

Association Between Chronic Pain, Coping Strategies, and Sleep Quality in Rural Chinese Older Adults: A Cross-Sectional Study

Xin Tao¹, Cheng Cheng², Jie Bai³

¹Eye & ENT Hospital of Fudan University, Shanghai, People's Republic of China; ²School of Nursing, Fudan University, Shanghai, People's Republic of China; ³Shanghai First Maternity and Infant Hospital, School of Medicine, Tongji University, Shanghai, People's Republic of China

Correspondence: Jie Bai, Shanghai Key Laboratory of Maternal Fetal Medicine, Shanghai Institute of Maternal-Fetal Medicine and Gynecologic Oncology, Shanghai First Maternity and Infant Hospital, School of Medicine, Tongji University, Shanghai, Shanghai, 200092, People's Republic of China, Tel +86 21 13865011018, Email baijieyfy@tongji.edu.cn

Purpose: This study aimed to investigate the current status of sleep quality and explore the associations between chronic pain, sleep quality, and coping strategies in older adults living in rural areas of China, a topic of growing interest and importance in gerontology and public health.

Patients and Methods: This was an observational, cross-sectional study with a convenience sample of Chinese older adults from a rural community in Northern Anhui, China, conducted from September to December 2023. A self-reported questionnaire was used to collect data on socio-demographic items, chronic pain (visual analogue scale, VAS), coping strategies (Coping Strategies Questionnaire-Revised, CSQ-R), and sleep quality (Athens Insomnia Scale, AIS). Descriptive statistics, Pearson correlation, Stepwise multiple linear regression, and mediation analysis were used to analyze the data.

Results: A total of 158 participants (48.7% female) were included in the study. Most participants (73.4%, $n = 116$) reported poor sleep quality. The regression model revealed significant associations between sleep quality and chronic pain ($\text{Beta} = 0.599$, $t = 9.99$, $p < 0.001$) and praying as a way of coping ($\text{Beta} = 0.165$, $t = 2.72$, $p = 0.007$). The model explained 46.5% of the variance in sleep quality ($p < 0.01$). Mediation analysis indicated that chronic pain had an indirect effect on sleep quality via praying, even after controlling for covariates ($B = 0.137$, 95% CI = 0.0614, 0.2227).

Conclusion: This study displayed a significant association between chronic pain, coping strategies, and sleep quality in Chinese older adults living in rural areas. Chronic pain directly affects sleep quality, while praying as a coping strategy may mitigate this effect. Nurses should prioritize pain management and promote adaptive coping strategies to improve sleep quality.

Keywords: chronic pain, coping, older adults, sleep

Introduction

China is undergoing a rapid increase in older populations. This demographic shift has posed significant challenges to individuals, healthcare providers, and the welfare system, particularly in rural areas where access to healthcare services and resources may be restricted.^{1,2} Chronic pain is a common experience among older adults, with studies finding a prevalence between 41% and 57%.^{3,4} Chronic pain can have a significant impact on an individual's physical and mental health. Research has linked chronic pain to reduced quality of life,⁵ decreased physical mobility,⁶ and increased risks of psychological distress such as anxiety and depression.⁷ Qualitative research also documented significant personal and economic burdens and suffering in daily activities caused by chronic pain.⁸

Sleep quality is a critical aspect of older adults' well-being.⁹ Older adults usually experience sleep disturbances, including difficulties falling asleep, frequent awakenings during the night, and early morning awakenings.¹⁰ These problems can lead to daytime fatigue, decreased cognitive function, and increased risk of mental health disorders.¹¹ A growing body of evidence supports that chronic pain and sleep problems are mutually linked. For example, a meta-

analysis found that people with chronic pain reported significant sleep disturbances by using objective polysomnographic measures¹² and some longitudinal findings indicated that lack of sleep predicts occurrences and exacerbations of chronic pain.¹³

