

ASSOCIATION OF CAFFEINE INTAKE AND STRESS AMONG UNIVERSITY STUDENTS



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Dedication

We dedicate this work to Prophet Muhammad (PBUH).

Acknowledgement

In the name of ALLAH (SWT) the most Beneficent, the most Merciful, who has given us the strength and ability to complete this study. All praises belong to ALLAH (SWT), Lord of the universe. May His blessings be upon the Prophet Muhammad (SAWW) and members of his family and companions.

Special thanks to our parents who were always there for us, supporting and encouraging us with their precious prayers and best wishes.

We would like to express my deepest gratitude to our supervisor, **Miss. Aqsa Nadeem** her excellent guidance, patience, motivation and immense knowledge

We would like to thank my friends and my colleagues who helped us in our work.

DECLARATION

We declare that the research project “**Association of caffeine intake and stress among university students**” is based on our own work carried out during the course of our study under the supervision of **Miss Aqsa Nadeem**. We assert that statements made and conclusions drawn are an outcome of our research work. We further certify that the work contained in the report is original and has been done by us under the general supervision of our supervisor.

The work has not been submitted to any other institution for any other degree in this university. We have followed the guidelines provided by the university in writing the report.

Whenever we have used materials (data, theoretical analysis, and text) from other sources, we have given due credit to them in the text of the report and have given their details in the references.

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APPROVAL CERTIFICATE

Research Project entitled “*Association of caffeine intake and stress among university students*” is accepted by the faculty of School of Health Sciences, University of Management and Technology, Lahore, in partial fulfillment of the requirement for the degree of *DNS*.

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Abstract

Stress is considered as a very profound factor these days; and is prevailing in stress as in society because of proceeding sense of comparison and excellence that leads to constant state of tension, emotional and physical discomfort especially when a matter of student is concerned whose time is mostly consumed in exams and different assessments so in this regard a cross sectional study was conducted where 154 undergraduate students of University of Management and Technology age 17 to 26 years were targeted. Online questionnaires were provided to them where the study used perceived stress scale that is a most widely used psychological instrument for measuring perception of stress and to assess caffeine frequency by calculating the caffeine servings per week accordingly.

The study highlighted the stress score which indicates that 15% were having low intensity of stress, 66% were having moderate intensity of stress and 19% students were classified under high stress category. We have analyzed their caffeine consumption and the results indicate that 82% students were having low consumption of caffeine, 14% were having moderate consumption of caffeine and only 4% students are classified under high consumption of caffeine. Out of all caffeinated products mostly consumed caffeinated drink amongst the undergraduate male students of UMT were tea (43% responded 5-6 times/week), coke/ carbonated beverages (38% responded 2-3 times/week) and milk chocolate bars (36% responded 4 times/week).

The study concluded that there is no relation between stress and caffeine intake. Null hypothesis has been justified.

Key words: Caffeine consumption, stress, anxiety, depression, stress and caffeine, caffeinated beverages

Chapter 1: Introduction

1.1. Background

We are living in a society where mental health problems are not considered as an issue of making change in society that results in extreme nervousness, discomfort and stress. In this society where education is prevailing day by day, students are pressurized at every moment of their life whether it is concerned with exams any basic kind of assessment that result in their deteriorate eating and drinking patterns and in result of that students become more inclined towards bad eating and drinking habits specially when it is the matter of cause of caffeine intake since Pakistan is considered as highly prone country to caffeine intake. According to NIH, Stress is a feeling of emotional or physical tension that induces frustration, anger or nervousness. Stress can be induced due to any reason or any event that builds up tension, anxiety and frustration in one's body. It is a natural response of our body to respond to a particular stressor (NIH., 2020) .There are various factors that act as a stressor in an undergrad's life such as academics, peers and social issues, any major changes or events such as leaving university or getting a job, lack of sleep, financial issues and many others. In any stressful conditions, our body releases a flood of hormones including adrenaline and cortisol. The release of these hormones increases heart rate and breathing rate, contracts muscles, raises blood pressure and sharpens senses. Stress also acts as a causative factor in many diseases, as it interacts with the disease and furthers worsens the disease. As a result of prolonged stress, our body starts showing different symptoms such as headache, aches, pains, heart ache, insomnia, digestive problems, weakened immune system, depression, panic attacks, anxiety, sadness, changing eating patterns (MedlinePlus. 2021).

Caffeine on the other hand is a natural stimulant that blocks adenosine which is also a neurotransmitter that relaxes the brain and prevents tiredness. Its main effect is on the brain. It is naturally found in leaves and fruits of some plants. It is also present in coffee, green and black tea, soft drinks, energy drinks, cocoa chocolate bars, energy bars. Increased consumption of caffeine poses many negative health effects as it increases the release of cortisol in our body which is a hormone that is naturally released in our body in stress. This hormone further causes many negative effects on our body such as increasing weight, endocrine diseases such as diabetes, cardiovascular diseases such as arhythmias, mood swings and many more (Scott et al., 2020). According to FDA, healthy adults can consume caffeine up to 400mg/ day which is considered safe. Increasing these amounts can cause anxiety, difficulty in sleeping, addictive, heart problems, digestive problems, increases blood pressure and heart rate and persistent fatigue and tiredness

Different people consume caffeine in different forms due to different reasons. Office workers, doctors, engineers, business man, merchants consume caffeine to prevent tiredness and fatigue at their work place. Housewives consume it for the same reason. Athletes and sports persons drink caffeine to enhance their performance whereas adolescents, teenagers and adults too drink caffeine for its distinctive taste and the ability to boost energy Caffeine is consumed in various ways by different types of people such as coffee, tea, energy drinks, carbonated beverages and chocolates. In Pakistan, tea is the most popularly consumed caffeinated drink in all age groups and nearly all members of the houses drink it as daily ritual. Majority of the people consume tea without knowing that it is a source of caffeine too. Surprisingly increased consumption of chocolate exposes individuals to excess caffeine so toddlers and adolescents who consume chocolate as a healthy snack are

actually imparting negative effects on their health. According to a survey conducted on students that were using energy drinks to check the consumption pattern of caffeine is a popular practice among the students for different variety of situations. In many cases, respondents consumed energy drinks once every 1 - 4 days per month, while others also reported to drink three or more energy drinks together with alcohol on events. The study showed that consumption of energy drinks had negative health (Malinauskas et al., 2007). Another study unveiled that intake of caffeine was causing anxiety and depression in secondary school children. These observed effects on mental health were distinct in both male and female children being more dominant in male children as compared to females (Richards et al., 2015). There are many other studies that throw light on the relation of stress and caffeine and its negative impact on health.

1.2. Problem statement

The purpose of this study is to measure the intake of caffeine under stressful condition in undergraduate students and to measure the relation and the proportion to which a student take caffeine under stressful conditions. There have been many researches that indicate the relationship of caffeine and stress. This research aims to analyze how the intake of caffeine is influenced in already stressed individuals under stressful conditions.

1.3. Significance of the study

Studies do show that excessive intake of caffeine induces stress, anxiety and depression in individuals but a research gap exists about the effect of the intake of caffeine under stressed conditions. This research aims to analyze how the intake of caffeine is effected in already stressed individuals under stressful conditions.

This research also unveil the consumption rate of energy drinks as compared to other

caffeine containing products among students. Both stress and caffeine cause negative effects on body, this research shows if stress compels students to increase or decreases consumption of caffeine in any form.

1.4. Objectives

- To determine the relationship between caffeine intake & stress in among university students
- To determine the effect stress has on the intake pattern of caffeine containing products.
- To find how the type & amount of caffeine consumption effects university students.

1.5. Hypothesis

There is no effect of stress that induces consumption of caffeine among university students.

- The effect of stress that induces increased consumption of caffeine among university students.
- The effect of stress that induces decreased consumption of caffeine among university students.

