

Factors predicting quality of life among patients with cervical spondylosis undergoing acupuncture in China: a cross-sectional study

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Abstract

Background: The quality of life (QoL) of individuals with cervical spondylosis (CS) can be impaired due to both physical discomfort and psychological harm. Acupuncture is known to be an effective treatment approach for CS; however, the relevant factors affecting QoL in this patient population remain unclear.

Objective: The purpose of this study was to assess QoL and investigate related factors among patients with CS undergoing acupuncture.

Methods: A predictive correlational study was conducted among 265 participants with CS undergoing acupuncture as part of routine clinical care. The following questionnaires were used to collect data on QoL and related factors: healthy lifestyle questionnaire (HLQ), Pittsburgh sleep quality index (PSQI), Chinese version of the perceptual stress scale (CPSS), self-rated abilities for health practices scale (SRAHP), social support rating scale (SSRS), cervical spine disease health knowledge awareness questionnaire and 12-item short form survey (SF-12). Standard multiple linear regression analysis was applied to determine the predictors of QoL in this patient population.

Results: The mean total score of the QoL scale was 37.8 ± 10.57 (mean \pm SD), indicating moderate QoL levels among patients with CS undergoing acupuncture. Based on multiple regression, lifestyle ($\beta = 0.25$, $p < 0.01$), health behavior ($\beta = 0.379$, $p < 0.01$), social support ($\beta = 0.098$, $p < 0.01$), knowledge about CS ($\beta = 0.107$, $p < 0.01$) and PSQI scores ($\beta = -0.196$, $p < 0.001$) explained 71% of the variance of QoL.

Conclusion: Lifestyle, health behavior, social support and knowledge about CS significantly and positively predict the level of QoL, while PSQI scores negatively predicted QoL.

Keywords

acupuncture, cervical spondylosis, influencing factors, multiple regression, quality of life

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Introduction

The quality of life (QoL) of individuals with cervical spondylosis (CS) has become a significant concern. QoL refers to a perception of cognitive judgment of satisfaction with one's life based on multi-dimensional health.¹ The QoL among patients with CS is decreased due to the physical discomfort caused by cervical spine problems.

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The physical discomfort also leads to psychological harm to patients, such as insomnia, irritability, anxiety and depression.²

Acupuncture, an important part of traditional Chinese medicine, has recently been widely used to treat CS in China. Acupuncture can accelerate the central nervous system to produce endogenous opioid peptides and activate related receptors, resulting in peripheral analgesia.³ Needling in the region of the cervical spine can mitigate dysfunction of autonomic nerves and inhibit pain transmission in the spinal cord, thereby exerting an analgesic effect; it can also stimulate signal transmission in the peripheral sensory nerves, modulate the paravertebral sympathetic trunk, improve the local microcirculation and mitigate tissue hypoxia and ischemia.⁴ Accordingly, an increasing number of patients opt for acupuncture treatment with a view to improving their QoL. However, although acupuncture typically has a good effect in terms of reducing neck pain, some patients still have poor QoL.

Several lifestyle factors can decrease QoL among patients with CS; for example, poor sitting posture, late bedtimes, long time periods spent reading or using a computer or cell phone, inappropriate pillow height, short reading distance and a lack of physical activity.⁵⁻⁷ Poor sleep quality can lead to less energy in patients, resulting in a decline in vitality and other QoL domains.^{8,9} Mental stress can make patients with CS lack confidence in life and treatment and close themselves off, potentially leading to a further decline in QoL.¹⁰

Other factors have been found to improve QoL. For example, knowledge about CS can effectively prevent or reduce the occurrence of CS, improve patients' awareness and correct bad habits and relieve patients' symptoms and psychological stress.¹¹ Social support can regulate the negative effects of adverse factors on physical and mental health.¹² Positive health behavior enables patients to be in the best condition to receive treatment in terms of physiology and psychology, which can improve treatment effects, effectively improving the discomfort of CS.¹³ Understanding predictors is crucial for the improvement of QoL.

There is increasing evidence of the positive effects of acupuncture on QoL during treatment.^{14,15} However, less attention has been given to predictors of QoL. Previous studies of QoL in China have largely involved effects on neck pain among patients with CS undergoing acupuncture,^{4,16} with few studies having examined factors influencing QoL among this population. Therefore, it is important to study predictors of QoL among patients with CS undergoing acupuncture. An understanding of QoL and its predictive factors might be used to develop relative intervention programs during treatment, in order to promote a high level of QoL.

