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A CROSS-SECTIONAL KAP ANALYSIS OF SLEEP DISORDERS AMONG PUBLIC AND PRIVATE UNIVERSITY STUDENTS IN PUNJAB, PAKISTAN

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Abstract

Sleep disturbances are a global public health problem among university students, about 50% to 62% of Pakistani students present with symptoms of clinical insomnia. This cross-sectional survey was conducted among 601 undergraduate students of three public and three private universities of Lahore, Punjab. Data were obtained by means of a standardized questionnaire, which included the Self-Rating Scale of Sleep (SRSS) and dedicated KAP dimensions. The results revealed mean scores of 10.82 ± 3.05 for knowledge, 34.24 ± 5.51 for attitude, and 27.39 ± 7.35 for practice. Significant

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differences in sleep quality were observed based on gender ($p < 0.001$) and personality traits ($p < 0.001$). The main disruptor was the excessive use of technological devices (27.8%) and academic pressure (24.5%). Multivariate logistic regression indicated that while knowledge (OR = 1.141, $p = 0.003$) and attitude (OR = 1.123, $p < 0.001$) independently correlate with practice, younger students (18–22 years) and second-year students have significantly reduced odds of maintaining good sleep hygiene. Structural Equation Modeling (SEM) demonstrated that attitude completely mediates the relationship between knowledge and practice; the direct impact of knowledge on practice was not statistically significant ($p = 0.105$). The survey concluded that students have a positive attitude yet there is a large knowledge gap. Because information only improves behavior when it successfully modifies a student's perspective, educational institutions must shift from passive information transmission to customized interventions. Integrating sleep hygiene, stress reduction, and digital wellness into curricula is essential to mitigate the long-term cognitive and physiological risks associated with chronic sleep deprivation.

1. INTRODUCTION

Sleep disorders include a range of conditions that markedly interfere with normal sleep structure, onset, and duration. The prevalence of sleep disruptions among young adults entering higher education is a significant public health issue, with global data revealing that up to 60% of university students have regular sleep interruptions and inadequate sleep hygiene[1, 2]. University students are particularly susceptible to disruptions in sleep homeostasis due to irregular schedules, the psychological burden of academic requirements, and excessive screen exposure[3]. The implications of these interruptions reach much beyond mere daytime tiredness. Chronic poor sleep quality in this group is closely linked to cognitive decline, emotional instability, diminished academic performance, and a heightened risk of long-term physiological and psychological difficulties, such as anxiety, depression, and cardiovascular problems[4, 5]. Although the prevalence of sleep disorders among students is recognized worldwide, focused research within the unique educational context of

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Lahore, Punjab, Pakistan, reveals a significant local epidemic. Recent regional research reveals that 50% to 62% of Pakistani university students exhibit signs of clinical insomnia, nocturnal awakenings, and inadequate sleep quality [6-8]. Furthermore, the academic landscape in Pakistan is markedly fragmented, resulting in unique environmental pressures. The stringent clinical requirements, comprehensive curricula, and practical rotations characteristic of medical and allied health sciences schools pose distinct hurdles compared to non-medical fields. Comparative research in Pakistan has revealed this discrepancy. Research employing the Pittsburgh Sleep Quality Index (PSQI) indicates that medical students experience markedly poorer sleep quality (approximately 67%) than their non-medical counterparts (approximately 50%), often demonstrating reduced sleep durations and considerably prolonged sleep latency[9, 10]. In contrast, recent data indicate that non-medical students may demonstrate elevated levels of problematic smartphone addiction, which acts as an independent predictor of worse sleep quality, thus confusing the risk profiles specific to each profession [11]. Notwithstanding these pronounced statistical discrepancies, the fundamental psychological and behavioral processes influencing these variances across many academic areas remain inadequately examined. Addressing these widespread sleep disorders necessitates comprehensive interventions, including sleep hygiene education, Cognitive Behavioral Therapy for Insomnia (CBT-I), stimulus management, and lifestyle adjustments[12, 13]. Effectively implementing such techniques necessitates a fundamental comprehension of the target population's existing awareness and daily practices. The Knowledge, Attitude, and Practice (KAP) model functions as a comprehensive quantitative framework to elucidate the behavioral and psychological determinants of health[14]. Recent implementations of the KAP framework in sleep medicine indicate that increased knowledge and more favorable attitudes are independently correlated with proactive sleep practices[15, 16]. Nonetheless, prior research indicates a notable disparity among students, wherein sufficient understanding of sleep hygiene does not consistently translate into beneficial practices under excessive academic pressure [17]. The implementation of this methodology to map and compare the sleep patterns of Pakistani university students across clinical and non-clinical paths is nearly

