

CONSUMPTION OF CAFFEINE THROUGHOUT THE DAY AND IN VARIOUS ENVIRONMENTS BY YOUNG ADULTS AGED 18-35 YEARS IN MUMBAI, INDIA

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ABSTRACT

Younger generations, including the majority of college students, frequently drink caffeine to feel alerted, enjoy the flavor, socialize, enhance physical energy, improve mood, and reduce stress. The aim of this study is to assess the caffeine consumption among participants aged 18-35 years throughout the day and in different environments. The total sample size (N) was 360 participants out of which 180 were students (90 females and 90 males) and 180 were working-class population (90 females and 90 males) aged 18-35 years. The participants completed a self-reported questionnaire containing questions related to time of the day caffeine is consumed and environments in which it is consumed. *p* values of less than 0.05 were considered statistically significant. The highest caffeine consumption is before breakfast (16% consumed tea), during breakfast (49% consumed tea), between lunch and dinner (36% consumed tea), and at no particular time (54% consumed chocolate). Most of the participants did not have a specific time to consume caffeine-rich products, it is finished whenever the participants are pleased to consume. Tea (72%), coffee (56%), and chocolate (63%) were predominantly consumed in the home environment. Cola-based beverages (35%) and energy drinks (17%) were predominantly consumed in the socializing environment. In conclusion, a high number of participants consumed caffeine in stressful environments and throughout the day with maximum consumption in the morning and evening.

Keyword: - Caffeine, environments of caffeine consumption, time of the day, young adults.

1. CAFFEINE CONSUMPTION ACROSS LIFECYCLE

Childhood is when most people first start using caffeine, generally in the form of chocolate, soda, and chocolate milk. As children grow into teenagers, they consume more soda and start mixing in drinks with more caffeine, such as coffee and energy drinks. Caffeine consumption rises from around 50 mg per day in childhood (ages 2 to 11) to 180 mg per day in maturity. For children, this quantity is around 2 mg/kg/day, for women, 2.4 mg/kg/day, and for males, 2.0 mg/kg/day. With adults adopting a more regular, daily pattern of consumption compared to children, there is a difference in the absolute amount of caffeine consumed from childhood to maturity. Additionally, the dietary sources of caffeine change over time: although children and teenagers prefer soda and chocolate, which contain considerably lower quantities of caffeine, adults often drink coffee and tea [1].

Although the general public isn't often considered a susceptible category when it comes to caffeine intake, some experts do think that children, teenagers, and expectant mothers are at risk for negative consequences from caffeine

usage. As these new sources of caffeine might be used in addition to the more conventional caffeine sources like coffee, tea, colas, and chocolate, the introduction of new caffeinated foods and drinks over the past several decades has given rise to these issues. Yet because most surveys only look at a few sources of caffeine, it hasn't been investigated if this is indeed the case. Therefore, it is essential to evaluate current caffeine intake from all sources in order to determine how much new caffeinated foods and beverages will contribute to our overall caffeine intake as well as to determine which specific categories of caffeine sources in our diet may be used to reduce our overall caffeine intake if this is necessary from the perspective of public health [2].

Caffeine use among different age groups is rising, owing to the availability of a variety of caffeinated goods, including colas and energy drinks, in addition to traditional sources such as tea and coffee. Caffeine levels in these drinks range from 50 mg (equal to a can of Coke) to 500 mg (equivalent to five cups of coffee). Despite having many physiological effects of caffeine, caffeine has no minimum safe limit; nonetheless, an upper limit of 300 mg/day is advised for teenagers. In India, the average daily caffeine intake of teenagers has not been reported. This is critical for permitting extra caffeine intake without exceeding the maximum permitted amount [3].

1.1 Caffeine Consumption among Young Adults

Coffee accounted for the majority (89%) of the caffeine consumed, followed by tea and carbonated soft beverages. Carbonated soft drinks were the leading caffeine source (30%) for young people (ages 15 to 19 years). Coffee was the major caffeine source for those who consumed the most caffeine (30-49 years old). Adults' overall caffeine use has not changed in terms of trends. There hasn't been a rise in daily caffeine intake as a result of the introduction of energy drinks as a new caffeinated product to the beverage industry. Over the past ten years, the total amount of caffeine consumed by children under the age of 12 has dramatically decreased, whilst the amount consumed by adolescents has stayed consistent. The use of caffeinated soft drinks has decreased over the previous 15 years, but coffee consumption has increased among kids and teenagers [2].

