

# **COMPARATIVE STUDY ON THE PERCENTAGE DISTRIBUTION OF OBESITY AND OVERWEIGHT AMONG MALE AND FEMALE COLLEGE STUDENTS**

Submitted in partial fulfillment of the requirements for the award of Bachelor of Science degree in Clinical Nutrition and Dietetics

by

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**DEPARTMENT OF CLINICAL NUTRITION AND  
DIETETICS**

**SCHOOL OF ALLIED HEALTH SCIENCES**

## **SATHYABAMA**

**INSTITUTE OF SCIENCE AND TECHNOLOGY  
(DEEMED TO BE UNIVERSITY)**

**Accredited with Grade "A" by NAAC**

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**MAY - 2023**



# SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY

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## DEPARTMENT OF CLINICAL NUTRITION AND DIETETICS BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of Mahalakshmi.D (40736005) who carried out the project entitled "COMPARATIVE STUDY ON THE PERCENTAGE DISTRIBUTION OF OBESITY AND OVERWEIGHT AMONG MALE AND FEMALE COLLEGE STUDENTS" under my/our supervision from June 2022 to May 2023

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## DECLARATION

6

I Mahalakshmi.D (4073005) hereby declare that the Project Report entitled "COMPARATIVE STUDY ON THE PERCENTAGE DISTRIBUTION OF OBESITY AND OVERWEIGHT AMONG MALE AND FEMALE COLLEGE STUDENTS" done by me under the guidance of Dr J. Premkumar at Sathyabama Institute of Science and Technology is submitted in partial fulfillment of the requirements for the award of Bachelor of Science degree in Clinical Nutrition and Dietetics.

DATE: 12.05.2023

PLACE: Chennai

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## **ABSTRACT**

A study was carried out to determine the percentage distribution of overweight and obesity among male and female college students. This cross-sectional study was conducted at Sathyabama Institute of Science and Technology, Chennai. During this study, the height and weight of 234 students (119 males and 119 females) under the age group of 18-24 were collected using a stadiometer and digital weighing scale to calculate the Body Mass Index and categorise them according to the body mass index chart by WHO (2022).. The percentage distribution of overweight and obesity between male and female in the age group of 18-22 was similar. The result of this study suggests that boys are more prone and susceptible to overweight and obesity. Which is in fact contradicting the previous studies that were reviewed. In boys 10.9% were underweight, 55.4% were normal, 24.3% were overweight or pre-obese, 8.4% were under obesity grade 1, 0.8% were under obesity grade 2. In girls 14.2% were underweight, 52.1% were normal, 26.9% were overweight or preobese, 6.7% were obesity grade 1. This results show that girls are more prone to underweight in our college whereas percentage of boys normally weighing was also more.

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## **1. INTRODUCTION:**

Adolescence is treated as a transition period from childhood to adulthood. During this transitional phase, adolescents develop behavioral patterns and make lifestyles that can also affect their present health and future. Obesity is a disease of an unhealthy or unnecessary accumulation of fat in adipose tissue to such a degree as to affect an individual's health. About 1.2 billion adults worldwide, one of every five people in the world is a teenager and about 18% of the world's population are teenagers. Around 90% of the world's population lives in developing countries and only around 20% of adolescents belong to India. More than 1 billion people worldwide are obese – 650 million adults, 340 million adolescents, and 39 million children. This number is still increasing. WHO estimates that by 2025, approximately 167 million people – adults and children – will become less healthy because they are overweight or obese.

Obesity is a disease impacting most body systems. It affects the heart, liver, kidneys, joints, and reproductive system. It leads to a range of non-communicable diseases (NCDs), such as type 2 diabetes, cardiovascular disease, hypertension, stroke, and various forms of cancer, as well as being more likely to be hospitalized for COVID-19 and mental health issues.

WHO is responding to the global obesity crisis on many fronts. This includes monitoring global trends and prevalence, developing a broad range of guidance addressing the prevention and treatment of overweight and obesity, and providing implementation support and guidance for countries. (WHO,2022)

In Tamilnadu, the percentage of obesity among males is 28.2% and in females, it is 30.9%.

According to NFHS 2015-16 the list of percentage of obesity among different states in India Tamil Nadu is the 9th and 11th highest rank respectively in India.

BMI is a useful measure of overweight and obesity. It is calculated from your height and weight. BMI is an estimate of body fat and a good gauge of your risk for diseases that can occur with more body fat. The higher your BMI, the higher your risk for certain conditions such as heart disease, high blood pressure, type 2 diabetes, gallstones, breathing problems, and certain cancers.

Although BMI can be used for most men and women, it does have some limits:

- It may overestimate body fat in athletes and others who have a muscular build.
- It may underestimate body fat in older persons and others who have lost muscle.

