



## A Review on Adolescent Obesity and PCOD: Causes, Symptoms and Remedial Measures

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### Abstract

The present era is popularly known as digital era. Physical activity is getting decreased in all over population that develops different life style diseases. Obesity, cardiovascular diseases and diabetes are very common in all sections of people. Children, adolescents are most vulnerable sections who suffer a lot from this menace. Literature survey reveals that adolescent obesity and prevalence of PCOD in adolescents' girls is observed due to food habit, life style and lack of exercise. So, the present investigator is interested to know whether any co-relation exists in obesity and PCOD, food habit and other related diseases. This study will also reveal the relationship between PCOD and adolescent obesity.

**Keywords:** Diabetes, Hypertension. PCOD, Obesity, Adolescents

### Introduction

In the contemporary era, the rise of digitization has resulted in reduced physical activity across the general population, contributing to the emergence of various lifestyle-related ailments such as obesity, cardiovascular diseases, diabetes, and hypertension. Among these ailments, children and adolescents are particularly vulnerable and suffer significantly from this issue.

Obesity is a condition characterized by the accumulation of excessive body fat to a degree that has adverse effects on one's health, potentially leading to a reduced lifespan and increased health complications. Typically, individuals are considered within a healthy range when their Body Mass Index (BMI) is less than 25, while a BMI of 25 or higher is indicative of being overweight. BMI is calculated by dividing a person's weight in kilograms by the square of their height in meters. This method is cost-effective and straightforward, serving as a screening tool to identify weight categories that may pose health risks [1]. In the case of children and teenagers, BMI is tailored to their age and sex, often referred to as BMI-for-age, ensuring age-specific and gender-specific assessments.

Literature survey reveals that adolescent obesity and prevalence of PCOD in adolescents' girls is observed due to food habit, life style and lack of exercise along with various socio-economic

factors. Adolescent is referred as the transition between childhoods to adulthoods. Now-a-days adolescent girls become obese because of eating fast food and lack of exercise in their daily routine. PCOD is the most common hormonal abnormality in Adolescent girl affecting 7% of this population. The reproductive features of PCOD include increased androgen production and disordered gonadotropin secretion leading to menstrual irregularity, hirsutism, and infertility. Obesity is a common finding in adolescent women with PCOD and between 40–80% of adolescent with this condition is reported to be overweight or obese.

According to J. Alfredo, 2008, the control of body weight and consumption is considered on an axis with three connected and self-controlled components in light of new data, food consumption, nutrient turnover, and thermogenesis, as well as body fat reserves. Obesity may be developed due to increased intake of energy dense foods that are high in fat and calorie, decreased physical inactivity due to the sedentary work, insufficient sleep, endocrine disruptors (environment pollutants that interfere with lipid metabolism), decreased variability in ambient temperature, increased use of medications that can cause weight gain, low intake of fruits and vegetables etc. Psychological factors also influence eating habits. Adolescent girls eat in response to negative emotions such as sadness, boredom, anger etc., illness and hormone problems such as

hypothyroidism, depression, and some rare diseases of brain that can lead to overeating. In the present study an initiative has been made to investigate the relationship between food intake, PCOD and the impact of life style in it. This study will also reveal the relationship between PCOD and adolescent obesity.

### Assessment of obesity

Assessment tools in obesity are psychological measures, diet, activity and body composition. Thapa *et al.*, [2] described a cross-sectional descriptive study among the participants to assess the obesity. Research instruments will be interview schedule, anthropometric assessmental tools, clinical and biochemical assessmental tools. The participants were informed about the study and obtained parental consent (if any), for the legal representative of the children prior to the study. The stratified sampling technique was applied. Both quantitative and qualitative survey were done in terms of factors affecting the adolescent obesity. To determine the actual sample size inclusion (selection criteria, age between 11-16yrs) and exclusion criteria (omitting sample, below 11yrs and above 16 yrs samples data will be rejected) was followed. Different types of questionnaire were employed (MCQ type) for data collection. Different attributes like sleep disturbance, hunger, physical activity, leisure time activity, taking fast food, taking any beverages, taking any medicines, any health disorder, having periods regular, having ever hospitalized, good economic condition, any sibling, good mental health, having chocolate and ice cream, physical exercise all were collected.

At first demographic data were collected. All other information's like participants name, age, gender, place, DOB-6. Veg/non veg-, religion, educational attainment (Class)/vi/vii/viii/ix/x (Age- 11-16 yrs), family member, monthly income, income source (father/mother), electricity (yes/no), drinking water (yes/no), health insurance (yes/no) all were noted for socio- demographic survey to get the appropriate data of the respondents [3]. For nutritional assessment ABCD (anthropometric measurement, biochemical assessment, Clinical assessment and diet survey method) method was employed.

