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Knowledge, attitude, and practice towards sleep disorders among high school students: a cross-sectional study

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Abstract

Background Sleep disorders are common in high school students. Despite the growing global attention to adolescent sleep issues, limited research has focused on the knowledge, attitude, and practice (KAP) of high school students toward sleep disorders in China, where academic pressure is particularly high. This study addresses this gap by exploring the KAP of Chinese high school students toward sleep disorders, providing insights for targeted educational interventions.

Methods A cross-sectional study was conducted at six schools between November 10, 2023, and December 20, 2023. Demographic characteristics, the Self-Rating Scale of Sleep (SRSS), and the KAP scores of the participants were collected using a self-administered questionnaire.

Results A total of 800 valid questionnaires were collected. The mean scores for the SRSS were 23.51 ± 6.18 (possible range: 10–50), for knowledge were 10.00 ± 4.84 (possible range: 0–18), for attitude were 35.53 ± 4.23 (possible range:9–45), and for practice were 28.85 ± 6.29 (possible range:8–40), respectively. The structural equation modeling (SEM) model demonstrated that sleep quality directly influenced knowledge (β = -0.154, $p < 0.001$), attitude (β = -0.169, $p < 0.001$), and practice (β = -0.356, $p < 0.001$). Knowledge also had a direct effect on attitude (β = 0.216, $p < 0.001$) and practice (β = 0.394, $p < 0.001$), and attitude directly affected practice (β = 0.141, $p = 0.042$).

Conclusions This study highlights significant knowledge gaps about sleep disorders among Chinese high school students, which could hinder their ability to manage these issues effectively. By focusing on this unique population under substantial academic pressure, the findings underscore the urgent need for tailored educational programs to promote better sleep habits and overall well-being. Educational interventions that enhance knowledge about sleep disorders should be implemented in high school curricula to bridge these gaps and improve sleep-related outcomes.

Keywords Sleep disorders, High school students, Knowledge, Attitude, Practice, Adolescent sleep patterns

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Background

Sleep disorders are a group of complex conditions that adversely affect regular sleep patterns. The prevalence of sleep disorders in adolescents is reported to be between 10% and 45% [1]. Adolescents, especially high school students, undergo rapid physical and psychological changes, often leading to behavior and sleep homeostasis changes [2]. Their sleep disturbances are frequently attributed to hormonal changes, academic stressors, and evolving social environments, including increased screen exposure [3, 4]. Moreover, adolescent sleep problems have been associated with a wide range of psychiatric problems. For example, a study has shown that poor sleep quality among students can result in cognitive impairments, emotional disturbances, reduced academic performance, and long-term health issues [5].

Although studies on adolescent sleep disorders have been conducted globally, research focusing on high school students in China is relatively scarce. Available studies indicate that approximately 50% of Chinese high school students experience insufficient sleep duration, with academic stress identified as a primary contributing factor [6]. A survey conducted in Beijing revealed that nearly 60% of adolescents reported significant sleep-related problems, yet awareness and treatment-seeking behavior remain low [7]. Compared with studies conducted in Western countries, which often emphasize lifestyle and environmental factors, research in China highlights the prominent influence of academic pressure on sleep quality and duration. Furthermore, the interplay between knowledge, attitudes, and practices (KAP) related to sleep disorders in this demographic has not been comprehensively explored, leaving critical gaps in understanding how educational interventions could address these issues.

Effective management of sleep disturbances in this demographic can be achieved through strategies such as basic sleep education, sleep restriction therapy, sleep hygiene, stimulus control therapy, cognitive therapy, physical exercise, and self-emotional regulation [8, 9]. The KAP survey is a quantitative method that provides access to quantitative and qualitative information and significantly influences human health behaviors [10]. Although previous studies have applied this framework to other health behaviors, its use in addressing sleep disorders among high school students remains underexplored, particularly in China. Understanding how knowledge and attitudes influence practices in this context is critical for designing interventions tailored to the unique challenges faced by this population.

This research aimed to investigate the KAP of high school students regarding sleep disorders in China. By applying the KAP model, the study seeks to identify misconceptions, unhealthy practices, and knowledge gaps to inform targeted educational initiatives and public health strategies.

Methods

Study design and participants

This cross-sectional study was carried out at six high schools: Changzhou Third High School, Xiamen No. 10 High School, Xi'an Jiaotong University Suzhou Affiliated High School, Suqian Siyang Experimental Senior High School, Jiangyin Senior High School in Jiangsu Province, and Yancheng Wuyou High School, between November 10, 2023, and December 20, 2023. Classes were selected to represent varying academic performance levels within each school, with one class randomly chosen from high-, medium-, and low-performing groups in each grade, ensuring diverse academic backgrounds among participants. Only high school students were included. The schools were chosen to reflect a range of geographic and socioeconomic contexts, including urban, suburban, and rural areas. The study was approved by the Ethics Review Committee of the First People's Hospital of Yancheng City (Approval Number: 2023-K-210), and informed consent was obtained from the student participants and their parents or guardians.

