

Risks of obesity among Indian adolescents

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Received: 30-06-2021 / Revised: 13-09-2021 / Accepted: 16-10-2021

Abstract

Obesity is connected to a wide range of ECG abnormalities that take place in adolescents leading to risks of Cardio Vascular Disease (CVD) mortality and sudden cardiac death. Some of the ECG abnormalities are being caused by the position of the diaphragm being pushed-up as a result of obesity (1). The position of the R wave might change, the QT might be prolonged or various malignant arrhythmias could develop. In obesity, the ECG signals of ventricular hypertrophy tend to be less informative because of the subcutaneous and epicardial adipose tissue. This study revealed that in adolescents, general and abdominal obesity is correlated to long PR intervals, wide duration of QRS, leftward shifts of the frontal P-wave, T-wave and QRS axes, free from the ECG variables like gender, age, blood pressure and ethnicity.

Keywords: Obesity, risk, adolescent

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Introduction

The occurrences of obesity worldwide has proved to be nothing less than an epidemic. This independent risk factor has been related to a variety of Electrocardiogram Abnormalities (ECG). According to the World Health Organization (WHO), obesity is classified in terms of the Body Mass Index (BMI) [2]. The classification system of obesity is divided into five levels: the normal or lean range spans from 18.5 to 24.9 kg m⁻², overweight or pre-obese spans from 25.0 to 29.9 kg m⁻², mild obesity or class I spans from 30.0 to 34.9 v kg m⁻², moderate obesity or class II spans from 35.0 to 39.9 kg m⁻² and morbid obesity or class III spans from 40.0 kg m⁻² and above [2]. This classification system is used for detecting the level of severity of the obesity. Researches reveal that the issue of obesity has increased massively for about three times in the last two decades in the United States [3]. According to a study conducted by the National Health Examination Survey in the United States, about 17% of children and adolescents were affected by obesity [4]. A bit similar results have been found in case of Indian adolescents where researchers claim that prevalence of obesity was 2.9% among boys and 1.5% among girls. Prevalence of overweight results show 14.3% among boys and 9.3% among girls [5]. The correlation between obesity and electrocardiogram abnormalities have been extensively studied by researchers over the years. ECG is linked to increased risks of cardiovascular adversities, high rests of heart rate, complications of cardiac like coronary heart diseases, stroke, sudden death, hypertension and HF [6,7]. Thus, in this study, the effect of obesity on the different ECG variables will be explored among adolescents. number of ECG deformity may be correlated with various causes of obesity. A left shift of P, QRS, and T axes, prolongation of QT and QTc intervals, flattening of T waves, low QRS amplitude, and a morphological deviation of the P wave are increasingly present in

individuals affected by obesity than those who are not. It is noteworthy that the heightened sympathetic activity feature that causes prolongation of Qt and QTc intervals also leads to an increase of the reduced heart rate variability leading to the risks of being affected by arrhythmia [8]. The obese individuals specially in those with co-existing sleep apnoea or left ventricular hypertrophy show symptoms of a variety of arrhythmias. Fraley et al. states that ECG abnormalities are reversible as they change proportionality with the loss of body weight [9]. This finding was confirmed by a study explaining reduction, after weight loss, of mild left shift of the P and QRS axes [9]. In obesity, ECG made changes in many ways due to elevation of the diaphragmatic level, left ventricular hypertrophy caused by increased cardiac output the presence of subcutaneous adipose tissue and epicardial functioning as electric insulation layers- as well as sleep apnoea/hypoventilation syndrome [10].

Methods**Sample**

This cross-sectional study included 5000 students from the urban community in Patna, Bihar among which 3000 were boys and 2000 were girls. The age group of the selected children was between 12-19 years. According to the World Health Organisation (WHO), individuals belonging to this age group are considered adolescents [11]. Hence, this age group was chosen as this study aims to focus only upon the prevalence of obesity among adolescents.

