

A CROSS-SECTIONAL STUDY TO INVESTIGATE
THE PREVALENCE OF OBESITY IN
ADOLESCENT GIRLS ATTENDING
GYNAECOLOGY OUT PATIENT CLINIC IN A
TERTIARY LEVEL HOSPITAL



A dissertation submitted in partial fulfilment of the requirements of the Tamil Nadu Dr
M.G.R Medical University for the degree of MS (Obstetrics and Gynaecology) examination
to be held in May 2018

DECLARATION CERTIFICATE

I hereby declare that this dissertation titled “A CROSS-SECTIONAL STUDY TO INVESTIGATE THE PREVALENCE OF OBESITY IN ADOLESCENT GIRLS ATTENDING GYNAECOLOGY OUT PATIENT CLINIC IN A TERTIARY LEVEL HOSPITAL” is carried out by me under the guidance and supervision of Dr Elsy Thomas, Professor and Head of Unit, Obstetrics and Gynaecology Unit 1, Christian Medical College, Vellore.

This dissertation is submitted in partial fulfilment of the requirements of the Tamil Nadu Dr M.G.R Medical University for the degree of MS (Obstetrics and Gynaecology) examination to be held in May 2018.

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Post Graduate Registrar

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CERTIFICATE

This is to certify that the dissertation titled “A CROSS-SECTIONAL STUDY TO INVESTIGATE THE PREVALENCE OF OBESITY IN ADOLESCENT GIRLS ATTENDING GYNAECOLOGY OUT PATIENT CLINIC IN A TERTIARY LEVEL HOSPITAL” is the original research work done by Dr Evangeline Reeni Christian and was carried out under my guidance and supervision towards partial fulfilment of the requirements of the Tamil Nadu Dr M.G.R Medical University for the degree of MS (Obstetrics and Gynaecology) examination to be held in May 2018.

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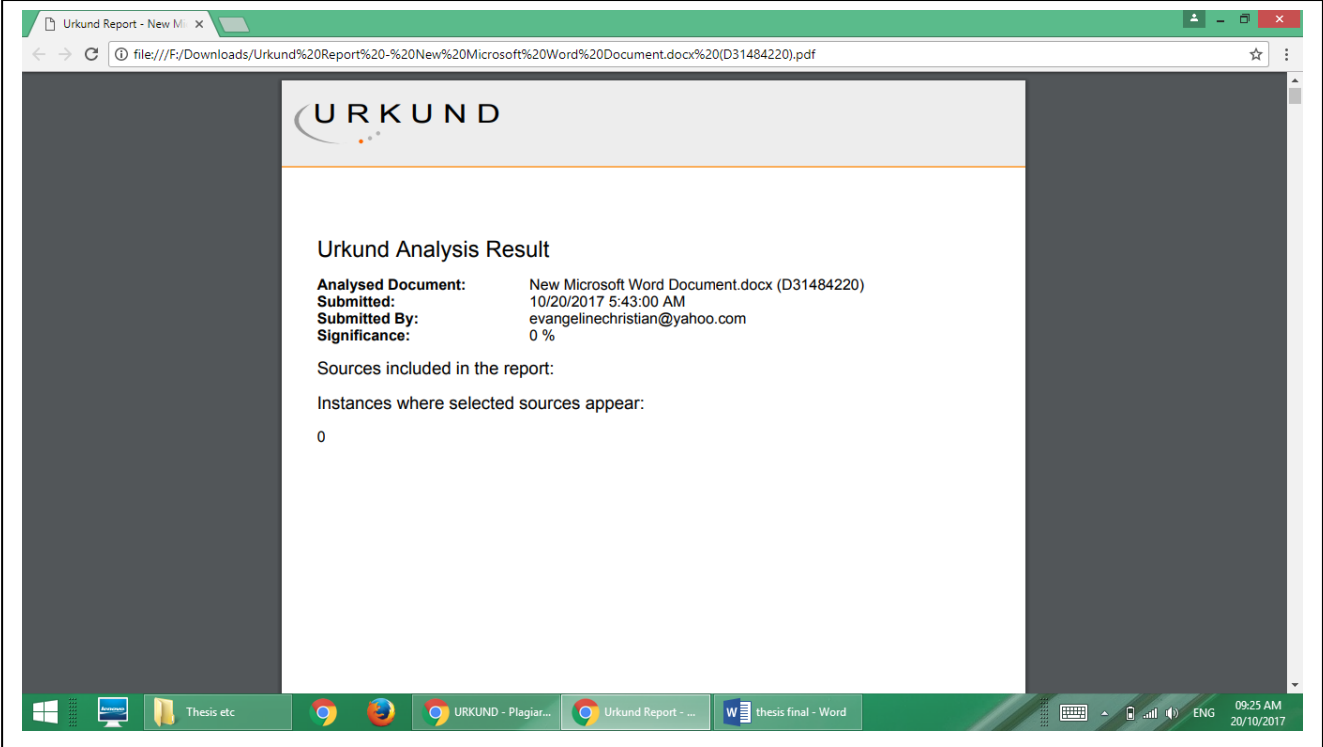
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A cross-sectional study to investigate the prevalence of obesity in adolescents, which will employ a case control framework to evaluate for risk factors for obesity.

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1. Institutional Review Board approval
2. Agreement

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With best wishes,

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The Institutional Review Board (Blue, Research and Ethics Committee) of the Christian Medical College, Vellore, reviewed and discussed your project titled "A cross-sectional study to investigate the prevalence of obesity in adolescents, which will employ a case control framework to evaluate for risk factors for obesity" on December 05th 2016.

The Committee reviewed the following documents:

1. IRB Application format
2. Consent forms (English, Tamil, Bengali, Telugu and Hindi)
3. Cvs of Drs. Elsy Thomas, Grace Rebekha and Jessie Lionel.
4. Questionnaire and Proforma
5. No. of documents 1- 4

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We approve the project to be conducted as presented.

Kindly provide the total number of patients enrolled in your study and the total number of withdrawals for the study entitled: "A cross-sectional study to investigate the prevalence of obesity in adolescents, which will employ a case control framework to evaluate for risk factors for obesity" on a monthly basis. Please send copies of this to the Research Office (research@cmcvellore.ac.in).

Fluid Grant Allocation:

A sum of 5,000/- INR (Rupees Five Thousand Only) will be granted for 6 months.

Yours sincerely,

Dr. Biju George
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TITLE

A CROSS-SECTIONAL STUDY TO INVESTIGATE THE PREVALENCE OF OBESITY
IN ADOLESCENT GIRLS ATTENDING GYNAECOLOGY OUT PATIENT CLINIC IN A
TERTIARY LEVEL HOSPITAL.

INTRODUCTION

‘Obesity is becoming an epidemic’. This is a statement often heard in the health circles today. But is obesity really a problem of such great magnitude or is this just an overstatement? That is a question that needs an answer. The alarming fact is that this ‘disease’ seems to be as much a problem of the adolescents as of the reproductive age group women. A report presented by NHANES for the year 2007-2008 stated that 16.9% of children and adolescents in the age group of 2-19 years were obese. Childhood obesity prevalence among preschool children increased from 5.0 to 10% between 1976-1980 and 2007-2008 and it increased from 6.5 to 19.6% among the age group of 6-11 years. Data from the same study also showed that in the adolescent age group (12-19 years) obesity increased from 5.0 to 18.1%. (1)

A study conducted among 24,000 school children in south India showed that the proportion of overweight children increased from 4.94 per cent of the total in 2003 to 6.57 per cent of the total in 2005, demonstrating the time trend of this rapidly growing ‘epidemic’ (2).

A study from northern India reported a childhood obesity prevalence of 5.59 per cent in the higher socio-economic strata compared to 0.42 per cent in the lower socio-economic strata.(3)

Though it is reasonable to assume that childhood obesity would carry over into the adolescent period, an objective measure of this problem in adolescent girls is not available, especially in the Indian subcontinent. This study aims to determine the prevalence of obesity in adolescent girls attending the gynaecology out-patient clinic in a tertiary level hospital. Though the prevalence of obesity in a hospital set up would not be an accurate estimate of the problem in the community, it would still reflect in great measure the magnitude of the problem in the community.

Menstrual irregularities are common in the adolescent period and this problem is aggravated in obese adolescents. The most common cause for irregular menses in adolescents is polycystic ovarian disease (PCOD). Patients with Polycystic Ovarian Disease (PCOD) present with oligo-ovulation (menstrual irregularity), features of hyperandrogenism and polycystic ovaries on ultrasonography. Women with polycystic ovarian disease tend to be obese but are not universally so(4) . We aim to evaluate obese adolescent girls who have oligo-ovulation with ultrasonography to look for the presence of polycystic ovaries.

The problems related to obesity are many and can be evident in the present or will make itself known in the future. An objective evaluation of the problem of obesity in adolescent girls would go a long way in encouraging both the patients and their carers in taking positive steps to deal with this 'epidemic'.

ABBREVIATIONS

ACOG	American College of Obstetricians and Gynaecologists
AE-PCOS	Androgen excess- polycystic ovary syndrome
BMI	Body Mass Index
CAH	Congenital Adrenal Hyperplasia
CDC	Centre for disease control and prevention
DHEAS	Dehydroepiandrosterone sulphate
DSD	Disorder of Sexual Development
FPG	Fasting plasma glucose
FSGS	Focal segmental glomerulosclerosis
FSH	Follicle Stimulating Hormone
HDL	High Density Lipoprotein
IASO	International Association for the study of obesity
IGF	Insulin like growth factor
IOTF	International Obesity Task Force
LDL	Low Density Lipoprotein
LH	Luteinizing Hormone
NAFLD	Non- alcoholic fatty liver disease
NASH	Non- alcoholic steatohepatitis
NHANES	National Health and Nutrition Examination Survey
NIDDM	Non-insulin dependent diabetes mellitus
OCP	Oral contraceptive pill
OHA	Oral hypoglycaemic agent
OHS	Obesity hypoventilation syndrome
OSA	Obstructive sleep apnea
PCO	Polycystic ovary
PCOD	Polycystic ovarian disease
PCOM	Polycystic ovarian morphology

PCOS	Polycystic ovarian syndrome
SCFE	Slipped capital femoral epiphysis
SHBG	Sex Hormone Binding Globulin
T2DM	Type 2 diabetes mellitus
TSH	Thyroid Stimulating Hormone
TV	Television
USA	United States of America
WHO	World health organisation

AIMS AND OBJECTIVES

To determine the prevalence of obesity in adolescent girls attending gynaecology out-patient clinic.

To assess the menstrual pattern in obese adolescent girls.

To find the proportion of obese adolescent girls with menstrual irregularity, who have PCOM.

To assess the risk factors for obesity in adolescent girls.

LITERATURE REVIEW

Introduction

Obesity is a serious public health problem(2). The term obesity refers to excess body fat, but since there are no direct methods of measuring body fat, in clinical practice, relationship between anthropometric measures like body weight and height are used to assess the body fat.(5) The prevalence of obesity has gone up both nationally and internationally. India, a “developing” country, has got its ‘double burden’ of obesity on one hand and undernutrition in the other. (6)

Epidemiology

Epidemiological data shows an increase in the prevalence of obesity globally. According to the International Association for the Study of Obesity (IASO) and International Obesity Task Force (IOTF) around 300 million people all over the world are obese, out of which 200 million come under the school going age group. (7) The WHO recently stated that “the growth in the number of severely overweight adults is expected to be double that of underweight during 1995-2025” (WHO 1998) (7) India is one of the fastest growing economies, experiencing transitions at epidemiological, demographical and nutritional level, along with increasing obesity in every age group. At the same time, due to its wide geographical, ethnic and socio-cultural variations, robust data on the prevalence of adolescent obesity is lacking in India.(6)

The data regarding adolescent obesity trends in India is shown in the table below.

Adolescent (10-18 year) obesity trends in India(6)

S. No.	Author	Year	Region	Age group (yr)	Sample size (n)	Methods/cut-points ^a	Overweight prevalence (%)			Obesity prevalence (%)		
							Overall	Boys	Girls	Overall	Boys	Girls
1	Gupta <i>et al</i> ¹⁰	1998	Jaipur, NI	13-17	237	WHO	-	-	-	10.1	-	-
2	Kapil <i>et al</i> ²¹	2002	New Delhi, NI	10-16	870	IOTF-Cole <i>et al</i> ²¹	24.7	23.1	27.7	7.4	8.3	5.5
3	Ramachandran <i>et al</i> ²²	2002	Chennai, SI	13-18	4700	IOTF-Cole <i>et al</i> ²²	-	17.8	15.8	-	3.6	2.9
4	Subramanyam <i>et al</i> ²³	2003	Chennai, SI	10-15	707 ¹ (1981)	IOTF-Cole <i>et al</i> ²³	9.6	-	-	5.9	-	-
					610 ² (1998)		9.7	-	-	6.2	-	-
5	Chhatwal <i>et al</i> ²⁴	2004	Punjab, NI	9-15	2008	WHO ²⁴	14.2	15.7	12.9	11.1 ^a	12.4	9.9
6	Mohar <i>et al</i> ²⁵	2004	Punjab, NI	11-17	3326	IOTF-Cole <i>et al</i> ²⁵	11.6 (U)	-	-	2.4 (U)	-	-
							4.7 (R)	-	-	3.6 (R)	-	-
7	Khadijkar & Khadijkar ²⁶	2004	Pune, WI	10-15	1228 ⁶	IOTF-Cole <i>et al</i> ²⁶	19.9	19.9	-	5.7	5.7	-
8	Sidhu <i>et al</i> ²⁷	2005	Punjab, NI	10-15	640	Must <i>et al</i> ²⁸	10.9	9.9	12.0	5.6	5.0	6.3
9	Gupta <i>et al</i> ²⁹	2006	Jaipur, NI	11-17	1224 ¹ (1997)	IOTF-Cole <i>et al</i> ²⁹	10.9	-	10.9	5.5	-	5.5
					915 ² (2003)		10.5	-	10.5	6.7	-	6.7
10	Kaneria <i>et al</i> ³⁰	2006	Rajasthan, NI	12-17	268	IOTF-Cole <i>et al</i> ³⁰	3.25	-	-	3.73	-	-
11	Iyer <i>et al</i> ³¹	2006	Baroda, WI	12-18	5329	IOTF-Cole <i>et al</i> ³¹	8.5	8.0	9.0	1.5	1.4	1.7
12	Singh <i>et al</i> ³²	2006	New Delhi, NI	12-18	510	CDC Growth Charts	-	-	-	-	18.6	16.5
13	Sood <i>et al</i> ³³	2007	Bangalore, SI	9-18	794 ¹	IOTF-Cole <i>et al</i> ³³	13.1	-	13.1	4.3	-	4.3
14	Rao <i>et al</i> ³⁴	2007	Pune, WI	9-16	2223	IOTF-Cole <i>et al</i> ³⁴	-	27.5	20.9	-	-	-
15	Laxmaiah <i>et al</i> ³⁵	2007	Hyderabad, SI	12-17	1208	IOTF-Cole <i>et al</i> ³⁵	-	6.1	8.2	-	1.6	1.0
16	Global School Based Student Health survey (CBSE) ³⁶	2007	-	13-15	8130	WHO ³⁶	10.8	11.6	9.7	2.1	2.5	1.5
17	Unnithan & Syamakumari ³⁷	2007	Kerala, SI	10-15	3886	IOTF-Cole <i>et al</i> ³⁷	17.7	-	-	5.0	-	-
18	Aggarwal <i>et al</i> ³⁸	2008	Punjab, NI	12-18	1000	Rosner <i>et al</i> ³⁸	12.7	-	-	3.4	-	-
19	Bharati <i>et al</i> ³⁹	2008	Wardha, WI	10-17	2555	CDC Growth Charts	3.1	-	-	1.2	-	-
20	Goyal <i>et al</i> ⁴⁰	2010	Ahmedabad, WI	12-18	5664	IOTF-Cole <i>et al</i> ⁴⁰	-	14.3	9.2	-	2.9	1.5
21	Jain <i>et al</i> ⁴¹	2010	Meerut, NI	10-16	2785	EHPA ⁴¹	-	18.4	19.7	-	10.8	5.3
22	Gupta <i>et al</i> ⁴²	2011	New Delhi, NI	14-17	3493 (2006)	Pandey <i>et al</i> ⁴²	24.2	-	-	9.8	-	-
					4908 (2009)		25.2	-	-	11.7	-	-
23	Saraswathi <i>et al</i> ⁴³	2011	Mysore, SI	13-17	1439(U)	WHO ⁴³	-	-	-	8.8 (U)	7.7 (U)	10.4 (U)
					750(R)		-	-	-	0.8 (R)	0.5 (R)	1.0 (R)
24	Kumar <i>et al</i> ⁴⁴	2011	Udipi Dist., SI	12-15	500	WHO ⁴⁴	3.0	-	-	2.6	-	-
25	Kumar <i>et al</i> ⁴⁵	2012	Surat, WI	13	277 ¹	IAP ⁴⁵	-	-	12.6	-	-	6.5
				14	271 ²		-	-	13.3	-	-	6.6
				15	215 ³		-	-	14.0	-	-	6.7
26	Jain <i>et al</i> ⁴⁶	2012	Chattisgarh, EI	13-17	500	CDC Growth Charts	-	-	23.8	-	-	8.4
27	Alok <i>et al</i> ⁴⁷	2012	Surat, WI	14-16	213 (U)	IOTF-Cole <i>et al</i> ⁴⁷	26.3 (U)	27.4 (U)	24.9 (U)	14.6 (U)	14.3 (U)	15.0 (U)
					176 (R)		25.8 (R)	25.6 (R)	26.2 (R)	12.8 (R)	11.2 (R)	14.1 (R)
28	Gupta <i>et al</i> ⁴⁸	2013	Bankura, EI	10-18	452	WHO ⁴⁸	7.7	8.9	6.3	4.0	4.0	3.9

¹Most studies include age group 10 years onwards in the adolescent age group except for two studies which included age 9 years onwards.

²BMI (kg/m²), ³Girls only, ⁴Boys only, ⁵based on triceps skin fold thickness (TSFT), ⁶based on a representative sample of students going to CBSE schools in India, ^a >95th or >90th percentile = obesity, ≥85th or 80th percentile = overweight & obesity; NI, North India; NEI, North East India; SI, South India; CI, Central India; EI, East India; WI, West India

Various cut-points used:

Must *et al* (1991)²⁸, International Obesity Task Force (IOTF)-Cole *et al* (2000)²¹, World Health Organization (WHO) Age and Gender Specific Cut-offs for Overweight & Obesity (1995²⁴, 2006²⁵), Centres for Disease Control and Prevention (CDC), Atlanta, USA, CDC Growth Charts for the United States³⁰, Eliz Health Path for Adolescents and Adults (EHPA)⁴¹, Pandey *et al*⁴², Indian Academy of Paediatrics (IAP) 2001⁴⁵, Rosner *et al*³⁸

Definition of obesity

WHO defines obesity in adults as ‘BMI of greater than or equal to 30 kg/m².’(8)

Obesity is further categorised as:(9)

- Class 1: BMI of 30 to < 35 kg/m²
- Class 2: BMI of 35 to < 40 kg/m²
- Class 3: BMI of 40 kg/m² or higher.

Class 3 obesity is sometimes categorized as “extreme” or “severe” obesity.

CDC criteria for obesity in children and adolescents

In children obesity cannot be defined as in adults, age has to be taken into consideration. The following criteria has been used to define obesity in children using the CDC growth chart where age and sex are taken into consideration.(10)

Underweight- BMI < 5th percentile for age and sex

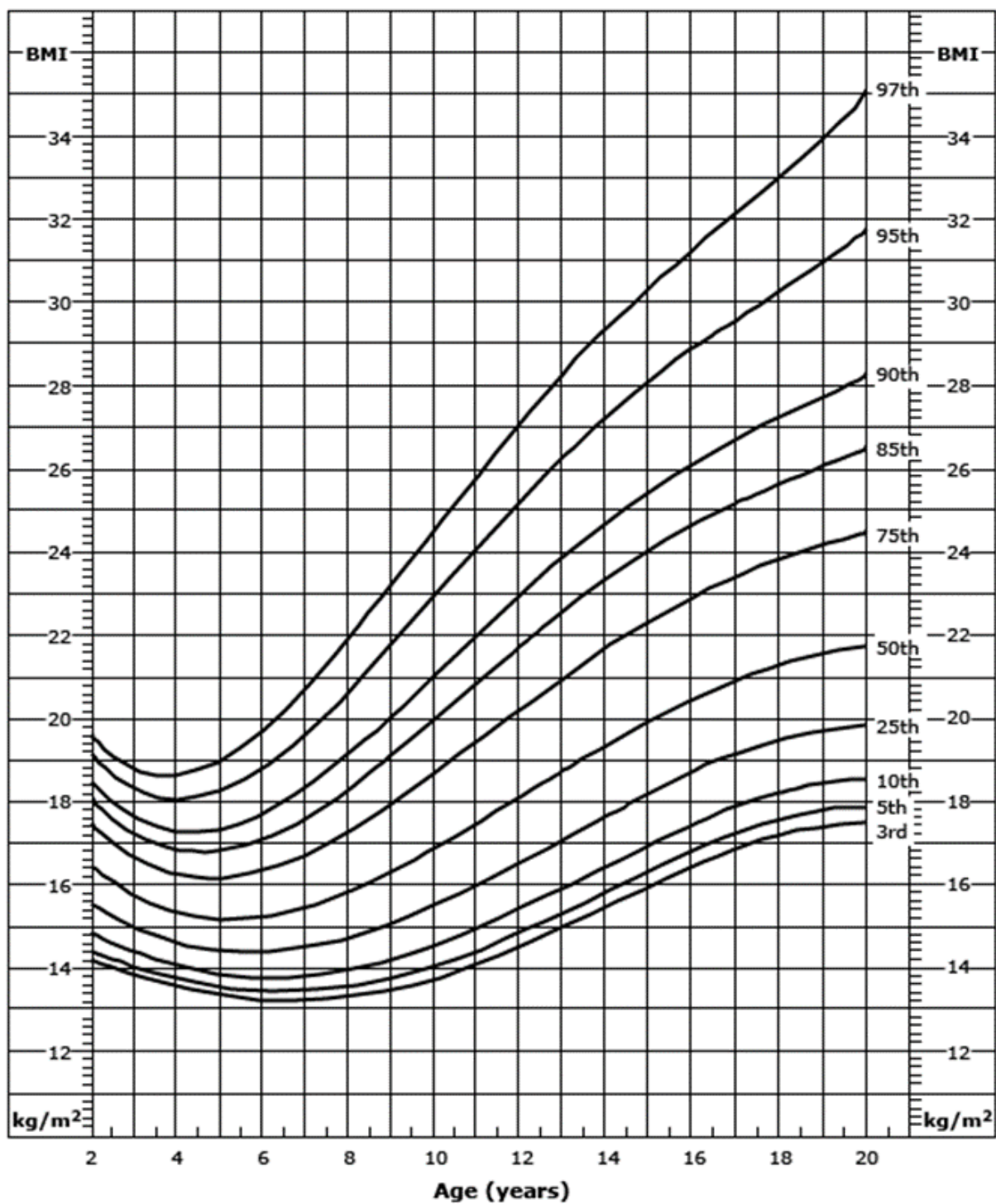
Normal weight- BMI between 5th -85th percentile for age and sex

Overweight- BMI between >85th - 95th percentile for age and sex

Obese– BMI ≥ 95th percentile for age and sex

Severe obesity-BMI ≥ 120% of the 95th percentile value or BMI ≥ 35kg/m².

Body mass index-for-age percentiles, girls, 2 to 20 years, CDC growth chart (United States):



Etio-pathogenesis of adolescent obesity

Etio- pathogenesis of adolescent obesity is multi-factorial. Several factors like genetic factors, neuroendocrine factors, metabolic factors, behavioural factors, environmental and various socio- cultural factors have been identified as contributing agents for childhood obesity. (11)

Genetic factors

Evidence shows that genetic factors play a role in the pathogenesis of obesity. In polygenic mouse models (closely related with human obesity phenotypes) it was shown that leptin deficiency can cause obesity. Multiple polygenic mutations were associated with cholesterol elevation, body fat alteration and tendency to increase in body weight after high fat consumption. (11) Genetic factors influence obesity in children by altering the body metabolism of the child.

Several genetic conditions are associated with obesity, like Prader-Willi syndrome, Bardet-Biedl syndrome and Cohen syndrome. Another pointer to genetic factor involvement is the observation that obesity shows a familial tendency. The Avon Longitudinal Study which was conducted among 8234 children, showed that the odds of children having obesity were 2.93, 4.66 and 11.75, respectively if the father or the mother or both the parents had obesity. (12) A study done in Washington among 854 subjects showed that parental obesity was a better predictor of adult obesity as compared to the child's weight itself till the age of 3 years. (13)

Neuroendocrine factors

Peptides like leptin, insulin and neuropeptide Y play a role in the etio-pathogenesis of obesity. Low levels of leptin and insulin stimulate neuropeptide Y that in turn inhibits different catabolic pathways seen during fasting and hypoglycaemic state. This results in a tendency to increase food intake. Increased level of leptin and insulin increases energy expenditure by releasing hormones like melanocortin and corticotropin-releasing hormone. Some humans are genetically leptin deficient and this may lead to their tendency to become obese. Few other peptides associated with increased feeding tendency are orexins A and B from hypothalamus and ghrelin from the stomach-(14)

Environmental and Social factors

Evidence strongly points towards environmental and socio cultural factors as important agents in the etio-pathogenesis of adolescent obesity. Sub-optimal level of cognitive stimulation by parents and choice of diet at home have a direct influence on food preferences of the children and can contribute to unhealthy eating habits and subsequent obesity. (15) Short sleep pattern in childhood was also shown to affect fat metabolism leading to obesity in children. (16)

Urbanization has been associated with obesity and it promotes obesity by encouraging fast-food consumption and accessibility of high calorie foods and beverages. (17) Television watching and sedentary lifestyle are other important factors contributing to obesity in childhood and adolescence. (18)

Factors contributing to obesity at different levels of evolution

Obesity in adulthood could have its origin at any time, starting from the intrauterine period itself. Intrauterine growth patterns determines obesity in adulthood by affecting fat and lean body mass, controlling pancreatic enzyme functions and altering neuroendocrine mechanisms. High birth weight is an independent risk factor for obesity later in life. (12)

Low birth weight was also found to be associated with increased risk of obesity in early adulthood and it added to cardiovascular risk factors too. (19)

Different studies have shown that breastfeeding has a protective influence on childhood obesity. (20) A study conducted in USA among 6507 adolescent girls showed that the two-fold rise in the rate of early menarche had an associated BMI of more than the 85th percentile. (21) It was found that almost 80 per cent of obese adolescents have the risk of becoming obese in their adulthood as well (22)

Risk factors for adolescent obesity

Studies conducted in school settings from 1990-2013 in three countries - India, Pakistan and Bangladesh showed some key individual risk factors as having significant association to childhood and adolescent overweight and obesity. These include lack of physical activity, prolonged hours of TV watching or prolonged playing of computer games and eating of junk food. Consumption of calorie dense food, higher socio-economic status and positive family history of obesity are also contributing factors for childhood obesity, as determined by various studies.(23) The National Centre for Chronic Disease Prevention and Health Promotion, CDC, USA has stated that several factors like higher costs of healthy food as compared to that of unhealthy foods and lack of safe places for children to play and/or exercise contribute to the increasing trend in obesity. (24) Childhood obesity is generally due

to discrepancy between calorie intake and calorie loss (25). Behavioural factors like excessive consumption of energy rich beverages and food, in large portion sizes, along with lack of physical activity contribute to childhood and adolescent obesity. Sedentary lifestyle, especially watching television for long time and snacking more while watching television is found to be an important cause for obesity. (25) Media also has a role in promoting obesity in children as it often encourages unhealthy eating habits. (26)

Comorbidities

There are various comorbidities associated with being overweight and obese and this affects the functioning of most of the systems of the body like- endocrine, cardiovascular, gastrointestinal pulmonary etc.