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nonexistent. Understanding how a student's foundational knowledge and mindset influence their bedtime rituals is essential for creating effective, customized interventions. This research aims to examine the knowledge, attitudes, and practices of sleep problems among university students in Lahore, Punjab, Pakistan. The study specifically assesses and contrasts medical and non-medical students from prominent public sector institutions (University of Veterinary and Animal Sciences (UVAS), Government College University (GCU), University of Engineering and Technology (UET) and private sector institutions (University of Central Punjab (UCP), University of Lahore (UOL), Superior University). This study employs the KAP approach to uncover misunderstandings, unhealthy practices, and knowledge deficiencies to guide targeted educational programs, public health policies, and institutional support systems.

2. Materials and Methods

2.1. Study design and participants

This cross-sectional study was conducted at six higher education institutions in Lahore, Punjab, Pakistan: three public universities, University of Veterinary and Animal Sciences (UVAS), Government College University (GCU), University of Engineering and Technology (UET) and three private universities, University of Central Punjab (UCP), University of Lahore (UOL), Superior University. This study recruited a total of 601 undergraduate students. Participants were intentionally chosen to reflect diverse academic performance levels (stratified by cGPA from < 1.00 to 4.00) and specific academic disciplines, namely medical/allied health sciences and non-medical programs. Only undergraduate students presently enrolled were included. The universities were selected to represent a variety of educational settings and socioeconomic conditions, encompassing both urban and rural student backgrounds. The study protocol received approval from the Institutional Review Board (IRB) of the University of Central Punjab, and informed written consent was acquired from all student participants before data collection commenced.

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2.2. Questionnaire and quality control

A pre-validated, standardized questionnaire, first developed in accordance with clinical standards and corroborated by prior literature, was utilized in this investigation without amendment. The internal consistency of the questionnaire for our study sample was deemed acceptable, with a Cronbach's α coefficient of 0.817 for the entire questionnaire, and 0.656, 0.675, and 0.834 for the knowledge, attitude, and practice sections, respectively. The questionnaire had strong construct validity, indicated by a Kaiser-Meyer-Olkin (KMO) value of 0.746 for the entire instrument, and 0.710, 0.718, and 0.832 for the knowledge, attitude, and practice sections, respectively.

The SRSS, developed by Professor Li Jianming, consists of 10 questions scored between 10 and 50 points, where lower values reflect less sleep-related concerns and higher scores indicate more severe or numerous sleep problems[18]. The Knowledge, Attitude, and Practice (KAP) components were evaluated systematically. The knowledge dimension had 9 questions, each allocated 2 points for comprehensive understanding ("Very familiar"), 1 point for rudimentary understanding ("Heard about"), and 0 points for lack of clarity ("Not familiar"), for a total possible score between 0 and 18 points. The attitude component had 9 items assessed via a five-point Likert scale, spanning from 'strongly agree' to 'strongly disagree,' with a total possible score ranging from 45 to 9 points. The practice dimension comprised 8 items assessed via a five-point Likert scale, with responses ranging from 'always' to 'never,' scored from 5 to 1. This was supplemented by a 9th multiple-choice question concerning specific exercise types (e.g., yoga, meditation, walking) and analyzed descriptively. The cumulative scores for the KAP dimensions varied from 17 to 103 points, with values exceeding 70% of the maximum in each category signifying sufficient knowledge, favorable attitude, and proactive practice.

The data collection for the 601 participants was executed in person via the distribution of paper-based questionnaires on-site. The distribution was conducted with the support of appointed academic representatives and project team members from the six chosen public and private sector universities. Questionnaires were disseminated to students in their designated departments and

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classrooms, and upon completion, they were promptly retrieved on-site. This approach guaranteed a substantial response rate and a fair distribution of both medical and non-medical participants.

