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THE INFLUENCE OF ACADEMIC STRESS AND CAFFEINE DEPENDENCE ON SLEEP DISTURBANCES AMONG UNIVERSITY STUDENTS

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Abstract

The present study was conducted to find out the influence of academic stress and caffeine dependence on sleep disturbances among university students. In the current study, students aged 18-30 years who were enrolled in HEC recognized universities in Rawalpindi Pakistan were assessed to evaluate the impact of academic stress and caffeine dependence on sleeping problems among students of Rawalpindi. A cross sectional research design was adopted. A simple random sampling technique was used to select HEC based universities for the present study and then through convenience sampling participants were selected. Questionnaires employed to assess academic stress and caffeine dependence, were the Perception of Academic Stress Scale (PASS; Bedewy & Gabriel, 2015) and the Caffeine Use Disorder Questionnaire (CUDQ; Meredith et al., 2013) . The Pittsburgh Sleep Quality Index (PSQI, Buysse et al., 1989) was used to assess sleep disturbances. The Pearson correlation coefficient was used to evaluate the relationship between the three variables. Caffeine dependency had a meaningful positive correlation with sleep disturbances($r = .278$, $p < .01$), and academic stress had a statistically nonsignificant correlation with sleep disturbances ($r = -.071$, $p > .05$). The regression analysis revealed that academic stress and caffeine dependency accounted for 7.9% of the variance in sleep disturbances ($R^2 = .079$), and caffeine dependence was the only significant predictor, while academic stress did not contribute significantly. This suggests that, while academic stress alone may have a limited effect, its combination with caffeine dependence can meaningfully lead to sleeplessness among university students. In order to lower sleep problems in university students, health services at the university may make programs to help students sleep better. Universities can control drinks with a lot of caffeine on campus. Public health groups can teach people about stress, safe caffeine use, and restful slumber habits for students.

INTRODUCTION

Academic stress refers to the mental stress due to academic tasks, such as fear from examinations, assignments load, pressure of time and performance expectation by self, parents and tutors (Bedewy & Gabriel, 2015; Kulakow et al., 2021).

Stress is viewed as the psychological state in which an individual perceives the pressure imposed by a particular situation to be greater than what he is capable of handling (Lazarus, 1966). A specific concept of the Yerkes-Dodson Law is that optimal performance occurs at an intermediate level of arousal, and it decreases at low and high levels of arousal (Kumaraswamy, 2013; Yerkes & Dodson, 1908)

Academic stress produces emotional and cognitive symptoms, such as depression, anxiety, self-destructive ideas (Pascoe et al., 2020; Mortier et al., 2018),poor concentration and can lower cognitive ability as well as school performance in adolescents (Sahu et al., 2024c). Female student always experiences more academic stress than males student. Mann-Whitney U-test showed a statistically significant difference between female and male student in academic stress (U = 4.85, p = .004) (Calaguas, 2011b;Parveen Banu et al., 2015;). Female students always report more depression and anxiety than male student, creating a vicious cycle and affect on school, sleep, well-being etc. (Muneer et al., 2024 ;Shakeel et al., 2022).

The sources of academic stress were financial pressures, family problems, demanding studies, scholarship/ stipend concerns and its consequences were fatigue, headache, sleeplessness and digestive problems. A survey showed that studies were the primary source of stress for 88% of student participants; moderate stress level for 78%; poor sleep for 54% (Ramachandiran & Dhanapal, 2018) and a link was also identified between high stress and increased hypertension, cardiovascular and other inflammatory diseases such as Crohn's disease, Type 2 diabetes and also affected on the quality of life (Zafar et al., 2021).

In Pakistan, a huge majority of students experience academic stress. 79% of student report high academic stress and 40% have developed mental health problems such as depression and anxiety (Murtaza et al., 2025; Muneer et al., 2024). Financial problems, digitalization and need to work while study cause stress to students in Karachi (Sajid et al., 2025). 96% of students experience stress in Khyber Pakhtunkhwa; stress factors were poor time management, frequency of tests/exams, finances and parental pressure (Saeed et al., 2020). In response to academic stress, students frequently resort to increased caffeine intake. Caffeine is a naturally occurring methylxanthine derivative found in products such as coffee, tea, coca and chocolate; it is also added to more than 70% of soft drinks in the U.S. and is the most widely consumed psychoactive substance in the world (Bernstein et al., 2002; Gilbert, 1984; Pendergrast, 1999;).

