The Effect of caffeine on sleep among medical students at King Faisal University Saudi Arabia

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Abstract

Background: Sleep needs are individualized and can vary from person to person. Adults should sleep for seven or more hours per night regularly to promote optimal health. Caffeine is a commonly consumed stimulant and it is commonly used as a fatigue relaxant and most people use it in the morning just after waking up or to keep alert during the daytime.

Aim: To assess effect of caffeine on sleep among medical students at King Faisal University, Saudi Arabia.

Methodology: The study was conducted among students in College of m=Medicine at King Faisal University in Al-hassa in Saudi Arabia. Initially a sample size of 200 was targeted. A total of 206 responses were received. Students with chronic health problems altering sleep and those with mental disorders were excluded. Data were collected using a pre-structured questionnaire that was developed by the authors after intensive literature review and experts' consultation. The questionnaire covered students' personal data, caffeine consumption and source, and sleep quality. The questionnaire was distributed via internet social media.

Results: There were 115 (55.8%) female and 91 (44.2%) male respondents. The majority of the respondents (51.9%) belonged to age group 18-20 years. The majority of the students; 140 (68.0%); responded not having any problem in going to sleep; while 66 (32.0%) students responded of having difficulty in going to sleep. Consuming more than 250 mg of caffeine had an effect on different aspects of sleep. It was significantly related with sleep hours of students (P=0.008); while there was no significant effect on sleep induction and sleep pattern (P=0.121).

Conclusions: In conclusion, the study showed that there was a relationship between caffeine consumption and sleep. The sleep hours were decreased in people who drank more than 250mg of caffeine.

Key words: Sleep hygiene, sleep quality, caffeine consumption, effect, students

Introduction

Caffeine is a commonly consumed stimulant and it is commonly used as a fatigue relaxant and most people use it in the morning just after waking up or to keep alert during the daytime [1]. However, some research revealed that drinking caffeine can alter sleep hygiene [2]. Furthermore, a few people consider caffeine as a major element of their diet, and it is consumed not only in coffee but in a mixture of commonly eaten foods and beverages such as chocolate, soft drink (soda), tea, and coffee [3]. In the USA, Australia and many countries, there are daily caffeine intake guidelines which is not the situation in Saudi Arabia. Therefore, it is important to examine the impact caffeine has on our sleep to make more informed recommendations on consumption and to better understand the impact of caffeine on sleep and the problems that it might cause on sleep.

Sleep needs are individualized and can vary from person to person [4]. Adults should sleep for seven or more hours per night regularly to promote optimal health [5]. Poor sleep quality has been significantly associated with reduced total sleep time and excessive daytime sleepiness and both negatively affected academic performance, behaviour, and social competence in adults [6] with poor health outcomes. Several experimental studies have been conducted among adults examining caffeine intake and its influence on sleep. The studies showed that when caffeine is consumed one to three hours before sleeping it decreases sleep efficiency [5,6], decreases total sleep time [5,6], and increases sleep onset latency [5,6]. It can also impact sleep architecture byreducing the amount of deep sleep [5,6]. However, the experimental nature of these studies ignored the impact of an individual's habitual caffeine intake on sleep patterns [7].

Recent studies revealed that age, tolerance, and differences in caffeine long consumption (prolonged half-life), genetic susceptibility besides other factors including sleep deprivation, may account for the observed differences on the effects of caffeine intake on sleep quality [8].

There is a wide variety of caffeine sources (coffee, tea, soft drink (soda) and chocolate beverages and foods). So, to address this we have developed a caffeine food frequency questionnaire (C-FFQ) [6]. It collects information about a wide variety of caffeine sources (coffee, tea, soft drink (soda) and chocolate beverages and foods). The overall aim of this study was to determine the relationship between caffeine consumption and sleep. And our objectives, in this study are: (1) identify what types of foods contribute to caffeine intake; [2] The effect of consuming more than 250 mg of caffeine on different aspects of sleep (difficulty in going to sleep, hours of sleep and disturbance in sleep pattern).

Methodology

Research design

A cross-sectional study was conducted on the students in College of Medicine at King Faisal University in Al-hassa, Saudi Arabia.