For people who are considered obese (BMI greater than or equal to 30) or those who are overweight (BMI of 25 to 29.9) and have two or more risk factors, it is recommended that you lose weight. Even a small weight loss (between 5 and 10 percent of your current weight) will help lower your risk of developing diseases associated with obesity. People who are overweight, do not have a high waist measurement, and have fewer than two risk factors may need to prevent further weight gain rather than lose weight.

Talk to your doctor to see whether you are at an increased risk and whether you should lose weight. Your doctor will evaluate your BMI, waist measurement, and other risk factors for heart disease.

Body mass index (BMI) has been found to be associated with a decreased risk of non-small cell lung cancer (NSCLC); however, the effect of BMI trajectories and potential interactions with genetic variants on NSCLC risk remains unknown.

An MR study using BMI trajectory associated with genetic variants revealed no significant association between BMI trajectories and NSCLC risk. (You Defang,2022)

The body mass index (BMI) is the metric currently in use for defining anthropometric height/weight characteristics in adults and for classifying (categorizing) them into groups. The common interpretation is that it represents an index of an individual's fatness. It also is widely used as a risk factor for the development of or the prevalence of several health issues. In addition, it is widely used in determining public health policies.

The BMI has been useful in population-based studies by virtue of its wide acceptance in defining specific categories of body mass as a health issue.

However, it is increasingly clear that BMI is a rather poor indicator of the percent of body fat. Importantly, the BMI also does not capture information on the mass of fat in different body sites. The latter is related not only to untoward health issues but to social issues as well (Nuttall Q, 2015).

The prevalence of childhood obesity, as assessed by BMI ( $\text{kg/m}^2$ ), has tripled over the last 3 decades, this index is a measure of excess weight rather than excess body fatness. In this review, we focus on the relation of BMI to body fatness and health risks, particularly on the ability of BMI for age  $\geq$  95th Centers for Disease Control and Prevention [CDC] percentile to identify children with excess body fatness. We also examine whether these associations differ according to race/ethnicity and whether skinfold and circumference measurements provide additional information on body fatness or health risks. (Freedman, 2009)

An estimation of fat mass obtained, for instance, with skinfolds is always suggested in addition to the measure of weight and height. It is possible to define a child as obese by calculating the ratio between weight (kg) and height squared (m). This ratio is an index, called body mass index (BMI), which is strictly associated with the level of adiposity in children, reproducible and valid. The BMI was recently proposed as the reference index for the diagnosis of childhood obesity at the international level. The use of the percentiles of BMI may offer useful information on the changes in weight excess, simplifying the follow-up of the patient and the sensitivity to treatment. The cut-off limits of BMI to define overweight or obesity are still debated. However, in agreement with Cole et al., the choice to use the BMI cut-off centiles passing through the adult BMI cut-off of 30, is reasonable. However, it is always preferable to use population-specific BMI reference tables. (Luciano. L, 2003)

The continuously increasing prevalence of childhood obesity is reaching epidemic proportions. Greece is among the countries with the highest childhood obesity prevalence rates. The present study aims to identify psychosocial factors associated with excess body weight in adolescents. Psychological problems, maternal occupation, the absence

of physical activity, and poor school performance were associated with adolescent overweight/obesity. It is important that screening for the presence of psychosocial issues is included in childhood obesity policies and treatment. (K Andrie,2021)

There is evidence that overweight and obese children tend to remain overweight or obese into adolescence and adulthood. However, little is known about the long-term psychosocial outcomes of childhood overweight and obesity. Overweight and obese children reported greater psychosocial distress than healthy-weight children, and these differences were more pronounced for girls than boys. Weight and psychosocial impairment showed stability from baseline to 2-year follow-up.(Gibson,2017)

Australia is predicted to have the highest overweight/obesity rate in the world by 2022 outranking the USA and UK. Evidence suggests that overweight/obese Australian children and adolescents, compared to normal-weight peers, had more cardio-metabolic risk factors and higher risk factors of non-alcoholic fatty liver disease and were experiencing more negative psychological outcomes (depression, low self-esteem and lower scores of health-related quality of life). Many other health consequences have either not been investigated in Australia, or as frequently as in other countries. Trend analyses have shown that obesity prevalence in Australia is increasing and will outrank the UK and the USA by 2022. • Every third Australian child/adolescent between 5 and 19 years old is predicted to be classified as overweight or obese by 2025. • Childhood obesity is associated with multiple immediate physical and psychological health co-morbidities and co-morbidities in adulthood. These have often been identified and examined individually (Sanders. H,2015).

There was a strong positive association between high childhood BMI and adult obesity [odds ratio 5.21, 95% confidence interval (CI) 4.50 to 6.02]. A positive association was found between high childhood BMI and adult coronary heart disease, diabetes, and a range of cancers, but not stroke or breast cancer. The predictive accuracy of childhood BMI to predict any adult morbidity was very low, with most morbidities occurring in adults who were of healthy weight in childhood. The predictive accuracy of childhood obesity was moderate for predicting adult obesity, with a sensitivity of 30% and a specificity of 98%. Obese children and adolescents were around five times more likely to be obese in

adulthood than those who were not obese. Around 55% of obese children go on to be obese in adolescence, around 80% of obese adolescents will still be obese in adulthood and around 70% will be obese over age 30.

