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A CUP OF CONSEQUENCES: THE IMPACT OF CAFFEINE DEPENDENCE ON STRESS, MOOD AND SLEEP AMONG PAKISTANI STUDENTS

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Abstract

Caffeine is among the most widely consumed psychoactive substances globally, with university students representing one of the highest-consuming groups due to academic pressures, irregular sleep schedules, and stress-related coping behaviors. The present study investigated the relationship between caffeine consumption and psychological outcomes, specifically stress, mood disturbances, and sleep loss, among Pakistani students. A correlational research design was employed with a sample of 200 students drawn from matric, intermediate, and university levels across various educational institutions in Pakistan. Participants were equally divided into two groups: 100 caffeine-dependent students and 100 non-dependent students. Data were collected through online forms and telephonic interviews. Three standardized instruments were administered: the Depression Anxiety Stress Scale (DASS-42) to measure stress and related psychological distress, the Brief Mood Introspection Scale (BMIS) to assess mood states, and the Epworth Sleepiness Scale (ESS) to evaluate daytime sleepiness and sleep loss. Pearson product-moment correlation, multiple linear regression, independent samples t-test, and one-way ANOVA were employed for statistical analysis.

Results revealed a statistically significant positive correlation among stress, mood, and sleep loss across the sample. However, caffeine dependence did not significantly predict stress, mood disturbances, or sleep loss, leading to the rejection of the second hypothesis. No significant mean differences were found between caffeine-dependent and non-dependent groups across psychological measures. Notably, sleep loss showed a significant difference across educational levels, with intermediate-level students reporting higher daytime sleepiness compared to other groups.

These findings suggest that while stress, mood, and sleep difficulties are interrelated among students, caffeine dependence alone may not be a significant predictor of these outcomes. Future research should employ experimental designs and larger, more representative samples to establish causal relationships and better inform student mental health interventions.

Introduction

Caffeine is one of the most widely consumed psychoactive substances globally, commonly found in beverages such as coffee, tea, energy drinks, and soft drinks. Its popularity stems from its stimulating effects on the central nervous

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system, which help enhance alertness, reduce fatigue, and improve cognitive performance. In recent years, caffeine consumption has significantly increased among adolescents and young adults, particularly students, due to rising academic demands and lifestyle changes (Mitchell et al., 2020).

University and college students represent one of the highest-consuming groups of caffeine worldwide. Academic pressures, irregular sleep schedules, and social influences contribute to increased reliance on caffeinated products. Students often use caffeine as a coping mechanism to manage academic stress, extend study hours, and maintain concentration (Miller et al., 2022). While moderate caffeine consumption may offer short-term cognitive benefits, excessive intake has been linked with negative psychological and physiological outcomes.

Recent research highlights that caffeine consumption is closely associated with stress, mood disturbances, and sleep problems, which are already prevalent issues among students. For instance, higher caffeine intake has been associated with increased levels of anxiety and stress, particularly during academic pressure (Richards & Smith, 2021).

Caffeine and Stress

Stress is a common experience among students due to academic workload and social expectations. Contemporary studies suggest that caffeine may influence the body's stress response by stimulating the release of cortisol, a key stress hormone (Lovallo et al., 2021). Recent evidence indicates that individuals who consume higher amounts of caffeine report greater perceived stress levels compared to those with moderate or low intake (Temple et al., 2021).

Caffeine and Mood

Caffeine is often perceived as a mood enhancer due to its ability to increase alertness and reduce fatigue. However, while low to moderate doses may improve mood, excessive intake has been linked with irritability and mood instability (Einöther & Giesbrecht, 2020). Habitual users may also experience withdrawal symptoms such as headaches and low mood, suggesting dependency patterns (Rogers et al., 2021).

Caffeine and Sleep Loss

Sleep is essential for cognitive functioning and emotional regulation. Caffeine intake can delay sleep onset, reduce total sleep time, and impair sleep quality (Clark & Landolt, 2020). A cycle often develops where caffeine disrupts sleep, leading to fatigue and further caffeine consumption (Watson et al., 2021).

Caffeine Use among Students

Globally, caffeine consumption among students has increased significantly. Over 90% of university students consume caffeine regularly (Mitchell et al., 2020). In Pakistan, caffeine use is culturally embedded through tea consumption, with increasing intake from energy drinks among youth (Nawaz et al., 2023).

