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Caffeine Intake and Burnout Level among Radiography Students at the University of Benin

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ABSTRACT

Background: Burnout is a growing concern among students, particularly in demanding fields like radiography. Caffeine consumption is prevalent among students, and its impact on burnout levels warrants investigation. This study examined the association between coffee intake and burnout levels among radiography students at the University of Benin.
Methodology: A cross-sectional survey approach was adopted, with data collected from 266 radiography students using a structured questionnaire that examined sociodemographic factors, coffee consumption patterns, and burnout symptoms.
Results: The results showed that 92.1% of students consumed caffeine, with tea (31.2%) and energy drinks (25.9%) being common sources. Most students (36.8%) had low caffeine intake, while 31.2% had moderate intake, and 24.1% had high to very high intake. Regarding burnout, 57.1% of students experienced moderate levels, and 26.7% reported high levels. Statistical analysis revealed a significant link between caffeine intake and burnout levels ($\chi^2 = 17.9$).
Conclusion: The study found a significant association between caffeine intake and burnout levels among radiography students. The findings suggest that students and educators should be aware of the potential impact of caffeine consumption on burnout and take steps to mitigate its effects.

Keywords: Caffeine intake. Stress. Burnout. Radiography student. Psychoactive.

INTRODUCTION

Caffeine, the most widely used psychoactive substance globally, is increasingly consumed by university students as a means to manage academic pressures and reduce fatigue (1). The substance is readily accessible through various sources, including coffee, tea, energy drinks, and soft drinks, each offering varying caffeine levels to meet the diverse preferences of consumers (2). For students, caffeine is perceived to provide short-term benefits, such as enhanced alertness, reduced tiredness, and improved focus, which are particularly useful in managing the intense demands of academic life (1, 2). However, these advantages are not without potential negative effects. Excessive caffeine consumption is associated with adverse outcomes, such as increased anxiety, insomnia, and in severe cases, caffeine dependency (2).

Research highlights that students, including those in healthcare fields, frequently resort to caffeine to keep up with their demanding schedules and study loads (1). Radiography students, for example, experience a unique blend of academic and clinical stressors that can drive their reliance on stimulants like caffeine. This academic environment, which demands both intensive theoretical understanding and hands-on clinical training, can lead to stress and fatigue, pushing students to depend on caffeine to maintain focus and alertness (1, 2). However, this reliance often contributes to a cycle where caffeine-induced sleep disturbances increase stress and impact students' ability to perform effectively in academic and clinical tasks. Nursing students who consumed high levels of caffeine reported poorer sleep quality, lower sleep duration, and elevated stress levels (1). Although caffeine can initially help students feel more alert and reduce sleepiness, its long-term impact on sleep and mental well-being has raised concerns.

Furthermore, caffeine consumption has been linked to increased levels of burnout, defined by emotional exhaustion, depersonalization, and a reduced sense of personal accomplishment (2). Burnout is especially prevalent among students in rigorous healthcare programs, where expectations are high, and schedules are taxing. The chronic fatigue associated with high caffeine intake may further drive burnout symptoms, as the body struggles to balance the stimulating effects of caffeine with the natural need for rest and recovery (1). While caffeine may temporarily alleviate symptoms of fatigue, studies indicate that its effects can contribute to a cycle of stress and exhaustion that intensifies burnout over time (1, 2). This relationship between caffeine intake, sleep quality, and burnout has been documented in multiple studies, suggesting the need for targeted research within specific student populations, such as radiography students at the University of Benin, where caffeine use may impact academic performance and health outcomes.

Without adequate research focused on radiography students

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in institutions like the University of Benin, there remains a knowledge gap regarding the specific ways in which caffeine use influences burnout in this student population. This study aims to bridge that gap by examining caffeine consumption patterns, associated sleep disturbances, and burnout symptoms among radiography students. Through this research, the aim is to generate insights that can inform policies on healthier study practices and effective stress management strategies, ultimately enhancing the well-being and academic performance of radiography students. The aim of this study is to investigate the relationship between caffeine intake and burnout levels among radiography students at the University of Benin.