Based on the theory of unpleasant symptoms,¹⁷ this study associated various factors with three sources: physiologic factors (including sleep quality); psychologic factors

(including mental stress); and situational factors (including lifestyle, knowledge about CS, social support and health behavior). We hypothesized that these factors, when combined, may explain QoL among patients with CS undergoing acupuncture. The conceptual framework of this study is depicted in Figure 1.

Methods

Study participants

A predictive correlational design was used. The study was conducted at the Rehabilitation Clinic of the Second Affiliated Hospital of Wenzhou Medical University (Wenzhou, China) from 5 September to 5 November 2022. In order to meet the inclusion criteria, participants needed to: (1) be 20 to 50 years old; and (2) have received at least one course of acupuncture (defined as six treatments).¹⁸ The exclusion criteria included: (1) a history of neck surgery; (2) cardiac, hepatic or renal dysfunction, coagulopathy, immune system diseases, malignant tumors or cognitive and behavioral dysfunction; (3) pregnancy, lactation or preparing to become pregnant; and (4) skin allergy or skin disease at the planned treatment site.

Ethical statement

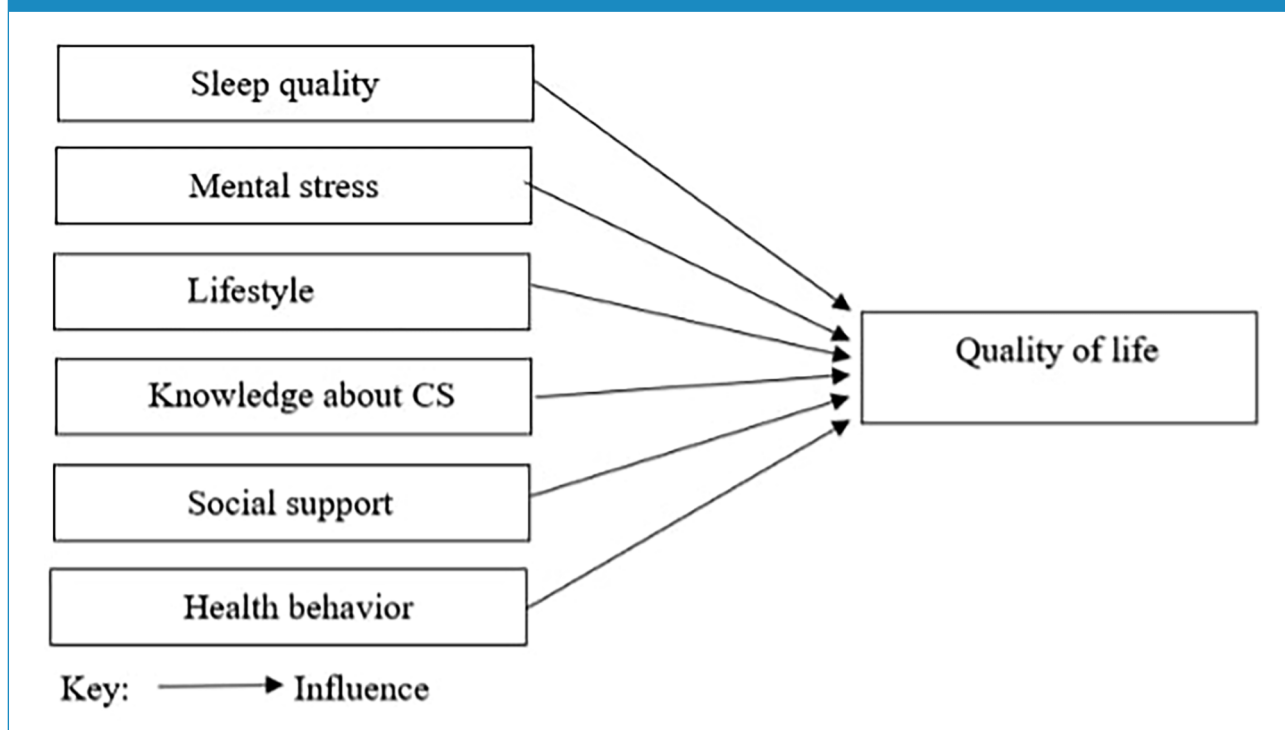
The study protocol was approved by the Institutional Review Board of Burapha University, Thailand (IRB # G-HS037/2565) and the Research Ethics Board of the Second Affiliated Hospital of Wenzhou Medical University, China (IRB # 2022K-87-01). Written informed consent was obtained from each participant before data collection.

