DISSERTATION SUBMITTED FOR THE MASTER'S DEGREE IN MEDICAL PHYSIOLOGY

TO STUDY THE RELATIONSHIP BETWEEN BODY MASS INDEX AND PERCENT BODY FAT IN YOUNG ADULTS

SUBMITTED BY

TABASSUM SIDDIQUI

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DEPARTMENT OF MEDICAL PHYSIOLOGY

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TITLE

"TO STUDY THE RELATIONSHIP BETWEEN BODY MASS INDEX AND PERCENT BODY FAT IN YOUNG ADULTS

A dissertation

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In partial fulfillment of the requirements for the award of degree of

Master of Science

In

Medical Physiology

by

TABASSUM SIDDIQUI

Enrolment No- 2100100144

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DEPARTMENT OF MEDICAL PHYSIOLOGY INTEGRAL INSTITUTE OF MEDICAL SCIENCES & RESEARCH

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DECLARATION BY CANDIDATE

I hereby declare that this dissertation entitle **"TO STUDY THE RELATIONSHIP BETWEEN BODY MASS INDEX AND PERCENT BODY FAT IN YOUNG ADULTS"** is a bona fide & genuine research work carried out by me under the guidance of **Dr. Gauhar Hussain** Professor, Department of Physiology and under the co-supervision of **Dr. Ausaf Ahmad**, Associate Professor, Department of Community Medicine **Dr. Pawan Kumar** Assistant professor, Department of medicine.

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Firstly, I express my sincere gratitude to my Lord for providing me light and guidance whenever I needed it the most. I begin in Thy Name.

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YOU, MY REVERED TEACHER

A GUIDE, INSPIRATIONAL PROFESSOR

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"Family and friends make performance better"

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DATE: TABASSUM SIDDIQUI

CONTENTS

List of Abbreviations

LIST OF ABBREVIATIONS

BMI	BODY MASS INDEX
BF	BODY FAT
CD	CHRONIC DISEASES
ABG	ABNORMAL BLOOD GLOCOSE
MOH	MEDICAL OFFICER OF HEALTH
BFP	BODY FAT PERCENT
HDL	HIGH DENSITY LIPID

Introduction

CHAPTER 1

INTRODUCTION

There have been numerous health issues for a very long time, both domestically and internationally, one of which is brought on by lifestyle disorders like being overweight or obese, which is indicated by a bloated stomach and the presence of body fat. Excessive nutrition intake is the primary cause of the typical body obesity incidence. Additionally, cardiovascular disease and cancer deaths are correlated with obesity, particularly abdominal fat.[1]

Obesity effect more than 850 million people (i.e.,10% of men and 14% of women) worldwide is a crucial risk factor for many serious health condition- including type II diabetes, cardiovascular disease, hypertension, sleep apnea and cancer and is thought to be one of the greatest contributors to preventable death India. Studies of childhood, teenage, and adult obesity have also provided consistent evidence that higher body mass index is related with a variety of cognitive deficits and may even lead to early-onset dementia. However, despite the myriad of obesity-related physical and psychological health concerns, most overweight individual struggle to initiate and maintain behaviors that would reduce adiposity and improve their overall health.[2]

Obesity prevalence has increased over the past few decades and is now a significant worldwide health risk. The measuring of excess body fat, which is linked to a higher risk of metabolic disease, is crucial for the implementation of both therapeutic and preventive health treatments. The BMI is utilized equally for all sexes and adults of all ages, making it the most practical population-level indicator of overweight and obesity, according to the World Health Organization (WHO).[3]

Obesity is a multifaceted and chronic condition, clinically defined as the accumulation of extra body fat to the ex-tent that it may have adverse effects on fitness.[4]

Obesity has long been associated with increased risks of mortality, cardiovascular diseases, diabetes, and cancer, and is connected with significant health and economic burden. BMI has long been denoted to state obesity in adults. World Health Organization (WHO) recommends an international BMI cut-off point classification for adults: overweight is BMI 25–29·9 kg/m2and obesity is BMI ≥30 kg/m2. Southeast Asia, with lower initial prevalence of obesity (2–15%), has also experienced increasing obesity over the last decade, in tandem with globalization, rapid urbanization, and increase in socio-economic status.[5]

The occurrence of obesity is increasing globally, and obesity is thus becoming a key public fitness concern.[6]

Obesity consequences from a nonexistence of balance between calorie intake and energy expending, which increase adipose tissue and activates endocrine entities.[7]

Adipose tissue energy expenditure, activity, insulin sensitivity and secretion, glucose and lipid metabolism, fat distribution, neuroendocrine regulation, and immune system function. As a result, obesity significantly contributes to the development of cardiometabolic problems such as hypertension, type 2 diabetes, dyslipidemia, and certain cancers.[8]

Human body consists of fat mass and mass without fat. The fat free mass contains of total body protein stored in the muscle mass, total body water, and total bone mineral. Level of fat mass varies between 13–21% in male and 23–31% in female Recently, the common method used to categorize overweight or obesity is body mass index (BMI), which is calculated by using a formula that consists of body weight in

kilogram divided by body height in meter square. However, someone who uses BMI cannot determine his body composition of fat and muscle precisely. The majority of people felt that having a higher BMI also meant having a higher percentage of body fat, although this is not always the case.[9]

The goal was to investigate the association between body mass index (BMI) and body fat percentage (BF%) in various Asian demographic groups. The study design was a literature overview with special attention to recent Asian data. The BMI was calculated from weight and height and the BF% was determined by deuterium oxide dilution, a chemical-for-compartment model, or dual-energy X-ray absorptiometry. All Asian populations studied had a higher BF% at a lower BMI compared to Caucasians. Generally, for the same BMI their BF% was 3-5% points higher compared to Caucasians. For the identical BF% their BMI was 3-4 units lower compared to Caucasians.[10]

Obesity is characterized by excessive body fat and it is classified by body mass index (BMI).[11]

The increase in the occurrence of obesity over the last few decades has become a worldwide major health problem in all generation of most countries.[12]

It is often reported that obesity is an important biological risk factor for the growth of chronic diseases (CDs). Thus, obesity could be categorized as an important health indicator that poses a public health challenge globally. Obesity and its relationship with the volume of exercises and active lifestyle coupled with inadequate amount of physical action have been analyzed in various populations.[13]