The Transactional Model of Stress and Coping, developed by Richard Lazarus and Susan Folkman, is a psychological framework that explains how individuals respond to stressful situations.¹⁴ This model emphasizes the dynamic and reciprocal interaction between a person and their environment, focusing on the processes of appraisal and coping.¹⁵ Coping strategies are termed psychological and behavioral responses that individuals use to manage internal and/or external stressors.¹⁴ Effective coping strategies can help older adults alleviate symptoms of psychological distress,¹⁶ maintain good psychological well-being,¹⁷ and promote their overall quality of life.¹⁸ However, inadequate coping strategies or maladaptive responses to stressors can impede emotional expression and even worsen stress.¹⁹ Individuals suffering from chronic pain employ a variety of strategies to preserve their physical and mental well-being throughout the prolonged duration of their condition.^{20,21} Consequently, the evolution of coping strategies is a crucial aspect of adapting to chronic pain.^{22,23} Studies have indicated that these coping strategies can significantly influence health-related outcomes in individuals with chronic pain. For instance, Murphy, Kratz, Williams and Geisser²⁴ analyzed secondary data and discovered that specific coping strategies, such as guarding, resting, task persistence, and pacing, could act as a moderating factor in the relationship between fatigue symptoms and physical activity levels in individuals with knee and hip osteoarthritis. Similarly, Greenberg, Bakhshaie, Lovette and Vranceanu²⁵ found that individuals suffering from chronic orofacial pain who favored strategies like pain catastrophizing reported higher symptoms of anxiety and depression. Current psychological interventions that focus on training in coping skills and enhancing pain-coping resources have proven effective in boosting individuals' confidence in managing their pain and maintaining pain reduction.²⁶

A growing body of evidence has indicated that the way individuals cope with stress can significantly predict sleep problems. Kozusznik, Puig-Perez, Kozusznik and Pulopulos²⁷ conducted a cross-sectional survey on middle-aged and older individuals, discovering a correlation between problem-focused and emotion-focused coping strategies and both subjective and objective sleep quality and bedtime. A separate longitudinal study revealed that individuals exhibiting symptoms of insomnia tended to utilize maladaptive coping strategies more frequently than those without insomnia symptoms.²⁸ Thus, exploring the coping strategies employed by older adults in rural areas of China and their association with sleep outcomes can provide valuable insights for facilitating supportive care.

The relationship between chronic pain, sleep quality, and coping strategies is complex and multifaceted. Understanding the interplay between these factors is essential for developing effective interventions to improve the well-being of rural Chinese older adults. This population is often underserved and understudied,²⁹ and our study aims to address this knowledge gap. Chronic pain and sleep disturbances are prevalent among older adults, with significant impacts on quality of life and healthcare utilization.³⁰ By investigating the relationships between these variables, our study contributes to the existing literature and informs the development of targeted interventions to improve sleep quality and overall well-being in this population. Our study's findings may provide valuable insights into the unique challenges faced by rural Chinese older adults and inform the development of targeted interventions and support systems.

Aims

This study aimed to examine the current status of sleep quality in Chinese older adults living in rural areas. Additionally, we sought to investigate the association between chronic pain, sleep quality, and coping strategies.

Guided by the Transactional Model of Stress and Coping,¹⁵ which conceptualizes coping as a dynamic process of managing stressors, chronic pain was considered the primary stressor, coping strategies the mediating processes, and sleep quality the outcome.

Based on this theoretical framework, we proposed the following research Questions:

1. What is the current status of sleep quality among older adults living in rural areas of China?
2. Is there an association between chronic pain and sleep quality in this population?
3. Do coping strategies mediate the association between chronic pain and sleep quality?

Materials and methods

Design

This was an observational, cross-sectional study conducted from September to December 2023. The reporting of this study followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement to ensure rigor.³¹

Setting

The data collection for this study took place in a rural community in Bengbu, Anhui, China. As of 2019, Bengbu had a year-end registered population of 3,863,000. The population comprised 2,000,900 males (51.8%) and 1,862,100 females (48.2%). The urbanization rate stood at 58.6%, a 1.4 percentage point increase from the previous year. The rural population accounted for 62.9% of the total population, with 2,431,600 individuals residing in rural areas. Furthermore, the older population aged 60 and above totaled 619,600, making up 16.0% of the total population.³²

Participants

A convenience sampling approach was used to recruit participants if they were (1) aged more than 60 years old, (2) living in a rural community (Rural areas in China are generally characterized as regions that lie beyond urban centers, marked by a lower population density, restricted access to urban facilities, and a greater emphasis on agriculture and natural resources), (3) reported having chronic back, neck, and shoulder pain (3 months or longer), and (4) consent to their data being used for research. Individuals who had a clinical diagnosis of dementia or psychological disorder were excluded.

By utilizing G* power 3.1.9.7, and setting an effect size of 0.15, an alpha of 0.05, a power of 0.90, and a total of 7 predictors, it was determined that a minimum of 130 participants would be required to yield significant results.

