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Research Article

A Retrospective Study to Check the Health Effects and Hazards of "Caffeine Consumption" in 100 Engineering Students Over a Period of 3 Months

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Abstract

The effects of caffeine are quite hazardous and has been ingested for centuries, currently being the most ingested pharmacologically active substance, its effects have been studied in regards to general toxicity, cardiovascular effects, effects on bone status and calcium balance, changes in behaviour, carcinogenicity and effects on male fertility, many different groups divided in gender and age groups have been studied with results advising moderate intake with evidence currently suggesting reproductive-aged women should consume </= 300 mg caffeine per day (equivalent to 4.6 mg kg (-1) bw day (-1) for a 65-kg person) while children should consume </= 2.5 mg kg (-1) bw day (-1).

Keywords: *Hazardous Substances; Addiction; Caffeine; Adverse Effects*

Introduction

Caffeine has been a component of the human diet for many centuries, primarily through the consumption of coffee and other beverages [1]. Caffeine is the most widely consumed psychoactive drug in the world [2]. In the 20th Century, consumption of carbonated soft drinks with added caffeine became commonplace.

Caffeine, whose chemical name is 1,3,7-trimethylxanthine, is a bitter white crystalline alkaloid that acts as stimulant and a mild diuretic. The beans, leaves, and fruit of more than 60 plants contain varying quantities of caffeine [3]; in those plants' caffeine serves as a pesticide, killing or paralyzing insects that feed on the plants. Coffee, tea, and cocoa are the major plants containing caffeine that are cultivated. The FDA classifies caffeine as a "Multiple Purpose Generally Recognized as Safe Food Substance" (21 FR, Section 182.1180), with tolerance at 0.02%, stating that moderate caffeine intake produces no increased risk to health.

Sources of Caffeine: The common dietary sources of caffeine are coffee, chocolate, tea, and some soft drinks.

Commercial Sources with Added Caffeine

Concentrations of caffeine in different beverages:

Beverage	Concentration
Coffee	94.8 mg/250 gm (1 cup)
Coke	34 - 45 mg/200 ml (2.8 mg/floz.)
Red bull	80 mg/250 ml (9.46 mg/floz.)
Hot chocolate	5 mg/250gms (1 cup)
Iced tea	11 mg/100 gms (1 cup)

Table 1

Caffeine is a stimulant to the central nervous system, and regular use of caffeine does cause mild physical dependence. Symptoms of withdrawal from caffeine are headache, fatigue, anxiety, constipation etc [9,10].

Background

With 356 million 10 - 24-year olds, India has the world's largest youth population despite having smaller population than China, according to the latest UN report [5].

It is said that developing countries with large youth population could see their economies soar, provided they invest heavily in young people's education and health.

The report titled "The power of 1.8 billion" said 28% of India's population is 10-24 years old [5].

Caffeine use among youth raises multiple concerns

Regular use can result in symptoms of dependence; daily users as young as 13 experience withdrawal symptoms.

Children who consume moderate amounts of caffeine for an adult (100 - 400 mg/day) can experience anxiety, nervousness, hyperactive behaviour and disruptive sleep, which could adversely impact learning and developmental processes.

Small to moderate amounts of caffeine have positive, immediate effects on mood, mental alertness and motor performance, effects that have a more potent impact on repeated use than negative, delayed consequences of chronic use.

The effects of caffeine may act synergistically with other substances, reinforcing the development of unhealthy behaviours.

Finally, as children learn to use caffeine to modify their mood or performance, it is unknown how such intentional behaviour at a young age generalizes to use of other substances, but they are correlated with other substance use [6,9].

It seems clear that increased attention should be directed at the potential consequences of caffeine use at increasingly younger ages. With the growing popularity of sweet beverages containing more caffeine than soda, and the marketing of caffeinated beverages and additives as performance enhancers, caffeine intake from non-traditional sources will probably continue to escalate.

The data and associated concerns about caffeine use among youth clearly indicates urgency for action in the research and regulatory communities.