Chapter 2: Literature Review

2.1. Effect of caffeine:

Chemically, caffeine is an adenosine receptor antagonist and a methyl xanthine it can potentially affect the way brain performs its function. Adenosine is considered as the sleep factor since the amount of adenosine in our brain determines the duration and quality of sleep. Presence of sufficient levels of adenosine in the brain causes one to feel drowsy, low activity levels and fall asleep. When high levels of caffeine are taken in, they act antagonistically to the adenosine. Caffeine acts as receptor to adenosine, thereby causing effects opposite to those caused by the adenosine (Sanchez et al., 2013). The caffeine intake improve mood (18%), concentration (31%), and highest to feel awake (79%). Change in social gatherings and Physical energy (27%) along with stress relieve (9%) is also among the reasons (Mahoney et al., 2019).

2.2. Caffeine and stress:

Caffeine is a controversial chemical which is consumed world widely. Caffeine may be have association with stress levels (Kale et al., 2017). A study on secondary school children in England was conducted that indicated intake of caffeine possibly linked with stress. Coffee was responsible as a contributing factor of caffeine observed through analysis but there were also many other resources. High caffeine intake was associated with risk factors like stress, depression and anxiety (Richards et al., 2015). Eating behavior of the college students is unhealthy because they were consuming few vegetables and fruits but high amount of fatty food.

2.3. Caffeine consumption:

Caffeine is an active substance which is usually ingested as an anti-depressant worldwide. Caffeine is present in different beverages like soft drinks, tea and coffee

as well as in chocolates. It is widely consumed at different levels in the population. Ingestion of caffeine has adverse effects on human health and after researches, it was concluded that the intake of caffeine up to 400mg/day for a healthy adult without association with adverse side effects on bones, cardiovascular system, behavior changes and male fertility (Nawrot et al., 2003). Coffee is a major source of caffeine in most of people and consumption of coffee was basically come across from northeast Africa and then to the Middle East in the 15th century and then spread out to the Europe. In caffeinated beverages coffee is the most valuable product in the world. Now a days, it is consumed almost regularly worldwide. Over half American population drinks coffee regularly (Bae et al., 2014).

2.4. Overview of relevant researches:

The study had been done on predominantly white females, in this study perceived stress was linked to daily dietary choices among college students. 613 public universities students did an online questionnaire that was associated with last week consumption of fruits, vegetables, fast foods, soda and various food as well as perceived stress capability to manage stress. The study analyzed linked between last week dietary consumption and perceived stress (Errisuriz et al., 2016). Various studies on western populations regarding intake of caffeine in young adults have been carried out. Though, very little information has been gathered about other populations. It studied effect of caffeine intake on physical and mental health in Bahraini people. They studied effect of caffeine intake on physical and mental health in Bahraini people. The caffeine consumption in general public especially among university students from various sources e.g. chocolates, energy drinks and tea were evaluated demographically. Almost 98% of the university students consumed 268 mg/day different forms of caffeine and its consumption was higher in males. Interestingly, for

caffeine intake university students were relying on coffee instead of black tea and energy drinks. Caffeine intake by university students in Bahrain is elevated due to the work stress. However, mean of caffeine intake from multiple sources was between the limits of dietary recommendations. Anxiogenic effect was linked with high caffeine consumption among the university students (Jahrami et al., 2020). A study demonstrated a relationship between unhealthy dietary behavior and caffeine intake through energy drinks for a number of college students. Most of the energy drink users were males and it was discovered that those who took a significant amount of energy drinks in the past week had low intake of vegetables, fruits, breakfast and milk subsequently. They were also reported to have high Body Mass Index. Positive relationship between high intake of caffeine and high BMI was also demonstrated by the research carried out in a Chinese university. (Poulos et al., 2015) University graduated who are involved in physical activity like weight loss or control is likely to be linked with high amount of caffeine consumption (Jeffers et al., 2014). Energy drinks and soft drinks often contain elevated amount of caffeine levels which is also associated with binge alcohol (Galluci et al., 2016).

A study was conducted on coffee intake among university students and found almost 92% consumed caffeine in any form. On daily basis caffeine consumption by university students included consumers and non-consumers was 159 mg/day. Among them 173 mg/day was observed in caffeine users. As proved by previous studies main source of caffeine intake is coffee. If we look into gender bases data 120mg/day of caffeine intake is for male and 111 mg/day is for female's consumers. Energy drinks were also examined and found that 53mg/day caffeine intake from energy drinks is seen in male. Reasons for energy drinks intake include enhanced performance in examination (41.2%) and accompanying friends in spending time (59.4%) are

reported for female university students (Rahamathulla et al., 2017). Caffeine intake increases screen time of the students by keeping them alert for some time. Out of 442 undergrad students 31.8% agreed that consumption of caffeine helps improving exams performance while 57.3% insisted that it doesn't (Afroz et al., 2020). University students may also rely on caffeine pills in order to enhance cognitive abilities during academic especially exams stress. This is referred to as Neuroenhancement (NE) - non-medical use of psychoactive substances for the enhancement of one's physiological functioning (Wolf et al., 2016). Caffeine is also considered as one of the drugs that has been in use nowadays for NE (Franke et al., 2011) Wolff et al., 2014). It is consistently used to improve cognitive abilities in different form such as energy drinks or caffeine tablets (Singh et al., 2014). A survey conducted in different Dutch universities has reported an association between stress levels and use NE drugs among university students (Schelle et al., 2015). Medical students in Italy were found to have a regular practice of using cognitive enhancers (CE). The substances used as CEs were readily available caffeinated drinks like tea, coffee and energy drinks or substances to be used only on prescription, e.g. modafinil and psychostimulants. Most of the students were using beverages that were readily available while 0.6% of them were reported to use prescription-only substances (Pighi et al., 2018). Use of caffeine for cognitive enhancement (EC) is very common among students of school and university, it may be in the form of caffeine tablets, coffee and/or other caffeinated drinks. The use of caffeine for cognitive enhancement and relevant factors were evaluated by analyzing students. The prevalence for caffeinated tablets is less as compared to the other two intake sources, the figures still remain a potential concern (Franke et al., 2011). From surveys it was noted that major sources of caffeine intake were coffee, tea and soft drinks. The national health and nutrition

examination survey (NHANES) stated that caffeine intake has increased in adults in USA. In this study it was reported that 89% of US adults specifically college going students were consuming caffeine in different forms. Daily caffeine intake reported was 211mg/day. Coffee (18%) being the highest contributor then soft drinks (Fulgoni et al., 2015). Trend in the consumption of energy drinks among different groups of individuals between 2003 and 2016 was studied. They selected a total of 9911 people of different groups that included high school graduates and college students as well. The results revealed that consumption of energy drinks per capita has been increased (1.1-9.7 calories) from 2003 to 2016, and for the survey year, it was calculated that 66.8% of the total caffeine intake came from energy drinks for young adults. People usually don't understand that there is a combined effect of caffeine with other substances present in energy drinks. Moreover, sometimes labels mentioning the quantity and warning against caffeine are also missing (Vercammen et al., 2019). Energy drinks vary in their caffeine levels with some having 300mg or even more per serving. Use of alcohol mixed energy drinks is also in trend these days in USA and the consumption of such drinks have elevated the symptoms related to alcohol use (O'Brien et al., 2008).