Caffeine is a psychostimulant that improves alertness, cognition, reading comprehension and reduce fatigue by blocking adenosine A1 and A2A receptors, stimulating the release of adrenaline, norepinephrine, dopamine and glutamate (Nazarudin, 2024; Zheng, 2023). Students taking medical degrees consume significant amounts of caffeine to combat their stress levels and achieve prolonged alertness (Jamil et al., 2023; Rajaseharan et al., 2021b; Seifi et al., 2025). Nurses use these stimulants to alleviate tiredness and elevate mood (Higbee & Gipson, 2025; Jamal, 2024; Kapała et al., 2024).A moderate amount of caffeine is generally not harmful and provides enhanced alertness, mood and energy without negative health consequences (Nehlig, 2016). Chronic excessive caffeine use however, leads to physical and psychological addiction, Tolerance and withdrawal symptoms such as headache, anxiety, low mood, fatigue, impaired concentration and comorbid psychiatric conditions (Davoudi et al., 2025).In addition to the broader impacts above, later day consumption of caffeine has been documented to have effects such as longer time to fall asleep, less time spent sleeping and reduced sleep quality, with the magnitude of these effects increasing with habitual consumption (Clark & Landolt, 2016; Drake et al., 2006; Kaldenbach et al., 2024).

Females tend to report greater total daily intake of caffeine compared to males while males tend to report a higher rate of Caffeine Use Disorder (CUD), (25.08% vs. 13.93%) (Abdoli et al., 2024; Dillon et al., 2019; Temple & Ziegler, 2011). Chronic consumption of caffeine results in development of tolerance within the central

nervous system through an increased number of adenosine receptors (Chou et al., 1985).

Adenosine, an integral component of the sleep mechanism, promotes sleep when bound to its respective receptors in the brain and throughout the central nervous system. When these receptors are blocked, caffeine has the ability to prevent the initiation of sleep, increase the time to fall asleep and decrease total sleep time (Clark & Landolt, 2016;Bryan,2025;Broman,2022).Sleep disturbances such as insomnia, hypersomnolence, and poor sleep quality are widespread among the adult population, with estimates suggesting that approximately one-third of adults experience sleep-related problems, of whom about 6–15% suffer from clinically diagnosed sleep disorders (Azad et al.,2015;Ohayon,2011;Cormier,1990).

Approximately 25% of variance in academic performance is explain by quality of sleep with lack of consistency in sleep or 'social jet lag' significantly related to poorer schoolwork (Okano et al., 2019; Marta et al., 2019). Academic stress, which increases the level of adrenaline and cortisol in the body that leads to caffeine consumption, further deteriorates sleep patterns that subsequently exacerbates stress levels forming a cyclical pattern (Drake et al., 2006;Kosecka et al., 2025).

Women paradoxically have better sleep architecture than men and still complain of sleeping problems (Almalki et al., 2025;Krishnan & Collop, 2006b). This study therefore aims to evaluate the impact of combined effect of academic stress and caffeine dependence on sleep disturbances in university students in Pakistan in light of the lack of research conducted on their interplay especially in South Asia.

Literature Review

Several studies have established significant correlation between energy drink intake, caffeine, academic stress and sleep disturbances among university students worldwide. Several studies show that the intake of energy drinks and caffeine negatively impacts sleep quality among university students. El-Shintiri et al. (2022) conducted a study among 1,000 students at a Libyan university where 59.4% students used energy drinks, and it served as a precipitating factor to cause poor sleep quality. Similarly, Kaldenbach et al. conducted a nationwide Norwegian cross-sectional study with 53,266 students and reported that even minimal use of energy drink was positively correlated with adverse sleep outcomes. In addition, it is observed that daily energy drink consumption was higher among males (4.7%) than females (3.3%).

Faris et al. (2016) surveyed 919 college students, of which 41% regularly used energy drinks and found significant relationship between energy drink use and disturbed sleep patterns. Tomanic et al. (2022) studied 1,287 adolescents, in which they observed that regular consumption of energy drink predicted lower sleep duration independent of sex in both males and females. Mwape et al. (2019) carried out a study on 100 university students in Zambia and found that while the use of energy drink among them was 27.4%, poor sleep quality was quite high among them at 59.6% and a statistically significant relationship was found between energy drink usage and poor sleep quality.