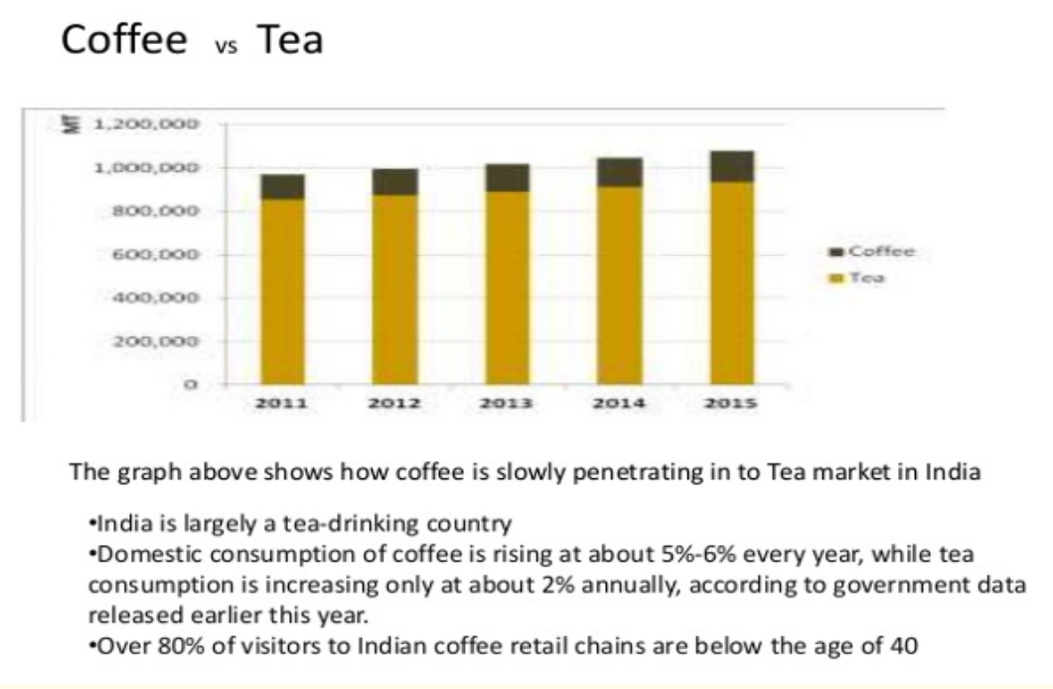

Figure 1

The line blurs between the addictive potential of caffeine, its capacity for harm and the social acceptance of caffeine as a harmless and perhaps beneficial substance [7]. Marketing tactics for caffeinated products targeting youth appear as egregious as previously admonished practices of the tobacco and alcohol industries [8]. As researchers we should move more quickly to understand more clearly the impact of caffeine products on youth health and behaviour [4].

Methodology

Study Design: Retrospective study.

Study Area: Nirma institute of technology, Ahmedabad.

Study Population: 100 Engineering Students.

Inclusion criteria

- Those engineering students who gave their consent.
- We selected only those 100 students who consumed caffeine in the form of 3 drinks namely coffee, coke, Red bull atleast once a week regularly (any of them).
- The students were selected irrespective of their branch or year of study.

Exclusion criteria

- Those engineering students who did not give their consent.
- Those students who do not consume caffeine atleast once a week regularly.

Method

We went to the Nirma Institute of Technology on 6/6/2016 and 7/6/2016 for collection of data.

First the engineering students of Nirma college were asked if they consume caffeine once a week atleast on a regular basis.

Then data collection was started by distributing the questionnaire (attached here) among the above selected students.

The filled forms by the students after collecting, information like alertness, times and amount of consumption, addiction, side effects, etc. were entered by us into MS Excel [11].

Then the analysis was carried out.

