

## Assessment of the levels of caffeine consumption among Saudi Arabian university students



Sami Abdulrahman Alhamidi<sup>1</sup>, Seham Mansour Alyousef<sup>2,\*</sup>

<sup>1</sup>Department of Maternal and Child Health, College of Nursing, King Saud University, Riyadh, Saudi Arabia

<sup>2</sup>Community and Psychiatric Department, College of Nursing, King Saud University, Riyadh, Saudi Arabia

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### ABSTRACT

This study aimed to assess the caffeine consumption of Saudi Arabian undergraduate students and to determine if the average amount consumed is within healthful parameters. Caffeine consumption in Saudi Arabia is a major cultural and social feature. Consumption of excessive amounts of caffeine can be deleterious to the health of university students. This is a cross-sectional study. A total of 145 male undergraduate nursing students were surveyed using the Caffeine Consumption Questionnaire to assess their caffeine intake on a typical day. Among this group, 34.5% of students exceeded the 400mg daily safe levels for caffeine consumption. The average consumption of the total group, those consuming below 400mg and those exceeding 400mg were 325.1, 201.2, and 570.1 mg, respectively. Tea and coffee were the major contributors to total caffeine intake ranging from 0-8 (240ml) servings per day. Health promotion aimed at illuminating health risks of caffeine consumption exceeding safe limits may assist in modification of intake to more healthful levels.

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### 1. Introduction

In Saudi Arabian and neighboring states, coffee and tea consumption are an important aspect of culture and social life. Caffeinated beverages are very popular. Their consumption forms a backbone of social occasions where tea and coffee of many varieties and flavors are equated with hospitality. Coffee mixtures, tea, chocolate, some soft drinks, energy drinks, and some over-the-counter medications contain varying amounts of caffeine and add to the total amounts of caffeine consumed.

Although sleep quality and duration is perhaps the most frequent concern related to consumption of caffeine, other adverse effects cited such as restlessness, nervousness, and insomnia have been discussed. Caffeine intoxication may result from rapid consumption of an average of 500mg of caffeine, although this threshold varies among individuals ranging from 250-1000mg (EFSA, 2015).

Methods of extraction during the preparation of coffee and tea yield various caffeine concentrations.

The questionnaire is based on data from the Starbucks Caffeine Guide (Caffeineinformer, 2018), which lists a 240ml cup of medium roast coffee at 112mg caffeine. However, the NCL (2016) lists a 240ml cup of regular home-brewed or coffee house coffee at 95.2 and 180mg of caffeine, respectively (NCL, 2016). Boiled coffee, such as that consumed in Saudi Arabian homes, has a caffeine content of 160-240mg /240ml, whereas brewed black tea is listed at 47mg /240ml (Caffeineinformer, 2018).

A review of the literature has not yielded quantitative data about caffeine consumption in Saudi Arabia. Empirical data suggests that the daily safe caffeine level of consumption should not exceed 400mg on average daily (Health Canada, 2017; EFSA, 2015). Considering that there is an established safety level, it may be of benefit to students and the target population in general to assess the level of consumption of this dietary element from the standpoint of promoting healthful levels of caffeine intake.

In this research, we try to answer the following questions:

1. What amounts and forms of caffeine are consumed by Saudi university students?
2. Does this level of consumption meet or exceed recommended safe consumption levels?

\* Corresponding Author.

Email Address: [smansour@ksu.edu.sa](mailto:smansour@ksu.edu.sa) (S. M. Alyousef)

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Corresponding author's ORCID profile:

<https://orcid.org/0000-0003-0435-1353>

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## 2. Research methodology

### 2.1. Research design, setting, and sample

Social cognitive theory, as explained by Albert Bandura (American-Canadian psychologist), is useful in understanding and viewing health-related behavior (Butts and Rich, 2011), and Pender's Health Promotion Model may suggest ways to provide assistance in planning and delivery of health-related information (Peterson and Bredow, 2012). This cross-sectional study aimed to illuminate aspects of caffeine consumption patterns of Saudi Arabian students' culture. The study was conducted in the College of Nursing at King Saud University, which is considered a large urban-based university located in Riyadh, Saudi Arabia. A convenience sample of 145 male undergraduate nursing students enrolled in professional nursing courses was recruited to participate in the study.

### 2.2. Instrument and data collection

The Caffeine Consumption Questionnaire (CCQ) is a standardized measure for caffeine consumption, which was developed and validated by Shohet and Landrum (2001). It is well suited to this purpose, reliable, and publicly available. This tool was adapted for the present study by the addition of local products such as cold coffee known as Frappe and exclusion of some over-the-counter medications, which were listed in the original form and used locally in Saudi Arabia. Students were asked to record their typical daily intake of the items on the questionnaire. Figures and tables show the original form and that which was amended with caffeine values employed, respectively.