Physical action is considered to be crucial for the development and maintenance of health. The classification of obesity, level of nutrition, assessment of exercise

benefits, preservation and improvement of general health all depend on body composition within the context of physical fitness.[14]

Regular physical action or exercise has been shown in numerous national and international studies to improve body composition and weight management, consequently lowering the occurrence of chronic diseases. Body structure can be examined in two sections as fat mass also fat free mass. Fat-free mass contains muscle, bone, water, nerves, veins and organic structures, fat mass contains subcutaneous fat, storage fat, and essential fats.[15]

Review of Literature

CHAPTER 2

REVIEW OF LITERATURE

OBESITY

Obesity and overweight are both characterized by an abnormal or excessive buildup of body fat that could be harmful to health. Adolescence is a critical period of development when lifestyle behaviors, such as eating habits, are created and cemented. Reestablishing lifestyle behavior patterns in early life can have a significant impact on one's health and well-being.[16]

BODY MASS INDEX

Body Mass Index (BMI) is calculated by dividing a person's weight in kilograms (or pounds) by their height in meters (or feet), squared. High body fatness may be indicated by a high BMI. BMI does not make a body fat or health diagnosis for a person, but it does screen for weight categories that may cause health issues. Adult obesity has historically been classified by BMI. For adults, the World Health Organization (WHO) suggests a global BMI cutoff point classification.: overweight is BMI 25–29·9 kg/m2and obesity is BMI ≥30 kg/m2.[4]

BMI FORMULA

Body mass index (BMI) = Weight (kg)/ Height^2 (m^2)

BMI RANGE

Below 18.5= underweight range.

Between 18.5 and 24.9 -healthy weight.

Between 25.0 and 29.9-Overweight

Between 30.0 and 39.9-obese range

BODY FAT PARCENTAGE

Physiologically, women need more important body fat than men. Because of this, women need a little bit more body fat for excellent health. Insulation, internal organ protection, vitamin storage, and hormone regulation are all made possible by essential body fat, which is also necessary for a healthy pregnancy. With aging, body fat also varies. Your age, sex, and amount of activity can all affect your optimal body fat percentage. No single figure can accurately depict your personal health. Your total health and well-being can often be better predicted by how you treat your body and mind.

Between 8 and 19 percent body fat is considered healthy for males between the ages of 20 and 40, whereas between 11 and 25 percent is considered typical for males over the age of 40. A body fat percentage of greater than 30% is regard as obesity.

ACE Body Fat % Chart		
Description	**Women**	**Men**
Essential fat	10-13%	2-5%
Athletes	14–20%	6-13%
Fitness	21–24%	14–17%
Average	25–31%	18–24%
Obese	32%+	25%+

J.Janjic (2016)Studies connection among Body Mass Index and Body Fat Percentage among Adolescents from Serbian Republic.

They conducted a study in 2014 with 1000 healthy teenagers (ages 15 to 19) from various regions of the Serbian Republic (Federation of Bosnia and Herzegovina) to ascertain the connection between body mass index (BMI) and body fat percentage (% BF). After determining BMI and considering the correlation between BMI and %BF, the four groups of teenagers under research were separated into. the result The findings indicate that boys (ages 15–18) are substantially more likely than girls to be at a healthy weight (p 0.01; p 0.05). The findings indicate that boys (ages 15–18) are considerably more expected than girls to be at a healthy weight (p 0.01; p 0.05). For both the boys and the girls who were studied, the connection between BMI and %BF was very positive and strong (r = 0.975). There were substantially more (p 0.01) boys than girls in the group with normal% BF and increased BMI, whereas there were significantly (p 0.05) more girls than boys in the group with increased BMI and% BF. Results obtained indicate that the majority of teenagers in the Serbian Republic are of

a normal body weight, with a tendency to rise, especially among girls who are more susceptible to an imbalanced diet.[16]

Jo A.Mainous(2018) Studies have conducted a cross-sectional study on the informational value of body mass index and percent body fat for the risk of abnormal blood sugar levels.

Their study looked at the relationship between body mass index (BMI) and percent body fat (%BF) in relation to the risk of abnormal blood glucose (ABG) in persons who are normal weight or overweight. In that study they formed 64% of population with normal BMI classification had a high %BF. Prevalence of ABG in normal-weight group with high %BF (13.5%) is significantly higher than the overweight group with low %BF (10.5%, $P<0.001$).[17]

H.Achmad Sofyan.(2020)Conducted a research on outcome of the body mass index to body fat.

The place of research was conducted at the martial arts athlete of the Indonesian National Sports Committee (KONI), Karawang Regency. This research method uses causal studies and path analysis testing. Based on the study results of body fat variables, the mean = 50.00; standard deviation = 9.92; variance = 98,3077; median = 47.5; and mode = 39. Based on the results of the study of body mass index variables (BMI), the mean =50.07; standard deviation = 10.01; variance of 100,2253; median = 48.0; and mode = 48.[1]

C.Kexun Kenneth is(2021) have done the yishun study'on Relationship between BMI with percentage body fat and obesity in Singaporean adults – The Yishun Study.

This was a population-based study of 542 community-dwelling Singaporeans (21–90 years old, 43.1% men). Anthropometry and body composition were assessed. Relationship between BMI and BF% were analysed using multiple

regression models. The result formed in overall population-adjusted prevalence of obesity according to WHO International classification (BMI ≥30 kg/m2) was 12.9% (14.9% men; 11.0% women); and 26.6% (30.7% men; 22.8% women) according to the MOH classification (BMI ≥27.5 kg/m2). However, using the BF% cut-off (> 25% for men and > 35% for women) resulted in very high prevalence of obesity of 82.0% (80.2% men; 83.8% women).[4]

S.Marzieh (2022) Did study on Performance of body mass index and body fat percentage in guessing metabolic syndrome risk factors in diabetic patients of Yazd, Iran.

A total no. of 1022 (499 males and 523 females) diabetic patients participated in this study. According to Asian BMI criteria, Overweight was diagnosed if a participant had a BMI ≥25 kg/m2 (both male and female) or BFP ≥25% for male and ≥ 32% for female. In that study the BMI of 23.4% were normal and BMI of 76.6% were overweight, respectively. Moreover, the BFP of 25.7 and 74.3% of the studied population were considered as Non-Fat and Fat, respectively. A strong relationship was found with respect to sex stratification; R2 = 0.79. BFP is not as good a predictor of hypertension and hypertriglyceridemia in males as BMI. In comparison to BFP, BMI was a better indicator of hyperglycemia in women. Furthermore, BFP was a greater predictor of hypertension, hypertriglyceridemia, and low HDL than BMI in the female group, whereas it was a better predictor of hyperglycemia in the male group.[18]

Research Question

RESEARCH QUESTION

Is there any correlation between BMI and body fat?