Questionnaire and quality control

The questionnaire was designed with reference to clinical guidelines reported in previous studies [11–13] and revised by three veteran experts in psychiatry and psychology; similar or repetitive questions were deleted, and unclear formulated questions were adjusted. The internal consistency of the questionnaire was considered acceptable, with a Cronbach's α coefficient of 0.833 for the whole questionnaire, and 0.929, 0.742, and 0.835 for the knowledge, attitude, and practice sections, respectively. The questionnaire also demonstrated good construct validity, as evidenced by a KMO value of 0.895 for the whole questionnaire, and 0.928, 0.751, and 0.867 for the knowledge, attitude, and practice sections, respectively. The original questionnaire is available in the Supplementary Files.

For the Self-Rating Scale of Sleep (SRSS), originally developed for use among college students, its applicability to high school students was assessed during the pilot test, showing good reliability (Cronbach's $\alpha = 0.806$) and validity (KMO = 0.846). In addition, a previous study [14] that measured sleep among high school students using the SRSS scale supports its applicability to this population, which is similar to ours.

The KAP measures were adapted specifically for high school students by referencing similar KAP studies conducted in adolescent populations. The knowledge section was revised to include items addressing common sleep issues faced by high school students, such as academic

stress and screen exposure. The attitude and practice sections incorporated Likert-scale questions that align with adolescents' typical sleep habits and beliefs. These adaptations were validated through expert review and pilot testing to ensure content relevance and clarity for this demographic.

The SRSS, formulated by Professor Li Jianming, comprises 10 questions ranging from 10 to 50 points, with lower scores indicating fewer sleep-related issues and higher scores suggesting more severe or numerous sleep problems [15]. Before the national norm was obtained, 162 college students in the third grade were evaluated repeatedly, and the reliability and validity of the scale were analyzed (Cronbach's α coefficient was 0.642) [16]. The knowledge dimension consisted of 9 questions, each one assigned with 2 points for complete understanding, 1 point for basic understanding, and 0 points for unclear, with a total possible score ranging from 0 to 18 points. The attitude dimension of the questionnaire consisted of 9 items evaluated using a five-point Likert scale, ranging from 'strongly agree' to 'strongly disagree,' with a total possible score ranging from 5 points to 1 point. The practice dimension of the questionnaire consisted of 8 items evaluated using a five-point Likert scale, with options ranging from 'always' to 'never,' and similarly scored from 5 to 1; they were complemented by a 9th question formatted as a multiple-choice item and subject to descriptive analysis. The total score for the three dimensions ranged from 8 to 40 points, with scores > 70% of the maximum in each section indicating adequate knowledge, positive attitude, and proactive practice [17].

Paper questionnaires were distributed with the assistance of project team members within their respective units. These team members, who were school teachers recruited as research assistants, were guided in distributing and collecting the questionnaires. Upon completion, which occurred on-site, the questionnaires were promptly collected. The distribution was conducted by randomly selecting city high schools, county high schools, and district high schools, all with similar enrollment numbers, consisting of approximately 30 classes with 10 classes per grade level and around 45 students per class.

Statistical analysis

SPSS 26.0 (IBM, Armonk, NY, USA) and AMOS 24.0 (IBM, Armonk, New York, USA) were used for the analysis. Continuous data were presented as means and standard deviations, while categorical data were expressed as n (%). If continuous data adhered to a normal distribution, a t-test, and ANOVA analysis were employed for comparing two groups or multigroup, respectively. Conversely, the Kruskal-Wallis test was applied for data with non-normal distribution. Spearman correlation test was also conducted before to explore the correlation between the four subcategories. Those variables screened by univariate logistic regression to identify factors associated with good knowledge, positive attitude, and active practice were included in multivariate regression. Structural equation modeling (SEM) was employed to explore potential interrelationships among sleep quality, knowledge, attitude, and practice. Based on the principles of KAP, the following four hypotheses were formulated: (1) sleep quality would affect knowledge, attitude, and practice; (2) knowledge would influence attitude and practice; (3) attitude would affect practice. Statistical significance was established at a two-sided p of < 0.05.