Study population & Sampling

The College of Medicine included 1,000 students and our sample size was 198 and it was calculated using URL of www.openepi.com. Parameters for sample size calculations were population size of 1,000 with the Anticipated % frequency (p) was 20% and the confidence limit is 95 % and the design effect was 1. Sample size was rounded to 200 respondents to avoid uncompleted responses. However 206 responses were received and all were included. Students with chronic health problems altering sleep and those with mental disorders were excluded.

Data collection

Data was collected using a questionnaire that was developed by the authors after literature review and experts' consultations. The questionnaire covered students' personal data, caffeine consumption and its source, sleep quality including sleep hours, sleep difficulties and nature of sleep. Then, the questionnaire was distributed among the students via an internet link to the questionnaire via social media including What's App between April and May 2017. Students voluntarily participated in the study through the link provided for the questionnaire.

Data analysis

After data was collected, it was modified, coded and entered into statistical software IBM SPSS version 22(SPSS, Inc. Chicago, IL). All statistical analysis was done using two tailed tests. P value less than 0.05 was considered to be statistically significant. Descriptive analysis based on frequency and percent distribution was done for all variables including demographic data, caffeine consumption, and sleep hygiene. The cut off value was considered as 250 mg of caffeine consumption daily [8]. Also, the value of caffeine in one cup was considered as: coffee (95 mg), tea (50 mg), soda (50 mg), energy drinks (75 mg), chocolate (43 mg) [9]. Distribution of sleep quality with caffeine consumption was tested using Pearson Chi-square test.

Results

Table 1 shows that there were 115 (55.8%) female and 91 (44.2%) male respondents. The majority of the respondents (51.9%) belonged to age group 18-20 years, 42.7% belonged to 20-23 years, while 5.3 % belonged to 23-26 years.

Similarly, there were 60 (77.7%) single students, and 30 (14.6%) students were married. The number of smokers was 16 (7.8%), the number of Non-smokers was 183 (88.8%), and the number of people who stopped smoking was 7 (3.4%). Also, the students of the first year 2016 were 141 (68.4%), the students of the second year 2015 were 32 (15.5%), and the students of the third year 2014 were 18 (8.7%).

Table 2 shows the sleep hygiene practices. The majority of the students; 140 (68.0%); responded not having any problem in going to sleep; while 66 (32.0%) students responded having difficulty in going to sleep.

The majority (50%) of the students were sleeping from 5-7 hours daily; 28.6% were sleeping between 7-9 hours, 12.1% were sleeping for less than 5 hours, while 9.2% were sleeping more than 9 hours.

Regarding the sleep pattern, the table shows that 75 (36.4%) students had intermittent sleep while 131 (63.6%) had continuous sleep.

Figure 1 shows the effect of consuming more than 250 mg of caffeine on different aspects of sleep. It was significantly related with sleep hours of students (P=0.008); while there was no significant effect on the sleep induction and sleep pattern (P=0.121)

These results are similar to the findings of research mentioned earlier[6] where they also found a significant relation between total caffeine intake and sleeping hours but no significant relationship between sleep induction and pattern. This is explained in detail below.

Among the students consuming more than 250 mg of caffeine (n=84), 40 (47.6%) of respondents had decrease in sleep hours while 44(52.4%) did not have decrease in sleep hours.

There was significant relationship between the sleep hours and consuming more than 250mg of caffeine and the P value was 0.008.

However, among the students consuming more than 250 mg of caffeine (n=84), 29 (35.5%) of respondents had problems in going to sleep while 55 (65.5%) had no problem in going to sleep.

There was no significant relationship between the sleep induction and consuming more than 250mg of caffeine; the P value was 0.121.

Also, among the students consuming more than 250 mg of caffeine (n=84), 35 (41.7%) of respondents had intermittent sleep pattern while 49(58.3%) did not have intermittent sleep pattern. There was no significant relationship between the sleep pattern and consuming more than 250mg of caffeine and the P value was 0.121.

Figure 2 shows the effect of consuming less than 250 mg of caffeine on different aspects of sleep. Among the students consuming less than 250 mg of caffeine (n=122), 36 (29.5%) of respondents had decrease in sleep hours while 86(70.5%) did not have decrease in sleep hours.