### Anthropometric measurement

It is the most basic method for assessing body composition and is used to determine body mass, size, shape, level of fatness. Measurements include height, weight, Skin fold thickness, (SKP) and circumferences of the waist, hip, head and neck measured, measurement of body fat, waist circumference with a flexible quilting tape. Anthropometric measurements are easy, safe and inexpensive for assessing obesity.

### Biochemical assessment

It plays a pivotal role in evaluating an individual's nutritional status by analyzing specific biochemical markers and parameters. It provides valuable information for healthcare professionals to

make informed decisions about nutrition-related health and dietary interventions.

- **Blood Tests:** These assess the levels of various substances in the blood, such as glucose, cholesterol, hormones, enzymes, and electrolytes
- **Urine Tests:** Urinalysis measures components like glucose, proteins, creatinine, and metabolites to assess kidney function, metabolic disorders, and more.
- **Genetic Testing:** This involves the assessment of DNA and RNA to identify genetic mutations, gene expression patterns, and genetic predispositions to diseases.
- **Enzyme Assays:** Enzyme activity is measured to diagnose enzyme deficiencies or abnormalities.
- **Protein Analysis:** Techniques like electrophoresis and immunoassays are used to study proteins in various biological samples.

### Clinical assessment

Biochemical parameters like glucose level, haemoglobin content, serum protein level all will be detected. etc.

### Dietary method

24 hrs recall method would be followed.

### Student Health Evaluation Questionnaire for assessment of obesity

Key components of a questionnaire are- Gender, ethnicity, age, education level, and attendance all demographic data are to be gathered. Choose minimally processed, whole foods – whole grain, vegetables, fruits, nuts, healthful sources of proteins and plant oils. Limit sugared beverages refined grains, potatoes, red and processed meats, and other highly refined foods.

### Data collection and data analysis

Data from the willing participants were gathered at a frequent interval using an anonymous self-administered questionnaire. Using the survey, data on the characteristics and expertise of HCPs were gathered. After collecting data, further data shall be validated and analyzed statistically as required.

### Discussion

Peters and colleagues introduced an intriguing theory that places the brain at the core of the organism's functioning. They proposed that the brain plays a pivotal role in maintaining a stable level of adenosine triphosphate (ATP) and achieves this by orchestrating the metabolism of the organism. The brain activates an "energy-on-request" system, establishing a direct connection between the supply and demand for energy within the cerebral system. This request system involves various components, including the cerebral hemispheres, the hypothalamus, peripheral somatomotor neurons, autonomic-visceromotor neurons, and neuroendocrine-secreto-motor neurons, all operating in a hierarchically organized manner.

In a study conducted by Douchi T et al. in 1995 [4] they explored the reasons behind the abandonment of weight loss initiatives, which were attributed to negative attitudes held by health professionals toward individuals who are obese. This research examined the perspectives of professionals who participated in a continuing education conference focused on the causes and management of obesity. The study identified significant diversity in opinions related to three key dimensions of obesity-related beliefs: a) the perception of obese individuals, b) the causes of obesity, and c) methods for reducing weight. The study also provided evidence regarding the relationships between the measurements of these belief dimensions. In 2005, Eric A. and colleagues put forward the notion that obesity is not merely a matter of health but also carries significant financial implications. They delved into the economic consequences of obesity, examined the underlying economic factors, including technological advancements, and discussed the role of government intervention in curbing the obesity epidemic.

Additionally, Dunaif A et al., 1992 [5] study, provided a comprehensive review of the most recent research on obesity, encompassing its prevalence, causes, health risks, and treatment options. Obesity has emerged as a progressively pressing health concern. Risk factors for obesity include a high-fat diet, reduced energy expenditure, and a genetic predisposition to gain weight.

Addressing obesity necessitates a shift in dietary habits, which can be achieved through various means. In 1980, William DeJong proposed that the extent to which a physically distinctive individual is stigmatized hinges on the degree to which that person can be held accountable or blamed for their appearance.

In 2002, Dietz WH et al. [6] and colleagues conducted research that also established a connection between television viewing and obesity. They gathered data as part of the National Health Examination Surveys.

Furthermore, in a study by scientists Kaufmann NA and Flegal KM et al., [7], opinions regarding good nutrition, the causes of obesity, and methods for its prevention were explored. This study involved 482 Israeli children, aged thirteen to fourteen, comprising 251 boys and 231 girls. The researchers collected height, weight, and triceps skinfold measurements. The mean relative weight and relative logarithmic skinfold thickness were found to be close to the standard values. However, it's worth noting that 8% of the boys and 9% of the girls exceeded 120% of the standard weight for their respective age and sex.