STATISTICAL HYPOTHESIS

NULL HYPOTHESIS (H0):

There is no correlation between BMI and body fat.

ALTERNATIVE HYPOTHESIS (H1):

There is correlation between BMI and body fat.

Aim And Objectives

CHAPTER 3

AIM AND OBJECTIVES

AIMS

The main objective of this study to the determine association between Body Mass Index (BMI) and percentage body fat (BF%) in young adults.

OBJECTIVES

1. To determine the level of overweight/obesity by BMI calculation
2. To correlate the BMI with percent body fat

Materials And Methods

CHAPTER 4

MATERIALS AND METHODS

TYPE OF STUDY:

A cross -sectional study

PLACE OF STUDY:

The study was performed in the Department of Physiology at Integral Institute of Medical Science & Research, Lucknow. (U.P)

STUDY PERIOD:

6 months.

SUBJECT SELECTION:

Number of subjects was selected from students in integral university& and following the inclusion and exclusion criteria.

INCLUSION CRITERIA:

1. Age group between 18-35 years.
2. 1st and 2nd year students was included in the study.

EXCLUSION CRITERIA:

1. Age outside the given range
2. Any chronic heart disease, known history of hypertension
3. Any diagnosed case of obesity related disease undergoing treatment; i.e. hormonal / thyroid disorder.

SAMPLE SIZE ESTIMATION

The sample size was calculated using the formula-

$$n=z^2 p(1-p)/d^2$$

Where, Sample size=n

P=50%

Confidence level 95% so Z score=1.96

Margin of error(d)=10%

Calculated sample size=96

Final sample size=100

SO,

100 case was included in the study.[19]

COLLECTION OF DATA

Procedure

Body mass index

Height and weight of the subjects was measured using a standardized height and weight machine. For this, the subjects was lightly clothed but without shoes. Standing height was measured to the nearest 0.5 cm. Body weight was recorded in kilograms on an empty bladder and before lunch on a standardized weighing scale. The weight measurement was recorded to the nearest 0.1 kg.

After taking height and body weight, BMI was calculated as: -

Body mass index (BMI) = Weight (kg)/ Height^2 (m^2)

BMI RANGE

Below 18.5= underweight range.

Between 18.5 and 24.9 -healthy weight.

Between 25 and 29.9-Overweight

Between 30 and 39.9-obese range

Percent body fat

Skinfolds was measured with a Harpenden caliper to the nearest 0.1 and with the same instruments throughout the study.

The measurements was taken at four anatomical sites –

-biceps

-triceps

-subscapular

-supra-iliac region.

The thickness of the double layer of skin and subcutaneous tissue was read directly from caliper dial and recorded in milli meters (mm) within 2-5 seconds after applying the full force of caliper. All skinfolds was taken on the right side of the body.

Body density in gm/cc was derived from the sum of these four skin fold thickness scores using regression equations of Durnin & Womersley.[20]

Body Density = c- m x log (sum of skin fold thickness measurements at 4 sites in mm)

Where c and m values are two constants (different for age and gender).

Body fat percentages was determined according to Siri equation.[21]

% Body fat content = ((4.95/ Body density) - 4.50) x 100.

STATISTICAL ANALYSIS

The results are presented in mean with SD. Pearson coefficient are use to assess the corelation if any association between body mass index and percent of body fat among study parameters. The p-value<0.05 which is significant.

Result Observations

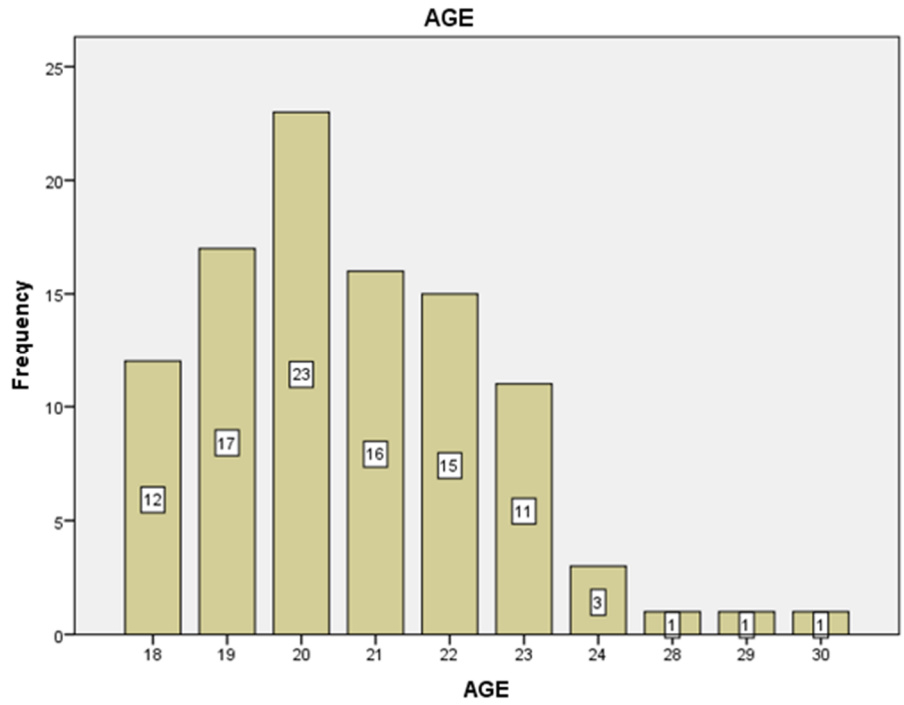
CHAPTER 5

RESULT OBSERVATIONS

Table 1: Distribution of Age of Respondents

Characteristic	Male (n=50)	Female (n=50)
Age (years)		
18	5	8
19	12	5
20	7	15
21	7	9
22	10	5
23	6	5
24	3	3

FIGURE-1 AGE DISTRIBUTION OF RESPONDENT



Age distribution: The data allows us to compare the distribution of ages between males and females. For example, there are more females than males in the 20-year-old age group (15 females vs. 7 males). Similarly, there are more males than females in the 19-year-old age group (12 males vs. 5 females). You can see the differences and similarities in age distribution across the two genders.