3. Results

Table 1:Baseline characteristics and SRSS, KAP scores of investigated population (N=601)

Baseline Characteristics	n (%)	SRSS (Mean ± SD)	p-value	Knowledge (Mean ± SD)	p-value	Attitude (Mean ± SD)	p-value	Practice (Mean ± SD)	p-value
Total Score	601	248.60 ± 57.22		10.82 ± 3.05		34.24 ± 5.51		27.39 ± 7.35	
Gender			**0.000**		0.432		0.490		0.154
Female	306 (50.9)	260.92 ± 57.31		10.92 ± 2.77		34.40 ± 4.88		26.97 ± 7.16	
Male	295 (49.1)	235.83 ± 54.34		10.72 ± 3.31		34.08 ± 6.10		27.83 ± 7.52	
Age			0.761		0.263		0.074		**0.000**
18–22 years	355 (59.1)	248.82 ± 56.64		10.68 ± 2.98		33.82 ± 5.62		25.85 ± 7.41	
23–26 years	242	248.6		11.04 ±		34.86 ±		29.63 ±	

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	(40.3)	4 ± 57.91		3.16		5.17		6.60	
> 26 years	4 (0.6)	227.50 ± 78.89		9.50 ± 0.57		34.50 ± 11.90		28.25 ± 11.70	
Study Year			**0.025**		0.172		**0.000**		**0.000**
1st Year	77 (12.8)	264.68 ± 47.73		10.94 ± 3.02		33.36 ± 4.65		27.95 ± 5.70	
2nd Year	180 (30.0)	246.39 ± 61.89		10.39 ± 2.98		32.82 ± 6.79		23.85 ± 7.91	
3rd Year	66 (11.0)	238.64 ± 44.55		10.68 ± 3.67		34.45 ± 4.13		27.55 ± 6.76	
4th Year	106 (17.6)	255.09 ± 57.77		10.98 ± 3.19		35.33 ± 4.28		28.56 ± 7.39	
5th Year	172 (28.6)	243.55 ± 58.76		11.17 ± 2.75		35.37 ± 5.16		30.07 ± 6.13	
Academic Ranking			0.898		0.391		**0.001**		**0.003**
Top 25%	7 (1.2)	268.57 ±		11.00 ± 1.63		31.29 ± 5.99		26.57 ± 8.50	

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		55.81							
25-50%	20 (3.3)	246.50 ± 41.71		11.85 ± 3.48		32.10 ± 2.49		27.20 ± 4.16	
50-75%	190 (31.6)	247.26 ± 58.25		10.58 ± 3.36		33.24 ± 6.91		25.67 ± 8.32	
75-100%	381 (63.4)	249.08 ± 57.51		10.89 ± 2.88		34.88 ± 4.67		28.27 ± 6.82	
Residence			0.776		**0.002**		0.652		0.186
Urban	402 (66.9)	250.57 ± 58.63		10.62 ± 3.03		34.33 ± 5.81		27.62 ± 7.58	
Rural	186 (30.9)	244.89 ± 55.37		11.09 ± 3.04		34.09 ± 4.98		26.83 ± 7.01	
Personality Trait			**0.000**		**0.007**		**0.034**		0.088
Social	112 (18.6)	240.18 ± 54.59		10.22 ± 2.99		35.54 ± 4.31		26.92 ± 6.06	
Careful	167 (27.8)	252.63 ± 58.43		10.48 ± 2.72		33.92 ± 4.70		26.99 ± 6.83	