A wastewater-based epidemiology conducted over a US university attempted to evaluate the consumption caffeine along with alcohol and nicotine among the students through the analysis of metabolites of these substances in the wastewater. The results showed that caffeine was most consumed on weekdays rather than weekends. (Driver et al., 2020). A survey from University of Lahore, Pakistan on caffeine intake among 185 students (Male: 52, Females: 133) (medical and non-medical) along with its benefits and hazardous effects were examined. It was reported that 167 out of 185 consumed caffeine based products on daily basis. Products

containing caffeine consumed by students were tea (62.4) and soft drinks (52.8%). Lowest consumption rate was observed for coffee (41.6%) possibly because of high price. Among students (77.4%) it is believed that caffeine helps them achieve high physical performance, however, 63.4% believed it to be harmful for health. Among them 24.8% reported fatigue to be the most common withdrawal effects (Nasir et al., 2018). In another study no significant evidence of association between the consumption level and anthropometric measures was observed. However, caffeine consumption is strongly linked with blood pressure. Soft drinks were excessively consumed by university student which contains caffeine. Students exceeded safe limits set by EFSA were 65.3%. Though, lot of work needed to be done when it comes to awareness and therapeutic use of caffeine (El-Nimr et al., 2019). Saudi universities studied examination stress a major reason of increased consumption of energy drinks among youngsters (Alrasheedi et al., 2016). A study identified the determinants of caffeine consumption among a representative group of university students Pattern and reasons for the use of energy drink were collected through the questionnaire. Students were reported to consume energy drinks, and most of them were males from non-medical colleges of the university. The study suggests a positive association between being a non-medical student and the energy drink intake. Another study included only female students from a Saudi university in order to evaluate the prevalence, rate of consumption of energy drinks, and their side effects (Alabbad et al. (2019).

98.6 % medical and 97.4 % of non-medical students were taking caffeine from different sources and soft drink was contributing 39 % per 126 responses. Secondly, tea was contributing 26.5% per 86 responses followed by coffee whose consumption was 20.6% per 67 responses and then energy drinks which were contributing 11.2%

per 36 responses, whereas some other products like caffeinated tablets and gums etc. were used by 4.8% of the respondents. Different reasons for consuming caffeine included studying for exams, relieving headache, going out with friends, driving over long distance, staying alert while at work, and taking in when unable to sleep. Some people used a specific product just because they liked its taste. A significant percentage (62%) of the students disclosed that they increased their caffeine intake as a result of increased study pressure. Considering the knowledge of students about caffeine and its effects, 46% medical and 25% non-medical students were found to have significant knowledge (Ahmad et al., 2017). A six month duration study included a representative group from 3 different private universities of Lahore, Pakistan. It consisted of 670 individuals (278 males, 392 females) out of which 506 were caffeine consumers (79.9% of males and 72.4% of females) with rest of them being non-consumers. The consumers said that they felt more energetic and alert after caffeine intake while non-consumers said that using caffeine made them feel uncomfortable by increasing their heartbeat (81.7%) and turning them irritable (76.8%) (Zahra et al., 2021). A descriptive study in Islamabad, Pakistan have analyzed the awareness and prevalence of caffeine intake among students of medical field. It included 220 students (92 male, 128 female). Data was collected using a self-monitored questionnaire that included questions regarding gender, preferred source of caffeine intake and awareness about caffeine and its effects. Most common source came up to be the tea with an intake frequency of less than 5 cups a day. Some respondents (64.5%) said that taking caffeine makes them feel energetic. Others said that they took a habit of drinking tea from family (55.5%) and 47.7% of them reported that they feel agitated if not consumed caffeine. Considering the effects of caffeine, 136 of the students believed that caffeine have harmful effect on the body whereas 122 of them

said that it has beneficial effects (Hassan et al., 2020). Physical inactivity time were also linked to the increased caffeine consumption. Overall, high caffeine consumption has profound effect in enhancing BMI, sedentary lifestyle and late phenotype (Zhang et al., 2018). Lebanese university students were examined in order to study of negative health effect of high caffeine intake through energy drinks. Data. Students who consumed caffeine on daily basis were found to have high risk of harmful effects on their health. Two third of these students described that they faced difficulty falling asleep, with some having palpitation and high blood pressure. One third of the them had anxiety problems, high thirst levels and feeling nervous, one fifth of the high-risk students had headache and feeling of being tired (Dwaidy et al., 2018). Negative health effects associated with elevated use of energy drinks had been reported (Reid et al., 2015).

Caffeine also affects sleeping habits of its consumers. Sixty-three percent of the total undergrad consumers were observed to have negative effects of caffeine consumption like having less hours during night, daytime dysfunction and falling asleep during lecture (Afroz et al. 2020). Medical students who used caffeine regularly were also observed to feel difficulty staying awake when attending a lecture or driving a vehicle (Pecotić et al., 2008). A research also demonstrates a positive association between the acute sleep deprivation and reduced physical abilities among university students who consume caffeine (Patrick et al., 2017). The results are consistent with another study (Sanchez et al. (2013). They interviewed 2458 (1493 female, 965 male) college students in order to evaluate the effects of caffeinated beverages on the sleep patterns of students. They used Pittsburgh Sleep Quality Index (PSQI) for the assessment of sleep quality. It was discovered that 58.4% females and 52.0% males were facing the problem of poor sleep. The problem was even severe in females who

consumed 3 or more beverages per week. This was in turn linked with daytime dysfunction, loss of sleep or even use of sleeping pills. Students of Ethiopia who were consumers of caffeinated beverages were observed to face sleep onset latency (Lemma et al, 2012). Students from different Korean universities were analyzed in order to study the effects of caffeine consumption through energy drinks. 45% of them reported to have sleep problems whereas 51.1% had problems of sleeplessness and palpitation (Park et al., 2015). The effect of caffeine on sleep quality can be explained biologically. Chemically, caffeine is an adenosine receptor antagonist and a methylxanthine it can potentially affect the way brain performs its function. Adenosine is considered as the sleep factor since the amount of adenosine in our brain determines the duration and quality of sleep. Presence of sufficient levels of adenosine in the brain causes one to feel drowsiness, low activity levels and fall asleep. When high levels of caffeine are taken in, they act antagonistically to the adenosine. Caffeine acts as receptor to adenosine, thereby causing effects opposite to those caused by the adenosine (Sanchez et al., 2013).

2.5. Population uniformity for reliable outcomes

In most of the study analyzing caffeine intake in undergraduate male students, a self-reported or self-structured questionnaire is used. Such kind of questionnaire is usually considered as imprecise method of data collection. A number of research studies have been carried out on a small sample size that could result in large differences when considered at bigger levels. In this contradictory information may be resulted (Zhang et al., 2018). Moreover, there is an unequal participation of males and females in different studies that may also lead to the collection of unreliable data (Alabbad et al., 2019). We need to include a bigger population in upcoming research so that more applicable data can be obtained for use in planning and policy making

(Ahmad et al., 2017).

Caffeine is considered as one of the factors leading to the death of young people as per latest New York Times report 2021. This may also prove fatal if the students of college and university who consume caffeine are having some underlying conditions like cardiovascular or nervous system problems (Temple et al., 2019). Students in a study were observed to misunderstand energy drinks and cola as having high caffeine content whereas tea and coffee as low caffeine content drink (Mackus et al., 2016). A serious responsibility lies to the government for making public fully aware of the sources and amounts of caffeine into their diet. Different policies need to be developed and implemented in this regard that will make sure of labelling caffeinated beverages in order to indicate the amount of caffeine per serving, arranging public awareness sessions/seminars (either virtual or physical) and using different platforms like home and public screens in order to let people know the side effects of high caffeine intake (Temple et al., 2019). Guidelines on daily caffeine intake for people of different age and physical condition should be drawn. Public awareness programs about per day usage limits should be launched. Moreover, alternatives to caffeine intake such as herbal tea should also be presented. Herbal tea is reported to increase alertness and physical activity potential without causing side effects (Nasir et al., 2018).

2.6. Research gap:

Studies do show that excessive intake of caffeine induces stress, anxiety and depression in individuals but a research gap exists about the effect of the intake of caffeine under stressed conditions. This research aims to analyze how the intake of caffeine is effected in already stressed individuals under stressful conditions.