Endocrine

Endocrine comorbidities like impaired glucose tolerance or prediabetes are common abnormalities seen in obese adolescents, followed by growth and pubertal abnormalities in girls. (27) (28) In a study conducted in USA in more than 6000 students with an average age of 11.8 years, impaired fasting glucose (FPG ≥ 100 mg/dL) was seen in 15.5% in the overweight category, 20.2% in the obese category, and 22.5% in the severely obese category. Type 2 diabetes mellitus (T2DM) is also a common comorbidity of obesity in adolescents. In another study conducted in United States 4 percent out of 167 students with BMI $\geq 95^{\text{th}}$ percentile for age and sex was diagnosed to have asymptomatic T2DM. (29) Moreover, this group of people presenting with T2DM in their adolescence were found to have faster development of diabetes-related complications, in comparison to people

presenting with T2DM later in life. A study based in Oklahoma showed that adolescent patients who were found to have T2DM, were also diagnosed with other comorbidities like-microalbuminuria 13.0%, dyslipidemia 80.5% and hypertension 13.6%.(30) Adolescent obesity in girls is often associated with hyperandrogenism and can give rise to early onset polycystic ovary syndrome (PCOS), which can result in decreased fertility in adulthood. (27)

Cardiovascular

Obesity in adolescence can lead to different cardiovascular changes that result in increased cardiovascular risk later in life, the most common being hypertension and dyslipidemia, which are also a part of the metabolic syndrome. (31) A study done in Texas showed that students having a body mass index (BMI) $\geq 95^{\text{th}}$ percentile for age and sex had three times higher risk for hypertension compared to those having BMI $< 95^{\text{th}}$ percentile for age and sex. Ambulatory blood pressure monitoring was used in this study and almost 50% of obese students were found to have hypertension.(32) Studies have also shown that there is significant association between childhood obesity and hypertension which persists even if the person loses weight in his or her adulthood.(33) Dyslipidemia is another association of adolescent obesity and is characterised by elevated serum low-density lipoprotein (LDL), serum cholesterol, serum triglycerides and low level of high-density-lipoprotein (HDL). Risk of dyslipidemia increases as the severity of obesity increases. (34) Obese children also show cardiac structural changes similar to that seen in middle-aged adults. Some of these abnormalities include left ventricular hypertrophy, increase in left atrial and ventricular diameter, increased amount of epicardial fat and diastolic dysfunction. (35) (36) Adolescent obesity is not only associated with progressive atherosclerosis but it can also lead to increased carotid intima-media thickness. (37) Insulin resistance, a frequent metabolic

abnormality seen in obesity, is by itself an independent risk factor for premature carotid atherosclerosis.(38) A study done in USA demonstrated that cardiovascular risk factors increased in overweight adolescents (BMI 85th to 95th percentile) and increased further with obesity (BMI \geq 95th percentile). These risk factors were associated with acute coronary disease in adulthood.(39) A population-based study conducted in Denmark demonstrated the linear rise in risk for both fatal and non-fatal adulthood cardiovascular events associated with increased BMI value in adolescent period. (40) A predictive model study in USA estimated that by 2035, the prevalence of coronary heart disease in the United States would rise from 5 to 16 percent, resulting in more than 100,000 excess incidences of coronary heart disease due to the rise in childhood obesity. (41)

Gastrointestinal

Obesity is associated with non-alcoholic fatty liver disease (NAFLD), an umbrella term used for a group of liver diseases which have different clinical presentations. This may present as steatosis or non-alcoholic steatohepatitis in the initial stages or as fibrosis or cirrhosis in the later stages or ultimately as liver failure. (42) Insulin resistance as seen in obesity is found to be a risk factor for NAFLD. (43) An autopsy study done in California among 742 children and adolescents showed that the prevalence of NAFLD was 9.6 percent in the general population while it was found to be 38 percent in obese children. (44) Obesity is the commonest risk factor for cholelithiasis in adolescents and girls are at a higher risk as compared to boys. A cross-sectional study based on medical records of more than 5 lakh patients in the age group 10 to 19 years, reported a sevenfold higher risk for cholelithiasis among severely obese girls as compared to girls having normal BMI (45)

Pulmonary

Obstructive sleep apnea (OSA) and the obesity hypoventilation syndrome (OHS) are two common obesity related pulmonary comorbidities found in obese children and adults. In a study done in Belgium, out of 64 obese adolescents, 8 percent showed moderate to severe OSA. The pathology in obesity hypoventilation syndrome is alveolar hypoventilation while the person is awake and this is a potentially life-threatening disorder requiring early diagnosis and management. Obesity is a contributing factor as it causes restrictive ventilatory effort in these patients. In the same study, 17 percent subjects showed episodes of hypoventilation, sometimes associated with severe oxygen desaturation. (46) Some obese children may even need continuous positive airway pressure on a regular basis until weight loss is adequate to restore normal ventilation. (47)

Orthopaedic

Obese children are more prone to develop slipped capital femoral epiphysis (SCFE), genu valgum, tibia vara and musculoskeletal pain. (48) These children are also more susceptible to fractures than normal weight children. (49)

Neurologic

The risk of idiopathic intracranial hypertension (pseudotumor cerebri) increases with the severity of obesity. (50)

Dermatologic

Conditions like intertrigo, furunculosis and hidradenitis suppurativa are some of the common dermatological comorbidities associated with obesity. Acanthosis nigricans is also a frequent accompaniment of obesity and serves as a surrogate marker for insulin resistance, which is commonly seen in obesity. Striae distensae are caused by skin distension (mechanical factors), possibly along with higher level of adrenocorticosteroids as associated with obesity. (51)

Psychosocial

Obesity has a lot of psychosocial effects like social marginalisation, poor peer relationships, low self-esteem, (52) body image anxiety and depression. (53) All these psychosocial morbidities increase with age and is commoner in girls than boys. (54) In a community-based study conducted in San Diego, obese adolescents and their families reported decreased quality of life as compared to those of non-obese adolescents. In the same population, quality of life in the aspect of health in case of severely obese adolescents was comparable to that of cancer patients belonging to the same age group. (55)

It was found that girls suffering from obesity often develop a low self-image that continues even into adulthood.(56) Data from the National Longitudinal Survey of Youth showed that adolescent women suffering from obesity had lesser years of advanced education, lower family income in adulthood, lower marriage rates, and higher poverty rates as compared to non-obese women belonging to same age group. (57)

Information pertaining to adverse outcomes is shown in the table below.

Adverse outcomes in childhood obesity(11)

Cardiovascular	High blood pressure Early onset atherosclerosis Left ventricular hypertrophy
Endocrine	Insulin resistance Diabetes mellitus (NIDDM) Menstrual abnormalities Polycystic ovarian syndrome (PCOS)
Gastrointestinal	Gallstones Non alcoholic steatohepatitis (NASH) Hepatic fibrosis Cirrhosis
Neurological	Pseudotumor cerebri
Orthopaedic	Slipped capital femoral epiphysis Tibia Vara Osteoarthritis
Psychosocial	Obsessive concern about body image Expectation of rejection Progressive withdrawal Low self esteem Depression
Pulmonary	Increased bronchial hyperactivity Asthma exacerbation Obstructive sleep apnoea Pickwickian syndrome Pulmonary embolism
Renal	Increased sensitivity to sodium Decreased natriuresis Proteinuria Focal segmental glomerulosclerosis (FSGS)

Obesity and its effects on fertility and reproduction (59)

In addition to all the comorbidities mentioned above, obesity in adolescent girls can have an adverse effect on fertility and future reproductive potential.

Menstrual irregularities due to chronic oligo or anovulation is common in adolescent girls with obesity. Anovulation is caused by the higher levels of circulating oestrogen (due to

increased aromatisation in the periphery), interfering with the feedback mechanism. Other metabolic abnormalities like insulin resistance and hyperinsulinemia associated with obesity could also contribute to anovulation. Early onset obesity can result in infertility in adulthood. In addition there is increased incidence of miscarriages, recurrent pregnancy loss, congenital anomalies and preterm deliveries associated with obesity, in pregnant women. The outcomes of assisted reproductive techniques are also impaired in obese individuals. All these adverse outcomes are more in the presence of PCOS.

Complications like foetal macrosomia and post term pregnancy are common in obese women. This often results in an increase in the perinatal morbidity and mortality. The incidence of stillbirth increases as the class of obesity increases.

Obese women are also prone to develop more obstetrical, medical and surgical complications as compared to non-obese women. The obstetric medical complications which are increased are gestational diabetes mellitus, preeclampsia, non-alcoholic liver disease, proteinuria, sleep apnea and cardiac dysfunction. (58) There is also an increased incidence of emergency caesarean section, postpartum haemorrhage, pelvic infection, urinary tract infection, wound infection and venous thrombo-embolism in obese gravida as compared to pregnant women with normal BMI.

Over and above the metabolic risks conferred by obesity, it is also an important risk factor for endometrial carcinoma. (59)

Adolescent obesity and polycystic ovary disease (PCOD)

Obesity is a well-known association of adolescent PCOD. A study done in Bulgaria showed that more than 50% of adolescents suffering from PCOD were obese. (60) PCOD is the most

common cause of menstrual irregularity and hirsutism in the adolescent age group. It is characterised by excess secretion of LH and androgens. The exact aetiology of PCOS is unknown, but evidence suggest that there is an abnormal production of ovarian androgens in this disease. Although it manifests much later in the adolescent period this may have its origin during childhood or even during foetal life itself.

During puberty, hyperinsulinaemia and insulin resistance, can be considered as physiological metabolic changes, but in obese children this is exaggerated, and can manifest as PCOS. (61) Hyperinsulinism as seen in central obesity is a result of insulin resistance and it plays an important role in the pathophysiology of PCOS. Hyperinsulinism increases pituitary LH secretion, which in turn alters the LH/FSH ratio, resulting in anovulation. Insulin along with LH synergistically stimulates theca cells to produce androgens. (62) Hyperinsulinism lowers SHBG level and thus increases free testosterone which contribute to hirsutism, acne and alopecia as seen in PCOS. (63) Women suffering from PCOS show a phenomenon called ‘insulin paradox’ wherein insulin resistance is seen at muscular, adipose tissue and hepatic level, while normal sensitivity to insulin is seen at the ovarian level. (62)

Diagnosis of PCOS

PCOS in adults (69)

A diagnosis of PCOS is considered when a patient presents with:

1. Hyperandrogenism (clinical hyperandrogenism - Ferriman-Gallwey Score ≥ 8 or biochemical hyperandrogenism - elevated total/ free testosterone)
2. Oligomenorrhea or amenorrhea (less than 6-9 menses per year) or oligo-ovulation

3. Polycystic ovarian morphology (PCOM) (≥ 12 antral follicles in one ovary or ovarian volume $\geq 10\text{cm}^3$).

Previously the Rotterdam criteria was used to diagnose PCOS, in which 2 out of the three above mentioned criteria had to be met to make a diagnosis of PCOS. More recently the androgen excess and polycystic ovarian syndrome (AE-PCOS) Society criteria has been proposed for diagnosing PCOS where, along with hyperandrogenism one of the other 2 criteria should be present to diagnose PCOS.

PCOS in adolescents (64)

The criteria used for diagnosing PCOS in adults cannot be applied to diagnose PCOS in adolescent girls. Sultan and Paris recommend that four out of five of the following criteria be met in order to diagnose adolescent PCOS:

1. Oligomenorrhea or amenorrhea > 2 years after menarche
2. Clinical hyperandrogenism
3. Biochemical hyperandrogenism
4. Insulin resistance or hyperinsulinemia
5. Polycystic ovaries on ultrasound (PCOM)

Carmina and colleagues recommend applying the Rotterdam criteria, but all three criteria has to be met for a diagnosis of PCOS. They also recommend that those who meet 2 of the 3 criteria should be followed up and re-evaluated as adults.(65)

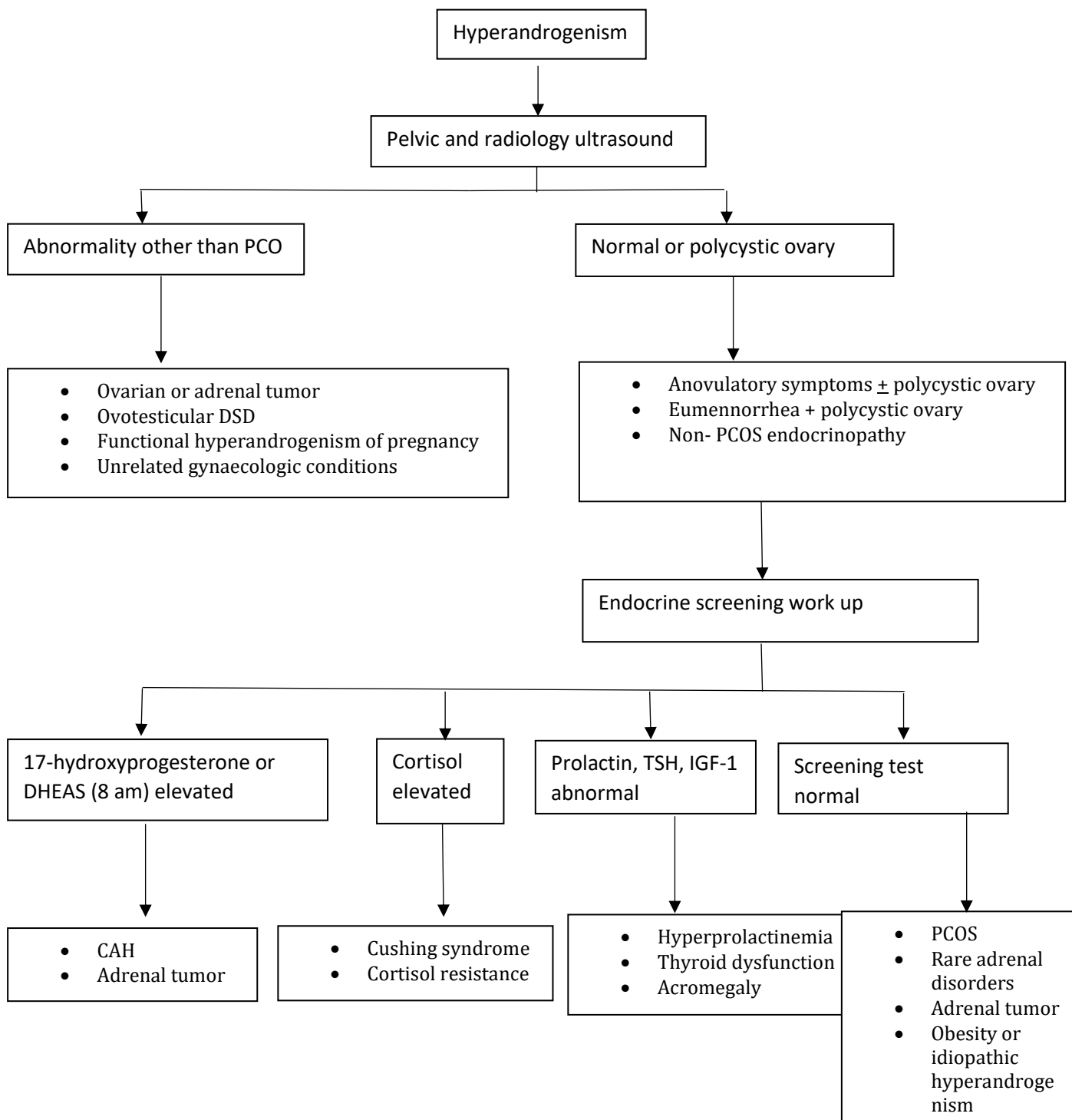
These recommendations are not as yet endorsed by any of the expert panels or societies in the field of PCOS.

Ultrasonographic criteria for polycystic ovary morphology

The criteria used to confirm diagnosis of PCOM in adults cannot be used in adolescents. The adolescent ovarian size is more than that of the adult ovary. (66) Consequently, one-third to one-half of normal adolescent girls meet adult criteria for diagnosis of PCOM. (67) The higher resolution transvaginal ultrasound picks up more follicles compared to an abdominal ultrasound and it has been found that smaller antral follicles up to 24, are normal in adolescents. (68) It is difficult to diagnose PCOM just based on abdominal ultrasonography and transvaginal scan is not an option in adolescent girls who are not sexually active. Therefore proper identification of PCOM is a challenge in this age group. (69) In addition there is another entity called multifollicular ovary seen on ultrasound, which can be mistaken for PCOM. In multifollicular ovary more than or equal to 6 follicles, each measuring 4-10 mm are seen. (65). Multifollicular ovary is a normal variant and unrelated to hyperandrogenism. (65) Till definitive criteria for diagnosis of adolescent PCOM are established, it is suggested that a mean ovarian volume >12 cc (or single ovarian $>$ volume 15 cc) be considered for diagnosis of PCOM in adolescents. (70) Girls with symptomatic hyperandrogenism and PCOM but who have regular cycles, are at risk of development of PCOD in later life, hence they need close follow up. (70)

In certain situations it may be necessary to perform a diagnostic endocrinological panel of tests to rule out other causes of hyperandrogenism.

A screening panel suggested by the American College of Obstetricians and Gynaecologists (ACOG), Endocrine Society and adolescent guidelines for the diagnosis of PCOS is given below and it excludes most of the non-PCOS hyperandrogenism causes (71)



Evaluation for polycystic ovary syndrome (72)

Evaluation for polycystic ovary syndrome (PCOS) should be done for adolescent girls with one or more of the following features:

- An abnormal level of hirsutism or having hirsutism equivalent, like inflammatory acne vulgaris poorly responsive to topical therapies.
- Menstrual abnormality including persistent amenorrhea or oligomenorrhea, or period of amenorrhoea followed by increased bleeding per vaginum.
- Obesity or focal hirsutism along with menstrual abnormality

Treatment of obesity

The short term goals of treatment of obesity are, first to decrease the rate of weight gain, then to maintain weight followed by reduction of weight. The long-term goal is the improvement in quality of life and decrease in morbidity and mortality related to being overweight and obese. (73)

The various strategies employed to achieve these goals are dietary modification, increased physical activity, restriction of sedentary behaviour, pharmacological treatment and surgical treatment.

Dietary strategies

Dietary strategies for treatment of obesity encourage proper calorie intake, with reduction of excess calories without compromising the nutritional requirements. Decreasing the frequency of eating out and consumption of healthy snacks, intake of balanced diet, eating fruits and

vegetables, including fibre rich food and avoidance of calorie dense food are some of the practices that help reduce obesity. Limited use of salt, sugar and trans-fatty acids are strongly related to reduction of morbidities associated with obesity. (74) (75)

Physical activity

Regular physical activity for 60 minutes a day prevents as well as treats obesity in children and decreases the cardiac morbidities related to it. (76) Systematic reviews have shown that exercises like brisk walking reduces body fat. (77) Exercise is also associated with an increase in energy expenditure and significant reduction in the morbidity and mortality associated with obesity.(78)

Restriction of sedentary behaviour

Increased television watching is responsible for increased adiposity and higher BMI. Excessive TV watching is also associated with consumption of energy dense food, sweet and salty snacks and high calorie beverages which further predispose to obesity. (79) Television watching hours can predict adult BMI. (80) Studies have shown that limiting screen time to a maximum of 2 hours a day can significantly decrease obesity in children and adolescents.(81) Therefore limiting screen time should be taken seriously by parents and they should be motivated to get this implemented by their wards.

Pharmacological treatment

There is not much data regarding drugs for treatment of obesity in children. Some commonly used drugs to treat obesity are sibutramine, orlistat and metformin. Sibutramine which is a serotonin nor- adrenaline reuptake inhibitor increases satiety but has side effects like tachycardia and high blood pressure. Orlistat is a pancreatic lipase inhibitor and acts by increasing faecal fat loss. The side effects of this drug are that it causes flatulence, occasional diarrhoea, gallbladder diseases, steatorrhea and needs fat-soluble vitamin supplementation. This drug is less effective in the setting of a low fat diet like the Indian diet. Metformin is used to counter the insulin resistance causing impaired glucose tolerance and this forms an important part of the drug therapy in patients with polycystic ovarian disease. Pharmacological intervention is a second line treatment when primary intervention of lifestyle modification fails. (82)

Surgical treatment

Surgical intervention is needed for adolescents with a BMI of $>40 \text{ kg/m}^2$ and it is undertaken only in those adolescents who have attained most of their skeletal maturity. This generally includes girls more than 13 years and boys more than 15 years. Surgical intervention is appropriate when these adolescents have comorbidities related to obesity that might be reversed or reduced with weight reduction. (83) In case of BMI more than 50 kg/m^2 , even lesser degree of comorbidities warrant surgical intervention. The preferred procedures are Roux-en-Y gastric bypass and adjustable gastric banding. Though these procedures show good results they are associated with complications like small-bowel obstruction, hernia, vitamin and micronutrient deficiencies. In addition these patients generally need life-long follow up. Bariatric surgery in adolescent period is generally more effective for childhood

onset obesity as compared to obesity in adulthood. These procedures give a satisfactory result for both weight reduction and decrease in obesity related comorbidities-(84)

Future directions

Childhood and adolescent obesity is a major health issue throughout the world. Though there is a growing interest in this field, high quality data regarding various factors contributing to childhood obesity, is lacking in India. Determinants of childhood obesity should be addressed at the population level and more research should be directed to assess the appropriateness of public health policies to bring down the prevalence of childhood and adolescent obesity. (73)

Prevention

Schools, child care facilities and health care centres at community level can be used for implementation of programmes related to prevention of childhood obesity. Different strategies like serving healthy food in school settings or community related outlets, giving more time and options for physical activities to students and providing financial as well as technical support to the policies related to obesity control, will help prevent obesity in the long run. Other strategies like providing physical education at school level and having teachers with formal training in physical education will help achieve the objective of decreasing childhood obesity. The advantage of this kind of strategies based in school setting is that it works among a 'captive audience'. It is easier to influence the mind set of children and adolescents in this setting and this in turn may have a positive influence outside the school setting. (85) Multicomponent based programs addressing both nutrition and physical activity are found to have a holistic effect on control of obesity. (86)

The best way to prevent obesity is to prevent children having normal BMI from becoming overweight and this should start in the new born period itself. Promoting breastfeeding, having a balanced diet including fruits and vegetables, taking in more of fibre rich food and

restricting consumption of energy dense diet, are all shown to have a preventive effect on obesity. (87) Various strategies like restriction of sugar intake, watching television for not more than 2 hours a day and not having television or video games in sleeping areas are also helpful in this regard. In addition, having regular breakfast, limiting fast food intake, avoiding large portion sizes and having family meals instead of eating out, are found to be beneficial in preventing obesity. (88) One hour of physical activity per day, also goes a long way in preventing obesity in childhood.

At community level having parks, walking paths, bicycle pathways and community education to promote physical activity are measures that can be taken to prevent obesity. At health care level, obese parents must be counselled about their children being at risk for developing obesity in the future. (89) Physicians should also encourage parents to become role models for their children in regard to proper diet, physical activity on a daily basis and screen time at home. Positive influence can be made and awareness increased in obese parents if frequent enquiry is made about their lifestyle at their physician visits. (90)

Conclusion

Obesity is reaching epidemic proportions both internationally and nationally. India is a rapidly growing economy, but it has to deal with obesity, which is becoming a major public health issue. Childhood and adolescent obesity is multifactorial and may result from certain behavioural, genetic and environmental factors. Different comorbidities are associated with obesity and some of these may persist throughout life. Measures need to be taken at various levels to stop the progression of this 'epidemic'. As the dictum goes 'prevention is better than cure'.

MATERIALS AND METHODS

Study Design

Cross sectional study: To investigate the prevalence of obesity in adolescent girls. The other objectives of the study were, to assess the menstrual pattern in obese adolescent girls and to determine the proportion of obese girls with irregular cycles who had PCOM and to determine the associated risk factors for obesity. Data was collected prospectively.

Location

Gynaecology out-patient department (OPD) of Christian Medical College (CMC), Vellore

Recruitment

All adolescent girls (aged 12-19 years) attending the Gynaecology OPD from January 5, 2017 to June 7, 2017 were considered eligible to be recruited for the study. Adolescent girls seen earlier and coming for follow up after the start of the study were also recruited for the study. The non-recruiting days were April 1, 4, 8, 18, 25, 28, 29 and May 13, 20, 2017.

Sample size

Historical data collection was done for a period of 45 days in the gynaecology OPD in CMC, Vellore and the prevalence of obesity among adolescent girls was found to be 12%. With a precision of 5% and a desired confidence interval at 95%, the minimum sample size was calculated to be 162.

Inclusion criteria

Adolescent girls (aged 12-19 years) attending the Gynaecology out-patient clinic and consenting to be a part of the study.

Exclusion criteria

1. Adolescent girls who were medical, nursing or allied health students of CMC.
2. Girls/parents/guardians not consenting for the study.

Methodology

Adolescents girls (12-19 years) coming to the gynaecology out-patient clinic were identified and the nature of the study was explained to them. Informed consent was then taken from the girls and one of the parent or guardian accompanying the patient. A questionnaire was filled based on one on one interview. This questionnaire required information regarding risk factors for obesity and details regarding diet and physical activity. Detailed information about the menstrual cycles was also collected, along with information pertaining to clinical evidence of hyperandrogenism (acne and epilation for hirsutism). Information regarding the presence of common comorbidities associated with obesity, was also gathered. Following this a physical examination was carried out. This was done with special reference to anthropometric measurements and included the height, weight, waist circumference and hip circumference of the subjects. Pulse and blood pressure readings were also recorded. Hirsutism if present, was

graded using the Ferriman-Gallwey score. Information regarding the presence or absence of acanthosis nigricans was also documented.

All obese adolescents with history of menstrual irregularities suggestive of oligo-ovulation/anovulation were advised to undergo ultrasonography to evaluate for the presence of polycystic ovaries.

Data analysis was done using SPSS 16.0. Mean and standard deviation was used to describe continuous variables, while frequency and percentages were obtained for categorical data.

The chi square test and the student t test was employed to study the statistical significance of categorical and continuous variables respectively.

ANALYSIS AND RESULTS

585 adolescent girls attended the gynaecology out-patient clinic from January 5, 2017 to June 7, 2017. Of these 501 girls were recruited for the study. 84 girls were not recruited as they were either CMC medical/ nursing students or had not consented to be a part of the study.

Figure 1: Patient recruitment

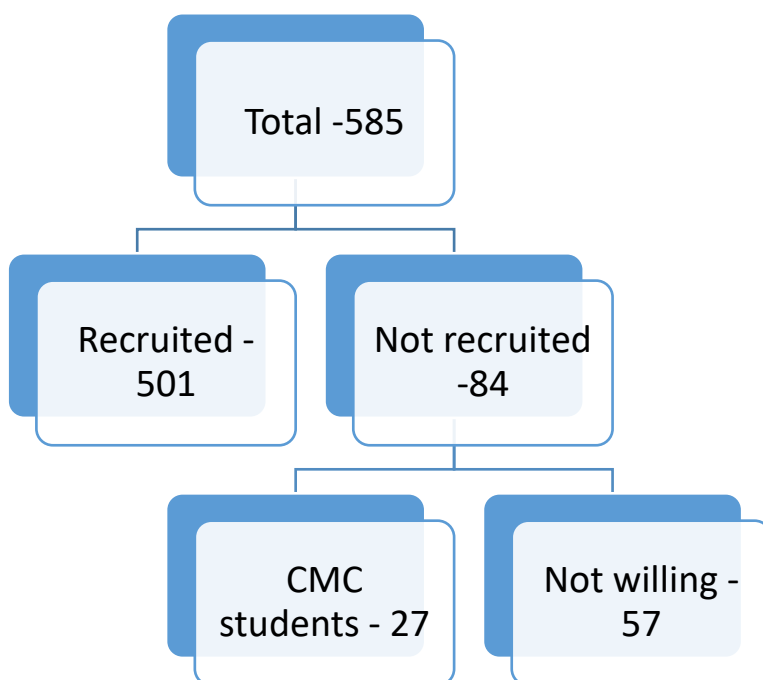


Table 1: BMI of patients not recruited

BMI	No.	%
Under weight	6	10.5
Normal	35	61.4
Overweight	8	14
Obese	7	12.3
Missing	1	1.8
Total	57	100

The percentage of girls with obesity who were not recruited for the study was 12.3%.

Patients who attended gynaecology out-patient clinic for the first time had their height, weight, blood pressure and pulse rate measured as part of routine evaluation. Therefore the above data was available for analysis.

Table 2: Descriptive Statistics

	Mean +/- SD
Age (years)	16.12 +/- 1.887
Weight at birth (kg)	2.756 +/- 0.5133
Age of onset of obesity (years)	10.19 +/- 4.770
Fathers BMI (kg/m ²)	25.3434 +/- 3.87079
Mothers BMI (kg/m ²)	25.9353 +/- 4.35542
Age at menarche (years)	12.47 +/- 1.343
Number of years since menarche (years)	2.09 +/- 0.399
Height (cm)	155.70 +/- 6.445
Weight (kg)	54.83 +/- 14.437
BMI (kg/m ²)	22.5229 +/- 5.41642
Waist circumference (cm)	73.53 +/- 12.278
Hip circumference (cm)	89.55 +/- 12.106
Waist hip ratio	.8173 +/- 0.05202
Systolic blood pressure (mmHg)	106.43 +/- 12.996
Diastolic blood pressure (mmHg)	68.10 +/- 9.028
Pulse rate (/min)	94.28 +/- 15.308

501 girls were recruited for the study. The average age of the study population was 16.12 years.

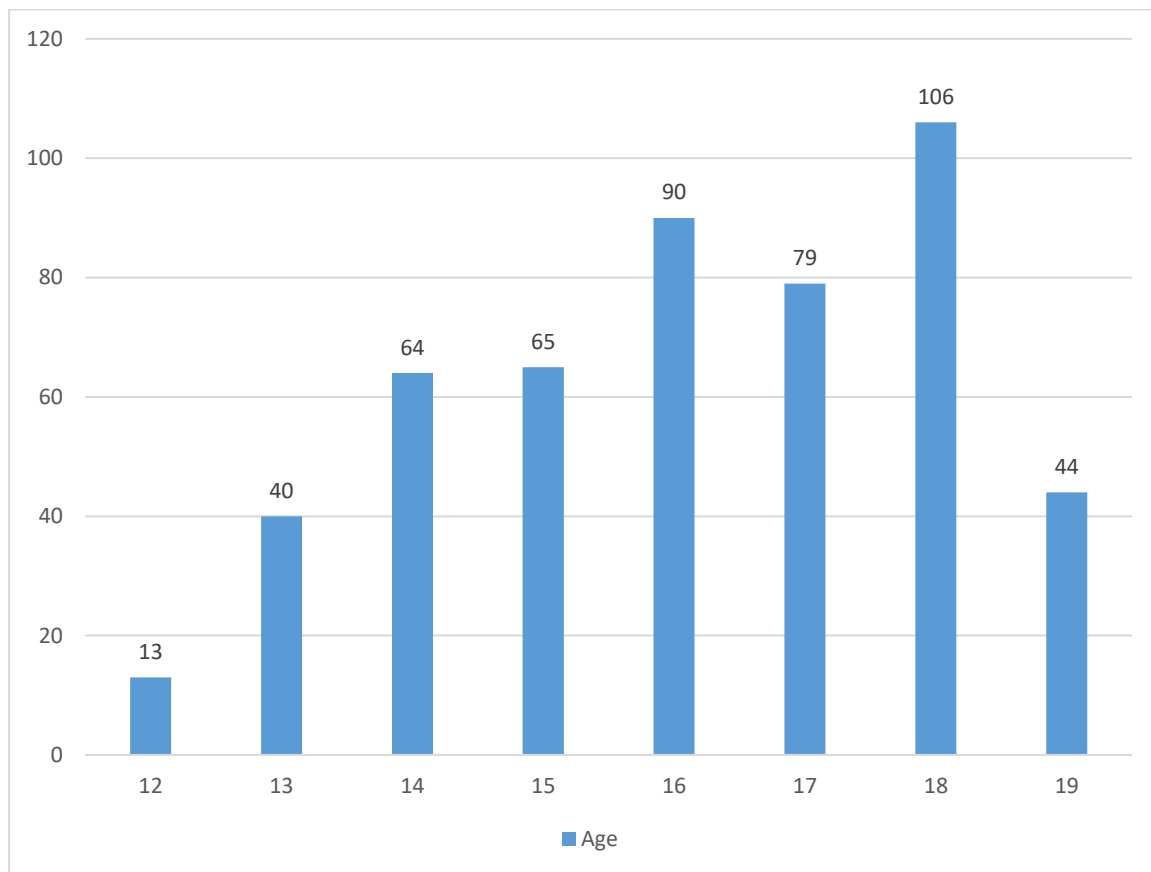
Weight at birth was known for 480 girls, with the lowest birth weight being 1000 grams and the highest 4500 grams. The average weight at birth was 2756 grams. In 21 girls the birth weight was not known because they were born at home and therefore the weight was not measured or because the parent could not recollect the weight of the infant at birth.

Of the 501 girls, 90 were found to be overweight and 70 were obese, but the average BMI of the patients was 22.5 kg/m².