However, among the students consuming less than 250 mg of caffeine (n=122), 30 (24.6%) of respondents had problems in going to sleep while 92 (75.4%) had no problem in going to sleep.

Also, among the students consuming less than 250 mg of caffeine (n=122), 38 (31.1%) of respondents had intermittent sleep pattern while 84(68.9%) did not have intermittent sleep pattern.

Figure 3 shows that the biggest source of caffeine was coffee with 36% of the caffeine intake, then chocolate with 23% of the caffeine intake then tea with 22% of the caffeine intake, then soda with 14% of the caffeine intake; the smallest source of caffeine was energy drink with 5% of the caffeine intake.

These finding are similar to another study by Watson et al [6] who also found coffee as the main source of caffeine among the 18-30 years age group. However, in their study, tea, soda, energy drinks and chocolate were second, third, fourth and fifth common sources of caffeine. So, chocolate is more commonly consumed here (being the 2nd common source for caffeine)..

Also, the current study assessed the effect of consuming more than 250 mg of caffeine on different aspects of sleep; namely difficulty in going to sleep, hours of sleep and disturbance in sleep pattern which all were higher with more caffeine consumption.

Table 1: Demographical data of Participants of Study

	Frequency (N)	Percent (%)
Gender		
Male	91	44.2
Female	115	55.8
Age		
20 -23 years	88	42.7
18 – 20 years	107	51.9
23 - 26 years	11	5.3
The marital status		
Single	160	77.7
Married	30	14.6
Smoker		
Yes	16	7.8
Quit	7	3.4
No	183	88.8
Education level		
The first year 2016	141	68.4
The second year 2015	32	15.5
The third year 2014	18	8.7

Table 2 : Sleep hygiene practices of Students

	Category	Frequency n (%)
1. Sleep hours	less than 5 hours	25 (12.1)
	from 5 up to 7 hours	103 (50.0)
	from 7 up to 9 hours	59 (28.6)
	from 9 hours or more	19 (9.2)
2. Difficulty in Sleep induction (going to sleep)	Yes	66 (32.0)
	No	140 (68.0)
3. Sleep pattern	intermittent	75 (36.4)
	continuous	131 (63.6)