Age range: The provided data covers the age range from 18 to 24 years for both males and females. This range allows for a direct comparison between the two groups within the specified age bracket. Sample size: It's important to note that the sample size for both males and females is the same (n=50), which allows for a fair comparison between the genders. These findings are based solely on the

information provided in the table. Further analysis, such as statistical tests, would be needed to draw more conclusive interpretations or determine the significance of the observed differences.

Table 2: T Test of BMI

	Mean	SD	T	P value
Male	21.48	24.00	2.87	0.0029
Female	24.42	29.84		<0.05

The mean BMI for males was 21.48965, while for females it was 24.42134, indicating that females, on average, had a slightly greater BMI than males. The standard deviation of BMI was higher among females (29.84847) compared to males (24.00938), suggesting greater variability in BMI among females. The t-test analysis yielded a t-value of 2.87369, indicating a significant difference in BMI between males and females. The associated p-value (0.002992) confirmed the statistical significance of this difference, indicating that it is unlikely to be owed to chance alone. The higher BMI observed in females may have implications for health and wellness, but it is important to consider other factors such as body composition for a comprehensive understanding. The study's limitations include the sample size and lack of consideration for confounding variables. In conclusion, gender-specific differences in BMI should be taken into account when addressing health and wellness, and further research with

larger and more diverse samples is needed to explore gender disparities in body composition and health outcomes.

Figure 2: Bar diagram Body mass index

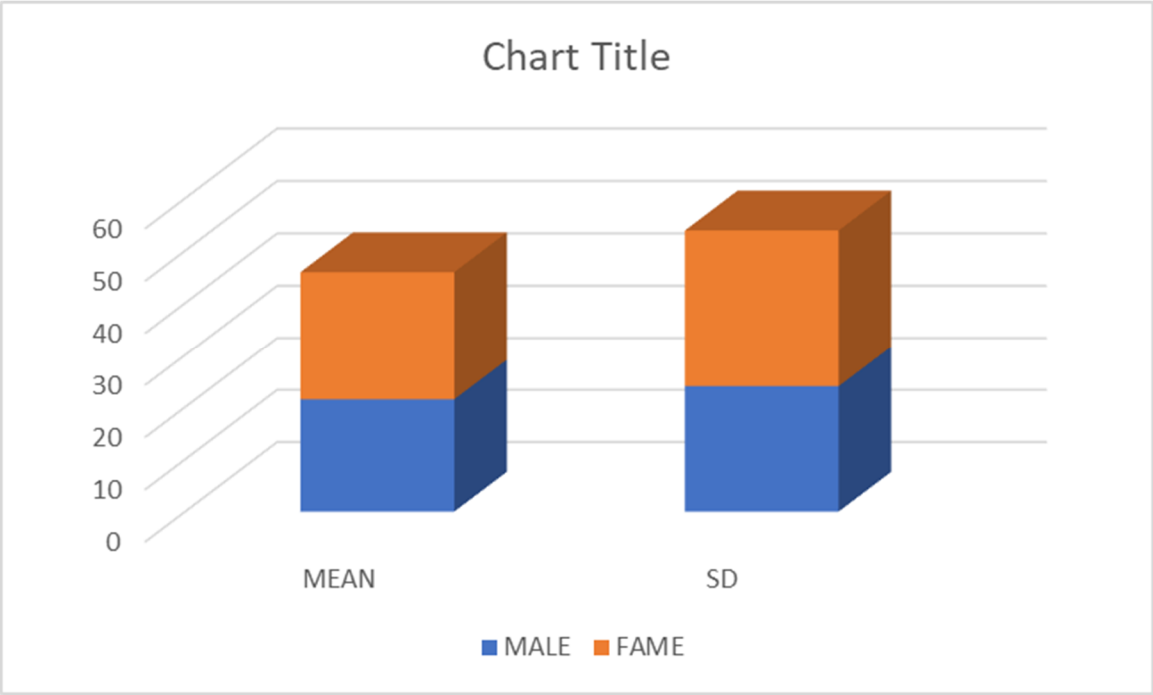


Table 3: T Test of Body Fat Percentage

	Mean	SD	T	P value
Male	16.95	21.54	5.57	1.06
Female	23.38	41.47		>0.05

The mean body fat percentage was higher in females (23.38) compared to males (16.95), indicating that females, on average, had a slightly higher body fat percentage. The standard deviation of body fat percentage was also higher among females (41.47) compared to males (21.54), suggesting greater variability in body fat percentage among females. The t-value obtained from the t-test analysis was 5.57, indicating a potential difference in body fat percentage between males and females. However, the p-value provided as 1.06 is inconsistent with the expected range for a two-sided t-test, making it difficult to determine the statistical significance of the observed difference. Further clarification or additional information is needed to interpret the results conclusively. The potential difference in body fat percentage between males and females may have implications for health and fitness, but considering other factors such as muscle mass, body fat distribution, and overall body composition is crucial for a comprehensive understanding. The limitations of the study include the sample size, lack of an exact p-value, and the omission of potential confounding variables. In conclusion, further research with a larger sample size and more precise statistical reporting is necessary to gain a better understanding of the differences in body fat percentage between genders and their impact on health and wellness.