The age of onset of obesity ranged from birth to 18 years, with the mean age being 10.19 years.

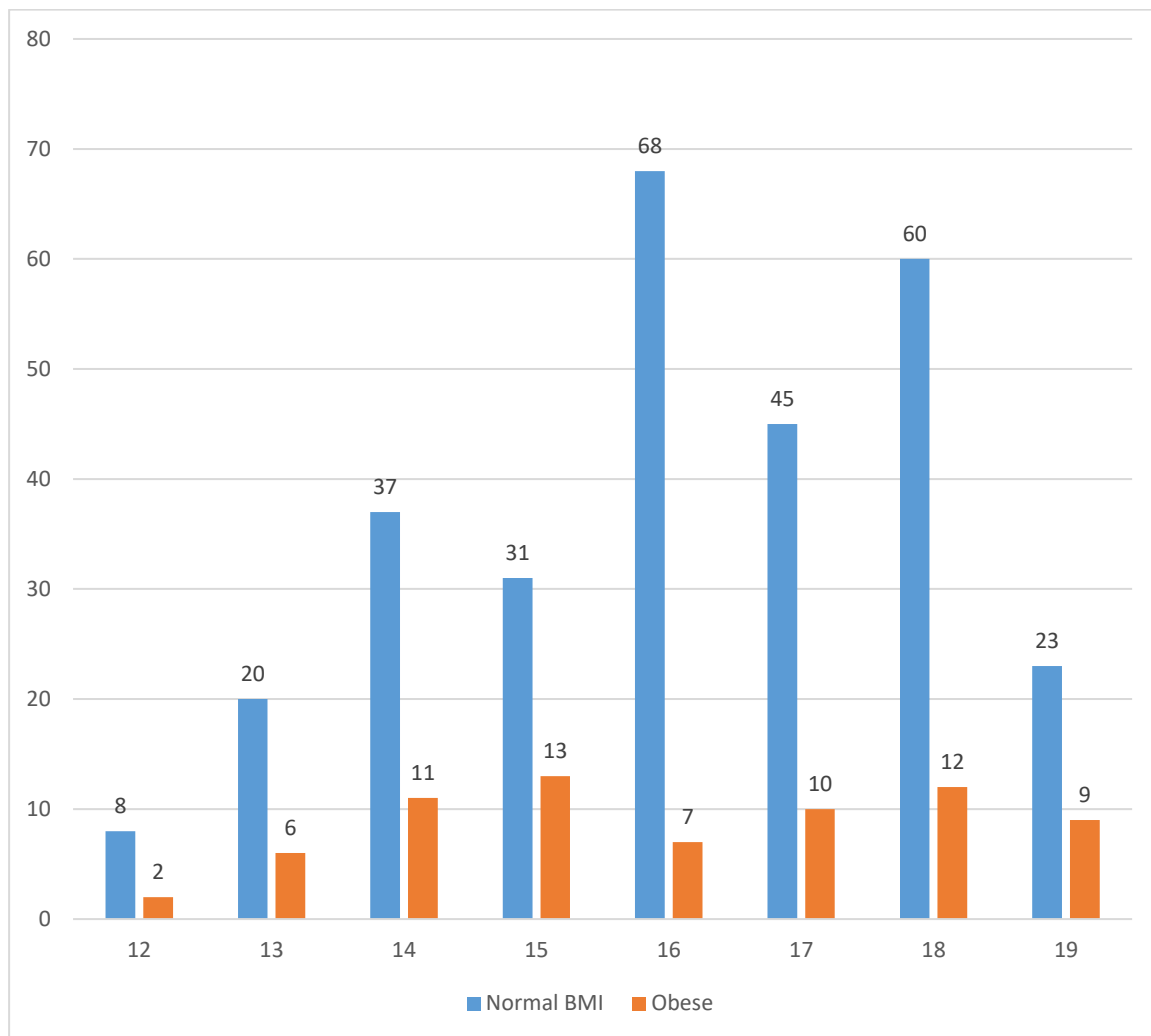
At the time of recruitment into the study 467 girls had attained menarche while 34 girls presented with primary amenorrhoea. The average age of menarche was 12.47 years and the average number of years since menarche was 2.07 years.

Figure 2: Distribution of girls according to age



275 (54.8%) of girls were in the age group of 16-18 years.

Figure 3: Age wise distribution - normal BMI and obese



Analysis of the study population with reference to aims and objectives.

A. BMI

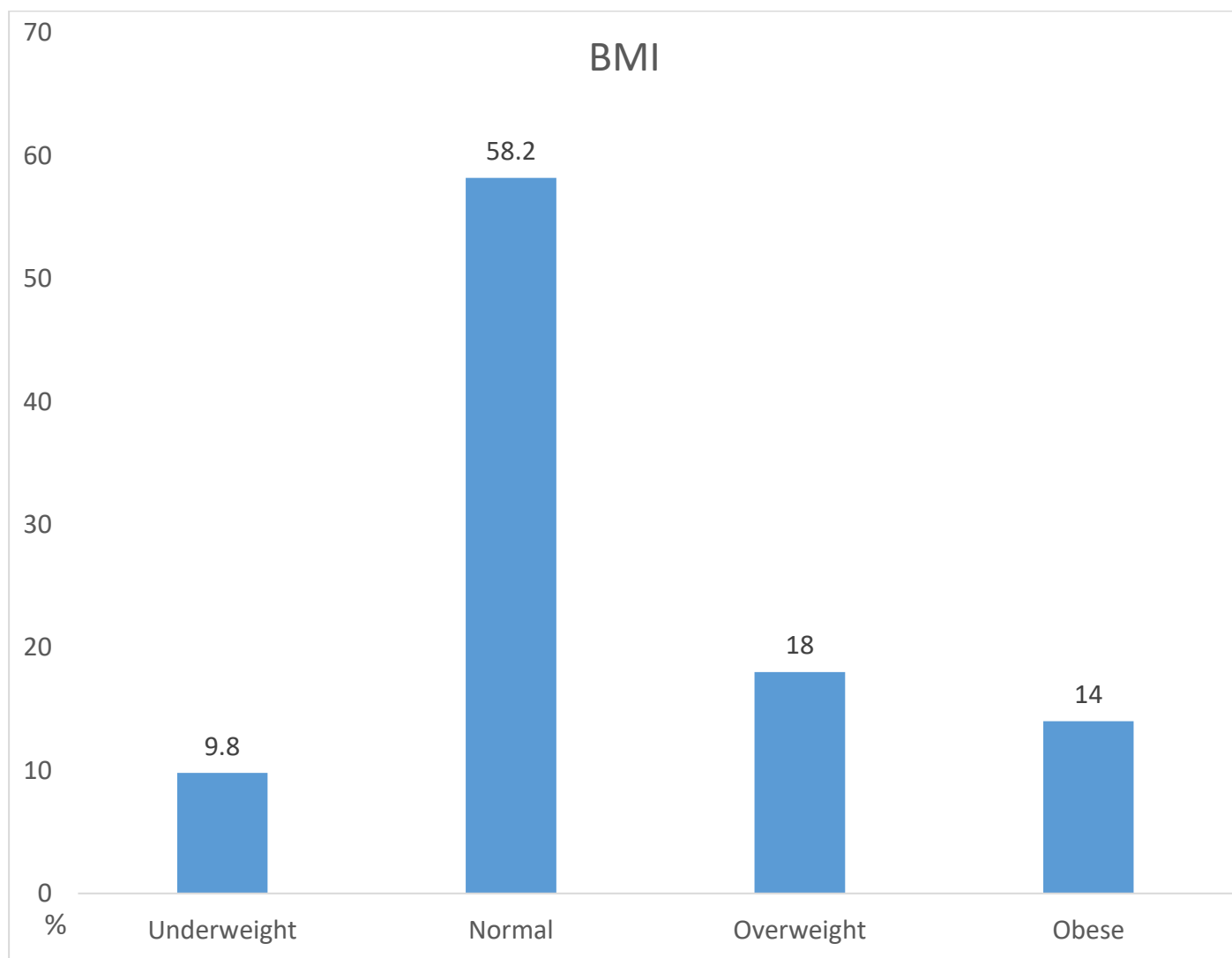
The BMI of the girls were checked and plotted on the CDC growth chart and accordingly grouped into different categories. The percentage of girls in each of the groups were as shown in table 3.

Table 3: BMI of study population

BMI	No.	%
Under weight	49	9.8
Normal	292	58.2
Overweight	90	18
Obese	70	14
Total	501	100

58.2% of the girls had normal BMI, 18% were overweight and 14% were obese.

Figure 4: Percentage distribution according to BMI

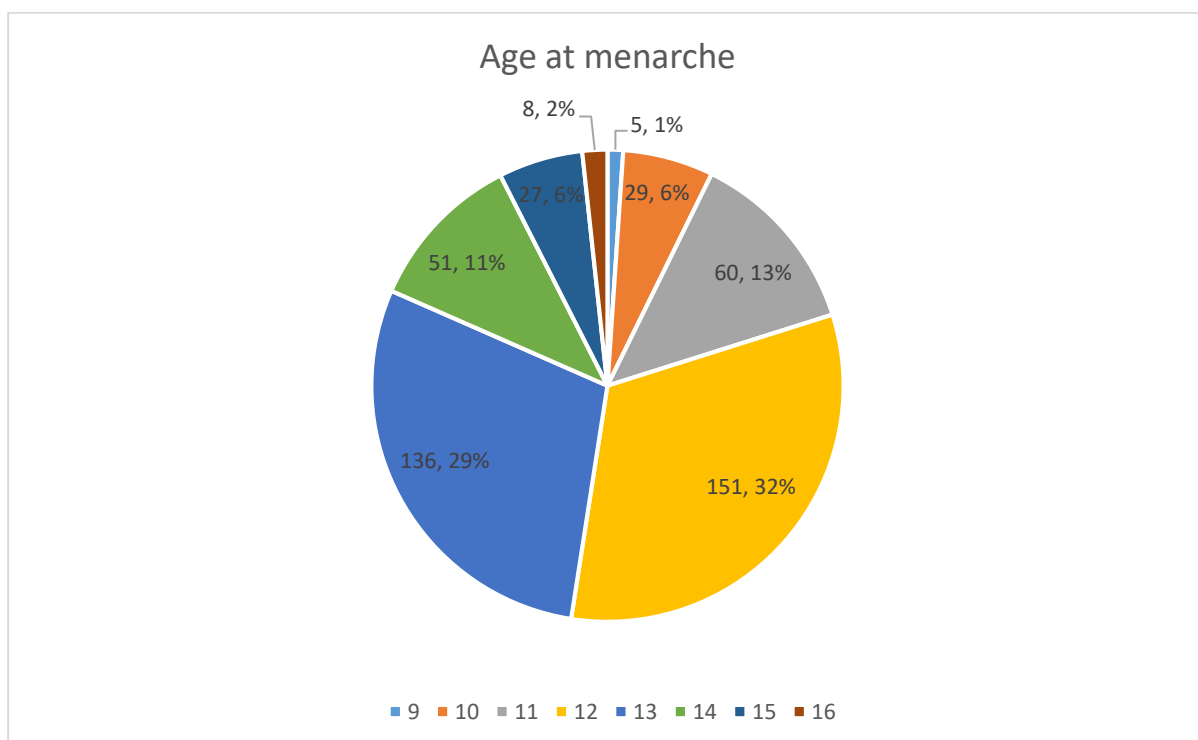


Majority (58.2%) of the girls had normal BMI.

B. Menstrual pattern in study population

Details regarding menstrual cycle such as age at menarche, regularity of cycle, duration, frequency, number of pads changed per day and the passage of clots, were collected.

Figure 5: Age at menarche



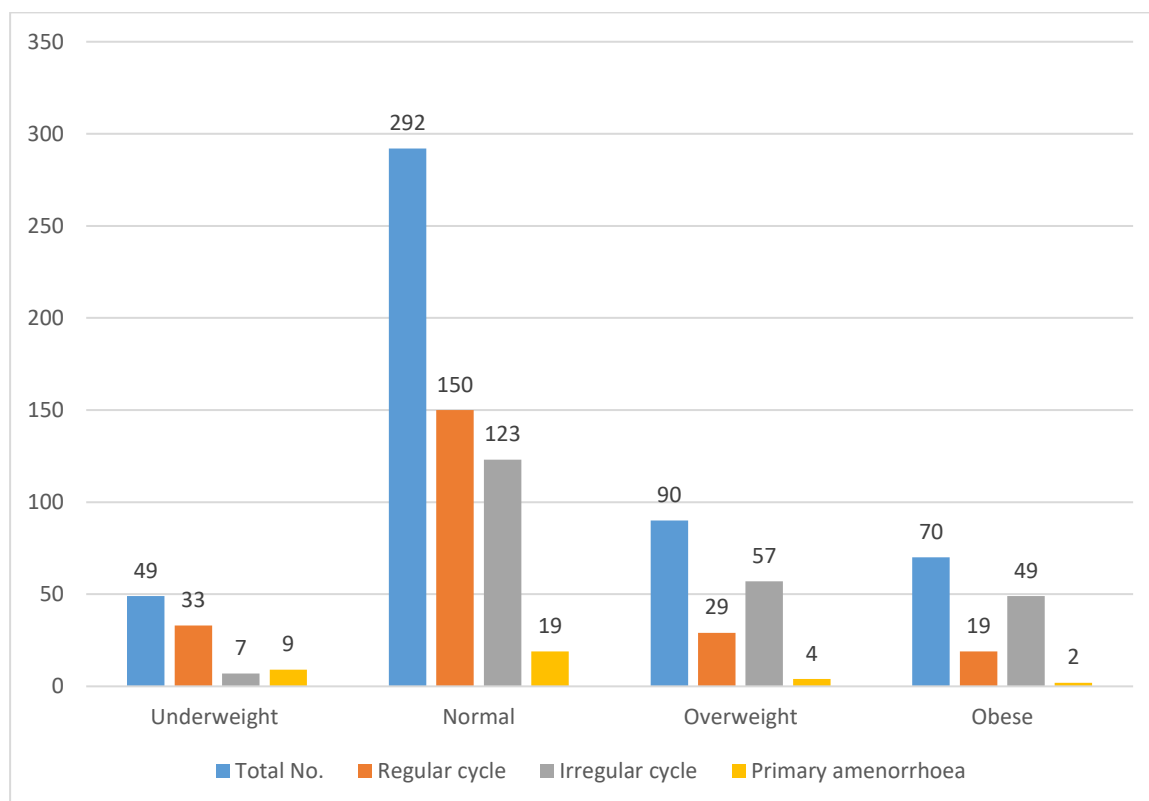
32% of the girls attained menarche at 12 years of age and 2% attained menarche only by 16 years of age. 7% of the girls had primary amenorrhea.

Table 4: Age at menarche- normal BMI and obese

Age at menarche	Number	Mean +/- SD	P value
Normal BMI	274	12.62 +/- 1.299	0.002
Obese	68	12.07 +/- 1.331	

Obese girls attained menarche earlier than girls with normal BMI and this finding was found to be statistically significant.

Figure 6: Menstrual pattern according to BMI



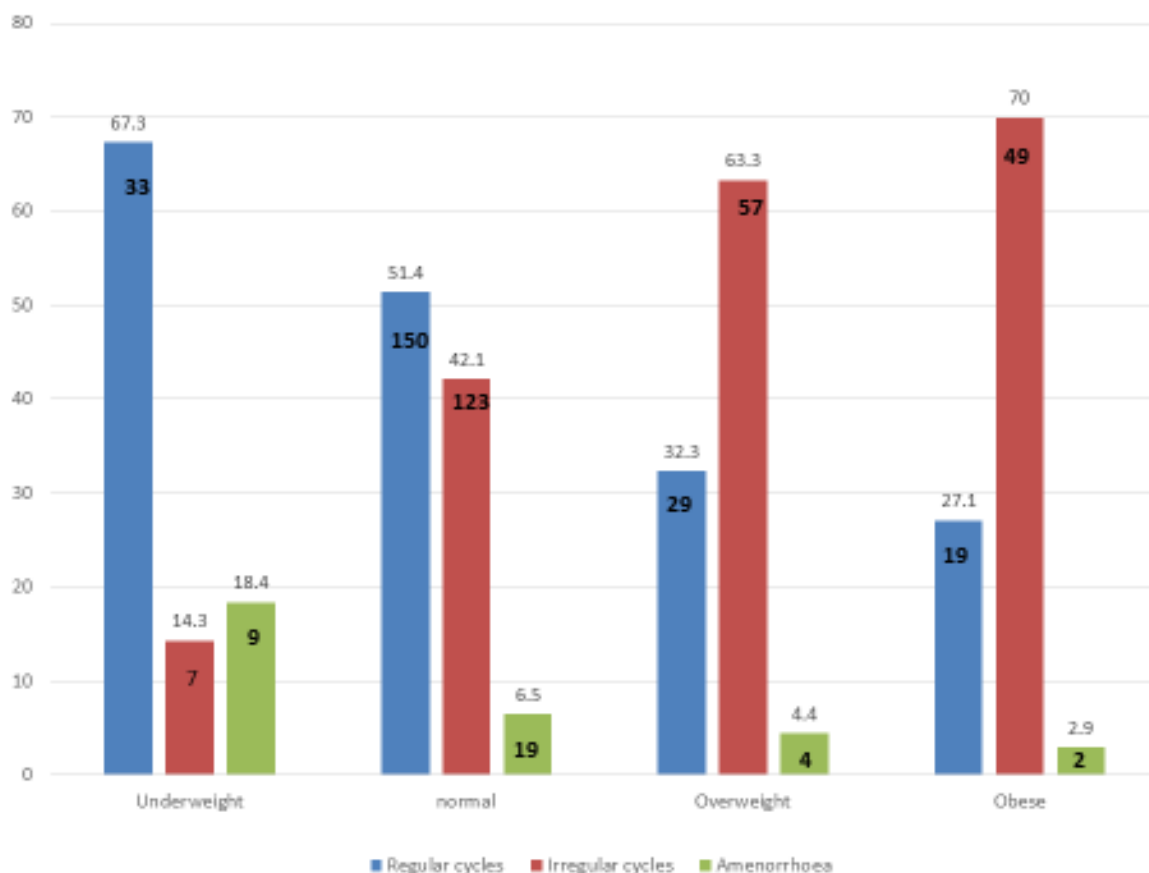
49 girls were underweight- of these 33 had regular cycles, 7 had irregular cycles and 9 had primary amenorrhoea.

Out of the 292 girls who had normal BMI, 150 had regular cycles, 123 had irregular cycles and 19 had primary amenorrhoea.

90 girls were overweight- of these 29 had regular cycles, 57 had irregular cycles and 4 had primary amenorrhoea.

Out of the 70 girls who were obese, 19 had regular cycles, 49 had irregular cycles and 2 had primary amenorrhoea.

Figure 7: BMI and menstrual pattern



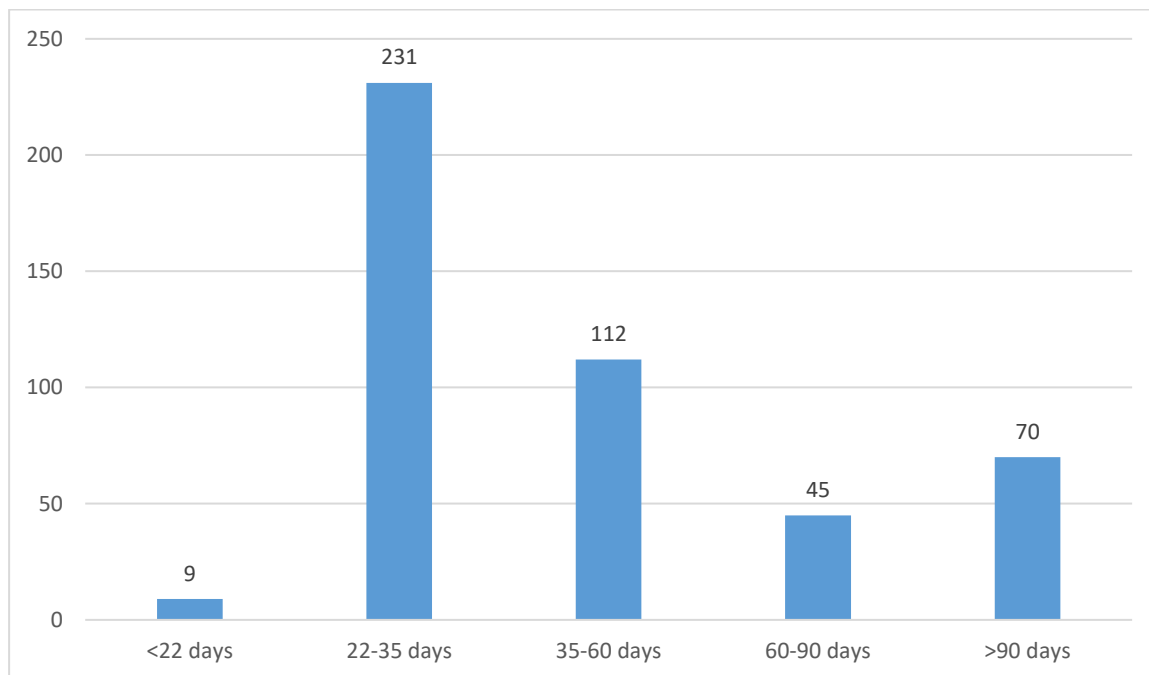
Among the girls who were underweight 67.3% had regular cycles, 14.3% had irregular cycles and 18.4% had primary amenorrhoea.

In girls who had normal BMI 51.4% had regular cycles, 42.1% had irregular cycles and 6.5% had primary amenorrhoea.

Among the girls who were overweight 32.3% had regular cycles, 63.3% had irregular cycles and 4.4% had primary amenorrhoea.

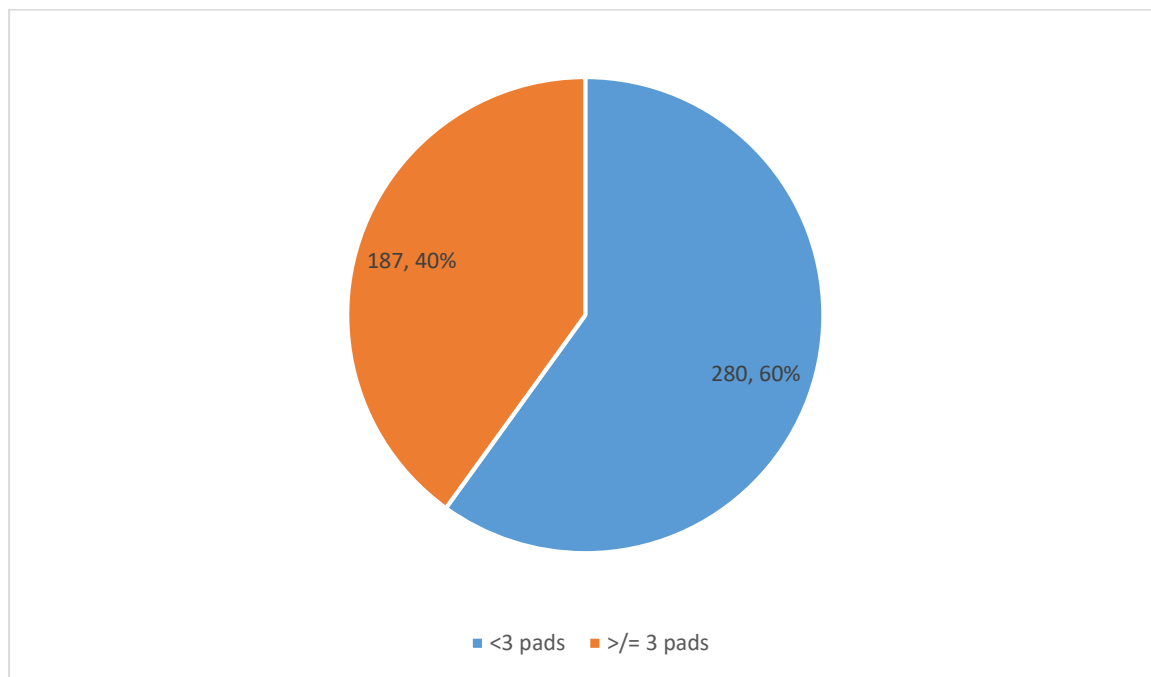
In girls who were obese 27.1% had regular cycles, 70% had irregular cycles and 2.9% had primary amenorrhoea.

Figure 8: Menstrual Pattern- frequency



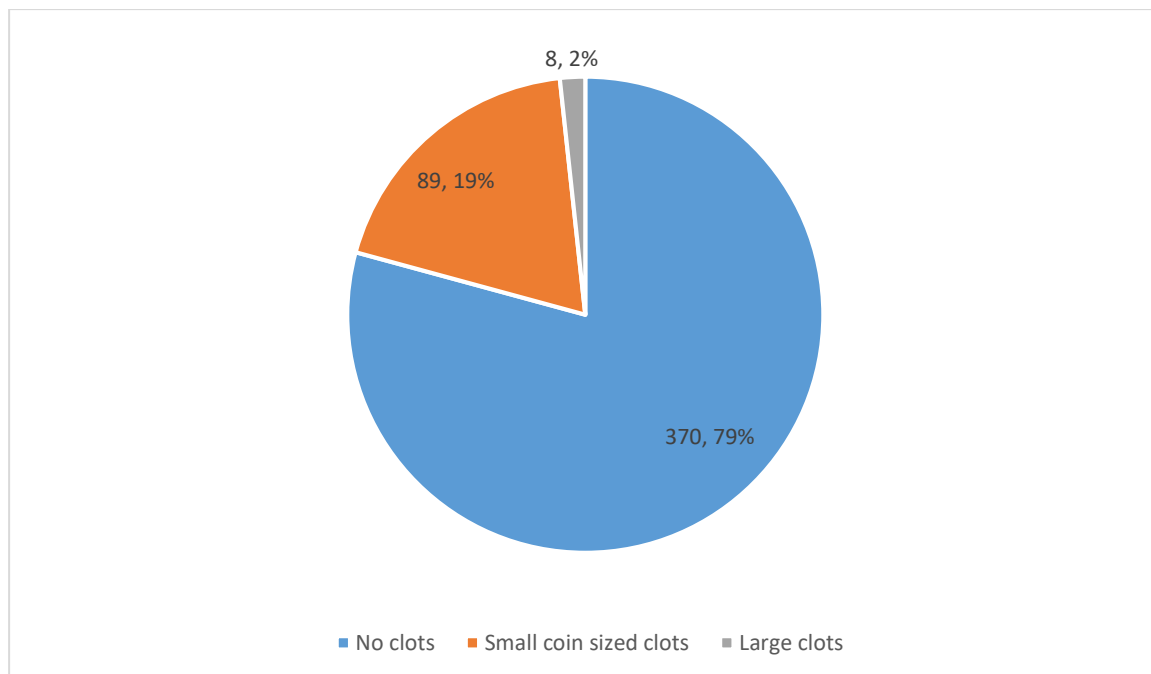
Of the 467(93.2%) girls who had attained menarche, 231(46.1%) girls had cycles every 22-35 days. 45 (9%) girls had cycles once in 2-3 months and 70 (14%) girls had cycles once in more than 3 months.

Figure 9: Pads changed per day



280 (60%) girls changed less than 3 pads per day.

Figure 10: Passage of clots



Only 2% of the patients had history of passage of large clots.

C. Associated comorbidities

Information was gathered regarding the various comorbidities associated with obesity.

Table 5: Comorbidities

Comorbidities	Normal BMI	Obese
Hypertension	1	1
Diabetes Mellitus	1	1
Gallstones	1	0
Non Alcoholic fatty liver	2	0
Hypothyroid	12	7

Of the 501 girls, two had hypertension, 1 each in the obese and normal BMI category.

Two girls had diabetes mellitus, out of which 1 girl was obese and 1 girl had normal BMI.

Interestingly it was seen that gallstones and non alcoholic fatty liver disease commonly associated with obesity, was seen in girls with normal BMI and not in the obese population.

Incidence of hypothyroidism was 4.1% in patients with normal BMI and 10% in obese patients. None of the patients had a history of slipped capital femoral epiphysis.

Table 6: Hypothyroidism - normal BMI and obese

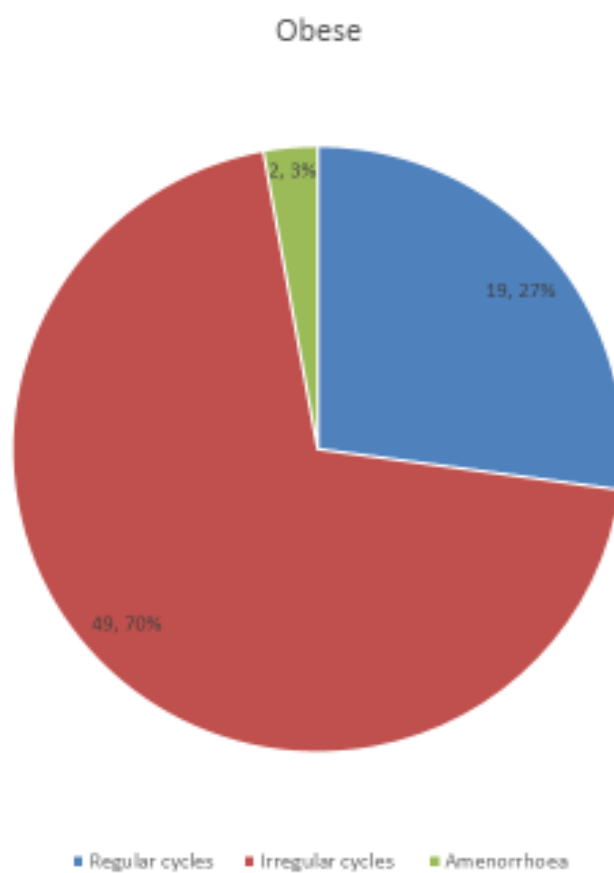
Hypothyroidism	Normal BMI	Obese	P value
Yes	12	7	0.068
%	4.1%	10%	
No	280	63	
%	95.9%	90%	

Statistical significance in the incidence of hypothyroidism is not seen between the two groups.