3.1. Research design:

This study is explanatory because it is dealing with correlation between two variables; that were stress and caffeine consumption and seeks explanations between the two. It was a cross sectional study as the study determined the exposure to risk factor might correlate with the outcome. Here the risk factor is stress & the outcome is caffeine. The study method is quantitative because the study correlates the relation between stress and caffeine consumption.

Chapter 3: Methods

3.2. Sample/ participants:

The study used a non-probability sampling technique that is convenience sampling of 154 undergraduate male students of University of Management and Technology between ages 17 – 26 yrs. old that were easy to reach during the pandemic via social media. Reaching students of our same university and same education level (undergraduate) made the data collection more feasible.

3.2.1. Sample size:

We calculated our sample size using the formula:

$$n = [t^2 * p (1 - p)] / m$$

[Where n = sample size, t = confidence level - 95 % (1.96), p = Estimated prevalence – 88.5% (0.885) and m= Error -5% (0.05)]

Sample size calculated by above mentioned formula and applying the mentioned parameters is 154.

3.2.2. Sample characteristics:

The sample included 154 undergraduate male students between the ages of 17 -26 yrs.

3.2.3. Inclusion criteria:

The inclusion criteria included undergraduate male students between ages 17 to 26 yrs. old.

3.2.4. Exclusion criteria:

Exclusion criterion included all the female students and employees of University of Management and Technology, male students under 17 yrs. old, postgraduate male students and special students having some form of disability.

3.3. Data collection techniques:

Data collection is based on primary source and multiple tools were used for collecting data.

3.3.1. Data collection tools:

Self-structured questionnaire was used for conducting online survey.it consisted of four following parts:

1. Demographics
2. Perceived stress scale-American sociological association
3. Self-designed questionnaire
4. Food frequency questionnaire

Demographical part included Age, weight and height, a perceived stress score of American Sociological Association including questions that helped analyze people with low stress score between 0-13 points , moderate stress score between 14- 26 points or high stress score between 27 – 40 points. Self-structured questionnaire included different serving's sizes of different products. The last section contained food frequency questionnaire of a week with questions regarding the frequency of consumption of caffeinated products in their particular serving size in the last week that helped us analyze if the consumption of caffeine was low, moderate or high in the respondents.

3.3.2. Data collection procedure:

Respondents were informed about the objective and they responded voluntarily.

Data was collected online through Google form reached through social media and data was recorded on excel sheet.

3.4. Statistical techniques:

SPSS.V22 version, software were used for data analysis. The analysis is represented through number of pie charts, bar charts and tables. The study applied bivariate correlation to find the relation between variables (stress and caffeine) and also applied one way ANOVA test to test hypothesis.

3.5. Ethical consideration:

Aim of the study was described to the participants. Consent of the members was taken before gathering their information. Information was kept confidential and used solely for generating results of the research.

Chapter 4: Results

	N	Minimum	Maximum	Mean	Std. Deviation
Age	154	17	26	22.95	2.129
BMI	154	18.0	39.3	23.991	4.2343
Caffeine	154	0	4773	708.54	784.417
Stress Score	154	1	3	2.04	.582
Valid (list wise)	154				

Table 4.1: Descriptive Statistics

		Frequency	Percent	Valid Percent	Cumulative Percent
BMI	Normal	94	61.0	61.0	61.0
	Overweight	42	27.3	27.3	88.3
	Obese	18	11.7	11.7	100.0
	Total	154	100.0	100.0	
Diseases	None	154	100.0	100.0	100.0
Stress Score	Low	23	14.9	14.9	14.9
	Moderate	102	66.2	66.2	81.2
	High	29	18.8	18.8	100.0
	Total	154	100.0	100.0	
Caffeine intake	Low	126	81.8	81.8	81.8

Moderate	22	14.3	14.3	96.1
High	6	3.9	3.9	100.0
Total	154	100.0	100.0	

Table 4.2: Cross tabulations between BMI, disease, Stress score and caffeine intake

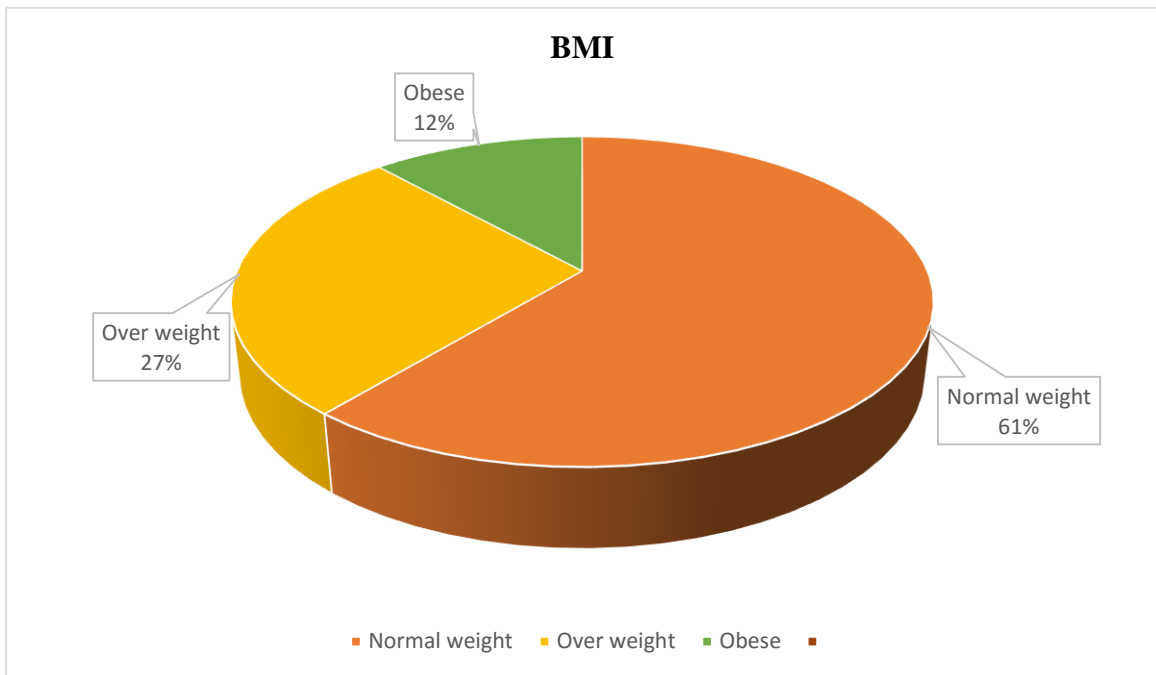


Figure 4.1: Percentages of students according to BMI (normal, over weight and obese)

On the basis of the data gathered from male students, the BMI distribution shows the normal percentage is 61% which makes it about 94 respondents and overweight percentage is 27% which makes about 42 students and obese are 12% which makes about 18 out of 154 undergraduate students in Fig 4.1. This data represents that majority of respondents are from normal BMI ranges.