According to various research, college students' heavy usage of caffeinated drinks is one of their coping mechanisms for dealing with difficult academic conditions [4]. Nearly 30% of American adolescents are said to regularly drink something caffeinated, and soda seems to be the preferred beverage, followed by coffee. The popularity of energy drinks is growing. More than two-thirds of respondents to a nationally representative study reported drinking soda once or more each day. Over half of the respondents said they never drank coffee, and two-thirds said they only did so once a week or less. In comparison to teenagers reporting low caffeine intake, those reporting high caffeine intake (defined as a frequency of consumption > 1 drink/d) were 1.9 times more likely to have trouble falling asleep and 1.8 times more likely to feel sleepy in the morning [5].

1202 food and beverage products were examined in South Korea to evaluate their caffeine level. A nationwide representative sample of an average age of 21.573 Koreans was used to quantify the daily caffeine intake using information from the Korean National Health and Nutrition Examination Survey (KNHNES), which was performed in 2010–2012. The average daily caffeine consumption for the entire general population of Korea was 67.75 mg (77.24 mg for men and 58.23 mg for women), and 81.91 mg for individuals 19 years of age and above. The average daily consumption of caffeine among 15–18-year-old adolescents was 30.04 mg (0.52 mg/kg BW/day). The age group of 30-49-year-olds consumed the most caffeine (101.83 mg/day, or 1.55 mg/kg BW/day) [2].

The aim of the study was to assess the caffeine consumption among participants aged 18-35 years throughout the day and in different environments.

2. METHODOLOGY

The proposed study was conducted using a cross-sectional design. Data was collected via physical meetings and telephonic conversations on one-on-one basis through the interview method. The study was conducted for three months in Mumbai, India. The total sample size (N) was 360 participants out of which 180 were students (90 females and 90 males) and 180 were working-class population (90 females and 90 males) aged 18-35 years. The participants were recruited using snowball sampling. The participants were included based on the inclusion and exclusion criteria. The participants were explained in detail about the purpose of the study by providing a participant information sheet and written informed consent was obtained. After the screening process, the participants were

given the participant information sheet, consent letter, and the questionnaire consisting of the case record form, anthropometric measurements, and caffeine-consumption based questionnaire from CaffCo (Caffeine Consumption and Habits Questionnaire) and 24-hour Caffeine Intake Tool [6,7]. The data were analyzed by using SPSS (Statistical Package for Social Science) software (Version 21). Descriptive statistical tests and inferential statistical tests like t-test for obtaining the results. p values of less than 0.05 were considered statistically significant.

2.1 Inclusion Criteria

Samples were recruited based on the following inclusion criteria:

1. Participants aged between 18-35 years.
2. Working population and students.

2.2 Exclusion Criteria

Samples were eliminated based on the following exclusion criteria:

1. Participants who have diabetes, cardiovascular disease, or cancer at baseline.
2. Pregnant and Lactating women.
3. Participants who have not consumed in the last 12 months.

3. RESULTS AND DISCUSSION

The cross-sectional study was undertaken to assess caffeine intake using a questionnaire accounting for the environment and time of the day caffeine was consumed. The study consisted of 360 participants aged in between 18-35 years. The mean age of the study sample was 23.37 ± 4.48 years. The study sample included an equal percentage of males (50%) and females (50%). The ratio of males to females in the study was 1:1.

| Demographic Factors | | |
|---------------------|---------------|-------------|
| | Frequency (n) | Percent (%) |
| Gender | | |
| Male | 180 | 50.0 |
| Female | 180 | 50.0 |
| Occupation | | |
| Student | 180 | 50.0 |
| Working | 180 | 50.0 |
| Dietary Preferences | | |
| Vegetarian | 106 | 29.4 |
| Non-Vegetarian | 254 | 70.6 |

Table-1: Demographic Characteristics of the Study Sample

3.1 Caffeine Consumption in Each Meal by the Study Participants

To identify the time of day with the highest caffeine intake, the present study additionally recorded the amount of caffeine ingested at each meal. With the help of a caffeine consumption questionnaire meal wise data was established before breakfast, breakfast, between lunch and dinner, and at no particular time. Only few participants consumed caffeine in other meals like between breakfast and lunch, at lunch, at dinner, after dinner, and all day.