Alshumrani et al. Conducted a study with 260 Saudi medical students and stated that 74.6% students suffered from poor quality of sleep and 46.2% of students slept less than 5 hours daily. Sanchez et al. Investigated the use of energy drinks, caffeinated drinks and alcohol in 2458 Peruvian university students, stating that 58.4% of females and 52.0% of males consumed energy drinks, caffeinated drinks and alcohol respectively and also complained of experiencing poor sleep quality.

In addition, Patrick et al. (2018) in a study with 667 college students revealed that energy drinks significantly affected sleep duration, quality and increasing daily fatigue. Similarly, academic stress seems to be a major predictor of sleep disturbance. AlHamlan et al. (2025) investigated 875 university students in Kuwait and found a significant relationship between higher academic stress levels and poorer sleep quality. Lund et al. (2010) investigated 1,125 students and reported that 60% of the respondents complained about poor sleep quality with emotional and academic stress identified as two main precipitating factors causing sleep disturbance.

Paudel et al. (2022) reported that 38.2% Nepalese medical students had poor sleep quality and a significant correlation between poor sleep quality and depression and poor academic performance was observed. Hershner et al. (2014) showed that 50% college students suffer from daytime sleepiness with caffeine, stress and use of electronics reported as main causative factors. Wang et al. (2020) investigated four key factors for poor sleep quality as psychological stress, irregular schedule and high consumption of caffeine and determined that these factors were significant determinants for poor sleep quality. Mehta (2022) reported poor sleep quality and determined that it led to decreased attention, reduced memory and poor academic grades. Ong et al. (2023) reported that approximately three fourths of 403 Malaysian students had poor sleep quality which was strongly associated with anxiety, depression and poor academic performance.

Dinis et al. (2018) established a bidirectionality between sleep quality and depression whereas, Byrd et al. (2014) conducted a study on 2,645 Ethiopian students and determined that individuals with poor sleep quality are more prone to common mental disorders, and the prevalence was higher in females (30.6%) compared to males (25.4%). Hashim et al. (2022) found that 36.7% of 338 Malaysian dental students experienced poor sleep quality. The prevalence of poor sleep quality was found to be higher among males compared to females and it was linked with poor mental health and unhealthy lifestyle habits. It is interesting to note that Sadık et al. (2025) found that caffeine intake had a significant relationship with social jetlag but there was no association found between academic performance and caffeine consumption among 457 university students. In a similar study by Rosdi et al. (2023) it was determined that no significant association was found between frequency of caffeine intake with stress and sleep quality among 290 Malaysian students.

Objectives and Hypotheses

The purpose of the study was to investigate the link between academic stress and sleep disturbances in university students, assess whether academic stress and caffeine dependence was significant predictor of sleep disturbances. The hypotheses were: H1 there is a significant correlation between academic stress and sleep disturbances in university students, and H2 there is a significant correlation between caffeine dependence and sleep disturbances in university student and H3 Academic stress, and caffeine dependence may significantly predict sleep disturbances among university students

Figure No.1

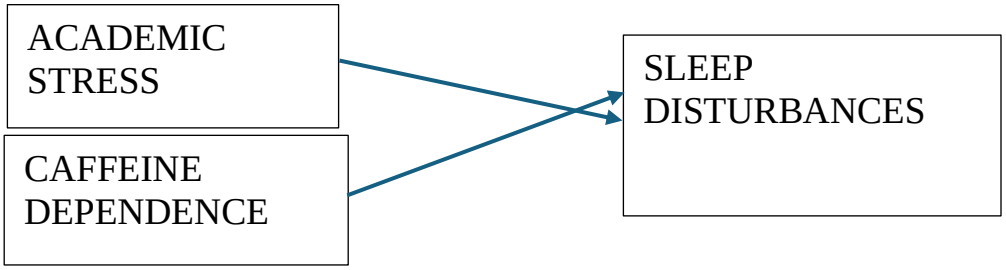

Figure No.1 showing the predictive relationship of academic stress and caffeine dependence on sleep

Method

Research Design

A quantitative cross-sectional design was employed for this study. University undergraduate students within the ages of 18-30 years were recruited from public and private HEC-recognised universities in Rawalpindi, Pakistan. These students were chosen within this specific age range as literature

suggested that this group of students were typically more vulnerable to issues such as academic pressure, caffeine dependence and poor sleep (Beiter et al, 2015;Lund et al, 2010).