Results

A total of 1,000 high school students from 6 high schools were invited to fill out offline paper questionnaires, and 888 questionnaires were recovered, achieving a response rate of 88.8%. The following abnormal questionnaires were excluded: (1) 70 questionnaires with incorrect answers; (2) 1 incomplete questionnaire; (3) 17 abnormal questionnaire responses (e.g., selecting multiple options in single-choice questions, choosing options outside the provided choices), resulting in a final count of 800 valid questionnaires. Among them, 425 (53.13%) were collected from male students and 488 (61.00%) from four-star schools; 292 participants (36.50%) had easygoing personality trait type, and their mean acceptance of treatment for sleep disorders was 7.21 ± 2.43, while 627 (78.38%) believed that academic stress potentially affected their sleep.

The average scores were 23.51 ± 6.18, 10.00 ± 4.84, 35.53 ± 4.23 and 28.85 ± 6.29 for SRSS, knowledge, attitude, and practice, respectively. High school students of different gender, age, grade, school level, and personality trait were more likely to have different SRSS scores; those of different age, school level, and residence were more likely to have different knowledge scores; those of different gender, school level, and residence were more likely to have different attitude scores, and those of different gender, school level, residence, academic ranking, and personality trait type were more likely to have different practice scores (all $p < 0.05$) (Table 1).

The results of the SRSS scale showed that 61% of high school students slept an average of only 5–6 h per night, and 83.75% reported not using sleeping pills (Table S1). In the knowledge dimension, most participants who selected the "Very familiar" option were different classifications for sleep disorders (K2) with 40.38%. In contrast, participants who "Not familiar" to anxiety affected sleep quality (K8) was the largest number (Table S2). Concerning sleep-related attitude, 80.63% strongly disagreed that adequate sleep is important for health (A1), and 70% disagreed that insomnia needs to be taken seriously (A2).

Table 1 Baseline characteristics and SRSS, KAP scores of investigated population

	n (%)	SRSS, mean ± SD	*p*-value	Knowledge, mean ± SD	*p*-value	Attitude, mean ± SD	*p*-value	Practice, mean ± SD	*p*-value
n = 800									
Total score		23.51 ± 6.18		10.00 ± 4.84		35.53 ± 4.23		28.85 ± 6.29	
Gender			0.001		0.627		0.013		< 0.001
Male	425 (53.13)	23.02 ± 6.79		9.92 ± 5.31		35.15 ± 4.44		29.72 ± 6.90	
Female	375 (46.88)	24.07 ± 5.36		10.09 ± 4.25		35.95 ± 3.94		27.54 ± 6.24	
Age			0.001		0.004		0.113		0.225
14–17 years	693 (86.63)	23.18 ± 5.93		10.18 ± 4.80		35.63 ± 4.17		28.83 ± 6.71	
≥ 18 years	107 (13.38)	25.68 ± 7.29		8.80 ± 4.95		34.86 ± 4.58		27.85 ± 6.49	
Grade			< 0.001		0.064		0.362		0.591
Grade 10	350 (43.75)	22.25 ± 5.57		10.14 ± 4.66		35.78 ± 4.08		28.99 ± 6.84	
Grade 11	232 (29.00)	23.47 ± 6.06		10.35 ± 4.72		35.33 ± 4.39		28.53 ± 6.89	
Grade 12	218 (27.25)	25.58 ± 6.69		9.40 ± 5.19		35.33 ± 4.29		28.42 ± 6.19	
School level			0.001		< 0.001		< 0.001		< 0.001
Three-star and below	170 (21.25)	24.23 ± 5.67		9.76 ± 4.72		34.46 ± 3.97		25.72 ± 5.87	
Four-star	488 (61.00)	22.91 ± 6.31		10.47 ± 4.95		35.93 ± 4.27		29.87 ± 6.92	
Five-star	142 (17.75)	24.75 ± 6.10		8.68 ± 4.33		35.42 ± 4.21		28.25 ± 5.55	
Residence			0.079		0.001		0.04		0.029
Rural	222 (27.75)	23.34 ± 5.85		9.14 ± 4.62		35.11 ± 3.84		27.74 ± 6.48	
Urban	235 (29.38)	22.95 ± 6.40		10.84 ± 5.07		35.97 ± 4.14		29.31 ± 7.04	
City	343 (42.88)	24.01 ± 6.21		9.98 ± 4.73		35.49 ± 4.51		28.91 ± 6.52	
Academic ranking			0.125		0.446		0.15		0.008
Top 25%	272 (34.00)	22.96 ± 6.07		10.26 ± 5.23		35.84 ± 4.08		29.44 ± 6.94	
25-50%	213 (26.63)	23.31 ± 5.80		9.58 ± 4.36		35.37 ± 3.98		29.15 ± 6.06	
50-75%	189 (23.63)	23.78 ± 5.71		10.39 ± 4.71		35.75 ± 4.30		28.22 ± 6.66	
75-100%	126 (15.75)	24.67 ± 7.49		9.57 ± 4.88		34.78 ± 4.78		27.08 ± 6.91	
Personality trait type			0.006		0.285		0.696		0.028
Extraverted	186 (23.25)	23.05 ± 6.82		10.48 ± 5.16		35.55 ± 4.26		30.12 ± 7.03	
Conscientious	141 (17.63)	23.91 ± 6.03		10.13 ± 4.96		35.40 ± 4.27		28.30 ± 6.75	
Easygoing	292 (36.50)	23.01 ± 5.38		9.68 ± 4.26		35.36 ± 4.15		28.34 ± 6.58	
Emotionally stable	115 (14.37)	23.40 ± 5.99		10.22 ± 5.28		36.10 ± 4.44		28.75 ± 6.42	
Open-minded	66 (8.25)	26.39 ± 7.49		9.39 ± 5.20		35.47 ± 4.10		27.08 ± 5.92	
Acceptance of treatment for sleep disorders	7.21 ± 2.43								
Factors potentially affecting sleep									
Academic pressure	627 (78.38)								
Excessive use of electronic devices (phone, computer, etc.)	301 (37.63)								
Excessive worry or anxiety	469 (58.63)								
Social media usage	101 (12.63)								
Dietary habits	134 (16.75)								
Insufficient physical activity	145 (18.13)								
Family issues	120 (15.00)								
Noise pollution	355 (44.38)								
Other	41 (5.13)								

