

BMI perception of undergraduate students on caffeine intake, smoking and physical exercise

Submitted By

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A thesis submitted to the Department of Pharmacy in partial fulfillment of the requirements for the degree of Bachelor of Pharmacy (Hons.)

Department of Pharmacy
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January, 2020

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Declaration

It is hereby declared that

1. The thesis submitted is my own original work while completing degree at Brac University.
2. The thesis does not contain material previously published or written by a third party, except where this is appropriately cited through full and accurate referencing.
3. The thesis does not contain material which has been accepted, or submitted, for any other degree or diploma at a university or other institution.
4. I have acknowledged all main sources of help.

Student's Full Name & Signature:

A handwritten signature in cursive script that reads "Fatema". The signature is written in black ink and has a decorative wavy underline.

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Approval

The thesis/project titled “BMI perception of undergraduate students on caffeine intake, smoking and physical exercise” submitted by Fatema Shorna (ID-16146054) of Spring 2016 has been accepted as satisfactory in partial fulfillment of the requirement for the degree of Bachelors of Pharmacy (Hons.) on 23 January 2020.

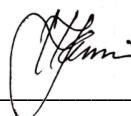
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Ethics Statement

This study does not involve any kind of human and animal trial.

Abstract

Obesity is one of the leading causes of morbidity and mortality worldwide. As being overweight and obese makes an individual vulnerable to other likely associated chronic and life-long diseases. It is obvious now-a-days, that abnormal BMI is very prevalent and needs a lot of attention from health authorities as well as all the people around the globe in order to prevent or cure obesity and other long term diseases linked to obesity. A well stated and reviewed questionnaire was distributed among students age between 20-28 of different universities to collect data about their weight, height, smoking habits, drinking habits, workout time, social media usage time and other necessary parameters. This study was carried out to find out any related association between the mentioned parameters and their effects on BMI. According to our findings, it is evident that tea intake, smoking and physical exercise are not fairly associated with abnormal BMI and other factors can put an effect in BMI sidewise.

Keywords: BMI, physical exercise, smoking, caffeine intake, undergraduate students.

Dedication

Dedicated to my family and my younger sister who is a special child suffering from obesity since her early age.

Acknowledgement

The mercy and blessings bestowed by the most gracious and merciful Almighty Allah is the reason of our strength and courage and who has guided me to continue this far and complete my studies with full diligence. I pray and hope to reflect my potentials in this project in a positive way.

This survey would have been hard to complete without the assistance of many people who are going to be acknowledged here.

First and foremost, I would like to express my deepest gratitude, thankfulness and sense of indebtedness to my supervisor Dr. Afrina Afrose (Assistant Professor, Department of Pharmacy, Brac University), without whom I would not get the track to peacefully complete this survey. Her continuous assistance and effort towards this project has also led me to explore different fields interlinked with pharmacy. She has helped and mentored me to come this far with all her patience, necessary comments on my updated works and commitments.

I wish to put forward my keen and sincere thanks to Dr. Md. Shaki Mostaid (Assistant Professor, Department of Pharmacy, Brac University) for his assistance throughout the project and also for teaching me a new set of applications on using and inputting data in IBM SPSS software. And also to our honourable chairperson Dr. Eva Rahman Kabir for being an inspiration and support to all of us.

Lastly, I would also put forward my admiration and regards to all the participants from different universities including Brac University who have given their valuable time and interest in all respects and helped me work and complete my project.

Table Of Contents	Page Number
Declaration	II
Approval	III
Ethical Statement	IV
Abstract/Executive Summary.....	V
Dedication.....	VI
Acknowledgement.....	VII
Table of Contents.....	VIII
List of Tables.....	XI
List of Figures.....	XII
List of Acronyms.....	XIII
Chapter 1 : Introduction.....	1
1.1 Background.....	1
1.2 Research design gap.....	1
1.3 Objective.....	2
1.4 Significance of the study.....	3
Chapter 2 : Literature Review	4
2.1 BMI.....	4
2.2 Body fat deposition and location.....	5
2.3 Maintaining a healthy and normal BMI.....	5
2.4 Factors effecting BMI.....	6
2.4.1 Genetic predisposition.....	6
2.4.2 Social media and technology.....	7
2.4.3 Ethnicity.....	7
2.4.4 Sedentary activities.....	8
2.4.5 Television watching time	8
2.4.6 Consumption of carbonated drinks.....	9

2.4.7 Smoking.....	9
2.4.8 Tea.....	9
2.4.9 Regular Exercise.....	10
2.5 Health Consequences of obesity.....	10
2.5.1 Diabetes.....	10
2.5.2 Cardiovascular disease.....	11
2.5.3 Cancer.....	11
2.5.4 Others.....	11
Chapter 3 : Methodology	12
3.1 Methodology.....	12
Chapter 4: Results And Discussion	14
4.1 Results.....	14
4.2 Participant’s overall data	14
4.2.1 BMI and tea consumption.....	16
4.2.2 BMI and tea drinkers / non tea drinkers.....	17
4.2.3 BMI and tea drinkers (Group 1 and Group 2).....	18
4.2.4 BMI and smoking.....	18
4.2.5 BMI and smokers / non smokers.....	19
4.2.6 BMI and smokers (Group 1 and Group 2).....	20
4.2.7 BMI and workout	20
4.2.8 BMI and work outers / non work outers.....	21
4.2.9 BMI and work outers (Group 1 and Group 2).....	22
4.3 Previous findings and history about the parameters and their effects.....	22
4.3.1 BMI and tea drinking.....	22
4.3.2 BMI and smoking.....	23
4.3.3 BMI and workout.....	23
4.4 Limitations.....	24

4.5 Recommendations.....	24
Chapter 5: Conclusion.....	25
References.....	26
Appendix.....	30

List of Tables	Page Number
Table 1 : Body Mass Index Categorization (according to WHO).....	5
Table 2 : Participants' data (median \pm range)	16
Table 3 : BMI & Tea consumption.....	17
Table 4 ; Group 1 (non- drinkers) & 2 (drinkers) : Between BMI and caffeine intake	17
Table 5 : Group Tea Drinkers 1 (2-3cups) & Group 2 (4-6cups) : Between BMI and caffeine intake	18
Table 6 : BMI & Smoking	19
Table 7 :Group1 (Smokers) & Group 2 (Non-Smokers) : Between BMI and Smoking	19
Table 8 : Smokers Group 1 (1-3 sticks) & Smokers Group 2 (4-1 pack)	20
Table 9 : BMI & Workout time.....	21
Table 10 : Group 1(No Workout) & Group 2 (Workouts) : Between BMI and Workout Group.....	21
Table 11 : BMI with Workout Group 1 (1-2hrs) & Workout Group 2 (3-4hrs).....	22