A simple random sampling technique was used to select universities for the present study. A list of Higher Education Commission (HEC) recognized public and private universities was obtained from HEC website and universities were categorized into public and private sectors. Using the fishbowl random selection method, two public and two private universities were selected proportionately and the through convenience sampling participants were selected.

After obtaining permission from the selected institutions, data were collected at convenience according to the accessibility and availability of students. Questionnaires were administered collectively to students who were available at the time of data collection and who voluntarily agreed to participate. A total of 320 students participated in the study with 80 students drawn from each university.

Out of 320 participants, female students (52.2%, n=167) while males students were 47.8% (n=153). 97.2% of participants were of an age ranging from 18 to 25 years and 2.8% of the sample had an age from 26 to 30 years, which can be described as representative age group for students pursuing higher studies. As far as consumption of caffeine was concerned, the largest group of participants identified themselves as occasional users (44.1%, n=141). The rest were daily users (once or more than once) who made up 46.5% of the total sample (n=149), of which 30.9% consumed caffeine once a day and 15.6% consumed it more than once a day. Only 9.4% of the participants claimed to have never consumed caffeine in any form, suggesting the pervasive nature of caffeine use in student lives. Tea was by far the most popular source of caffeine among students (39.7%, n=127); not surprising in a culture that cherishes this beverage. The next popular sources were others (19.1%, n=61,), coffee (16.6%, n=53), soft drinks (7.8%, n=25), energy drinks (7.5%, n=24), while 9.4%, n=30) reported no primary caffeine source. Finally, 15.0% (n=48) participants claimed to have been clinically diagnosed with a chronic sleep disorder.

Instruments

Perception of Academic Stress Scale (PASS; Bedewy & Gabriel, 2015) an 18-item scale used to examine students' experience of stress related to academics, workload and academic self-efficacy. Good construct validity was evidenced by factor analysis that proved that PASS has three factors. Convergent validity was established due to significant relationships with other psychological variables. The reliability of this measure in the present sample was .868.

Caffeine Dependence was examined using Caffeine Use Disorder Questionnaire (CUDQ; Meredith et al., 2013) an 10-item measure based on DSM-5 substance use disorder criteria. This measure measures both behavioural and psychological symptoms associated with caffeine dependence. Satisfactory construct validity and convergent validity were evidenced since the measure correlated with both caffeine usage and impairment due to caffeine intake. The reliability of this measure in the present sample was 0.880.

Sleep Disturbances were assessed via the Pittsburgh Sleep Quality Index (PSQI; Buysse et al., 1989) which is a 19-item self report questionnaire that is used to give an overall evaluation of sleep quality over the past month on seven components: sleep latency, sleep duration, sleep efficiency, sleep disturbance, sleep medication use, daytime dysfunction, and subjective sleep quality. Construct and criterion validity have been proven, and it efficiently separates good sleepers from poor ones. Seven component model was validated in different population groups. Cronbach's alpha was 0.780.Permission was obtained from the use of PSQI.

Operational Definition

Academic Stress

Academic stress is the psychological stress of students related to exams, deadlines, workload, or performance expectations (Bedewy & Gabriel, 2015). The Perceived Academic Stress Scale (PASS) was created by Bedewy & Gabriel (2015).

The scale measures study, workload and self-appraisal pressure, and will be used as a measure for this variable.

Academic stress was evaluated using the Perception of Academic Stress Scale (PASS).

Caffeine Dependence

Caffeine dependence is a behavioural and physiological syndrome characterized by "the strong desire or sense of compulsion to take caffeine, difficulty controlling its use, and symptoms of withdrawal when attempting to cease its use" (Meredith et al., 2013b). Caffeine dependency was measured using the Caffeine Use Disorder Questionnaire(CUDQ) ,adapted from the DSM 5 diagnostic criteria for substance use disorder.

Caffeine dependence will be evaluated using the Caffeine Use Disorder Questionnaire (CUDQ).