Rationale of the Study

Caffeine is a widely consumed psychoactive substance found in many beverages and is especially common among students. High academic demands, extended study hours, and a lack of fixed routines create a need among students to rely on caffeinated drinks. This helps them stay alert and cope with fatigue. The widespread availability of caffeine in coffee, tea, energy drinks, and other dietary sources further contributes to its regular use among young adults. While moderation in all things may have benefits, many studies have shown that high caffeine consumption is linked with negative health outcomes, particularly when intake becomes excessive or unregulated (Song et al., 2025). The increased and often unmonitored consumption of caffeine among students therefore highlights the need to better understand its psychological and behavioral impacts.

The prevalence of caffeine consumption is strongly linked to its ability to improve wakefulness, attention, and short-term cognitive performance. Caffeine acts as a central nervous system stimulant by blocking adenosine receptors, which reduces fatigue and increases

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alertness. However, its effects are time-limited, with physiological impacts lasting several hours depending on dose and individual metabolism. Research shows that while caffeine can temporarily improve vigilance and cognitive functioning, it may also interfere with sleep quality and recovery when consumed later in the day (McLellan et al., 2016; Gardiner et al., 2024). For students, this short-term improvement in alertness often reinforces repeated use, especially during periods of academic pressure such as examinations. Experimental and review-based studies also show that caffeine is commonly perceived as a performance-enhancing substance that reduces fatigue and improves productivity, although its long-term effects on sleep and mental functioning may be underestimated (O'Callaghan et al., 2018; Ricupero et al., 2024).

In Pakistan, this pattern is also commonly observed among university and medical students, where caffeine and energy drink use is reported to be highly prevalent. Students often consume these beverages to manage academic workload, long study schedules, and exam-related pressure. Research conducted in Pakistani student populations has shown that higher caffeine intake is associated with poor sleep quality and reduced sleep duration, suggesting that sleep disruption is a common outcome in this context (Farooq et al., 2025; Ikram et al., 2025). This indicates that caffeine use is not only a matter of preference but is also closely linked with academic lifestyle demands.

Furthermore, studies in Pakistan have highlighted a significant relationship between academic stress and caffeine consumption, where students experiencing higher levels of stress are more likely to rely on caffeinated drinks as a coping strategy. This suggests that caffeine use may be reinforced by psychological distress rather than only physical fatigue, reflecting a behavioral coping mechanism in response to academic pressure (Hafeez et al., 2016). In addition, evidence indicates that excessive caffeine intake may be associated with symptoms such as anxiety, irritability, and emotional instability among students, further impacting their mood and psychological well-being (Morvarid Meamar et al., 2024). These findings suggest that caffeine may play a dual role as both a coping aid and a contributing factor to psychological distress.

Overall, this interconnected pattern highlights the importance of examining caffeine use alongside stress, mood, and sleep collectively rather than in isolation. The existing evidence suggests a potentially cyclical relationship in which academic stress increases caffeine consumption, excessive caffeine intake disrupts sleep quality, and poor sleep further exacerbates stress and mood disturbances. Therefore, there is a clear need to explore these variables together in the context of student populations to better understand their combined psychological impact and to inform future preventive and educational interventions.

Methodology

Objectives of the Study

1. To explore the relationship between caffeine consumption and stress.2. To examine the relationship between caffeine consumption and mood.3. To investigate the association between caffeine consumption and sleep loss.4. To assess the impact of caffeine dependence on stress, mood, and sleep.

Hypotheses

1. There is a significant relationship between caffeine consumption and stress, mood, and sleep loss.
2. Caffeine dependence significantly predicts stress, mood disturbances, and sleep loss.

Sample:

In this research the data was collected from 200 students who participated with their consent during the year 2020 - 2021. These students were from matric level, intermediate level and university level. The students in our research all belonged to different educational institutions of Pakistan and the data was collected through calls and online forms that were shared via email. 100 students were those who were caffeine dependent and 100 were not caffeine dependent. Male and female were both included in this study.

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Inclusion Criteria:
1. Students of Matric level, Intermediate level and University level.
2. Students who are caffeine dependent and students who are not dependent on caffeine.

Exclusion Criteria:
1. Students who are in lower educational level than Matric.
2. Individuals who are not currently studying.