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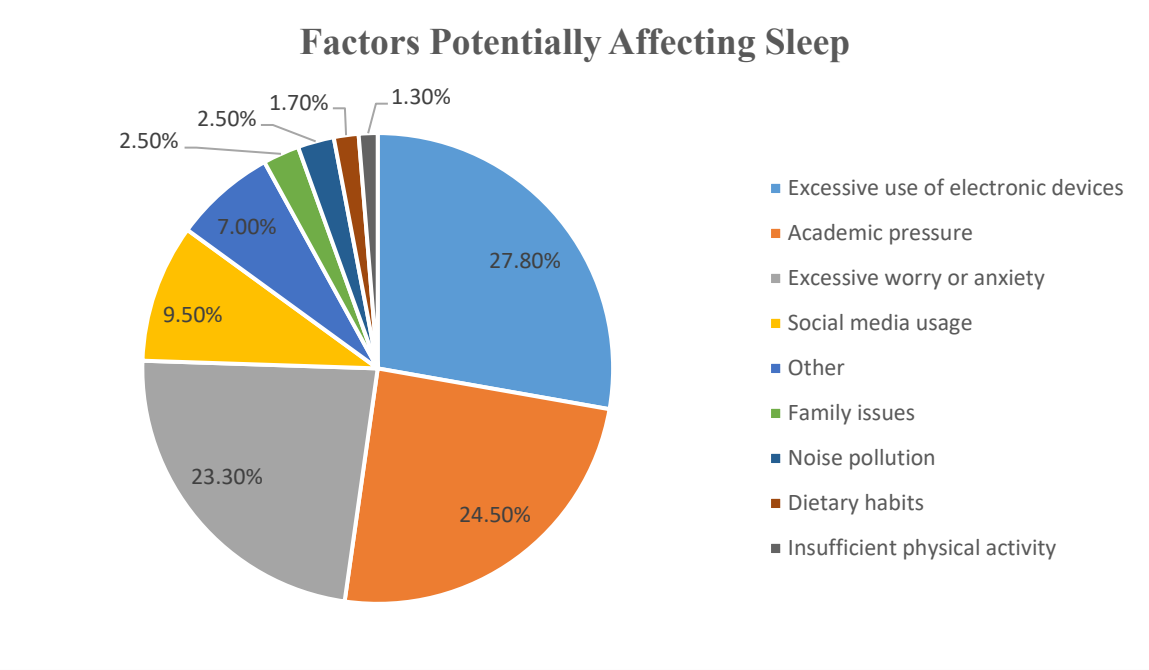
Relaxed	136 (22.6)	235.96 ± 51.23		10.95 ± 3.64		33.71 ± 7.88		27.60 ± 7.81	
Emotionally stable	84 (14.0)	233.93 ± 53.77		11.14 ± 2.87		34.80 ± 4.56		29.36 ± 7.10	
Open-minded	102 (17.0)	280.20 ± 56.34		11.59 ± 2.75		33.59 ± 4.54		26.66 ± 8.77	
Acceptance of Treatment		1.43 ± 0.65							



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A total of 601 university students from the University of Central Punjab were solicited to partake in this study. All 601 questionnaires were retrieved and verified, resulting in a response rate of 100%. Of the participants, 306 (50.9%) were female, and 295 (49.1%) were male. In terms of personality qualities, 136 individuals (22.6%) were categorized as relaxed, 167 (27.8%) as careful, and 112 (18.6%) as social. The average acceptance of treatment for sleep problems within the population was 1.43 ± 0.65. The mean scores for the studied population were 248.60 ± 57.22 for SRSS, 10.82 ± 3.05 for knowledge, 34.24 ± 5.51 for attitude, and 27.39 ± 7.35 for practice. University students of varying gender ($p < 0.001$), academic year ($p = 0.025$), and personality traits ($p < 0.001$) exhibited significant differences in SRSS scores. Individuals with varying residences ($p = 0.002$) and personality traits ($p = 0.007$) exhibited a higher likelihood of possessing disparate knowledge scores. Attitude score variations were significant across different study years ($p < 0.001$), academic rankings ($p = 0.001$), and personality traits ($p = 0.034$). Practice scores showed substantial variation according to age ($p < 0.001$), study year ($p < 0.001$), and academic standing ($p = 0.003$) (Table 1). Concerning elements that may influence sleep, 27.8% (n=167) of students indicated excessive electronic device usage, 24.5% (n=147) attributed it to academic pressure, and 23.3% (n=140) claimed excessive stress or anxiety. Additional cited factors were social media utilization (9.5%), eating practices (1.7%), and inadequate physical activity (1.3%). Multivariate logistic regression analysis revealed multiple independent factors for sleep practices. The knowledge score (OR = 1.141, 95% CI: [1.046–1.246], $p = 0.003$), attitude score (OR = 1.123, 95% CI: [1.067–1.181], $p < 0.001$), and SRSS score (OR = 0.991, 95% CI: [0.987–0.995], $p < 0.001$) exhibited significant associations with practice. Demographic characteristics remained significant; students aged 18–22 years (OR = 0.463, 95% CI: [0.247–0.869], $p = 0.017$) and second-year students (OR = 0.353, 95% CI: [0.161–0.773], $p = 0.009$) exhibited reduced odds of good practice relative to their respective reference groups. The fit indices indicated that the SEM model exhibited an outstanding fit (Table 3). The observed outcomes were CMIN/DF = 0.000, RMSEA = 0.000, IFI = 1.000, TLI = 1.000, and CFI = 1.000. Path analysis revealed that knowledge has a direct and significant impact on attitude (beta = 0.372, $p < 0.001$).