Figure 1: Effect of more than 250 mg of caffeine on different aspects of sleep

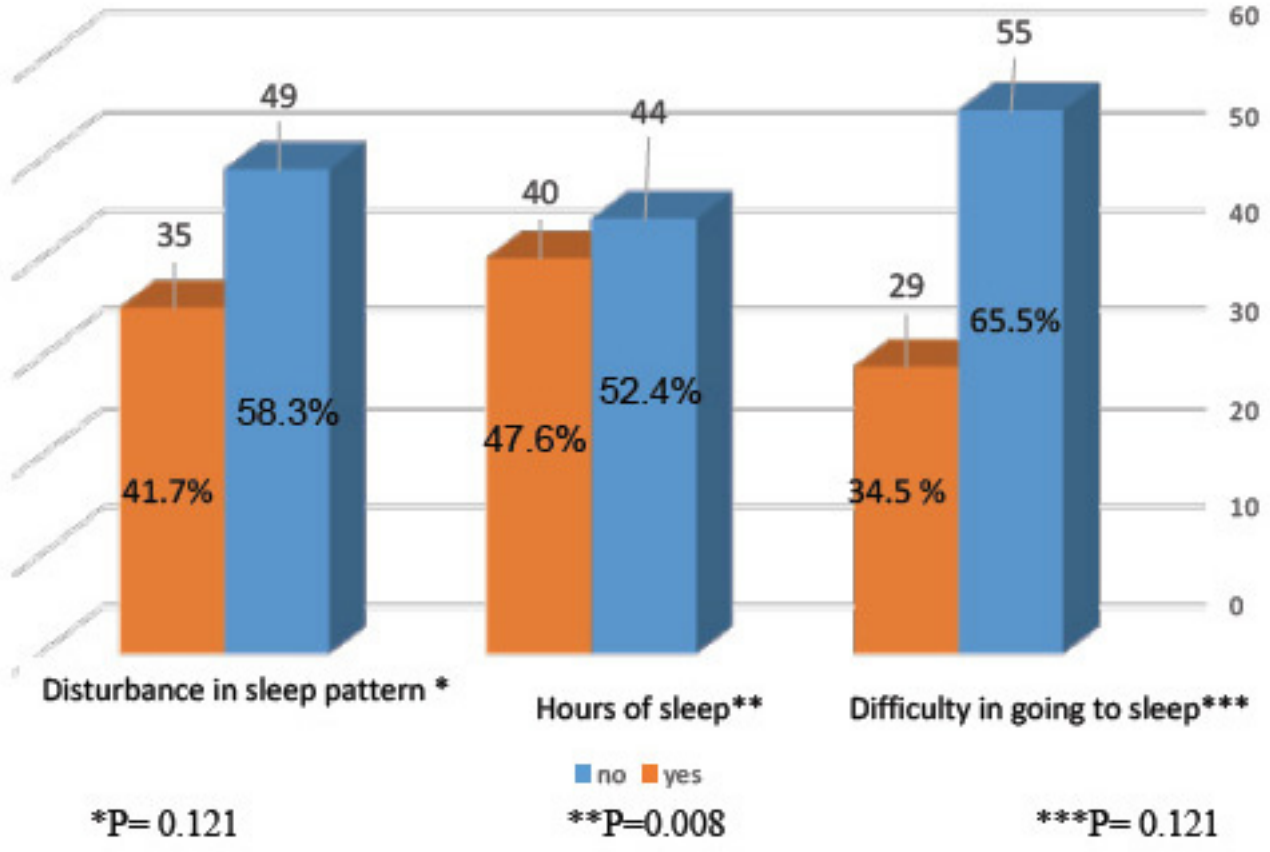