Research Design:
For this research correlational research design was used.

Operational Definition:
Caffeine Dependence: An individual who can spend 24 hours without caffeine without feeling sleepy and tired.

Stress: Feeling mental, emotional or physical pressure due to any environmental factor.

Mood: A state or feeling at a particular time can be either good or bad due to any circumstance faced.

Sleep Loss: Sleep deprivation which will then result in difficulty in concentrating at work , feeling of tiredness, can cause bad mood and maybe can cause headache during day time.

Scales:
For this research Demographics sheet, Depression Anxiety Stress Scale for measuring stress, Brief Mood Introspection Scale for measuring mood, Epworth Sleepiness Scale for measuring sleep loss were used.

Demographic Sheet:
Demographic sheet was used which inquired from participants about their gender, age, educational level, their caffeinated beverage preference, quantity of caffeine they consume in a day, how much they feel dependent on caffeine and can they spend 24 hours without caffeine consumption or not. This last question was the criteria for differentiating between caffeine dependent individual and individual who is not dependent.

DASS Scale:
The DASS was designed by SYD Lovibond and Peter Lovibond at the university of New South Wales in 1995. Depression Anxiety Stress Scale (DASS), which consists of 42 items comprising three scales of 14 items. Items refer to the past week; and scores range from 0, “Did not apply to me at all,” to 4, “Applied to me very much, or most of the time.” It is also stressed in the instruction that there is no right or wrong answers .The main purpose of the DASS is to isolate and identify aspects of emotional disturbance. DASS can be administered and scored without psychology qualification.Reliability for the DASS total score was ρ=.94. Cronbach’s alpha for each of the other measures ranged between .86 and .90 (Lovibond, S.H. & Lovibond, P.F. ,1995).

BMIS Scale:
The brief mood introspection scale (BMIS) is an open source mood scale consisting of 16 mood adjectives to which a person respond (e . g , Are you happy ,sad or caring etc) . The scale can yield measure of overall pleasant , unpleasant mood ,arousal-calm mood, and it also can be scored according to positive-tired and negative-calm mood. It was designed by Mayor, J. in 1988 . It is for adult. Relaibility of BMIS Scale is higher than 0.5 in all sub-scales (John D. Mayer & Rachael Cavallaro, 1998).

ESS Scale:
The Epworth sleepiness scale(ESS) is a scale intended to measure day time sleepiness that is measured by use of a very short questionnaire. This can be helpful in diagnosis sleep disorder . It was introduced by in 1991 by Dr Murray johns of Epworth Hospital in Melbourne, Australia .The test is a list of eight situations in which you rate your tendency to become sleepy on a scale of 0, no chance of dozing, to 3 high chance of dozing. Epworth is a self administered questionnaire. Internal consistency of responses to the eight questions has been tested by Cronbach’s alpha,

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which has varied between 0.73 and 0.90. Correlation coefficient which has varied between 0.81 and 0.93 (Johns, 1991).

Procedure:

The sample of this research comprised of 200 students comprising of Martic, Intermediate and University level students so there was no issue for them in order to understand english version of scales.The participants of the research were approached through Email, social media and by meeting them in personal. They were debriefed about the purpose of research, they filled consent form voluntarily and filled the questionnaires provided. Participants were then thanked at the end for their cooperation.

Ethical Consideration:

1. Consent was taken before the data collection.
2. Debriefing was done before data collection.
3. Subject's confidentiality was assured.
4. Anonymity of individuals was assured.

Analytical Consideration:

Statistical analysis were conducted using SPSS software. Reliability in our study was used to analyze consistency among variables. Pearson Product Moment Correlation analysis is used to quantify the degree to which two variables are related and also provide a linear relationship between variables of this study. Multiple Linear regression analysis is used to predict impact of variables. Independent sample t test to determine whether there is a statistically significant difference between the means in caffeine dependent and non-dependent group.