Research instruments

Demographic data record form. A demographic data record form was used to assess the demographic characteristics of participants, including age, marital status, education level, type of occupation, household income, duration of illness, type of cervical spondylosis and pain level.

Lifestyle questionnaire. A validated healthy lifestyle questionnaire (HLQ) was used to assess lifestyle;¹⁹ this consists of 42 items across six subscales (diet, sleep, psychology, exercise, stress control and environment). It is a five-point rating scale on which 1 = "never", 2 = "seldom", 3 = "sometimes", 4 = "often" and 5 = "always". Higher scores indicate a healthier lifestyle.

Pittsburgh sleep quality index. The Pittsburgh sleep quality index (PSQI),²⁰ which was translated into Chinese by Liu et al.,²¹ was used to measure sleep quality. The 19 self-rated items are combined into seven components, each of which ranges between 0 and 3 points. In all cases, a score of "0"

Figure 1. Conceptual framework. CS, cervical spondylosis.

indicates no difficulty, while a score of “3” indicates severe difficulty. The seven component scores are then added to yield one “global” score, with a range of 0 to 21 points. The higher the score, the poorer the sleep quality.

Chinese version of perceptual stress scale. The Chinese version of the perceptual stress scale (CPSS)²² was used to measure mental stress. The scale consists of 14 items, including seven forward questions and seven reverse questions, among which the reverse scoring questions are 4, 5, 6, 7, 9, 10 and 13, respectively. The scale has two dimensions—namely, the sense of tension and the sense of loss of control. A five-point scoring method is adopted to calculate the total score of the scale, as follows: 1=“never”, 2=“occasionally”, 3=“sometimes”, 4=“often” and 5=“always”. The final total score ranges from 14 to 70. The higher the score, the higher the mental stress.

Self-rated abilities for health practices scale. The self-rated abilities for health practices scale (SRAHP),²³ translated by the College of Nursing of Sun Yat-sen University,²⁴ was used to measure health behavior. It contains 28 items and four subscales (exercise, nutrition, responsible health practice and psychological well-being). Items are rated from 0 (not at all) to 4 (completely). Total scores range from 0 to 112, with higher scores indicating healthier behavior.

Social support rating scale. The social support rating scale (SSRS)²⁵ was used to measure social support. It consists of

10 items, including three dimensions (objective support, subjective support and utilization of social support). The higher the score, the higher the degree of social support.

Cervical spine disease health knowledge awareness questionnaire. The cervical spine disease health knowledge awareness questionnaire²⁶ was used to measure knowledge about CS. The questionnaire consisted of 10 questions with scores calculated as follows: 2=“know”, 1=“partially know” and 0=“don’t know”. The higher the score, the greater the participant’s knowledge of CS.

12-item short form survey. QoL was measured using the 12-item short form survey (SF-12),²⁷ which is known to have high reliability and validity. The SF-12 can be broken down into physical component summary (PCS)-12 and mental component summary (MCS)-12 scores. The PCS consists of four dimensions, which correspond to the physical discomfort and illness of the subjects. The MCS consists of four dimensions, which correspond to the mental or psychological discomfort or illness of the subjects.

Psychometric properties of the instruments

None of the research instruments used in this study was tested for validity, since they are all extensively used and their validity has previously been established.

All the research instruments were tested for reliability using Cronbach’s alpha coefficient analysis before

conducting the actual study. A pilot study was conducted to measure reliability in 30 patients with the same characteristics as the study sample in the Rehabilitation Clinic of the Second Affiliated Hospital of Wenzhou Medical University. The acceptable value using the Cronbach alpha coefficient analysis was deemed to be at least 0.70. During the pilot study, the reliability of each questionnaire had been tested, and the Cronbach's alpha reliability coefficient was 0.909 for the HLQ, 0.723 for the PSQI, 0.893 for the CPSS, 0.976 for the SRAHP, 0.867 for the SSRS, 0.923 for the cervical spine disease health knowledge awareness questionnaire and 0.808 for the SF-12.

Data collection

The researcher obtained the list of participants receiving daily treatment from the acupuncturist one day in advance, selected participants who met the inclusion criteria on that day by simple random sampling and then obtained the participants' consent before administering the questionnaires. The participants only had one chance to complete the questionnaires within 45 to 60 min. The researcher explained the purpose, significance and content of the investigation, and then had the participants sign the consent form before administering the questionnaires. During the survey, the researcher was around and ready to answer any questions the participants might pose. The researcher did not induce participants to complete questionnaires. Incomplete questionnaires were considered invalid and were not included in data analysis.

