



Adolescent obesity in adolescent clinic, Chulalongkorn University

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- Objective** : *To study the adolescent obesity, its medical correlates, factors contributing to obesity and out-come of treatment.*
- Setting** : *Adolescent clinic, Pediatric department, Faculty of Medicine, Chulalongkorn University*
- Research design** : *Retrospective study*
- Patients** : *80 obese adolescents*
- Method** : *Reviewing of questionnaires and medical records of every obese adolescents who came to adolescent clinic during the year 1991-1996.*
- Result** : *Total number of obese adolescents was 80. Male to female ratio was 39:41. The mean age was 11.7 \pm 2.3 years. The average weight at the beginning of treatment was 72.4 \pm 2.1 kgs. 7,27,34 and 12 cases were in the mild, moderate, severe and morbid range of obesity respectively. 63% were in process of pubertal changes, SMR 2,3,4 or 5. The height of 79.5% of the patients were between the mean and +2SD, 15.4% were above +2SD and only 5.1% were below the mean. 42.5% of the patients began their obesity before 4 years of age. 77.5% of patients had at least one family's member with obesity. More than half of*

the patients had some health consequences of obesity, poor eating habit and exercised only 1-2 hours during gym-class at school. Most of the patients did not attend the clinic regularly and out come of treatment was unsatisfactory.

Conclusion : *The number of obese patients in adolescent clinic was increasing. More than half of the patients were in the severe and morbid ranges of obesity and was accompanied with health consequences and extremely difficult to treat.*

Key word : *Obesity in adolescent.*

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วัตถุประสงค์ : เพื่อรวบรวมและประเมินสภาวะของผู้ป่วยวัยรุ่นโรคอ้วนที่มารับรักษาที่
คลินิกวัยรุ่น โรงพยาบาลจุฬาลงกรณ์ รวมทั้งปัจจัยที่มีผลต่อโรคอ้วนและ
ผลการรักษา เพื่อเป็นแนวทางในการดูแลรักษาผู้ป่วยต่อไป

สถานที่ทำการการศึกษา : คลินิกวัยรุ่น ภาควิชากุมารเวชศาสตร์ คณะแพทยศาสตร์ จุฬาลงกรณ์
มหาวิทยาลัย

รูปแบบการวิจัย : *Restrospective study*

ผู้ป่วยที่ทำการการศึกษา : ผู้ป่วยวัยรุ่นโรคอ้วนจำนวน 80 ราย

วิธีการศึกษา : เก็บรวบรวมข้อมูลจากแบบสอบถามและหน้าป้ายของผู้ป่วยโรคอ้วนทุกราย
ที่มารับรักษาที่คลินิกวัยรุ่นระหว่างปี พ.ศ.2534-2539 เพื่อหาปัจจัยต่างๆ
ที่อาจมีต่อโรคอ้วน รวมทั้งหาสาเหตุ จำแนกความรุนแรงของโรคอ้วน
ประเมินการเปลี่ยนแปลงเข้าสู่วัยรุ่น และภาวะแทรกซ้อนของโรคอ้วน
รวมทั้งประเมินผล การรักษา

ผลการศึกษา : ผู้ป่วยวัยรุ่นจำนวน 80 ราย เป็นชาย 39 ราย หญิง 41 ราย อายุเฉลี่ย
 11.7 ± 2.3 ปี น้ำหนักเฉลี่ยเมื่อเริ่มทำการศึกษา 72.4 ± 2.1 กิโลกรัม เป็น
โรคอ้วนระดับเริ่มต้น 7 ราย ระดับปานกลาง 27 ราย ระดับรุนแรง 34
รายและระดับอันตราย 12 ราย ผู้ป่วยร้อยละ 63 มีการเปลี่ยนแปลงเข้าสู่
วัยรุ่นอยู่ในระยะ ระหว่าง SMR II ถึง V ร้อยละ 79.5 มีความสูงอยู่
ระหว่าง mean และ +2SD ร้อยละ 15.4 มีความสูงมากกว่า + 2SD มี
เพียงร้อยละ 5.1 มีความสูงต่ำกว่า mean ผู้ป่วยร้อยละ 42.5 เริ่มอ้วนก่อน
อายุ 4 ปี ร้อยละ 77.5 มีคน ในครอบครัวอ้วน ผู้ป่วยส่วนใหญ่
มีภาวะแทรกซ้อนของโรคอ้วน มีบริโภคนิสัยที่ไม่ถูกต้องและ ออกกำลังกาย
ไม่สม่ำเสมอ รวมทั้งมารับการรักษาไม่สม่ำเสมอทำให้ผลการรักษาไม่เป็น
ที่น่าพอใจนัก