Instrument

A pre-designed, structured questionnaire was used to collect data on socio-demographic and clinical information, chronic pain, coping strategies, and sleep quality in this study. A pilot study was implemented on five participants to improve the questionnaire. The results of those five participants were excluded from the data analysis.

Socio-Demographic and Clinical Variables

Sociodemographic variables on age, sex, educational background, monthly income, and employment status were collected. Clinical variables including previous medical diagnosis and duration were also obtained.

Chronic Pain

A linear visual analogue scale (VAS) was used to evaluate the severity of feelings of chronic pain.³³ The VAS is a psychometric tool utilized to measure subjective perceptions of pain. Participants were requested to gauge their pain intensity on a scale ranging from 0 to 10, where 0 signifies no pain and 10 represents the most extreme, unbearable pain. Higher scores on the scale correspond to more pain. The VAS had a Cronbach's α value of 0.81 in this study.

Coping Strategy

The Coping Strategies Questionnaire-Revised (CSQ-R) was used to evaluate coping strategies for chronic pain.³⁴ It consists of 27 items on a 7-point Likert scale ranging from 0 (never) to 6 (always) and includes six coping subscales: distraction, catastrophizing, ignoring pain sensations, distancing from pain, coping self-statements, and praying. Each subscale is scored separately, with higher scores indicate more frequent use of the corresponding strategy. The CSQ-R has been validated and shown to be reliable among Chinese populations.³⁵ The CSQ-R had a Cronbach's α value of 0.71 in this study.

Sleep Quality

Sleep quality was assessed using the Athens Insomnia Scale (AIS), an 8-item self-assessment tool designed to measure sleep quality based on the ICD-10 criteria.³⁶ Participants rate the severity of sleep difficulties described in each item on a 4-point Likert-type scale (0 = “no problem” to 3 = “very severe problem”). The total AIS scores range from 0 to 24, with higher scores indicating more severe sleep difficulties. A score of more than 6 is an indicator of poor sleep quality. The AIS has been validated and shown to be reliable among the Chinese population.³⁷ The AIS had a Cronbach’s α value of 0.84 in this study.

Data Collection

Potential participants were recruited through word of mouth, flyers, and advertisements by two trained research assistants for screening based on the inclusion criteria at the study venue. Those interested in participating in this study were briefed on the aims of the study and were asked to give their consent. The participants filled the paper-based questionnaires by themselves. The primary investigator and two research assistants administered the whole procedure. A total of 183 older adults were approached, and 158 of them responded, resulting in a response rate of 86.3%.

Data Analysis

Descriptive statistics were used to summarize the data, including the range of scores, means (M), standard deviations (SD), and percentages (%). Bivariate correlations were used to examine the linear association between chronic pain, sleep quality, and coping strategies. To assess the characteristics of our sample regarding sleep quality, we performed a *t*-test and analysis of variance (ANOVA). We also conducted a Stepwise multiple linear regression analysis, with significant socio-demographic variables and sleep-related variables as the independent variables and sleep quality as the dependent variable. To examine the mediator effect of coping strategies, we performed six mediator models. Each analysis included pain experience as the independent variable, sleep quality as the dependent variable, and one of the six coping strategies as the mediating variable. All models were controlled for age and gender. We used bootstrapping with 10,000 samples to compute a bias-corrected confidence interval for the indirect effect. An effect was deemed significant if the bootstrap confidence interval (95% CI) did not contain a value of zero.

Missing data were managed using listwise deletion, whereby cases with missing values on any variables involved in the analyses would be excluded. However, due to the controlled administration of the survey, no missing data were observed in the dataset. All data analyses were performed using SPSS version 20 for Windows (Armonk, NY: IBM Corp). and the PROCESS macro version 4.1 for SPSS. A two-sided *p*-value of less than 0.05 was considered statistically significant.

Methodological Rigor

All measurement instruments used in this study had been previously validated and tested for reliability in Chinese populations, ensuring cultural and contextual relevance. To minimize procedural bias, research assistants received standardized training on participant registration, survey administration, and adherence to ethical research principles, including informed consent and data confidentiality. Data entry was double-checked by independent reviewers to prevent errors and reduce information bias. Furthermore, a statistics expert was consulted to review and confirm the accuracy and appropriateness of the data analysis procedures, thereby enhancing the methodological rigor of the study.