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Attitude had a significant direct impact on practice (beta = 0.574, p < 0.001). The direct relationship between knowledge and practice (beta = 0.146, p = 0.105) was not statistically significant, suggesting that the connection between knowledge and sleep practice is mediated by attitude (Table 4).

4. Discussion

The study's findings revealed that most university students in Punjab exhibited insufficient knowledge (mean score 10.82), although they had a proactive stance and a favorable attitude toward sleep disorders[13, 14]. Moreover, sound sleep practices were independently correlated with sleep quality (SRSS score), knowledge scores, and attitude ratings. Prior studies have shown the significance of these frameworks [14]. Therefore, to enhance students' comprehension and management of sleep problems, educational interventions must to be integrated into university curricula. This research enhances the understanding of the complex interplay between university students' knowledge, attitudes, and practices about sleep problems and many demographic and behavioral factors. Significant gender disparities in SRSS scores ($p < 0.001$) illustrate the unique sleep quality profiles of male and female students under academic strain[1, 2]. In contrast, the differences in knowledge concerning residency ($p = 0.002$) align with the assertion that students from diverse origins (urban versus rural) generally possess unequal access to health information and resources. The fifth-year students achieved the highest practice scores (30.07 ± 6.13), which correlated significantly with their academic year ($p < 0.001$). This indicates that academic seniority and enhanced clinical exposure may enhance self-management capabilities. In contrast, the diminished scores of junior students highlight the strong relationship between academic stress and sleep disturbances in the early university years[8, 17]. The study provides a foundational understanding of sleep problems and highlights considerable shortcomings in recognizing the elements that affect sleep and in executing associated preventive strategies. To aid students in making educated choices about their sleep patterns and to understand the complexities of sleep-related concerns, which are closely linked to cognitive and academic performance, this information gap must be addressed. Educational

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institutions must emphasize the need of early intervention in averting cardiovascular and mental health issues, along with the enduring consequences of unaddressed sleep disorders [4].The findings indicated that university students recognize the need of sleep. Academic duress was seen as a substantial factor affecting the sleep of 24.5% of pupils. This highlights the conflict between the opposing requirements of education and sleep health, especially in demanding academic and allied health programs[9, 10]. Educational institutions may consider establishing policies and processes that prioritize students' sleep health to address these attitudes. To adopt these interventions, institutions could incorporate sleep education into their current curricula, thereby minimizing the necessity for extra instructional time and improving overall sleep quality. The evaluation of sleep patterns among college students indicates a diverse degree of adherence, with certain students demonstrating favorable habits while others display inconsistency. The observed excessive use of electronic devices at night by 27.8% of participants is a significant observation. This aligns with recent studies indicating that smartphone addiction independently predicts worse sleep quality[11] and exposes students to sleep-disruptive blue light. Screen time guidelines may be created through the involvement of university students. Furthermore, educational institutions ought to promote the development of emotional regulation skills and physical activity among students, given that 23.3% of students indicated that their sleep was negatively impacted by excessive worry or anxiety. Structural Equation Modeling (SEM) investigations indicated that sleep-related attitudes significantly mediated behavioral change. Attitude was directly affected by knowledge ($\beta = 0.372$, $p < 0.001$), while practice was directly affected by attitude ($\beta = 0.574$, $p < 0.001$). The direct relationship between knowledge and practice was not statistically significant ($p = 0.105$), suggesting that information may enhance sleep habits only if it successfully modifies the student's attitude (full mediation). Our findings highlight the imperative of employing diverse ways to foster the cultivation of healthy sleep habits and attitudes, alongside the enhancement of awareness [15, 16]. Multivariate logistic regression indicated that enhanced practice was independently correlated with elevated knowledge ratings (OR = 1.141) and favorable attitude scores (OR = 1.123). Moreover, second-year