Results

Table 1

Frequencies and Percentages of the Demographic characteristics of sample (n=200)

Characteristics of Participants	Groups	(*f*)	(%)
Age	15	1	0.5
	16	4	2.0
	17	8	4.0
	18	9	4.5
	19	25	12.5
	20	40	20.0
	21	40	20.0
	22	23	11.5
	23	11	5.5
	24	13	6.5
	25	10	5.0
	26	5	2.5
	27	4	2.0
	28	3	1.5
	30	1	0.5
	32	2	1.0
	46	1	0.5

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		M=24.05	S.D= 7.49
Gender	Male	56	28
	Female	144	72
Education Level	Matric	8	4
	Intermediate	27	13.5
	University student	155	77.5
Caffeine	Drug	82	41
	Food supplement	114	57
Beverages	Yes	163	81.5
	No	35	17.5
Preferred	Coffee	43	21.5
	Tea	126	63
	Energy drinks	15	7.5
Quantity	0	13	6.5
	1	59	29.5
	2	60	30
	3	32	16
	4	19	9.5
	5	8	4
	6	3	1.5
	7	6	3
Dependence	0	49	24.5
	1	53	26.5
	2	42	21
	3	34	17
	4	12	6
	5	10	5
24 hours	Yes	100	50
	No	100	50

Interpretation

The above table shows that there is 1 (0.5%) participant of 15year age group, 4 (2.0%) participants of 16years age group, 8 (4.0%) participants of 17 years age group, 9 (4.5%) participants of 18 years age group, 25 (12.5%) participants of 19 years age group, 40(20.0%) participants of 20 and 21 years age group, 23 (11.5%) participants of 22 years age group, 11 (5.5%) participants of 23 years age group, 13 (6.5%) participants of 24 years age group, 10 (5.0%) participants of 25 years age group, 5 (2.5%) participants of 26 years age group, 4(2.0%) participants of 27 years age group, 3(1.5%) participants of 28 years age group, 1(0.5%) participants of 30 year age, 2(1.0%) participants of 32 years age group, 1(0.5%) participant of 46 year age group. They have total mean of 24.05 and standard deviation of 7.49. The table shows that there were more females than males. The education level of participants were matric students (f=8), intermediate (f=27), university student (f=155). The majority of participants respond to caffeine as food supplement 57% and other respond to caffeine as drug 41%. 81.5% participants respond YES for consuming beverages and 17.5% respond NO. 21.5% participants preferred coffee, 63% preferred tea and 7.5% preferred energy drinks. Two groups were assigned for one group without caffeine and second group with caffeine, both groups were equal of 100 participants with 50%.

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Table 2

Psychometric Properties of study variables (n=200)

	No of items	α	M	SD	Range		Skewness	Kurtosis
					Potential	Actual		
BMIS WHOLE	16	0.65	4.08	4.85	16-64	-10-10	-.81	.21
DEPRESSION	14	0.91	11.71	9.03	14-56	0-42	.65	-.05
ANXIETY	14	0.89	12.36	8.87	14-56	0-42	.46	-.37
STRESS	14	0.90	14.07	9.19	14-56	0-42	.34	-.33
DASS WHOLE	42	0.96	38.15	25.86	42-168	0-126	.42	-.23
ESS WHOLE	8	0.68	8.68	4.86	8-32	0-22	-.08	-.44

Note: BIMS= Brief Mood Introspection Scale, DASS= Depression Anxiety and Stress Scale, ESS= Epworth Sleepiness Scale.

Interpretation

The results of the table shows that all scales have moderate alpha coefficient reliabilities. Cronbach's alpha reliability coefficient of BMIS whole is (0.65), whole DASS (0.96), depression (0.91), stress(0.90),anxiety (0.89) and whole ESS(0.68) . The ESS whole scale and BMIS whole scale have acceptable reliability. Sub-scales of DASS have excellent reliability.

Table 3

Pearson's product moment correlation among DASS, BMIS, ESS and their sub-scales (n=200)

	1	2	3	4	5	6
1. BMIS WHOLE	1	.04	.04	.01	.03	-.07
2. DEPRESSION		1	.87**	.86**	.96**	.25**
3. ANXIETY			1	.85**	.95**	.27**
4. STRESS				1	.95**	.28**
5. DASS WHOLE					1	.28**
6. ESS WHOLE						1

Note: BIMS= Brief Mood Introspection Scale, DASS= Depression Anxiety and Stress Scale, ESS= Epworth Sleepiness Scale.

