer at different clinical stages. *Chinese Journal of Cancer*. 2013; 32: 275–282.
- [14] Jianhua Y, Saimei L, Xintian L, Wei L, Birong Y, Longtao Y, *et al.* Analyses of incidence and mortality of malignant tumors in cancer registration areas of Yunnan province in 2017. *Practical Oncology Journal*. 2023; 37: 6–10.
- [15] Min Z, Yanping L, Yongci M, Fei L, Xuebin X, Jufen Y. Epidemiological analysis of 4744 cases of cervical cancer in Yunnan Provincial Tumor Hospital. *Soft Science of Health*. 2018; 32: 74–77. (In Chinese)
- [16] Jayasekara H, Rajapaksa LC, Greimel ER. The EORTC QLQ-CX24 cervical cancer-specific quality of life questionnaire: psychometric properties in a South Asian sample of cervical cancer patients. *Psycho-Oncology*. 2008; 17: 1053–1057.
- [17] Shajahan Ahamed M, Degu A. Health-related quality of life among cervical cancer patients at Kenyatta National Hospital. *Journal of Oncology Pharmacy Practice*. 2023; 29: 393–400.
- [18] Xu H, Ding Y. The current status and influencing factors of quality of life in patients with cervical cancer. *Chinese Journal of Nursing*. 2011; 46: 688–690. (In Chinese)
- [19] EQ-5D. EQ-5D instruments. Available at: <https://euroqol.org/eq-5d-instruments/> (Accessed: 4 February 2021).
- [20] Luo N, Liu G, Li M, Guan H, Jin X, Rand-Hendriksen K. Estimating an EQ-5D-5L Value Set for China. *Value in Health*. 2017; 20: 662–669.
- [21] Koh WJ, Abu-Rustum NR, Bean S, Bradley K, Campos SM, Cho KR, *et al.* Cervical Cancer, Version 3.2019, NCCN Clinical Practice Guidelines in Oncology. *Journal of the National Comprehensive Cancer Network*. 2019; 17: 64–84.
- [22] Araya LT, Fenta TG, Sander B, Gebremariam GT, Gebretekle GB. Health-related quality of life and associated factors among cervical cancer patients at Tikur Anbessa specialized hospital, Addis Ababa, Ethiopia. *Health and Quality of Life Outcomes*. 2020; 18: 72.
- [23] Mennini FS, Panatto D, Marcellusi A, Cristoforoni P, De Vincenzo R, Di Capua E, *et al.* Time trade-off procedure for measuring health utilities loss with human papillomavirus-induced diseases: a multicenter, retrospective, observational pilot study in Italy. *Clinical Therapeutics*. 2011; 33: 1084–1095.e4.
- [24] Endarti D, Riewpaiboon A, Thavorncharoensap M, Praditsithikorn N, Hutubessy R, Kristina SA. A Comparison of EQ-5D-3L Index Scores Using Malaysian, Singaporean, Thai, and UK Value Sets in Indonesian Cervical Cancer Patients. *Value in Health Regional Issues*. 2018; 15: 50–55.
- [25] Kyei KA, Yakanu F, Donkor A, Kitson-Mills D, Opoku SY, Yarney J, *et al.* Quality of life among cervical cancer patients undergoing radiotherapy. *The Pan African Medical Journal*. 2020; 35: 125.
- [26] Peerawong T, Suphasynth Y, Kongkamol C, Rordlamool P, Bridhikitti J, Jiratrachu R, *et al.* Validation of the Functional Assessment of Cancer Therapy with Cervical Cancer Subscale (FACT-CX) for Quality of Life in Thai Patients Prior to Chemoradiotherapy. *Asian Pacific Journal of Cancer Prevention*. 2020; 21: 1891–1897.
- [27] Giannini A, Di Donato V, Sopracordevole F, Ciavattini A, Gheardi A, Vizza E, *et al.* Outcomes of High-Grade Cervical Dysplasia with Positive Margins and HPV Persistence after Cervical Conization. *Vaccines*. 2023; 11: 698.
- [28] Li M, Junfeng C, Xiaofen G, Fanghui Z, Xiaohong G, Ruifang W, *et al.* Health related quality of life based on EQ-5D in cervical carcinoma patients. *Maternal and Child Health Care of China*. 2013; 28: 3471–3473. (In Chinese)
- [29] Khalil J, Bellefqih S, Sahli N, Afif M, Elkacemi H, Elmajjaoui S, *et al.* Impact of cervical cancer on quality of life: beyond the short term (Results from a single institution): Quality of life in long-term cervical cancer survivors: results from a single institution. *Gynecologic Oncology Research and Practice*. 2015; 2: 7.
- [30] Fernandes WC, Kimura M. Health related quality of life of women with cervical cancer. *Revista Latino-americana De Enfermagem*. 2010; 18: 360–367.
- [31] Galloway SK, Baker M, Giglio P, Chin S, Madan A, Malcolm R, *et al.* Depression and Anxiety Symptoms Relate to Distinct Components of Pain Experience among Patients with Breast Cancer. *Pain Research and Treatment*. 2012; 2012: 851276.
- [32] ACTION Study Group. Health-related quality of life and psychological distress among cancer survivors in Southeast Asia: results from a longitudinal study in eight low- and middle-income countries. *BMC Medicine*. 2017; 15: 10.