Study tool

A semi-structured questionnaire was provided to the parents of the students to fill. The questionnaire consisted of questions related to the socio-demographic profile, the lifestyle practices and the dietary practices of the participants. The lifestyle practices included sports participation, physical exercises, sleeping habits, etc while the dietary practices included consumption level of junk food, having vegetarian and/or non-vegetarian foods, frequency of visiting restaurants etc. The questionnaire had also collected information regarding the family history of obesity or being overweight.

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Results

A total of 5000 students were screened for their weight, height and their body mass index. Out of the total participants, 60% were boys while the other 40% were girls. The results revealed that the weight, height and body mass index of boys was higher in comparison to that of girls.

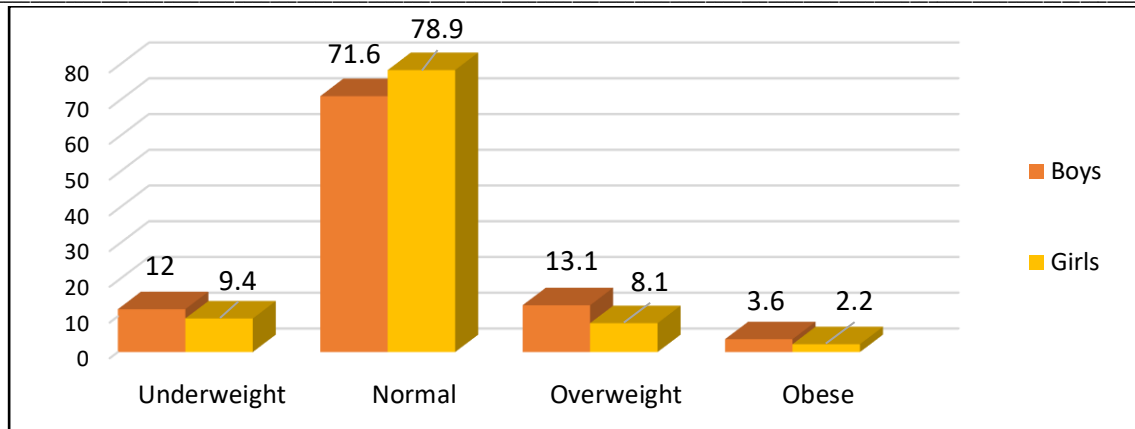


Fig 1. Distribution of underweight, normal, overweight and obesity among boys and girls

As shown in figure 1, the questionnaires had revealed that about 71.6% of boys and 78.9% of girls had normal Body Mass Index. Among the boys, 12% were underweight, 13.1% were overweight while 3.6% were obese. In case of girls, however, 9.4% were underweight, 8.1% were overweight and a 2.2% of the total girls were obese. A higher prevalence of both obesity and overweight in boys as compared to girls was evident. However the difference between both was insignificant.

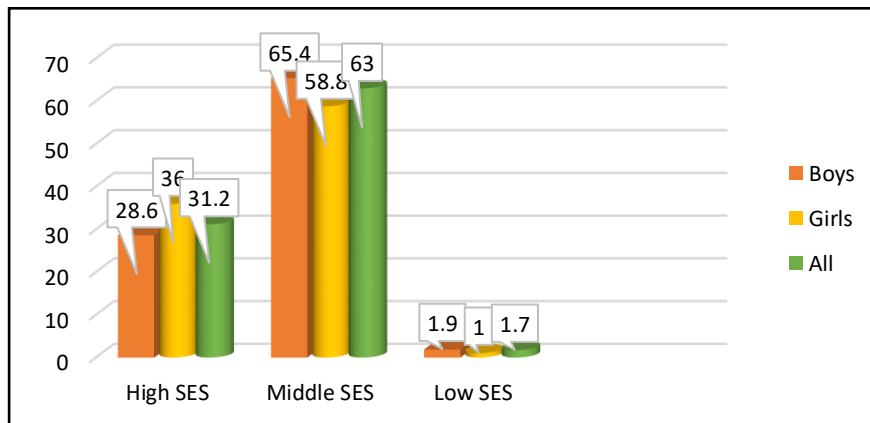


Fig 2. Connection between overweight and the socioeconomic status of participants

As shown in figure 2, the risks of prevalence of overweight among the children who belonged to middle SES was high when compared to the higher SES and lower SES, in both boys and girls. A value of 65.4% in middle SES as compared to 28.6% in high SES among boys and a value of 58.8% in middle SES as compared to 36% in high SES among girls shows the massive differences in the overweight rates.