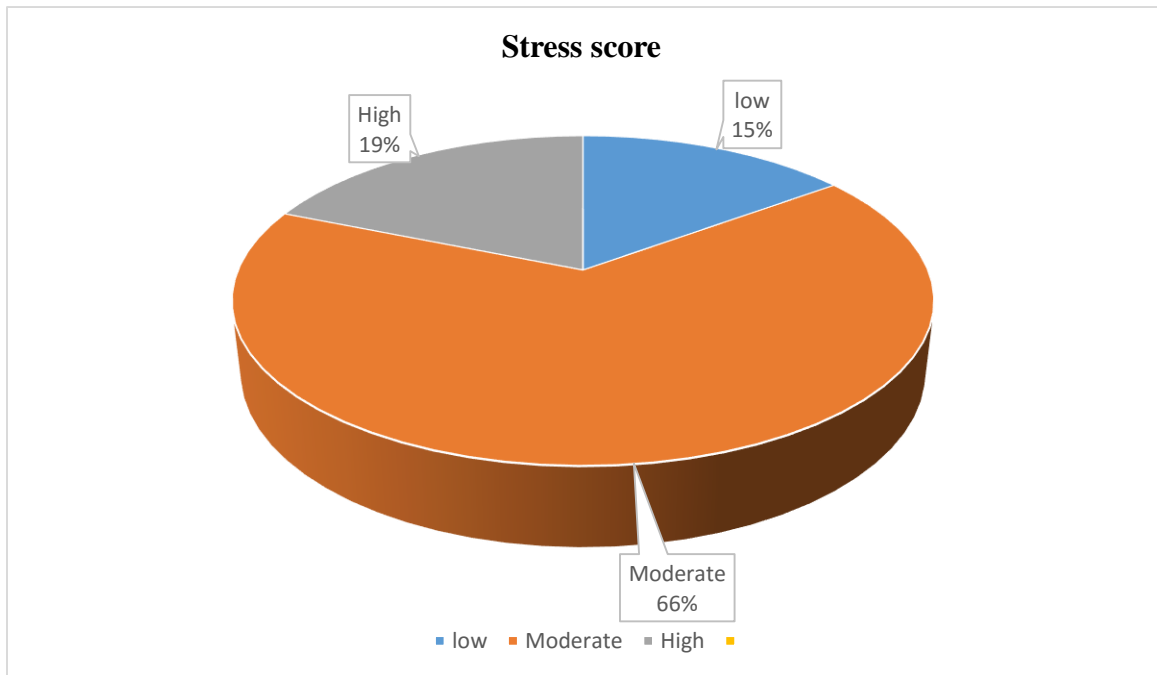


Figure 4.2: Percentage of students of high, moderate and low stress score

Low = 0-13 (stress score)

Moderate = 14 – 26 (stress score)

High = 27 – 40 (stress score)

In Fig 4.2, out of 154 students 23 are considered having low intensity of stress which equals to 15%, 102 are considered having moderate intensity of stress which equals to 66% and 29 students were classified under high stress category which equals to 19% according to the data collected from undergraduate students of UMT. This data represents that majority of respondent's falls under moderate stress intensity.

4.1. Intake of caffeine:

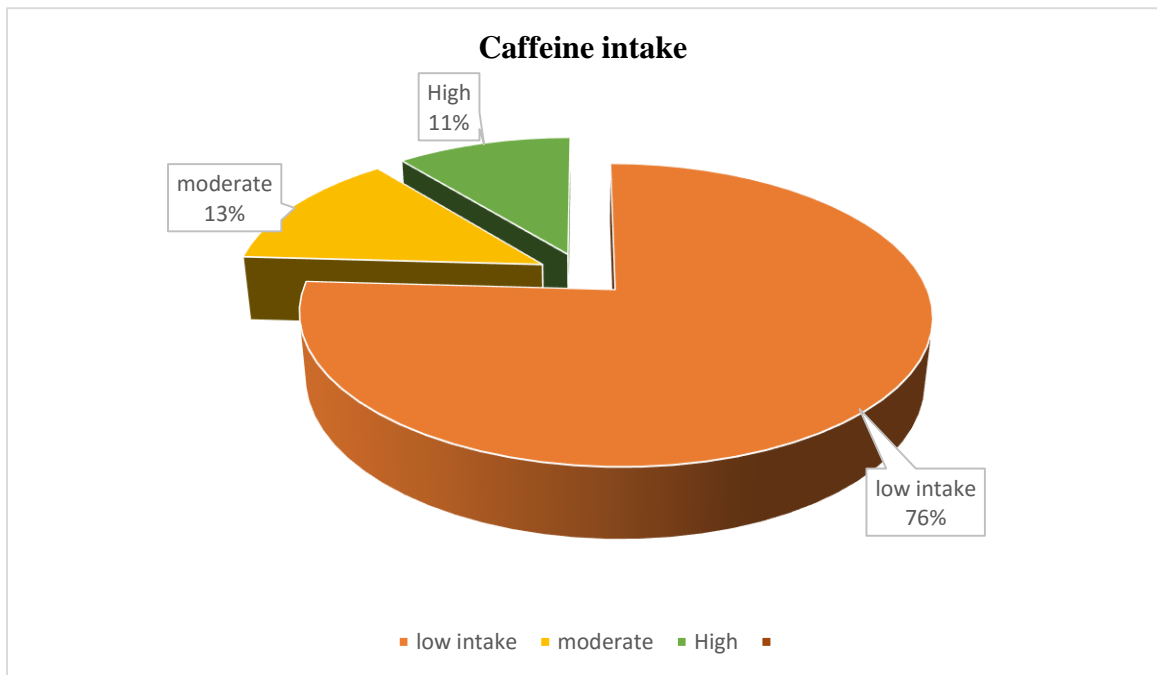


Figure 4.3: Students fall in low, moderate and high caffeine intake

According to the data collected from undergraduate students of UMT it can be interpreted that out of 154 students 76% students were having low consumption of caffeine intake, 13% students were having moderate consumption of caffeine intake while only 11% students had high consumption of caffeine intake in Fig 4.3. So this data represents that majority of respondents were consuming low caffeine.

		Frequency	Percent	Valid Percent	Cumulative Percent
Milk tea/ chai	None	17	11.0	11.0	11.0
	Extra small cup-118ml	14	9.1	9.1	20.1
	6 Oz cup-177ml	9	5.8	5.8	26.0
	Small cup-227ml	33	21.4	21.4	47.4
	Medium cup-340ml	51	33.1	33.1	80.5

	Large cup-454ml	30	19.5	19.5	100.0
	Total	154	100.0	100.0	
Coke	None	20	13.0	13.0	13.0
	half Can or less	30	19.5	19.5	32.5
	1 can or Glass	71	46.1	46.1	78.6
	2 can or glass	23	14.9	14.9	93.5
	3 or more Can or glass	10	6.5	6.5	100.0
	Total	154	100.0	100.0	
Milk	None	44	28.6	28.6	28.6
	chocolate				
	Small 1 bar (45 g)	50	32.5	32.5	61.0
	Large 1 bar (100 g)	24	15.6	15.6	76.6
	2 bars	23	14.9	14.9	91.6
	3 or more	13	8.4	8.4	100.0
	Total	154	100.0	100.0	