Therefore, action to reduce and prevent obesity in these adolescents is needed. However, 70% of obese adults were not obese in childhood or adolescence, so targeting obesity reduction solely at obese or overweight children needs to be considered carefully as this may not substantially reduce the overall burden of adult obesity.(Simmonds M,2015).

High childhood BMI was associated with an increased incidence of adult diabetes (OR 1.70; 95% CI 1.30-2.22), coronary heart disease (CHD) (OR 1.20; 95% CI 1.10-1.31), and a range of cancers, but not stroke or breast cancer. The accuracy of childhood BMI when predicting any adult morbidity was low. Only 31% of future diabetes and 22% of future hypertension and CHD occurred in children aged 12 or over classified as being overweight or obese. Only 20% of all adult cancers occurred in children classified as being overweight or obese. Childhood obesity is associated with moderately increased risks of adult obesity-related morbidity, but the increase in risk is not large enough for childhood BMI to be a good predictor of the incidence of adult morbidities. This is because the majority of adult obesity-related morbidity occurs in adults who were of healthy weight in childhood. Therefore, targeting obesity reduction solely at obese or overweight children may not substantially reduce the overall burden of obesity-related disease in adulthood (Llewellyn A 2016). Therefore by proceeding with this study I would like to understand in depth the relationship between obesity and gender and which gender is more prone to obesity and why during late adolescence and early adulthood. Recent studies suggest that men are more susceptible to obesity in adolescence. In this study, I will be comparing the male and females to conclude the percentage of obesity prevalence using the anthropometric measurement (body mass index).

There are many risk factors for overweight and obesity. Some are individual factors like knowledge, skills, and behaviors. Others are in your environment, such as school, workplace, and neighborhood. Additionally, food industry practices and marketing as well as social and cultural norms and values can also impact your risk.

Lack of physical activity, combined with high amounts of TV, computer, video game, or other screen time has been associated with a high body mass index (BMI).

Most adults need at least 150 minutes of aerobic activity a week. It is also recommended that adults do muscle-strengthening activities for major muscle groups on 2 or more days each week, as these activities give additional health benefits. Children should get 60 minutes of aerobic activity each day. Type 2 diabetes occurs when your blood sugar is higher than normal. Over time, this can lead to other health issues, like heart disease, nerve damage, stroke, kidney disease, and vision problems. Heart disease is more prevalent in people with obesity. Over time, fatty deposits may accumulate in the arteries that supply the heart with blood. People with obesity have higher than normal blood pressure, low-density lipoprotein (LDL) cholesterol, triglycerides, and blood sugar, all of which contribute to heart disease. Arteries that become narrow can lead to a heart attack. Blood clots in narrow arteries can result in a stroke. Stroke and heart disease share many of the same risk factors. Strokes occur when the blood supply to the brain is cut off. A stroke can cause damage to brain tissue and result in a range of disabilities, including speech and language impairment, weakened muscles, and changes to thinking and reasoning skills. Sleep apnea is a disorder in which someone may momentarily stop breathing during sleep. People who are overweight and living with obesity are at a higher risk of having sleep apnea. This is because they tend to have more fat stored around the neck, making the airway shrink. A smaller airway can cause snoring and difficulty breathing at night. Extra fat tissue in the body requires more oxygen and nutrients. Your blood vessels will need to circulate more blood to the extra fat tissue. This means your heart must work even harder to pump blood around the body. The increase in the amount of blood circulating puts extra pressure on the walls of your arteries. This added pressure is called high blood pressure, or hypertension. Over time, high blood pressure can damage your heart and arteries. People with obesity can develop a liver disease known as fatty liver disease or nonalcoholic steatohepatitis (NASH). This happens when excess fat builds up in the liver. The excess fat can damage the liver or cause scar tissue to grow, known as cirrhosis. Fatty liver disease usually has no symptoms, but it can eventually lead to liver failure. The only way to reverse or manage the disease is to lose weight, exercise, and avoid drinking alcohol.

The gallbladder is responsible for storing a substance known as bile and passing it to the small intestine during digestion. Bile helps you digest fats. Obesity increases your risk of developing gallstones. Gallstones occur when bile builds up and hardens in the gallbladder. People with obesity may have higher levels of cholesterol in their bile, or have large gallbladders that don't work well, which can lead to gallstones. Gallstones can be painful and require surgery. Eating a diet high in fiber and healthy fats may help prevent gallstones. Avoiding refined grains like white rice, bread, and pasta can also help.

Because cancer isn't a single disease, the association between obesity and cancer isn't as clear as other diseases like heart disease and stroke. Still, obesity can increase your risk for certain cancers, including breast, colon, gallbladder, pancreatic, kidney, and prostate cancer, as well as cancer of the uterus, cervix, endometrium, and ovaries. Pregnant women who are overweight or have obesity are more likely to develop insulin resistance, high blood sugar, and high blood pressure. Many people affected by obesity experience depression. Some studies have found a strong correlation between obesity and major depressive disorder. People affected by obesity may often experience discrimination based on their body size. Over time, this can lead to feelings of sadness or lack of self-worth.