D. Menstrual pattern in obese adolescents

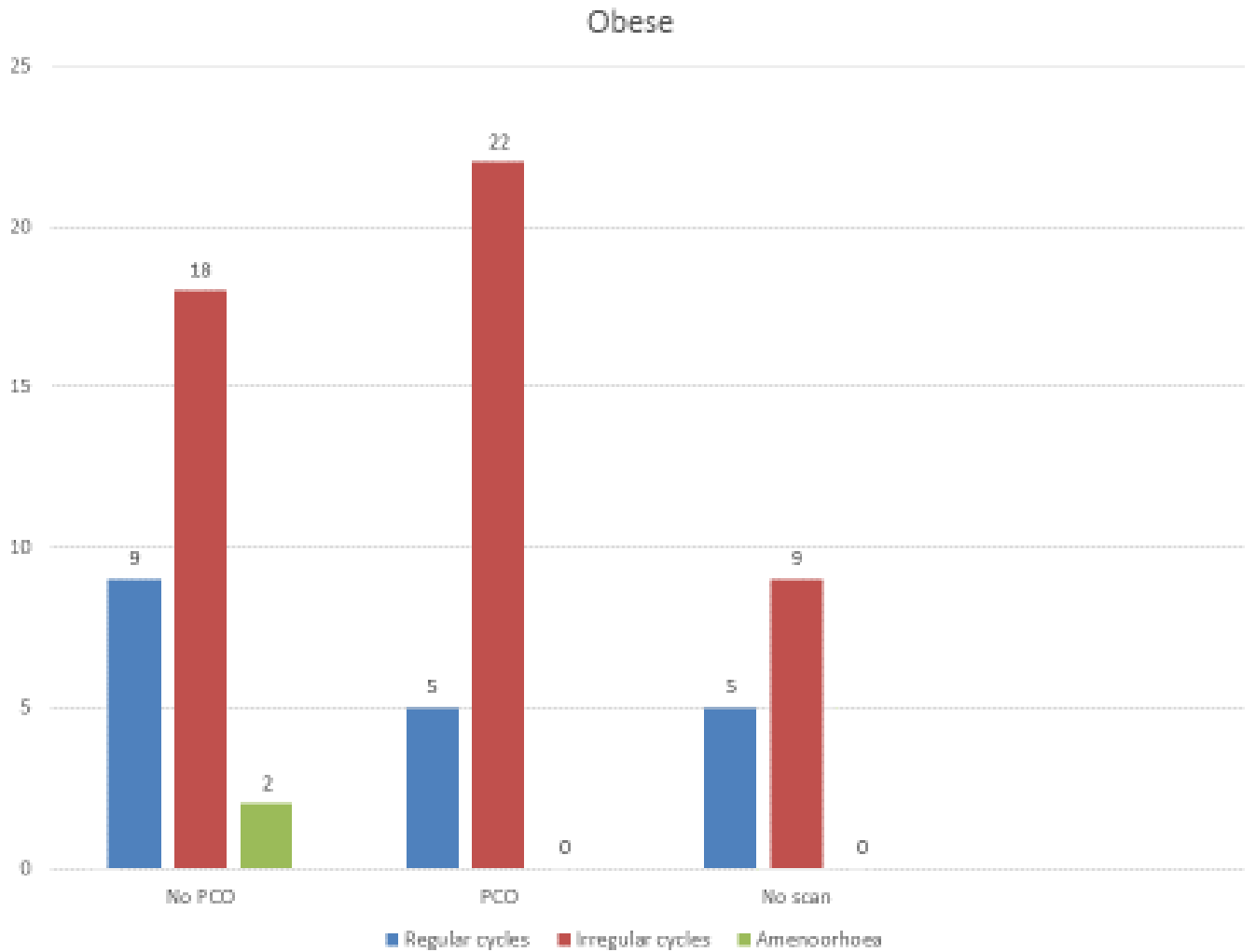
Majority of the obese adolescent girls were found to have irregular cycles.

Figure 11: Menstrual pattern in obese girls



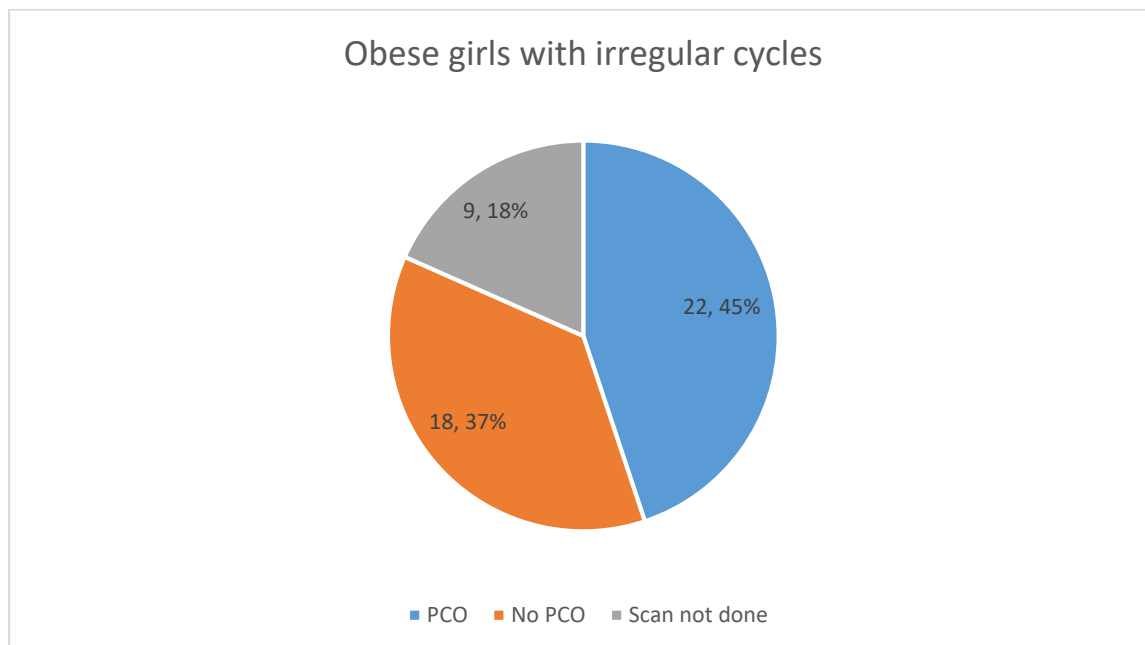
Seventy girls were obese, out of these 49 (70%) had irregular cycles, 19 (27%) had regular cycles, and 2 (3%) had primary amenorrhoea.

Figure 12: USG findings in obese girls



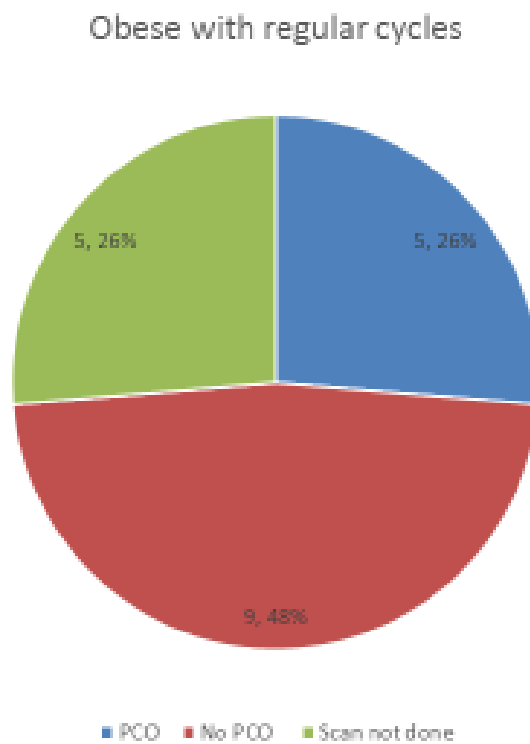
Of the 70 obese girls, 29 (41.4%) had no PCOM on scan, 27 (38.6%) had PCOM and scan was not done for 14 (20%) girls.

Figure 13: PCOM in obese girls with irregular cycle



Scan was done for 40 (82%) obese girls with irregular cycles. Twenty two (45%) of the girls had PCOM and 18 (37%) had no PCOM.

Figure 14: Obese girls with regular cycles



Scan was done for 14 (74%) of the obese girls with regular cycles. Out of this, 5 (26%) girls had PCOM and 9 (48%) girls had no PCOM.

E. Risk factors for obesity

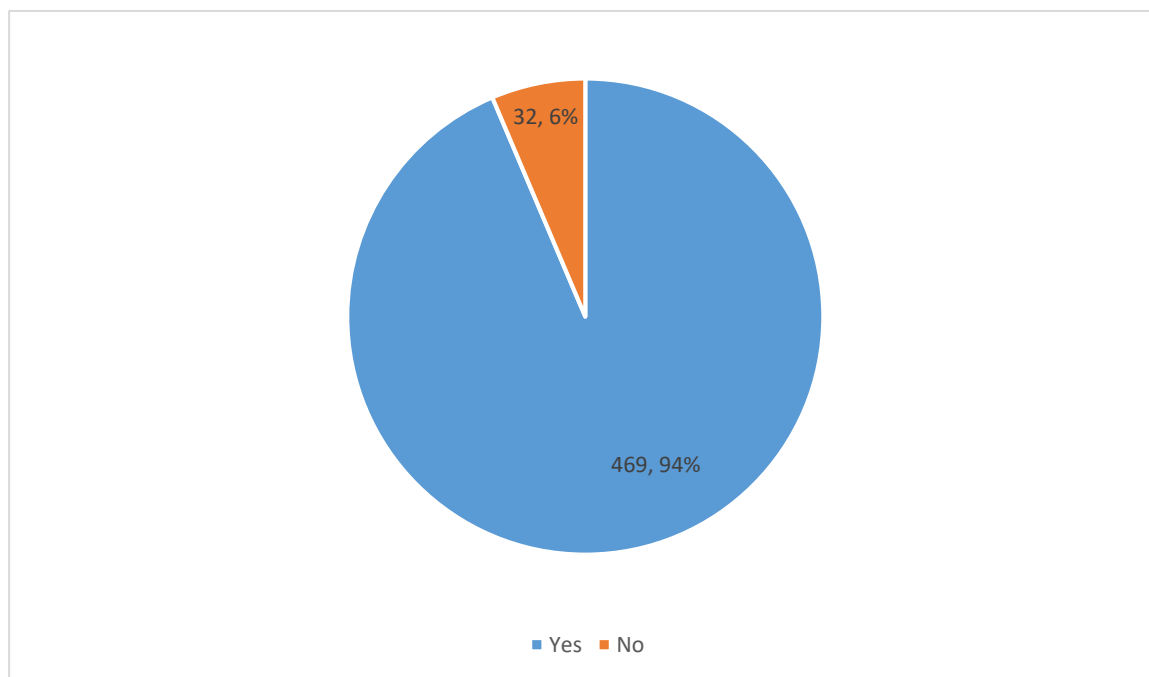
Information was collected regarding various factors involved in the etio-pathogenesis of obesity.

Table 7: Weight at birth- normal BMI and obese

Weight at birth	Number	Mean +/- SD	P value
Normal BMI	280	2.725 +/- 0.5013	0.05
Obese	67	2.864 +/- 0.5956	

Obese adolescents were found to have a higher birth weight than those with a normal BMI and the difference was found to be significant.

Figure 15: Breast Feeding



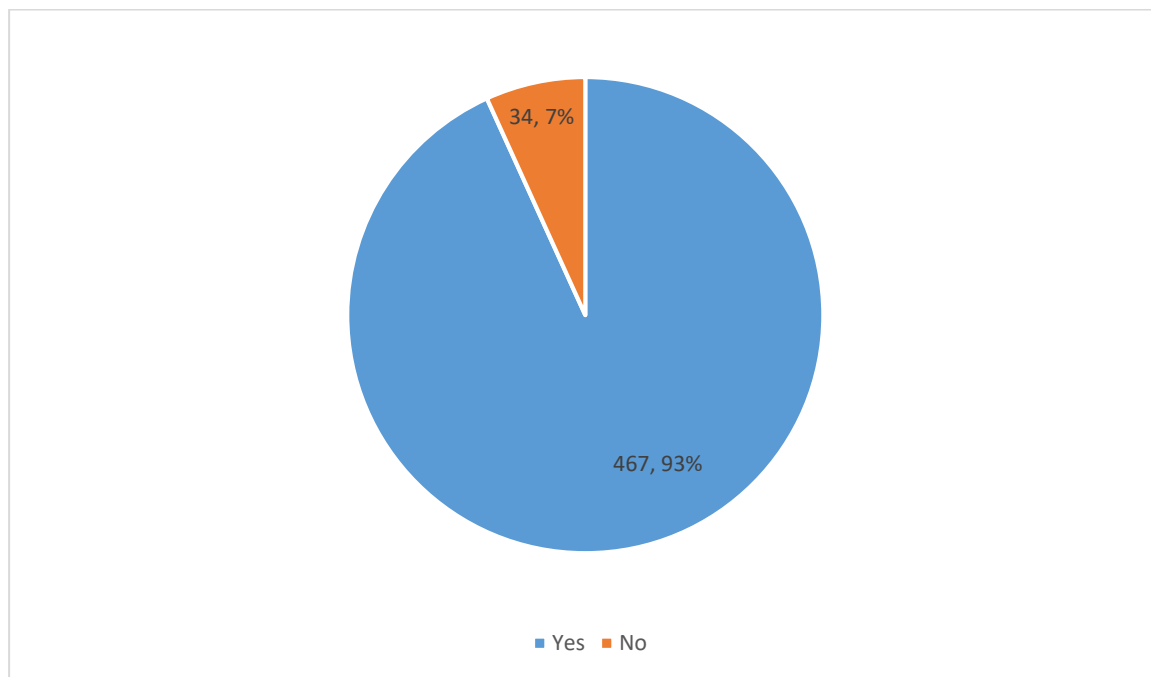
Of the 501 girls, 94% were breast fed.

Table 8: Breast feeding- normal BMI and obese

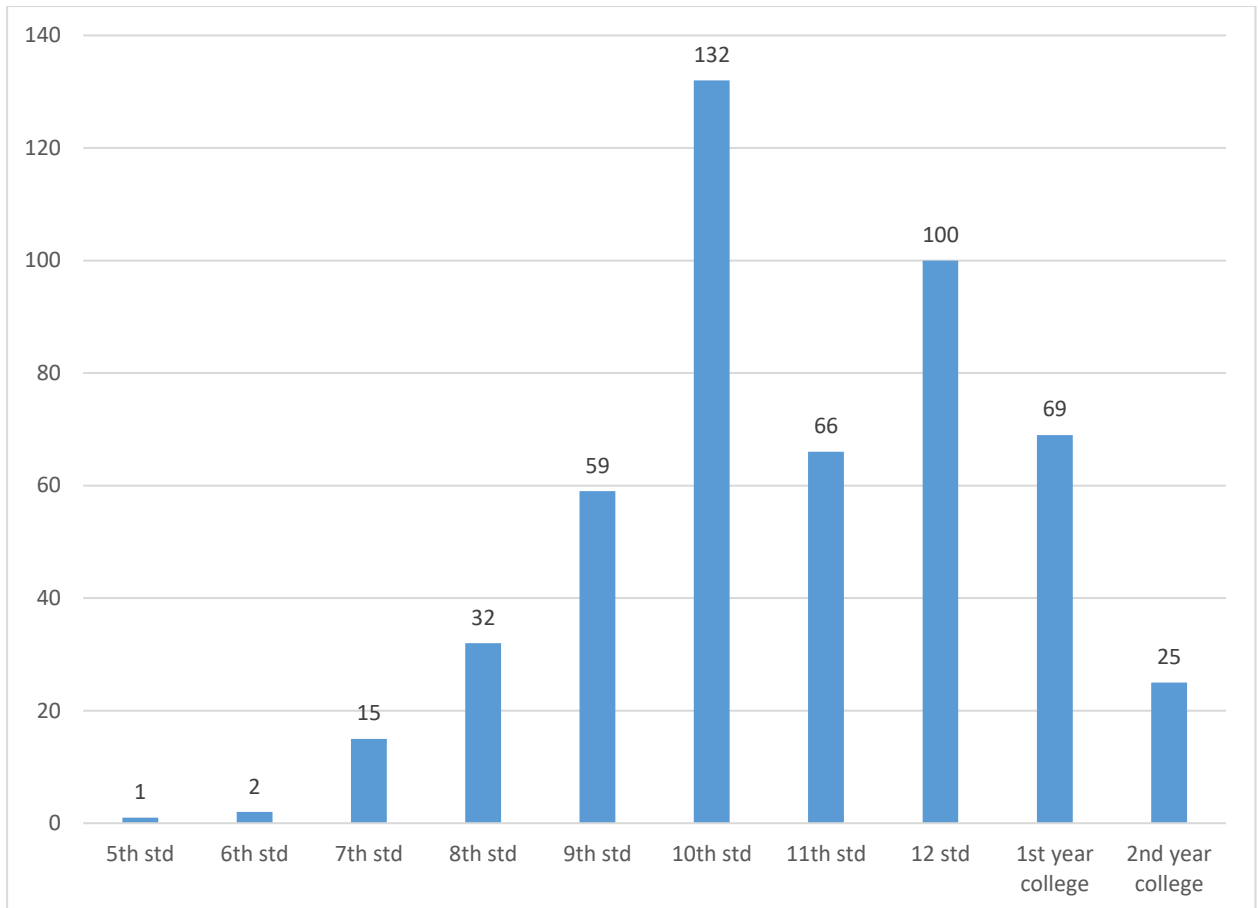
Breast feeding	Normal BMI	Obese	P value
Yes	271	65	0.989
%	92.8%	92.9%	
No	21	5	
%	7.2%	7.1%	

About 7% of girls with normal BMI and in the obese category were not breast fed. Absence of breast feeding was not found to be a significant risk factor for obesity in adolescents.

Figure 16: Current educational status



7% of the girls had dropped out of school.

Figure 17: Grade at school/college

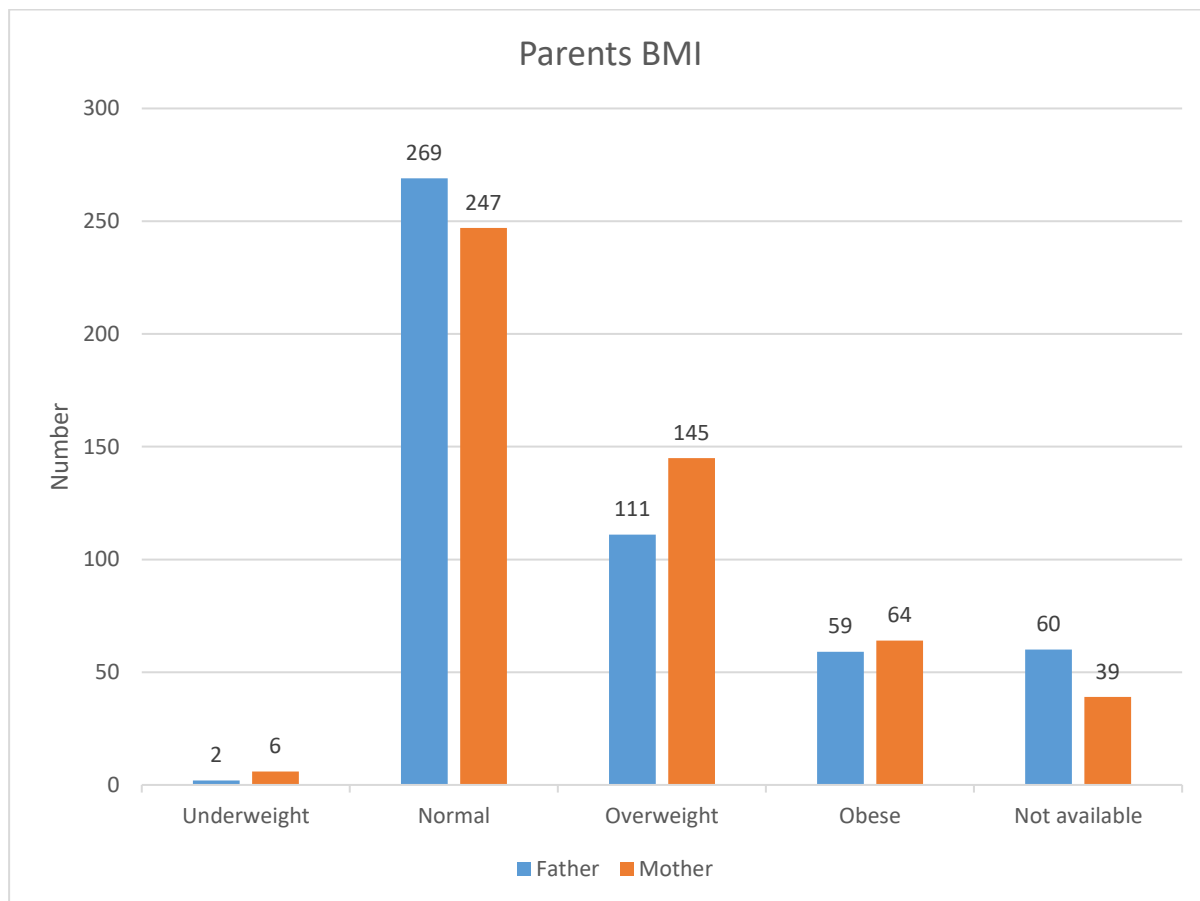
Majority 298 (59.5%) of the students were in the 10th- 12th grade, 94 (18.8%) were college students.

Table 9: Parents BMI

		Father	%	Mother	%
BMI	Underweight	2	0.4	6	1.2
	Normal	269	53.7	247	49.3
	Overweight	111	22.1	145	28.9
	Obese	59	11.8	64	12.8
	Total	441	88.0	462	92.2
Missing	System	60	12	39	7.8
Total		501	100	501	100

11.8% of the fathers and 12.8% of the mothers were obese.

Figure 18: Parents BMI



53.7% fathers and 49.3% mothers had normal BMI.

Table 10: Fathers BMI- normal BMI and obese

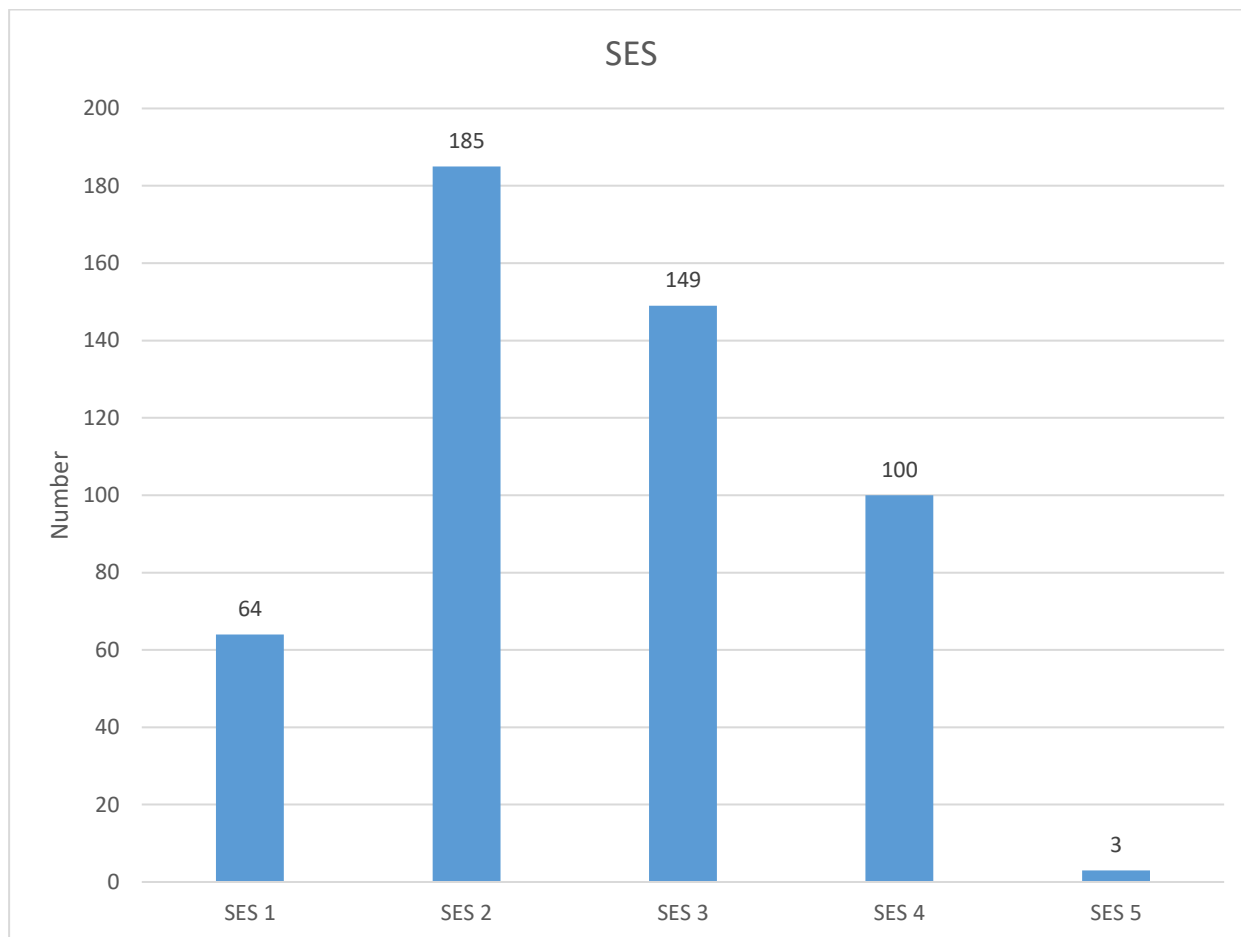
	Number	Mean +/- SD	P value
Normal	144	24.7408 +/- 3.65209	<0.01
Obese	37	27.6230 +/- 4.31914	

Table 11: Mothers BMI - normal BMI and obese

	Number	Mean +/- SD	P value
Normal	155	25.0476 +/- 3.82128	<0.01
Obese	37	28.0103 +/- 5.28000	

Parental obesity was associated with adolescent obesity in the children and this was found to be statistically significant.

Figure 19: SES



Majority (37%) of the patients belonged to SES class 2 and 30% belonged to SES class 3.

Table 12: SES - normal BMI and obese

SES	Normal BMI	Obese	P value
1	33	12	0.413
%	11.3%	17.1%	
2	107	24	
%	36.6%	34.3%	
3-5	152	34	
%	52.1%	48.6%	

There was no statistically significant difference in the SES between obese patients and those with normal BMI.

Figure 20: Obesity in siblings



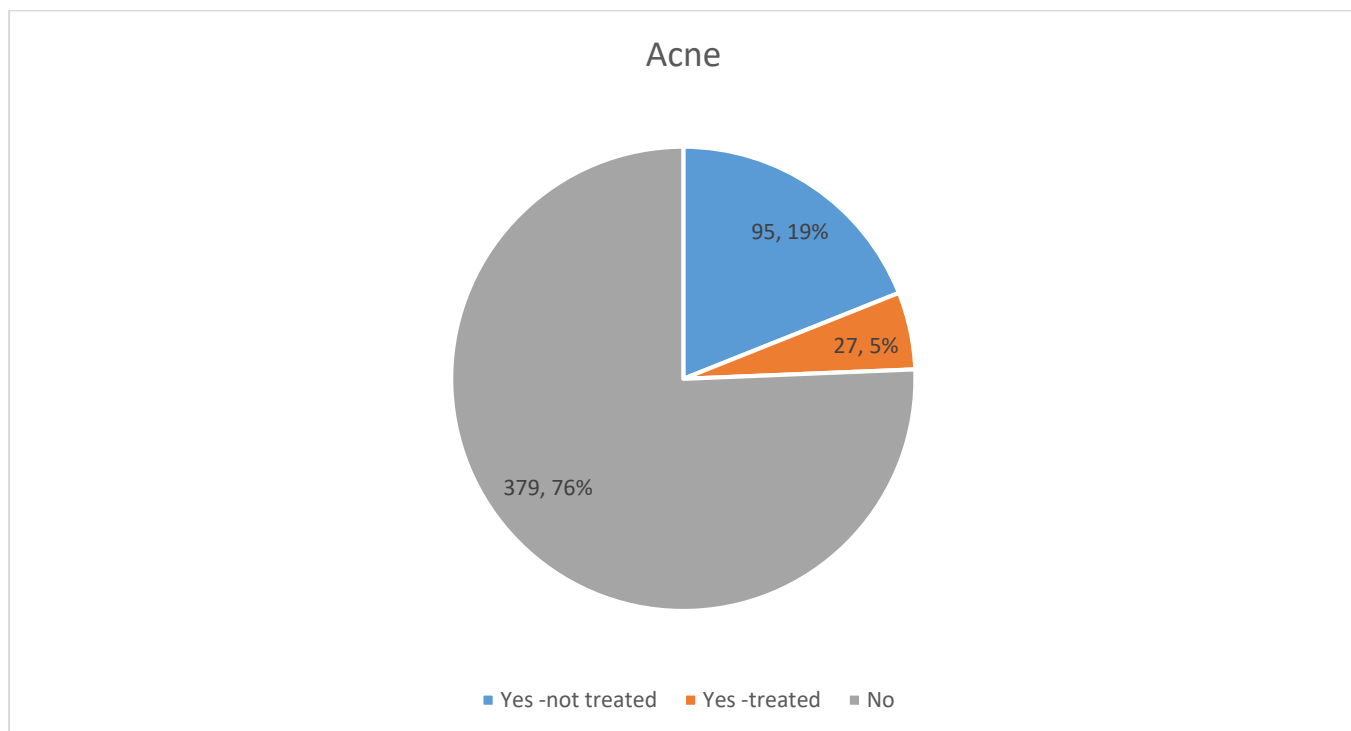
12% of the girls had siblings who were obese and 14% had no siblings.

Table 13: Obesity in siblings - normal BMI and obese

Obesity in siblings	Normal BMI	Obese	P value
Yes	23	18	<0.01
%	7.9%	25.7%	
No	230	40	
%	78.8%	57.1%	
No sibling	39	12	
	13.4%	17.1%	

Adolescents who were obese had siblings who were obese too and this finding was statistically significant.

Figure 21: History of acne and treatment



122 (24.4%) girls had acne of which only 27 (22.1%) required topical treatment.