Table 4.3: cross tabulation of milk tea/ chai, coke and chocolate

4.2. Frequencies of caffeinated products

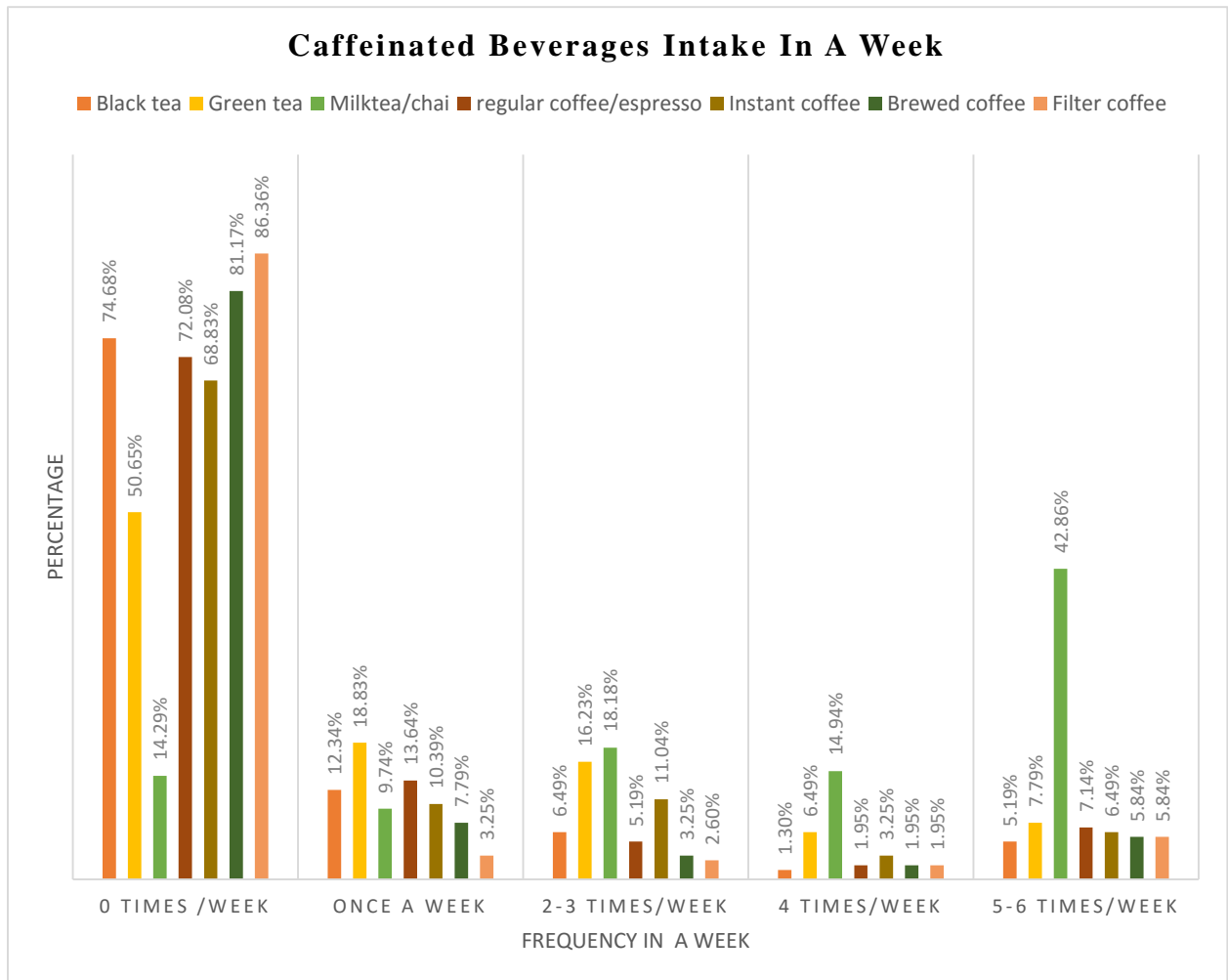


Figure 4.4: Caffeinated Beverages intake in a week

The data in Fig 4.4 represents weekly recall frequency of caffeinated products, according to this data it can be interpreted that majority of males students of UMT had black tea (74.68%), green tea (50.65%), regular coffee/espresso (72.08%), instant coffee (68.83%), brewed coffee (81.1%) and filter coffee (86.36%) 0 times/week in their last week whereas majority of students had milk tea/chai (42.86%) 5-6 times/week. So, the male students of UMT preferred milk tea/chai more as compared to other caffeinated beverages.

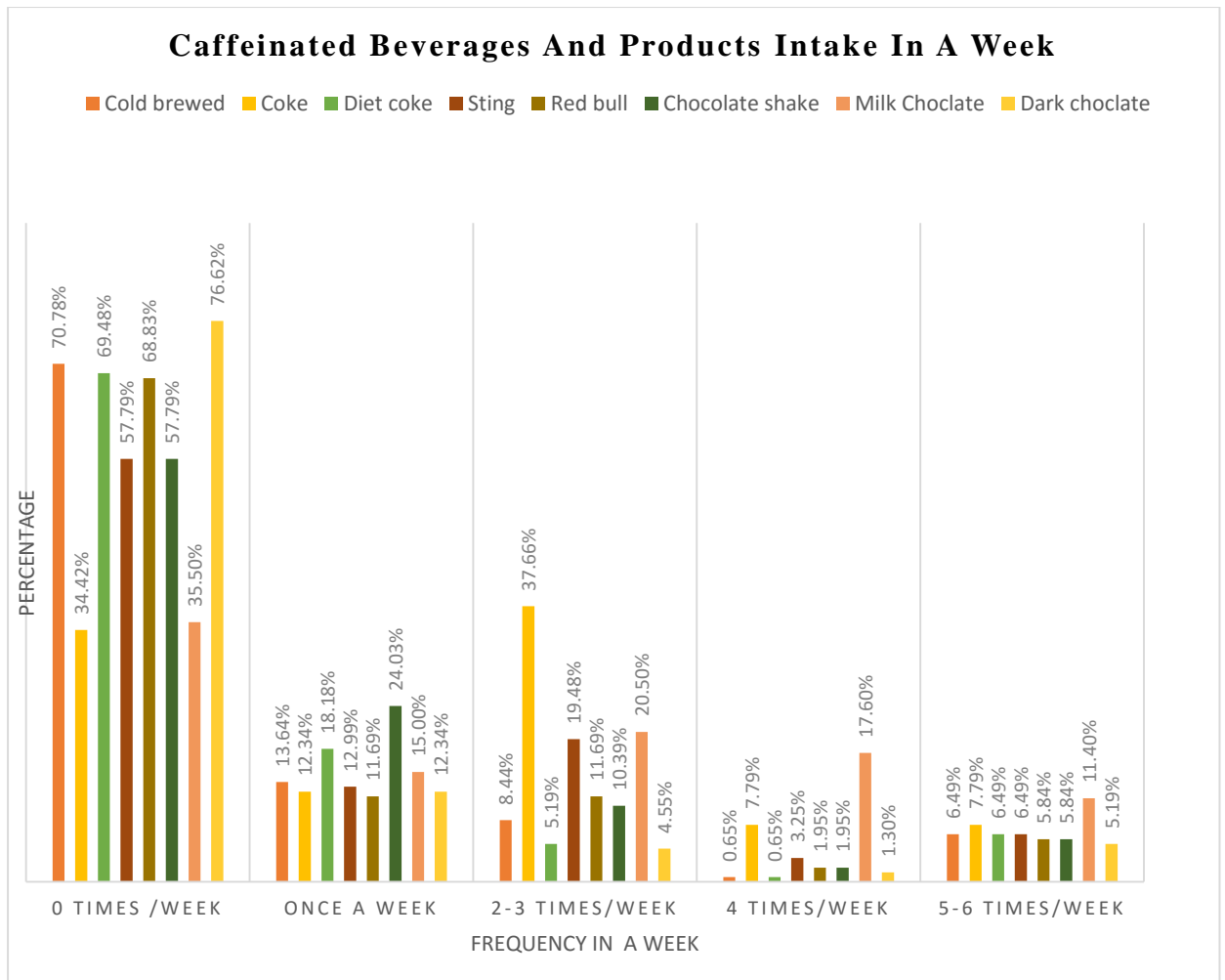


Figure 4.5: caffeinated Beverages and products intake in a week

The data of Fig 4.5 represents weekly recall frequency of caffeinated products, according to this data it can be interpreted that majority of males students of UMT consumed cold brewed (70.78%), diet coke (69.48%), sting (57.79%), red bull (68.83%), chocolate shake (57.79%) and dark chocolate (76.62%) 0 times/week in their last week whereas majority of students had coke (37.66%) 2-3 times/week. So, male students preferred coke more as compared to other caffeinated beverages.