Today, many advocacy groups, such as the National Association to Advance Fat Acceptance (NAAFA), are working to eliminate discrimination based on body size. These organizations provide opportunities to get involved in fighting against this discrimination. If you have obesity and are experiencing symptoms of depression, ask your doctor for a referral to a mental health counselor. Obesity can impact both your physical health and your mental health. You may be unsure of where to begin, but taking steps now to manage your health can prevent you from complications like type 2 diabetes and high blood pressure. Talk to your doctor about exercising more, eating a healthier diet, seeing a therapist, and other treatment methods. Globally, obesity is affecting an increasing proportion of children. Physical activity plays an important role in the prevention of becoming overweight and obese in childhood and adolescence, and reducing the risk of obesity in adulthood. Puberty and the following adolescent period are acknowledged as

particularly vulnerable times for the development of obesity due to sexual maturation and, in many individuals, a concomitant reduction in physical activity. In many Western settings, a large proportion of children and adolescents do not meet recommended physical activity guidelines and, typically, those who are more physically active have lower levels of body fat than those who are less active. Active behaviours have been displaced by more sedentary pursuits which have contributed to reductions in physical activity energy expenditure. Without appropriate activity engagement there is an increased likelihood that children will live less healthy lives than their parents. Owing to the high risk of overweight adolescents becoming obese adults, the engagement of children and adolescents in physical activity and sport is a fundamental goal of obesity prevention. Obesity is a highly prevalent comorbidity in severe cases of COVID-19 in children and adolescents; social isolation may lead to increase fat accumulation. Excessive adipose tissue, deficit in lean mass, insulin resistance, dyslipidemia, hypertension, high levels of proinflammatory cytokines, and low intake of essential nutrients are factors that compromise the functioning of organs and systems in obese individuals. These factors are associated with damage to immune, cardiovascular, respiratory, and urinary systems, along with modification of the intestinal microbiota (dysbiosis). In severe acute respiratory syndrome coronavirus 2 infection, these organic changes from obesity may increase the need for ventilatory assistance, risk of thromboembolism, reduced glomerular filtration rate, changes in the innate and adaptive immune response, and perpetuation of the chronic inflammatory response. The need for social isolation can have the effect of causing or worsening obesity and its comorbidities, and pediatricians need to be aware of this issue.

Facing children with suspected or confirmed COVID-19, health professionals should

- 1) diagnose excess weight;
- 2) advise on health care in times of isolation;
- 3) screen for comorbidities, ensuring that treatment is not interrupted;

- 4) measure levels of immunonutrients;
- 5) guide the family in understanding the specifics of the situation; and
- 6) refer to units qualified to care for obese children and adolescents when necessary.

Obesity is associated with many adverse maternal and fetal effects prenatally, but it also exerts a negative influence on female fertility. Obese women are more likely to have ovulatory dysfunction due to dysregulation of the hypothalamic-pituitary-ovarian axis. Women with polycystic ovarian syndrome who are also obese demonstrate a more severe metabolic and reproductive phenotype. Obese women have reduced fecundity even when eumenorrheic and demonstrate poorer outcomes with the use of in vitro fertilization. Obesity appears to affect the oocyte and the preimplantation embryo, with disrupted meiotic spindle formation and mitochondrial dynamics. Excess free fatty acids may have a toxic effect in reproductive tissues, leading to cellular damage and a chronic low-grade inflammatory state. Altered levels of adipokines, such as leptin, in the obese state can affect steroidogenesis and directly affect the developing embryo. The endometrium is also susceptible, with evidence of impaired stromal decidualization in obese women. This may explain subfecundity due to impaired receptivity, and may lead to placental abnormalities as manifested by higher rates of miscarriage, stillbirth, and preeclampsia in the obese population. Many interventions have been explored to mitigate the effect of obesity on infertility, including weight loss, physical activity, dietary factors, and bariatric surgery.

Not all children carrying extra pounds are overweight. Some children have larger than average body frames. And children normally carry different amounts of body fat at the various stages of development. So you might not know by how your child looks if weight is a health concern.

The body mass index (BMI), which provides a guideline of weight in relation to height, is the accepted measure of overweight and obesity. Your child's doctor can use growth charts, the BMI and, if necessary, other tests to help you figure out if your child's weight could pose health problems.