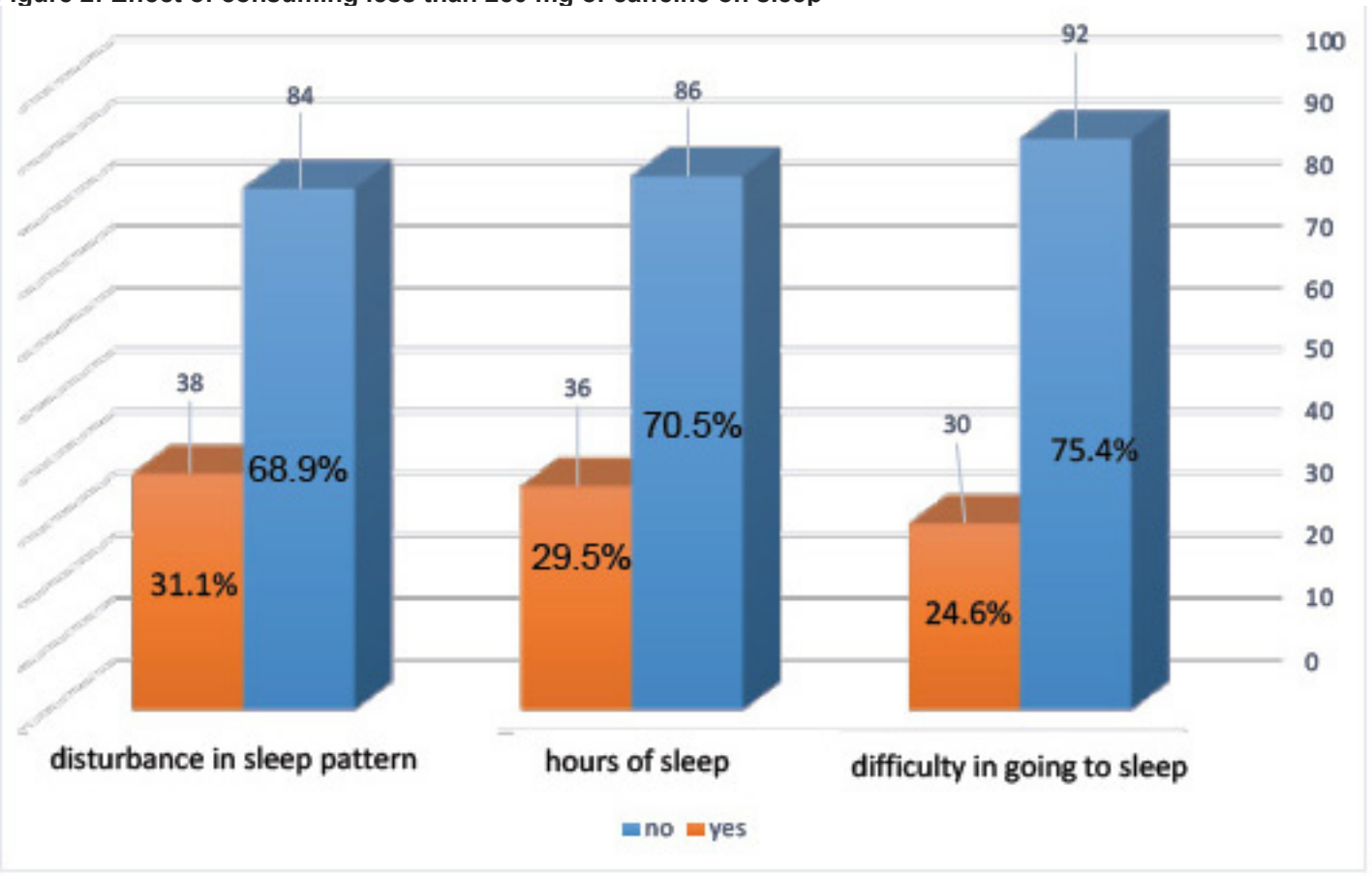
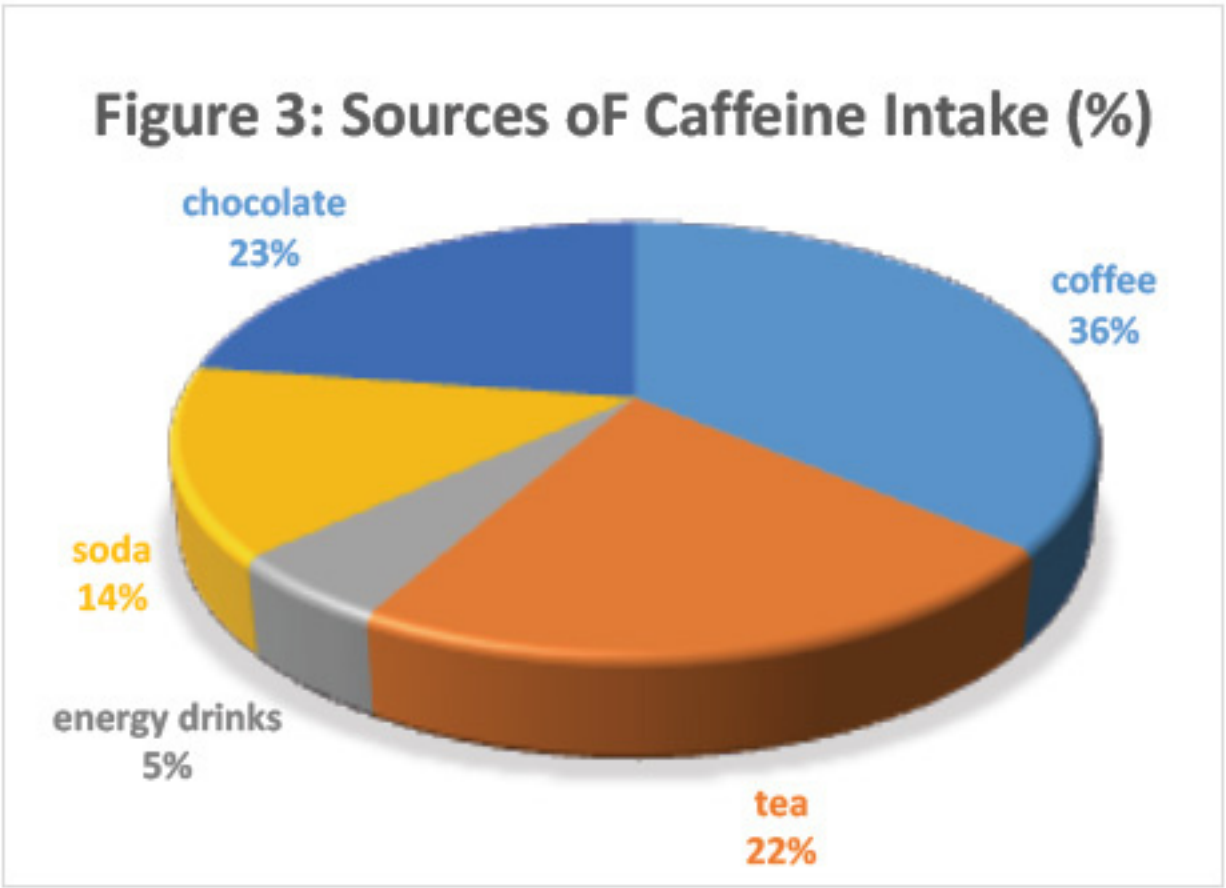