In addition, 33.13% were neutral about discussing sleep problems with friends or classmates being beneficial (A9) (Table S3). In terms of practice related to improving sleep, 49.75% never kept their bedroom quiet, dark, and cold (P5). Furthermore, 32% occasionally followed a routine (P1). Regarding forms of exercise, most commonly listened to music (67.5%) and eight-section brocade (51.25%) (Table S4).

Correlation analyses showed that SRSS scores were negatively correlated with knowledge (r = -0.19, $p < 0.001$) and practice (r = -0.36, $p < 0.001$); also, knowledge was positively correlated with attitude ($r = 0.08$, $p < 0.05$) and practice ($r = 0.28$, $p < 0.001$), and attitude was positively correlated with practice ($r = 0.1$, $p < 0.01$) (Fig. 1).

Delimited by 70% of the total score of each section, 221 participants had sufficient knowledge (knowledge scores > 12.6), 675 participants had a positive attitude (attitude scores > 31.5), and 405 participants had adequate practice (practice scores > 28). Multivariate logistic regression showed that SRSS score (OR = 0.946, 95% CI: [0.919–0.974], $p < 0.001$), acceptance of treatment for sleep disorders (OR = 1.094, 95% CI: [1.021–1.172], $p = 0.010$), and four-star school (OR = 1.793, 95% CI: [1.102–2.919], $p = 0.019$) were independently associated with knowledge (Table 2). Concurrently, knowledge score (OR = 1.045, 95% CI: [1.003–1.089], $p = 0.034$), acceptance of treatment for sleep disorders (OR = 1.100, 95% CI: [1.018–1.189], $p = 0.016$), male gender (OR = 0.633, 95% CI: [0.423–0.947], $p = 0.026$), and top 25% academic ranking (OR = 1.989, 95% CI: [1.126–3.515], $p = 0.018$) were independently associated with attitude (Table 2). Further, knowledge score (OR = 1.084, 95% CI: [1.048–1.121], $p < 0.001$), SRSS score (OR = 0.936, 95% CI: [0.910–0.962], $p < 0.001$), acceptance of treatment for sleep disorders (OR = 1.127, 95% CI: [1.055–1.203], $p < 0.001$), male gender (OR = 2.054, 95% CI: [1.499–2.813], $p < 0.001$), three-star school and below (OR = 0.351, 95% CI: [0.204–0.605], $p < 0.001$), and 25-50% academic ranking (OR = 1.873, 95% CI: [1.144–3.067], $p = 0.013$) were independently associated with practice (Table 2).