MATERIALS AND METHOD

Research Setting

The study was conducted at the University of Benin, Benin City, within the Department of Radiography. The university is one of the leading institutions in Nigeria, offering a comprehensive radiography program that combines both theoretical and practical components. Radiography programme is a five-year course with presently students in 100 level to 500 level.

Study Design

This study employs a descriptive cross-sectional design, which allows for the assessment of academic stress, identification of stressors, and exploration of coping strategies among radiography students at a specific point in time.

Study Population

The study population for this study includes all radiography students currently enrolled in the University of Benin, Benin City. These students are exposed to both academic and clinical components of the radiography program. Presently, there are 643 students in the department.

Determination of sampling technique and sample size

The sample size comprised of Two hundred and Sixty-Six (266) radiography students in the University of Benin. This is determined using the formulae below;

$n = \frac{N}{(1+Ne^2)}$ (Taro Yamen, 1967)

Where;

n = sample size
N = population size
e = level of precision (confidence interval)

e = 0.05
N = 613
Thus;

$$n = \frac{613}{(1 + 613(0.05)^2)} = 242.1$$

n ~242.

Applying a 10% attrition, we have 24

The minimum expected sample size = 242+24 = 266

Multi-stage sampling technique will be used. This technique is a method where sampling is carried out in stages, often starting from larger units down to smaller units.

Stage one

Stratified random sampling will be used to allocate students in the different selected levels

Table 1: Allocation of students in the different levels

Academic Level	Total Students (N)	Sample Size (n)
100 Level	91	39
200 Level	145	62
300 Level	154	67
400 Level	130	56
500 Level	92	41
Total	**613**	**266**

Stage Two: Students in each level is administered the questionnaire using convenient sampling technique. In this technique, any students in the desired met was administered the questionnaire to till the sample size for that level is completed.

Instrument for Data Collection

A structured questionnaire was used to collect data. The questionnaire consisted of three sections: Section A comprised sociodemographic of the respondents; Section B consisted of information on caffeine intake; while Section C consisted of questions related to Burnout using adapted Maslach Burnout Inventory (MBI) instrument. The MBI is a standardized assessment tool developed by Christina Maslach and Susan Jackson that measures burnout through emotional exhaustion, depersonalization and reduced personal accomplishment. It is used in research, assessment, and evaluation of interventions to identify and address burnout (3).

Validity of the Instrument

The validity of the questionnaire was established through expert review by a medical psychologist and a radiographer. They reviewed the items to ensure they are appropriate for the study's objectives.

Reliability of the Instrument

The reliability of the instrument was tested through a pilot study involving 27 physiotherapy students. Cronbach's alpha was calculated to determine the internal consistency of the

questionnaire, all the items gave a threshold above 0.7 being considered acceptable.

Data were collected through self-administered questionnaires, which was distributed to the students in their respective lecture halls during their break periods. The questionnaires were anonymously filled, and students were encouraged to complete them independently.

Data Analysis

Descriptive statistics, including frequencies, percentages, mean, and standard deviation, was used to summarize the data. Inferential statistics such as Correlation and ANOVA (with Tukey Honesty Significant Difference-HSD post hoc test), was used to compare variables and also assess relationships between variables. The IBM Statistical Package for the Social Sciences (SPSS) version 28.0 software was employed for data analysis. Level of significance was set at $p<0.05$.

Ethical Consideration

Ethical approval with number CMSR/RAC/20024749 was obtained from the College of Medical Sciences' Ethics and Research Committee. Informed consent was obtained from all participants, ensuring confidentiality and voluntary participation in the study.

RESULTS

The sociodemographic data (Table 2), shows that the majority of respondents were between 20-30 years (79.7%), with a slightly higher proportion of females (51.9%) than males (48.1%). The 300 Level had the highest representation (25.2%), and most students identified as Christians (75.6%). The predominant ethnic groups were Igbo (31.6%) and Benin (27.4%), with 63.5% of students living off-campus.

Table 3 reveals that most respondents (44.4%) consumed caffeine occasionally (3-5 times a week), with tea being the most common source (31.2%). For specific beverages, 42.9% consumed 1-2 cups of coffee weekly, 36.8% consumed 1-2 cups of tea weekly, 46.6% consumed 1-2 energy drinks weekly, and 40.2% consumed 1-2 caffeinated soft drinks weekly. Most students (36.8%) estimated their daily caffeine consumption to be between 1-100 mg.