Figure 3: Bar diagram body fat percentage

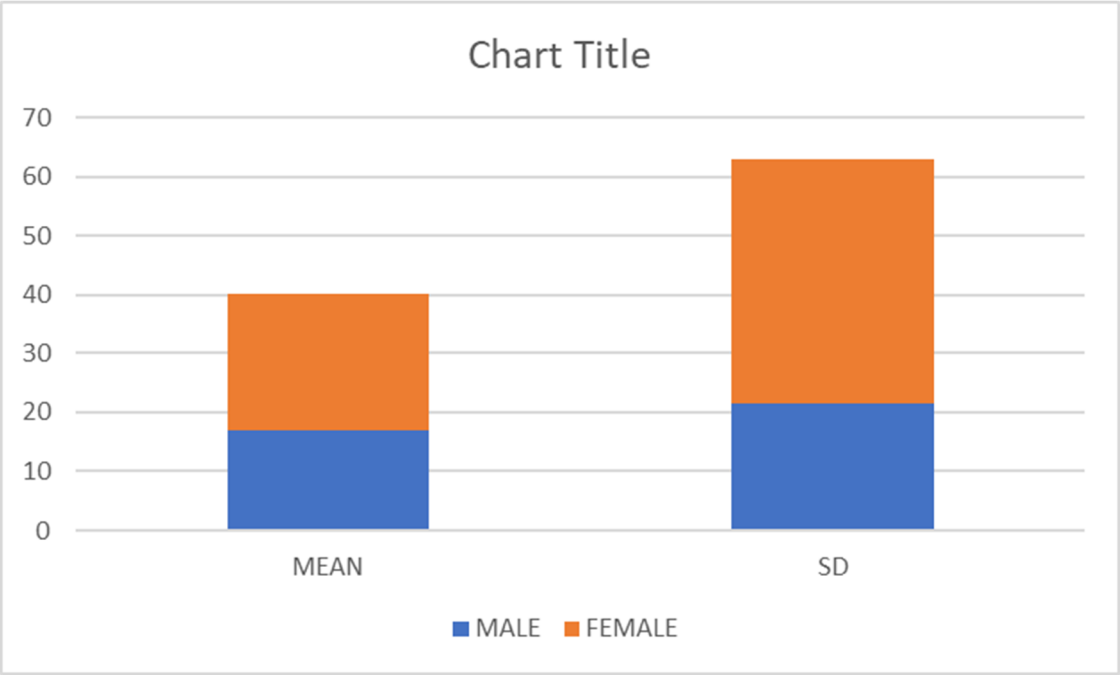


Table 4: Mean percentage of 4 site skin fold thickness

Variables	Female (Mean ±SD)	Male (Mean ±SD)
BICEPS(mm)	9.1+5.62	17.42+10.42
TRICEPS(mm)	8.68+5.23	16.51+9.88
SUBSCAPULAR(mm)	7.54+2.89	14.02+8.79
SUPRA-ILEAREGION(mm)	10.5+5.59	21.10+14.21

These values represent the average measurements (mean) and the variability (standard deviation) for each variable in both females and males. For example, in the BICEPS variable, females had an average measurement of 9.1 mm with a standard deviation of 5.628, while males had an average measurement of 17.428 mm with a standard deviation of 10.422. The variables TRICEPS, SUBSCAPULAR, and SUPRA-ILEAC REGION can all be compared in the same ways. These measurements provide insights into the differences in these specific body regions between females and males. However, further analysis and interpretation would be required to fully understand the significance and implications of these variations.