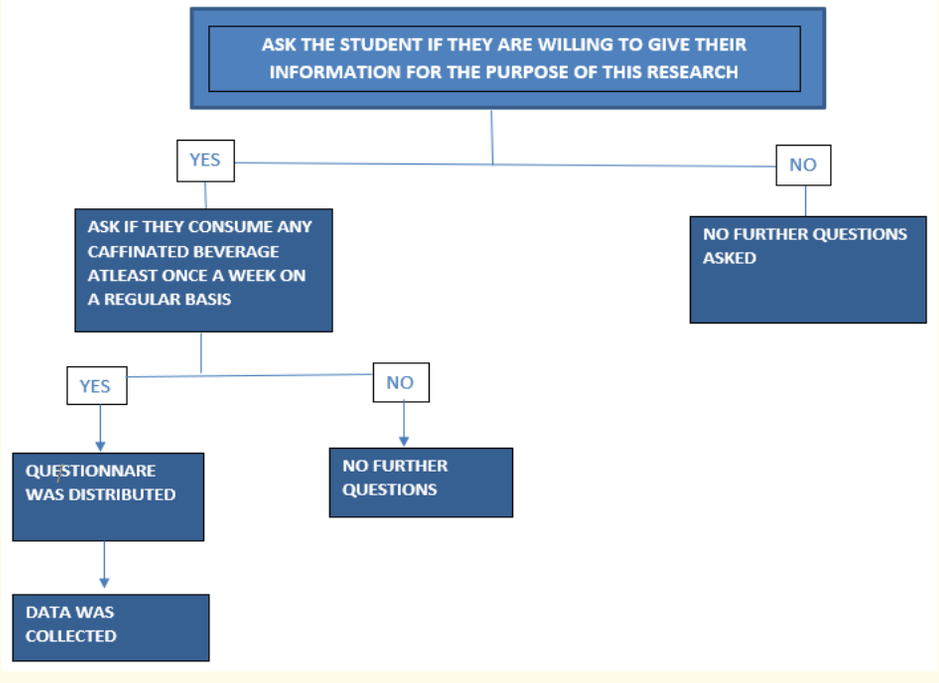

Figure 2

Data analysis

The data collected by above means was analysed by using SPSS and MS excel and other analytical tools. The results are as follows.

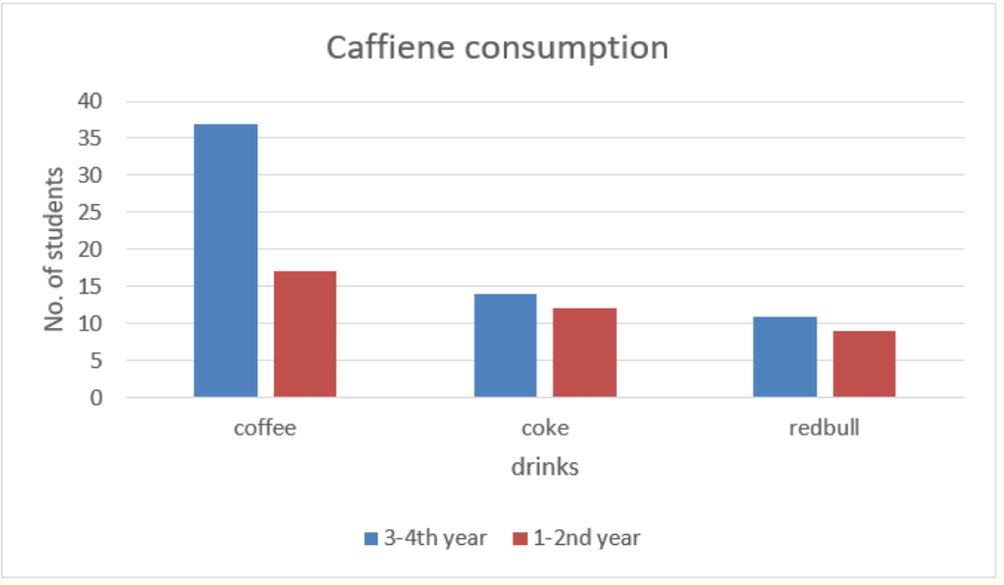

Figure 3

The above graph shows:

- Consumption of coffee is much more compared to the other two drinks.
- Consumption of caffeine is more in 3 - 4th year students than 1 - 2nd year students.
- In consideration of the above graph, alertness on consumption of caffeine and better performance after its effect is gone are compared amongst the two groups (1 - 2 year and 3 - 4 year students).