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students (OR = 0.353) and younger students aged 18-22 (OR = 0.463) were considerably less likely to exhibit outstanding practice compared to their counterparts. The main aim of interventions should be to enhance awareness and address specific aspects related to sleep practices, particularly for junior students facing considerable transitional academic stress[17]. Academic counselors and healthcare providers should prioritize the early detection and treatment of sleep issues. The SRSS findings corroborate the prevalent regional epidemics of nocturnal awakenings and insomnia[6, 7], suggesting that a considerable proportion of university students are encountering sleep disturbances. The significant frequency of these disorders underscores the importance for effective nonpharmacological therapies, including cognitive behavioral methods (CBT-I) and improvements in sleep hygiene. To address these sleep-related issues, it is advisable for higher education institutions to establish comprehensive sleep education programs.

Table 2: Univariate and Multivariate Logistic Regression Analysis for Factors Associated with Good Knowledge (N=601)

Variable	Univariate OR (95% CI)	p-value	Multivariate OR (95% CI)	p-value
SRSS Total Score	1.000 (0.997–1.004)	0.804	–	–
Acceptance of treatment	1.474 (1.110–1.959)	**0.007**	1.410 (1.064–1.870)	**0.017**
Gender			–	–
Male	0.966 (0.677–1.379)	0.849	–	–
Female	ref		–	–
Age			–	–

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18–22 years	0.909 (0.634–1.303)	0.602	–	–
>= 23 years	ref		–	–
Study Year		0.081	–	–
1st Year	1.692 (0.963–2.971)	0.067	–	–
2nd Year	0.740 (0.458–1.197)	0.220	–	–
3rd Year	1.091 (0.587–2.030)	0.782	–	–
4th Year	0.901 (0.523–1.553)	0.708	–	–
5th Year	ref		–	–
Academic Ranking			–	–
Top 50%	0.715 (0.284–1.804)	0.478	–	–
Bottom 50%	ref		–	–
Residence			–	–
Urban	0.921 (0.627–1.353)	0.675	–	–
Rural	ref		–	–
Personality Trait Type		**<0.001**		**<0.001**
Social	0.323 (0.173–	**<0.001**	0.329 (0.176–	**<0.001**

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	0.604)		0.616)	
Careful	0.353 (0.203–0.613)	**<0.001**	0.341 (0.195–0.595)	**<0.001**
Relaxed	0.838 (0.494–1.421)	0.512	0.780 (0.457–1.330)	0.361
Emotionally stable	0.705 (0.385–1.291)	0.257	0.621 (0.335–1.153)	0.131
Open-minded	ref		ref	

Table 3: Univariate and Multivariate Logistic Regression Analysis for Factors Associated with Positive Attitude (N=601)

Variable	Univariate OR (95% CI)	p-value	Multivariate OR (95% CI)	p-value
Knowledge Score	0.655 (0.581–0.740)	**<0.001**	0.605 (0.521–0.702)	**<0.001**
SRSS Score	0.998 (0.993–1.003)	0.506	–	–
Acceptance of treatment	0.563 (0.374–0.849)	**0.006**	0.614 (0.397–0.948)	**0.028**
Gender			–	–
Male	0.962 (0.531–1.743)	0.897	–	–
Female	ref		–	–
Age			–	–
18–22 years	1.121 (0.615–	0.709	–	–

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	2.043)			
>= 23 years	ref		–	–
Study Year		0.223		**0.018**
1st Year	0.388 (0.142–1.058)	0.064	0.348 (0.113–1.070)	0.066
2nd Year	0.412 (0.179–0.950)	**0.038**	0.220 (0.083–0.584)	**0.002**
3rd Year	0.791 (0.234–2.676)	0.706	0.972 (0.258–3.664)	0.967
4th Year	0.581 (0.222–1.520)	0.268	0.693 (0.223–2.152)	0.526
5th Year	ref		ref	
Academic Ranking			–	–
Top 50%	2.269 (0.298–17.251)	0.871	–	–
Bottom 50%	ref		–	–
Residence			–	–
Urban	0.778 (0.390–1.551)	0.476	–	–
Rural	ref		–	–
Personality Trait Type		0.098	–	–
Social	2.676 (0.776–9.222)	0.119	–	–