Figure 4: (A)Bar diagram of 4 site skin fold thickness in male

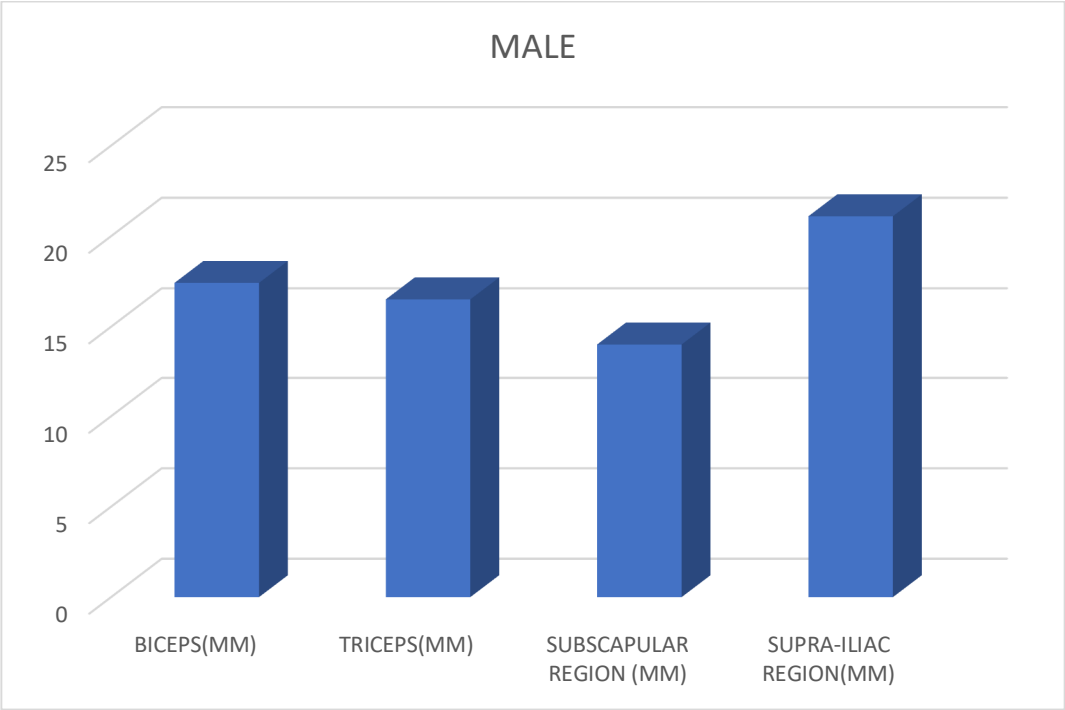


Figure 4: (B) Bar diagram of 4 site skin fold thickness in female

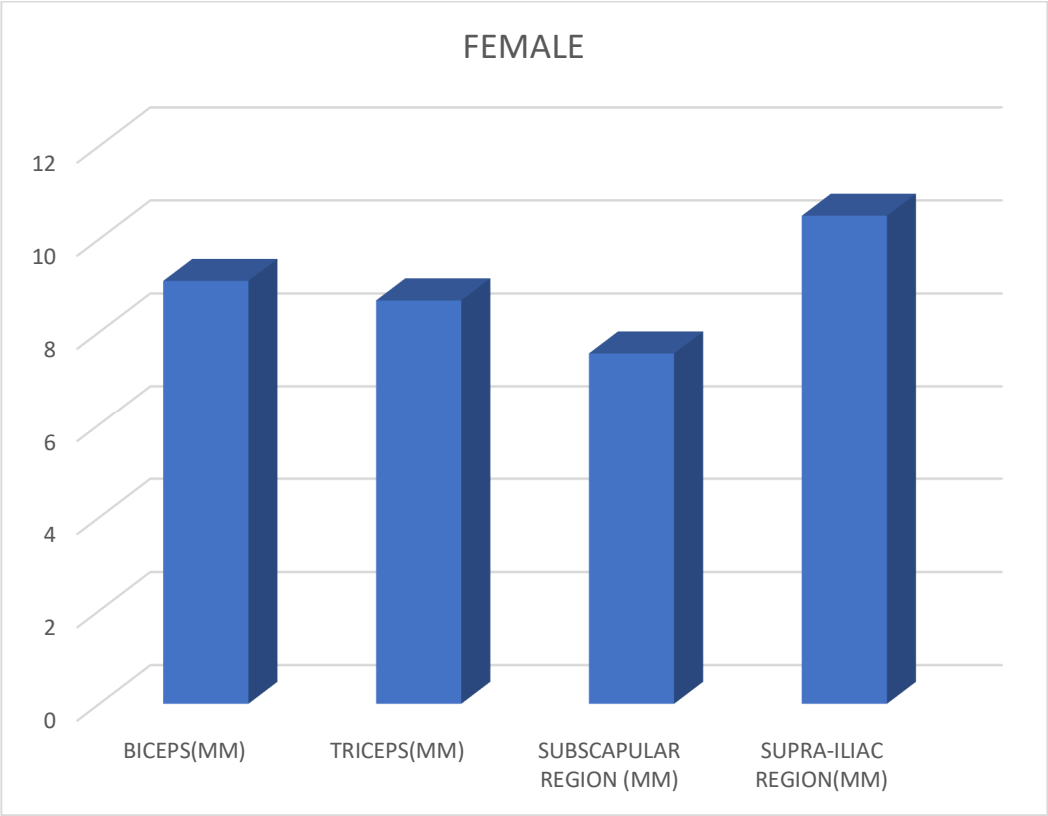
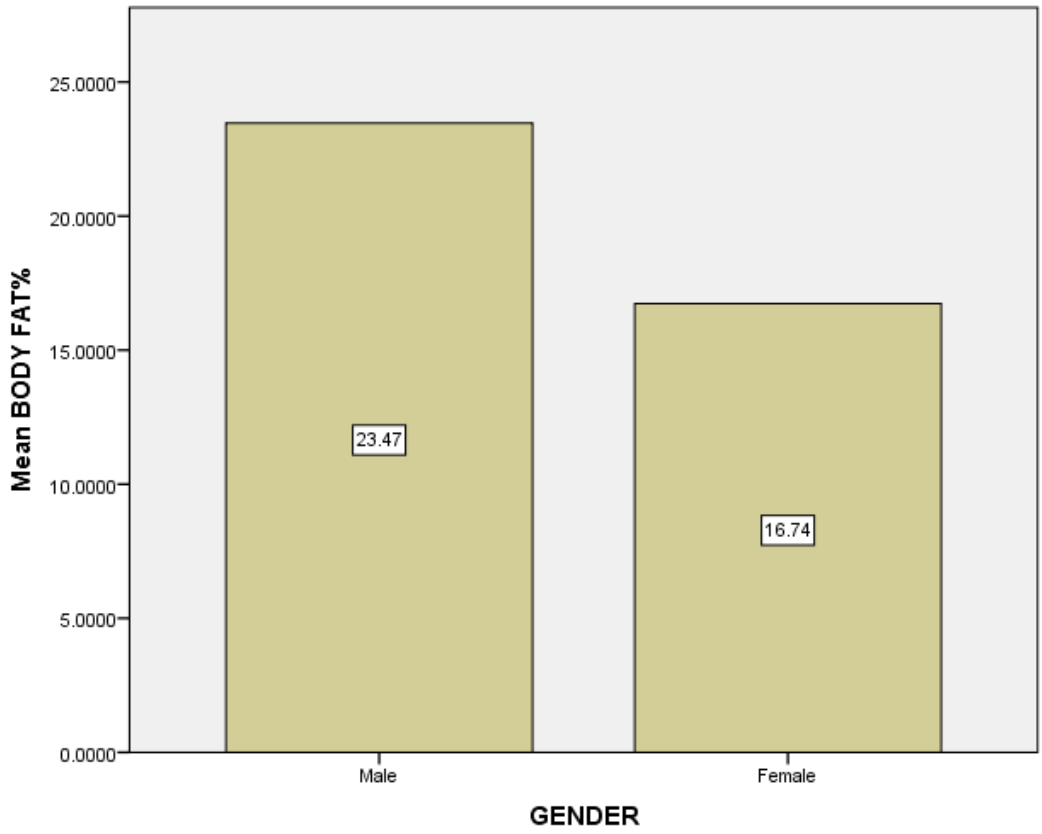


Table 5: Mean percentage of Body density and Body Fat (%)

Variables	Female (Mean ±SD)	Male (Mean ±SD)
BODY DENSITY	1.059+0.010	1.045+0.014
BODY FAT%	16.74+4.64	23.47+6.499

FIGURE-5 Mean percentage of Body density and Body Fat (%)



These values represent the average measurements (mean) and the variability (standard deviation) for each variable in females and males. For the variable "BODY DENSITY," females had an average body density of 1.059863 with a standard deviation of 0.010436, while males had an average body density of 1.045923 with a standard deviation of 0.014391.

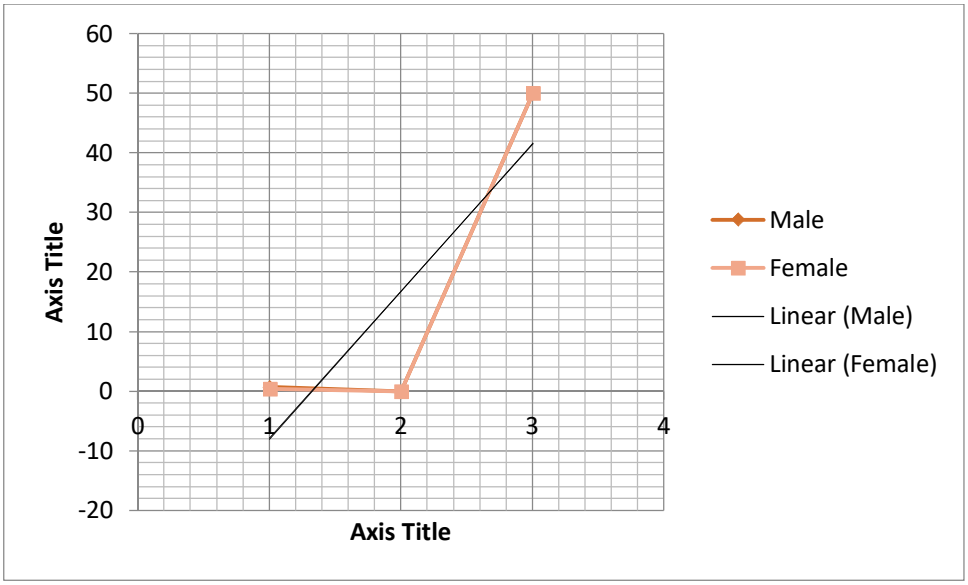
For the variable "BODY FAT%," females had an average body fat percentage of 16.74 with a standard deviation of 4.64, while males had an average body fat percentage of 23.45 with a standard deviation of 6.499.