Results

Reporting of Sociodemographic and Clinical Variables

Table 1 reports the results of socio-demographic and clinical variables. A total of 158 participants were recruited (Female: 77, 48.7%). Of the sample, nearly half (75, 47.5%) were aged between 60 and 70 years old, less than half (66, 41.8%) have received fundamental education, and most (136, 86.1%) were rural workers who were self-employed. Additionally, 141 individuals (89.2%) did not have a consistent monthly income.

Table 1 Characteristics for Sociodemographic and Clinical Variables and Differences in Sleep Quality (n = 158)

Variables		Number	Percent (%)	AIS (Mean $\pm$ SD)
Age ranges (years)	60 – 70	75	47.5	8.51 $\pm$ 4.71
	71 – 80	55	34.8	8.89 $\pm$ 5.08
	> 80	28	17.7	9.25 $\pm$ 5.34
Sex	Male	81	51.3	7.62 $\pm$ 4.75**
	Female	77	48.7	9.99 $\pm$ 4.85
Monthly income (Chinese Yuan) ¹	Not stable	141	89.2	9.24 $\pm$ 4.88 *
	0-1000	3	1.9	5.33 $\pm$ 4.93
	1001-2000	5	3.2	5.20 $\pm$ 4.44
	2001-3000	4	2.5	5.75 $\pm$ 3.40
	>3000	5	3.2	3.60 $\pm$ 2.07
Employment status	None	11	7.0	11.73 $\pm$ 3.77 **
	Retired	12	7.6	5.00 $\pm$ 3.28
	Rural worker	135	85.4	8.87 $\pm$ 4.95
Education level	Illiteracy	92	58.2	9.34 $\pm$ 5.14
	Elementary school	41	25.9	8.61 $\pm$ 4.39
	Junior high school	19	12.0	7.68 $\pm$ 4.96
	Senior high school and above	6	3.8	4.67 $\pm$ 3.14
Chronic diseases	None	21	13.3	7.38 $\pm$ 4.24
	Single chronic disease	75	47.5	8.88 $\pm$ 4.92
	Multimorbidity	62	39.2	9.11 $\pm$ 5.15

Note: * $p < 0.05$, ** $p < 0.01$. ¹ 100 Chinese Yuan $\approx$ 13.9 US Dollar.

Abbreviation: SD, Standard Deviation.

Reporting of Chronic Pain, Coping Strategies, and Sleep Quality

Table 2 reports the results of chronic pain, coping strategies, and sleep quality. The scores for chronic pain were 4.47 ± 2.29 , and for sleep quality 8.77 ± 4.93 . Of 116 participants (73.4%) might have poor sleep quality based on an AIS score of 6.

Correlation Between Chronic Pain, Coping Strategies, and Sleep Quality

Table 3 reports the results of correlations between chronic pain, coping strategies, and sleep quality. Pearson correlations showed that chronic pain is positively associated with sleep quality ($r = 0.65$, $p < 0.01$), the use of ignoring pain sensations ($r = 0.16$, $p < 0.05$), and praying as a way of coping ($r = 0.23$, $p < 0.01$). Sleep quality correlated with the use

Table 2 Characteristics for Chronic Pain, Coping Strategies, and Sleep Quality (n = 158)

Variables	Mean	SD	Range
Chronic pain severity			
VAS	4.47	2.29	1-10
Coping strategies			
Distraction	19.32	5.32	9-32
Catastrophizing	23.09	7.27	8-39
Ignoring pain sensations	18.70	6.77	7-34
Distancing from pain	14.59	4.58	6-28
Coping self-statements	13.49	5.73	5-26
Praying	8.18	3.07	3-21
Sleep quality			
AIS	8.77	4.93	1-24

Abbreviations: SD, Standard Deviation, VAS, Visual Analog Scale, AIS, Athens Insomnia Scale.

Table 3 Correlation Between Chronic Pain, Coping Strategies, and Sleep Quality (n = 158)

	Chronic Pain Severity	Sleep Quality	Distraction	Catastrophizing	Ignoring Pain Sensations	Distancing From Pain	Coping self-Statements	Praying
Chronic pain severity	1.00	0.648**	0.060	0.129	0.164*	0.012	0.096	0.232**
Sleep quality		1.00	0.141	0.187*	0.241**	0.143	0.170*	0.331**
Distraction			1.00	0.852**	0.780**	0.772**	0.838**	0.445**
Catastrophizing				1.00	0.865**	0.723**	0.851**	0.527**
Ignoring pain sensations					1.00	0.640**	0.772**	0.464**
Distancing from pain						1.00	0.753**	0.548**
Coping self-statements							1.00	0.586**
Praying								1.00

Notes: **Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed).

of catastrophizing ($r = 0.19, p < 0.05$), ignoring pain sensations ($r = 0.24, p < 0.01$), coping self-statements ($r = 0.17, p < 0.05$), and praying ($r = 0.33, p < 0.01$).