Sleep Disturbances

Sleep disturbances (i.e. difficulties in falling asleep, or maintaining sleep, or experiencing non-restorative sleep) in the present study referred to the sleep problems measured by the Pittsburgh Sleep Quality Index (PSQI).The PSQI is a self-report instrument that assessed subjective quality of sleep and disturbances over the past month across seven components; sleep latency, sleep duration, sleep efficiency, sleep disturbances, use of sleep medication, daytime dysfunction and subjective sleep quality(Buysse et al., 1989).

Sleep disturbance was measured by the Pittsburgh sleep quality index (PSQI).

Procedure and Ethical Considerations

Paper surveys were administered directly to the students in their university departments who fit the criteria All students involved were required to have their consent form signed before data collection. Students were assured of their rights and that they were welcome to drop out at any time without penalty. The data were entirely anonymous, and participant data was maintained in the strictest confidence. The ethical standards that this research study adhered to be the principles found in the APA Publication Manual. Demographic data was gathered for participants (age, gender, year of study, whether or not they used caffeine, source of caffeine, sleep disorder diagnosis), as well as the three psychometric scales.

Results

Descriptive statistics, Pearson's correlation, multiple regression analysis were performed using SPSS to evaluate the research questions.

Descriptive Statistics

Table 1 provides the mean, standard deviation, ranges and the reliability coefficients for all three variables of the study.The average summed PSQI score was 43.07 (SD = 9.56, range = 49.00), indicating a relatively high level of sleep disturbance in the sample.The average score of PASS was 54.66 (SD=13.58, range=72.00) indicating a high level of perceived academic stress, and the average score of CUDQ was 18.77 (SD=6.89, range=30.00) showing moderate dependence on caffeine. Academic stress showed the greatest dispersion (SD = 13.58), followed by sleep disturbances (SD = 9.56), while caffeine dependence showed the least (SD = 6.89).

Table 1

Mean, Standard Deviation, Range and Cronbach alpha reliability of Perception of Academic Stress Scale (PASS), Caffeine Use Disorder Questionnaire (CUDQ), and Pittsburgh Sleep Quality Index (PSQI)(N=320)

Variables	*N*	*M*	*SD*	*Range*	*A*
TPSQI	320	43.07	9.56	*25-74*	*.780*
TPASS	320	54.66	13.58	*18-90*	*.868*
TCUDQ	320	18.77	6.89	*10-40*	*.880*

Note: N= total number of participants, M=mean, SD=Standard deviation, α= Alpha reliability, PSQI=Pittsburgh Sleep Quality Index Scale, PASS= Perception of Academic Stress Scale, and CUDQ=Caffeine Use Disorder questionnaire.

Hypothesis Testing

The intercorrelations between the three measured variables are as given in Table 2. A very weak negative relationship was identified between the measures of academic stress (PASS) and sleep disturbances (PSQI; r=-.071, p>.05). There was a significant positive correlation between caffeine dependence (CUDQ) and sleep disturbances (r=.278, p<.01).A weak negative relationship existed between the measure of academic stress (PASS) and caffeine dependence (r=-.106, p<.05).

Table 2

Inter correlation of academic stress, caffeine dependence, and sleep disturbances.

Variable	N	M	SD	1	2	3
Academic stress	320	54.66	13.58	-		
Caffeine Dependence	320	18.77	6.89	-.106*	-	
Sleep Disturbances	320	43.07	9.56	-.071	.278**	-

Note: N= total number of participants, M=mean, SD=Standard deviation (Significance level p=<.05,p=<.01)

From the results as depicted in Table 2 below, it is clear that there was a low insignificant negative correlation between academic stress (PASS) and sleep disturbances (r = -.071, p > .05). Caffeine dependence (CUDQ) correlated positively and significantly with sleep disturbances (r = .278, p < .01) meaning that high levels of caffeine dependence were significantly linked to sleep disturbances. There was also an insignificant negative correlation between academic stress and caffeine dependence (r = -.106, p < .05). From the findings, it is evident that caffeine dependence was significantly related to sleep disturbances but not academic stress.