สรุป : ผู้ป่วยโรคอ้วนในคลินิกวัยรุ่นมีจำนวนเพิ่มขึ้น ส่วนใหญ่อ้วนในระดับรุนแรง
และอันตราย มีภาวะแทรกซ้อนของโรคอ้วน และยากต่อการรักษา

Obesity has become a condition of increasing concern in the care of children and adolescents in term of its serious long-term medical complications and psychological implications. Obesity in childhood appears to increase the risk of subsequent morbidity, whether or not obesity persist into adulthood⁽¹⁾ Obesity among children and adolescents is still growing in frequency and severity in many studies.⁽¹⁻⁵⁾ Management of obesity is very difficult. Many approaches have been tried, but most of them have failed to achieved long term weight loss.⁽⁶⁻⁷⁾

It is interesting to know about the characteristic of adolescent patients who come to the adolescent clinic, Chulalongkorn Hospital because of obesity problem.

Material and method

The subjects were 80 obese adolescents seen over a 6-year period (1991-1996) at the adolescent outpatient clinic, Pediatric Department, Chulalongkorn University.

Obesity is the result of excess adipose tissue. Studies of obesity often use weight for height measures as an approximation to measurement of adipose tissue mass. The definition of obesity in this study is based on the measurement of weight and height which is an excellent means of screening children for obesity in office setting^(8,9) Those with the weight in excess of 20% above the ideal weight for height,

age and sex are considered obese. Standard growth charts of Chulalongkorn Hospital provide a mean of approximating the ideal weight for male and female adolescents based on age and height.

The determination of the degree of obesity is made by the use of standard growth chart to identify ideal weight for height. A patient whose weight in the level of 20-39%, 40-59%, 60-99% and $\geq 100\%$ above the ideal weight for height, age and sex would be considered mild, moderate, severe and morbid obesity respectively. Triceps skinfold thickness and body mass index were not used in this study. The inconvenience and inaccuracy in the measurement of skinfold thickness and variability in the distribution of subcutaneous fat limit the use of this measure in clinical setting. Body mass index (BMI=weight/height²) has limited use in children and adolescents as it varies with age,sex, the maturation stage and race^(10,11) and standardized percentile curve of BMI for Thai children and adolescent has not been developed.

A complete medical history of 80 obese adolescents were taken by interviewing of the patients and parents to identify factors predispose the patient to obesity. The essential history of eating habit and detailed dietary history, social and family environmental problems likely to affect children's ability to diet were taken. The data collection included previous and presenting weights, heights, medical problems, and evidence

of parental and sibling obesity.

A careful physical examination and necessary laboratory test were done in order to assess growth and pubertal development, to rule out underlying metabolic disorders or syndromes and to find out the complication of obesity.

A periodic evaluation of the therapeutic intervention was done. Weight and height were recorded at each attendance to assess the growth pattern in adolescents treated for obesity.

Treatment condition

Because adolescents require nutritionally adequate diets to maintain normal rates of growth and pubertal maturation, the primary goal is to achieving gradual changes in diet and exercise without placing the adolescent at risk for caloric insufficiency. The aim of treatment would be to achieve appropriate weight for height and age and to keep weight within normal range, while allowing normal growth.

Therapy for obesity required active participation of patients and their parents. The obese adolescent and parent were seen together at the outpatient clinic. All had received regular

diet advice. An education about a healthy balanced weight-reduction diet was given. The patient was instructed to eat three meals per day from all five food groups and with less food or calories than previously by preparing low-calorie food. Emphasis lay on eating in a different way and on eating less. Counting calories was not done. The families were educated about healthy food and how to prepare it without sugar and fat.

Adolescents were taught about the advantages of exercise and caloric expenditure. Participation in a regular physical exercise program that individual would enjoy and was easily accessible for 20-30 minutes each day was promoted. Lifestyle changes to increase physical activity such as using stairs instead of elevators, walking instead of going by car, were encouraged. The drug therapy was not given to any of the patients.

Results

The 80 obese adolescents, aged 8 to 20 years, were seen over a 6 year period (1991-1996) at the adolescent outpatient clinic. The mean age was 11.7 year and the ratio of male to female was 39:41 (Table 1)

Table 1. Baseline characteristics of 80 obese adolescents (* \bar{X} +2SD).