List of Figures

Page Number

Figure 1 : Q-Q Plot for BMI15

Figure 2 : Detrended Q-Q Plot for BMI15

List of Acronyms

WHO	World Health Organisation
NIH	National Institute of Health
BMI	Body Mass Index
BP	Blood Pressure
WC	Waist Circumference
MR	Mendelian randomization
WHR	Waist Hip Ratio
HF	Heart Failure
SPSS	Statistical Package for Social Sciences

CHAPTER 1: INTRODUCTION

1.1 Background

The balanced nutritional value of individuals can be accessed by the metric tool known as Body Mass Index (BMI) and can be appropriately used to check and identify individuals who are underweight, normal, overweight or severely obese. In the past decades, a transition has been seen in the way people drinks, eats, moves, sleeps and these transitions are found to have link with human body and body composition (Popkin et al., 2012). Scientists and researchers have linked several factors such as eating habits and eating schedules, sedentary behaviors, smoking, drinking, physical exercise with Body Mass Index. However, some of the factors work by either decreasing the BMI while others work by increasing the BMI. In people who have BMI relating to underweight needs to increase their weight so factors which increases weight are said to be acceptable and in people who have BMI relating to overweight and obese needs to decrease weight and hence factors reducing weight are said to be acceptable. Despite all these findings, it is said that BMI calculation is an undefined indicator of checking body fat percentage as BMI does not show or give us information on where the body fat is located or even where the percentage of body fat is higher compared to other locations (Nuttall , 2015)

1.2 Research gap

Majority of the studies based on BMI were done on individuals of developed countries, and our study focuses primarily on individuals from one of the developing country which are usually deprived from such researches due to huge diversity in the population. Nevertheless, our study covers one of the many diversity in Bangladesh which is the student age group (20-28), who are the most conscious age group regarding their weight and health. Previously most of the studies and research based on BMI calculation were specially done among children or

adolescent groups and working men or women groups. A very limited study was done among the university adults of age 20-26 as they are not usually exposed to the parameters in the developed countries unlike developing countries. Moreover, due to rapid transition in the population of our country, there also lies a huge question on whether the certain age groups are getting the proper nutrition, unlike developing countries where every age group have access to proper nutritious food. In addition to that, we have done the study precisely focusing on the adults who despite the fact being exposed to the parameters effecting their BMI are also on constant pressure of studies and who barely get time to sit at home. Thus, our study will also conclude whether parameters which were found to increase or decrease rigorously can put a severe effect on students BMI who have a busy schedule and barely get time for being laid back.

1.3 Objectives

The main objective of this study is to see how different determinants can effect an individual's BMI among the different university students of Bangladesh. However, the purpose of the study was limited to few parameters which effect the BMI in a wide range. The survey was conducted fairly among the university students between the age of 20-26 of Bangladesh and to link the effect of smoking, caffeine intake and physical exercise on the participant's BMI.

Objective 1 (M1): To check how the BMI of students who drink or do not drink tea are effected.

Objective 2 (M2): To check how the BMI of students who smoke or do not smoke are effected.

Objective 3 (M3): To check how the BMI of students who does or do not workout are effected.

1.4 Significance of the study

Being underweight or overweight are both equally prevalent in developing countries like Bangladesh and both the conditions are linked with enhanced mortality and morbidity. Therefore, effective interventions by the government along with the public health authorities needs to be done to label and mark these situations so that preventive measure are taken as soon as possible. It was found that in last 20 years, Bangladesh has gone through a huge transition in epidemiology and demography, which indicates the rise in the level of different diseases such as cardiovascular diseases, diabetes, cancer , etc. which are interlinked in some way with abnormal BMI .

CHAPTER 2: LITERATURE REVIEW

2.1 BMI

An annual report has showcased that in United States (U.S.), there is an obesity epidemic. One sixth of the children are obese and children between the ages 6-19 are obese or overweight. And as a result, it has been said that comorbid diseases which were once only seen in adults such as diabetes, hypertension, dyslipidemia and cholesterol are now widely found in the population of young people and pediatrics due to early age obesity.

Being overweight can mean having extra body fat, extra muscle and bone volume or extra body fluids, where as being obese certainly means having body fat more than required. A useful way of measuring whether an individual is obese or overweight is through Body Mass Index, also known as BMI in short. It is a common and currently used metric to find and define the characteristics of anthropometric height/weight of individuals and to categorize them into certain groups such as underweight, normal, overweight, obese (which further is divided into class I ,class II and class III) . However, it is certain that BMI is a weak and rough method for indication of body fats as we cannot capture information about where the fat body tissues are more in number or more packed. (Nuttall, 2015). People of both developed and developing countries are facing various health problems due to obesity and exposure to social media has been documented one of the main causes of obesity in adolescents and children (Robinson et al., 2017).

Being overweight or obese has serious impact on social beings. Discrimination can be seen among adolescents which can make them socially and emotionally bruised. Societal prejudice restricts career choices; hence obese people limited job opportunities. Societal stigmatization also often impairs the ability of a person to communicate and explore their talents or other intellectuality; hence they remain underachievers compared to others. Similarly, obese people

often have small pool of mates as they are usually not chosen for their unattractiveness hence they are forced to marry obese people as well (Katzmarzyk et al., 2002).

This following table shows the different categories of BMI chart:

Table 1: Body Mass Index Categorization (according to WHO)

Underweight	15 – 19.9
Normal Weight	20-24.9
Overweight	25-29.9
Class I obesity	30-34.9
Class II obesity	35-39.9
Class III obesity	≥ 40

2.2 Body fat deposition and location:

One of the limitations and drawbacks of BMI is that it does not give us information about the location of the deposition of the body fat which is rather one of the most necessary variable in determining the impacts of fat accumulation in metabolism and mortality rate (VAGUE, 1956). The author further said that fat accumulation on the upper part of the body possessed higher risks to the individuals and made them more prone to diseases such as gout, cancer, coronary heart disease and gallstones where as individuals with lower body fat accumulation were not really prone to such complications.