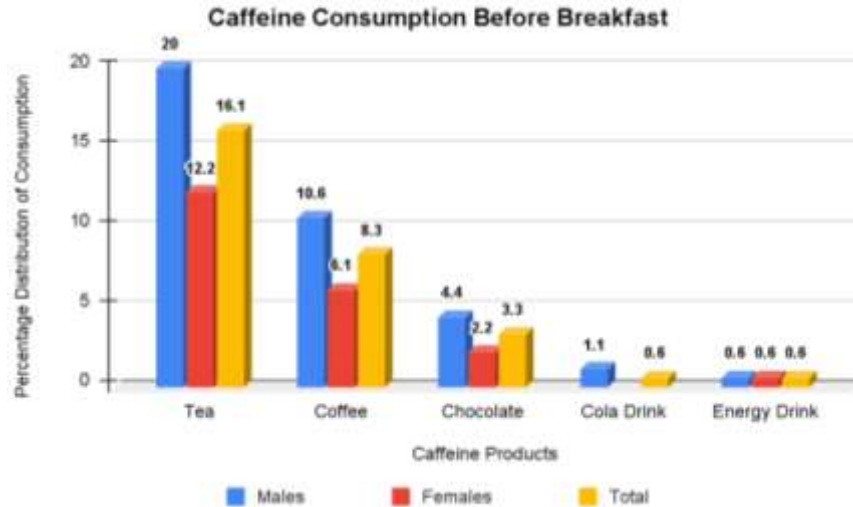


Fig-1: Percentage Distribution of Study Participants Consuming Caffeine Products Before Breakfast

Fig-1 shows the percentage distribution of participants consuming various caffeine products before breakfast. The most preferred before breakfast was tea (16.1%), coffee (8.3%), chocolate (3.3%), cola drink, and energy drinks (0.6%). It was observed that males have a higher consumption of these caffeine sources before breakfast as compared to females. No significant difference was observed gender-wise.

A study with 21-night shift employees, ages 31 to 62, found that drinking strong black coffee before breakfast significantly boosted the blood glucose response to breakfast by around 50%. As a result, using caffeine to wake up in the morning may have a negative impact on blood glucose regulation. Caffeine had a strong impact in that it lessened the decline in alertness that was seen after completing a battery of tests. Once more, this was a strong response that may indicate modifications to the noradrenergic system [8].

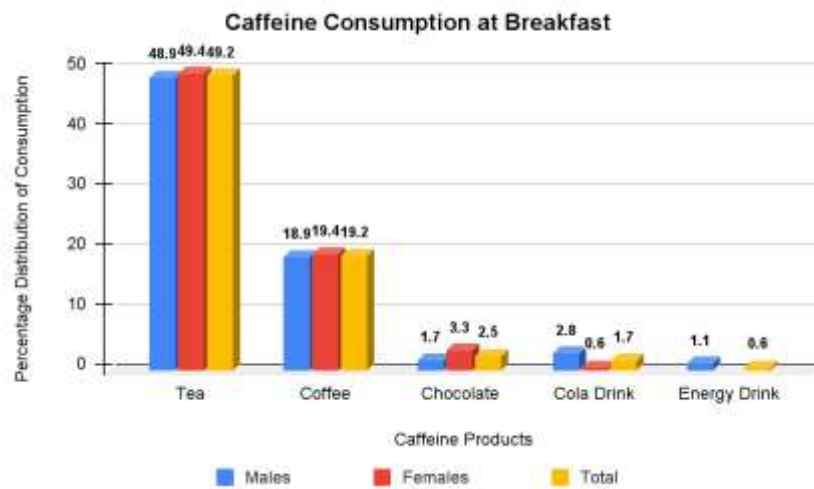


Fig-2: Percentage Distribution of Study Participants Consuming Caffeine Products at Breakfast

Fig-2 shows the percentage distribution of participants consuming various caffeine products at breakfast. The most preferred at breakfast were tea (49.2%), coffee (19.2%), chocolate (2.5%), cola drinks (1.7%), and energy drinks (0.6%). It was observed that females have a higher consumption of these caffeine sources at breakfast as compared to males, except for cola drinks and energy drinks. No significant difference was observed gender-wise.