The burnout inventory (Table 4) reveals that students most frequently felt overwhelmed by their academic workload (mean score 4.21), followed by feeling burned out from academic responsibilities (3.92) and feeling emotionally drained from studies (3.84).

According to the classification (Table 5), most students (36.8%) had low caffeine intake, followed by moderate intake (31.2%), high intake (15.8%), very high intake (8.3%), and no intake (7.9%).

The majority of respondents (57.1%) experienced moderate levels of burnout, while 26.7% reported high burnout levels, and 16.2% experienced low burnout (Table 6).

The cross-tabulation (Table 7) reveals that as caffeine intake increases, the percentage of students experiencing high burnout also increases. Among students with very high caffeine intake, 40.9% reported high burnout levels, compared to only 19.1% among those who consumed no caffeine.

The analysis (Table 8) shows a progressive increase in mean daily caffeine consumption as students advance in their academic levels, with 500 Level students consuming the highest amount (201.9 mg/day) and 100 Level students consuming the least (87.6 mg/day). Similarly, the percentage of students experiencing high burnout increases with academic level.

Table 2: Sociodemographic Characteristics of Respondents

Characteristic	Categories	Frequency	Percentage (%)
Age (Years)	Below 20	37	13.9
	20-30	212	79.7
	31-40	14	5.3
	41-50	3	1.1
Gender	Male	128	48.1
	Female	138	51.9
Academic Level	100 Level	39	14.7
	200 Level	62	23.3
	300 Level	67	25.2
	400 Level	56	21.0
	500 Level	42	15.8
Religion	Christian	201	75.6
	Muslim	59	22.2
	Others	6	2.2
Ethnicity	Hausa	27	10.2
	Igbo	84	31.6
	Yoruba	52	19.5
	Benin	73	27.4
	Others	30	11.3
Residence	On-campus	97	36.5
	Off-campus	169	63.5

Table 3: Caffeine Intake Patterns

Caffeine Consumption Parameter	Categories	Frequency	Percentage (%)
Frequency of Consumption	Never	21	7.9
	Rarely (1-2 times a week)	63	23.7
	Occasionally (3-5 times a week)	118	44.4
	Daily	64	24.0
Primary Source of Caffeine	Coffee	57	21.4
	Tea	83	31.2
	Energy drinks	69	25.9
	Soft drinks	52	19.6
	Others	5	1.9
Weekly Coffee Consumption	0 cups	91	34.2
	1-2 cups	114	42.9
	3-4 cups	43	16.2
	5 or more cups	18	6.7
Weekly Tea Consumption	0 cups	47	17.7
	1-2 cups	98	36.8
	3-4 cups	83	31.2
	5 or more cups	38	14.3
Weekly Energy Drink Consumption	0 drinks	73	27.4
	1-2 drinks	124	46.6
	3-4 drinks	53	19.9
	5 or more drinks	16	6.0
Weekly Soft Drink Consumption	0 drinks	58	21.8
	1-2 drinks	107	40.2
	3-4 drinks	79	29.7
	5 or more drinks	22	8.3
Estimated Daily Caffeine Consumption	0 mg	21	7.9
	1-100 mg	98	36.8
	101-200 mg	83	31.2
	201-300 mg	42	15.8
	More than 300 mg	22	8.3

Table 4: Burnout Levels (Maslach Burnout Inventory)