It is often seen that both girls and boys remain thin before reaching age of puberty. In contrast to boys, girls have fat deposition near the peripelvic and thigh regions. And in addition to that, boys develop lean mass (muscle and bone) rather than fat tissue during age of puberty. These changes are seen and reflected by the metric method, BMI (Silbert et al., 1983). A

study conducted showed that WHR is associated with the endocrinological reproductive status of females and other health risks related to it. The study was done to investigate whether humans have sensory and cognitive to use WHR to access the characteristics of women's beauty, youthfulness, attractiveness and reproductive ability. All around the world, it is said to believe that women's with low WHR being more good looking and attractive. Furthermore, it also dignifies them for having more potential reproducing capacity compared to those have higher WHR ratio (Singh , 1993).

2.3 Maintaining a healthy and normal BMI:

It is important for all of us to maintain to reach and maintain a healthy and proper weight and BMI and prevent ourselves from getting into the loop of various health related diseases as for now we know getting one disease might be linked to another. For instance, having diabetes or high sugar level may contribute to hypertension which further may lead to more severe case and lead the individual to heart disease and strokes. People are at higher risk of developing certain diseases if they are overweight or obese, such as high blood pressure, breathing problems, type 2 diabetes, gall stones and also different types of cancer. Hence, we should look forward to maintaining a healthy lifestyle in order to stay fit and healthy.

2.4 Factors effecting BMI:

2.4.1 Genetic Predisposition

Children, who were born with pediatric obesity, have higher chances of risk linked with genetic obesity and abdominal adiposity. Families having history of obesity in their family are most at risk hence it is crucial to contact and consult with them for obesity prevention and other complications. (Plomin et al., 2008).

2.4.2 Social media and technology

In this blooming new era, all the young generations devote most of their time on phones and other electronic devices exploring new gadgets and technologies. And with the dramatic advances and rise in technology, the negative impacts of these diverse technologies are also increasing. Moreover, it has been observed that the screen time and exposure to such devices is markedly more in case of young generations and also infants who does not fall under the recommended age given by the American Academy of Pediatrics for children under 18 months. Surveys and studies suggest that excessive exposure to media early are interlinked with having sleep disturbance , being obese and having an undesired BMI , and also causes delay in the development of children. It is certain and well established that the adolescent population are more exposed to increased screen time thus leading to various health problems including unhealthy food habits leading to obesity (Sourtiji et al., 2018).

In addition to that, different group of people carried out a study to show the effect of social media use compared to those who sit on computer instead of using mobile phone. The study revealed that people with increase social media exposure while using a computer in free time had significantly higher sitting times and highest on non-workdays (Alley et al., 2017).

Many other studies observed relationships and link between social media exposure and enhanced chances of obesity. In an experiment carried out, controlled trials were randomized which showed that lesser screen time exposure drastically reduced weight gain among children which further demonstrates the relationship of cause and effect between increased screen time and weight gain (Robinson et al., 2017).

2.4.3 Ethnicity

A study conducted dictated that in Hispanic children the percentage of children being obese is even higher compared to children in United States. This reports out cased the fact that the

time used by the children for sedentary behaviors is higher in Hispanic children compared to United State or non-Hispanic white children (Barlow, 2007). However, it is uncertain whether the surrounding environment of home actually plays a role to the obesity disparity between Hispanic children by promotion of sedentary behaviors (Barlow, 2007).

2.4.4 Sedentary activities

Researchers concluded and ended up with few behavioral patterns which leads to obesity which includes more and more sedentary activities, unhealthy food habits along with increased snacking time while watching movies or playing games and not having proper sleeping patterns (Barlow, 2007).

Children with higher sedentary behaviours with increased sitting time has higher chances and risk of type 2 diabetes, cardio-vascular disease ,obesity and poor and distorted mental health status. A study showed that in Australia about 70% of people over the age of 20 sits for browsing net for more than 8 hours per day. The study also showcased that the use of social media sites such as Snapchat, Twitter, Instagram and Facebook are on the rise. But alongside that, the interlink between use of these social media site with body mass index (BMI) and sitting time has not been explored yet. Children who become obese at a very early age are at a higher risk for serious and life – threatening health problems such as high cholesterol, hypertension, diabetes and cardiovascular disease which can exaggerate in adulthood and also cause death at an early age (Corneel et al., 2016).

2.4.5 Television watching time

Television being one of the prior and main threats for exposing majority of the children to media and screen time, recent findings have concluded that children spend more of their time in computers, mobile phones and tablets for playing games, watching cartoons hence bringing up the fact that the threats laid by television has been overtaken by the other available gadgets

(Corneel et al., 2016). Due to rapid transition of new sources and gadgets to the children, we can't be quite sure whether the new sources are also linked with obesity and other unwanted effects.

2.4.6 Consumption of carbonated drinks

They also further concluded that weight gain was observed in them who drank a can of soda per day and that 10% of the children's calorie intake was from soda. A study carried out showed people who drank sugar sweetened and carbonated drinks were more prone to the epidemic of weight gain and obesity due to high added content of sugar and insufficient total energy. According to current estimates, Americans have an average intake or consumption of sugar which provides them with 15.8% of total energy and it was found that most amount of these sugars were from non-diet beverages which usually have higher sweetening agents compared to diet beverages (Guthrie & Morton, 2000). Parallel to the soda intake trend is the consumption of fruit juices and beverages which are often sweetened for enhancing the taste to children and similarly are consumed in higher amounts by children and infants, hence making them obese from a very early age (Popkin & Nielsen, 2003).

2.4.7 Smoking

It has been identified that in the last few decades rate of smoking has decreased tremendously especially in developed countries and also that BMI has increased tremendously in people of developed countries showing evidence that smoking reduces or inhibits weight gain and also that smoking cessation has an effect on individuals by making them gain weight.

Nicotine in cigarettes was recommended in reducing weight by increased energy consumption and also by suppressing appetite (McGovern & Benowitz, 2011). Hence, it is often seen that people who smoke either have a normal BMI or underweight BMI.

2.4.8 Tea

Tea being the second most consumed beverage after water derived from steeped leaves of the plant *Camellia sinensis*. It is said to be rich in polyphenolic compounds and caffeine (Tijburg et al., 1997). Numerous human intervention research and laboratory experiments has dictated that polyphenols in tea can be effective for preventing metabolic syndromes and also obesity (Hursel et al., 2009).

2.4.9 Regular exercise

Numerous studies carried out, showed significant interlink between low BMI and high physical activity and fitness (Rowland, 1991). The physical activity was measured and it was found that steps taken per day and body fat percentage and also BMI were inversely proportional (Tudor-Locke et al., 2001). The results are still not defined as other factors such as social ,personal and other physical activities (smoking, alcohol consumption, sugar intake, etc.) were involved , hence regular exercise were alone not responsible for lowering body fat or BMI.