Statistical analysis

The required sample size for this study was estimated using G*Power 3.1 software, based on a power estimate of 90%, an alpha level of 0.05 and an effect size of 0.04. A simple random sampling method was used to select 265 participants. Descriptive statistics—including frequency (percentage) and mean \pm standard deviation (SD)—were used to describe demographic characteristics and other variables. The factors that influenced patients' QoL were analyzed by multiple linear regression analysis. We conducted testing for the assumptions of multiple linear regression. The relationships between different factors were assessed using Pearson's correlation test. Statistical significance was set at $p < 0.05$.

Results

Participant demographics

A total of 256 questionnaires were completed, and the attrition rate was 3.5%. The mean age (\pm SD) of the participants was 35.2 ± 8.74 years (range 20–50). Only 41.4% had a high level of education. More than half of the participants were female (73.1%), married (58.0%) and had a household

income per month >5000 Yuan (75.0%). More than half of the participants had neck type CS (73.1%), had been living with the health problem for more than one year (76.6%) or had mild pain (67.2%). Only 18.0% of participants had severe pain when they completed one course of treatment (Table 1).

Studied variables

The mean score (\pm SD) on the HLQ scale was 144.7 ± 20.9 , suggesting that the lifestyle of participants was not sufficiently healthy (Table 2). The mean scores \pm SD were 11.1 ± 3.2 for sleep quality, 33.7 ± 15.8 for mental stress, 68.3 ± 6.33 for health behavior, 25.0 ± 6.06 for social support and 11.5 ± 4.97 for knowledge about CS. The total score of the QoL scale was 37.8 ± 10.57 (Table 3).

Pearson's correlation test was performed to evaluate the relationships between lifestyle, sleep quality, mental stress, health behavior, social support, knowledge about CS and QoL (Table 4). The results showed that PSQI scores were negatively correlated with QoL ($r = -0.558$, $p < 0.01$), while positive correlations were observed between QoL and lifestyle ($r = 0.800$, $p < 0.01$), mental stress ($r = 0.380$, $p < 0.05$), health behavior ($r = 0.799$, $p < 0.01$), social support ($r = 0.352$, $p < 0.01$) and knowledge of CS ($r = 0.491$, $p < 0.01$).

The variance inflation factor (VIF) values for lifestyle (6.38), sleep quality (1.37), mental stress (1.22), health behavior (5.67), social support (1.13) and knowledge about CS (1.38) were all smaller than 10, indicating that there was no severe multicollinearity. In addition, there were no outliers and the results of the homoscedasticity test indicated unequal variance ($p < 0.001$). As shown in Table 5, results of the multiple regression indicated that lifestyle ($\beta = 0.25$, $p < 0.01$), health behavior ($\beta = 0.379$, $p < 0.001$), social support ($\beta = 0.098$, $p < 0.01$) and knowledge about CS ($\beta = 0.107$, $p < 0.01$) significantly and positively predicted the QoL level. By contrast, PSQI scores ($\beta = -0.196$, $p < 0.001$) negatively predicted QoL, indicating that poorer sleep quality (reflected by higher PSQI scores) was associated with worse QoL. Mental stress ($\beta = 0.047$, $p > 0.05$) was not predictive of QoL level.

Discussion

The aim of this study was to investigate QoL among patients with CS undergoing acupuncture and its influencing factors. Overall, lifestyle, health behavior, knowledge about CS and social support were shown to significantly impact QoL in this population.

Quality of life

The mean score on the QoL scale for this study was 37.8, which is a moderate level and higher than that found in previous Chinese studies.^{2,28} The difference in mean score

Table 1. Description of demographic characteristics of the participants (n=256).

Characteristic	Category	Frequency n (%)
Age (years)	20–30	76 (29.7)
	31–40	92 (35.9)
	41–50	88 (34.4)
Marital status	Single	81 (31.6)
	Married	158 (61.7)
	Divorced	17 (6.6)
Level of education	Junior high school or below	52 (20.3)
	High school/technical school	98 (38.3)
	Bachelor's degree or above	106 (41.4)
Occupation	Worker	35 (13.7)
	Teacher	86 (33.6)
	Medical staff	39 (15.2)
	Civil servant	59 (23.1)
	Unemployed	14 (5.5)
	Other	23 (9.0)
Household income (Yuan, ¥)	<1000	5 (2.0)
	1001–5000	59 (23.1)
	>5000	192 (75.0)
Duration of disease	<12 months	60 (23.4)
	>13 months	196 (76.6)
Type of cervical spondylosis	Neck type cervical spondylosis	187 (73.1)
	Cervical radiculopathy	61 (23.8)
	Cervical myelopathy	6 (2.3)
	Other types of cervical spondylosis	2 (0.8)
Pain level	Slight pain	172 (67.2)
	Moderate pain	38 (14.8)
	Severe pain	46 (18.0)

Table 2. Description of studied variables.