Similar research, which focused on how breakfast affects how well people performed memory tests, was reported. Breakfast consumption enhanced recall and word recognition but showed no positive impact on working memory or semantic memory tasks. Once more, the benefits of breakfast were unaffected by coffee, personality, or gender.

Breakfast had no impact on free recall in the late morning or after lunch, indicating that its effects on episodic memory were only present for a short period of time following the meal [9].

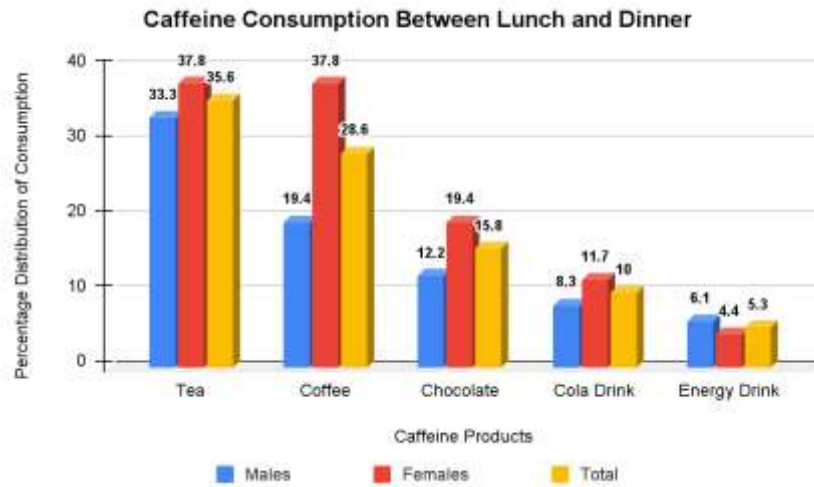


Fig-3: Percentage Distribution of Study Participants Consuming Caffeine Products Between Lunch and Dinner

Fig-3 shows the percentage distribution of participants consuming various caffeine products between lunch and dinner. The most preferred between lunch and dinner were tea (35.6%), coffee (28.6%), chocolate (15.8%), cola drinks (10%), and energy drinks (5.3%). It was observed that females have a higher consumption of these caffeine sources between lunch and dinner as compared to males, except for energy drinks where males consume more as compared to females. No significant difference was observed gender-wise.

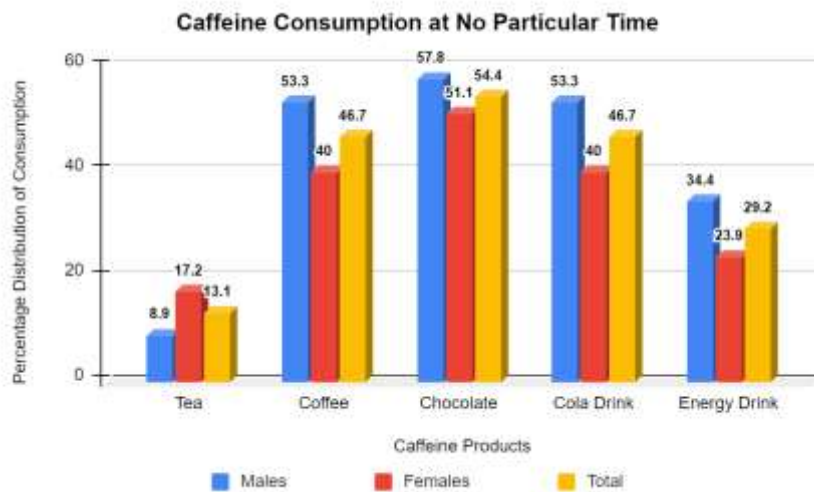


Fig-4: Percentage Distribution of Study Participants Consuming Caffeine Products No Particular Time

Fig-4 shows the percentage distribution of participants consuming various caffeine products at no particular time. The most preferred caffeine product at no particular time was chocolate (54.4%), coffee, cola drink (46.7%), energy drinks (0.6%), and tea (13.1%). It was observed that females have a higher consumption of these caffeine sources at breakfast as compared to males, except for tea. No significant difference was observed gender-wise.