All undergraduate nursing students in selected sections were invited to participate. Students who did not wish to participate were instructed to return a blank form. Informed consent forms were provided separately and returned to the researcher in an envelope which was provided. No questionnaires or informed consent forms were returned blank to the researcher. Questionnaires were completed and collected by the course instructor, who deposited them in an envelope which was sealed and held in a secure location.

### 2.3. Data analysis

Data were tabulated to assess the type and amount of caffeine bearing items consumed. Two responses were eliminated from the sample due to the value of caffeine ingested exceeding 1,000mg daily. Data were analyzed using descriptive statistical measures (SPSS software version 23).

## 3. Results

As shown in Table 1, the 145 male nursing students who participated in this inquiry had a mean

caffeine intake of 325.1mg with a standard deviation of 213.9. Consumption of more than the recommendations by Health Canada (2017) and EFSA (2015) of 400mg daily was reported by 50 participants (34.5%) who consumed a mean value of 570.1mg daily with a standard deviation of 145.5. Students who consumed less or equal to the maximum recommended level of 400mg daily used an average of 201.3mg caffeine daily with a standard deviation of 111.2. Table 1 shows the average intake and range of caffeine consumed by the entire group, those consuming 400mg or less, and more than the recommended limit of daily intake of 400mg

Table 2 shows the range of intake by units employed in the questionnaire. The highest frequency consumed by this group was in the form of 240ml servings of tea and coffee at a maximum of 8 servings per day per participant, thereby making coffee and tea the most popular form of beverage with this group of participants. Extra-large (380ml) servings of coffee ranged from 0-4 servings consumed. Coffee was also consumed as a cold drink (Frappe) and espresso shot with ranges of 0-2 and 0-3 servings per day, respectively. The remainder of caffeine consumption recorded was contributed by hot chocolate (0-3), energy drinks (0-3), and caffeinated soft drinks (0-4) servings, respectively. Over-the-counter caffeine-containing analgesics and candy bars were consumed in amounts (0-3) and (0-6) units listed in the questionnaire, respectively.

The resulting outcome of average caffeine consumption of the entire sample averages below the recommended maximum safe level of 400ml per day suggested by Health Canada (2017) and the EFSA (2015) for those who consumed an average above 400mg accounts for 34.4% of the total group.

## 4. Discussion

On the basis of the data gathered, 65.6% of the sample consumed on average at or below the recommended 400mg limit for daily caffeine consumption. The remaining 34.4% of the group consumed caffeine in amounts on average at levels above the recommended safe level.

These data show that university students in the sample consumed larger amounts of caffeine on average than their American counterparts, who were found to consume 173mg and 141mg daily among males and females, respectively (Mitchell et al., 2014). Students in the current study consumed, on average, 325.1mg caffeine daily, which is within the recommended level for safe consumption of caffeine of 400mg daily (EFSA, 2015; Health Canada, 2017).

However, there are 34.4% among the total Saudi group who consume, on average more than the recommended margin. This is in contrast to the American group in which the 90<sup>th</sup> percentile for caffeine consumption equaled 380mg day on average (Mitchell et al., 2014) or 9 out of 10 students averaged less than the safe limit. Among potential negative outcomes of excess caffeine intake is a disturbance in sleep. Historically, Hollingworth

(1912), in a cross-sectional study, gave participants varying amounts of caffeine and compared it to the amount of sleep experienced. Consumption of caffeine was found to be inversely related to sleep

duration. The ASA (2018) recommended avoiding intake of caffeine after noon, and the NINDS (2018) also counsels avoidance of caffeine and nicotine late in the day for the regulation of sleep patterns.

**Table 1:** Daily average amount of caffeine consumed (N=145)

Table 2. Daily average amount of caffeine consumed (n = 145)				
Average caffeine consumed (mg)		Standard Deviation	Number	Range
Total group	325.1	213.9	145	943-0
Less or equals 400 mg	201.3	111.2	95	398-0
More than 400 mg	570.1	145.5	50	943-408

**Table 2:** Caffeine consumed by the number of servings daily

Item	Range of servings consumed	mg Caffeine
Coffee (240 ml)	0-8	112 *
Coffee (380 ml)	0-4	168 *
Espresso shot (60 ml)	0-3	120 *
Tea	0-8	47*
Caffeinated soft drinks (can)	0-4	38*
Hot Chocolate (240 ml)	0-3	13**
Energy Drink (250 ml)	0-3	80***
Chocolate Bar (30 mg)	0-3	15 **
Panadol Extra (2 tablets)	0-4	60****
Solpadine Capsule	0-2	60 *****

\*<https://cspinet.org/eating-healthy/ingredients-of-concern/caffeine-chart>; \*\*<https://www.caffeine-content.com/caffeine-in-chocolate/caffeine-content-in-chocolate/>; \*\*\*<https://energy-drink-au-redbull.com/caffeine-in-red-bull/>; \*\*\*\*<https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=>\*\*\*\*\*<https://solpadeine.co.uk/products/solpadeine-/headache/>