Table 3

Multiple Regression Analysis Predicting Sleep Disturbances from Academic Stress and Caffeine Dependence

Variables	B	S.E	t	p	CI(95%)(LL,UL)
Constant	37.55	2.69	13.95	.000	(32.26,42.86)
Academic Stress	-.03	.03	-.77	.43	(-.10,.045)
Caffeine Dependence	.38	.07	5.03	.000	(.23,.528)

Note:B=unstandardizedbeta;S.E=standarderror;p=significancelevel;CI=confidenceInterval;UL=upper limit;LL=lower limit.

Results of the multiple regression analysis with academic stress and caffeine dependence (Table 3) found that a total of 7.9% variance in sleep disturbances could be explained (R^2=.079). Caffeine dependence predicted sleep disturbance (B = .38, t = 5.03, p < .001) whereas academic stress did not predict sleep disturbance (B = -.03, t = -.77, p = .43).

Discussion

The purpose of the present study was to find out the impact of academic stress and caffeine dependence on sleep disturbances in university students in Rawalpindi, Pakistan. This study found support for the hypothesis testing in the study caffeine dependence proved a strong and reliable predictor of sleep disturbances, whereas academic stress failed to show significant association directly on sleep disturbances.

Hypothesis 2 that caffeine dependence has a significant relationship to sleep disturbances was strongly supported by this study, as well as the majority of previous studies. This neurobiological phenomenon is quite understandable caffeine blocks the adenosine receptors thereby inhibiting the drive for endogenous sleep and prolonging arousal beyond the individual's desired sleep time (Bryan, 2025; Clark & Landolt, 2016). Numerous experimental studies have found evening caffeine use delayed sleep onset and reduced total sleep time. In accordance, Kaldenbach et al. (2024) reported strong negative correlations between energy drink consumption and sleep parameters among 53,266 Norwegian students and Faris et al. (2016) found significant associations between energy drink use and impaired sleep quality in a cross-sectional study of 919 university students. The present sample evidenced moderate caffeine dependence with a mean CUDQ of M=18.77 and the coefficient for the model was significant B = .38, $p < .001$-meaning that as caffeine dependence increased, the probability of having sleep disturbances also increased. Similarly, McLellan et al. (2016) found that individuals who drink coffee and use it as a compensatory mechanism for fatigue report greater physiological arousal, thus sleep disturbances than others. Thus, the present finding that caffeine dependence has a positive association with sleep disturbance is well supported and can be explained by the framework of arousal theory which the present study has adopted.

The hypothesis 1 testing-academic stress has a significant relationship to sleep disturbance was not supported. Not only was the correlation coefficient between academic stress and sleep disturbances negative, r = -.071, but it was also non-significant.The relationship between academic stress and sleep disturbances was therefore weak, negative, and non-significant, indicating no meaningful association between the two variables.There can be multiple reasons behind this finding. First, academic stress could have an indirect relationship to sleep disturbances. Students under stress from academic duties might drink caffeinated beverages, resulting in sleep disturbances due to their dependence on the beverage rather than the stress itself. This explanation fits well with the result from the multiple regression analysis, where caffeine dependence remained significant while academic stress failed to show significance and the overall multiple regression model explained 7.9% of the variance in sleep disturbances.Second, stressed students may exhibit certain adaptive coping mechanisms (e.g., good time management, increased motivation to study) that may prevent sleep disturbance from arising. Third, certain factors social, cultural and other factors prevalent in Pakistan students could be involved that may modulate the relationship between stress and sleep. Factors such as co-sleeping arrangements with family members, praying times at late night and living with others may reduce the sleep disturbance caused due to academic stress. This hypothesis is further strengthened by the study of Rosdi & Hamirudin (2023) who also reported nonsignificant associations between coffee intake, stress and sleep quality among a Malaysian Muslim undergraduate sample attributing the same null findings to individual and cultural variations.