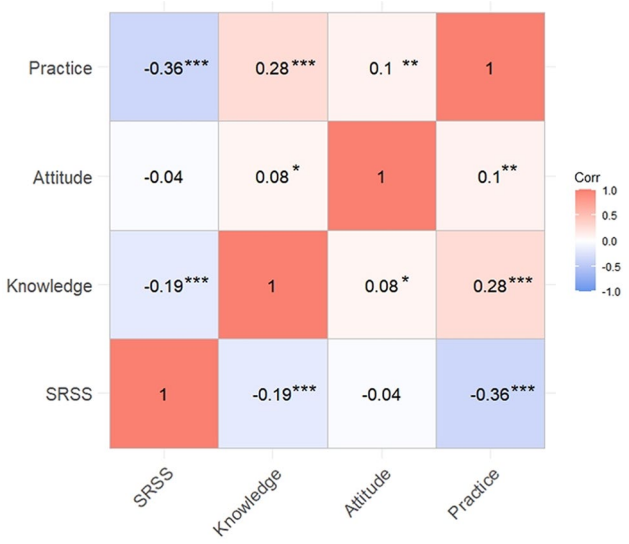

Fig. 1 Heat map of the correlation between SRSS, knowledge, attitude and practice. *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$

The fit indices demonstrated that the SEM model had a good fit (Table 3). Also, sleep quality directly affected knowledge (β = -0.154, $p < 0.001$), attitude (β = -0.169, $p < 0.001$), and practice (β = -0.356, $p < 0.001$); knowledge directly affected attitude (β = 0.216, $p < 0.001$) and practice (β = 0.394, $p < 0.001$), and attitude directly affected practice (β = 0.141, $p = 0.042$) (Table 4; Fig. 2).

Discussion

This study revealed that high school students generally possessed inadequate knowledge but exhibited positive attitude and proactive practice regarding sleep disorders. Also, sleep quality, acceptance of treatment for sleep disorders, and school level were independently associated with knowledge scores. Educational interventions aimed at increasing knowledge of sleep disorders should be incorporated into high school curricula to enhance students' understanding and management of these issues.

The findings of this study shed light on the multifaceted relationship between high school students' knowledge, attitude, and practice regarding sleep disorders and various demographic and behavioral factors. The notable gender differences observed in the SRSS scores diverge from previous research, suggesting that male high school students experience better sleep quality than female students [18]. On the other hand, the residence-related differences in knowledge and attitude are consistent with research showing that urban students often have better access to information and healthcare facilities, potentially contributing to higher knowledge levels [19]. The association between academic ranking and practice scores is consistent with previous studies, indicating that inadequate sleep leads to stress due to poor academic performance, highlighting the crucial link between sleep quality, quantity, and academic success [20].

This study among high school students indicates a basic understanding in sleep disorder, highlighting significant gaps in recognizing the factors affecting sleep disorders and related preventive measures. Notably, there is a marked deficiency in awareness about the diverse determinants of sleep quality, encompassing lifestyle, environmental, psychological, physiological, and genetic factors. These findings align with previous studies highlighting the limited awareness and understanding of sleep disorders among parents [21]. Sleep disorders are often underdiagnosed and undertreated, which can have significant implications for individuals' health and well-being. Bridging this knowledge gap is essential to helping

Table 2 Univariate and multivariate logistic regression results for knowledge, attitude, and practice

		Univariate logistic regression		**Multivariate logistic regression**	
		OR (95%CI)	**p-value**	**OR (95%CI)**	**p-value**
Knowledge	SRSS score	0.939 (0.913–0.966)	< 0.001	0.946 (0.919–0.974)	< 0.001
	Acceptance of treatment for sleep disorders	1.093 (1.023–1.169)	0.009	1.094 (1.021–1.172)	0.010
	Gender				
	Male	1.151 (0.843–1.572)	0.376		
	Female	ref			
	Age				
	14–17 years	1.661 (1.003–2.752)	0.049	1.277 (0.755–2.159)	0.361
	≥18 years	ref		ref	
	Grade				
	Grade 10	1.228 (0.834–1.808)	0.299		
	Grade 11	1.318 (0.867–2.002)	0.196		
	Grade 12	ref			
	School level				
	Three-star and below	1.418 (0.817–2.462)	0.215	1.567 (0.858–2.861)	0.144
	Four-star	2.057 (1.291–3.279)	0.002	1.793 (1.102–2.919)	0.019
	Five-star	ref		ref	
	Residence				
	Rural	0.735 (0.491-1.100)	0.135	0.681 (0.439–1.056)	0.086
	Urban	1.593 (1.113–2.280)	0.011	1.440 (0.984–2.107)	0.061
	City	ref		ref	
	Academic ranking				
	Top 25%	1.455 (0.897–2.359)	0.129		
	25-50%	0.931 (0.553–1.567)	0.788		
	50-75%	1.417 (0.848–2.368)	0.184		
	75-100%	ref			
	Personality trait type				
	Extraverted	1.601 (0.844–3.034)	0.149		
	Conscientious	1.465 (0.753–2.849)	0.261		
	Easygoing	0.842 (0.449–1.580)	0.593		
	Emotionally stable	1.367 (0.686–2.723)	0.374		
	Open-minded	ref			
		Univariate logistic regression		Multivariate logistic regression	
		OR (95%CI)	P	OR (95%CI)	P