In a survey including 65 students with a mean age of 21.92 years, it was found that the majority of the students identified coffee and coffee-based drinks as their preferred choice of favorite caffeinated beverages, followed by tea and soft drinks. The majority of participants used one to two cups or cans of caffeinated beverages per day on

average, while the morning and evening hours saw the highest levels of consumption, according to the data on average daily consumption. It was noted that 44% of the total participants consumed caffeine during evening snacks, 21% during the morning, 14% at lunchtime, 6% and 4% at dinner and after respectively [10].

In a study with age, heavier smokers, morning personalities, and worried individuals all consumed considerably more coffee in the morning ($p < 0.001$). Males, older persons, heavier smokers, and those scoring higher on the sensation-seeking scale drink more coffee in the afternoon ($p < 0.001$). Being older, a heavier smoker, being more impulsive, and having an evening personality all predicted coffee use in the evening/night ($p < 0.001$) [11].

3.2 Caffeine Consumption in Various Environments by the Study Participants

The present study also documented the use of caffeine in diverse settings. All of the participants were given a choice of many environments in which to consume each product after being asked "In what environment do they consume these products?". The most typical settings for using caffeine products were indicated as being at home, socializing, working, in cafes, and in studying environments. This might be useful in determining the best setting for caffeine usage.

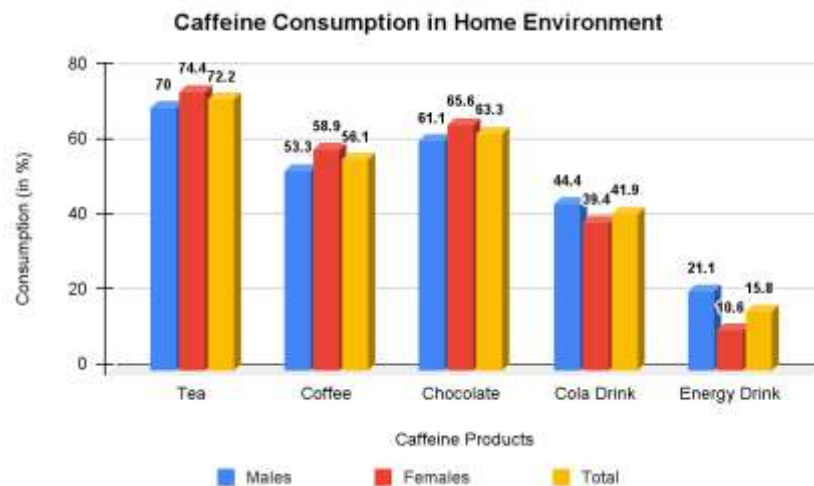


Fig-5: Percentage Distribution of Study Participants Consuming Caffeine Products in Home Environment

Fig-5 shows the percentage distribution of participants consuming various caffeine products at home. Most preferred at home was tea (72.2%), chocolate (63.3%), coffee (56.1%), cola drink (41.9%), and energy drinks (15.8%). It was observed that females have a higher consumption of these caffeine sources at home as compared to males, except the cola and energy drink which was consumed by more males as compared to females. No significant difference was observed gender-wise.

In the last few years due to the COVID-19 pandemic, the 'work from home' concept was gaining popularity and this was also accompanied by an increase in stress and sleepless nights due to stress-causing daytime dysfunction and an increasing need to improve alertness and staying away during the work hours. This was a phenomenon that increased the consumption of caffeinated beverages at home.

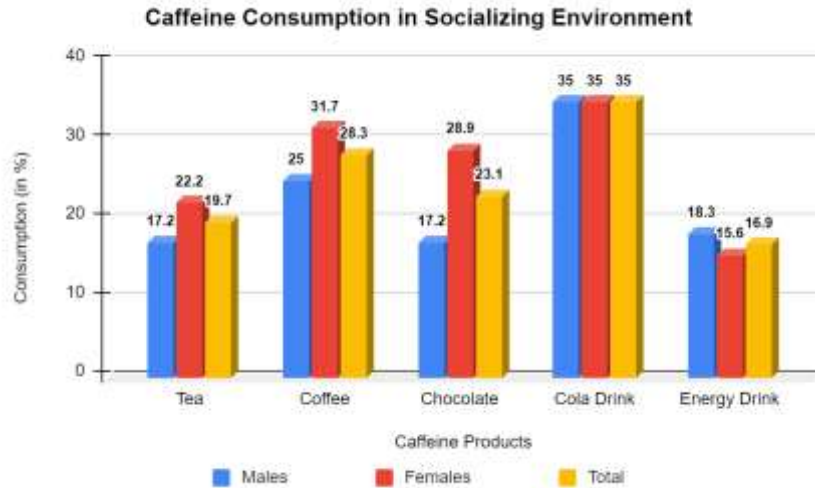


Fig-6: Percentage Distribution of Study Participants Consuming Caffeine Products in Socializing Environment