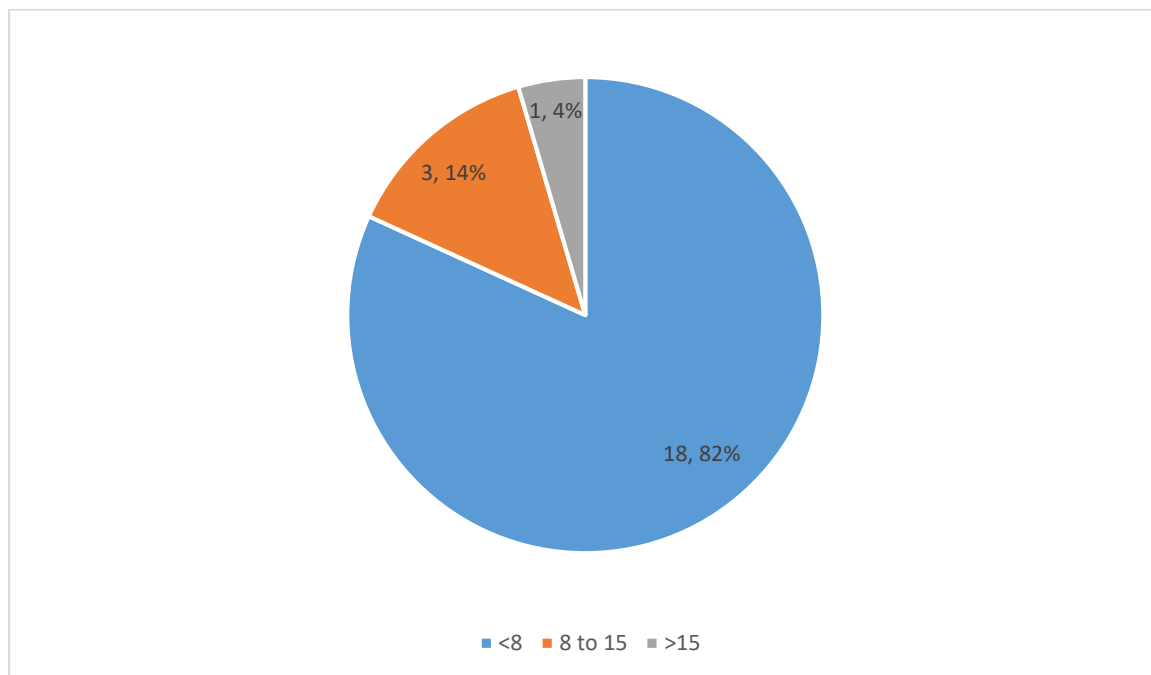
Table 14: Acne and PCOM

Acne	PCOM
Yes	47
No	116

47 (38.5%) girls with acne had PCOM.

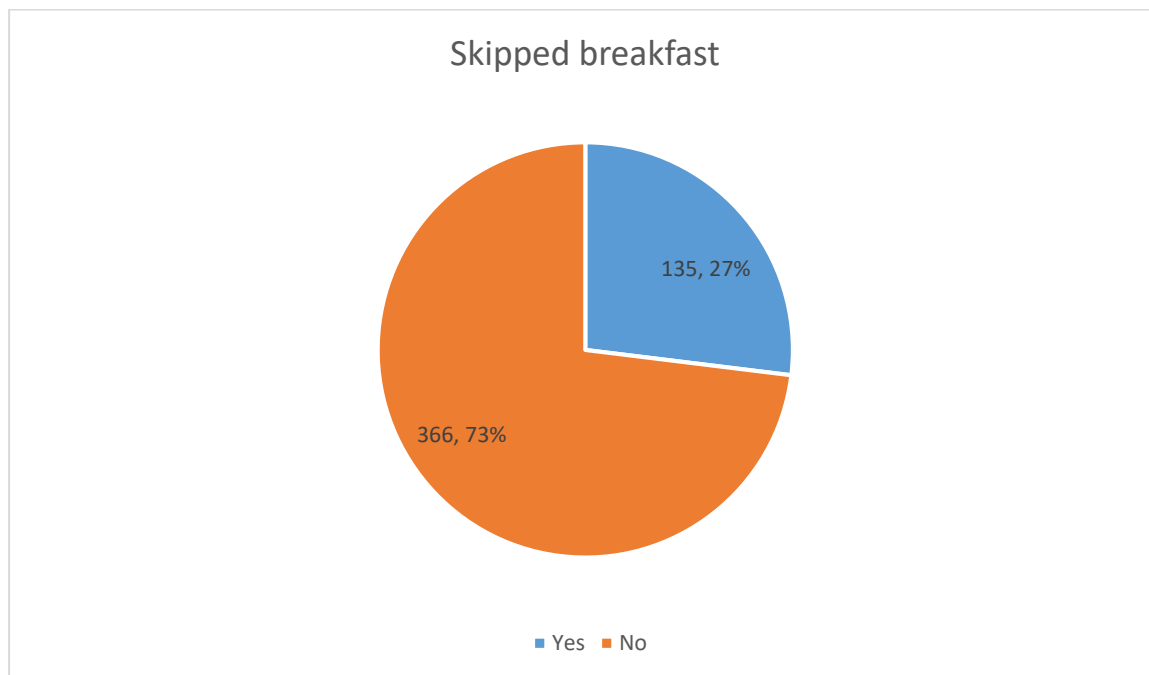
35 (7%) of the total girls had irregular cycles, acne and PCOM.

Figure 22: Hirsutism- Ferriman Gallwey score



According to the score < 8 is normal, 8-15 is mild hirsutism and >15 is moderate to severe hirsutism. 3 girls had mild hirsutism and 1 girl had severe hirsutism.

Figure 23: Breakfast habit



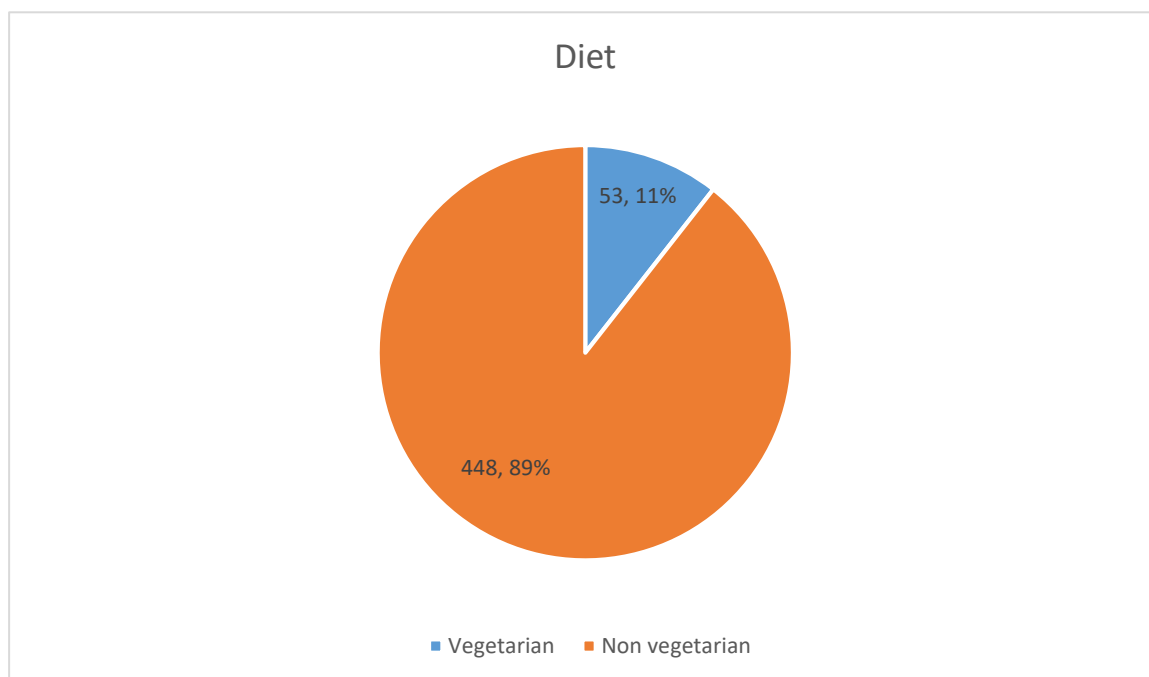
27% of the girls skipped breakfast.

Table 15: Breakfast habit - normal BMI and obese

Breakfast	Normal	Obese	P value
Yes	76	19	0.849
	26%	27.1%	
No	216	51	
	74%	72.9%	

There was no statistical difference between the two groups in breakfast habits.

Figure 24: Diet



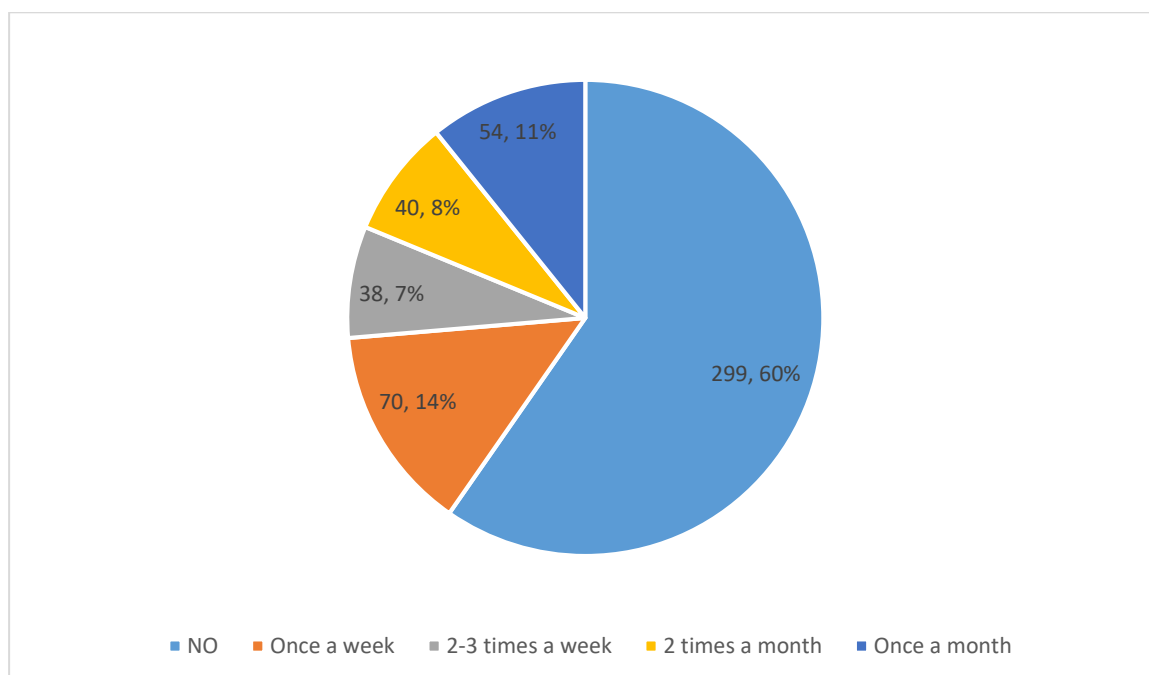
Majority (89%) were non vegetarians.

Table 16: Diet - normal BMI and obese

Diet	Normal	Obese	P value
Vegetarian	29	5	0.473
	9.9%	7.1%	
Non-vegetarian	263	65	
	90.1%	92.9%	

There was no statistical difference between the two groups with reference to the type of diet.

Figure 25: "Eating out"



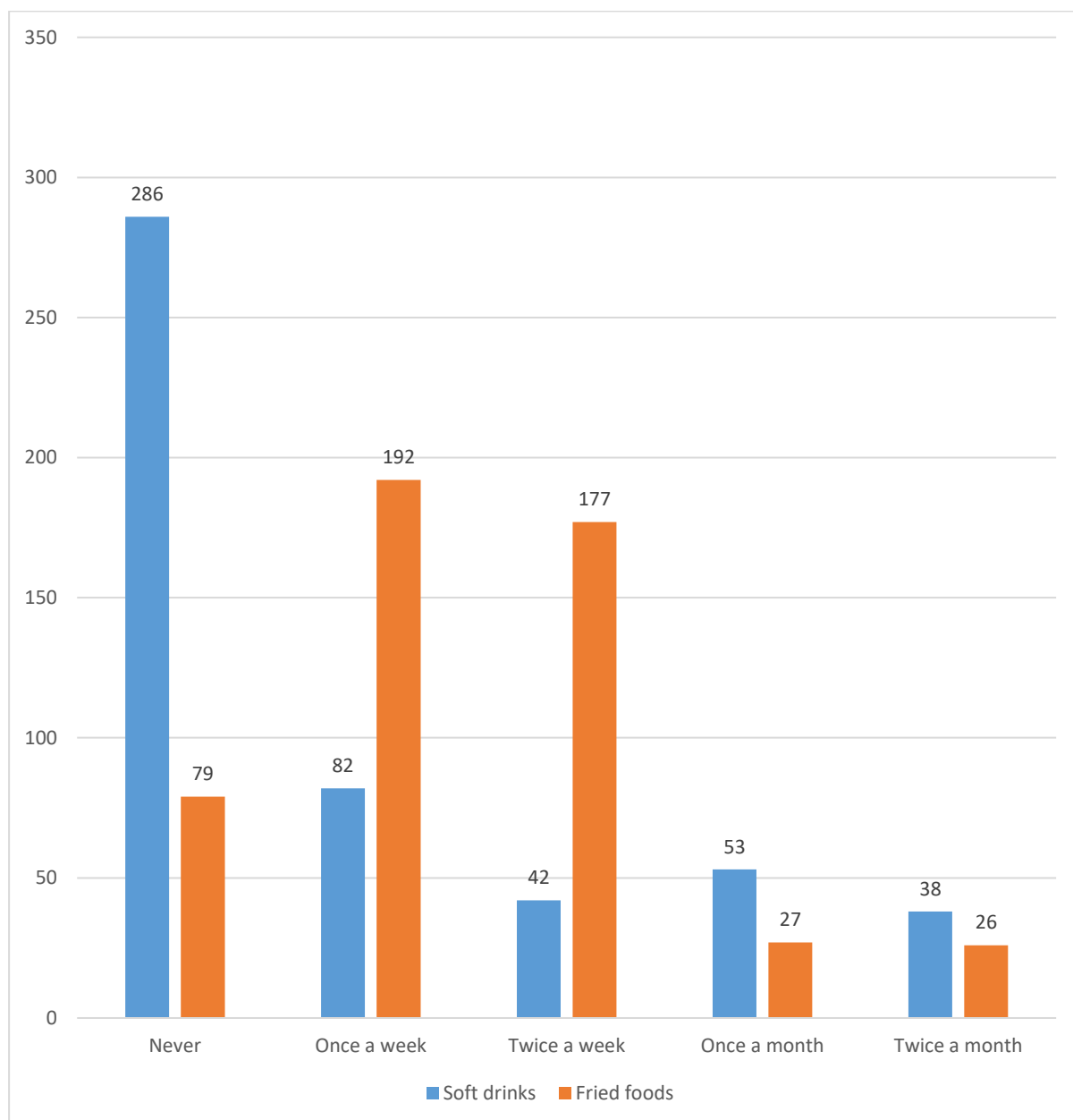
60% of the girls were not in the habit of eating in hotels, restaurants or fast food joints.

Table 17: Eating out - normal BMI and obese

Eating out	Normal	Obese	P value
Yes	114	34	0.145
	39%	48.6%	
No	178	36	
	61%	51.4%	

There was no statistical difference between the two groups with reference to eating out.

Figure 26: Intake of soft drinks / fried food items



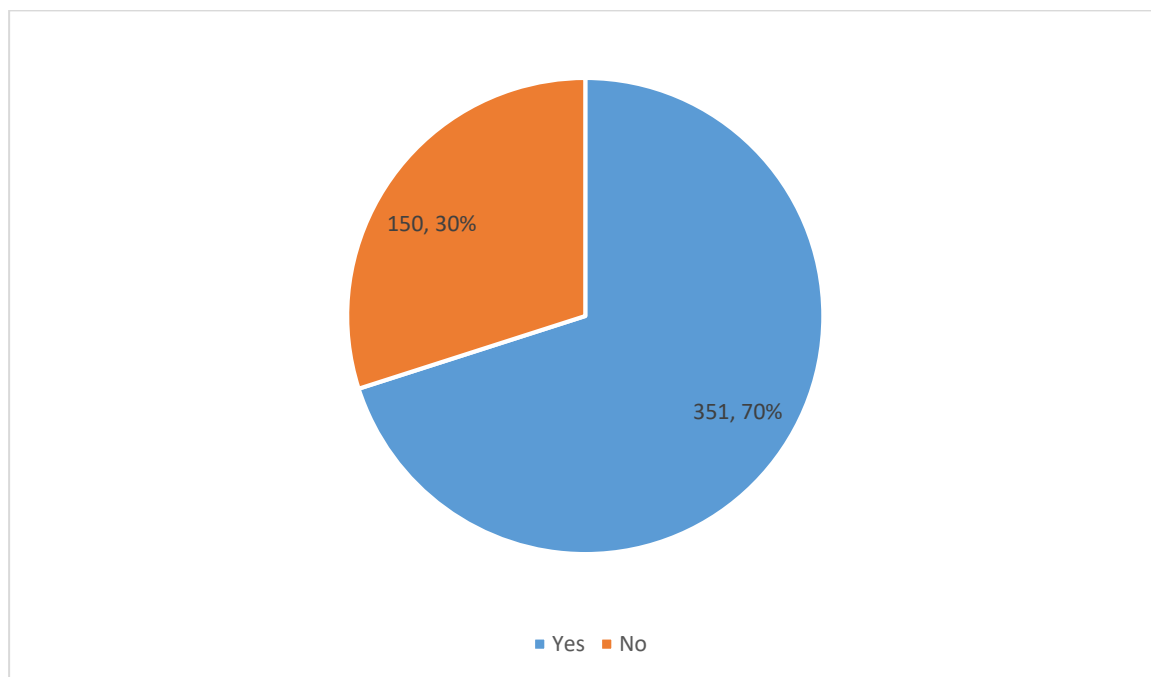
286 (57%) girls denied consumption of soft drinks. 192 (38.3%) girls consumed fried food at least once a week.

Table 18: Intake of soft drinks - normal BMI and obese

Intake of soft drinks	Normal	Obese	P value
Never	175	40	0.719
	59.9%	57.1%	
Once a week	40	14	
	13.7%	20%	
Twice a week	24	6	
	8.2%	8.6%	
Once a month	28	5	
	9.6%	7.1%	
Twice a month	25	5	
	8.6%	7.1%	

There was no statistically significant difference between the two groups in respect to intake of calorie rich diet.

Figure 27: Intake of fruits and vegetables daily



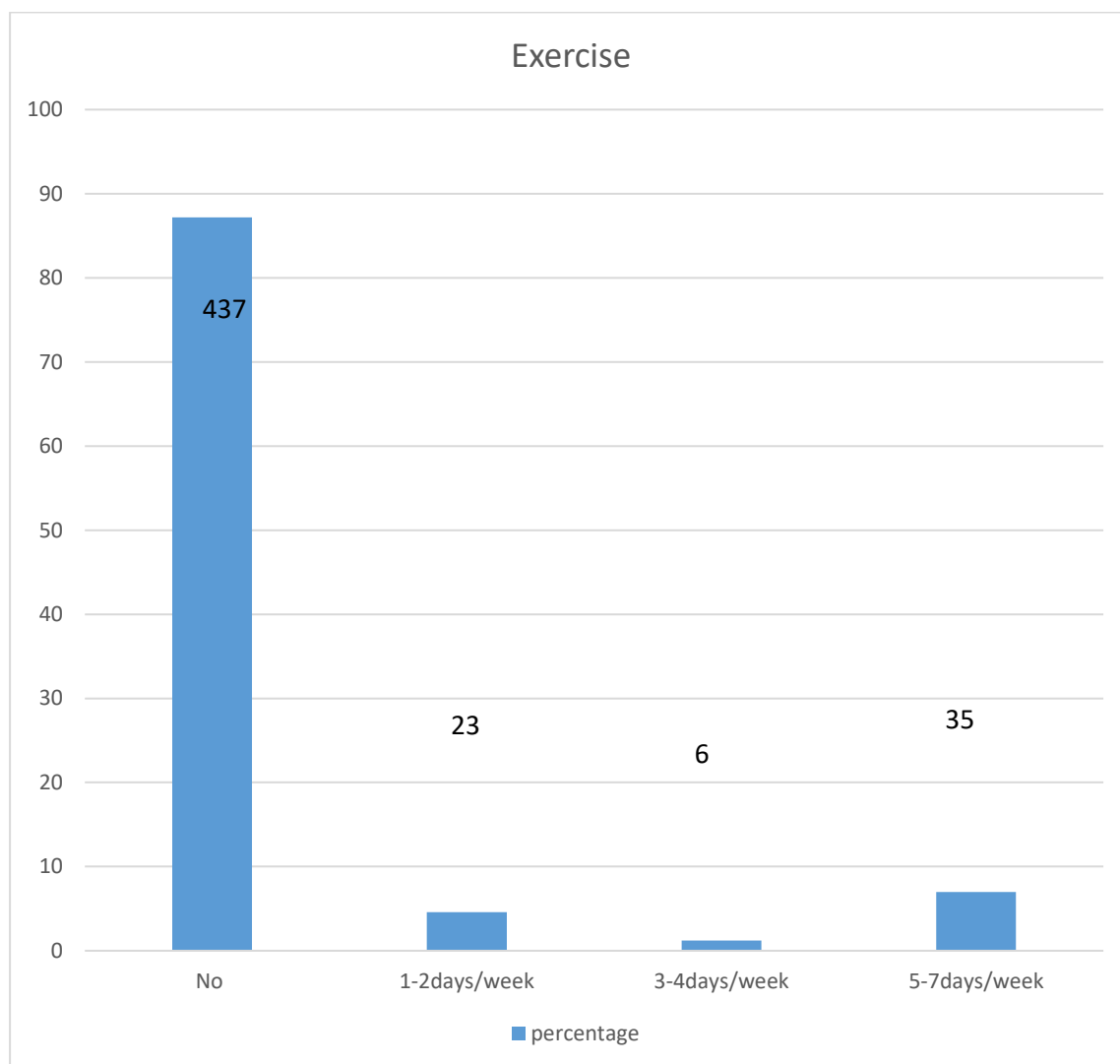
70% of the girls consumed fruits and vegetables daily.

Table 19: Intake of fruits and vegetables daily - normal BMI and obese

Intake of fruits and Veg	Normal	Obese	P value
Yes	205	49	0.973
	70.2%	70%	
No	87	21	
	29.8%	30%	

There was no statistically significant difference between the two groups in the daily intake of fruits and vegetables.

Figure 28: Physical activity (exercise at least 30 min involving profuse sweating)



87.2% of girls had no regular physical activity. 7% of girls were engaged in some physical activity 5-7 days a week.

Table 20: Physical activity - normal BMI and obese

	Normal	Obese	P value
5-7 days	15	10	0.019
	5.1%	14.3%	
3-4 days	3	2	
	1%	2.9%	
1-2 days	12	4	
	4.1%	5.7%	
Never	262	54	
	89.7%	77.1%	

There was statistically significant difference between the two groups in terms of time spent in physical activity.

Figure 29: Regular exercise / yoga



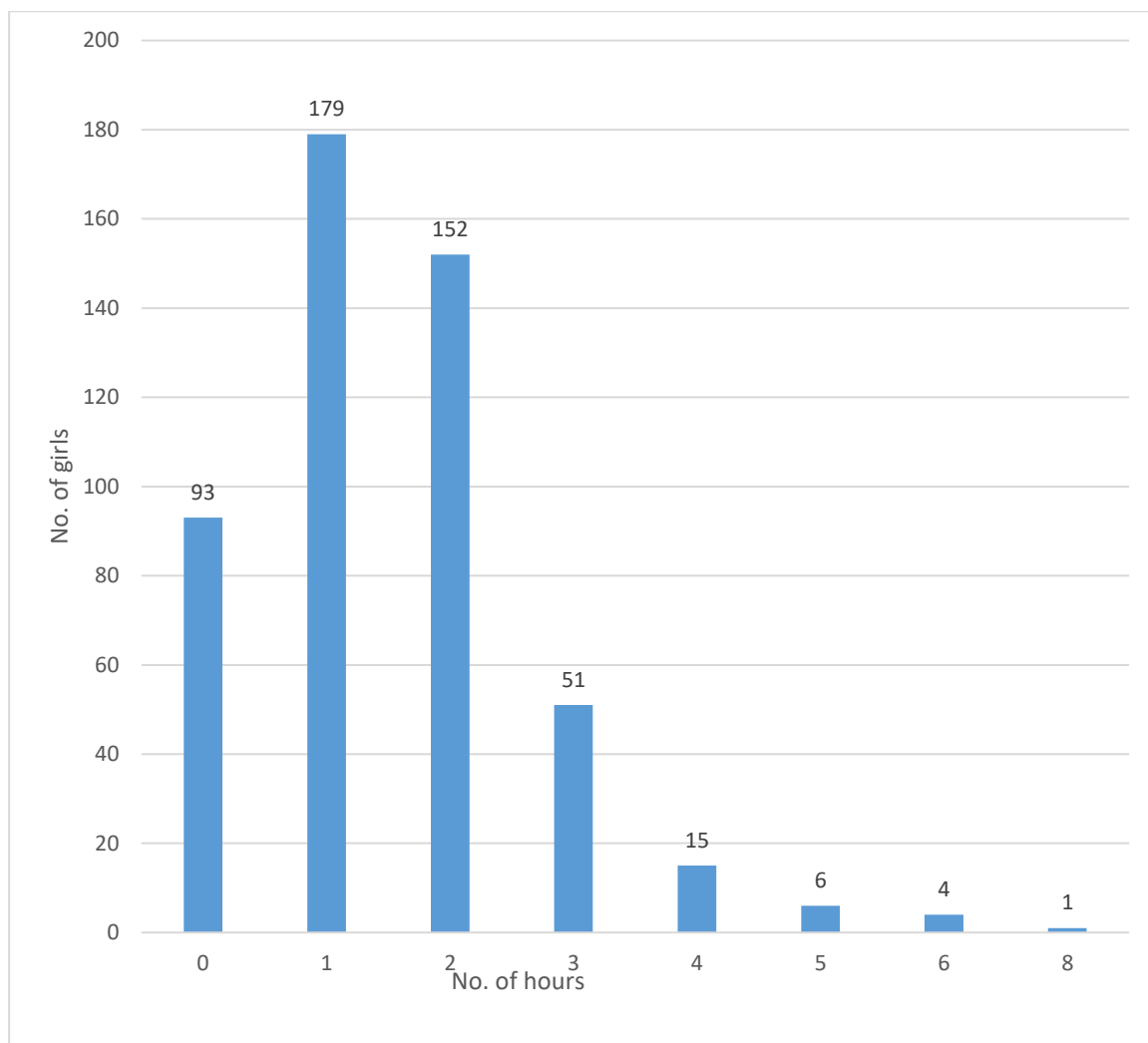
10% of the girls engaged in regular exercise or yoga.

Table 21: Regular exercise/yoga - normal BMI and obese

Regular exercise/Yoga	Normal BMI	Obese	P value
Yes	26	12	0.043
%	8.9%	17.1%	
No	266	58	
%	91.1%	82.9%	

There was statistically significant difference between the groups in terms of time spent in light exercise/yoga.

Figure 30: Screen time



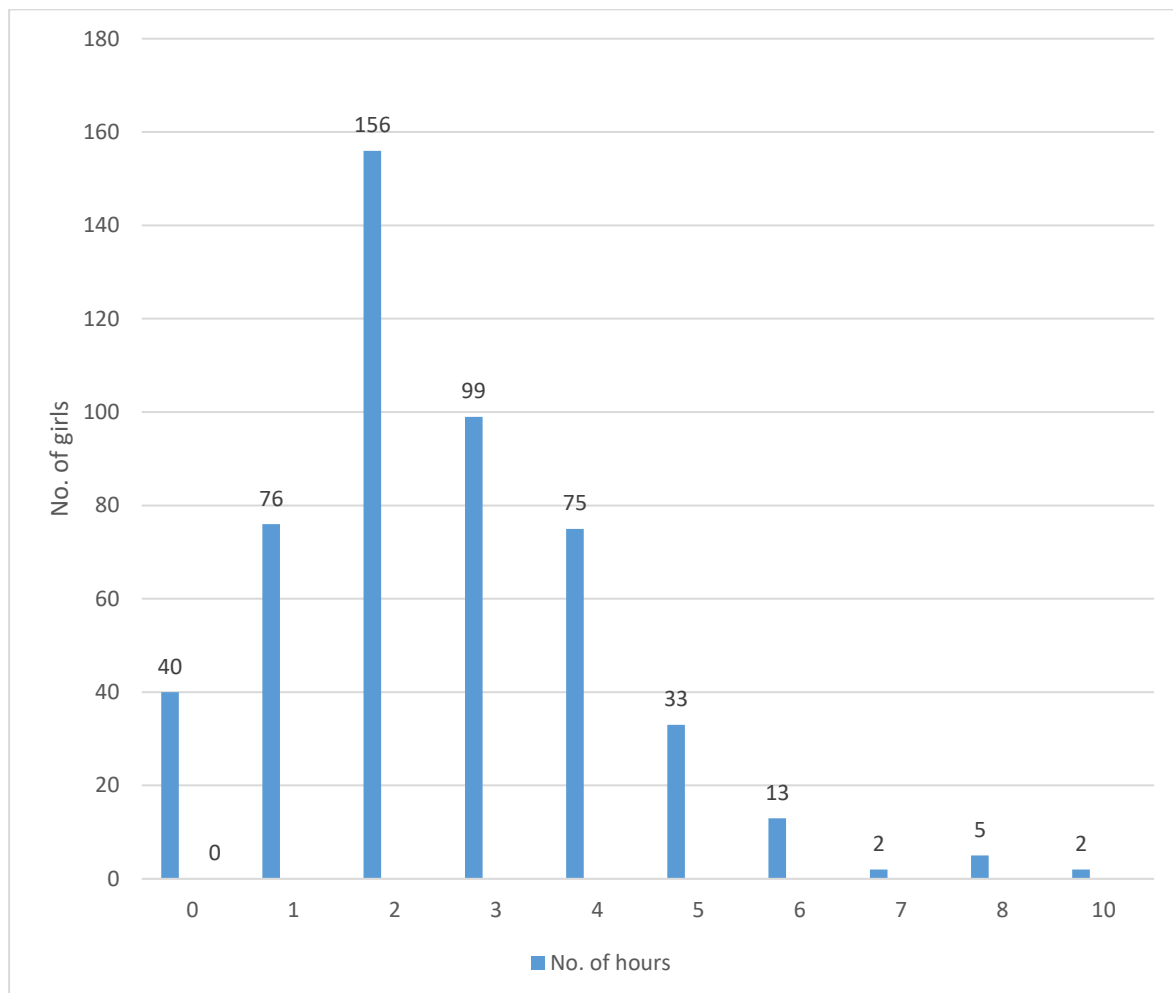
Majority of the girls (35.7%) spent 1 hour in front of the screen daily.