Table 2 (continued)

		Univariate logistic regression		**Multivariate logistic regression**	
		OR (95%CI)	**p-value**	**OR (95%CI)**	**p-value**
Attitude	Knowledge score	1.062 (1.020–1.106)	0.004	1.045 (1.003–1.089)	0.034
	SRSS score	0.965 (0.937–0.993)	0.017	0.974 (0.945–1.005)	0.100
	Acceptance of treatment for sleep disorders	1.125 (1.043–1.213)	0.002	1.100 (1.018–1.189)	0.016
	Gender				
	Male	0.663 (0.449–0.981)	0.040	0.633 (0.423–0.947)	0.026
	Female	ref		ref	
	Age				
	14–17 years	1.586 (0.956–2.634)	0.074		
	≥18 years	ref			
	Grade				
	Grade 10	1.227 (0.772–1.949)	0.388		
	Grade 11	1.044 (0.636–1.714)	0.866		
	Grade 12	ref			
	School level				
	Three-star and below	0.733 (0.407–1.323)	0.303		
	Four-star	1.113 (0.661–1.874)	0.686		
	Five-star	ref			
	Residence				
	Rural	0.975 (0.625–1.521)	0.911		
	Urban	1.600 (0.981–2.610)	0.060		
	City	ref			
	Academic ranking				
	Top 25%	2.000 (1.151–3.476)	0.014	1.989 (1.126–3.515)	0.018
	25-50%	1.677 (0.952–2.957)	0.074	1.658 (0.928–2.963)	0.088
	50-75%	1.402 (0.796–2.470)	0.243	1.313 (0.735–2.346)	0.357
	75-100%	ref			
	Personality trait type				
	Extraverted	1.734 (0.840–3.580)	0.137		
	Conscientious	1.312 (0.629–2.739)	0.469		
	Easygoing	1.440 (0.738–2.811)	0.285		
	Emotionally stable	1.666 (0.755–3.678)	0.207		
	Open-minded	ref			
		Univariate logistic regression		Multivariate logistic regression	
		OR (95%CI)	P	OR (95%CI)	P

Table 2 (continued)

		Univariate logistic regression		Multivariate logistic regression	
		OR (95%CI)	p-value	OR (95%CI)	p-value
Practice	Knowledge score	1.098 (1.065–1.132)	< 0.001	1.084 (1.048–1.121)	< 0.001
	Attitude score	1.064 (1.029–1.101)	< 0.001	1.037 (0.998–1.077)	0.062
	SRSS score	0.919 (0.896–0.943)	< 0.001	0.936 (0.910–0.962)	< 0.001
	Acceptance of treatment for sleep disorders	1.153 (1.086–1.223)	< 0.001	1.127 (1.055–1.203)	< 0.001
	Gender				
	Male	1.829 (1.381–2.422)	< 0.001	2.054 (1.499–2.813)	< 0.001
	Female	ref		ref	
	Age				
	14–17 years	1.425 (0.945–2.149)	0.091		
	≥18 years	ref			
	Grade				
	Grade 10	1.232 (0.878–1.729)	0.228		
	Grade 11	0.904 (0.624–1.308)	0.591		
	Grade 12	ref			
	School level				
	Three-star and below	0.429 (0.269–0.682)	< 0.001	0.351 (0.204–0.605)	< 0.001
	Four-star	1.380 (0.949–2.008)	0.092	1.015 (0.669–1.538)	0.946
	Five-star	ref		ref	
	Residence				
	Rural	0.686 (0.489–0.964)	0.030	0.938 (0.628–1.402)	0.755
	Urban	1.023 (0.733–1.426)	0.895	1.099 (0.748–1.613)	0.631
	City	ref		ref	
	Academic ranking				
	Top 25%	1.710 (1.113–2.626)	0.014	1.479 (0.918–2.383)	0.108
	25-50%	1.888 (1.207–2.954)	0.005	1.873 (1.144–3.067)	0.013
	50-75%	1.472 (0.933–2.325)	0.097	1.431 (0.866–2.365)	0.162
	75-100%	ref		ref	
	Personality trait type				
	Extraverted	1.578 (0.895–2.782)	0.115		
	Conscientious	1.264 (0.701–2.279)	0.436		
	Easygoing	1.376 (0.802–2.359)	0.246		
	Emotionally stable	1.588 (0.862–2.923)	0.138		
	Open-minded	ref			