Factors	Possible range	Actual range	Mean	SD
Lifestyle	42–210	104–182	144.7	20.90
Sleep quality	0–21	2–19	11.1	3.22
Mental stress	14–70	14–70	33.7	15.79
Health behavior	0–112	52–84	68.3	6.33
Social support	12–66	15–35	25.0	6.06
Knowledge about CS	0–20	4–20	11.5	4.97

CS, cervical spondylosis. SD, standard deviation.

Table 3. Description of quality of life variables (n = 256).

Factors	Possible range	Actual range	Mean	SD
PCS score	13–56	13–56	37.4	10.41
MCS score	9–60	10–60	38.1	12.13
Total score	11–58	14–55	37.8	10.57

PCS, physical component score. MCS, mental component score. SD, standard deviation.

Table 4. Relationship between factors and quality of life (n = 256).

	Lifestyle	Sleep quality	Mental stress	Health behavior	Social support	Knowledge about CS	Quality of life
Lifestyle	1.000	−0.511**	0.413**	0.907**	0.328**	0.513**	0.800**
Sleep quality		1.000	−0.209**	−0.484**	−0.190**	−0.206**	−0.558**
Mental stress			1.000	0.390**	0.108	0.280**	0.380**
Health behavior				1.000	0.287**	0.484**	0.799**
Social support					1.000	0.191**	0.352**
Knowledge about CS						1.000	0.491**
Quality of life							1.000

CS, cervical spondylosis.

**p < 0.01.

Table 5. Factors predicting quality of life among participants (n = 256).

Predicting factors	B	SE	β	t	p
Lifestyle	0.126	0.043	0.250	2.941	0.004
Sleep quality	−0.709	0.143	−0.196	−4.973	<0.001
Mental stress	0.032	0.025	0.047	1.267	0.206
Health behavior	0.059	0.012	0.379	4.724	<0.001
Social support	0.579	0.211	0.098	2.747	0.006
Knowledge about CS	0.226	0.084	0.107	2.692	0.008

CS, cervical spondylosis. SE, standard error.

R = 0.847, R² = 0.717, adjusted R² = 0.710, p < 0.05, constant = −9.32.

might be related to the age of participants, the type of CS and some social factors. This study found that participants with CS undergoing acupuncture were young (average age of 35.2) and had a moderate QoL level. Most of these participants were women and married with stable jobs and incomes. These participants likely had a moderate QoL level due to good social support, as a good family and social environment is arguably a prerequisite and foundation for improving QoL.²⁹ This study found that participants with CS undergoing acupuncture were generally highly educated and could perceive stress and regulate their mood. The study also found that participants with slight cervical pain within 5 years had a moderate QoL level. Their QoL

did not appear to be affected by the long course of the disease. Most of the participants had less than three types of comorbidity, and neck type CS was the most predominant type. The neck pain of the participants may be relieved by acupuncture. Though the clinical symptoms and the type of CS can impact QoL among patients with CS,³⁰ patients can improve their QoL by knowing their disease status and receiving appropriate interventions.

Lifestyle

Lifestyle was a significant predictor of QoL, implying that patients with a healthy lifestyle had higher QoL. This is

consistent with the findings of Tsai⁵ and Gordon et al.³¹ Lifestyle can impact the pain level.³² Lifestyle behaviors can lead to changes in the physiological curvature and bony structure of the cervical spine and have an effect on the muscular tissues of the neck, resulting in inadequate oxygen and blood supply to the local tissues. Living habits and work mode are the main lifestyles influencing cervical vertebra health.³³ It is believed that lifestyle has an effect on fatigue of cervical spine muscles and ligaments, which in turn affects the health of the cervical spine and patients' QoL.³¹

Health behavior

Health behavior was positively correlated with QoL, which is consistent with previous studies showing that this is a significant predictor of QoL.^{13,34} The establishment of healthy behaviors and the enhancement of self-care awareness can prevent the recurrence of CS, improve the function of the cervical spine and enhance the ability of patients with CS to perform their activities of daily living. When individuals understand their own health status, learn to manage their health and stop negative daily lifestyle behaviors, this may potentially help promote health, improve QoL and reduce the incidence of disease.³⁵