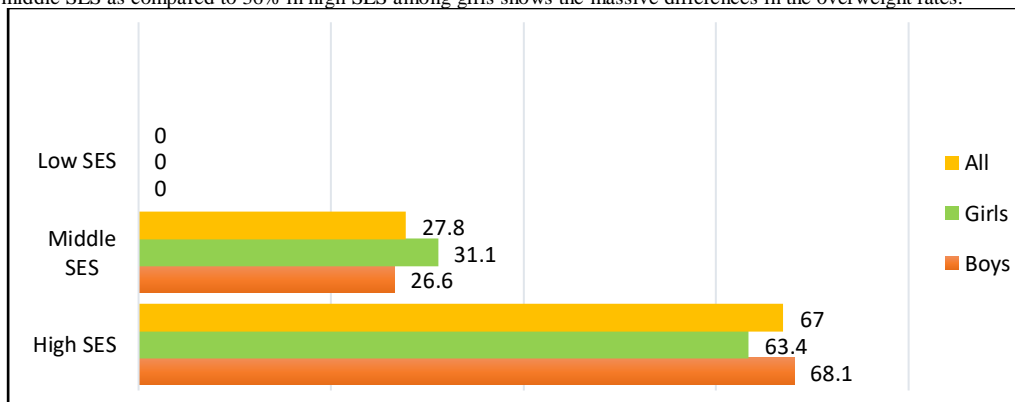


Fig 3. Connection between obesity and the socioeconomic status of participants

Contrastive to the prevalence of overweight among adolescents, figure 3 shows how obesity risk was higher among the participants belonging to high SES. Comparing the percentages of occurrences of obesity among the high, middle and low SES, the massive differences are evident. A value of 63.4% in high SES and 31.1% in middle SES, a value of 68.1% in high SES and 26.6% in middle SES shows the massive differences in the obesity rates. The risks of obesity among the lower SES was negligible.

Table 1. Characteristics of underweight, normal, overweight and obese among boys

Characteristics	Underweight	Normal	Overweight	Obese
Ages	12	71.6	13.1	3.6
Sports participation				
Yes	55.2	50.1	41.6	30.0
No	34.6	33.7	54.1	65.6
Sleeping habits (during afternoon)				
Yes	39.7	44.0	52.7	57.1
No	55.8	51.6	42.9	38.5
Physical exercises				
Yes	56.2	50.4	35.5	25.1
No	39.7	45.3	59.3	70.1
Dietary habits				
Vegetarian	94.1	93.5	89.9	86.6
Non-vegetarian	2.1	2.4	6.4	8.0
Consuming junk food				
Yes	44.6	55.2	60.4	65.6
No	52.0	40.5	34.0	30.0
Visiting restaurants				
More than once	74.8	79.8	84.3	84.7
Once or none	21.0	15.2	11.7	10.0
Chocolate eating habits				
Yes	40.9	53.4	58.2	64.0
No	54.0	42.1	37.4	31.7
Family history of obese				
Yes	21.4	24.0	33.1	36.9
No	74.2	71.6	62.5	58.9
Family history of diabetes				
Yes	16.6	18.5	22.4	22.5
No	79.0	77.1	75.2	74.1

Table 2. Characteristics of underweight, normal, overweight and obese among girls