2.5 Health consequences of obesity

The occurrence rates for being overweight or obese has shown significant increase over the last decades and are of huge concern as these are associated with high risk chronic diseases such as diabetes, CVD, cancer, etc. Hence, it has become necessary now to make and also implement some or many effective guidelines and interventions to not only treat excess body fat or weight but also to prevent them (NIH).

2.5.1 Diabetes

Out of all the chronic life hazards, type II diabetes was found to have the strongest connection with weight or obesity. Increased BMI and WC were found to be significantly connected with the occurrence of type II diabetes in both women and men. As defined through BMI, Obesity possessed the strongest connection with the occurrence of this type of

diabetes in comparison to other present and doubted co-morbidities. The relative risks were found to be 6.75 (averaged) in male and 12.41 (averaged) in female (Anis et al., 2009).

2.5.2 Cardiovascular Disease

In addition, having weight more than normal or being obese can also make that individual have numerous CVD which includes dyslipidemia, hypertension and coronary heart disease such as ischemia or stroke (Anis et al., 2009). In a study assessing the link between CVD risk factors, subclinical vascular disease and obesity, it was concluded that higher BMI or being obese were linked to increased levels of BP, fasting glucose concentration, lipoproteins and higher chances of hypertension. (Carnethon et al., 2008).

2.5.3 Cancer

Furthermore, numerous studies have also linked between being obese and having cancer. The relative risk was found to be between 1.05 – 2.29 in males and between 1.13 – 3.22 in females. (Anis et al., 2009). World Cancer Research Fund and the American Institute for Cancer Research presented a report on 2007 providing enough convincing evidences which showed being obese or overweight highly enhances the cancer risks in certain organs such as pancreas, kidney, rectum, colon, breast, endometrium and esophagus. Also, the report gave evidences in order to support the fact that individuals with more abdominal fat were more prone to colon cancer which in turn might have enhanced their chances of endometrium and breast cancer in females.

2.5.4 Others

There are also evidences and studies which show that development of other illness or diseases are also linked to being obese or overweight which includes chronic kidney diseases, respiratory diseases, gastrointestinal and hepatic disorders, musculoskeletal disorders and also psychological problems.

CHAPTER 3: METHODOLOGY

3.1 Methodology

3.1.1 Research Design

This descriptive study was carried out in Department of Pharmacy, BRAC University, Dhaka in the year 2019. Participants of both sexes (male and female) were included in the project. Around 100 undergraduate students between the age group 20-28 from different universities of Bangladesh participated in this project. This survey was solely done with the purpose to find out any related association between the mentioned parameters and the participant's BMI.

3.1.2 Data Collection

A structured and well-reviewed questionnaire was made and circulated among the diverse group of students via online who were willing to participate in the project. The questionnaire was made to collect and keep a track of records of information regarding the participant's gender, age, height weight, living status, marital status, time spent on watching TV, time spent on social media, time spent on physical exercise, sleeping time, consumption of tea and carbonated drinks, fast food intake, number of cigarette intake per day and other necessary data on history of insomnia or other mental illness were also asked. Later, BMI of each individual was measured using the formula specified in WHO (weight (in kilogram)/ height² (in meter)). A sample of the questionnaire is attached in the appendix section.

3.1.3 Data Analysis

After proper and fair collection of all the required data and information about the participants, the statistical analysis based on the data were done by using IBM SPSS version 23. First-of-all, by using IBM SPSS we determined whether BMI of the participants were normally distributed or not normally distributed, which upon finding will assist us whether

we should go for parametric tests or non-parametric tests. After proper inputs, we found that the BMI of our chosen generation were normally distributed and hence we had to go for non-parametric tests. According to our available data, we did Mann – Whitney tests between different groups to see if the data were significant or not significant. In some cases for doing Mann – Whitney, we had to select certain two groups and delete the third group prior to analysis, as Mann – Whitney can be done only between two groups only. As mentioned, we did many tests by grouping the parameters in several ways such as between smokers and non – smokers, tea drinkers and non- tea drinkers and also work outers and non-work outers to find out any effect of these parameters on the BMI of the participants.

CHAPTER 4: RESULTS AND DISCUSSION

4.1 Results

Different parameters were checked individually and also the different parameters were correlated to check for any relation between the parameters. The survey was carried out between 100 individuals of different sex (Male and Female) from different universities of Bangladesh.

4.2 Participant's overall data

Prior to analysis of the data, we had to find out whether the BMI of our participants were normally distributed or not normally distributed, which would further assist us to do non-parametric tests or parametric tests respectively. The figure below shows the distribution of BMI of our participants across the line of best fit. And we can conclude, our data on BMI is normally distributed hence we will go for non- parametric tests.