Above table shows the correlation of scales with one another. Correlation between DEPRESSION and ANXIETY scales having surety level of 99% and there is only 1% chance of error with level of significance about 0.8 which is very high effect size. Correlation between DEPRESSION and STRESS scales having surety level of 99% and there is only 1% chance of error with level of significance about 0.8 which is very high effect size. Correlation between DEPRESSION and DASSWHOLE scales having surety level of 99% and there is only 1% chance of error with level of significance about 0.9 which is very high effect size. Correlation between DEPRESSION and ESSWHOLE scales having surety level of 99% and there is only 1% chance of error with level of significance about 0.2 which is very low effect size. Correlation between ANXIETY and STRESS scales having surety level of 99% and there is only 1% chance of error with level of

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significance about 0.8 which is very high effect size. Correlation between ANXIETY with DASSWHOLE scales having surety level of 99% and there is only 1% chance of error with level of significance about 0.9 which is very high effect size. Correlation between ANXIETY and ESS WHOLE scales having surety level of 99% and there is only 1% chance of error with level of significance about 0.2 which is very low effect size. Correlation between STRESS and DASSWHOLE scales having surety level of 99% and there is only 1% chance of error with level of significance about 0.9 which is very high effect size. Correlation between STRESS and ESSWHOLE scales having surety level of 99% and there is only 1% chance of error with level of significance about 0.2 which is very low effect size. Correlation between DASSWHOLE and ESSWHOLE scales having surety level of 99% and there is only 1% chance of error with level of significance about 0.2 which is very low effect size.

Table 4

Linear regression analysis to predict Stress by Gender and Caffeine dependence/ Not dependent (n=200)

		Model2		
			CI 95%	
variables	β Model 1	β	LL	UL
Constant	15.25	16.36	11.15	21.57
Gender	-0.92	-0.82	-3.70	2.06
24 Hours		-0.82	-3.41	1.76
R^2	0.02	0.04		
ΔR^2		0.02		
F	0.27	0.62		
ΔF		0.35		

The above table of linear regression analysis which predicted stress by seeing its impact on gender and caffeine dependent or non-dependent subjects. There is no significant value in both of the models in Anova value.so there is no impact of DASS on caffeine dependence and independence.

Table 5

Linear regression analysis to predict Mood (BMIS Whole Scale) by Gender and Caffeine dependence/ Not dependent (n=200)

		Model2		
			CI 95%	
variables	β Model 1	β	LL	UL
Constant	3.06	5.35	2.65	8.06
Gender	0.80	1.01	-0.48	2.50
24 Hours		-1.71	-3.05	-0.36

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R^2	0.00	0.03	
ΔR^2		0.03	
F	1.09	3.71	
ΔF		0	2.62

Interpretation

The above table of linear regression analysis which predicted mood by seeing its impact on gender and caffeine dependent or non-dependent subjects. In this table there is no significant value in both of the models in Anova value.so there is no impact of BMIS on caffeine dependence and independence.

Table 6

Linear regression analysis to predict Sleep loss (ESS Whole Scale) by Gender and Caffeine dependence/ Not dependent (n=200)

		Model2		
			CI 95%	
variables	β Model 1	β	LL	UL
Constant	9.19	8.26	5.51	11.02
Gender	-0.39	-0.48	-2.00	1.04

	Matric (N=8)		Intermediate (N=27)		University Level (N=155)				95% CI		
Variables	M	SD	M	SD	M	SD	F	P	I-J	LL	UL
BMIS WHOLE	4.75	2.71	3.59	4.27	4.23	4.98	0.26	0.77	-	-	-
DEPRESSION	13.12	11.12	13.18	8.66	11.47	9.19	0.48	0.61	-	-	-
ANXIETY	12.50	10.09	15.77	7.68	11.87	9.06	2.18	0.11	-	-	-
STRESS	11.25	8.56	15.48	9	14	9.38	0.68	0.50	-	-	-
DASS WHOLE	36.87	29.19	44.44	23.23	37.36	26.61	0.84	0.43	-	-	-
ESS WHOLE	6.12	4.82	10.51	4.58	8.47	4.89	3.19	0.04	-4.39*	7.96	9.36
24 Hours			0.68		-0.68			2.05			
R^2	0.00		0.00								

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ΔR^2		0.00
F	0.27	0.62
ΔF		0.35

The above table of linear regression analysis which predicted sleep loss by seeing its impact on gender and caffeine dependent or non-dependent subjects. There is no significant value in both of the models in Anova value.so there is no impact of ESS on caffeine dependence and independence.