Knowledge about CS

Knowledge about CS was a predictor of QoL, implying that patients who had more knowledge about CS showed a high level of QoL, which is consistent with the findings of Li et al.¹¹ Knowledge about CS can effectively prevent or reduce the occurrence of CS. Similar to the findings of Qiu et al.,³⁶ increased disease-related health knowledge was positively associated with individual health and QoL. Put another way, those who lack knowledge about CS usually have low QoL. In a prior study by Guan et al.,³⁷ 76.9% of participants lacking knowledge about CS had negative behavioral habits, which may have affected their cervical vertebral health, and the prevalence of neck discomfort was at a high level.

Social support

Social support was also a predictor of QoL, indicating that patients with more social support had a higher level of QoL. This is consistent with the findings of Na and Li.²⁹ Social support can potentially reduce stress and increase patients' psychological satisfaction and confidence in life, thus improving their self-care ability and QoL. Similar to previous studies,^{7,38} adequate social support can help patients build an optimistic attitude and improve the mental health dimension of QoL. Support from family members can help patients reduce anxiety caused by disease and

adjust themselves to changes so that they can build confidence and potentially recover more promptly.

Sleep quality

Poor sleep quality was also a predictor, given that PSQI scores were negatively associated with QoL. This study used the PSQI to measure sleep quality, where higher scores indicate poorer sleep quality, and found that the poorer the sleep quality, the lower the level of QoL. Approximately 40% of patients with neck pain have disordered sleep, which can lead to decreased work efficiency, thereby affecting their QoL.³⁹ This may be related to changes in the physiological structure and abnormal function of the cervical spine. Such changes can cause neurological weakness in patients with CS, which can subsequently affect sleep quality. Furthermore, sleep quality also influences the experience of physiological symptoms among patients and affects treatment effects and recovery, as demonstrated in a previous study.⁴⁰

Mental stress

In this study, mental stress factors did not predict QoL. Previous studies have found that mental stress can affect QoL by enhancing pain severity and decreasing sleep quality.^{2,12} However, the results of our multiple regression analysis showed no association between mental stress and level of QoL. This might be a feature of our specific research population. As 67.2% of participants had slight pain and 75.0% of participants had >5000 Yuan as their household income per month, they may not have had as much stress as those in other studies. A previous report pointed out that high mental stress increases patients' pain and brings other negative emotions that affect QoL.¹⁰ On the other hand, mental stress alone is unlikely to change the structure of the cervical vertebra and thus may not significantly influence QoL.

Clinical implications

As patients with CS pay more attention to QoL, health care professionals should not only evaluate the effect of treatments but also pay more attention to factors influencing QoL. The results of this study demonstrate that lifestyle, health behavior, social support and knowledge about CS could positively predict the level of QoL, while poor sleep quality was a negative predictor. Health care professionals might develop effective interventions through these findings. By actively knowing what CS patients understand about their health problems (and recognizing misunderstandings), nurses and doctors may be able to provide interventions to promote QoL, such as adjusting unhealthy lifestyle factors, promoting healthy behaviors and helping

patients access useful health care information. These study findings are likely beneficial not only to patients with CS directly but also to medical/nursing practice and health education.

Strengths and limitations

The research setting was a tertiary-level hospital in Wenzhou, China, where the researchers could recruit participants who met the inclusion criteria within a short period of time. In addition, this study achieved a high response rate of 96.6% using self-report surveys, as most participants were willing to be enrolled. The quality of the questionnaires was guaranteed, providing valid and reliable data for analysis. However, the use of self-report surveys is also a limitation, as they might not accurately capture the factors affecting QoL among patients with CS undergoing acupuncture. In addition, this study was only conducted in the Wenzhou area and is therefore not generalizable to all Chinese patients with CS undergoing acupuncture (or to other countries). Finally, a more substantial sample size is needed to ensure the study's statistical power to detect weaker associations and the reliability of the findings.

Conclusion

This study focuses on factors influencing QoL among patients with CS undergoing acupuncture. The results showed that lifestyle, health behavior, social support and knowledge about CS could significantly and positively predict the QoL level. By contrast, sleep quality, as measured using the PSQI, negatively predicted QoL. Thus, modifying these influencing factors may lead to improvement in cervical vertebral health and QoL.

Author's Note

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