



Consumption of caffeine among medical Students, Interns and Residents: An Overview.

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Abstract

The field of medicine has always been dynamic. Healthcare is a 24/7 functional department and doctors are always on their toes in the hospital. Demanding working hours, especially night shifts require more alertness and most doctors resort to caffeine to keep them awake. In the hospital, residents and interns make up the strong-ground while students slog into the night hours with the help of caffeine. Though caffeine is not classified as harmful, anything in excess has deleterious effects. Thus it becomes important to keep in check of the caffeine consumption of medical students, interns and residents.

Keywords: Healthcare, caffeine, dynamic, alertness

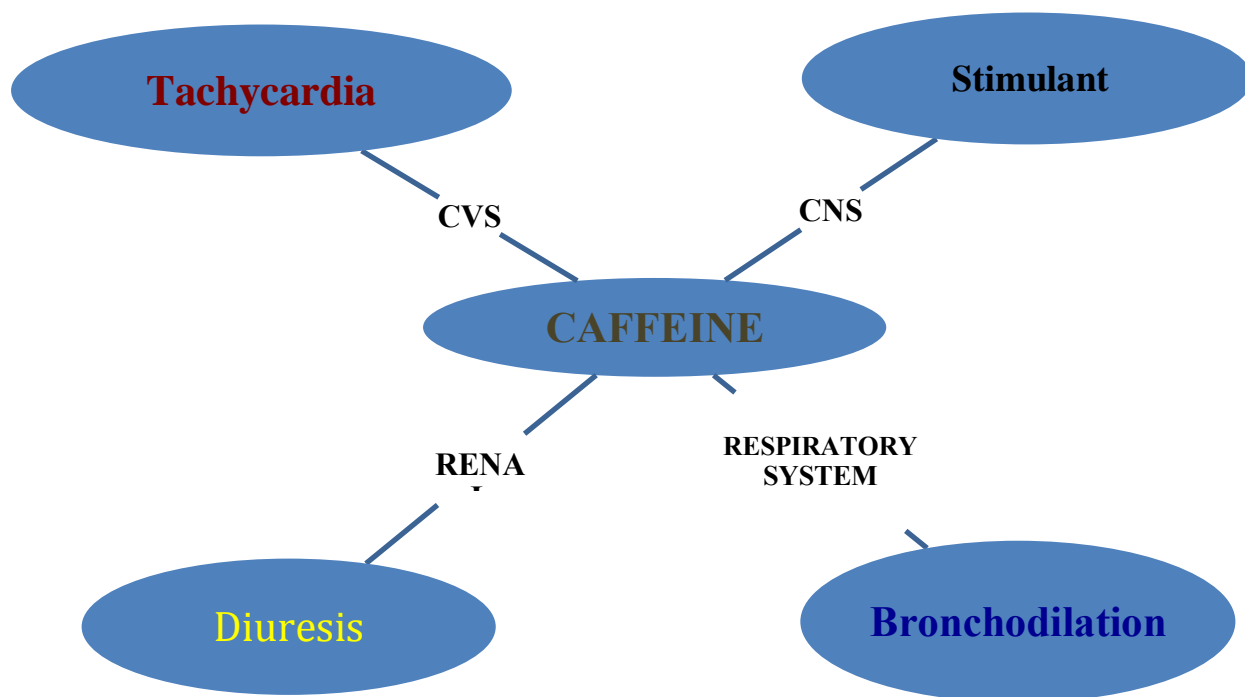
Introduction

Caffeine, chemically 1,3,7 trimethylxanthine, is a well known commonly used stimulant of the Central Nervous System, belonging to a class of drugs known as methylxanthines. It is often recreationally used or as an enhancer of cognitive and attentive performance. One of the foremost documentations of coffee consumption and mentions of coffee plant can be traced back to the Sufi monasteries of Yemen, at around the middle of the 18th century [1]. It is now found in not just coffee but also in soft drinks, chocolates, tea, tablets and so on. Often, medical students undergo extended periods of training which is vast and taxing. Therefore, in pursuit of an exceptional GPA, candidates often toil par their physical and mental capacities. Hence, medical trainees form one among the most vulnerable and affected groups to succumb to excessive caffeine consumption in comparison to students of other streams. [2] After almost 4.5 years of vigorous academic training, they have to serve 1 year compulsorily in rotatory internship. Internship is also a period where most of the students study for post graduate entrance or licensing exams, along with their work.