	All subjects	male	female
age(yr)	11.7 \pm 2.3*	11.7 \pm 2.1	11.7 \pm 2.5
weight(kg)	72.4 \pm 21.1	74.0 \pm 23.9	70.9 \pm 18.2
male:female	39:41		
percentage of excess weight over ideal wt.for Ht	70.4 \pm 27.4	77.4 \pm 30.4	63.7 \pm 22.7

The average weight of both sexes was 72.4 ± 21.1 kg. The maximum weight at the beginning of treatment was 138 kg. The mean percentage of excess weight over the ideal weight for height was 70.4 ± 27.4 for both sexes, 77.4 ± 30.4

for male and 63.7 ± 22.7 for female patients. The maximum was 139.1%. Figure 1 showed the trend of new cases of obese patients each year and it seemed to be increasing.

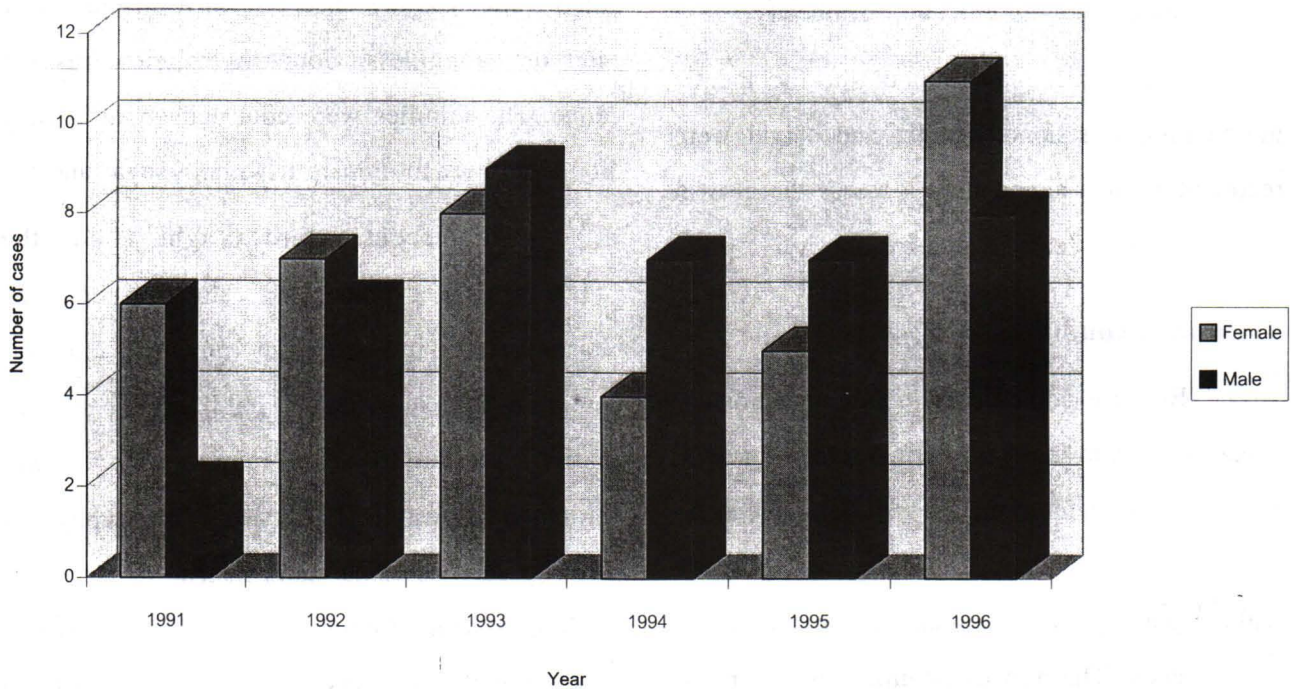


Figure 1. Trends in new cases of obesity in adolescent clinic.

7,27,33 and 11 patients were in the mild, moderate, severe and morbid range of obesity respectively. Because the data of height was missing in 2 patients, the calculation of % excess weight over the ideal weight for height could

not be done in these 2 cases. Of all patient, the average percentage of excess weight over the ideal weight for height in the mild moderate, severe and morbid group were 35, 50.2, 77.2 and 121.5 respectively. (table 2)

Table 2. Patients classified according to degree of obesity

(No.= number of patient, *= $X \pm 2SD$).