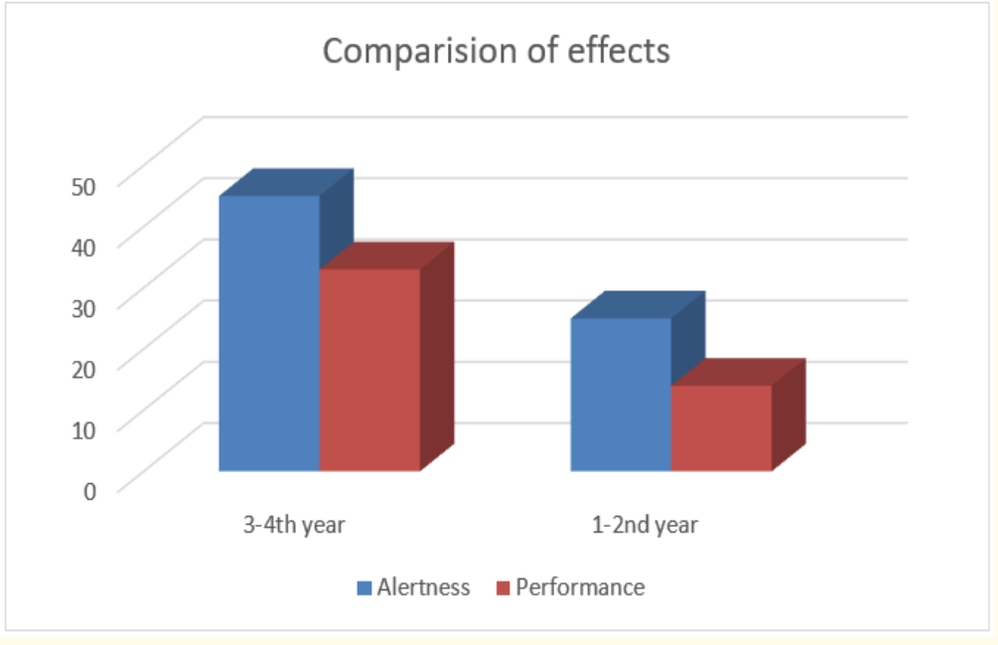

Figure 4

This graph shows various purposes for which caffeine is consumed, refreshments being the most common followed by staying awake, studying and increasing concentration in decreasing order.