Table 22: Screen time - normal BMI and obese

No. of hours	Normal BMI	Obese	P value
0 hours	49	15	0.284
%	16.8%	21.4%	
<3 hours	231	50	
%	79.1%	71.4%	
>3 hours	12	5	
%	4.1%	7.1%	

There was no statistically significant difference in the screen time between the two groups.

Figure 31: Hours spent on computer/talking on phone/doing homework



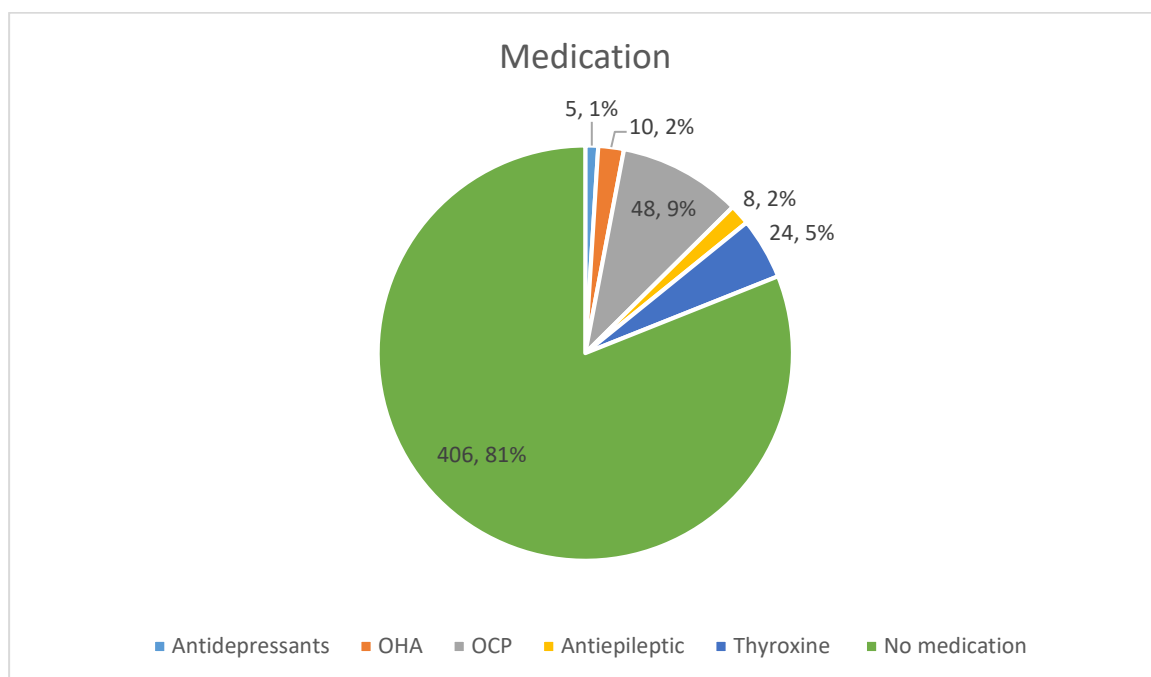
31.1% spent about 2 hours a day in desk bound activities.

Table 23: Hours spent on computer/talking on phone/doing homework -normal BMI and obese

No. of hours	Normal BMI	Obese	P value
0 hours	21	7	0.678
%	7.2%	10%	
<3 hours	196	44	
%	67.1%	62.9%	
>3 hours	75	19	
%	25.7%	27.1%	

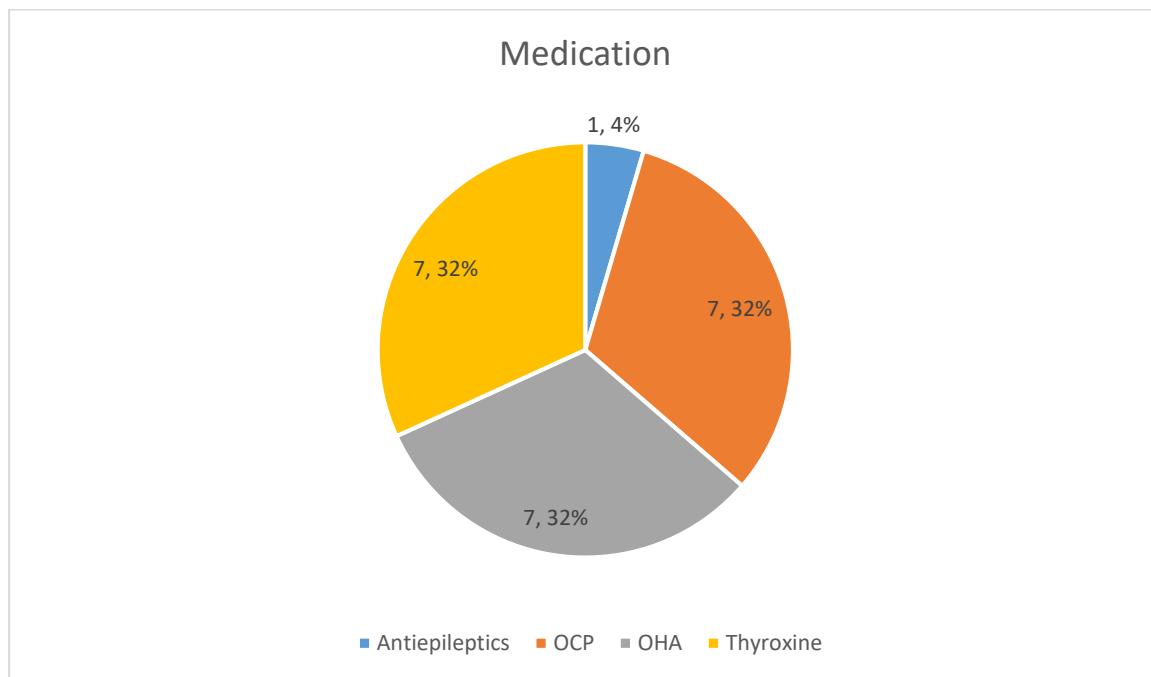
There was no statistically significant difference between the two groups in terms of sedentary lifestyle.

Figure 32: Medication



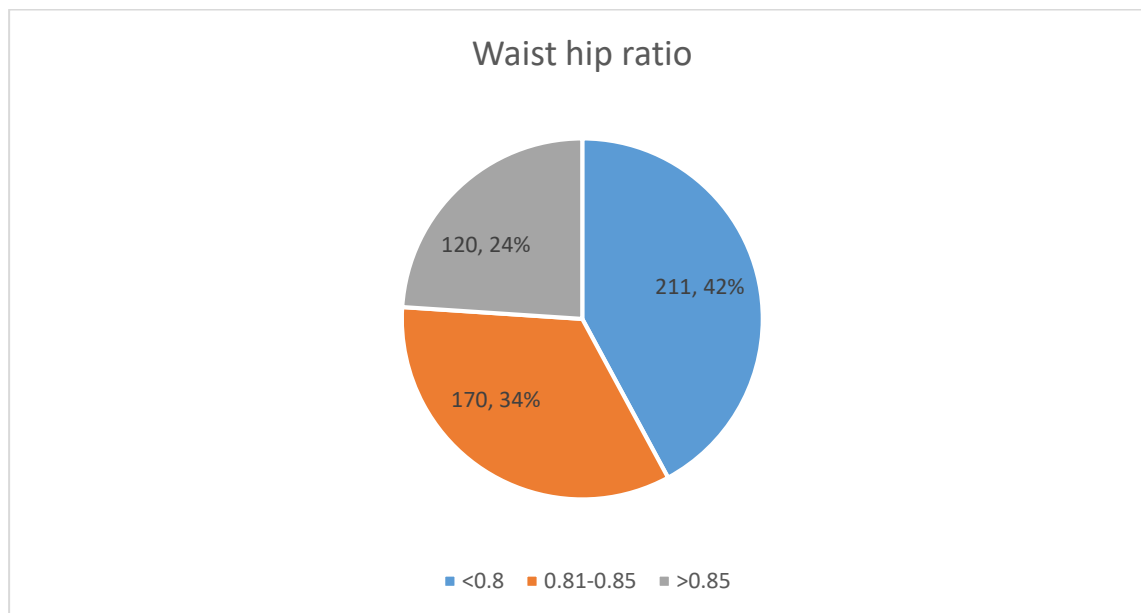
95(19%) girls were on medications, out of these 51% were on OCP either for irregular cycles or abnormal uterine bleeding.

Figure 33: Medication - obese girls



22 of the 70 obese girls were on medications. 7 each on OCP, OHA and thyroxine.

Figure 34: Waist hip ratio



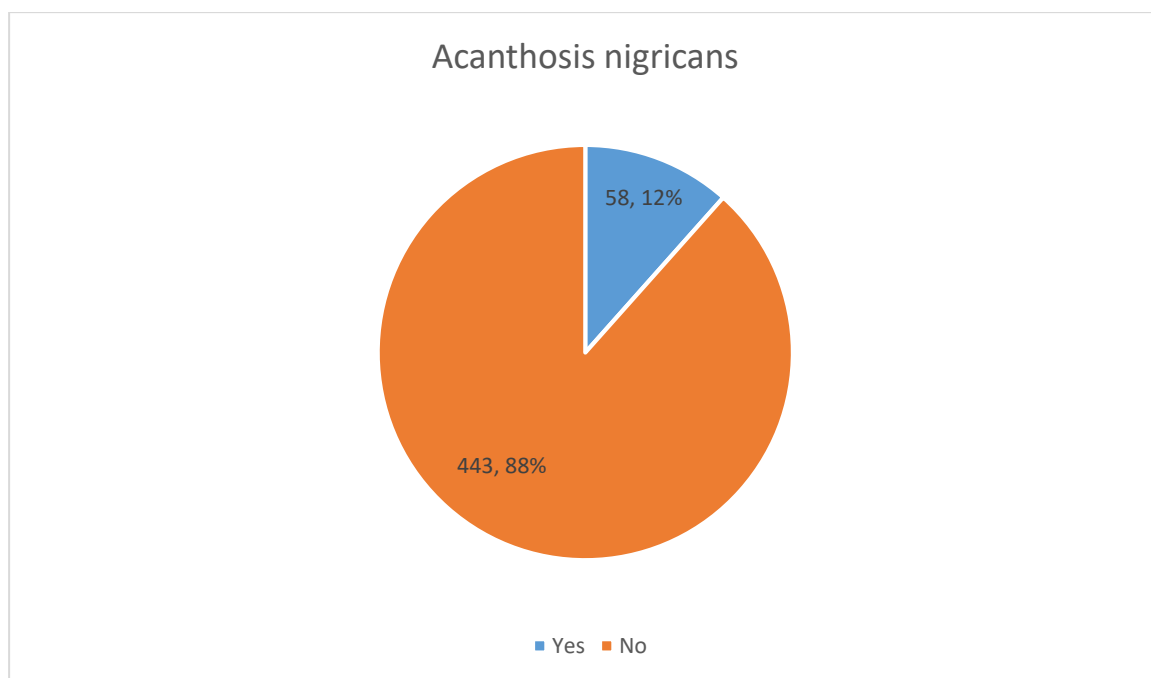
42% of the girls had a low risk of developing metabolic syndrome and 58% had a moderate to very high risk of developing metabolic syndrome.

Table 24: Waist hip ratio- normal BMI and obese

Waist-hip ratio	Normal	Obese	P value
<0.8	135	18	0.001
	46.2%	25.7%	
0.81- 0.85	96	24	
	32.9%	34.3%	
>0.85	61	28	
	20.9%	40%	

There was statistically significant difference between the two groups in respect to waist hip ratio.

Figure 35: Acanthosis nigricans



88% of the study subjects had no acanthosis nigricans

Table 25: Acanthosis nigricans -normal BMI and obese

Acanthosis Nigricans	Normal BMI	Obese	P value
Yes	10	30	< 0.01
	3.4%	42.9%	
No	282	40	
	96.6%	57.1%	

There was statistically significant difference in the occurrence of acanthosis nigricans in obese adolescents and adolescents with normal BMI.

DISCUSSION

Obese and overweight adolescents form a major part of the malnutrition spectrum in society today. The effects of adolescent obesity are far reaching and may not be evident immediately but may present in adulthood as co-morbidities associated with obesity. These co-morbidities are forerunners for increased morbidity and mortality in these patients. Therefore this problem of obese and overweight adolescents needs to be tackled at the earliest.

Epidemiological studies show an increasing trend in the prevalence of obesity in the adolescent age group. In this study the prevalence of obesity was found to be 14%. This is similar to the findings of Alok et al who reported the prevalence of obesity to be 14.1%. (6) Chhatwal et al reported a prevalence of obesity of 9.9% in 2004, and Saraswathi et al reported a prevalence of 10.4% in 2011, compared to the 14% prevalence in our study. This clearly demonstrates the increasing trend in the prevalence of this 'disease'.

It has consistently been shown that the prevalence of overweight adolescents is more than that of obese adolescents. Data from Indian studies showed a prevalence of overweight adolescents to be 12.9% (Chhatwal et al 2004) and 13.1% (Sood et al 2007). In our study the prevalence of overweight adolescents was found to be 18% and this is similar to the prevalence of 19.7% as reported by Jain et al (2010). (6) Therefore though obesity is a problem, being overweight seems to be a greater problem than obesity, in adolescent girls. This only highlights the importance of dealing with this inappropriate weight for height at an earlier stage, so that the burden of the disease can be reduced.

An encouraging finding in this study was that even though 32% of the girls were either overweight or obese, the average BMI of the 501 girls recruited was 22.5kg/m².

Abnormal uterine bleeding is common in the adolescent period and this can be aggravated in obese adolescents. We collected detailed information regarding menstrual cycles from all the

study subjects. Thirty two percent of the girls attained menarche by the age of 12 years. Analysis showed that the age of menarche was earlier in obese girls (cases) as compared to girls with normal BMI (controls) and this finding was statistically significant. This is in keeping with studies done by Bralic I et al (91) and Adair LS (21)

Seventy percent of the obese girls had irregular cycles, as compared to 42.1% of the girls with normal BMI who had irregular cycles. This is in agreement with the study done in 2015 by Mustaqeem et al who reported that a higher percentage of obese girls have irregular cycles as compared to girls with normal BMI. (92)

Of the 70 obese girls, 41.4% had no PCOM on scan and 38.6% had PCOM on scan. Though we had planned to perform trans-abdominal ultrasonography for all obese girls with irregular cycles, ultrasonography was done only for 40 (82%) of obese girls with irregular cycles.

Thirty seven percent of the obese girls with irregular cycles had no PCOM while forty five percent had PCOM on ultrasonography. This is similar to the findings of a study done in Bulgaria which showed that more than 50% of adolescents suffering from PCOD were obese. (60) On the other hand 5 obese girls with regular cycles also had PCOM, in our study. This could possibly represent a ‘multifollicular’ ovary rather than a polycystic ovary. As ultrasonography could not be done for all the obese girls with irregular cycles, the analysed result is probably not a reflection of the true incidence of PCOM in these girls.

Various risk factors have been suggested in the aetiopathogenesis of obesity. The risk factors we assessed were weight at birth, parental BMI (father and mother separately) obesity in siblings, physical activities and dietary habits. Other factors like SES, breast feeding practices and screen time duration were also looked into.

In our study, high birth weight (> 4 kg) was associated with adolescent obesity and this association was statistically significant. In addition this study also found that obese

adolescents had parents with high BMI as compared with adolescents with normal BMI and this finding too attained statistical significance. Similar findings have been reported in a cohort study done by Reilly JJ et al in 2005 where high birth weight and high BMI in parents (either one or both) were found to be risk factors for obesity in children and adolescents. (12) Obesity in siblings was also found to be a statistically significant risk factor for obesity in adolescents, in our study. These findings strengthen the concept of genetic factors in the aetiopathogenesis of obesity.

Our study found that physical activity and regular exercise had an inverse co-relation with obesity in adolescence and this finding was statistically significant. This is in keeping with the findings reported in a systematic review of studies conducted in the Indian subcontinent. (23)

This study did not find intake of fast-food, high calorie foods and beverages to be a significant risk factor for obesity. This is in contrast to studies which show a strong association between the above mentioned factors. (15) (16) (17) Other risk factors like television watching and sedentary lifestyle including increased screen time were also not found to be statistically significant risk factors for obesity in adolescents. This is different from the findings reported in a study by Steven L Gortmaker et al (18) where the above mentioned variables were found to be important contributory factors to obesity in childhood and adolescence. Other factors looked into and which did not attain statistical significance were breakfast skipping habit, type of diet (vegetarian/ non-vegetarian) and daily intake of fruit and vegetables. The difference in findings could probably be attributed to the small sample size or information bias.

Different studies have shown that breastfeeding has a protective influence on childhood obesity. (20) (93) A systematic review in 2004 concluded that breast feeding has a protective

effect on obesity (94), but our study did not find any statistically significant difference between the two groups (obese Vs normal BMI) in the protection afforded by breast feeding. Our study did not find SES to be a significant risk factor for obesity. This is in contrast to a study done by Marwaha RK et al in 2006 (3) where a significant association was found between SES and obesity. The difference in the findings is being attributed to the small sample size.

The incidence of diabetes and hypertension in obese adolescents in our study was 1.4% each. This is in contrast to studies conducted in USA which showed that 4% of adolescents had asymptomatic T2DM (29) and 13.6% had hypertension.(30). There could have been a higher number of asymptomatic T2DM in our study, which would have been picked up if screening for DM had been done. Biochemical testing was not part of our study; therefore it is likely that probable asymptomatic T2DM patients were missed out. Diabetes and hypertension was seen equally in both groups (normal BMI and obese).

Interestingly it was seen that gallstones and non alcoholic fatty liver disease commonly associated with obesity, was seen in girls with normal BMI and not in the obese population. This is in contrast to studies which showed a higher prevalence of NAFLD and cholelithiasis in obese children as compared to children with normal BMI. (44) (45)

Comorbidities like diabetes mellitus, hypertension, gallstones and NAFLD are commonly associated with obesity. These comorbidities were not seen in our study; the probable reason being the small sample size or the controlled patient selection, as only those girls attending the gynaecology out- patient clinic were included in the study.

Acanthosis nigricans is a frequent accompaniment of obesity and serves as a surrogate marker for insulin resistance, which is commonly seen in obesity.(95) We found that there

was a statistically significant difference in the occurrence of acanthosis nigricans in obese adolescents and adolescents with normal BMI.

Measuring waist hip ratio is becoming an important part of clinical examination, as it predicts the development of metabolic syndrome in the future. A ratio <0.8 denotes a low risk of developing metabolic syndrome. A ratio of 0.81 to 0.85 points to a higher chance of developing the syndrome. Waist hip ratio of >0.85 is indicative of high risk of developing metabolic syndrome later on in life. In our study, 42% of the girls had a low risk of developing metabolic syndrome and 58% had a moderate to very high risk of developing metabolic syndrome. This was in the background of the average BMI of the study population being 22.5 kg/m². Therefore it needs to be highlighted that even patients with a normal BMI can have an abnormal waist hip ratio which would be a surrogate marker for an unhealthy metabolic milieu in the future.

CONCLUSION

1. The prevalence of obesity in the adolescent age group was 14% and the prevalence of overweight was 18%.
2. 70% of the obese girls had irregular cycles.
3. 45% of the obese girls with irregular cycles had PCOM.
4. Risk factors which were significantly associated with adolescent obesity were – birth weight, fathers BMI, mothers BMI and obesity in sibling.
5. Physical activity and regular exercise were significantly associated with less obesity in the adolescent period.
6. Risk factors which were not associated with adolescent obesity were- breast feeding practices, SES, skipping of breakfast, eating out, intake of soft drinks, daily intake of fruits and vegetables, screen time and time spent in desk bound activities.
7. Acanthosis nigricans was seen significantly more in obese adolescents than in adolescents with normal BMI.
8. Adolescents with normal BMI can have a waist hip ratio more than 0.8

LIMITATIONS OF STUDY

- As this was not a community based study, the results obtained may not be representative of the actual burden of the disease in the community.
- Information regarding variables like birth weight, fathers BMI and mothers BMI were not available for all patients; this would have affected the analysis and interpretation of data.
- Ultrasonography could not be done for all the obese girls with irregular cycles, therefore the analysis may not be a true reflection of PCOM in these girls.

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ANNEXURE

Questionnaire

1. Name
2. Age
3. DOB
4. Weight at birth
5. Breast fed –yes/no
6. Age of onset of obesity
7. Grade at school/college
8. Phone number
9. Fathers BMI
10. Mothers BMI
11. SES
12. Obesity in sibling- yes/no
13. History of acne yes/no

Treated yes/no
14. History of epilation- yes /no

If yes, how often-

15. Eating habits

1) Veg/nonveg

2) Do you eat out- yes /no

If yes a) once a week

b) 2-3 times/ week

3) Intake of soft drinks/flavoured milk/sweetened

a) once a day

b) twice a day

c) thrice a day

4) Fried foods

a) once a week

b) twice a week

c) ≥ 3 times a week

5) What do you eat for snacks

6) Do you eat fruits and veg daily yes/no

7) Do you skip breakfast yes/no

16. a) Physical activity (exercise at least 30 min involving profuse sweating)-

1) 5-7 days / week

2) 3-4 days / week

3) 1-2 days/week

b) Hours spent watching TV//movies / playing video games

c) Hours spent on computer/talking on phone/doing homework

17. Co-morbidities - were you diagnosed to have any of the following problems

Co-morbidities	Yes	no
Hypertension		
Diabetes mellitus		
Non alcoholic fatty liver disease		
Gallstones		
Slipped femoral epiphysis		

18. History of any medication

- antidepressants

- OHA

- OCP

- antiepileptic

19. Regular exercise/yoga

20. Age at menarche

21. Menstrual cycle- duration

1) ≤ 2 days

- 2) 2-8 days
- 3) >8 days
- Frequency
 - 1) < 21 days
 - 2) 22-35 days
 - 3) > 35 days
- Pads changed per day
 - 1) <3
 - 2) ≥ 3
- Passage of clots
 - 1) No
 - 2) Small coin sized clot
 - 3) Large clots

Profoma (Examination)

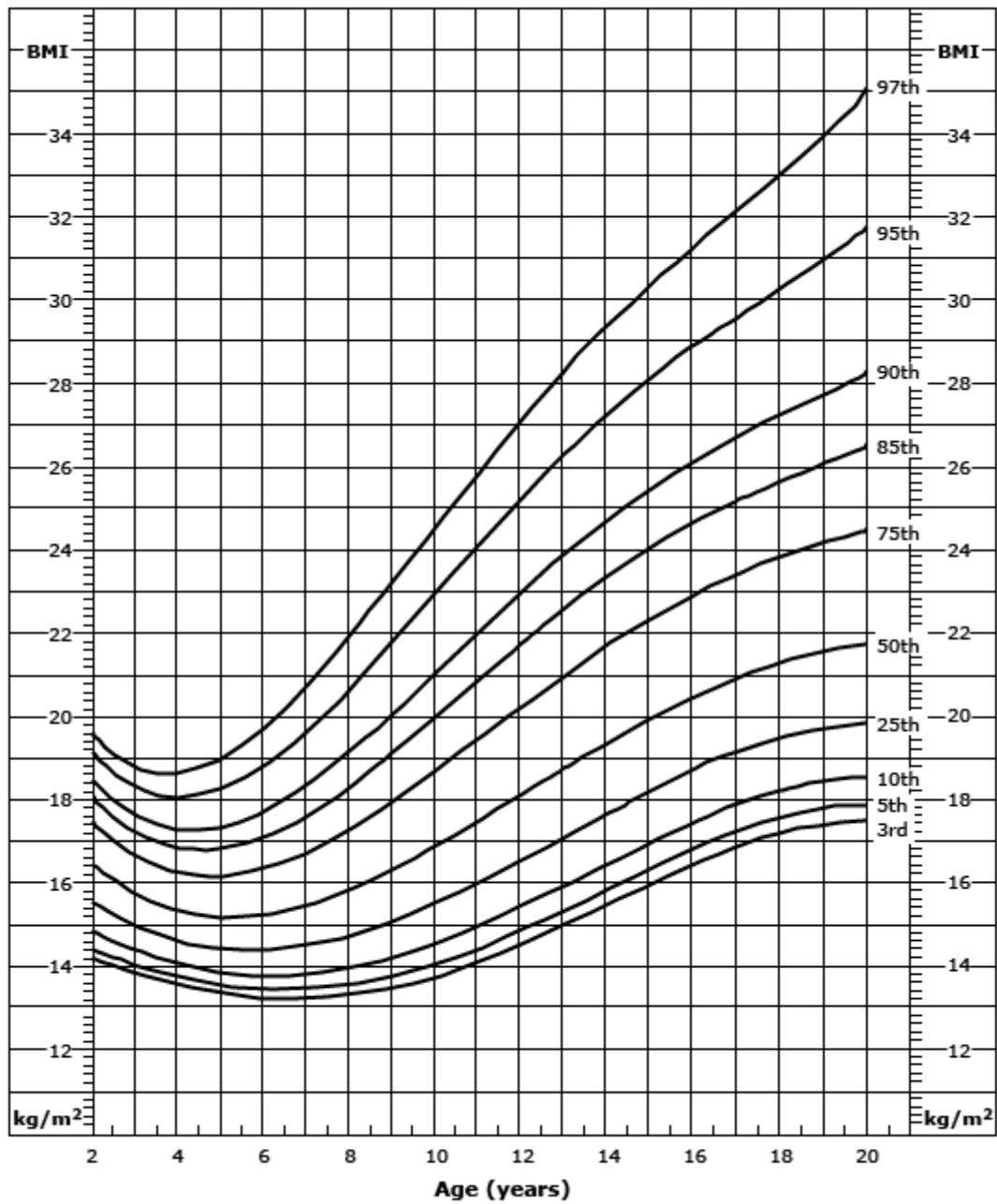
1. Height

2. Weight

3. BMI

Body mass index-for-age percentiles, girls, 2 to 20 years, CDC growth charts:

United States



4. Waist circumference

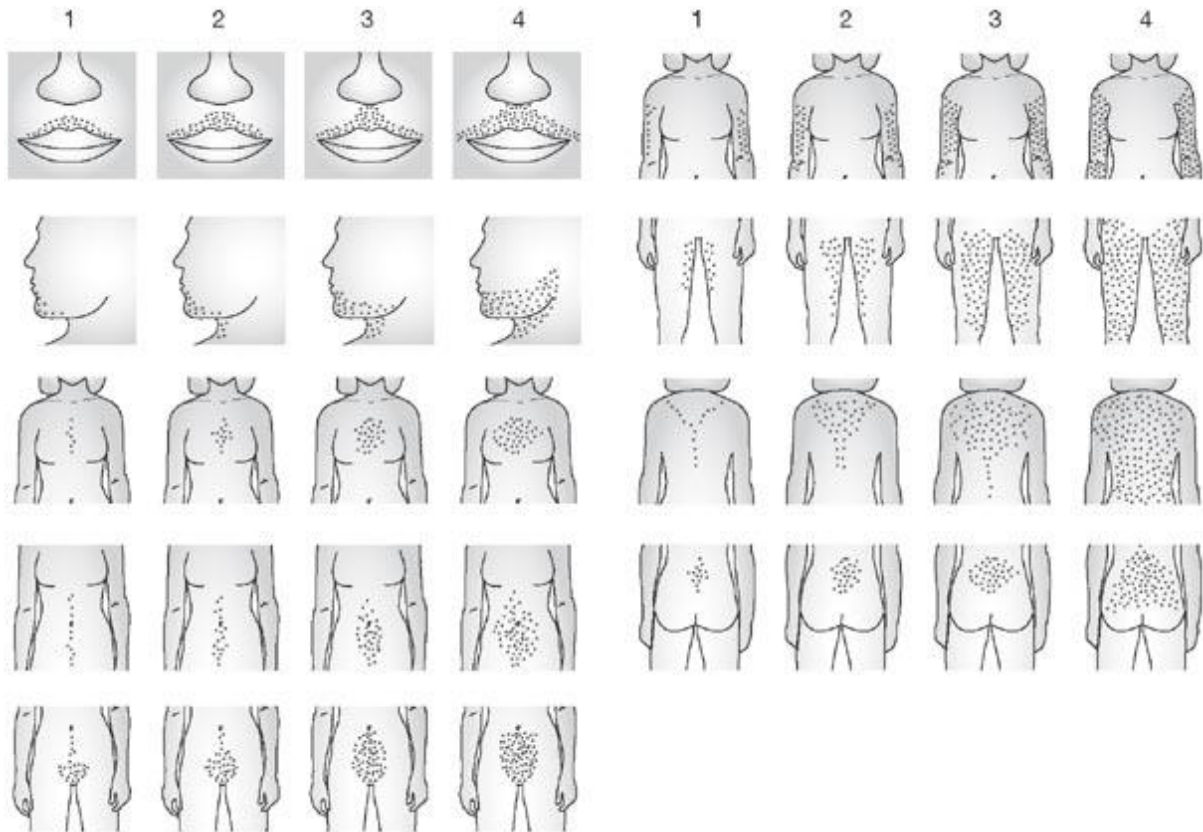
5. Hip circumference

6. Waist hip ratio

7. BP

8. PR

9. Hirsutism- yes/no



10. Acne

-Topical therapy used- Yes/no

11. Acanthosis nigrans

12. Ultrasound findings :

Patient information sheet

Obesity (excess weight) is becoming a big problem in our societies. The number of teenage girls who are obese is much more now than before. There are various reasons why obesity occurs. Irregular periods are common in teenage girls. Irregular periods can also occur if the child is obese. There is a condition called Polycystic Ovarian Disease (PCOD) which can also present with irregular periods, in teenage girls. In this condition there are many small cysts in the ovary and this can be diagnosed with an ultrasound scan. Patients with PCOD are mostly obese but there is a group of patients with PCOD who are not obese.

This study is being done to find out the extent of the problem of obesity in adolescent girls and to assess the risk factors for obesity in them. It is also being done to assess the menstrual pattern in obese teenage girls and to find out how many of the obese teenage girls have PCOD.

For this study you will be required to answer questions regarding details of the child's menstrual cycles, lifestyle and other details which may point to the cause of obesity. The child will be examined by the doctor and if necessary the doctor will order for ultrasound scan.