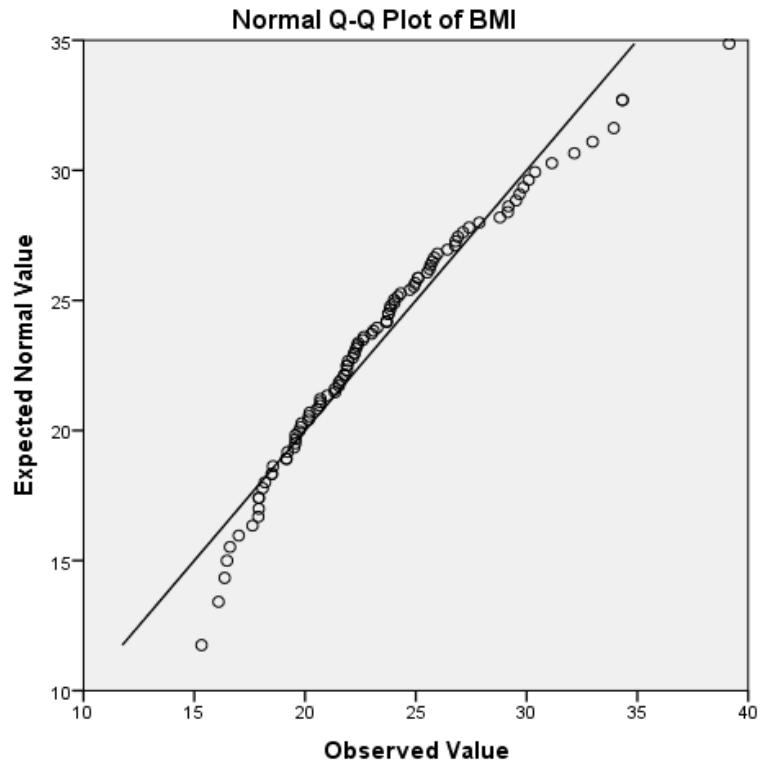


Figure 1: Normal Q-Q Plot for BMI

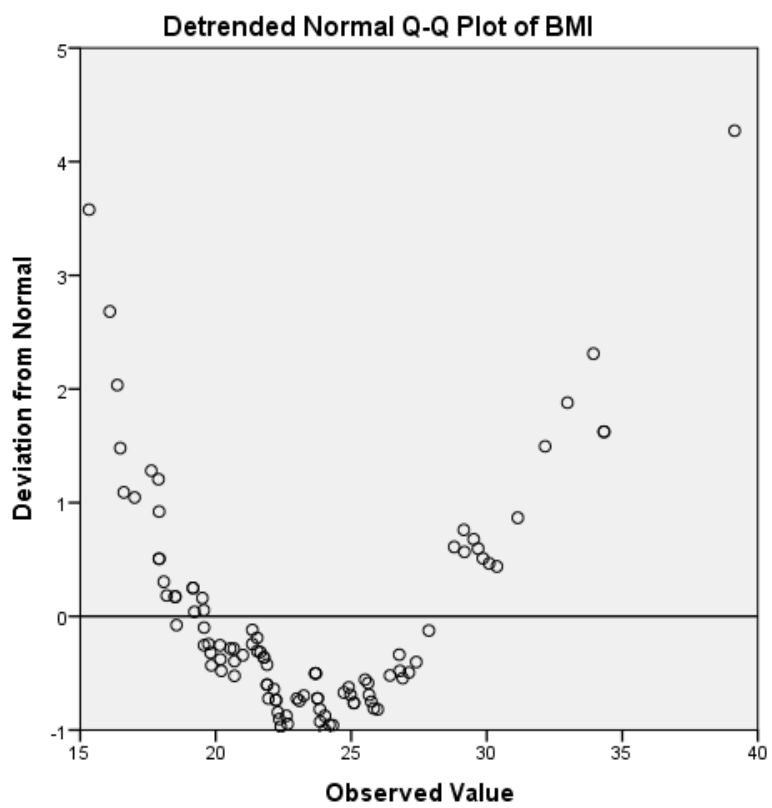


Figure 2: Detrended Normal Q-Q Plot of BMI

We collected a total of 100 individual data, among which 52 were from male and the rest 48 were from female. The table provided below shows the median of the participant's age, height in cm, weight in kg and BMI in kg/m^2 and also their respective range. All the above mentioned parameters were categorized into male and female prior to calculation and the total median and range of the parameters were also calculated.

Table 2: Participants' data (median \pm range)

Gender	n	Age	Height (cm)	Weight (kg)	BMI (kg/m^2)
Male	52	23 \pm 4	170.69 \pm 36.58	69.00 \pm 65.00	23.94 \pm 22.67
Female	48	22 \pm 4	158.50 \pm 24.38	55.00 \pm 37	22.23 \pm 14.53
Total	100	23 \pm 4	164.59 \pm 39.62	60.00 \pm 70	22.37 \pm 23.81

4.2.1 BMI & Tea consumption

We have divided the participants in 3 groups fairly, Group 1 (who drink 0-3 cups of tea daily), Group 2 (who drink 4-6 cups of tea daily) and Group 3 (who drink more than 6 cups of tea daily). Later, we have compared between these different groups to check whether the P – value to be observed through Mann – Whitney U is significant or not significant. To our concern, we have found all the P- values to be not significant (> 0.05), which concludes in our study that the BMI of the participants of the different groups are not effected by the number or volume of tea consumption. The effect of tea consumption (independent variable) was not found on BMI (dependent variable).

Table 3 : BMI & Tea consumption

Groups	BMI (kg/m²) (median±range)	P-value (Mann-Whitney U)
1,2	22.50 ± 23.81	0.813
	21.95 ± 12.46	
1,3	22.50 ± 23.81	0.449
	19.22 ± 9.23	
2,3	21.95 ± 12.46	0.373
	19.22 ± 9.23	

** [Group 1 (who drink 0-3 cups of tea daily), Group 2 (who drink 4-6 cups of tea daily) and Group 3 (who drink more than 6 cups of tea daily)].

4.2.2 BMI and tea drinkers/ non tea drinkers

In this part of analysis of data, we divided the parameter into two groups stated Group 1 (non-drinkers) & Group 2 (drinkers) and calculated the P-value through Mann – Whitney U test to check whether the effect of drinking tea or not drinking tea were significant or not significant on the participant's BMI. The test results concluded that the relationship between BMI and the parameter is not significant (P –value > 0.05).

Table 4 : Group 1 (non- drinkers) & 2 (drinkers) : Between BMI and caffeine intake

Groups	P- value (Mann- Whitney U)
1 (non-drinkers)	0.319
2 (drinkers)	

4.2.3 BMI and tea drinkers (Group 1 and Group 2)

In this part of analysis of data, we divided the parameter into two groups stated Tea drinkers Group1 (2-3cups) & Group 2 (4-6cups) and omitted the non- drinkers data to calculate the P-value through Mann – Whitney U test and check whether the effect of increased number of tea cups were significant or not significant on the participant’s BMI. The test results concluded that the relationship between BMI and the grouped parameter is not significant (P –value > 0.05).

Table 5: Group Tea Drinkers 1 (2-3cups) & Group 2 (4-6cups): Between BMI and caffeine intake.

Groups (Drinkers)	P- value (Mann- Whitney U)
1(2-3 cups)	0.653
2 (4-6 cups)	

4.2.4 BMI & Smoking

We have divided the participants in 3 groups fairly, Group 1 (who smoked 0-3 cigarettes daily), Group 2 (who smoked 4-6 cigarettes daily) and Group 3 (who smoked around a pack of cigarettes daily). Later, we have compared between these different groups to check whether the P – value to be observed through Mann – Whitney U is significant or not significant. To our concern, we have found all the P- values to be not significant (> 0.05), which concludes in our study that the BMI of the participants of the different groups are not effected by the number of cigarettes consumed. The effect of smoking (independent variable) was not found or was negligible on the participant’s BMI (dependent variable).