Table 3 Structural equation model fit

Model fit	Ref.	Measured results
CMIN/DF	1–3 excellent, 3–5 good	5.118
RMSEA	< 0.08 good	0.072
IFI	> 0.8 good	0.803
TLI	> 0.8 good	0.787
CFI	> 0.8 good	0.802

Table 4 Path estimate results for the structural equation model

Path	Estimate	S.E.	C.*R.*	*p*-value
Sleep_quality→Knowledge	-0.154	0.043	-3.580	< 0.001
Knowledge→Attitude	0.216	0.039	5.541	< 0.001
Sleep_quality→Attitude	-0.169	0.042	-4.062	< 0.001
Knowledge→Practice	0.394	0.057	6.913	< 0.001
Sleep_quality→Practice	-0.356	0.067	-5.341	< 0.001
Attitude→Practice	0.141	0.069	2.031	0.042

students make informed decisions about their sleep habits and recognize the complexity of sleep-related issues. Educational institutions should emphasize the long-term consequences of untreated sleep disorders and the significance of early intervention. Raising awareness about the potential health risks of untreated sleep problems is of crucial importance [22].

This study revealed high school students' attitude towards sleep, showing their recognition of the importance of sleep to health and the seriousness of insomnia. However, many also view sacrificing sleep for academics as justifiable, highlighting a conflict between educational demands and sleep health. Educational institutions can consider policies and practice prioritizing students' sleep health to address these attitudes. To implement these interventions, schools could integrate sleep education into existing health or physical education curricula, minimizing additional instructional time demands.

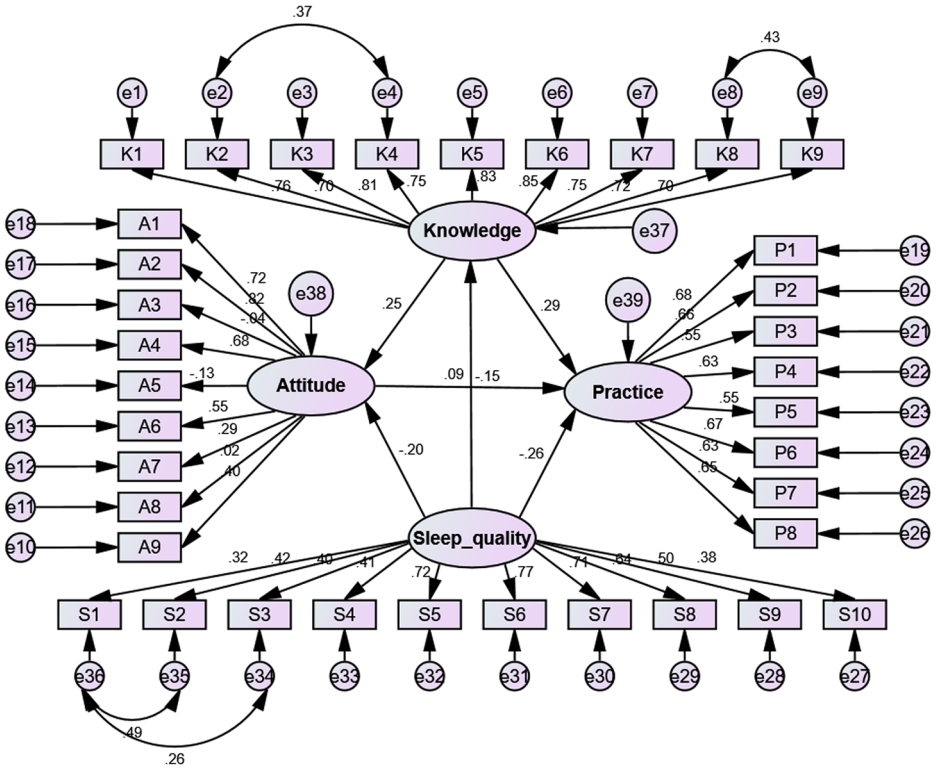

Fig. 2 Structural equation model diagram for the relationships among sleep quality (SRSS), knowledge, attitude, and practice

Collaboration with parents to promote consistent sleep habits at home is also essential. Potential challenges include limited resources and resistance from stakeholders prioritizing academics. These could be addressed through targeted funding, teacher training, and emphasizing the link between sleep quality and academic performance. These measures may include setting reasonable academic expectations, advocating for balanced extracurricular activities, and fostering a culture that values sleep as a fundamental component of well-being [2, 23].

The evaluation of sleep practice in high school students shows varied adherence, with some practicing positive habits and others being inconsistent. A significant observation is the prevalent use of electronic devices at night, exposing students to sleep-disruptive blue light. Collaborative efforts between schools, parents, and students can help establish guidelines on screen time and promote the importance of creating a sleep-conducive bedroom environment. Additionally, schools should encourage students to engage in physical exercise and cultivate emotional regulation abilities as part of their overall well-being and sleep hygiene [24, 25].