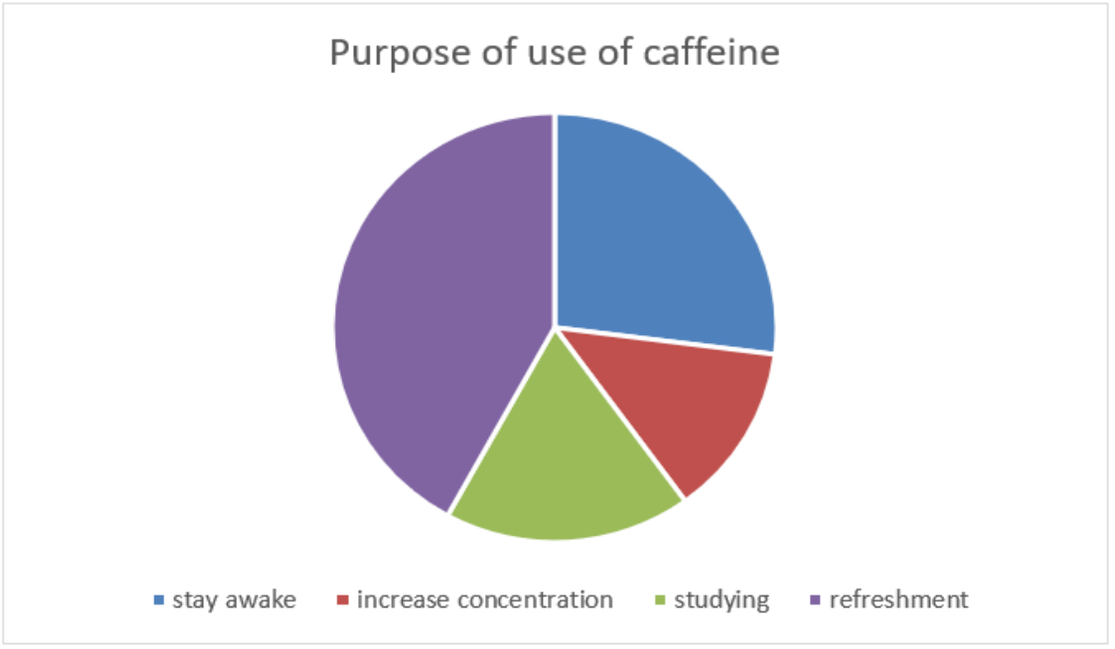

Figure 5

Caffeine is strongly associated in increasing concentration and alertness.

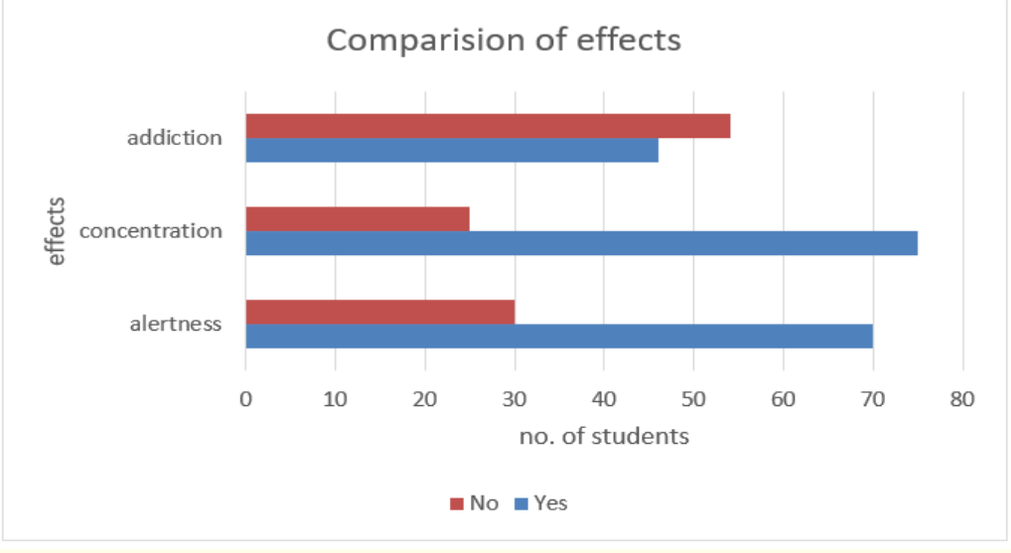

Figure 6

The table below is 2 * 2 table for finding association between the two factors.

Null hypothesis: There is no association between alertness caused by caffeine and the next day better performance by it.

Effects	Yes	No	Total
Alertness	70	30	100
Next day better Performance	47	53	100
Total	117	83	200

Table 2

At Degree of Freedom = 1,

X^2 value = 10.9

p value < 0.05

Hence the null hypothesis may be rejected suggesting a strong association between alertness due to caffeine and the performance after the effect subsides.

This graph indicates headache being the most common side effect of caffeine consumption. Other side effects are nausea, constipation, depression etc.