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Careful	1.381 (0.510–3.741)	0.525	–	–
Relaxed	0.703 (0.286–1.728)	0.442	–	–
Emotionally stable	0.658 (0.250–1.735)	0.398	–	–
Open-minded	ref		–	

Table 4: Univariate and Multivariate Logistic Regression Analysis for Factors Associated with Good Practice (N=601)

Variable	Univariate OR (95% CI)	p-value	Multivariate OR (95% CI)	p-value
Knowledge Score	1.173 (1.095–1.258)	**<0.001**	1.141 (1.046–1.246)	**0.003**
Attitude Score	1.144 (1.097–1.194)	**<0.001**	1.123 (1.067–1.181)	**<0.001**
SRSS Score	0.993 (0.989–0.997)	**<0.001**	0.991 (0.987–0.995)	**<0.001**
Acceptance of treatment	1.077 (0.769–1.508)	0.667	–	–
Gender			–	–
Male	0.857 (0.567–1.295)	0.464	–	–
Female	ref		–	–
Age				**0.017**

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18–22 years	0.313 (0.191–0.512)	**<0.001**	0.463 (0.247–0.869)	**0.017**
>= 23 years	ref		ref	
Study Year		**<0.001**		**<0.001**
1st Year	1.049 (0.387–2.840)	0.926	2.738 (0.909–8.251)	0.073
2nd Year	0.165 (0.088–0.308)	**<0.001**	0.353 (0.161–0.773)	**0.009**
3rd Year	0.561 (0.230–1.367)	0.204	0.818 (0.311–2.154)	0.684
4th Year	0.406 (0.194–0.849)	**0.017**	0.642 (0.275–1.497)	0.305
5th Year	ref		ref	
Academic Ranking			–	–
Top 50%	2.916 (0.680–12.498)	0.150	–	–
Bottom 50%	ref		–	–
Residence			–	–
Urban	1.064 (0.683–1.656)	0.784	–	–
Rural	ref		–	–
Personality Trait Type		0.089	–	–
Social	2.038 (0.985–	0.055	–	–

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	4.218)			
Careful	0.956 (0.531–1.718)	0.879	–	–
Relaxed	1.793 (0.916–3.508)	0.088	–	–
Emotionally stable	1.237 (0.605–2.531)	0.560	–	–
Open-minded	ref		–	

Table 5: Structural Equation Model Fit Indices

Model fit	Reference Range	Measured Results
CMIN/DF	1–3 excellent, 3–5 good	0.000
RMSEA	< 0.08 good	0.000
IFI	> 0.8 good	1.000
TLI	> 0.8 good	1.000
CFI	> 0.8 good	1.000

Table 6: Path Estimate Results for the Structural Equation Model

Path	Estimate (B)	S.E.	C.R. (t-value)	p-value
Knowledge → Attitude	0.372	0.072	5.150	**<0.001**
Attitude → Practice	0.574	0.050	11.528	**<0.001**
Knowledge → Practice	0.146	0.090	1.623	0.105

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4.1. Strengths and Limitations:

This study provides valuable insights into the knowledge, attitudes, and practices of university students in Pakistan concerning sleep problems, notwithstanding the limitations of a cross-sectional design that depends on self-reported data and a particular locale. However, the applicability of the findings to other locations with different educational systems may be limited due to the confinement of the institutions to a single city (Lahore). Moreover, the use of self-report data is prone to possible response biases. The strengths of the study encompass: The survey was first completed by all 601 students, achieving a 100% response rate. This mitigates non-response bias and enhances data reliability. Secondly, the academic sample was exceptionally representative, as the research encompassed both the public and private sectors. The comprehensive understanding of the complex interactions among variables was enhanced by new statistical methods, including structural equation modeling. Future research should investigate the efficacy of tailored educational interventions, including the incorporation of sleep education into university curricula and the facilitation of seminars focused on stress reduction, time management, and minimizing screen time prior to sleep. Evidence of causal effects from these interventions can be acquired by experimental or quasi-experimental methodologies. Moreover, longitudinal studies can elucidate the enduring impacts of instructional tactics on academic achievement by tracking alterations in students' sleep patterns and knowledge, attitudes, and practices across time.