Results of the Stepwise Regression Model

Table 4 reports the results of the regression model. Sleep quality, measured by the AIS, was associated with chronic pain (Beta = 0.599, $t = 9.99, p < 0.001$), praying (Beta = 0.165, $t = 2.72, p = 0.007$), and retirement (Beta = -0.559, $t = -2.51, p < 0.05$). The total model was 46.5% of the variance ($p < 0.01$). Higher levels of chronic pain were associated with more sleep difficulties and more praying.

Mediational Effects of Coping Strategies

Table 5 presents the results of the mediational analysis, which examined the role of various coping strategies in the relationship between chronic pain and sleep quality. The analysis revealed a partial mediation effect of praying, indicating that praying partially explains the association between chronic pain and sleep quality ($B = 0.137, 95\% \text{ CI} =$

Table 4 Results of the Stepwise Regression Model

Model [†]	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Chronic pain severity	0.599	0.060	0.599	9.985	0.000
Praying	0.165	0.061	0.165	2.716	0.007
Retired status	-0.559	0.223	-0.149	-2.505	0.013

Note: [†]The total model was 46.5% of the variance ($p < 0.01$).

Table 5 Results of the Mediation Models Analysis

	Effect	Boot SE	t	p value	95% CI	
					LLCI	ULCI
Chronic pain ⇒ praying ⇒ sleep quality						
Total effect	0.5416	0.0899	6.0241	0.0000	0.3645	0.7187
Direct effect	0.4046	0.0975	4.1511	0.0000	0.2126	0.5966
Indirect effect	0.1370	0.0412			0.0614	0.2227

0.0614, 0.2227). In contrast, the mediation effects of distraction, catastrophizing, ignoring pain sensations, distancing from pain, and coping self-statements were not significant.

Discussion

This cross-sectional study investigated the current status of sleep quality and the association between chronic pain, sleep quality, and coping in rural Chinese older adults. A previous meta-analysis reported a prevalence of sleep disturbances among Chinese older adults of 35.9% (95% CI: 30.6% - 41.2%), with rural-dwelling older adults experiencing more sleep disturbances (44.0%, 95% CI: 31.2% - 56.8%) compared to their urban counterparts.³⁸ In contrast, our study found that over 70% of older adults reported poor sleep quality, indicative of possible sleep disturbances. The inconsistency between our study and the meta-analysis may be attributed to differences in study populations, measurement tools, and the presence of chronic diseases. The meta-analysis included a broader range of studies, which may have diluted the effect of rural-urban differences and chronic diseases on sleep quality. Additionally, the high prevalence of chronic diseases among our participants may have contributed to the reduced sleep quality observed in our study.³⁹ Together, these findings highlighted the importance of considering the rural context when addressing chronic pain and sleep quality in older adults. Rural areas often face unique challenges in terms of healthcare access and resources.⁴⁰ Therefore, interventions should be tailored to the specific needs and circumstances of rural Chinese older adults.

The findings of this study showed a significant association between chronic pain and sleep quality in rural Chinese older adults. It was found that individuals experiencing chronic pain were more likely to have poorer sleep quality. This finding echoes previous research. For example, evidence from a large Chinese cohort of middle-aged and older adults found a bidirectional link between sleep quality and pain. Among participants initially free of pain, those reporting poor sleep were at increased risk of developing pain over time.⁴¹ Conversely, individuals who began with satisfactory sleep but reported pain at baseline were more likely to experience a decline in sleep quality. Echoing longitudinal findings, a cross-sectional survey of 2052 rural residents in Central China showed that all levels of self-reported sleep quality were associated with some degree of pain. Also, poor sleep as well as general health emerged as a significant negative predictor of pain intensity.⁴² These findings highlighted the importance of addressing chronic pain as a potential factor contributing to sleep disturbances in this population. Healthcare providers such as nurses should consider incorporating pain management strategies into sleep interventions for older adults in rural areas.