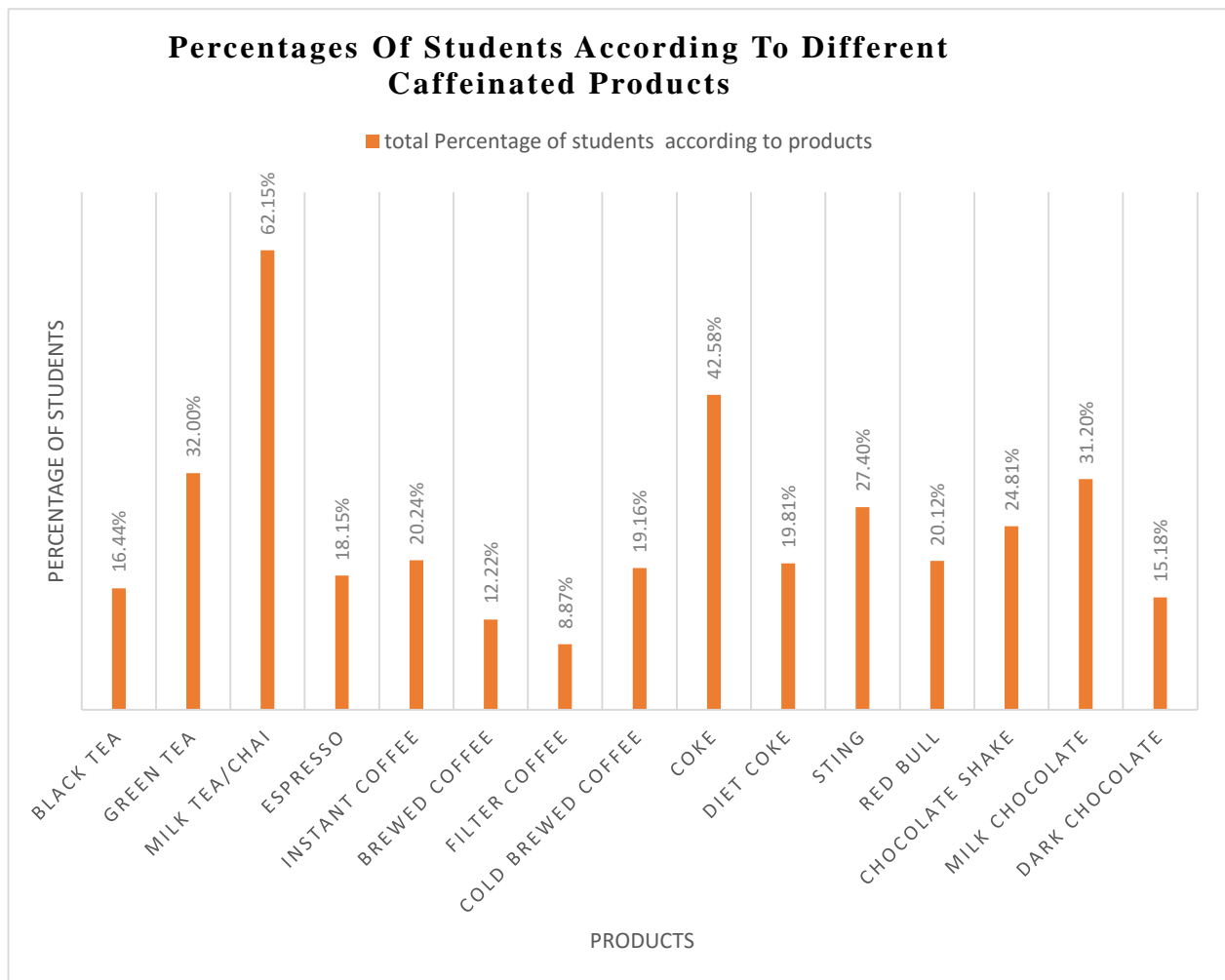


Figure 4.6: Percentages of students according to different caffeinated products

The data of Fig 4.6 represents overall intake of caffeinated products of the students of UMT males, according to this data it can be interpreted that 16.44% students had black tea, 32% students has green tea, 62.15% had milk tea/chai, 18.15% had espresso, 20.24% had instant coffee, 12.22% had brewed coffee, 8.87% had filter coffee, 19.16% had cold brewed coffee, 42.58% had coke, 19.81% had diet coke, 27.40% had sting, 20.12% had red bull, 24.81% had chocolate shake, 31.20% had milk chocolate and 15.18% had dark chocolate during last week. So, the consumption of milk tea/chai, coke and milk chocolate was more as compared to other caffeinated products in male students.

Products	Amount of caffeine according to serving sizes				
	Extra small cup-118ml	6Oz cup-117ml	Small cup-227ml	Medium cup-340ml	Large cup-454ml
1. Black tea	23.5 mg	32.5 mg	45 mg	67 mg	90 mg
2. Green tea	14 mg	21 mg	27 mg	40 mg	54 mg
3. Milk tea/chai	12.5 mg	18.75 mg	24 mg	35.8 mg	48 mg
4.Regular/espresso coffee	8 mg	12 mg	15.3 mg	23 mg	30.6 mg
5. Instant coffee	31 mg	46.5 mg	59 mg	89 mg	119 mg
6. Brewed coffee	48 mg	71 mg	91 mg	136 mg	182 mg
7. Filter coffee	88 mg	131 mg	168 mg	251 mg	335 mg
8. Cold brewed coffee	50 mg	75 mg	95.7 mg	143 mg	192 mg
	Half can or glass	1 can or glass	2 can or glass	3 or more can or glass	
9. Coke/carbonated drinks-335ml/can	17 mg	34 mg	68 mg	102 mg	
10. Diet coke-355ml/can	23 mg	46 mg	92 mg	138 mg	
11. Sting-330ml/can	31.25 mg	62.5 mg	125 mg	187.5 mg	
12. Red bull-250ml/can	40 mg	80 mg	160 mg	240 mg	
13. Chocolate shake-250ml/glass	9 mg	18 mg	3.6 mg	54 mg	
	Small 1 bar (45g)	Large 1 bar (100g)	2 bars	3 or more	
14.Dar chocolate	22 mg	43 mg	86 mg	129 mg	
15. Milk chocolate	9 mg	18 mg	36 mg	54 mg	

Table 4.4: Amount of caffeine in different products according to serving sizes

Products	Percentages of students according to serving sizes of different products					
	Extra small cup-118ml	6 Oz cup-117ml	Small cup-227ml	Medium cup-340ml	Large cup-454ml	None of the above
1. Black tea	23.38%	4.55%	9.09%	3.90%	1.3%	57.79%
2. Green tea	15.58%	9.09%	14.94%	17.53%	5.19%	37.66%
3. Milk tea/chai	9.09%	5.84%	21.43%	33.12%	19.48%	11.04%
4.Regular/espresso coffee	7.79%	5.84%	9.74%	13.64%	5.19%	57.79%
5. Instant coffee	6.49%	3.90%	10.39%	1.99%	3.25%	62.99%
6. Brewed coffee	6.49%	2.60%	5.84%	3.25%	3.25%	77.92%
7. Filter coffee	7.14%	2.60%	8.44%	3.90%	1.3%	76.62%
8. Cold brewed coffee	5.19%	4.55%	8.44%	9.09%	1.3%	71.43
	Half can or glass	1 can or glass	2 can or glass	3 or more can or glass	None of the above	
9. Coke/carbonated drinks-335ml/can	19.48%	46.10%	14.94%	6.49%	12.99%	
10. Diet coke-355ml/can	22.08%	18.83%	3.89%	3.25%	51.95%	
11. Sting-330ml/can	18.18%	22.73%	13.64%	4.55%	40.91%	
12. Red bull-250ml/can	18.83%	20.13%		4.55%	52.60%	
13. Chocolate shake-250ml/glass	15.58%	36.36%	5.19%	4.55%	38.31%	
	Small 1 bar (45g)	Large 1 bar (100g)	2 bars	3 or more	None of the above	
14.Dar chocolate	36.36%	6.49%	4.55%	2.60%	50%	
15. Milk chocolate	32.47%	15.58%	14.94%	8.44%	25.57%	

Table 4.5: Percentages of students according to serving sizes of different products

Table 4.5 shows the amount of caffeine present in different products in different serving sizes like milk tea have different amount of caffeine 12.5 mg, 18.75 mg, 24 mg, 35.8 mg and 48 mg in extra small cup-118ml, 6 Oz cup-117ml, small cup-227ml, medium cup-340ml and large cup-454ml accordingly. Different students opted different products in different serving sizes. Table 4.5 shows the percentages of

students that were consuming these products according to their serving sizes.