Table 6: BMI & Smoking

Groups	BMI (kg/m²) (median±range)	P-value (Mann-Whitney U)
1,2	22.40 ± 23.81 22.90 ± 16.43	0.852
1,3	22.40 ± 23.81 21.78 ±15.11	0.970
2,3	22.90 ± 16.43 21.78 ±15.11	0.887

**[Group 1 (who smoked 0-3 cigarettes daily), Group 2 (who smoked 4-6 cigarettes daily) and Group 3 (who smoked around a pack of cigarettes daily)].

4.2.5 BMI and Smokers/ Non – Smokers

In this part of analysis of data, we divided the parameter into two groups stated Group 1 (smokers) & Group 2 (non-smokers) and calculated the P-value through Mann – Whitney U test to check whether the effect of smoking or not smoking tea were significant or not significant on the participant’s BMI. The test results concluded that the relationship between BMI and the parameter is not significant (P –value > 0.05).

Table 7: Group1 (Smokers) & Group 2 (Non-Smokers) : Between BMI and Smoking

Groups	P- value (Mann- Whitney U)
1 (Smokers)	0.311
2(Non – smokers)	

4.2.6 BMI and Smokers (Group 1 and Group 2)

In this part of analysis of data, we divided the parameter into two groups stated Group 1 (1-3 sticks) & Group 2 (4 sticks – 1 pack) and furthermore omitted the non-smokers data and calculated the P-value through Mann – Whitney U test to check whether the effect of increased smoking were significant or not significant on the participant’s BMI. The test results concluded that the relationship between BMI and the parameter is not significant (P – value > 0.05).

Table 8: Smokers Group 1 (1-3 sticks) & Smokers Group 2 (4-1 pack)

Groups (Smokers)	P- value (Mann- Whitney U)
1(1-3 sticks)	
2(4 sticks – 1 pack)	0.114

4.2.7 BMI & Workout time

We have divided the participants in 3 groups fairly, Group 1 (who workouts for 0-1 hour per day), Group 2 (who workouts for 2-3 hours per day) and Group 3 (who workouts more than 4 hours per day). Later, we have compared between these different groups to check whether the P – value to be observed through Mann – Whitney U is significant or not significant. To our concern, we have found all the P- values to be not significant (> 0.05), which concludes in our study that the BMI of the participants of the different groups are not effected by the workout time. The effect of tea exercise or workout (independent variable) was not found on participant’s BMI (dependent variable).

Table 9: BMI & Workout time

Groups	BMI (kg/m²) (median±range)	P-value (Mann-Whitney U)
1,2	23.68 ± 23.81	0.319
	21.16 ± 15.54	
1,3	23.68 ± 23.81	0.279
	21.89 ±13.62	
2,3	21.16 ± 15.54	0.765
	21.89 ±13.62	

**[Group 1 (who workouts for 0-1 hour per day), Group 2 (who workouts for 2-3 hours per day) and Group 3 (who workouts more than 4 hours per day)].

4.2.8 BMI and workouters / non -workouters

In this part of analysis of data, we divided the parameter into two groups stated Group 1 (non-work outers) & Group 2 (work outers) and calculated the P-value through Mann – Whitney U test to check whether the effect of working out or not working out were significant or not significant on the participant’s BMI. The test results concluded that the relationship between BMI and the parameter is not significant (P –value > 0.05).

Table 10 : Group 1(No Workout) & Group 2 (Workouts) : Between BMI and Workout Group

Groups	P- value (Mann- Whitney U)
1 (No workout)	0.422
2 (Workouts)	

4.2.9 BMI and workouters (Group 1 and Group 2)

In this part of analysis of data, we divided the parameter into two groups stated Group 1 (1-2 hours of workout) & Group 2 (3-4+ hours of workout) and calculated the P-value through Mann – Whitney U test to check whether the effect of increased time of workout were significant or not significant on the participant’s BMI. The test results concluded that the relationship between BMI and the parameter is not significant (P –value > 0.05).

Table 11 : BMI with Workout Group 1 (1-2hrs) & Workout Group 2 (3-4hrs)

Groups (Workouts)	P- value (Mann- Whitney U)
1 (1-2 hrs)	
2(3-4+ hrs)	0.626

4.3 Previous findings and history about the parameters and their effects

4.3.1 BMI and Tea drinking

Numerous studies have been carried out to find out the relationship between tea intake and BMI (Chang et al., 2003). The research group concluded that drinking tea habitually results in lower waist: hip ratio (Weijenberg et al., 2008). A recent study was carried out with the same aim to find link between tea intake and BMI in US and the researchers found that tea intake and waist circumference was inversely proportional (Bouchard et al., 2010).Furthermore, several other studies have been carried out to portray the relationship between tea intake and different glucose count in blood , hence the results are pretty much unfair , mixed and also population specific, calling out more and more study and investigations (Shimizu et al., 2010).There are numerous methods which explain the relationship between tea intake and total BMI. Caffeine present in these tea or coffee usually results in high metabolic rate. (Schutz , 1995). Similarly, the additives such as sugar added by the consumers can also influence on the BMI. It was found that men who took sugar along

with their tea had a BMI value of 1.1 kg/m² less compared to those who took no sugar with their tea (Gyntelberg et al., 2009).

4.3.2 BMI and Smoking

The two most leading reasons for morbidity and mortality worldwide which can be prevented are obesity and smoking (WHO, 2009). To help prevent such incidents or disease, it is right now of high importance to understand the major pathways and the relationship through which smoking and BMI are linked (Audrain-McGovern & Benowitz, 2011). It is observed that people who are smokers have a lower BMI and also people who are heavy smokers are found to have higher BMI (Dare et al., 2015). However, it is usually seen that people often have cluster of bad habits such as smoking, poor diet, less physical activity, hence finding out a fair existence of a link between smoking and BMI is uncertain (Ma et al., 2000). Mendelian randomization (MR) studies showed legit evidence which showed that increased cigarette number daily and heaving smoking have caused BMI or weight reduction and other types of adiposity (Korhonen et al., 2015) . This mechanism could be understood by the fact that nicotine increases the metabolic rate of body and also lowers an individual's appetite, thus energy balance is also changed (Audrain-McGovern and Benowitz, 2011). An evidence was portrayed by a study that cessation of smoking results in weight gain of the individual thus supporting the fact that presence of nicotine actually increases metabolic rate (Abughosh et al., 2016).

4.3.3 BMI and Working Out

The association between working out and BMI is portrayed from the fact that a person with normal weight has usually has energy intake which is same as to their expenditure of energy (Tiruneh , 2010). That means, if an individual has energy intake more than his or her energy expenditure, he or she might or most probably become obese or overweight. However, one of the many ways to get rid of such extra energy and balance the energy in the body is via

working out regularly (Valencia et al., 2000). And in addition to that, in certain cases if working out is not done or maintained, even a person with normal weight might fall victim to overweight or obesity (Wing, 2007).