In contrast with previous findings that exhibited certain coping strategies, such as problem-solving and positive thinking, were associated with better sleep quality,⁴³ while maladaptive coping strategies, such as avoidance and self-blame, were associated with poorer sleep quality.⁴⁴ We observed that praying as a coping strategy has a mediating effect on the relationship between chronic pain with sleep quality. Our data indicated that perceived chronic pain may predispose individuals to use praying, and increased utilization of praying as a coping strategy could exacerbate sleep problems. Several factors may account for these differences. First, unlike other coping strategies that require specific training or sustained effort, prayer could be adopted without formal instruction, making it an accessible resource for individuals with limited health literacy or fewer social supports. Also, measurement differences between these studies, such as the inclusion of spiritual coping items in our survey, may reveal coping dimensions overlooked by instruments focused primarily on problem-focused or emotion-focused scales.

Using praying as a coping strategy more frequently could potentially worsen issues with sleep. This finding was in line with earlier literature reporting that praying was associated with poor sleep quality⁴⁵ and more pain experiences.⁴⁶ Praying could potentially offer health advantages in the short and long run,^{47,48} although it might not alter a person's situation. Praying can be an effective coping way for individuals to mitigate the adverse impacts of stress, potentially by fostering a sense of positivity.⁴⁹ However, an increased dependence on praying as a stress management tool could exacerbate sleep disturbances. This could be attributed to several factors. For instance, if a person prays late at night or at inconsistent times, it might interfere with their sleep routine.⁵⁰ Also, praying could potentially induce psychological discomfort such as anxiety and depression, which might amplify fears and consequently cause difficulties in falling asleep.⁵¹ Finally, if praying is utilized as a means to avoid confronting problems head-on, it could result in unresolved stress, which can further deteriorate sleep quality. Future research may include more characteristics of praying (eg, duration, frequency, source) when determining the role of praying in such association. This finding might have

implications for nursing practice, as it underscores the need for nurses to consider the spiritual and religious beliefs of their patients when developing pain management plans. For instance, nurses can incorporate spiritual assessments into their routine evaluations to identify patients who may benefit from spiritual support as part of their pain management plan. This approach aligns with the holistic model of nursing, which emphasizes the importance of addressing physical, emotional, and spiritual aspects of health.

Limitations

This study has several limitations that should be acknowledged. Firstly, the cross-sectional design precludes the establishment of a causal relationship between the variables, which is a limitation inherent to this type of study design. Secondly, the findings may not be generalizable to the broader population of older Chinese adults, as the sample was not representative of this population. Future studies using representative samples are needed to confirm the generalizability of the findings.

In addition, previous research has suggested that the association between praying and pain severity may be influenced by individuals' religiosity.⁵² Therefore, future studies may consider collecting data on participants' religious status and comparing the data between religiously affiliated and non-affiliated individuals. Finally, several significant covariates, such as medication-taking and healthcare insurance, were not included in this study, which may have impacted the results.

Implications for Practice

Nurses and other healthcare providers in rural areas should be aware of the high prevalence of chronic pain and poor sleep quality among older adults and make routine assessment and integrated management of these conditions a priority. Care plans should incorporate culturally relevant coping strategies, such as prayer, alongside conventional treatments. To ensure early identification and referral, primary care teams and nurses need targeted training in geriatric pain assessment and sleep quality screening, with clear pathways to multidisciplinary services for individualized care. At the policy level, there is a need for healthcare systems to develop targeted interventions and allocate appropriate resources to support pain management and sleep health in rural aging populations. Also, routinely incorporating sleep quality indicators into regional health surveys will help track needs and measure intervention impact. Finally, future research should emphasize longitudinal and randomized trials of combined pain-relief and sleep-modulation strategies, such as cognitive-behavioural interventions, and the validation of culturally appropriate sleep quality instruments.

Conclusions

Overall, this study contributes to an understanding of the complex relationship between chronic pain, coping strategies, and sleep quality among older adults living in rural China. The findings indicate that chronic pain has a significant negative impact on sleep quality, and suggest that praying as a coping strategy may help buffer this effect. These results have significant implications for the development of culturally sensitive psychosocial interventions designed to enhance sleep and overall well-being in underserved ageing populations.

Ethical statement

The study was conducted in accordance with the Declaration of Helsinki, and approved by the Ethics Committee of Fudan University's School of Nursing (IRB#2022-09-8). Informed consent was obtained from all subjects involved in the study.

Disclosure

The author(s) report no conflicts of interest in this work.

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