The finding from the multiple regression analysis that the combined model accounts for 7.9% of variance in sleep disturbance makes theoretical sense. Even if the amount contributed beyond that of caffeine dependence is not purely attributable to academic stress reaching statistical significance, students' experiences of caffeine dependence in university settings are rarely isolated from academic pressure. Conceptually, a reciprocal model based on Stress Appraisal Theory and Arousal Theory posits that increased academic demand is cognitively appraised as stressful, inducing arousal, increasing consumption of caffeine to maintain focus, which leads to

neurological stimulation which impairs sleep, heightening stress which increases academic demand, continuing the cycle (Kosecka et al., 2025; Drake et al., 2006). While causality cannot be determined in the cross-sectional nature of the current data, these results are consistent with the theoretical model. In Pakistani culture academic stress might be cushioned by deep religious observances, support of the family and support from peers so that stress doesn't have any influence on sleep. Academic stress could be influencing sleep indirectly through its effect on caffeine consumption rather than academic stress predicting sleep disruption, which implies that caffeine is the mediator, stress being on one side and sleep disruption on the other side with caffeine on between them, making stress not to be the sole predictor of sleep disturbance. Hypothesis 3 was partially supported when a multiple regression analysis was computed showing that academic stress and caffeine dependency account for 7.9% of the variability in students' sleep disturbances (R^2=.079). When examined individually caffeine dependency was a greater predictor of students sleep disturbances than was academic stress, which was not statistically significant.

Overall, the research proved that sleep problems are caused by complex physiological and behavioural processes. Thus, intervention strategies aimed at solving these issues should be more sophisticated.

A large proportion of the sample experienced disturbed sleep, with a relatively high mean summed PSQI score (M = 43.07). This pattern is broadly consistent with evidence that sleep problems are widespread, as roughly one-third of adults worldwide report some form of sleeplessness (Azad et al., 2015) and over 50% of university students commonly report poor sleep quality (Lund et al., 2010; Ong et al., 2023). These statistics add to a growing body of literature indicating that lack of sufficient sleep in university students is a public health problem affecting cognitive function, mental health, and academic performance (Okano et al., 2019;Mehta, 2022).

Gender differences in caffeine consumption, seen in the demographics, are in line with existing literature. The men in this sample consume different caffeine profiles than women which were consistent with studies by Dillon et al. (2019) and Temple and Ziegler (2011). The highest caffeine source in this sample (39.7%) was tea which, in the Pakistani context, may be underemphasized as a major source of caffeine dependence given tea's ubiquity in Pakistani social and academic culture.

Conclusion

This present research revealed that dependence on caffeine was a significant predictor of sleep disturbances among Pakistani university students while academic stress was not. These variables accounted for 7.9% variance of sleep disturbances and this could possibly reflect an additive or interaction effects and necessitate future studies employing longitudinal and mediation designs. Future research directions and implications involve increasing students' awareness regarding impact of caffeine consumption on sleep and the institution of a campus wide caffeine restriction program. By improving students' health and strengthening comprehensive campus health services can possibly bring beneficial effect on overall learning outcome and overall life. During periods of extreme stress i.e. Midterm and final exams, campuses need to launch various programs focusing on importance of sleep and caffeine dependence needs to be routinely considered during stress and sleep assessments by college counsellors.

Limitations

There are some significant limitations to acknowledge. The research design was not longitudinal, therefore causal links between sleep duration and other variable are not yet evident. The reliance on self-report in this study means the potential for both recall bias and social desirability is also present. In future, research using objective measurements for both sleep duration and caffeine consumption (i.e. Polysomnography/actigraphy for sleep, biomarkers for caffeine intake) will enhance the research design.Gender-based differences were not analysed in the present study, so the findings do not speak to how academic stress, caffeine

dependence, or sleep disturbances may differ between male and female students. Sleep disturbance was assessed using a subjective self-report measure (PSQI) in isolation from objective measures such as actigraphy or polysomnography, which may limit the precision of the sleep estimates. Some confounding variables that significantly influenced this research, namely anxiety, depression, part-time working status, social media usage and physical activity, were not sufficiently accounted for. The development of longitudinal study designs, diagnostic clinical instruments and samples drawn from multiple locations, would allow for stronger understanding of causality in relation to academic stress, caffeine dependence and sleep disruption.

Implications

University Health Services can also use these statistics to create targeted sleep health programming for students during periods of high stress, such as midterms and finals Counsellors and mental health professionals should assess caffeine dependence as part of stress and sleep evaluation for students Academic advisors can advocate for institutional policies that can reduce chronic academic overload Counsellor/advisors can include checking for caffeine use when testing students' stress and sleep levels Health services at the university can create programs to help students sleep better High caffeine energy drinks may be banned at universities. Public health organizations can educate individuals about stress, caffeine safety and good sleep hygiene.

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