4.4 Limitations

- 1) The survey was done among 100 participants only, which is a very small population. As a result, the effect was not significant. Having vast data would have showed a trend of effect.
- 2) We had unfair and uneven number of male and female participants. For instance, we had 48 females and only 3 of them were smokers whereas majority of the males were smokers, hence their participation in the parameters were uneven making the results irrational and unreasonable.

4.5 Recommendations

- 1) The study could be more selective. We could have chosen 50 smokers and 50 non-smokers and made sure at least equal number in both groups were involved in the activity prior to collection of data. Screening the participants according to our requirements is a possible target.
- 2) The other information collected as mentioned in the survey form can be used for further analysis in the future.
- 3) The generation of participants could have been increased. If we could have managed around 500 participants, we could show a possible trend on the plots.

CHAPTER 5: CONCLUSION

5.1 Conclusion

According to the previous data and results, we expected to find and conclude certain association of tea drinking, smoking and working out with BMI. For instance, tea drinking, smoking and working out all of these parameters would show a certain decrease of BMI in participants compared to those who didn't drink tea, smoke or workout. But our findings were not as expected. All of our parameters showed negligible or no trend of effect on the participant's BMI. Hence, we further concluded that the relationship between tea drinking, smoking and working out with BMI is not significant. Nevertheless, in the future, more responses will be added to the given questionnaire to get a more precise and accurate result on the parameter's relationship with BMI. Having a large population size will make the findings more fair and reasonable. Furthermore, more surveys needs to done in this field to make the people more conscious and aware of their health. Authors and researchers should come along many other parameters which might be responsible for abnormal BMI and prevent the people from the disastrous consequences and chronic diseases which are associated with increased BMI. Nevertheless, it is seen now that public healthy authorizes all around the globe have taken responsibilities and are taking necessary steps, providing guidelines, encouraging people for being healthy and sound.

References:

- Alley, S., Wellens, P., Schoeppe, S., de Vries, H., Rebar, A. L., Short, C. E., Duncan, M. J., & Vandelanotte, C. (2017). Impact of increasing social media use on sitting time and body mass index. *Health Promotion Journal of Australia : Official Journal of Australian Association of Health Promotion Professionals*, 28(2), 91–95. <https://doi.org/10.1071/HE16026>
- Audrain-McGovern, J., & Benowitz, N. L. (2011). Cigarette smoking, nicotine, and body weight. *Clinical Pharmacology and Therapeutics*, 90(1), 164–168. <https://doi.org/10.1038/clpt.2011.105>
- Barlow, S. E. (2007). Expert committee recommendations regarding the prevention, assessment, and treatment of child and adolescent overweight and obesity: *summary report. Pediatrics*, 120 Suppl. <https://doi.org/10.1542/peds.2007-2329C>
- Bouchard, D. R., Ross, R., & Janssen, I. (2010). Coffee, tea and their additives: Association with BMI and waist circumference. *Obesity Facts*, 3(6), 345–352. <https://doi.org/10.1159/000322915>
- Bracco D, Ferrarra JM, Arnaud MJ, Jequier E, Schutz Y.(1995). Effects of caffeine on energy metabolism, heart rate, and methylxanthine metabolism in lean and obese women. *The American Journal of Physiology*.269: E671–678. <https://doi.org/10.1152/ajpendo.1995.269.4.E671>
- Dare, S., Mackay, D. F., & Pell, J. P. (2015). Relationship between smoking and obesity: A cross-sectional study of 499,504 middle-aged adults in the UK general population. *PLoS ONE*, 10(4), 1–12. <https://doi.org/10.1371/journal.pone.0123579>

- Davey S. G., Bracha Y., Svendsen K.H., Neaton J.D., Haffner S.M., Kuller L.H. and Intervention M.R.F. (2005) Incidence of type 2 diabetes in the randomized multiple risk factor intervention trial. *Annals of Internal Medicine.*, 142, 313–322.
- Gyntelberg, F., Hein, H. O., & Suadicani, P. (2009). Sugar in coffee or tea and risk of obesity: A neglected issue. *International Journal of Food Sciences and Nutrition*, 60(SUPPL. 3), 56–64. <https://doi.org/10.1080/09637480802668471>
- Hughes LA, Arts IC, Ambergen T, Brants HA, Dagnelie PC, Goldbohm RA, van den Brandt PA, Weijenberg MP.(2008). Higher dietary flavone, flavonol, and catechin intakes are associated with less of an increase in BMI over time in women: a longitudinal analysis from the Netherlands Cohort Study. *The American Journal of Clinical Nutrition*, 88(5):1341–1352.
- Hursel, R., Viechtbauer, W., & Westerterp-Plantenga, M. S. (2009). The effects of green tea on weight loss and weight maintenance: A meta-analysis. *International Journal of Obesity*, 33(9), 956–961. <https://doi.org/10.1038/ijo.2009.135>
- Katzmarzyk, P. T., Hebebrand, J., & Bouchard, C. (2002). Spousal resemblance in the Canadian population. *International Journal of Obesity*, 26, 241–246.
- Ma, J., Betts, N. M., & Hampl, J. S. (2000). Clustering of lifestyle behaviors: The relationship between cigarette smoking, alcohol consumption, and dietary intake. *American Journal of Health Promotion*, 15(2), 107–117. <https://doi.org/10.4278/0890-1171-15.2.107>
- Morris, R. W., Taylor, A. E., Fluharty, M. E., Bjørngaard, J. H., Åsvold, B. O., Gabrielsen, M. E., Campbell, A., Marioni, R., Kumari, M., Korhonen, T., Männistö, S., Marques-Vidal, P., Kaakinen, M., Cavadino, A., Postmus, I., Husemoen, L. L. N., Skaaby, T.,