Burnout Statement	Never (0)	A few times a year (1)	Once a month (2)	A few times a month (3)	Once a week (4)	A few times a week (5)	Every day (6)	Mean Score
I feel emotionally drained from my studies.	15 (5.6)	23 (8.6)	28 (10.5)	36 (13.5)	46 (17.3)	71 (26.7)	47 (17.7)	3.84
I feel burned out from my academic responsibilities.	17 (6.4)	19 (7.1)	31 (11.7)	38 (14.3)	42 (15.8)	68 (25.6)	51 (19.2)	3.92
I find it hard to get excited about my academic work.	28 (10.5)	31 (11.7)	42 (15.8)	37 (13.9)	41 (15.4)	49 (18.4)	38 (14.3)	3.31
I feel that I am making a difference in my studies.*	47 (17.7)	56 (21.1)	43 (16.2)	45 (16.9)	31 (11.7)	29 (10.9)	15 (5.6)	2.47
I feel fatigued when I think about my studies.	21 (7.9)	27 (10.2)	32 (12.0)	39 (14.7)	44 (16.5)	59 (22.2)	44 (16.5)	3.68
I feel overwhelmed by my academic workload.	9 (3.4)	16 (6.0)	21 (7.9)	35 (13.2)	48 (18.0)	74 (27.8)	63 (23.7)	4.21
I feel indifferent towards my academic performance.	43 (16.2)	39 (14.7)	45 (16.9)	38 (14.3)	35 (13.2)	37 (13.9)	29 (10.9)	2.89
I have trouble sleeping because of academic stress.	29 (10.9)	30 (11.3)	32 (12.0)	36 (13.5)	43 (16.2)	53 (19.9)	43 (16.2)	3.57
Overall Mean Burnout Score								**3.49**

**Note: Item 4 is reverse-scored as it measures positive engagement rather than burnout.*

Table 5: Classification of Caffeine Intake Levels

Caffeine Intake Level	Daily Consumption (mg)	Number of Respondents	Percentage (%)
None	0 mg	21	7.9
Low	1-100 mg	98	36.8
Moderate	101-200 mg	83	31.2
High	201-300 mg	42	15.8
Very High	>300 mg	22	8.3
Total		**266**	**100**

Table 6: Classification of Burnout Levels

Burnout Level	Score Range	Number of Respondents	Percentage (%)
Low	0-2.0	43	16.2
Moderate	2.1-4.0	152	57.1
High	4.1-6.0	71	26.7
Total		**266**	**100**

Table 7: Relationship between Caffeine Intake and Burnout Levels

Caffeine Intake Level	Low Burnout	Moderate Burnout	High Burnout	Total
None	7(33.3)	10(47.6)	4(19.1)	21
Low	21(21.4)	59(60.2)	18(18.4)	98
Moderate	11(13.3)	49(59.0)	23(27.7)	83
High	3(7.1)	22(52.4)	17(40.5)	42
Very High	1(4.5)	12(54.6)	9(40.9)	22
Total	**43(16.2)**	**152(57.1)**	**71(26.7)**	**266**

Chi-square test: $\chi^2 = 17.94$, df = 8, p = 0.022

Table 8: Mean Daily Caffeine Consumption by Academic Level

Academic Level	Mean Caffeine Consumption (mg/day)	SD	Percentage of High Burnout
100 Level	87.6[a]	78.3	12.8%
200 Level	124.8[ab]	98.7	19.4%
300 Level	156.2[bc]	112.4	26.9%
400 Level	187.5[cd]	103.6	35.7%
500 Level	201.9[d]	121.5	40.5%
Overall	**151.6**	**108.9**	**26.7%**

ANOVA: F = 11.27, df = 4, p < 0.001

DISCUSSION

The study found that 92.1% of radiography students consumed caffeine to varying degrees, with 44.4% consuming it occasionally (3-5 times a week) and 24.0% consuming it daily. This high prevalence aligns with findings by Riera-Sampol *et al*. who reported that 91.1% of university students consumed caffeine (4). The preferred caffeine sources among radiography students were tea (31.2%), energy drinks (25.9%), coffee (21.4%), and soft drinks (19.6%). This differs somewhat from patterns reported by Kharaba *et al*. who found coffee to be the dominant source (67.7%) followed by tea (47.3%) among UAE university students, suggesting potential cultural and regional variations in caffeine preferences (5). Most radiography students (36.8%) reported low caffeine intake (1-100 mg/day), while 31.2% had moderate intake (101-200 mg/day), and 24.1% had high or very high intake (>200 mg/day). The overall mean daily caffeine consumption was 151.6 mg/day, which is considerably lower than the average of 264 mg/day reported by Kharaba *et al*. among UAE university students and significantly lower than the 424.69 mg/day reported by Alateeq *et al*. among female university students in Saudi Arabia (6, 5). The lower consumption levels in our study might be attributed to regional differences, economic factors, or awareness of potential side effects.