It appears that overweight teenagers are particularly mindful of their food intake. Medical illnesses that increase obesity risk include several rare genetic syndromes. High blood pressure, Heart disease, Diabetes, Pulmonary disease, Cancer etc. can occur due

to obesity. Insulin resistance is a common finding in PCOD that is independent of obesity. This defect is independent of but substantially worsened by obesity. This synergistic deleterious effect of obesity and PCOD on endogenous glucose production may be an important factor in the pathogenesis of glucose intolerance [8].

### Inter-relationship between obesity and PCOD

The mechanisms underlying the relationship between obesity and Polycystic Ovary disease (PCOD) are complex and interconnected. While the exact cause of PCOD is not fully understood, obesity is recognized as both a risk factor for PCOD development and a condition exacerbated by PCOD. Here are some of the mechanisms and interactions between obesity and PCOD are discussed.

#### Insulin resistance

Both obesity and PCOD are associated with insulin resistance, a condition where the body's cells do not respond effectively to insulin, leading to elevated blood sugar levels. Insulin resistance can stimulate the ovaries to produce more androgens (male hormones), such as testosterone, which can contribute to PCOD symptoms.

#### Hormonal imbalances

Obesity can disrupt the delicate hormonal balance in the body, leading to elevated insulin levels, increased androgen production, and irregular menstrual cycles. In PCOD, hormonal imbalances, including elevated androgens and disrupted gonadotropin-releasing hormone (GnRH) signaling, contribute to the condition's characteristic features.

#### Inflammation

Obesity is associated with chronic low-grade inflammation, which may exacerbate the inflammation seen in PCOD. Inflammation can lead to insulin resistance and contribute to the development of metabolic disturbances.

#### Adipose tissue activity

Adipose tissue (fat) is not just a storage depot; it's an active endocrine organ that produces hormones and cytokines. Excess adipose tissue, especially abdominal fat, can produce hormones that affect insulin sensitivity and contribute to PCOD symptoms.

#### Genetic factors

Both obesity and PCOD have genetic components. Certain genetic factors may predispose individuals to both conditions or make them more susceptible to one or the other.

#### Lifestyle factors

Unhealthy lifestyle choices, such as poor diet and lack of physical activity, can lead to obesity and worsen insulin resistance and hormonal imbalances in both PCOD and non-PCOD individuals.

### Vicious cycle

Obesity can exacerbate the symptoms and complications of PCOD, and conversely, PCOD can make it more challenging for individuals to manage their weight. This creates a vicious cycle where obesity worsens PCOD, and PCOD makes it harder to lose weight, leading to increased health risks.

### Ovulatory dysfunction

PCOD often leads to ovulatory dysfunction, which can result in infertility. Obesity can further complicate fertility issues by disrupting hormonal balance and increasing insulin resistance.

### Treatment challenges

Obesity can make it more difficult to manage PCOD symptoms and may require more intensive interventions for weight loss and metabolic control. In summary, the mechanisms of obesity and PCOD are interrelated, with obesity often exacerbating PCOD symptoms and complications. Both conditions share common features, such as insulin resistance and hormonal imbalances, making it essential to address them comprehensively through lifestyle modifications, medications, and targeted treatments to improve overall health and manage the symptoms of PCOD [9-10].

### Conclusion

This research endeavor will offer valuable insights into the domain of weight management for school-going children, with a particular focus on adolescent girls dealing with PCOD. The adoption of a healthy diet holds the potential to deter excessive weight gain and the onset of chronic ailments. Encouraging the inclusion of protein-rich foods in their diets, alongside fostering healthy eating habits and regular physical activity, while abstaining from smoking, alcohol, and drugs, can contribute significantly to maintaining the overall health of adolescents.

### Future Scope

Obesity and Polycystic Ovarian Disease (PCOD) are two interconnected health conditions that have gained significant attention in the field of medicine and research due to their rising prevalence and adverse health effects, particularly among women. Research in this area aims to better understand the mechanisms involved and develop effective strategies for prevention and management, highlighting the importance of a multidisciplinary approach involving diet, exercise, medications, and potentially surgery for some individuals.

### Author's Contribution

Dr. Rupali Dhara Mitra formulated the topic's concept. Prof Kakali Bandyopadhyay had given special inputs to the topic. Prantika Sengupta completed all the essential tasks to carry out the review paper, including manuscript writing. Poulomi Mistry helped in

literature finding. Dr. Rupali Dhara Mitra subsequently conducted thorough editing and provided a final revision for the entire document.

### Conflict of Interest

Authors declare no conflict of interest.

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