Physical complications of adolescent obesity may include:

- **Type 2 diabetes.** This chronic condition affects the way your child's body uses sugar (glucose). Obesity and a sedentary lifestyle increase the risk of type 2 diabetes.
- **High cholesterol and high blood pressure.** A poor diet can cause your child to develop one or both of these conditions. These factors can contribute to the buildup of plaques in the arteries, which can cause arteries to narrow and harden, possibly leading to a heart attack or stroke later in life.
- **Joint pain.** Extra weight causes extra stress on hips and knees. Childhood obesity can cause pain and sometimes injuries in the hips, knees and back.
- **Breathing problems.** Asthma is more common in children who are overweight. These children are also more likely to develop obstructive sleep apnea, a potentially serious disorder in which a child's breathing repeatedly stops and starts during sleep.
- **Nonalcoholic fatty liver disease (NAFLD).** This disorder, which usually causes no symptoms, causes fatty deposits to build up in the liver. NAFLD can lead to scarring and liver damage.

To help prevent excess weight gain in your child, you can:

- **Set a good example.** Make healthy eating and regular physical activity a family affair. Everyone will benefit and no one will feel singled out.
- **Have healthy snacks available.** Options include air-popped popcorn without butter, fruits with low-fat yogurt, baby carrots with hummus, or whole-grain cereal with low-fat milk.

- **Offer new foods multiple times.** Don't be discouraged if your child doesn't immediately like a new food. It usually takes multiple exposures to a food to gain acceptance.
- **Choose nonfood rewards.** Promising candy for good behavior is a bad idea.
- **Be sure your child gets enough sleep.** Some studies indicate that too little sleep may increase the risk of obesity. Sleep deprivation can cause hormonal imbalances that lead to increased appetite.

Also, be sure your child sees the doctor for well-child checkups at least once a year. During this visit, the doctor measures your child's height and weight and calculates his or her BMI. A significant increase in your child's BMI percentile rank over one year may be a possible sign that your child is at risk of becoming overweight.

## 2. REVIEW OF LITERATURE

Christina Carla (2010) proved that The major factors that tends to cause obesity in adolescents are increased sugar consumption , processed foods , and inadequate consumption of nutritious diet.

Antonio Nicolucci (2011) stated that Obesity in adolescence shows significant comorbidities such as cardio-metabolic comorbidities and biochemical alterations, including hypertension, dyslipidemia, dysglycemia and hyperinsulinemia, hyperuricemia, MAFLD, and increased risk for Polycystic Ovary Syndrome (PCOS) in girls.

Ilaria Brambilla et al.(2022) proposed that obesity can be a causative factor for risk of hospitalization , intensive care admission , need for mechanical ventilation in COVID 19 patients

Munim Mannan et al.(2016) proved that Depression caused due to obesity is proven to higher in adolescent girls than in adolescent boys .

Al-Ghabban (2018) found that the prevalence of overweight and obesity among male students compared to female students was 27.4% vs 18.9% respectively among the students from a University in Kerala, while the prevalence of underweight and obesity were not significantly different from 5.6% vs 5.3% respectively.

Premalal,et.al ( 2016 ) reported that the incidence of overweight and obesity among the student population of a college in Kancheepuram town, Tamil Nadu to be 11.7% and 21.5% (females vs males) and 20.6% of the population was underweight and males were found to be more prone to overweight and obesity.

Pelletier . E (2022) Higher stress was associated with higher prevalence of overweight/obesity (crude prevalence ratio [PR] = 1.05; 95% confidence interval [CI: 1.01, 1.09]), though the relationship was no longer statistically significant after controlling for a wide range of weight-related health risk behaviors (adjusted PR = 1.04; 95% CI [1.00, 1.08]). Stress levels were significantly associated with meal skipping and being a current smoker.

Seema .S (2021) showed adolescent of 16 years of age has 3.2 times more chances, male gender has 0.41 times more chances, belongs to class III socioeconomic status has 4.56 times more chances and having nuclear family has 1.17 times more chance for abnormal BMI, that is, overweight and obesity. Odds Ratio also showed adolescent who were non-vegetarian has 0.77 times more chances, regularly taking junk food has 0.52 times more chances, eating food in front of TV has 0.67 times more chances and who were using chocolate regularly has 0.74 times more chances for having abnormal BMI. Adolescent who are using public/private mode of transportation to school has 0.48 times more chances, who were not participating in sports has 0.35 times more chance, who were doing sometime physical exercise has 0.25 times more chance and who were watching TV more than 2 h has 0.84 times more chances for having overweight/obese.

Sarah. H (2020) suggested that Changing the way you approach weight loss can help you be more successful at weight management. Most people who are trying to lose weight focus on just the goal of weight loss. However, setting the right goals and focusing on lifestyle changes such as following a healthy eating plan, watching portion sizes, being physically active, and reducing sedentary time are much more effective.

WHO ( 2022) The key to preventing obesity is to act early, ideally even before a baby is conceived. Good nutrition in pregnancy, followed by exclusive breastfeeding until the age of 6 months and continued breastfeeding until 2 years and beyond, is best for all infants and young children.