Characteristics	Underweight	Normal	Overweight	Obese
Ages	9.4	78.9	8.1	2.2
Sports participation				
Yes	60.1	56.7	42.1	26.4
No	35.5	38.9	53.5	69.2
Sleeping habits (during afternoon)				
Yes	36.4	43.0	52.2	67.4
No	59.2	52.7	43.3	29.2
Physical exercises				
Yes	43.0	36.0	33.2	7.3
No	53.1	59.7	63.3	88.1
Dietary habits				
Vegetarian	95.3	93.5	91.9	93.0
Non-vegetarian	2.4	2.1	4.1	7.6
Consuming junk food				
Yes	43.7	52.2	61.1	75.0
No	51.9	44.4	34.5	21.6
Visiting restaurants				
More than once	64.5	80.1	84.2	90.0
Once or none	31.1	15.5	11.4	5.6
Chocolate eating habits				
Yes	42.2	49.5	69.2	83.5
No	53.3	46.1	26.4	12.1
Family history of obese				
Yes	31.1	21.1	33.2	45.4
No	63.3	75.5	62.4	50.2
Family history of diabetes				
Yes	16.0	19.1	21.9	22.6
No	79.6	76.5	73.7	74.0

Table 1 and Table 2 show that the participants were involved in various physical activities and had variety of dietary habits that might have affected upon the level of overweight and obesity among them. The data in the tables will be analysed in the following discussion chapter.

Discussion

The trend of accelerating rates of overweight and obesity among adolescents have been widely reported. Among the children of United

States and Australia during the year 1999-2000, more than 15% and 20% had obesity respectively [12]. In Egypt, around 14% of adolescents were obese or overweight during 1997. In Brazil since the

1970s, the risks of overweight have increased by three times from 4% in 1970s to 14% in 1990s. In these countries, debates regarding the use of Body mass index for calculating obesity and overweight rates have been evident. However, for Asian and Caucasian populations, different cut offs of Body Mass Index is used for studying obesity.

In the present study, it was evident that the prevalence of overweight among boys and girls was high, 13.1% in boys, 8.1% in girls. However, when comparing the data with obesity, it is noteworthy that the rates are not at all high in the former. Obesity was seen 3.6% among boys and 2.2.% among girls. the low prevalence of obesity among Indian adolescents is surprising, specifically when it is compared to the data with the foreign countries like the United States, Australia, Egypt and Brazil. However, the high rates of overweight is alarming since overweight adolescents could become overweight adults with time [13]. This could lead to various diseases like cardiovascular disease or type 2 diabetes mellitus which could lead to morbidity and mortality. The study had also shown that the numbers of overweight and obesity is far more in boys than in girls. It had, however, decreased with age leading to the conclusion that those adolescents who are 12 years old are at higher risks of obesity and overweight than the 19 year olds. This gives away to the idea that both age and gender play a particular role in terms of obesity and overweight. This might be due to the different levels of physical activities observed among the boys and girls. Various studies had stated before that BMI tends to be influenced by different SES backgrounds. This was revealed through this study when overweight was seen as strikingly high among adolescents from middle SES than the ones from high and low SES. Contrariwise, in case of obesity, prevalence rates were seen as high among the adolescents from high SES in comparison to those belonging to middle and low SES. While studying about overweight and obesity it is necessary to explore the different dietary habits of the adolescents since these factors play a massive role in triggering such health issues. Rich people tend to have better access of meat and other energy products as these food products tend to be more expensive than usual. Middle SES people consume more fruits and vegetables when compared to the poor which are lesser dense in energy but denser than junk food that low SES people consume. As a result, the SES backgrounds of adolescents play a massive role in terms of lifestyles, dietary styles, physical exercise patterns, sleeping patterns etc. These results are therefore consistent with others studies that have been conducted on the adolescents of India revealing that overweight is more prominent among them as compared to obesity. Thus, our data had revealed that numerous variables could be associated to risks of obesity and overweight leading to health diseases among adolescents.

Conclusion

The prevention of obesity among adolescents is easier when compared to adults. So, the practices of consuming more junk food or high fat and high energy foods need to be limited among adolescents. This study had many limitations since it included only a limited number of participants and that it had only included participants from urban areas. In future researches, this gap needs to be bridged by including people belonging to diverse backgrounds and having diverse lifestyle preferences.

Conflict of Interest: Nil Source of support: Nil

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