These measurements provide insights into the differences in body density and body fat percentage between females and males. Females, on average, had a slightly greater body fat percentage and body density compared to males. However, further analysis and interpretation would be required to fully understand the significance and implications of these differences in body composition between the two genders.

Table 6: Pearson's Test result for correlation between BMI and body fat percentage

Pearson's rho test	Male	Female
Correlation coefficient®	0.673	0.389
Sig. (2-tailed) (p)	0.000	0.006
n	50	50

Note: p<0.05=data was significant, p>0.05=data was not significant **FIGURE -6**



The findings of a Pearson correlation analysis performed on two sets of data—one for men

and one for women—are shown in the table. The investigation looked at the relationship between two variables, although the table makes no indication of the precise variables.

A measurement of the strength and direction of the association between two variables is the correlation coefficient. The correlation coefficient for men in this instance is 0.673, indicating a positive association between the two variables for men that is reasonably strong. Females have a smaller positive correlation between the two variables, as seen by the correlation coefficient for females, which is 0.389.

If there is no correlation between the two variables in the population, the significance value (p-value) shows the likelihood of finding a correlation coefficient that is as extreme as the one found in the sample. The correlation coefficients are statistically significant, implying that it is extremely improbable to find such a strong association by chance alone, according to a p-value of 0.000 for men and 0.006 for women.

The sample is reasonably large because it has a sample size of 50 for both males and females. However, it is challenging to make any firm inferences regarding the link between the factors for males and females without knowledge of the precise variables being examined.

While the average body fat percentage was higher in women than men, the average BMI for females was higher than the average for males. Men and women who participated in the study were more likely to be 19 years old than were respondents who were 24 years old.

The study's correlation result had a significant score with a p value of 0.000 for both male and female respondents. According to the aforementioned Pearson test table, the

correlation between male and female students was 0.673 for male students and 0.389 for female students. As a result of the score not being within the range of 0.80 to 1.00, this result showed a negative correlation with low power of correlation. According to the study's findings, there is a negative link between BMI and body fat %; greater BMIs do not necessarily correspond to larger body fat percentages.

Discussion

CHAPTER 6

DISCUSSION

This thesis' discussion chapter investigates the relationship between students' body fat percentage and BMI (body mass index). Males and females were found to have correlation values of 0.673 and 0.389, respectively. These coefficients show a lesser correlation for females, but a generally positive correlation between males and females.

The significance level (p-value) was also calculated for each correlation coefficient. The p-value for males was reported as 0.000, which is less than the conventional threshold of 0.05. This suggests that the correlation between males is statistically significant. Similarly, the p-value for females was found to be 0.006, indicating that the correlation between females is significant, albeit with a lower level of significance compared to males.

The results of this study align with previous research conducted by Flegal et al. among U.S. public research subjects. Their study reported higher mean BMI values in males compared to females, with males having an average BMI of 27.9 kg/m2 and females having an average BMI of 28.2 kg/m2. Additionally, the body fat percentage was higher in women (39.9%) compared to men (28.1%).[22]

Another study conducted by Daud et al. in Malaysia divided the respondents into three groups: athletes, individuals who exercise regularly, and those with sedentary activity. The study revealed that subjects with sedentary activity had

higher average BMI (24.3 kg/m2), while athletes had lower average BMI (22.6 kg/m2). The body fat percentage was also found to be higher in the sedentary

activities group (20.6%) compared to the exercise group (18.9%) and the athlete group (15.7%). These findings suggest that BMI and body fat percentage are influenced by factors such as age, race, and activity level.[23]

The current study found a strong correlation between BMI and body fat percentage in both male and female students, which is consistent with the findings of Ranasinghe et al. in Sri Lanka. They measured body fat percentage using BIA (Bioelectrical Impedance Analysis) and classified the subjects based on gender and age intervals. The study indicated that age and gender significantly influenced the correlation between BMI and body fat percentage.[24]

Furthermore, Rao et al. conducted a study in South India involving individuals aged between 20 and 60 years. Their research showed a strong correlation between BMI and body fat percentage, with correlation coefficients of 0.73 in males and 0.70 in females. The study used the skin-fold method to determine body fat percentage and concluded that the correlation between BMI and body fat percentage varied and was influenced by gender and age.[25]

Additionally, Ode et al.reported a significant correlation between BMI and body fat percentage in both athlete and non-athlete student groups. The non-athlete respondents exhibited a stronger correlation ($r = 0.70$) compared to athlete respondents ($r = 0.65$). Furthermore, female students had a more significant correlation than male students.[26]

Conversely Meeuwsen et al. found a weaker correlation in individuals with a BMI below 27 kg/m2, and this correlation was influenced by the age of the subjects. Despite the valuable insights gained from this study, there are several limitations to consider. Firstly, many respondents were measured shortly after eating, which may

have affected the study results. Ideally, respondents should have been fasting for at least 3 hours prior to the measurements. Furthermore, the study did not consider factors such as eating style, socioeconomic status, and various physical activities that could influence the subjects' body composition and the resulting data.[27]

The findings are consistent with previous research, indicating the influence of factors such as gender, age, race, and lifestyle on this correlation. However, it is important to acknowledge the limitations of the study and consider additional factors that may affect body composition.

Conclusion

CHAPTER 7

CONCLUSION

The findings of this study show a moderately positive connection between men and women for the analysed variable. Males and females have different correlations in terms of their strength and significance; males have a stronger and more significant connection than females. According to the study's findings, there may be substantial gender-related differences in the association between the variables being studied. It is important to remember that further research is necessary to comprehend the underlying factors causing these gender-related variations. Overall, this study clarifies how men and women interact and can serve as a model for future research aimed at revealing the complex relationship between gender and the factors under study.