Maximum consumption of products was milk tea, coke and milk chocolate.

4.3. Correlations

		Stress Score	Caffeine Intake
Stress Score	Pearson Correlation	1	-.007
	Sig. (2-tailed)		.929
	N	154	154
Caffeine Intake	Pearson Correlation	-.007	1
	Sig. (2-tailed)	.929	
	N	154	154

Table 4.6: correlations between stress and caffeine intake

The above table show the correlation of stress with caffeine intake. The more the R value near to 0 the more it indicates no correlation between the variable and the significance value is 0.929 which mean it is not significant.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.370	2	.185	.733	.482
Within Groups	38.123	151	.252		
Total	38.494	153			

Table 4.7: caffeine intake between groups and within groups

According to ANOVA testing the significance value is 0.482 which means the effect of stress on caffeine is not significant.

Chapter 5: Discussion and Limitations

5.1. Discussion:

This study analysis the stress score of last month in students, quantity and frequency of caffeinated products in last week as well as the relation between stress and caffeine consumption. Among 154 male students, 29 students are classified in high stress, 102 in moderate stress and 23 students in low stress (Table 4.2) .Total mean of stress score was 2.04 in the last month (Table 4.1). Out of 154 students 6 students are classified under high consumption of caffeine, 22 are having moderate and 126 are having low consumption of caffeine (Table 4.2).

In the study of U.S college students, total mean of caffeine consumption was 159mg/day for whole student population and total mean of regular students for both male and female was 173mg/day. Majority of the students were consuming regularly soda, coffee and tea (Mahoney et al., 2019). But this study targeted only male students between the ages of 17-26 years and the total mean consumption of caffeine of UMT students was 708.5 mg/week (Table 4.1). Majority of students of UMT were not consuming caffeinated products regularly, in the last week mostly they were consuming tea, coke, green tea and milk chocolate.62.15% students are consuming tea, 42.58% are consuming coke, 32% are consuming green tea and 31.2% are consuming milk chocolate (Figure 4.6).A survey from University of Lahore, Pakistan on caffeine intake among 185 students 52 students were male and 133 students were female. Benefits and hazardous effects of caffeine were examined. Products containing caffeine consumed by students were tea 62.4% and soft drinks (52.8%). Lowest consumption rate was observed for coffee 41.6% (Nasir et al., 2018). This study has some similarities related caffeine to the study. In this study 62.15% students were consuming tea and less 50% of were consuming coffee lowest consumption rate

was filter coffee 8.87%, brewed coffee 12.22%, dark chocolate 15.18%, and espresso 18.15%. 47.52% students were consuming energy drinks in which 27.4% were consuming sting and 20.12% were consuming red bull (Figure 4.6).

A study results suggested that caffeine consumption may be associated with stress but in this study there is no correlation between stress and caffeine consumption (Richards et al., 2015). Another research found the negative correlation between stress and caffeine (Zunhammer et al., 2014). This study found no correlation between caffeine and stress. Conway et al. studied not significant correlation between stress and caffeine consumption (Conway et al., 1981). Similarly Josue L et al also reported that there is no correlation between caffeine and stress that is also seen in this study (Ríos et al., 2013). A research was conducted in Mumbai on consumption of caffeine which was associated with appetite and stress (Kale et al., 2017). They found negative association of caffeine with appetite but no significant association with stress and it's also substantiate to this study (Table 4.6).

5.2. Limitations:

Firstly, due to Covid-19 situation, the research was not conducted physically instead online questionnaires were used for data collection. 154 undergraduate male students were selected for this research between ages of 17 to 26 years, which do not represent the entire population. The sample size had only male students so, the effect of caffeine could not be compared on the basis of gender. Some factors like level of physical activity, consumption of alcohol have association with caffeine and these factors have not been assessed. Food items containing caffeine were not included in the study. The serving size may be different in different places and it is different from the standard size so the serving calculation of caffeine can be different.

Chapter 6: Conclusion and Recommendations

Through the analysis regarding caffeine consumption and stress the study conclude that mostly students are consuming milk tea, coke and milk chocolate .Mostly student's falls in moderate stress and some are in high but their caffeine consumption is low and moderate. So, there is no significant relation of intake of caffeine in students with stress.

There are some recommendations for further studies.

- This research has been conducted only on the male participants to understand the intake of caffeine under stressful conditions, we cannot generalize this research to both males and females. This research should be conducted on the females also to check the consumption of caffeine in stressful conditions.
- Random sampling should be used for the collection of data so all individuals will get equal chance of being selected in the population.
- Instead of online data collection, physical data collection should have been used. It is recommended to conduct this study on a bigger population so that the results could be more accurate and bigger sample size also reduces the margin error.
- Caffeine withdrawal and addiction symptoms should be studied among high caffeine consuming students.
- A survey or interview base study to examine the detailed reasons of caffeine consumption.
- This research include only those products that are highly caffeinated but there are other products that do contain caffeine but in limited amount.

Consumption of those can also influence the results.

- Awareness campaigns should especially focus college and university students keeping in view their study load, peer pressure and other relevant factors. Healthy alternatives to caffeine should be recommended to spread awareness of side effects of high caffeine consumption on health.

Appendices

Association of Caffeine Intake and Stress among University Students

(17-26 years)

Age:

Weight:

Height:

Do you have any disease; if yes, mention the name of the disease

Perceived Stress Scale (PSS)

In the last month, how often have you	Never (0)	Almost never (1)	Sometimes (2)	Fairly often (3)	Very often (4)
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1. Been upset because of something that happened unexpectedly

2. Felt that you are unable to control the important things in your life

3. Felt nervous or stressed?

4. Felt confident about your ability to handle your personal problems?

5. Felt that things were going your way?

6. Found that you could not cope with all the things that you had to do?

7. Been able to control irritations in your life?

8. Felt that you were on top of things?

9. Been angered because of things that were outside of your control?

10. Felt difficulties were piling up so high that you could not overcome them?

Q 1. How much do you consume in one serving?

Extra small cup-	6Oz cup-	Small cup-	Medium cup-	Large cup-	None
118ml	117ml	227ml	340ml	454ml	

1. Black tea

2. Green tea

3. Milk tea/chai

4. Regular/ espresso coffee

5. Instant coffee

6. Brewed coffee

7. Filter coffee

8. Cold brewed

coffee

Q2. How much do you consume in one serving?

Half can or glass 1 can or glass 2 can or glass 3 or more can or glass None

1. Coke/carbonated drinks-

335ml/can

2. Diet coke-355ml/can

3. Sting-330ml/can

4. Red bull-250ml/can

5. Chocolate shake-

250ml/glass

Q3. How much do you consume in one serving?

Small 1 bar (45g) Large 1 bar (100g) 2 bars 3 or more None

1. Dark chocolate

2. Milk chocolate

Q4. In your last week, how many times did you consume these servings?

0 times/ week Once a week 2-3 times/week 4 times/week 5-6 times/week

1. Black tea

2. Green tea

3. Chai/tea

4. Regular/espresso

coffee

5. Instant coffee

6. Brewed coffee

7. Filter coffee

8. Cold brewed coffee

9. Carbonated drinks/

coke

10. Diet coke

11. Sting

12. Red bull

13. Chocolate shake

14. Milk chocolate

15. Dark chocolate

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