Correlation analyses showed that lower sleep quality in students was linked to lower knowledge and less positive attitude about sleep disorders, suggesting these individuals might be less aware or concerned about these issues. A positive correlation between knowledge and attitude and between knowledge and practice indicated that improving knowledge about sleep can lead to more positive attitude and healthier practice. Our results highlight the need for multifaceted interventions, including tailored education programs for students with good sleep quality, to increase awareness and promote healthier sleep practice and attitude [26, 27].

The logistic regression results showed that better sleep quality, awareness of treatment options, and attending a high-resource school were linked to better knowledge about sleep disorders. Improving knowledge, especially among male students, can foster a more positive attitude toward sleep disorders. Interventions should focus on increasing knowledge and addressing specific factors related to sleep practice, targeting students in lower-resourced schools and those with lower academic rankings [28, 29]. In order to enhance sleep hygiene, we suggest a couple of practical steps. Schools should introduce comprehensive sleep education, workshops, and awareness campaigns to improve knowledge and self-efficacy. Healthcare providers should focus on early detection and treatment of sleep disorders. Tailored gender-specific education may be useful. Lower-rated schools should receive targeted interventions to promote better sleep habits.

The SRSS results show that many high school students face sleep issues, such as insufficient sleep and difficulty maintaining sleep, echoing previous studies on adolescent sleep problems [30]. The notable use of sleeping pills among these students indicates a need for effective non-pharmacological interventions, like behavioral strategies and sleep hygiene improvements [31–33]. In order to address these sleep-related challenges, educational institutions should consider implementing comprehensive sleep education programs that emphasize the importance of sleep and provide strategies for improving sleep quality without medication. Furthermore, schools can explore adjusting start times to match students' natural sleep patterns [3] more effectively.

Strengths and limitations

Despite the focus on a specific region, a cross-sectional design, and reliance on self-reported data, this study provides important insights into high school students' knowledge, attitudes, and practices regarding sleep disorders. However, the restriction to schools in particular city may limit the generalizability of the findings to other regions with different educational systems or cultural contexts. Additionally, the reliance on self-reported data introduces the potential for response biases, such as social desirability bias or recall bias, which may have influenced the accuracy of reported behaviors and attitudes. This study has several strengths. First, the use of a probabilistic sampling method ensures that the sample is representative of the target population, enhancing the generalizability of the findings. Second, the participation rate exceeding 80% minimizes non-response bias, strengthening the reliability of the data. Third, conducting a pilot study allowed us to validate the questionnaire and refine the study design, ensuring the reliability and clarity of the measures. Finally, the use of advanced statistical techniques, including structural equation modeling, facilitated a comprehensive understanding of the complex relationships among variables, providing robust and meaningful insights into the factors influencing students' knowledge, attitudes, and practices regarding sleep disorders.

Future suggestions

Future studies could also explore the effectiveness of tailored educational interventions, such as integrating sleep education into school curricula or conducting workshops focused on time management, stress reduction, and minimizing screen use before bedtime. These interventions could be evaluated using experimental or quasi-experimental designs to establish causal relationships. Additionally, longitudinal research could track changes in students' sleep habits and KAP over time, offering insights into the long-term impact of educational and behavioral strategies on sleep quality and academic performance. Such studies would help identify best practices for promoting healthy sleep habits in adolescent populations.

Conclusions

While high school students generally exhibited positive attitude and proactive practice regarding sleep disorders, this study revealed a notable gap in their knowledge of this condition. Thus, it is essential to develop targeted educational programs to further the understanding of sleep disorders, potentially improving high school students' sleep quality and overall health.

Abbreviations

KAP knowledge, attitudes, and practices
SRSS Self-Rating Scale of Sleep
SEM Structural equation modeling

Supplementary Information

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Supplementary Material 1

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Author contributions

Wei Zhong and Jie Ding carried out the studies, participated in collecting data, and drafted the manuscript. Jie Ding and Xiaoyi Cai performed the statistical analysis and participated in its design. Jun Yan and Fengshu Zhu participated in acquisition, analysis, or interpretation of data and draft the manuscript. All authors read and approved the final manuscript.

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Data availability

All data generated or analysed during this study are included in this published article and its supplementary information files.

Declarations

Ethics approval and consent to participate

This work has been carried out in accordance with the Declaration of Helsinki (2000) of the World Medical Association. The study was approved by the Ethics Review Committee of the First People's Hospital of Yancheng City (Approval Number: 2023-K-210), and informed consent was obtained from the student participants and their parents or guardians.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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