Fig-6 shows the percentage distribution of participants consuming various caffeine products in a socializing environment. Most preferred in a socializing environment were cola drinks (35%), coffee (28.3%), chocolate (23.1%), tea (19.7%), and energy drinks (16.9%). It was observed that females have a higher consumption of these caffeine sources in a socializing environment as compared to males, except in energy drinks where males consume more energy drinks as compared to females and cola consumption was equal between genders. No significant difference was observed gender-wise.

Caffeine in the form of coffee, tea, cola, or energy drink was an easily available form of beverage in India after urbanization. The growing Western influence has led to an increase in spaces available to socialize and which provide food and drinks while spending time. It was also observed that participants enjoyed spending time with loved ones while consuming caffeine.

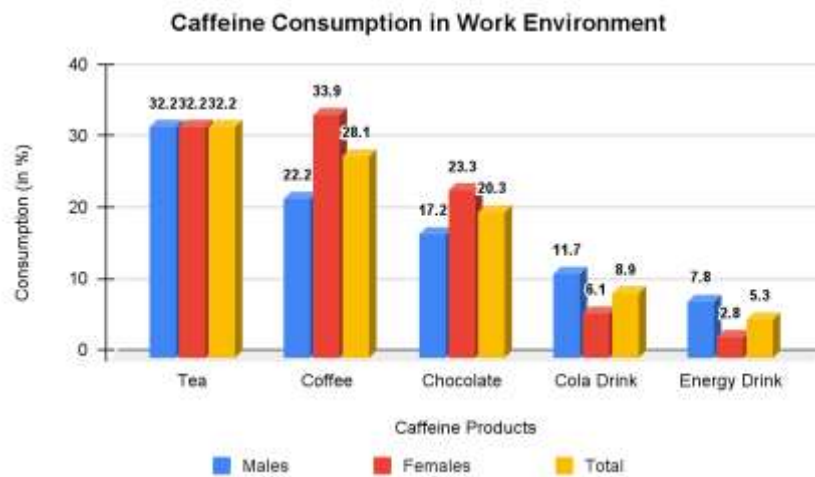


Fig-7: Percentage Distribution of Study Participants Consuming Caffeine Products in Work Environment

Fig-7 shows the percentage distribution of participants consuming various caffeine products in the work environment. Most preferred in the work environment was tea (32.2%), coffee (28.1%), chocolate (20.3%), cola drinks (8.9%), and energy drinks (5.3%). It was observed that females have a higher consumption of these caffeine sources in the work environment as compared to males, except in cola and energy drinks where males consume

more energy drinks as compared to females and tea consumption was equal between genders. No significant difference was observed gender-wise.

In a study, 136 healthcare professionals at a primary care clinic, an acute care hospital, and a mental health clinic found that when workers were feeling fatigued at work, 87% of them preferred to drink caffeinated beverages, 20% preferred non-caffeinated beverages, and 5% preferred sugary foods. Some employees turned to caffeine and sugar as a first resort, while others use these tactics only when other options (like physical activity, breaks, and environment changes) were impractical [12].