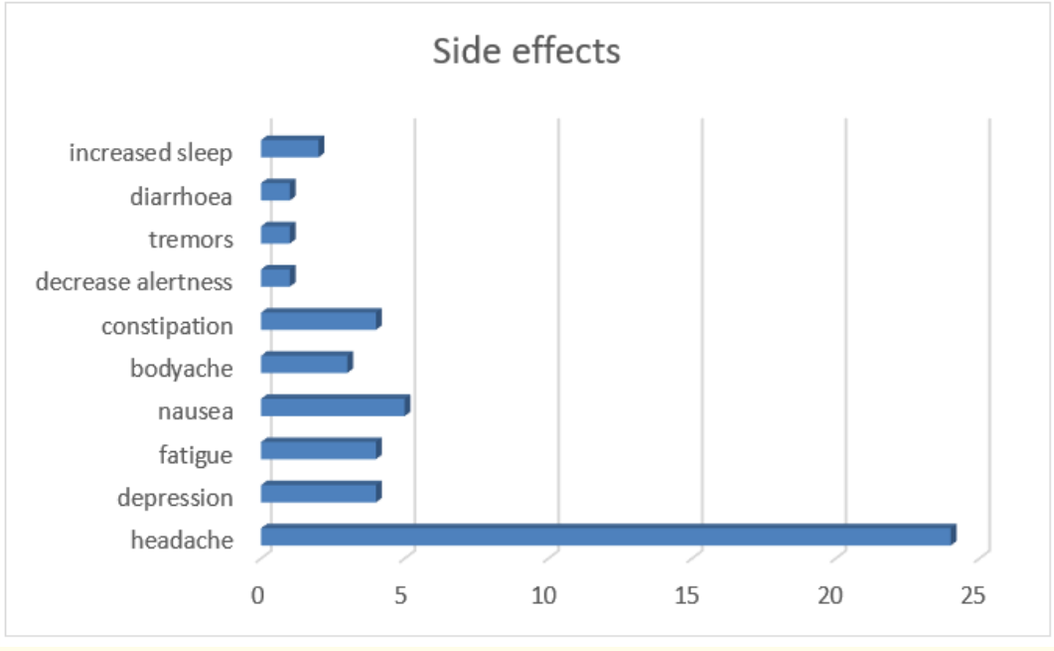

Figure 7

Comparing the drinks, coffee is associated with good alertness and better performance next day with moderate addiction; coke is associated with less alertness and more addiction; red bull is associated with more alertness and addiction is moderate.

The graph below shows addiction status in different drinks.

Here a 2 * 2 table was formed for the calculation of association between addiction effects of the two drinks namely: coffee (highest addiction) and red bull (lowest addiction).

Null hypothesis: There is no association between addiction effect of caffeine among coffee and red bull.

At degree of freedom = 1,

X^2 value = 2.04,

As this value is less than 3.84, null hypothesis may be accepted. There is no association between the two drinks.