Informed consent

Study Title: Obesity in adolescent girls

Study Number: _____

Subject's Name: _____

Subjects Hospital Number: _____

Date of Birth / Age: _____

- (i) I confirm that I have read and understood the information sheet dated _____ for the above study and have had the opportunity to ask questions. []
- (ii) I understand that my participation in the study is voluntary and that I am free to withdraw at any time, without giving any reason, without my medical care or legal rights being affected. []
- (iii) I understand that the Ethics Committee and the regulatory authorities will not need my permission to look at my health records both in respect of the current study and any further research that may be conducted in relation to it, even if I withdraw from the trial. I agree to this access. However, I understand that my identity will not be revealed in any information released to third parties or published. []
- (iv) I agree not to restrict the use of any data or results that arise from this study provided such a use is only for scientific purpose(s). []
- (v) I agree to take part in the above study. []

Signature (or Thumb impression) of the Subject/Legally Acceptable

Date: ____/____/____

Signatory's Name: _____

Signature: _____

Signature of the Investigator: _____

Date: ____/____/____

Study Investigator's Name: _____

Signature or thumb impression of the Witness: _____

Date: ____/____/____

INFORMED ASSENT FORM

This informed assent form is for girls between the ages of 12-17 years who attend the gynaecology OPD and we are inviting to participate in study of prevalence of obesity in adolescent girls and associated risk factors for the same.

Name of principal investigator: Dr Evangeline

Name of Organisation: Christian Medical College and Hospital (CMCH)

Name of project: Study of obesity in adolescent girls

INFORMATION SHEET

My name is Dr Evangeline Reeni, I am a post graduate student in the department of gynaecology and obstetrics. I am doing a study on 'obesity in adolescent girls' attending the gynaecology OPD in CMCH- to find out the prevalence of obesity and the associated risk factors for it. You will be required to answer a few questions (given in the form) and after that I will be examining you. If your menstrual cycles are irregular an ultrasound scan will be done and you will be required to pay for the same. I am giving you this information about the study and I invite you to be part of it. You can choose to participate or not do so. I have discussed this study with your parents/guardian and they know that we are also asking you for your agreement. If you are going to participate in the study, your parents/guardian also have to agree. But if you do not wish to take part in the study you do not have to, even if your parents have agreed. You can decide whether to participate or not after you have talked it over with your parents or friends or anyone else you feel comfortable talking to. You do not have to decide immediately.

There may be some words you don't understand or things that you want me to explain more about because you are interested or concerned. Please ask me to stop at any time and I will take time to explain.

Purpose: Why are you doing this research?

I am doing this study to find out the prevalence of obesity and its associated risk factors. I am also trying to find out the number of obese adolescent girls with polycystic ovarian disease.

Choice of participants: Why are you asking me?

My study involves adolescent girls.

Participation is voluntary: Do I have to do this?

You do not have to be in this study if you do not want to be. It is up to you. If you decide not to be in the research it is okay and nothing changes. This is still your clinic, everything stays the same as before. Even if you say "yes" now, and later change your mind it is still okay.

I have checked with the child and they understand that participation is voluntary
 __ (initial)

Procedures: What is going to happen to me?

You will be asked a few questions and then a physical examination will be done. If you have menstrual irregularity an ultrasound scan will be done. You do not have to come back to the hospital for the sake of the study, but if you have any medical problems you can follow up in CMCH at any time.

I have checked with the child and they understand the procedures _____ (initial))

Benefits: Is there anything good that happens to me?

You will get to know your BMI and the associated risk factors that you have. You will be advised accordingly to change your lifestyle.

I have checked with the child and they understand the benefits_____ (initial)

Reimbursements: Do I get anything for being in the research?

No

Confidentiality: Is everybody going to know about this?

We will not tell other people that you are in this study and we will not share information about you to anyone who is not part of this study.

Information that will be collected from the research will be put away and no-one but the researchers will be able to see it. Any information about you will have a number on it instead of your name.

Right to Refuse or Withdraw: Can I choose not to be in the research? Can I change my mind?

You do not have to be in this study, if you choose not to. No one will be angry or disappointed with you if you say no. It is your choice. You can think about it and tell us later if you want.

You can say “yes” now and change your mind later and it will still be okay.

Who to Contact: Who can I talk to or ask questions to?

For any information you can contact on this number and I will get back to you.

Phone number: 9788595589

If you choose to be part of this research I will also give you a copy of this paper to keep for yourself.

You can ask me any more questions about any part of the research study, if you wish to. Do you have any questions?

Certificate of Assent

I understand the study is about ‘obesity in adolescent girls’ attending the gynaecology OPD in CMCH.

I will be asked questions and a physical examination will be done. If menstrual irregularities are present an ultrasound scan will be done.

I have read this information (or had the information read to me) I have had my questions answered and know that I can ask questions later if I have them.

I agree to take part in the study.

OR

I do not wish to take part in the study and I have not signed the assent below. _____ (initialled by child/minor)

Only if child assents:

Print name of child _____

Signature of child: _____

Date: _____ **day/month/year**

If illiterate:

A literate witness must sign (if possible, this person should be selected by the participant, not be a parent, and should have no connection to the research team). Participants who are illiterate should include their thumb print as well.

I have witnessed the accurate reading of the assent form to the child, and the individual has had the opportunity to ask questions. I confirm that the individual has given consent freely.

Print name of witness (not a parent)_____ AND Thumb print of participant

Signature of witness _____

Date _____

Day/month/year

I have accurately read or witnessed the accurate reading of the assent form to the potential participant, and the individual has had the opportunity to ask questions. I confirm that the individual has given assent freely.

Print name of researcher_____

Signature of researcher_____

Date_____Day/month/year

Statement by the researcher/person taking consent

I have accurately read out the information sheet to the potential participant, and to the best of my ability made sure that the child understands that the following will be done:

1. Filling up of questionnaire
2. Physical Examination
3. Ultrasound scan in case of menstrual irregularities

I confirm that the child was given an opportunity to ask questions about the study, and all the questions asked by her have been answered correctly and to the best of my ability.

I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

A copy of this assent form has been provided to the participant.

Print Name of Researcher/person taking the assent _____

Signature of Researcher /person taking the assent _____

Date _____ Day/month/year

Copy provided to the participant _____ (initialed by researcher/assistant)

Parent/Guardian has signed an informed consent ___Yes ___No _____ (initialed by researcher/assistant)

180	748348g	Shruri	14	2	2.7	1		1	8	28.7	3	23.8	2	2	2	2	2	2	2	2	2	2	2	4	2	cake,chips,chocolate
181	805342g	Ishwarya	14	2	3	1	10	1	9	35.5	5	26	3	4	1	2	2	2	1	1		4	0	2	chips,samosa	
182	806786g	Vithya	13	1	2	1		1	9	21.8	2	24.8	2	4	2	2	2	2	1	1		4	0	0	0	
183	805380g	Varsha	15	1	2.7	1		1	11	18.7	2	26.7	3	4	2	2	2	2	2	1		4	0	1	biscuit,chocolate	
184	823197c	Anitha	16	1	2.7	1		1	13	23.1	2	18.9	2	2	2	2	2	2	2	2		4	0	0	0	
185	812220g	Neha	19	1	2.5	1		1	13			24.1	2	4	2	2	2	2	2	1		2	0	2	burger,pizza	
186	807624g	Gayathri	18	1	2.8	1		1	13	26	3	25.4	3	3	2	2	2	2	2	2		4	4	4	biscuit,chips	
187	754995g	Arpita	18	2	3.1	1		2	10	21.48	2	25.96	3	4	2	2	2	2	2	1		4	4	2	puffed rice	
188	401472G	Shreyasee	16	2	1.9	1	11	1	11	26.4	3	25	2	1	1	1	1	2	2	2		4	1	1	bread,noodles,puffed rice	
189	965124c	Prema	16	2	2.4	1		1	10	31.88	4	22.36	2	2	2	2	2	2	2	1		1	4	1	0	
190	807421g	Ishwarya	18	2	3.5	1		1	13	31.6	4	28.1	3	3	2	2	2	2	2	1		4	0	0	chips,icecream	
191	220985g	Preeti	17	1	2.3	1	15	1	11	23.4	2	34.7	4	2	3	2	2	2	2	1		3	0	2	chips,noodles,puffed rice	
192	810971g	Shaikh	18	2	2.5	2		2	10			19.5	2	5	2	2	2	2	2	2		0	0	0	0	
193	170786c	Santhoshini	14	2	2.9	1		1	10	37.5	5	22.3	2	2	2	2	2	2	1	2		0	0	0	biscuit	
194	471146g	Soma	16	1	2.7	1		1	11	29.6	2	23.1	2	4	3	2	2	2	2	2		0	0	0	puffed rice	
195	795175g	Rimpa	18	1	2.4	1		1	14	22.1	2	18.2	1	3	2	2	2	2	2	2		4	2	2	biscuit	
196	802853g	Monisha	17	1	3	1		1	8					2	2	1	2	2	1	2		4	4	4	chips	
197	813970g	Dolan	18	1	1.7	1		1	13	31.1	4	29.7	3	4	2	2	2	2	2	1		4	0	2	chips,pakoda	
198	763246g	Churni	13	1	3	1	11	1	7	24.4	2	25.4	3	2	3	1	2	2	2	1		4	0	0	0	
199	773314g	Poulami	15	2	2.3	1		1	10	30.5	4	25.9	3	3	3	1	1	2	2	2		0	2	0	2	
200	749963g	Jothika	15	2	2.7	1		1	9	24.4	2	28.8	3	4	3	2	2	2	2	2		0	0	0	0	
201	811368g	Gayathri	17	2	2.8	1	16	1	13	24.8	2	28.1	3	4	2	2	2	2	2	2		0	0	0	0	
202	544397g	Keerthana	18	2	3	1		1	13	18.5	2	21.5	2	4	2	2	2	2	2	2		3	0	0	biscuit,chips	
203	546092g	Shoba	19	2	2.9	1		2	11	23.5	2	24.9	2	2	2	1	1	2	2	2		0	0	0	peas	
204	991077b	Yuvasakti	16	1	3.5	1		1	11		2		2	3	1	2	2	2	2	2		1	1	1	biscuit,chips	
205	545605g	Shiny	18	1	3	1		1	13		3		2	3	2	1	2	2	2	1		2	1	1	puff	
206	812384g	Ananda	18	1		1	16	1	14		2		4	3	1	2	2	2	2	1		1	2	1	biscuit	
207	823048g	Keerthi	14	1	2.5	2		1	9		4		4	3	1	2	2	2	2	1		1	2	2	chips,panipuri	
208	789100g	Chandana	18	1	2.2	1	12	1	12	30.5	4	27.2	3	4	2	2	2	2	2	2		0	1	1	biscuit,chips	
209	103522g	Saindhabi	15	1	2.7	1	12	1	10	29.4	3	30	3	1	2	2	2	2	2	2		2	2	2	2	biscuit
210	147373C	Sandhya	19	1	2.7	1		1	14	22	2	21.5	2	2	2	2	2	2	2	2		0	1	1	biscuit,chocolate	
211	806504G	Upasana	13	1	2.4	1	10	1	8	25.1	3	25.5	3	2	2	2	2	2	2	1		2	1	2	biscuit	
212	001994F	Esha	16	1	2.9	2		1	10	24	2	26.4	3	2	3	1	1	2	2	2		0	4	4	biscuit	
213	536228G	Gayathri	16	1	2.6	1		1	11	19.5	2	24.8	2	4	2	2	2	2	2	2		0	1	0	1	
214	806346G	Suparna	19	1	2.7	1	1	2	12	27	3	24.2	2	2	3	1	1	2	2	2		0	2	chips		
215	758813G	Dipika	14	2	2.4	1		1	9		17.5		1	4	2	2	2	2	2	2		0	1	1	puffed rice	
216	760463G	Kaushikee	15	2	3.5	1	1	1	10	32.7	4	28.2	3	2	3	1	2	2	2	2		0	2	2	noodles	
217	760437G	Rimjhim	17	2	2.4	1		1	13	22.1	2	21.9	2	3	2	2	2	2	2	2		2	1	1	biscuit	
218	818973G	Shruthi	19	2	3	1	14	1	13	25.1	3	27.9	3	1	2	2	2	2	2	1		4	1	2	biscuit,noodles	
219	759591G	Susweta	16	1	3	1	8	1	10	21.1	2	21.5	2	2	3	1	2	2	2	2		0	2	2	biscuit,chips	
220	293273G	Hemalatha	17	1	4.5	1	0	2	10		24		2	4	2	2	2	2	2	2		0	2	2	biscuit	
221	821343g	Barsha	13	1	2.6	1		1	9	26.2	3	23.8	2	3	2	2	2	2	2	2		0	2	2	biscuit	
222	216544c	Farhath	15	1	2.5	1	10	1	9	35.9	5	39.1	5	3	2	1	2	2	2	2		0	2	2	puff,samosa	
223	821747g	Debsena	15	1	3	1		1	8	31.6	4	25.6	3	1	2	1	2	2	2	2		3	2	chips,chocolate,noodles		
224	787473g	Ananya	14	1	3.5	1		1	9	20.2	2	26.4	3	1	2	1	2	2	2	1		3	1	2	biscuit,chips,chocolate	
225	827751g	Riti	14	1	2.5	1		1	8	25	2			4	3	1	2	2	2	2		0	2	2	chips,kurkure	
226	794302f	Vaswati	19	2	1.7	1		1	11	22	2	30.1	4	2	3	1	2	2	2	1		4	0	1	puffed rice	
227	817018g	Atquia	16	2	3	1		1	12	28.6	3	23.1	2	2	2	1	1	2	2	2		1	1	1	chips,chocolate	
228	824188g	Suchanda	19	2	2.7	1	18	1	13	25.9	3	24.8	2	3	3	1	2	2	2	1		2	1	2	chips,chocolate	
229	815371g	vijayashanthi	17	2	2	1		1	13					4	2	1	2	2	2	1		4	0	2	0	
230	164718g	Dharani	19	2	2.5	1	13	2	12				4	4	2	1	2	2	2	1		4	0	4	bonda	
231	794224g	Punam	16	2		1		1	10		4		4	4	2	2	2	2	2	2		0	1	1	biscuit,mixture	
232	823074g	pavithra	17	2	1.5	1		1	11					3	2	1	2	1	3	2		1	1	1	2	samosa
233	812419g	Fariha	12	1	2	2	3	1	8	25.7	3	23.2	1	3	3	2	2	2	2	2		0	2	2	biscuit,noodles,puffed rice	
234	699065g	Rajashree	16	1	3.5	1		1	10	22.5	2	22.7	2	3	3	2	2	2	2	2		0	2	2	momo,noodles	
235	824687g	Ruhi	18	1	3	1		1	14	26.2	3	21.2	2	2	2	2	2	2	2	1		4	1	2	biscuit,chips	
236	818728g	Parna roy	18	1	2.3	1		1	10	27.3	3	33.1	4	3	3	2	2	2	2	2		0	2	2	biscuit,chips	
237	998311f	Rameshwari	18	1	2.9	1		1	13	25.4	3	27.9	3	3	2	2	2	2	1	2		0	1	1	biscuit,mixture	
238	148202g	Vidhya	17	2	2.5	1		1	12	26.23	3	35.67	5	2	2	2	2	2	2	1		4	4	4	biscuit,chips,chocolate	
239	830710g	Saheli	13	2	1.2	1		1	9	19.5	2	26.7	3	4	3	2	2	2	1	2		3	1	1	noodles	

240	280371c	Jecintha	14	2	3.7	1		1	8	25.7	3	24.6	2	2	2	2	2	2	2	2	2	1	3	0	3					
241	158649d	Priya	19	2	2.9	1	1	2	11				4	2	2	2	2	2	2	2	2	2		0	4					
242	362098c	Muskaan	13	1	2.8	1	1	1	8		2		2	2	2	2	2	2	2	2	2	2	1	2	1	2	chips,chocolate			
243	831234g	Trina	16	1	2.4	1		1	10	26.1	3	23.1	2	3	2	2	2	2	2	2	2	2	1	4	3	0	bread,puffed rice			
244	695954g	Shanthini	18	1	2.7	1	10		13		2		2	2	2	2	2	2	2	2	2	1	1	2	2	1	biscuit,chips			
245	594604b	Surya	19	1	2.7	1		1	14	26.9	3	24.2	2	1	3	2	2	2	2	2	2	2	1	3	4	2				
246	307449f	Annie	15	1	1.7	1		1	10		2	24.5	2	3	2	2	2	2	2	2	2	2		0	3					
247	203260c	Poorna	14	1	2.1	1		1	10	27.2	3	22.4	2	3	2	2	2	2	2	2	2	2	1	4	0	3	biscuit,chocolate,wafers			
248	827434g	Abigail	15	1	4	1	12	1	10	25.3	2	27.5	3	2	2	1	2	2	2	2	2	2	1	1	0	2	burger,noodles			
249	929490b	Vijayadharshini	16	1	2.5	2		1	11	23.4	2	22.4	2	2	2	1	2	2	2	2	2	1	2		0	2	biscuit,samosa			
250	809734g	Mskura Khatun	14	1	2	2		1	10	22.1	2	23.5	2	3	2	2	2	2	2	2	2	2		0	1	1	biscuit,puffed rice			
251	137781c	Rebecca	14	1	2.6	1		1	10	25.4	3	26.8	3	2	2	2	2	2	2	2	2	2	1	4	0	1	biscuit			
252	543405g	Sriya	15	2	3	1		1	11	24.6	2	22.1	2	1	2	1	2	2	2	2	2	1	1	1	1	2				
253	814681g	Ajija	16	2	3.5	1		2	10	24.2	2	22.2	2	4	2	2	2	2	2	2	2	2		0	1	1	biscuit,puffed rice			
254	822974g	Neha	18	2	2.3	1		1	14	24.2	2	23.6	2	2	2	2	2	2	2	2	2	1	2		3	1				
255	899743b	Dakshayni	16	2	2.5	1		1	9	21.3	2	25.4	3	3	2	2	2	2	2	2	2	2		0	1					
256	820234g	Priya	18	2	2.7	1		2	12	22.7	2	24.2	2	4	2	2	2	2	2	2	2	2	1	4	0	1				
257	823060g	Asma	13	1	3.5	1		1	7	30.1	4	26.3	3	3	1	2	2	2	2	2	2	2		0	3	1	chips,icecream			
258	712708g	Angelina	14	1	2.6	1	9	1	9	25	2	28.8	3	2	2	2	2	2	2	2	2	2		0	1	1	biscuit,puff			
259	810187g	Deblila	16	1	2.5	1		1	10	20.5	2	25.3	3	1	2	1	2	2	2	2	2	2		3	4	0	noodles			
260	369725g	Manjula	17	1	1.7	1	14	1	13	28.7	3	30.3	4	4	2	2	2	2	2	2	2	2		0	1	1	biscuit			
261	831647g	Ankita	18	1	2.7	1		1	13	24.5	2	29.7	3	2	2	1	2	2	2	2	2	2		0	1	1	biscuit			
262	762577f	Anju	18	1		1		1	10				3	2	1	2	2	2	2	2	2	2		1	2	1	biscuit			
263	188952g	Anwesha	14	2	2.5	2		1	9	25.9	3	19.9	2	2	3	2	2	2	2	2	2	2		0	1	1	biscuit			
264	804214g	Parthona	15	2	3	2		1	9	28	3	24	2	2	2	1	2	2	2	2	2	2	1	4	1	2	chips,chocolate,noodles			
265	964126d	Shuvra	15	1	2.5	1		1	10	21.6	2	26	3	2	1	2	2	2	2	2	2	2		0	2	1	biscuit,mixture			
266	824165g	Jayasree	19	1	2.7	1	10	1	12	25.2	3	25.1	3	1	2	2	2	2	2	2	2	2	1	3	0	1	1	biscuit,cake		
267	777946g	Sayani	17	1	2.5	1		1	12	21.7	2	26.6	3	1	2	2	2	2	2	2	2	2	1	4	0	2	1	noodles		
268	822072g	Pallabi	18	1	2.1	1		1	10	19.7	2	22.2	2	4	2	2	2	2	2	2	2	2		4	2	2	2	biscuit,puffed rice		
269	443589g	Anannya	14	1	2.2	1	1	1	9	33.9	4	27.9	3	1	2	1	2	2	2	2	2	2	1	3	0	2	1	biscuit,noodles		
270	881332b	Swatha	16	1	2.9	1		1	12	27.2	3	28.5	3	3	2	1	2	2	2	2	2	2		0	2	1	1	chips,puff,samosa		
271	695495d	Ummay	18	1	2.3	1	12	1	10	24.7	2	24	2	2	2	2	2	2	2	2	2	2		0	2	1	1	noodles		
272	800758g	Srilekya	12	1	1.7	1		1	7		2		2	3	1	2	2	2	2	2	2	1	2		0	0	1	biscuit		
273	776894g	Pallam	15	2	3.6	1		1	11	24.9	2	25.8	3	2	3	2	2	2	2	2	2	2	1	1	2	1	1	1	chips, kurkure	
274	572809c	Deekshitha	13	2	3.5	1	8	1	9	24.3	2	20.8	2	2	2	1	2	2	2	2	2	2		0	4	1	1	biscuit		
275	838874g	Chandani	14	2	2.4	1		1	10	22.5	2	24.4	2	4	2	2	2	2	2	2	2	2		0	1	1	1	noodles		
276	778812g	Shivangi	15	1	2.1	1	14	1	10	27.2	3	26.1	3	2	3	1	2	2	2	2	2	2		0	4					
277	469146g	Nandhini	15	1	2.6	1		1	10				2	4	2	2	2	2	2	2	2	2		0	0					
278	827017g	Poornima	18	1	3.5	1		1	13	20.1	2	26.7	3	3	2	2	2	2	2	2	2	1	1	1	1	1	2	1	chocolate	
279	046441g	Vichitra	17	1	4.5	1		1	12				2	5	2	2	2	2	2	2	2	2		0	1					
280	231908c	Jisha	14	1	2.3	1	8	1	9	29.4	3	32.4	4	2	2	1	2	2	2	2	2	2		0	2	1	1	2	murku,sweets	
281	074078g	Supriti	16	1	2.7	1		1	12	18	1	19.2	2	1	2	2	2	2	2	2	2	2		3	2	2	2	2	puffed rice	
282	837728g	Anupriya	14	1	3.6	1		1	10		2	33.4	4	3	2	2	2	2	2	2	2	2		0	1	1	1	1	biscuit	
283	776121g	Tanushree	18	1	3	1	10	1	12	24.8	2	24.2	2	3	2	1	2	2	2	2	2	2		4	2	2	2	2	puffed rice	
284	792507g	Sohini	17	1	2.5	2	16	1	11	27.1	3		2	1	2	1	2	2	2	2	2	2		0	2					
285	827692b	Monisha	17	1	3.2	1		1	12	27.5	3	24.4	2	3	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	chips,chocolate
286	994814f	Sakshi	16	1	3	1		1	12		2		2	1	2	2	2	2	2	2	2	2		3	2	2	2	2	2	chocolate,mixture
287	826363g	Suriya	13	1	3.1	1		1	7	24.5	2	35.4	5	2	2	1	2	2	2	2	2	2	1	3	2	2	2	2	2	icecream
288	832783g	Vijayalakshmi	13	1	3	1		1	8	26.5	3	27.9	3	2	2	2	2	2	2	2	2	2		0	0					
289	485346c	Haripriya	16	1	2.4	1		1	11				2	4	2	1	2	2	2	2	2	2		0	0	0	0	0	0	bread,bun
290	843244g	Sujata	17	1	1.6	1		1	10	22.8	2	28	3	4	2	2	2	2	2	2	2	2		0	2	1	1	1	biscuit	
291	621924g	Sumithra	18	1	2.5	1		1	13		2		2	3	2	2	2	2	2	2	2	1	2		0	0				
292	844490g	Raisa	14	1	3	1	11	1	10		2		2	1	2	1	2	2	2	2	2	2	1	1	1	1	1	1	1	biscuit,bread,samosa
293	436921f	Souparnee	17	2	3.6	1		1	12	25.2	3	28	3	1	3	2	2	2	2	2	2	2	1	1	4	1	1	1	1	biscuit,cake
294	253483f	Yamini	19	2	3.5	1		2	10	28.2	3	26.7	3	2	2	2	2	2	2	2	2	2		0	2	1	1	1	bread	
295	724452d	Uma	17	2	3	1	13	1	12		4		2	5	2	1	2	2	2	2	2	1	2		0	0				
296	824591g	Deepannita	14	2	2.5	2		1	10	24.9	2	18.7	2	2	2	2	2	2	2	2	2	2		0	3	1	1	1	biscuit	
297	670543g	Parameshwari	14	2	3	1	10	1	10		4		4	4	1	2	2	2	2	2	2	1	2		0	1	1	1	biscuit	
298	619932g	Priti	18	2	3.5	1	15	1	12	25.5	3	25.8	3	2	2	2	2	2	2	2	2	2		0	3	1	1	1	1	biscuit,sweets
299	547890D	Tejaswini	16	1	2	1		1	10		2		2	1	2	2	2	2	2	2	2	2		0	1	1	1	1	1	biscuit,chocolate

1	2	4	0	2	2	2	2	2	2	1	1	3	2	12	2	2	2	1	1	167	61	21.87	2	78	94	0.83	2	112	75	100	2	2	2	2							
1	2	4	0	0	2	2	2	2	2	2	2	2		2	15	4	2	2	1	1	155	71	29.55	3	88	106	0.83	2	107	73	79	2	2	2	2					1	
1	1	1	1	1	2	2	2	2	2	2	2		2	12	1	2	2	1	1	149	85	38.29	5	106	114	0.92	3	109	69	90	2	2	2	1	fbroid						
1	2	4	1	2	2	2	2	2	2	2	1	3	2	13	3	2	1	1	155	47	19.56	2	65	82	0.79	1	85	57	80	2	2	2	2					1			
2	1	1	1	3	2	2	2	2	2	2	2	2		2	12	6	2	3	2	1	157	73	29.62	3	82	111	0.73	1	109	69	96	2	2	2	2					1	
1	2	4	2	1	2	2	2	2	2	2	2	2		2	13	6	2	3	1	1	165	60	22.04	2	76	93	0.81	2	114	75	96	2	2	2	2	normal					
1	1	4	1	3	2	2	2	2	2	2	2	2		2	12	3	2	5	2	1	158	49	19.63	2	73	82	0.89	3	101	61	113	2	2	2	2						
1	2	1	1	3	2	2	2	2	2	2	2	2		2	13	1	2	5	1	1	155	50	20.81	2	70	88	0.79	1	90	58	79	2	2	2	2	normal					
1	2	4	3	0	2	2	2	2	2	2	2	2		2	11	4	1	4	1	1	149	69	31.08	5	86	99	0.86	3	97	57	80	2	2	2	2	normal					
1	2	4	2	3	2	2	2	2	2	2	2	2		2	12	4	2	5	1	2	151	49	21.49	2	74	84	0.88	3	105	60	101	2	2	2	2						
1	2	4	2	2	2	2	2	2	2	2	2	2		2	12	2	2	2	1	1	146	44	20.64	2	72	82	0.87	3	119	74	75	2	2	2	2	adnexal cyst					
1	2	1	1	2	2	2	2	2	2	2	2	2		1	14	0	2	5	1	1	153	47	20.08	2	65	82	0.79	1	110	74	90	2	2	2	2						
1	2	3	2	2	2	2	2	2	2	2	2	2		2	13	2	2	5	2	1	165	56	20.57	2	69	85	0.81	2	97	64	107	2	2	2	2					1	
1	2	4	2	0	2	2	2	2	2	2	2	2		2	13	3	2	2	1	1	150	45	20	2	67	78	0.85	2	100	53	90	2	2	2	2	normal					
1	2	4	2	2	2	2	2	2	2	2	2	2		2	13	5	2	2	1	1	161	36	13.89	1	49	72	0.68	1	113	72	109	2	2	2	2	uterus diadelphus					
1	2	4	5	2	2	2	2	2	2	2	1	4	1	13	3	2	5	2	2	2	2	154	50	21.09	2	77	86	0.89	3	99	54	90	2	2	2	2					1
2	2	4	0	0	2	2	2	2	2	2	2	2		2	14	4	3	2	2	2	2	157	49	19.88	2	73	80	0.91	3	104	63	97	2	2	2	2	normal				
1	2	4	3	2	2	2	2	2	2	2	2	2		2	12	1	3	3	2	2	2	158	43	17.22	2	68	82	0.83	2	99	62	151	2	2	2	2	normal				
1	2	1	0	5	2	2	2	2	2	2	1	3	1	13	1	2	2	1	1	1	158	74	29.64	5	91	99	0.92	3	137	80	111	2	2	2	2					1	
1	2	4	0	4	2	2	2	2	2	2	2	1	3	2	12	4	2	2	1	1	159	59	23.34	2	64	89	0.72	1	110	83	73	2	2	2	2						
1	2	4	2	3	2	2	2	2	2	2	2	1	3	2	13	4	2	2	1	1	148	59	26.94	3	73	92	0.79	1	118	71	111	2	11	2	2	2					1
2	2	4	2	1	2	2	2	2	2	2	2	2		2	12	6	2	2	1	1	164	46	17.1	1	64	81	0.79	1	109	63	78	2	2	2	2						
1	1	4	0	2	2	2	2	2	2	2	2	2		2	13	5	2	2	2	2	153	40	15.38	1	62	78	0.79	1	114	81	84	2	2	2	2	normal					
1	2	4	1	2	2	2	2	2	2	2	1	2		2	11	3	2	3	1	1	151	50	21.93	2	69	86	0.8	1	109	70	103	2	2	2	2						
2	2	4	3	4	2	2	2	2	2	2	2	1	1	2	13	2	2	2	2	2	2	163	56	21.08	2	74	90	0.82	2	125	86	106	2	2	2	2	paraovarian cyst				
1	2	4	1	5	2	2	2	2	2	2	2	2		2	10	5	2	2	2	2	154	50	21.08	2	70	85	0.82	2	96	71	105	2	2	2	2	normal					
1	2	4	2	0	2	2	2	2	2	2	1	2		2	11	8	2	2	2	2	151	59	25.88	3	72	96	0.75	1	132	93	106	2	2	2	2						
1	2	4	2	4	2	2	2	2	2	2	2	2		2	13	4	2	2	1	1	158	54	21.63	2	64	89	0.72	2	102	61	85	2	2	2	2	normal					
2	1	4	0	0	2	2	2	2	2	2	2	2		2	13	5	2	2	2	2	156	42	17.26	2	66	80	0.82	2	100	72	96	2	2	2	2	normal					
1	2	1	2	4	2	2	2	2	2	2	2	1	2	1	11	3	1	5	1	1	161	99	38.19	5	101	117	0.86	3	95	66	90	2	2	2	1	normal					
1	2	4	1	4	2	2	2	2	2	2	2	2		2	12	4	2	5	1	1	153	49	20.93	2	73	86	0.85	2	98	51	101	2	2	2	2					1	
1	2	4	2	3	2	2	2	2	2	2	2	2		2	13	5	2	4	2	1	156	66	27.12	3	93	100	0.93	3	121	86	103	2	2	2	2						
1	2	4	1	1	2	2	2	2	2	2	2	1	3	2	12	0	2	2	2	2	151	44	19.3	2	69	86	0.8	1	93	53	79	2	2	2	2						
1	2	4	1	4	2	2	2	2	2	2	2	2		2	13	2	2	2	1	1	162	60	22.86	2	70	91	0.77	1	104	76	67	2	2	2	2					1	
1	2	4	1	3	2	2	2	2	2	2	2	2		1	11	2	2	5	2	1	160	65	25.39	4	84	91	0.92	3	104	61	70	2	2	2	2						
1	2	1	2	2	2	2	2	2	2	2	2	2		2	12	2	2	2	1	1	153	53	22.64	2	73	84	0.87	3	101	69	100	2	2	2	2						
2	2	4	2	6	2	2	2	2	2	2	2	2		2	11	4	2	3	1	1	156	75	30.82	5	92	106	0.86	3	111	63	95	2	2	2	1					1	
2	2	4	3	3	2	2	2	2	2	2	2	2		2	13	2	2	1	2	2	157	40	16.23	2	60	75	0.8	1	111	68	120	2	2	2	2						
1	1	4	2	1	2	2	2	2	2	2	2	2		2	16	2	2	4	2	1	149	40	18.02	2	56	73	0.76	1	91	63	76	2	2	2	2					1	
2	1	4	1	0	2	2	2	2	2	2	1	2		2	16	1	2	5	1	1	150	51	22.67	2	70	83	0.84	2	96	68	84	2	2	2	2					1	
1	2	4	0	2	2	1	2	2	2	2	2	1	2	1	11	3	2	3	2	2	161	83	32.02	5	90	106	0.85	2	111	62	107	2	2	2	1					1	
1	2	4	2	4	2	2	2	2	2	2	2	2		2	14	2	2	2	1	1	154	40	16.87	2	57	75	0.76	1	91	65	122	2	2	2	2						
1	2	4	1	4	2	2	2	2	2	2	2	2		2	12	2	2	2	1	1	167	52	18.65	2	69	82	0.84	2	113	69	107	2	7	2	2	2					1
1	2	4	2	4	2	2	2	2	2	2	2	2		2	10	8	2	5	1	1	158	80	32.05	4	94	106	0.88	3	120	78	96	2	2	2	2					1	
2	1	4	0	6	2	2	2	2	2	2	2	2		2	10	7	2	5	2	1	155	74	30.8	4	89	110	0.81	2	103	76	96	2	2	2	2						
2	2	4	2	4	2	2	2	2	2	2	2	2		2	14	3	2	2	2	2	158	44	17.63	2	63	80	0.79	1	90	60	92	2	2	2	2					1	
1	2	4	2	3	2	2	2	2	2	2	2	2		2	13	3	2	2	2	1	159	46	18.2	2	64	84	0.76	1	121	70	98	2	2	2	2	normal					
1	1	4	2	2	2	2	2	2	2	2	2	2		2	12	1	2	3	2	2	163	55	20.7	2																	