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CHAPTER 9

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ANNEXURE I(A)

INFORMED CONSENT FORM

1. I **TABASSUM SIDDIQUI** MSC third year student medical physiology IIMS&R Lucknow.
2. I am not associated with your treating doctor panel.
3. There will be no charges /fees/any consideration given or taken for the study.
4. Your identity will be confidential and information and result of your history examination will not be revealed to any other except you if u desire.
5. The study has nothing to do with your treatment and is not going to hamper if you refuse to participate.
6. The study has nothing to do with your current treatment but may improve the knowledge and understanding of disease process and that knowledge may or not be helpful in future.
7. After knowing the all above detail would you like to participate in our study? Yes/ No

Name of the patient Signature of the Research Scholar:

Signature:

CONSENT FORM

I…….aged…….W/O,D/O,S/O……..……
…….R/O……..…here with state that I have been duly informed about the study titled **"TO STUDY THE RELATIONSHIP BETWEEN BODY MASS INDEX AND PERCENT BODY FAT IN YOUNG ADULTS"** its prospects and consequences. I hereby give informed and written consent for the collection of Height/weight and Body fat for the above said study only.

Signature/thumb impression of the patient:

Signature/thumb impression of the witness: Signature of research scholar:

अनुलग्नक I (ए)

सूचित सहमति फॉर्म

1. मैं तबस्सुम सिद्दीकी एमएससी थर्ड ईयर स्टूडेंट मेडिकल फिजियोलॉजी आईआईएमएस आर लखनऊ।

2. मैं आपके ट्रीटिंग डॉक्टर पैनल से जुड़ा नहीं हूं।

3. अध्ययन के लिए कोई शुल्क /शुल्क /दिया गया या दिया गया कोई विचार नहीं होगा।

4. आपकी पहचान गोपनीय होगी और जानकारी और आपके इतिहास की परीक्षा का परिणाम किसी अन्य के अलावा आपके लिए नहीं होगा यदि आप चाहते हैं।

5. अध्ययन का आपके उपचार से कोई लेना -देना नहीं है और यदि आप भाग लेने से इनकार करते हैं तो आप बाधा नहीं डालेंगे।

6. अध्ययन का आपके वर्तमान उपचार से कोई लेना -देना नहीं है, लेकिन रोग प्रक्रिया के ज्ञान और समझ में सुधार हो सकता है और यह ज्ञान भविष्य में सहायक हो सकता है या नहीं।

7. उपरोक्त सभी विस्तार को जानने के बाद क्या आप हमारे अध्ययन में भाग लेना चाहेंगे? हां नहीं

रोगी का नाम: अनुसंधान विद्वान का हस्ताक्षर

हस्ताक्षर:

सहमति पत्र

मैं..... आयु .....

पुत्री/पुत्र/पत्नी.....पता.....

.....। यहाँ राज्य के साथ कि मुझे "" युवा वयस्कों में बॉडी मास इंडेक्स और प्रतिशत बॉडी फैट के बीच संबंधों का अध्ययन करने के लिए शीर्षक से अध्ययन के बारे में विधिवत जानकारी दी गई है। , इसकी संभावनाएं और परिणाम। मैंने अनुसंधान कार्य के विवरण को बहु तअच्छी तरह से जाना है और मैं उसी के लिए अपनी सहमति देता हूं।

रोगी के हस्ताक्षर/अंगूठे की छाप: गवाह के हस्ताक्षर/अंगूठे की छाप:

अनुसंधान विद्वान के हस्ताक्षर:

INSTITUTIONAL ETHICS COMMITTEE (IEC)

IIMS&R INTEGRAL UNIVERSITY, LUCKNOW

IEC/IIMS&R/2023/13

CERTIFICATE

This is to certify that research work entitled **"To Study the Relationship Between Body Mass Index and Percentage Body Fat in Young Adults"** submitted by **Tabassum Siddiqui** for ethical approval before the Institutional Ethics Committee IIMS&R. The above mentioned research work has been approved by Institutional Ethics Committee, IIMS&R with consensus in the meeting held on **30th December 2022.**

Dr.Q.S.Ahmed
(Member Secretary)
IRC/IEC
IIMS &R

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INTRODUCTION There have been numerous health issues for a very long time, both domestically and internationally, one of which is brought on by lifestyle disorders like being overweight or obese, which is indicated by a bloated stomach and the presence of body fat. Excessive nutrition intake is the primary cause of the typical body obesity incidence. Additionally, cardiovascular disease and cancer deaths are correlated with obesity, particularly abdominal fat. [1] Obesity effect more than 850 million people (i.e.,10% of men and 14% of women) worldwide is a crucial risk factor for many serious health condition- including type II diabetes, cardiovascular disease, hypertension, sleep apnea and cancer and is thought to be one of the greatest contributors to preventable death India. Studies of childhood, teenage, and adult obesity have also provided consistent evidence that higher body mass index is related with a variety of cognitive deficits and may even lead to early-onset dementia.

However, despite the myriad of obesity-related physical and psychological health concerns, most overweight individual struggle to initiate and maintain behaviors that would reduce adiposity and improve their overall health. [2] Obesity prevalence has increased over the past few decades and is now a significant worldwide health risk. The measuring of excess body fat, which is linked to a higher risk of metabolic disease, is crucial for the implementation of both therapeutic and preventive health treatments.

The BMI is utilized equally for all sexes and adults of all ages, making it the most practical population-level indicator of overweight and obesity, according to the World Health Organization (WHO). [3] Obesity is a multifaceted and chronic condition, clinically defined as the accumulation of extra body fat to the ex-tent that it may have adverse effects on fitness. [4] Obesity has long been associated with increased risks of mortality, cardiovascular diseases, diabetes, and cancer, and is connected with significant health

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PROFARMA

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GENDER: …….

AGE: ……..

OPD\IPD\ENROLMENT NO: …….

MOBILE NO: ……..

ADDRESS: …….

BODY MASS INDEX

HEIGHT: ……..

WEIGHT: …….

BMI FORMULA: Weight(kg)\height^2 (m^2)

RESULT: …….

PERCENT OF BODY FAT

MESEARMENT OF

BICEPS: ……..

TRICEPS: …….

SUBSCAPULAR: ……..

SUPRA-ILIAC REGION: …….

FORMULA OF BODY FAT: ……..

RESULT: ……..