- Ahluwalia, T. V. S., Treur, J. L., Sattar, N. (2015). Heavier smoking may lead to a relative increase in waist circumference: Evidence for a causal relationship from a Mendelian randomisation meta-analysis. *The CARTA consortium. BMJ Open*, 5(8). <https://doi.org/10.1136/bmjopen-2015-008808>
- Popkin, B. M., Adair, L. S., & Ng, S. W. (2012). Global nutrition transition and the pandemic of obesity in developing countries. *Nutrition Reviews*, 70(1), 3–21. <https://doi.org/10.1111/j.1753-4887.2011.00456.x>
- Popkin, B. M., & Nielsen, S. J. (2003). The sweetening of the world's diet. *Obesity Research*, 11(11), 1325–1332. <https://doi.org/10.1038/oby.2003.179>
- Speiser, P. W., Rudolf, M. C. J., Anhalt, H., Camacho-Hubner, C., Chiarelli, F., Eliakim, A., Freemark, M., Gruters, A., HersHKovitz, E., Iughetti, L., Krude, H., Latzer, Y., Lustig, R. H., Pescovitz, O. H., Pinhas-Hamiel, O., Rogol, A. D., Shalitin, S., Sultan, C., Stein, D., Hochberg, Z. (2005). Consensus statement: *Childhood obesity. Journal of Clinical Endocrinology and Metabolism*, 90(3), 1871–1887. <https://doi.org/10.1210/jc.2004-1389>
- Tijburg, L. B. M., Mattern, T., Folts, J. D., Weisgerber, U. M., & Katan, M. B. (1997). Tea flavonoids and cardiovascular diseases: A review. *Critical Reviews in Food Science and Nutrition*, 37(8), 771–785. <https://doi.org/10.1080/10408399709527802>
- Tudor-Locke, C., Ainsworth, B. E., Whitt, M. C., Thompson, R. W., Addy, C. L., & Jones, D. A. (2001). The relationship between pedometer-determined ambulatory activity and body composition variables. *International Journal of Obesity*, 25(11), 1571–1578. <https://doi.org/10.1038/sj.ijo.0801783>
- VAGUE, J. (1956). The degree of masculine differentiation of obesities: a factor

determining predisposition to diabetes, atherosclerosis, gout, and uric calculous disease. *The American Journal of Clinical Nutrition*, 4(1), 20–34.
<https://doi.org/10.1093/ajcn/4.1.20>

Wardle, J., Carnell, S., Haworth, C.M., Plomin, R. (2008). Evidence for a strong genetic influence on childhood adiposity despite the force of the obesogenic environment. *The American Journal of Clinical Nutrition*, 87(2): 398– 404.

World Health Organisation (2009) Global Health Risks: Mortality and Burden of Disease Attributable to Selected Major Risks. *WHO Press*, Geneva.

Wu, C.H., Lu, F.H., Chang, C.S., Chang, T.C., Wang, R.H., Chang, C.J. (2003). Relationship among habitual tea consumption, percent body fat, and body fat distribution. *Obesity Research*,11(9):1088–1095.

Yang, M., Chen, H., Johnson, M.L., Essien, E.J., Peters, R.J., Wang, X. and Abughosh, S. (2016). Comparative effectiveness of smoking cessation medications to attenuate weight gain following cessation. *Substance Use And Misuse*, 51, 586–597.

Appendix

A SURVEY FORM

Project name: BMI perception of undergraduate students on caffeine intake, smoking and physical exercise

Name : Fatema Shorna

ID: 16146054

University: Brac University

Participants: Students of Brac University

Project Supervisor: Dr. Afrina Afrose, PhD

Assistant Professor, Department of Pharmacy, Brac University.

*Required

Disclaimer

All the data for this survey will be used for research purpose only. The subject's name and identity will not be disclosed in any research publication.

I acknowledge that I have been asked to participate in a survey regarding social media usage. This survey is conducted by Fatema Shorna . I understood the disclaimer and agreed to participate willingly. *

Signature: _____

Date: _____

Name of the participant:

Date of birth :

Name of the University studying:

Department:

Instructions:

Mark only one box.

1. Gender *

Mark only one box.

- Male
- Female
- Others

2. Age *

Mark only one box.

- 21-22
- 23-24

- 25-26
- 26+

3. Height (ft-in) *

.....

4. Weight (kg) *

.....

5. Living status *

Mark only one box.

- Living alone in apartment
- Sharing
- Rent with family
- Own home

6. Marital status

Mark only one box.

- Married
- Unmarried
- Single
- Divorce
- In a relationship

7. How many hours do you spend watching TV every day? *

Mark only one box.

- None
- 1
- 2
- 3
- 4
- 5
- 6+

8. How many hours do you spend on Facebook, YouTube, Instagram, Snapchat, twitter etc every day? *

Mark only one box.

- None
- 1
- 2
- 3
- 4
- 5
- 6+

9. How many hours do you sleep? *

Mark only one box.

- 4
- 5

- 6
- 7
- 8
- 9
- 10+

10. When do you go to sleep? *

Mark only one box.

- Before 10 pm
- 10-11 pm
- 11-12pm
- After 12pm

11. History of insomnia

Mark only one box.

- Yes
- No

12. How many hours do you work out every day? *

Mark only one box.

- None
- 1 hr
- 2 hrs
- 3 hrs
- 4+ hrs

13. How many hours do you walk, run or play outside every day? *

Mark only one box.

- None
- 1 hr
- 2 hrs
- 3 hrs
- 4+ hrs

14. How often do you eat fast food? *

Mark only one box.

- None
- Once a week
- Twice a week
- Everyday

15. How much carbonated drinks (250ml) do you take per week? *

Mark only one box.

- None
- 2-3
- 4-5
- 7+

16. How many cups of tea/coffee do you drink per day? *

Mark only one box.

- None
- 2-3
- 4-5
- 6+

17. Do you eat timely on a regular basis? *

Mark only one box.

- Yes
- No
- Sometimes

18. How many cigarettes do you smoke per day?

Mark only one box.

- Non-smoker
- 1-3
- 4-6
- 1pack

19. Have you ever been to a restaurant because of the recommendation from social media?

Mark only one box.

- Yes
- No
- Sometimes

20. After using social media daily, how do you feel? *

Mark only one box.

- Excited
- Happy
- Normal
- Bored
- Sad
- Depressed

21. How much do you care about your social appearance in Facebook or Instagram? *

Mark only one box.

- Must be perfect
- Has to be good
- Okay is fine
- Don't care much
- Don't care at all

22. After starting to use social media, how is your face-to-face interaction with other people?

Mark only one box.

- Same as before
- I have more interaction
- I have less interaction
- little to none

23. Guardian's socio economic status?

Mark only one box.

- Less income (below 20000 tk)
- Moderate (20,000-50,000 tk) High (50,000-100,000 tk)
- Very high (above 100,000 tk)

24. History of mental illness?

Mark only one box.

- Depression
- Anxiety
- Schizophrenia
- Suicidal
- Others

25. Family history of health disorder

Mark only one box.

- Yes
- No