Figure 2: Effect of consuming less than 250 mg of caffeine on sleep





Discussion

The current study included 206 participants and it is outlined in Table 1: the result on the part of gender was, 115 (55.8%) of students were female and 91 (44.2%) of students were male. In regard to age, we had three groups of ages, in the first group was 107 of students from 18-20 years (51.9%), in the second group was 88 of students from 20-23 years (42.7%), and in the third group was 11 of students from 23-26 years (5.3%). In regard to marital status the result was, 160 (77.7%) of students were single and 30 (14.6%) of students were married. In regard to smoking, the number of smokers was 16 students (7.8%), the number of Non-smokers was 183 students (88.8%), and the number of people who stopped smoking was 7 students (3.4%). Also, the students of the first year 2016 numbered 141 (68.4%), the students of the second year 2015 numbered 32 (15.5%), and the students of the third year 2014 numbered 18 (8.7%).

In Table 2: the result in the part on sleep hours was, 25 (12.1%) of students slept less than 5 hours, 103 (50%) of students slept from 5 up to 7 hours, 59 (28.6) of students slept from 7 up to 9 hours, and 19 (9.2%) of students slept from 9 hours or more. In the part on Sleep induction (going to sleep) the result was, 140 (68 %) of students' answers were Yes and 66 (32%) of students' answers were NO. Also, the result in the part of sleep pattern was, 75 (36.4%) of students answered their sleep was Intermittent and 131 (63.6%) of students answered sleep was Continuous.

As for the effect of more than 250 mg of caffeine on sleep the result was, the students who answered they had disturbance in sleep pattern, and the hours of sleep, and the difficulty in going to sleep with No were more than the students who answered these questions with Yes. Also, in the Figure 2: Effects of caffeine intake on different sleep aspects, the result was, the students who answered disturbance in sleep pattern, hours of sleep, and the difficulty in going to sleep with No were more than the students who answered these questions with Yes.

In the Figure 3: The percentage of caffeine intake from the various sources, the result was coffee had the biggest percentage 36% then, chocolate was 23% and tea was 22%. Finally, soda was 14% and energy drink was 5%. In Figure 4: The relationship between caffeine intake levels & hours of daily sleep, we can see the difference between the students who drink less than 1250 mg of caffeine and the students who drink more than 250 mg of caffeine, and how that affects their pattern of sleep.

These findings were concordant with that reported by Edward S et al. (10) who found that the frequency of caffeine consumption among medical students is higher during exam days while it remains moderate to low on regular days and the most common side effect associated with such intake was found to be nervousness and loss of sleep. Also, Pfaff C, (11) in his doctorate thesis found that there was a significant difference with sleep and consumer status (p=0.001), with high caffeine consumers sleeping less than low caffeine consumers. Orbeta RL et al. (12) concluded that the majority of students report drinking soda more than once a day, and more than two-thirds report drinking soda once a day or more. Also, after adjusting for sociodemographic factors, students with a high caffeine intake, in the form of either soda or coffee, were 1.9 times more likely to have difficulty sleeping and were 1.8 times more likely to be tired in the morning than students who reported a very low caffeine intake. The same findings were reported by Lodato F et. (13) who revealed that the median intake of caffeine was 23.1 mg/d, with soft drinks being the major source. Adolescents who reported less sleep duration and those who spent more time watching TV during the weekend had a significantly higher caffeine intake.

Conclusion

The study showed that there was a relationship between caffeine consumption and sleep. The sleep hours were decreased in people who drank more than 250mg of caffeine.

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