Table 7: One-way Anova and post hoc analysis among categories of Educational level on variables of DASS, BMIS and ESS scale (n=200)

Note: BIMS= Brief Mood Introspection Scale, DASS= Depression Anxiety and Stress Scale, ESS= Epworth Sleepiness Scale.

The table shows the difference between variables of educational levels with scales BIMS, DASS and ESS. The mean score of ESS whole with metric is 4.82(6.12), whereas with intermediate is 4.58(10.51) and with university level is 4.89(8.47) with significance difference ($p<0.05$) which means the chance of error is about 5% and surety level is 95% . So ESSWHOLE has significant impact on all these levels (metric , intermediate as well as university level).

Table 8

	Dependent (n=100)		Non-Dependent (n=100)				95% CI		
Variables	M	S.D	M	S.D	t	p	LL	UL	Cohen's d
BMIS WHOLE	3.28	5.03	4.89	4.54	2.37	0.28	0.27	2.94	0.33
DEPRESSION	10.64	8.22	12.79	9.69	1.69	0.09	-0.35	4.65	0.23
ANXIETY	11.51	8.36	13.22	9.32	1.36	0.30	-0.76	4.18	0.23
STRESS	13.62	9.06	14.53	9.34	0.69	0.90	-1.65	3.47	0.09
DASS WHOLE	35.77	24.44	40.54	27.11	1.30	0.30	-2.43	11.97	0.18
ESS WHOLE	9	4.54	8.36	5.17	-0.92	0.18	-1.99	0.71	0.13

Note: BIMS= Brief Mood Introspection Scale, DASS= Depression Anxiety and Stress Scale, ESS= Epworth Sleepiness Scale.

Table shows statistically significant mean difference between sub-scales and the category which respect to dependent and Non-dependent. The analysis shows that there is no any significant relationship of sub-scales of DASS, ESS and BMIS on dependence and independence of caffeine.

Discussion

The purpose of this research was to explore if there is any significant relationship of caffeine with mood, stress and sleep loss among students. As it has been seen that in higher educational level the pressure on students to produce extra ordinary results is very much high in pakistani society. And due to this fact students suffer from stress, sleep issues and mood issues (Yasmeen Kashifa et al., 2024). Literature review shows that

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students consume caffeine on daily basis to deal with their daily life stressors. And for this purpose a correlational research has been conducted.

The scales used in this resarch were; Depression Anxiety Stress Scale(Lovibond, S.H. & Lovibond, P.F. ,1995) with relaibility 0.9 and in our research it is also 0.9, Brief Mood Introspection Scale (John D. Mayer & Rachael Cavallaro, 1998) with relaibility higher than 0.5 and in our research it is 0.6, Epworth sleepiness scale (Johns, 1991) with reliability varied between 0.73 and 0.90 and in this research it is 0.6. Through which we can conclude that in this research the relaibility of scales remained same as original scale reliability.

The objective and hypothesis of this study were similar. The first hypothesis was "There is significant relationship of caffeine with sleep loss, mood and stress among students." This hypothesis has been accepted as there was correlation among variables of our resaerch according to statistical results of our research (Table 3). The second hypothesis was "There is an impact of caffeine dependence with stress, mood and sleep among students." This hypothesis has been rejected in our research as there was no significant value in our regression analysis results (Table 4,5 & 6).

The additional findings of this study are that the mean differences among the educational level categories across the scales and sub-scales of Depression Anxiety Stress Scale, Brief Mood Introspection Scale and Epworth Sleepiness Scale have been found but only sleep loss has significant difference among educational level (Table 7). Furthermore there is no significant difference found between the caffeine dependent and non-dependent group on sub-scales and scales of Depression Anxiety Stress Scale, Brief Mood Introspection Scale and Epworth Sleepiness Scale (Table 8).

Conclusion

This study explored that there is a significantly positive correlation among stress, sleep loss and mood among students. Results also showed that there is no impact of stress, mood and sleep loss with gender and caffeine dependence among students. The further findings of this research showed significant difference between caffeine dependent group and non-caffeine dependent group. Also sleep loss has significant difference among educational level in this research.

Limitations

1. The results could have been more accurate and scientific if an experimental research design was used to explore caffeine's relationship and its impact on students.
2. 200 sample is not suitable for generalizing results sample size should be increased for future studies.

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