Freedman.S et.al, (2022) mentioned that the accuracy of BMI varies according to the degree of body fatness. Among relatively fat children, BMI is a good indicator of excess adiposity, but differences in the BMIs of relatively thin children can be largely due to fat-free mass. Although the accuracy of BMI in identifying children with excess body fatness depends on the chosen cut points, we have found that a high BMI-for-age has a moderately high sensitivity and positive predictive value, along with a high specificity . Children with a high BMI are much more likely to have adverse risk factor levels and to become obese adults than are thinner children.

### **3. METHODOLOGY**

The data was collected from 234 participants , 119 girls and 119 boys at Sathyabama Institute of Science and Technology .The sample size was obtained from a software called raosoft with a population size of seven thousand . The following data was collected

- Name
- Age
- Gender
- Department
- Height in meters
- Weight in kilograms
- Body mass index

The data was then assessed and calculated. To obtain the body mass index and classify if they are overweight , obese,normal or underweight.according to the classification table announced by the world organization.

The following departments participated in this study from the college:

- Bsc.Clinical nutrition and dietetics

- Bsc. Medical lab technology
- B.tech Biotechnology
- Bsc. Microbiology
- B.E CSC

Anthropometric measurements are noninvasive quantitative measurements of the body. According to the Centers for Disease Control and Prevention (CDC), anthropometry provides a valuable assessment of nutritional status in children and adults. Typically they are used in the pediatric population to evaluate the general health status, nutritional adequacy, and the growth and developmental pattern of the child. Growth measurements and normal growth patterns are the gold standards by which clinicians assess the health and well-being of a child. In adults, body measurements can help to assess health and dietary status and future disease risk. These measurements can also be used to determine body composition in adults to help determine underlying nutritional status and diagnose obesity.

The core elements of anthropometry are height, weight, head circumference, body mass index (BMI), body circumferences to assess for adiposity (waist, hip, and limbs), and skinfold thickness. Anthropometric measurements are noninvasive and, as such, do not have any contraindications for their use. There are situations in which the measurements might give inaccurate results (such as acute illness) or be impossible to measure (such as a limb deformity or casting). Using anthropometric measurement in such situations can give falsely reassuring or alarming data and should be avoided.

Evaluation of body composition is an important part of assessing nutritional status and provides prognostically useful data and an opportunity to monitor the effects of nutrition-related disease progression and nutritional intervention. The aim of this narrative review is to critically evaluate body composition methodology in adults, focusing on anthropometric variables. The variables considered include height, weight, body mass index and alternative indices, trunk measurements (waist and hip circumferences and sagittal abdominal diameter) and limb measurements (mid-upper arm and calf circumferences) and skinfold thickness. The importance of adhering to a defined measurement protocol, checking measurement error and the need to interpret checking

measurement error and the need to interpret measurements using appropriate population-specific cut-off values to identify health risks were highlighted. Selecting the optimum method for assessing body composition using anthropometry depends on the purpose (i.e. evaluating obesity or undernutrition) and requires practitioners to have a good understanding of both practical and theoretical limitations and to be able to interpret the results wisely. These measurements provide indicators of fat tissue content or body composition and evaluate trends in nutritional status. Anthropometric measurements in the elderly are similar to these in other groups of population but they have to be adopted according to changes in constitution and posture of elderly and disabled people. Understanding normal changes in the body's composition with old age and their health and nutritional implications is important in determining the nutritional status of the elderly. Suitable reference data for anthropometry and body composition obtained from large representative samples of black, white, Hispanic, and Asian elderly persons are needed to improve their nutritional health and care. Distribution statistics for body measurements of persons 65 to 80 years of age are available from national health and nutrition surveys, but for persons older than 80 years, there is little information. Recumbent anthropometric techniques have been developed that are applicable. Underwater weighing continues to be a gold standard for determining body composition in the elderly, but a four-compartment model would improve estimates of body composition in the elderly because of changes in the density of the fat-free mass with old age. Noninvasive methods such as anthropometry and bioelectric impedance could be used to predict body composition if they were validated against direct methods and if appropriate equations become available. There are a variety of anthropometric assessments that can be used to study the range of body sizes and body types found within human populations. Some of the anthropometric characteristics commonly studied by researchers include height, weight, percent body fat, cranial circumference, and limb length. As mentioned earlier, these measurements can be obtained relatively easily, without having to use invasive procedures that could cause pain or discomfort to the individual.

Reliable and reproducible measurements are required to obtain meaningful data from anthropometric measurements. As such, clinicians should ensure the use of well-calibrated, quality equipment that is checked regularly for accuracy. For this project the following anthropometric equipments were used:

- 1) Stadiometer
- 2) Digital weighing scale

### **3.1 STADIOMETER:**

A stadiometer is a piece of medical equipment used for measuring human height. It is usually constructed out of a ruler and a sliding horizontal headpiece which is adjusted to rest on the top of the head. Stadiometers are used in routine medical examinations and also clinical tests and experiments. The person was asked to stand up straight, with buttocks, shoulder blades, and heels together touching the back of the stadiometer. The feet faced outward at a 60-degree angle. Arms was asked to be loosely hanging at the sides with palms facing the thighs. The horizontal bar of the stadiometer should be lowered until the hair is compressed to the crown of the head. Removed any objects on the head and hair that may obstruct the bar from compressing the hair to the crown of the head.