The Effects of Caffeine

Caffeine constitutes of a three-dimensional structure, identical to adenosine, which thereby permits it to not only bind but also block adenosine A1/A2A receptors [3]. This in turn activates a calcium signal driven dopamine surge which is responsible for its CNS stimulating action. Methyl Xanthine on Serotonin neurons enhances alertness. [4] Some studies have shown that caffeine may have a protective effect against the onset of depression [5]. Via non-specific inhibition of phosphodiesterases, it increases levels of cAMP [6]. This leads to tachycardia and higher coronary blood flow [7]. Caffeine was also found to cause smooth muscle relaxation and bronchial dilatation, thus likely explaining its anti-asthmatic effects. [7]. Caffeine also has diuretic properties, and it is ultimately metabolized in the liver. Studies also found that there is no significant relation with menstrual irregularities with respect to caffeine consumption, in females who have regular menstrual cycle [8]. Some studies also suggested that Caffeine may have a protective effect against COVID-19, although further reviews are needed for confirmation [9].

Figure 1. General Effects of Caffeine in the human body



Trends in consumption of caffeinated products

As anticipated, among many studies done, among various available caffeinated products, the most preferred one was coffee. In 2 studies done in Tamil Nadu among medical students, the majority was, and second highest was tea.[10][11]. Coffee was the most frequently used substance for cognitive enhancement purposes in a study done in Portugal [12]The dominance of coffee as the major source was also seen in a study conducted in 2019 in Lebanon [13]

It was noticed in a study done in 2012,Pakistan where medical students had a higher consumption of soft drinks [14] A similar trend was noticed in a study done in Lahore in the year 2014, that soft drinks were in the majority, followed by tea and coffee was in the 3rd position[15]Further down the line in 2016 Lahore, Tea overtook coffee and soft drinks as the major source of caffeine[16]

In 2016 France, it was observed that a large number of students went for high dose caffeinated pills and was dependent on it. [17].Caffeine consumption was not drastically changed even during COVID-19 Pandemic and subsequent lockdowns [18]

Table 1

Major source of caffeine	Cumulative absolute of number of consumers from all studies reviewed in this article review [10][11][12][13][14][15][16][17]
COFFEE	740
TEA	557
SOFT DRINKS	745
OTHERS	509

CAFFEINE CONTENT IN CONSUMABLES [19]

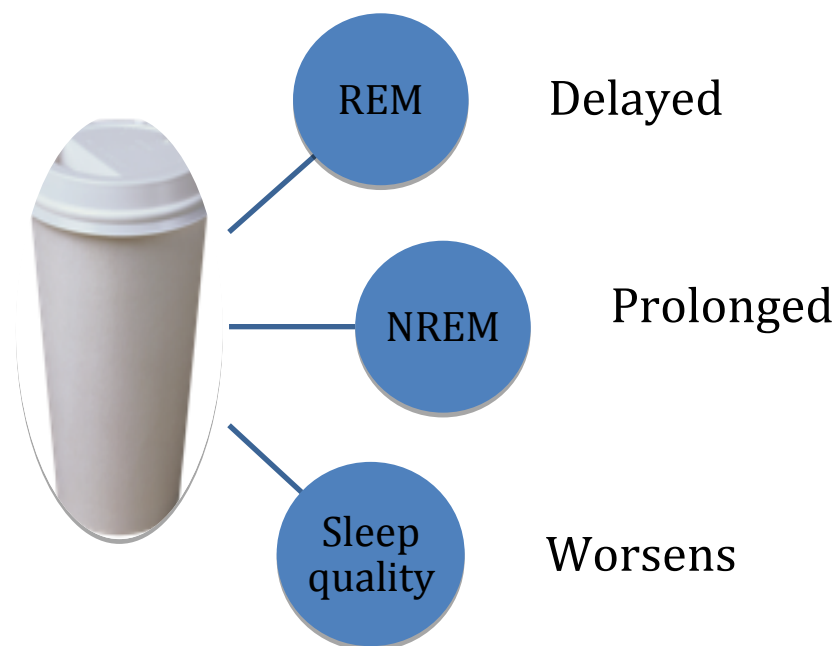
Table 2

Consumable containing caffeine	Approximate Caffeine content (mg/L)
Coffee	659-755
Tea/Ice tea	13-183
Soft drinks	266-340
Canned ice coffee	448
Coffee flavoured yogurts	33-48
Chocolate milk	15
Chocolate bars	17(milk chocolate)- 551(coffee filled)