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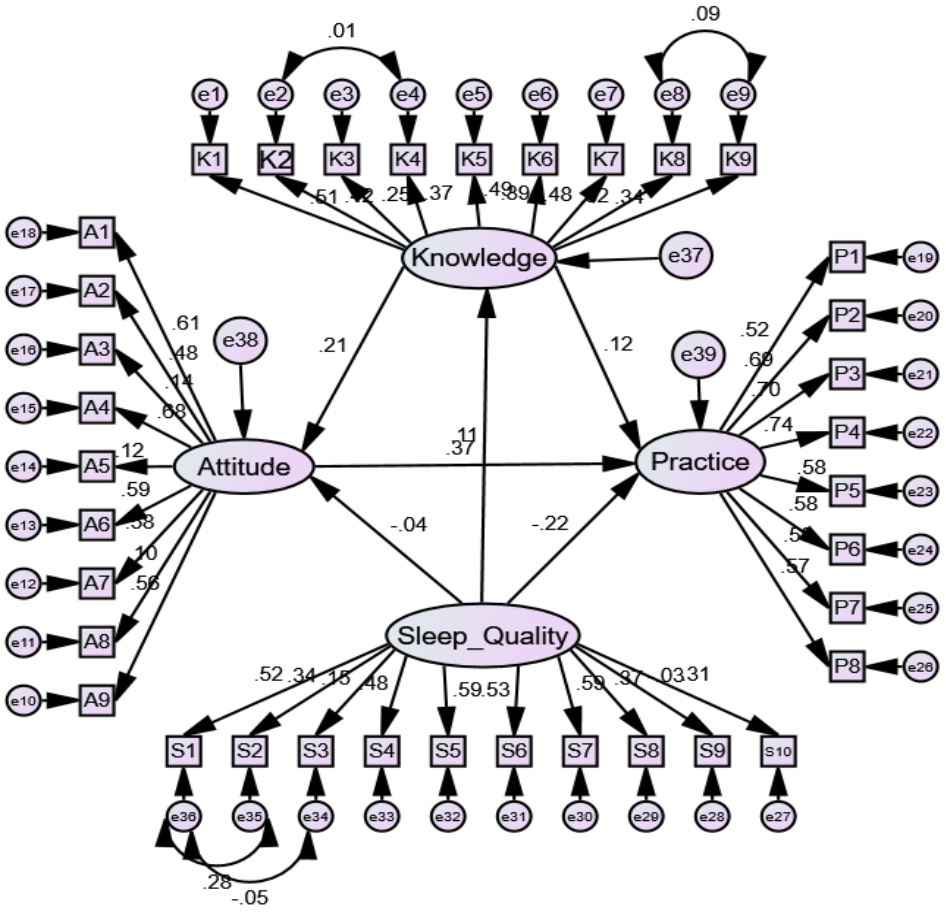

5. Conclusion

This study definitively demonstrates that while university students in Punjab maintain active sleep hygiene practices, there exists a considerable deficiency in fundamental knowledge concerning sleep problems. The findings from the structural equation modeling (SEM) indicate that attitude completely controls the relationship between knowledge and practice; only disseminating information is insufficient unless it can alter a student's perspective. The study identifies specific at-risk populations, notably first-year students (ages 18-22) and second-year students, who have markedly diminished likelihoods of adopting healthy sleep practices. To rectify these deficiencies, higher education institutions must progress from mere passive information transmission to

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implementing comprehensive and customized interventions. Such as ought to encompass: Integrating sleep hygiene education and stress reduction strategies into existing university curricula to improve long-term cognitive and physical health. Formulating institutional procedures to mitigate academic stress, identified by around one-quarter of participants as a significant disruptor of sleep. Establishing criteria for digital wellness to mitigate the adverse impacts of excessive electronic device usage on sleep quality. The fostering of a culture that prioritizes sleep health is essential for improving the academic performance and overall well-being of future professionals in Pakistan.

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