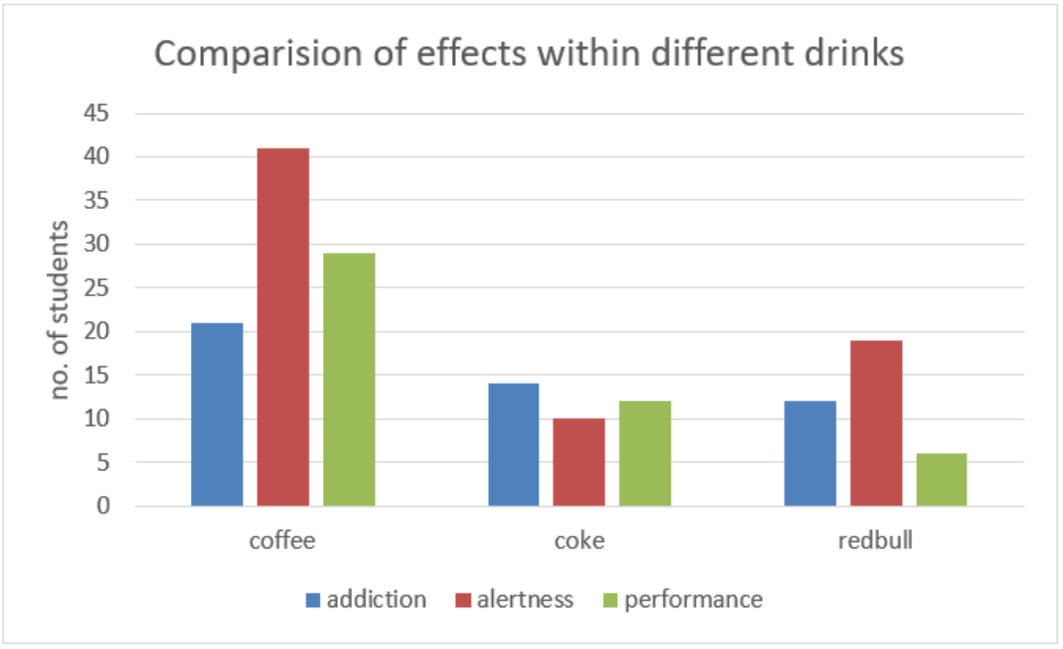

Figure 8

	Addiction	No Addiction	Total
Coffee	21	33	54
Red bull	12	9	21
Total	33	42	75

Table 3

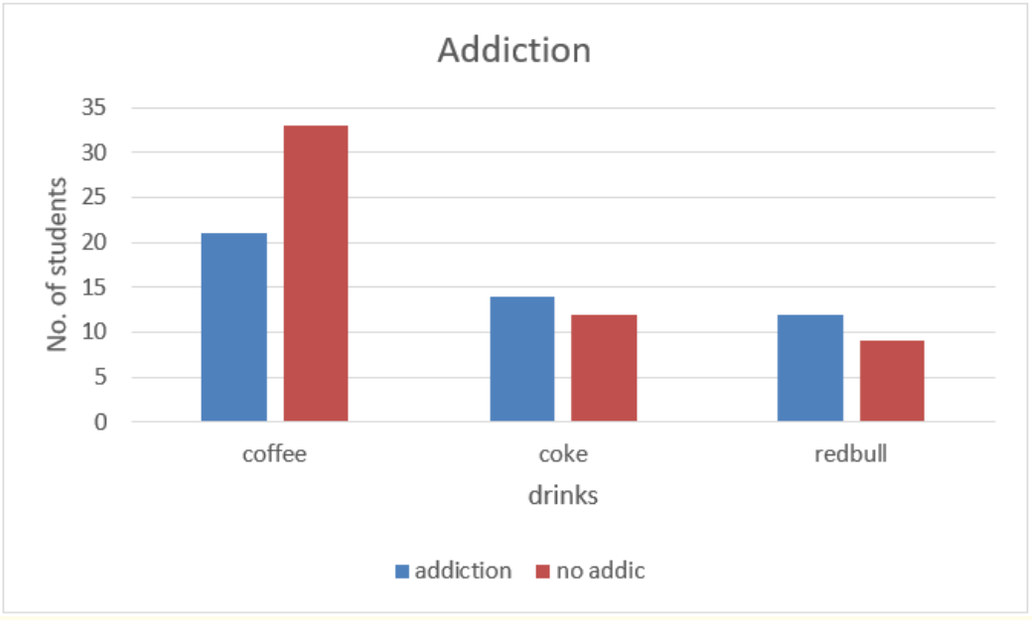

Figure 9

Conclusion

There is a strong association between alertness due to caffeine and the performance after the effect subsides. Caffeine is consumed more in 3 - 4th year students than 1 - 2 year. Headache is found to be the commonest side effect amongst the students. No other severe complication was found. The students should be made aware of the hazards of caffeine as a drug. Educational lecture should be carried out for awareness. Deaddiction programmes should be conducted explaining withdrawal symptoms. There is evidence suggesting decaffeinated coffee has the same benefits as regular coffee, adults who consume 300 - 400 mg/d of caffeine have little to nil health risks and some evidence of health benefits. The benefits and hazards of coffee depend on its additives with multiple studies supporting this theory.

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