300	604488g	Mahvish	18	1	2	1		1	12		2		3	2	2	2	2	2	2	2	2	2	1	2	0	2	biscuit,mixture	
301	406482g	Anamika	18	1	3.5	1		1	12		2		2	2	2	2	2	2	2	2	2	2	2	2	0	2	chips,chocolate	
302	549545g	Jayashree	17	1	3.5	1		1	11		2		2	4	2	2	2	2	2	2	2	2	2	0	1			
303	868595b	Pooja	17	1	1.7	1		1	11	30.1	4	20	2	3	2	2	2	2	2	2	2	2	2	1	1	3	1	chips,curkure
304	837611g	Priyanka	17	2	2.5	1		1	10		4		3	3	2	2	2	2	2	2	2	2	2	2	0	2	biscuit,noodles	
305	839927g	Asha	16	2	2	1		1	11		2		2	3	2	2	2	2	2	2	2	2	2	0	1			
306	024619c	Faiza	16	2	2	1	1	1	12		4		4	3	2	2	2	2	2	2	2	2	2	0	2	biscuit,chips		
307	207365g	Kasu	16	2	2.5	1		1	10		2		2	2	3	2	2	2	2	2	2	2	2	0	2	biscuit,chocolate		
308	829886g	Lakshmi	17	2	3.3	1		1	13		2	24.2	2	4	2	2	2	2	2	2	2	2	2	0	0	biscuit		
309	834671g	Janani	17	1	3.5	2		1	13	29	3		2	3	2	2	2	2	2	2	2	2	2	1	1	1	4	biscuit
310	264604c	Sakiba Anjum	18	1	2.7	1		2	10	22	2	25.6	3	2	2	2	2	2	2	2	2	2	2	3	1	biscuit,chips		
311	005765g	Debalina	18	1	2.2	1	15	1	12		2		2	3	1	2	2	2	2	2	2	2	1	4	1	2		
312	752066g	Sowmiya	13	1	2.7	1	10	1	8		2		2	1	2	2	2	2	2	2	2	2	1	4	1	1	biscuit,cake	
313	473707g	Nazifa	16	1	2.5	1		1	10	19.4	2	31.6	4	1	2	2	2	2	2	2	2	2	2	4	2	biscuit,bread		
314	765110g	Srilekha	15	1	2.8	1		1	10		2		2	4	2	1	2	2	2	2	2	2	1	1	2	1	chocolate	
315	816953g	Revathi	17	1	3.6	1		1	12		2		2	4	2	2	2	2	2	2	2	2	1	1	2	0	chocolate	
316	110305g	Anjali	18	1	2.3	1		1	10		2		2	4	2	2	2	2	2	2	2	2	1	1	2	1	biscuit	
317	840124g	Ananya	16	1	2.4	1		1	10		2		2	3	2	2	2	2	2	2	2	2	2	1	2	biscuit,burger,chips,sandwich		
318	842078g	Khansa Tabassum	18	1	3.7	1	5	2	9		4	26	3	3	2	1	2	2	2	2	2	2	2	0	2	biscuit		
319	499791c	Nithiasri	13	1	3.5	1		1	8	29.4	3	27.5	2	2	2	1	2	2	2	2	2	2	1	1	0	2	cutlet,samosa	
320	816823g	Moumi	16	1	2.8	1		1	10	27.5	3	27.1	3	2	3	2	2	2	2	2	2	2	1	1	4	4		
321	857262g	Ranti Chanda	17	1	2.9	1		1	10		2		2	4	2	2	2	2	2	2	2	2	2	0	1	biscuit		
322	847552g	P Harshita	13	1	3	1	8	1	10		2		2	2	2	1	2	2	2	2	2	2	1	3	0	2	chips,curkure,mixture	
323	203278c	Rithiga	14	1	3.5	1	8	1	10		4	26.4	3	3	2	2	2	2	2	2	2	2	1	2	4	1	biscuit,chips,sweets	
324	468985g	Lalrinawmi	16	1	3.9	1		1	10	26.6	3	26.7	3	2	2	2	2	2	2	2	2	2	2	1	2	biscuit,noodles		
325	855477g	Shilpi	15	1	3.8	1	12	1	10		2	32	4	2	2	2	2	2	2	2	2	2	1	3	0	2	chips,noodles	
326	806390g	Sahali	18	2	2.5	1		1	12		4		4	2	3	2	2	2	2	2	2	2	1	1	2	2	bhajji,biscuit	
327	319151f	Subhashree	18	2	2	1		1	11	27.2	3	25.1	3	2	3	2	2	1	6	2	2	1	3	3	1	puffed rice		
328	252618c	Sree Shakti	14	1	3	1		1	10		2	29.2	3	3	2	2	2	2	2	2	2	2	1	4	0	0	chips,samosa	
329	858731g	Jatia	17	1	2.4	1		1	12				2	3	2	2	2	2	2	2	2	2	1	4	0	2	chips,noodles	
330	549052g	Lavanya	15	1	2.5	1		1	8				4	2	2	2	2	2	2	2	2	2	2	0	0	biscuit		
331	838103g	Nalini	16	1		1		1	12				4	2	2	2	2	2	2	2	2	2	2	0	0	biscuit,chips		
332	818981g	Ariba	19	1	3.2	2		1	12		2		2	1	2	1	2	2	2	2	2	2	2	0	1	biscuit		
333	844240g	Sulagna	16	1	2.5	1		1	10		2		2	2	3	2	2	2	2	2	2	2	1	2	3	1	chocolate,icecream	
334	859191g	Sumaiya	15	1	4	2	10	1	9		2		4	2	2	1	2	2	2	2	2	2	1	3	1	2	noodles	
335	859902g	Tulasinarmada	18	1	2.4	1	14	1	13		2		2	3	3	1	2	2	2	2	2	2	1	2	1	2	panipuri	
336	802136g	Debjani	16	1	1.8	2	11	1	11	27.1	3	27.8	3	1	2	2	2	2	2	2	2	2	1	2	1	2	biscuit,chat	
337	846259g	Suparna	14	1	3	1		1	8		2		2	3	2	2	2	2	2	2	2	2	2	0	1	puffed rice		
338	899340b	Sharmila	17	1	2.5	1	14	1	12		4		2	3	2	2	2	2	2	2	2	2	2	0	1	biscuit,chocolate		
339	549680g	Poornima	17	1	2.5	1		1	12		2		2	4	2	1	2	2	2	2	2	2	1	1	1	1	chips,chocolate,icecream	
340	860263g	payel	18	1	2.5	1		1	12		2		2	3	3	1	1	2	2	2	2	2	1	1	0	2	biscuit	
341	852610g	Nirosha	14	1	2.8	1	12	1	10	27.33	3	31.24	4	2	2	2	2	2	2	2	2	1	2		4	0	sweets	
342	829661g	Soumi	15	1	2.4	2		1	10		4		4	2	1	2	2	2	2	2	2	2	1	2	0	1		
343	865841g	Shreya	16	1	3.2	1		1	12	27.5	3	26.7	3	2	2	2	2	2	2	2	2	2	1	1	4	1	biscuit	
344	855681g	Priyanka	17	1	2.7	1		1	11		2		4	3	2	2	2	2	2	2	2	2	1	1	0	2	biscuit,cake	
345	849411g	Mahalakshmi	19	2	2.4	1		1	14		3		4	3	2	2	2	2	2	2	2	2	2	0	3	chocolate		
346	856914g	Alafiya	14	2	3	1		1	9		4		2	3	2	2	2	2	2	2	2	2	2	0	4			
347	090154c	Mubasshira	15	2	2.7	1		1	11		2		2	4	2	2	2	2	2	2	2	1	2	1	1	biscuit		
348	557502g	Lavanya	16	2	2.6	1		1	10		2		2	4	1	2	2	2	2	2	2	1	2	0	0			
349	861521g	Susmita	18	1	3	1		1	12		2		2	3	2	2	2	2	2	2	2	2	2	0	1	biscuits,puffed rice		
350	825428g	Sourita	14	1	2.8	1		1	9				2	1	3	1	1	2	2	2	2	2	1	3	3	0	cake	
351	458502f	Kaviarasi	14	1	2.7	1		1	10		2		3	4	2	2	2	2	2	2	2	2	2	0	1			
352	837179g	Priya	16	1	3.2	1		1	10		2		2	3	2	2	2	2	2	2	2	2	2	0	1	biscuit,puffed rice		
353	854005g	Tanima	18	1	2.7	1		1	13				3	2	3	1	2	2	2	2	2	2	2	0	2	noodles,puffed rice		
354	557010g	Bharathi	17	1	2.4	1		2	10				2	4	2	2	2	2	2	2	2	2	2	0	1	biscuit		
355	853898g	Dishita	12	1	3	1	8	1	8				2	3	2	2	2	2	2	2	2	1	2	0	1	biscuit		
356	817393f	Sutotthita	15	1	2.5	1		1	10	25.4	3	28	3	1	2	1	1	2	2	2	2	2	2	1	2	2	biscuit,chips	
357	854798g	Babli	15	1	1.7	1	10	1	10		2		2	2	3	1	2	2	2	2	2	2	2	3	3	biscuit,cake		
358	854952g	deepika	15	1	2.5	1	12	1	10		2		2	4	2	1	2	2	2	2	2	1	1	1	0	1	chips	
359	884080b	Thahseen	17	1	2.9	1	14	1	12		2		2	4	2	2	2	2	2	2	2	2	2	0	1	chocolate,biscuit		

1	1	4	0	4	2	2	2	2	2	2	2	2	2	11	7	3	2	2	2	158	37	14.82	1	57	70	0.81	2	85	61	120	2			2	2	2	normal		
1	2	4	1	6	2	2	2	2	2	2	2	2	2	12	6	2	5	2	2	164	57	21.19	2	67	83	0.8	1	106	84	81	2			2	2	2			1
1	2	4	1	2	2	2	2	2	2	2	2	2	2	13	4	3	2	2	148	54	24.65	2	78	93	0.83	2	104	60	85	2			2	2	2	normal			
1	2	4	1	3	2	2	2	2	2	2	2	2	2	12	5	2	2	2	143	40	19.56	2	57	67	0.85	2	90	67	121	2			2	2	2				
1	2	4	1	2	2	2	2	2	2	2	2	2	2	11	6	2	3	1	154	52	21.93	2	75	87	0.86	3	130	70	96	2			2	2	2			1	
1	2	4	1	2	2	2	2	2	2	2	2	2	2						143	41	20.05	2	63	78	0.8	1	110	68	96	2			2	2	2	small uterus no ovary			
2	1	4	0	3	2	2	2	2	2	2	2	2	2	11	5	3	4	1	157	69	27.99	3	85	103	0.82	2	99	56	98	2			2	2	2			1	
1	2	4	2	2	2	2	2	2	2	2	2	2	2	12	4	2	2	1	148	41	18.72	2	62	76	0.81	2	103	69	95	2			2	2	2	normal			
1	1	4	0	3	2	2	2	2	2	2	2	2	2	15	2	2	2	1	154	45	18.97	2	62	78	0.79	1	110	69	75	2			2	2	2				
1	2	4	2	1	2	2	2	2	2	2	2	2	2	15	2	2	2	1	166	45	16.33	1	63	84	0.75	1	95	60	80	2			2	2	2				
1	2	4	0	1	2	2	2	2	2	2	2	2	2	12	6	2	4	1	145	46	21.88	2	70	87	0.8	1	116	76	115	2			2	2	2			1	
1	2	1	0	1	2	2	2	2	2	2	1	1	4	1	11	7	2	3	2	150	60	26.67	3	85	96	0.88	3	106	73	91	2			2	2	2			1
1	2	4	1	1	2	2	2	2	2	2	2	1	3	11	2	2	2	1	156	58	23.83	3	73	89	0.82	2	130	80	90	2			2	2	2			1	
1	1	4	1	5	2	2	2	2	2	2	2	1	3	14	2	3	3	2	163	66	24.84	2	76	93	0.81	2	108	83	86	2			2	2	2	normal			
1	2	2	1	0	2	2	2	2	2	2	2	2	2	12	3	2	4	2	160	53	20.7	2	78	92	0.84	3	94	62	97	2			2	2	2			1	
1	2	4	1	0	2	2	2	2	2	2	2	1	2	14	3	2	2	1	160	56	21.88	2	70	90	0.78	1	104	64	92	2			2	2	2				
1	2	4	1	1	2	2	2	2	2	2	2	2	2	14	4	2	2	1	148	44	20.09	2	76	84	0.9	3	122	71	88	2			2	2	2	normal			
2	1	4	2	4	2	2	2	2	2	2	2	2	1	12	4	2	2	2	163	57	21.45	2	66	80	0.82	2	104	69	89	2			2	2	2				
1	2	4	3	0	2	2	2	2	2	2	2	2	2	11	7	2	3	1	161	73	28.16	3	86	98	0.88	3	99	60	89	2			2	2	2			1	
1	2	3	3	2	2	2	2	2	2	2	2	2	2	12	1	3	2	2	154	37	15.6	2	63	77	0.81	2	125	66	128	2			2	2	2				
2	2	4	2	4	2	2	2	2	2	2	2	2	2	13	3	2	2	2	157	45	18.26	2	63	82	0.77	1	114	74	123	2			2	2	2			1	
2	2	4	1	3	2	2	2	2	2	2	2	2	2	15	2	2	2	1	150	35	15.56	1	54	71	0.76	1	94	68	104	2			2	2	2	dermoid			
2	2	4	2	1	2	2	2	2	2	2	2	2	2	12	1	3	4	2	157	62	25.15	3	79	92	0.86	3	117	73	102	2			2	2	2			1	
1	2	4	0	3	2	2	2	2	2	2	2	2	2	12	2	2	2	1	165	70	25.71	3	78	92	0.85	2	110	61	88	2			2	2	2				
1	1	4	0	8	2	2	2	2	2	2	2	2	2	12	4	3	2	1	153	48	20.5	2	59	86	0.69	1	98	63	98	2			2	2	2	normal			
1	2	4	0	5	2	2	2	2	2	2	2	2	2	15	3	2	2	1	161	63	24.3	3	81	96	0.84	2	98	58	78	2			2	2	2				
2	1	4	5	3	2	2	2	2	2	2	2	1	3	12	6	2	2	2	157	41	16.63	1	59	77	0.76	1	103	72	88	2			2	2	2	adnexal cyst			
2	2	4	1	5	2	1	2	2	2	2	2	1	2	14	4	2	4	1	164	63	23.42	2	77	90	0.85	2	120	74	97	1	3		2	2	2			1	
1	2	4	1	2	2	2	2	2	2	2	2	2	2	12	2	2	1	1	154	48	20.24	2	74	90	0.82	2	88	66	80	2			2	2	2				
1	2	4	1	2	2	2	2	2	2	2	2	2	2	13	4	3	3	1	154	56	23.61	2	75	97	0.77	1	113	69	88	2			2	2	2			1	
2	1	4	1	2	2	2	2	2	2	2	2	2	2	11	4	2	2	1	162	39	14.86	1	65	81	0.8	1	102	68	86	2			2	2	2				
1	1	4	2	1	2	2	2	2	2	2	2	2	2	12	4	3	3	2	155	52	21.64	2	74	94	0.78	1	103	58	107	2			2	2	2			1	
1	2	4	2	4	2	2	2	2	2	2	2	1	3	13	6	2	2	1	150	52	23.11	2	77	90	0.85	2	112	74	131	2			2	2	2	ovarian cyst			
1	2	4	2	4	2	2	2	2	2	2	2	1	3	10	6	2	2	1	153	51	21.79	2	75	85	0.88	3	65	42	86	2			2	2	2	ovarian cyst			
1	2	4	2	4	2	2	2	2	2	2	2	2	2	12	3	3	3	1	156	67	27.53	3	78	95	0.82	2	120	86	122	2			2	2	2	bicornuate uterus			
1	1	4	0	1	2	2	2	2	2	2	2	2	2	13	5	2	5	2	158	80	32.05	4	90	118	0.76	1	103	69	98	1	3		2	2	2			1	
1	1	4	1	8	2	2	2	2	2	2	2	2	2	10	6	2	5	2	158	80	32.05	5	87	100	0.87	3	144	79	104	1	3		2	2	2			1	
2	1	4	2	2	2	2	2	2	2	2	2	2	2	13	1	2	2	1	154	34	14	1	58	77	0.75	1	102	77	81	2			2	2	2				
1	2	4	4	2	2	2	2	2	2	2	2	2	2	14	3	2	3	2	149	57	25.67	3	73	88	0.83	2	89	56	90	2			2	2	2			1	
1	2	4	1	2	2	2	2	2	2	2	2	2	2	12	5	2	2	1	158	45	18.03	2	66	79	0.83	2	110	70	102	2			2	2	2	normal			
1	1	4	4	4	2	2	2	2	2	2	2	2	2	12	6	2	2	2	151	38	16.67	1	53	72	0.74	1	102	58	83	2			2	2	2			1	
1	2	4	0	4	2	2	2	2	2	2	2	2	2	12	2	2	2	2	157	67	27.18	3	82	96	0.85	2	96	57	69	2			2	2	2			1	
1	2	3	1	1	2	2	2	2	2	2	2	2	2	13	2	1	1	1	158	47	18.83	2	67	80	0.83	2	110	70	78	2			2	2	2	adnexal cyst			
1	2	4	1	4	2	2	2	2	2	2	2	2	2	11	5	1	2	1	152	52	22.51	2	69	87	0.79	1	115	70	81	2			2	2	2			1	
1	2	4	3	4	2	2	2	2	2	2	2	2	2	15	2	2	2	1	154	43	18.13	2	58	77	0.75	1	114	67	120	2			2	2	2	dermoid			
2	1	4	3	3	2	2	2	2	2	2	2	2	2	16	3	2	2	2	153	41	17.51	2	55	74	0.74	1	103	63	125	2			2	2	2	normal			
1	2	4	1	2	2	2	2	2	2	2	2	2	2	13	1	2	5	2	156	43	17.67	2	57	80	0.71	1	131	75	118	2			2	2	2				
1	2	4	2	2	2	2	2	2	2	2	2	2	2	11	4	3	5	1	162	41	15.62	1	59	76	0.77	1	93	56	82	2			2	2	2			1	
2	1	4	2	1	2	2	2	2	2	2	2	2	2	14	2	3	5	1	148	42	19.17	2	59	72	0.81	2	107	65	101	2			2	2	2			1	
1	2	4	3	1	2	2	2	2	2	2	2	2	2	15	3	2	2	1	157	42	17.04	1	64																

360	854604g	Aparna	18	1	2.3	1		2	10		2		2	4	2	2	2	2		2	2		0	1	mixture,puffed rice	
361	782234d	Suchita	18	1	2.8	1		1	13	26.04	3	26.84	3	1	2	1	2	2		2	2		0	0	biscuit	
362	797702g	Neha	16	2	2.7	2		1	12		2		3	2	2	2	2	2		2	1	1	2	1	chocolate	
363	844774g	Ekta	15	2	2.3	1		1	10		2		2	2	3	2	2	2		2	2		0	1	bread	
364	859717g	Vijayalakshmi	17	2	3.2	1		1	12		3		4	3	2	1	2	2		2	2		0	2	chips,samosa	
365	926682f	Jena	18	2	2.3	2		1	14		2		3	3	2	1	2	2		2	2		0	1	chips,vada	
366	414946f	Faria	14	1	3	1	12	1	9		3	26.7	3	2	2	2	2	2		2	2		4	2	biscuit,chips	
367	824853g	Nabanita	16	1	3	1	14	1	10		4		2	2	3	1	2	2		2	1	2	3	2	biscuit,chips	
368	853654g	Nandhini	16	1	2.3	1		1	12		4		2	4	2	2	2	2		2	2		0	0		
369	837491g	Monika	18	1	2.7	1		2	10		2		2	4	2	2	2	2		2	2		0	1		
370	461509g	Ummu	18	1	1	1	15	2	12		4		4	2	1	2	2	2		2	1	3	3	1	biscuit,chocolate	
371	060711c	Mythili	15	1	3	1		1	12				2	1	1	2	2		2	1	2	1	2	1	chicken 65	
372	813656b	Deepas baby	17	1	3	1	15	1	12				2	1	1	2	2		2	1	2	1	2	1	chicken 65	
373	821403g	Subhagi	17	2	2.5	1		1	12		3		2	2	3	1	2	2		2	1	4	0	2	biscuit,chocolate,noodles,roll	
374	496102g	Devika	18	2	2.8	1	16	1	13	27.2	3	36.2	5	2	1	2	2	2		2	2		3	1	biscuit,mixture	
375	857095g	Rakhi	13	2	2.5	1	8	1	9		4		2	3	1	2	2	2		2	2		0	1	puffed rice	
376	289854c	Ramiya	17	2	3	1	12	1	12		2		2	4	2	2	2	2		2	2		0	1		
377	275563g	Yamuna	16	1	2.5	1		1	12		2		2	4	2	2	2	2		2	2		0	0		
378	819350f	Nisha	17	1	2.7	1		1	12		2		4	4	2	2	2	2		2	2		3	3	chips	
379	447497d	Moumita	15	1	2.5	1	12	1	9		2		2	2	2	2	2	2		2	2		3	1	biscuit	
380	452809g	Manisha	17	1	2.2	1		1	12		2		2	1	2	2	2	2		2	1	2	4	2	biscuit,mixture	
381	831443g	Kakali	18	1	2.5	1		1	12		2		2	2	2	1	2	2		2	2		0	1	biscuit,puffed rice	
382	834159g	Sridipta	17	1	3.7	1		1	12		2		2	2	3	2	2	2		2	2		0	2	noodles,pasta	
383	362580c	Jaswina	13	1	2.5	1	10	1	8		4		2	3	2	2	2	2		2	2		0	1	chips, kurkure	
384	853981g	Chandrima	17	1	3	1		1	11		3	25.6	3	2	3	2	2	2		2	1	3	0	2	biscuit,chocolate,noodles	
385	824531g	Ditsa	18	2	3.5	1		1	12	23.7	2	28.4	3	2	3	1	1	2		2	2		0	0	mixture,puffed rice	
386	852016g	Marilyn	16	2	2.7	1		1	11		2		2	3	3	2	2	2		2	2		1	1	biscuit,chips	
387	853099g	Arbina	16	2		1		1	10	29.4	3	27.1	3	3	2	2	2	2		1	2		0	1	biscuit,chips	
388	868134g	Brunda	14	2	2.7	1		1	9		2		3	3	3	2	2	2		2	1	1	0	1	biscuit,chocolate	
389	822206g	Sudipta	17	1	2.8	1	12	1	12		2		4	3	3	1	2	2		2	1	4	3	3	noodles,puffed rice	
390	186837d	Saranya	12	1	3	1		1	7		2		2	2	2	2	2	2		2	2		0	0	biscuit	
391	558655g	Archana	13	1	2	1		1	7		2		3	4	3	2	2	2		2	2		0	1	biscuit	
392	181248c	Shalini	15	1	2.5	1	12	1	11				4	2	2	2	2	2		2	2		1	1	biscuit,chocolate	
393	024459c	Monisha	16	1	2.4	1		1	12				2	4	2	2	2	2		2	2		0	0	biscuit	
394	860766g	Sadhana	17	1	2.3	1		1	10		2		2	4	2	2	2	2		2	2		0	1	puffed rice	
395	825638g	Riya	15	1	2.7	1	12	1	10				2	2	2	2	2	2		2	2		1	2	biscuit	
396	443525f	Suzanne	16	2	2.7	1		1	10	19.5	2	31.2	4	2	3	2	2	2		2	1	4	0	0		
397	323773c	Rashmita	15	2	3	1		1	9		2		2	1	3	2	2	2		2	1	4	4	2	biscuit	
398	153729c	Jayashree	15	2	2.7	1		1	10		2		2	2	2	2	2	2		2	2		0	4	mixture,murukku	
399	243821d	Harita	17	2	3.3	1		1	12		3		3	2	2	2	2	2		2	1	4	0	1	biscuit	
400	829531g	Subarna	17	2	3.5	1		1	12		2		2	1	2	2	2	2		2	1	2	2	2	2	icecream,noodles
401	182690f	Babita	15	2	4	1	1	1	10		4		4	3	1	2	2	2		2	2		0	1	biscuit	
402	752018g	Divya	19	1	3.2	1	17	2	12	34.3	4		4	3	2	2	2	2		2	1	3	0	1	rusk	
403	876800g	Mona	16	1	2.5	1		1	12		2		3	3	2	2	2	2		2	1	2	0	2	biscuit,chips	
404	836719g	Tanushree	17	1	3.5	1	15	1	12		2		3	3	1	2	2	2		2	1	2	3	1	noodles,pasta	
405	800289b	Monisha	17	1	2.7	1		1	13		4		4	2	2	2	2	2		2	1	2	0	2	chips,puff	
406	869606g	Dhanushree	17	1	3.5	1	15	1	12	27	3	26.1	3	3	3	2	2	2		2	2		0	1		
407	878856g	Elemi	18	1	1.5	1		1	12		2		4	2	2	2	2	2		2	2		0	1	biscuit	
408	834028g	Payel	15	1	2.3	1		1	10		2		3	2	3	2	2	2		2	2		0	1	biscuit	
409	870740g	Salma	18	1	2.8	1		1	12		2		2	3	2	2	2	2		2	1	3	1	1	chocolate	
410	709939g	Fouzia	18	1	2.9	1		1	13		2		2	2	2	2	2	2		2	2		3	2	noodles,roll	
411	867793g	Sneha	16	1	2.7	1		1	12		2		2	3	3	2	2	2		1	2		0	2	biscuit	
412	688339c	Aishi	18	1	2.2	1	12	1	12	22.8	2	19.9	2	3	2	1	2	2		2	2		3	2		
413	881201g	Adriana	13	1	3	1	10	1	7	29.4	3	27	3	1	2	1	1	1	1	1	2	2	2	1	1	pizza
414	395947c	Swetha	13	2	3.1	1	10	1	9	24.6	2	28.8	3	1	2	2	2	2		2	1	3	0	3	biscuit, cake	
415	879017g	Lavanya	14	1	3.2	1		1	9		4		2	1	2	2	2	2		1	1	3	0	2	biscuit,chocolate,noodles	
416	831846g	Maneeshreddy	16	1	2.5	1		1	12		3		3	1	2	2	2	2		2	1	3	0	1	biscuit,chocolate	
417	377050d	Sreejita	16	1	2.7	1		1	11		2		2	1	2	2	2	2		2	2		0	3	biscuit,puffed rice	
418	492707g	Siri	17	1	2.4	1		1	12		2		3	1	2	2	2	2		1	2		3	0	chips, chocolate, icecream	
419	345169c	Bhavani	13	1	3.6	1		1	8		2		3	4	2	2	2	2		2	2		0	1	chocolate,panipuri	

CERTIFICATE

This is to certify that the dissertation titled “A CROSS-SECTIONAL STUDY TO INVESTIGATE THE PREVALENCE OF OBESITY IN ADOLESCENT GIRLS ATTENDING GYNAECOLOGY OUT PATIENT CLINIC IN A TERTIARY LEVEL HOSPITAL” by the candidate Dr Evangeline Reeni Christian with registration number 22161401 towards partial fulfilment of the requirements of the Tamil Nadu Dr M.G.R Medical University for the award of the Degree of MS OBSTETRICS AND GYNAECOLOGY (BRANCH II) examination to be held in May 2018, I personally verified the urkund.com website for the purpose of plagiarism check. I found that the uploaded thesis file contains from title to conclusion pages and the result shows **ZERO** percentage plagiarism in the dissertation.

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