Caffeine on sleep

In Western countries there exists a cycle of caffeine consumption and sleep deprivation subsequently. Unregulated caffeine consumption during the first daytime will ensue sleep deprivation, and performance deficits during the subsequent daytime [20]. Caffeine was shown to have an inhibitory effect on the rate of the central circadian pacemaker. NREM sleep was found to be prolonged in chronic caffeine consumers [21]. Consuming caffeine very often in daytime, stalls REM sleep. This may result in a worse quality of awakening and thus reinforce the maintenance of daytime caffeine intake. [22]. There is no clear-cut relation established among the dose nor timing of caffeine consumption with respect to sleep quality [23]

Figure 2 - Chronic caffeine intake on sleep



Specialty vs usage of caffeine

Since caffeine is a stimulant of the CNS, most of the on-call specialties were expected to have the highest caffeine consumption. Trauma and emergency medicine specialties have the maximum on-call cases during nights along with OBGYN doctors, who will have to be always ready during their shifts for delivery. In a study done in Switzerland, on average Orthopedic consultants purchased the most coffee per person per year followed by radiologists and general surgeons. Anesthesia consultants surprisingly purchased the least coffee even though they tag along with the surgeons for cases posted in the operating room [24] However no available literature is there to compare the scenario among interns and residents posted in various specialties in an Indian setup. The more the number of night shifts are there in a particular posting/ specialty, the caffeine consumption (if the subject consumes it) is likely to be higher.

Dependence and withdrawal of caffeine (as per ICD 11 [25])

The term "caffeine addiction (now dependence)" refers to a pattern of consumption that results in serious personal injury or harm to others. Health damage to the person may be brought on by intoxication, primary or secondary toxic effects on body organs, or a dangerous method of delivery. Physical injury, trauma, or mental problems that are linked to the person's behavior are all considered harm to others' health.

When caffeine consumption is stopped or reduced, a group of symptoms, actions, and physiological characteristics are said to occur as caffeine withdrawal. The amount, frequency, and duration of caffeine usage before quitting are all factors that affect the intensity and length of withdrawal.

A single dose of over 10g caffeine may cause fatal convulsions and vomiting [26]

It was reported in a study among university students in the UAE that almost 94% of them consume caffeine and has no awareness about its dependence.[27] The lack of awareness was also seen in a study done among College students in Korea[28]

Caffeine products in India has minimal information about their caffeine content and this can be a potential threat to the psychological well being of consumers if left unchecked. [29] There is no clear demarcation between the social acceptance and dependency of caffeine consumption, and this may be a topic of concern in the future [30]

Conclusion

Caffeine is used by medical students, interns, and residents mainly to improve their cognitive and attention span, mostly as a defense against the academic and clinical overload they face. It was observed that the source of caffeine intake has been changing from coffee, the conventional source to caffeinated drinks and even caffeinated pills. Coffee and caffeinated drinks are the most popular sources till date. The maximum amount of caffeine among the usually consumed beverages was found to be in filter coffee. Despite caffeine being a CNS stimulant and enhances alertness, care should be noted that it should not get into a dependent state. It ultimately has a deleterious impact on the quality of sleep, on a chronic consumptive basis. More than 250mg of caffeine a day can cause adverse reactions and dependence while the lethal dose would be anything over 10g.

Effective night shift rotations, providing adequate leaves post night duties, academic breaks in between can help to curb the dependency on caffeine. Most of the consumption was noted among trauma surgeons and postings/specialties that had a higher number of night duties. However more literature is needed to comment on the trend of Caffeine consumption and residents with respect to specialties. The review also shows that there is a need to assess the awareness of caffeine dependence in the medical fraternity.

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