How to measure :

Remove shoes, hats and bulky clothing such as coats and sweaters

Undo hair styles and remove hair accessories that may interfere with measurement .

Ask the child to stand against the stadiometer with heels together, legs straight, arms at sides and shoulders relaxed

Bring the headpiece down to touch the crown of the head with enough pressure to compress the hair

- Measurer's eyes should be parallel with the headpiece to read the measurement

Head, shoulders, buttocks, and heels touching vertical surface

- Eyes should be looking straight ahead
- Chin not tucked or stretched too far back Measure to the nearest 0.1 cm and record

- If the child cannot stand unassisted, measure recumbent length, subtract 0.7 cm to convert to height

Measurements using a stadiometer are clearly more accurate to use. Especially with the base stadiometer, the measurement is clearly more stable to do. So that the measurement results must be more precise.

### **3.2 WEIGHT :**

The weight of the participant was measured by a digital weighing scale for convenience and was measured twice for accuracy.

There are several types of scales, including digital scales, dial or analog scales, and balance beam scales, like the kind used in many doctor's offices. To weigh yourself using a digital or dial scale, place the scale on a flat surface and step onto it. Then, simply read the numbers to find out how much you weigh. Alternatively, if using a balance beam scale, step on the scale, adjust the weights, and add up the numbers.

**Place your scale on a flat surface.** Choose a flat, hard surface to place your scale, such as a linoleum or hardwood floor. Avoid placing it on uneven or bumpy tiles, rugs, or carpet

**Step onto the scale.** Stand still on the scale with both feet even and flat. Don't touch or hold on to anything, as that will affect the weight displayed by the scale.<sup>[2]</sup>

- If you're using a programmable scale that measures your Body Mass Index (BMI), you need to weigh yourself with bare feet. You should also input your height, age, and gender to get the most accurate reading. Follow the instructions included with the scale to determine how to do this.
- If you're using a balance scale, slide all the weights on the horizontal rail over to the left after you stand on the scale.

**Adjust the sliding weights, if using a balance scale.** Move the large weight on the bottom bar over to the right, one notch at a time. Stop when the arrow on the right end of the balance beam begins to dip downward when it does, move the large weight back one notch.

Then, move the small weight on the top bar over to the right, one notch at a time, until the arrow is as level as possible.

- Moving the weights to the left will cause the arrow to rise, rather than dip.

**Read the number.** A digital scale will tell you exactly how much you weigh in pounds or kilograms, depending on what it is set to. A dial scale will point to a numbered mark, or a space in between two marks, to show you how much you weigh.

- A balance beam scale can be read by adding the top number (from the top bar with the small sliding weight, indicated by an opening or an arrow, such as 7 or 32) with the bottom number (from the bottom bar with the large sliding weight, indicated by an opening or an arrow, such as 50 or 100) when the scale is balanced.

**Step off the scale.** Take care not to jump on or off the platform, as this can damage the scale. Simply step off the scale, slowly, one foot at a time. If you are using a balance beam scale, move the weights all the way back to the leftmost starting position

**Record the number if desired.** If you are tracking your weight, record the number in a journal or on a piece of graph paper. Graphing your weight will help you see overall trends and changes in your weight and also provides a visual aid of your progress.

### **3.3 BODY MASS INDEX :**

In adults, BMI is used to diagnose obesity as it correlates with body fat. However, it does not directly measure body fat and has its limitations when used in isolation. Percent body fat varies with age, gender, and ethnicity. Percent body fat increases with age even if the weight stays the same, making it a less accurate measure of obesity in adults. Also, in athletes, increased muscle mass for a given height and age will increase their BMI, even though they have a very low percentage of total body fat.

**Body mass index (BMI)** is a value derived from the mass (weight) and height of a person. The BMI is defined as the body mass divided by the square of the body height, and is expressed in units of  $\text{kg/m}^2$ , resulting from mass in kilograms and height in meters.

The BMI may be determined using a table or chart which displays BMI as a function of mass and height using contour lines or colours for different BMI categories, and which may use other units of measurement (converted to metric units for the calculation).

The BMI is a convenient rule of thumb used to broadly categorize a person as *underweight*, *normal weight*, *overweight*, or *obese* based on tissue mass (muscle, fat, and bone) and height. Major adult BMI classifications are underweight (under 18.5 kg/m<sup>2</sup>), normal weight (18.5 to 24.9), overweight (25 to 29.9), and obese (30 or more). When used to predict an individual's health, rather than as a statistical measurement for groups, the BMI has limitations that can make it less useful than some of the alternatives, especially when applied to individuals with abdominal obesity, short stature, or unusually high muscle mass.