The study revealed a statistically significant relationship between caffeine intake and burnout levels ($\chi^2 = 17.94$, p = 0.022), with higher caffeine consumption associated with increased burnout. Among students with very high caffeine intake (>300 mg/day), 40.9% reported high burnout levels, compared to only 19.1% among non-caffeine consumers. This finding is consistent with AlAteeq *et al*. who observed a strong positive association between caffeine consumption and perceived stress (p < 0.045) among female university students (6).

The association between elevated caffeine consumption and higher burnout levels may be explained by caffeine's impact on sleep quality, a critical factor in stress management and overall well-being. This interpretation is supported by Higbee *et al*. who found that nursing students who consumed energy drinks reported lower sleep quality, fewer sleep hours, and higher levels of perceived stress (1). Similarly, Kim *et al*. discovered a positive link between caffeine intake and poor sleep quality (r = .204, p = .001) among college students, identifying caffeine intake as a significant predictor of sleep quality (β = .15, p = .005) (7).

Akowa *et al*. provided further support for this relationship, observing that caffeine use increased among medical students with high anxiety and stress ratings (8). The disruption of normal sleep patterns through excessive caffeine consumption creates a vicious cycle where students consume more caffeine to combat fatigue, which further compromises sleep quality and ultimately exacerbates burnout symptoms.

The study found a progressive increase in mean daily caffeine consumption as students advanced in their academic levels, with 500 Level students consuming the highest amount (201.9 mg/day) and 100 Level students consuming the least (87.6 mg/day). This difference was statistically significant (F = 11.27, p < 0.001). Similarly, the percentage of students experiencing high burnout increased with academic level, from 12.8% in 100 Level to 40.5% in 500 Level.

This finding resonates with Galhardo *et al*. who observed that many medical students began caffeine usage during pre-

college years but increased consumption during their college education (9). The progressive increase in caffeine consumption may be attributed to mounting academic pressures, clinical responsibilities, and examination stress as students' advance in their studies. Qasem *et al*. observed that energy drink consumption increased during examination periods among medical students in Jordan, primarily to enhance alertness and stay awake at night (10).

Bajar *et al*. found that age was directly proportional to coffee intake among undergraduate students, which supports our observation of increased caffeine consumption in higher academic levels where students are typically older (11). The parallel increase in burnout levels with academic progression suggests a potential interplay between caffeine consumption, academic stress, and burnout symptoms.

The majority of radiography students (57.1%) experienced moderate levels of burnout, while 26.7% reported high burnout levels. The most commonly reported burnout symptom was feeling overwhelmed by academic workload (mean score 4.21 out of 6), followed by feeling burned out from academic responsibilities (3.92) and feeling emotionally drained from studies (3.84).

These findings are comparable to Al Ateeq *et al*. who reported high levels of stress among 88.6% of female university students (69.9% moderate, 18.7% high) (5). Similarly, Güneş and Demirer found that 56.5% of university students reported severe fatigue, which can be considered a manifestation of burnout (12).

The high prevalence of burnout among radiography students might be attributed to the demanding nature of the program, which combines theoretical knowledge with clinical practice. The progressive increase in burnout levels with academic advancement suggests that the cumulative effect of academic stressors, coupled with increased caffeine consumption, may contribute to worsening burnout symptoms as students' progress through their education.

While our study did not directly measure academic performance, the findings on burnout and caffeine consumption have implications for academic success. Faris *et al*. found that high caffeine intake (>100 mg/day) was significantly associated ($p = 0.001$) with lower GPA among schoolchildren in the UAE, along with reduced sleep duration, difficulty falling asleep, and other negative health behaviours (13).

The relationship between caffeine intake, burnout, and academic performance warrants further investigation in the context of radiography education. The finding that students in higher academic levels consumed more caffeine and experienced higher burnout levels raises concerns about the potential impact on their academic and clinical performance.

Conclusion: The study found a significant association between caffeine intake and burnout levels among radiography students, with higher caffeine consumption linked to increasing burnout. To address this, recommendations include incorporating education on caffeine use and healthy alternatives into the curriculum, developing stress management programs, and establishing counselling services. Additionally, regular burnout screening and relaxation spaces can help mitigate academic stress and prevent burnout.

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