Interestingly, energy drink consumption rates differ from previous studies in Saudi Arabia. They were found to be consumed by 18 students of the sample who drank an average of 1.5 cans (250ml) on average daily. This is in contrast with previous inquiries in which more frequent use of these products was reported. Alsunni and Badar (2011) found 54.6 and 26.1% of male and female university students, respectively, and Musaiger and Zagzoog (2014), found 71.3 and 35.9% of male and female high school students respectively consumed these beverages. Musaiger and Zagzoog (2014) reported that students who participated in a survey of beverage consumption considered energy drinks to be in the same class as soft drinks and were unaware of any deleterious ingredients 67% and 49% of the time, respectively. The current data may reflect that Saudi Arabia has recently banned the sale of energy drinks at government, health, and education facilities, including sports clubs, and prohibits advertising of these products in any form (Naeem, 2014).

#### 4.1. Limitations of the study

This is a cross-sectional study in which the sample consisted of male undergraduate participants and was relatively small. Results for females or other sectors of the population may differ. The generalization to different locales may require careful consideration of local dietary consumption patterns and cultural patterns.

#### 5. Conclusion

This study has provided a new perspective on caffeine consumption among Saudi Arabian students. Coffee culture is an important facet of Saudi Arabian society and is readily available in many settings and venues countrywide. Based on these data, it was

found that the majority of students consume caffeine on average within the international safety standards of not more than an average daily intake of 400mg. However, there is a considerable minority of the sample that exceeds this consumption limit. Consideration of these data may be important in structuring health promotion efforts in an effort to restructure some aspects of caffeine consumption among university students. Further inquiry into the consumption patterns of the general population may also be important, especially for groups who may be at risk of negative impact on their general health of consumption of caffeine.

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#### Compliance with ethical standards

#### Ethical consideration

Ethical approval was obtained from the Institutional Review Board at King Saud University with Reference Number: E 18-2823.

#### Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

#### References

Alsunni AA and Badar A (2011). Energy drinks consumption pattern, perceived benefits and associated adverse effects

- amongst students of University of Dammam, Saudi Arabia. Journal of Ayub Medical College Abbottabad, 23(3): 3-9.
- ASA (2018). Sleep hygiene. American Sleep Association, Boston, USA.
- Butts J and Rich K (2011). Philosophies and theories for advanced nursing practice. Jones and Bartlett Publishers, Burlington, USA.
- Caffeineinformer (2018). Coffee. Available online at: <https://www.caffeineinformer.com/caffeine-content/coffee-brewed>
- EFSA (2015). Scientific opinion on the safety of caffeine. European Food Safety Authority Journal, 13(5): 4102. <https://doi.org/10.2903/j.efsa.2015.4102>
- Health Canada (2017). Health Canada is advising Canadians about safe caffeine consumption. Available online at: Available at: <https://www.healthycanadians.gc.ca/recall-alert-rappel-avis/hc-sc/2017/63362a-eng.php>
- Hollingworth HL (1912). The influence of caffeine on mental and motor efficiency. Science Press, Berlin, Germany. <https://doi.org/10.1037/10936-000>
- Mitchell DC, Knight CA, Hockenberry J, Teplansky R, and Hartman TJ (2014). Beverage caffeine intakes in the US. Food and Chemical Toxicology, 63: 136-142. <https://doi.org/10.1016/j.fct.2013.10.042> **PMid:24189158**
- Musaiger AO and Zagzoog N (2014). Knowledge, attitudes and practices toward energy drinks among adolescents in Saudi Arabia. Global Journal of Health Science, 6(2): 42-46. <https://doi.org/10.5539/gjhs.v6n2p42> **PMid:24576364 PMCID:PMC4825248**
- Naeem Z (2014). Health hazards of Energy Drinks and positive actions by Saudi Government. International Journal of Health Sciences, 8: 2. <https://doi.org/10.12816/0006077> **PMid:25246888**
- NCL (2016). NCL releases '11 surprising facts you may not know about caffeine'. National Consumers League, Washington, USA. Available online at: [https://www.nclnet.org/caffeine\\_month](https://www.nclnet.org/caffeine_month)
- NINDS (2018). Brain basics: Understanding sleep. National Institute of Neurological Disorders and Stroke, Bethesda, USA.
- Peterson S and Bredow T (2012). Middle range theories: Application to nursing research. 3<sup>rd</sup> Edition, Lippincott, Williams and Wilkins, New York, USA.
- Shohet KL and Landrum RE (2001). Caffeine consumption questionnaire: A standardized measure for caffeine consumption in undergraduate students. Psychological Reports, 89(3): 521-526. <https://doi.org/10.2466/pr0.2001.89.3.521> **PMid:11824711**