BMIs under 20 and over 25 have been associated with higher all-cause mortality, with the risk increasing with distance from the 20–25 range

A common use of the BMI is to assess how far an individual's body weight departs from what is normal for a person's height. The weight excess or deficiency may, in part, be accounted for by body fat (adipose tissue) although other factors such as muscularity also affect BMI significantly (see discussion below and overweight).

The WHO regards an adult BMI of less than 18.5 as underweight and possibly indicative of malnutrition, an eating disorder, or other health problems, while a BMI of 25 or more is considered overweight and 30 or more is considered obese. In addition to the principle, international WHO BMI cut-off points (16, 17, 18.5, 25, 30, 35 and 40), four additional cut-off points for at-risk Asians were identified (23, 27.5, 32.5 and 37.5). These ranges of BMI values are valid only as statistical categories.

| <b>BMI</b> | <b>Weight status</b> |
|------------|----------------------|
| Below 18.5 | Underweight          |
| 18.5-24.9  | Normal weight        |
| 25.0-29.9  | Overweight           |
| 30.0-34.9  | Obesity class I      |
| 35.0-39.9  | Obesity class II     |
| Above 40   | Obesity class III    |

(source - WHO 2022)

#### **4. RESULT AND DISCUSSION**

BOYS :

| CLASSIFICATION  | NO.OF PARTICIPANTS | PERCENTAGE |
|-----------------|--------------------|------------|
| UNDERWEIGHT     | 13                 | 10.9       |
| NORMAL WEIGHT   | 66                 | 55.4       |
| OVERWEIGHT      | 29                 | 24.3       |
| OBESITY GRADE 1 | 10                 | 8.4        |
| OBESITY GRADE 2 | 1                  | 0.8        |
| total           | 119                | 100        |

TABLE - 4.1 PERCENTAGE DISTRIBUTION FOR BOYS

## GIRLS :

| CLASSIFICATION  | NO.OF PARTICIPANTS | PERCENTAGE |
|-----------------|--------------------|------------|
| UNDERWEIGHT     | 17                 | 14.2       |
| NORMAL WEIGHT   | 62                 | 52.1       |
| OVERWEIGHT      | 32                 | 26.9       |
| OBESITY GRADE 1 | 8                  | 6.7        |
| OBESITY GRADE 2 | 0                  | -          |
| total           | 119                | 100        |

TABLE - 4.2 PERCENTAGE DISTRIBUTION FOR GIRLS

The result of this study suggests that boys are more prone and susceptible to overweight and obesity. Which is in fact contradicting the previous studies that were reviewed . In boys 10.9% were underweight , 55.4% were normal, 24.3% were overweight or pre-obese, 8.4% were under obesity grade 1 , 0.8% were under obesity grade 2 . In girls 14.2% were underweight , 52.1% were normal , 26.9% were overweight or preobese , 6.7% were obesity grade 1 . This results show that girls are more prone to underweight in our college whereas percentage of boys normally weighing was also more.

## 5. SUMMARY AND CONCLUSION

In this study the following observations were made

- Boys were more prone to obesity with 8.4% under obesity grade 1 , 0.8% under obesity grade 2 .
- Girls were more prone to underweight by 14.2%.
- Majority of the boys were normal weighing .(55.4%).

The following measures is suggested to prevent or overcome overweight and obesity in early adulthood ;

- Good eating habits and physical activity can help prevent obesity. Keep a food diary. Write down what you eat, where you eat, and how you feel before and after you eat.

- Make half your plate and vegetables. Recommended serving sizes vary based on age, sex, height, weight and physical activity levels.
- Choose whole-grain foods. These include brown rice and whole-wheat bread. Don't eat foods made with refined white sugar, flour, high-fructose corn syrup, or saturated fat.
- Weigh and measure food. This is so you can learn healthy portion sizes. For instance, a 3-ounce serving of meat is the size of a deck of cards. Don't order super-sized menu items.
- Learn to read food nutrition labels and use them. Keep the number of portions you are really eating in mind.
- Balance your food checkbook. If you eat more calories than you burn, you will gain weight. Weigh yourself each week.
- Don't eat foods that are high in energy density. This means foods that have a lot of calories in small amounts. For instance, a cheeseburger with fries can have as much as 1,000 calories and 30 or more grams of fat. Order a grilled chicken sandwich or a plain hamburger and a small salad with low-fat dressing instead. You can avoid hundreds of calories and lower your fat intake. For dessert, have a serving of fruit, yogurt, a small piece of angel food cake, or a piece of dark chocolate.
- Reduce portion sizes. Using a smaller plate can help you do this.
- Exercise each week. Aim for at least 150 minutes of medium to intense physical activity per week. For instance, this can be 30 minutes of exercise 5 days a week. Examples of medium-intensity exercise are walking a 15-minute mile. Or weeding and hoeing a garden. Running is a more intense activity.
- Build activity into your day. Look for ways to get 10 or 15 minutes of some type of activity during the day. Walk around the block. Walk up and down a few flights of stairs.

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