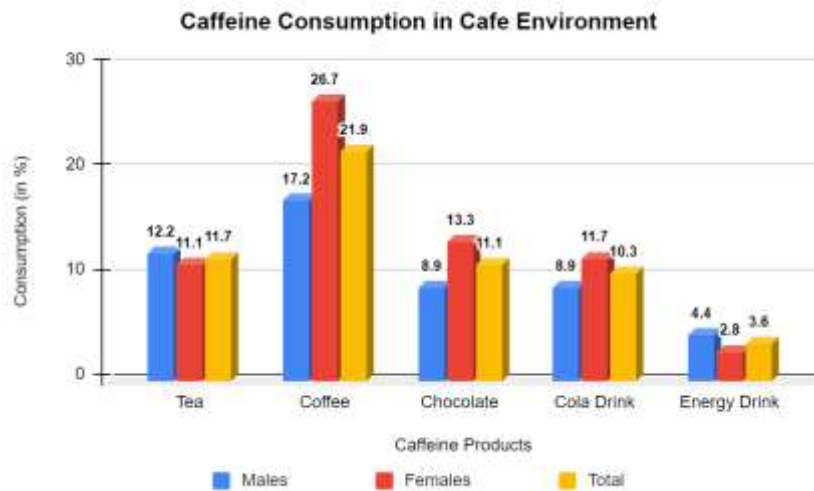


Fig-8: Percentage Distribution of Study Participants Consuming Caffeine Products in Cafe Environment

Fig-8 shows the percentage distribution of participants consuming various caffeine products in a cafe environment. Most preferred in a cafe environment was coffee (21.9%), tea (11.7%), chocolate (11.1%), cola drinks (10.3%), and energy drinks (3.6%). It was observed that females have a higher consumption of these caffeine sources in a cafe environment as compared to males, except in tea and energy drinks where males consume more energy drinks as compared to females. No significant difference was observed gender-wise.

According to research, drinking coffee in cafes was sometimes viewed as a trend rather than a habit, a sign of an affluent lifestyle [13]. Demand for goods like coffee has grown as a result of rising earnings, rising living standards, and middle-class customers' awareness of Western trends. The first place was the house, the second was the office, and coffee shops and cafes, which were referred to as "third places," were focal points of daily social interaction and frequently include food and beverage outlets [14].

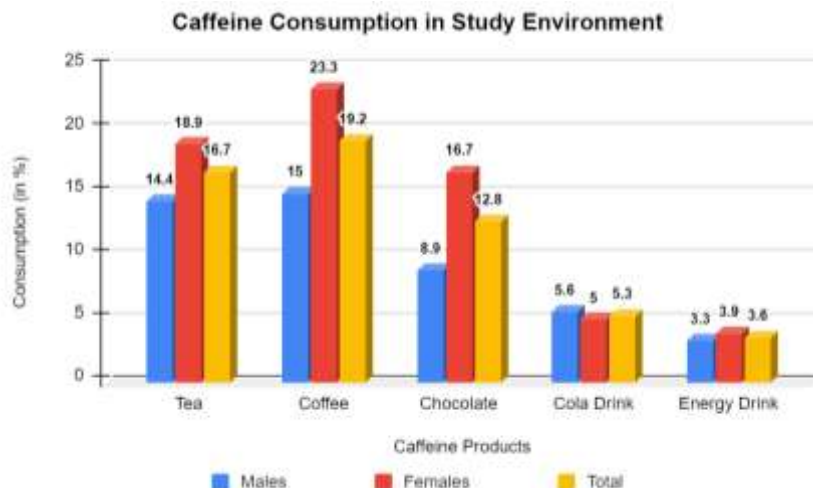


Fig-9: Percentage Distribution of Study Participants Consuming Caffeine Products in Study Environment

Fig-9 shows the percentage distribution of participants consuming various caffeine products in the study environment. Most preferred in the study environment was coffee (19.2%), tea (16.7%), chocolate (12.8%), cola drinks (5.3%), and energy drinks (3.6%). It was observed that females have a higher consumption of these caffeine sources in the study environment as compared to males, except in cola drinks where males consume more energy drinks as compared to females. No significant difference was observed gender-wise.

A study including 65 students, with a mean age of 21.92 years, revealed a rising trend in the use of caffeinated beverages among college-bound students. Possible explanations include the promotion of these beverages to the younger population, the preference for coffee flavor among adults, and their accessibility on campuses and in student hotspots. These coffee-based beverages were enjoyed by both male and female pupils. This demonstrates that these caffeinated beverages were becoming more and more popular with this age group [10].

4. CONCLUSION

The study was conducted with the objective to determine the caffeine consumption of young adults in various environments and throughout the day. 360 participants were screened for the study with a mean age of 23 years. The environment and the time of the day caffeine consumed plays a role in the absorption of caffeine. In conclusion, most of the participants did not have a specific time to consume caffeine-rich products, it is consumed whenever the participants are pleased to consume, especially in stressful environments like while working and studying.

5. REFERENCES

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