	Male	No	Female	No	Total average	No
mild(20-39% above the ideal)	34.2	1	35.8(± 2.7)	6	35.0(± 2.5)*	7
moderate(40-59% above the ideal)	48.7(± 7.1)	11	51.3(± 6.5)	16	50.2(± 6.7)	27
severe(60-99% above the ideal)	74.8(± 10)	17	79.8(± 11.3)	16	77.2(± 10.8)	33
morbid($\geq 100\%$ above the ideal)	122.2(± 19.2)	9	118.4(± 17.4)	2	121.5(± 18.1)	11
Total	77.4(± 30.4)	38	63.7(± 22.7)	40	78.4(± 27.4)	78

Growth and pubertal development

In term of pubertal development, 37% of all patients were in sex maturity rating stage I (SMR I) and 63% were in SMR 2,3,4 or 5 at the beginning of treatment. 18 of 41 female patients (44%) had already had menstruation. 17 patients had their first menstrual period at the age of ≤ 12 years. Of these patients, 9 had their first menstrual period even before the age of ≤ 11 years.

The heights of most of the patients (79.5%) were between the 50th and 97th centile, 15.4% were above the 97th centile and only 5% of the patients had their height below the 50th centile on standard growth chart appropriate for age and sex. None were below the 25th centile.

Factors predisposing to obesity

Obesity in 42.5% of the patients began before 4 years of age. Sixty-two of 80 cases (77.5%) had one or more family's member with obesity. Twenty-three of 62 (37%) had obese mother or father. Eight (12.9%) of 62 had both parents with obesity.

7 patients lived with parents whose job were involved in preparing, serving and selling foods at home. Past medical history showed that none of our patients had underlying metabolic disorders or syndromes. But we did have three cases of past history of convulsion of unknown etiology, one case with convulsion and hepatomegaly, two cases with history of allergy,

two cases with mild to moderate mental retardation, three cases with underlying heart diseases (VSD, heart block, Takayasu) and one cases with previous history of meningitis (table 3). 18 of 80 patients had tried to lose weight before coming to our clinic by restriction of food intake (7/18) or use of medication (11/18). None were success.

Table 3. Past-medial history.

Past medical illness	No. of patients
convulsion	3
convulsion and hepatomegaly	1
allergy	2
mild to moderate MR	2
heart disease (VSD,heartblock,Takayasu)	3
meningitis	1

Eating habit and exercise

In assessment of eating habit, both the amount and kind of food eating, we found that 43 of 80 cases (53.8%) ate 3 or less meals per day, 27 of 80 cases (33.8%) ate 4 or more meals per day and 10 of the 80 cases (12.5%) ate variable number of meals. (table 4). The favorite foods were as follow; fried food or high-fat foods (66.8% of the cases), carbonated beverages (50% of cases) and "junk food" (42.5% of cases). And 17.5% of the patients preferred to eat every-kind of foods (table5).

Table 4. Number of meals per day.

number of meals per day	number of patients
2	2
3	41
4	16
>4	11
variable	10

Table 5. Favorite kind of foods.

kind of foods	number of patients
fried-foods or high-fat meals	68.8%
carbonated beverages	50.0%
“junk foods”	42.5%
cake, ice-cream	28.8%
Thai-styled sweet dessert	20.5%
dessert with coconut milk	17.5%
milk	25%
every-kind of foods	17.5%

On reported level of physical activity, more than half of the patients(47 cases) exercised only 1-2 hours per week during gym-class at school. 23 patients exercised more than gym-class but did it irregularly. Only 10 patients reported of regular exercise.

Influence of obesity on health

Many study subjects had medical problems considered to be related to obesity: 18 subjects had pain in the hips, knees or ankles, 23 subjects had skin lesion, e.g. acanthosis nigrican, friction dermatitis, 23 cases reported of poor exercise intolerance (table 6).

Table 6. Number of subjects reporting diseases or symptoms associated with obesity.

diseases or symptoms	No. of patients
pain in the hips, knees or ankles	18
skin lesion(acanthosis nigrican, friction dermatitis)	23
poor exercise intolerance	23
heat intolerance	11
headache	4
elevated blood pressure	7
hyperlipidemia	7 in 10 cases
gynecomastia	2
snoring	2
no complication	28

Obesity is associated in some individual with hypertension, although most obese individuals do not become hypertensive. In this study 7 cases had elevated blood pressure in the mild to moderate range. 7 out of 10 patients who did check the lipid profiles had hyperlipidemia and 4 of them were in the severe or morbid group of obesity. Approximately one-third of patients did not have any of the physical consequences listed in the table 6.

Result of treatment

At the first 1,2,6 and 12 months follow-up visit, the number of patients with decreased percentage of excess weight over ideal weight for height (lost-weight) were out number the patients whose weight remained unchanged or increased (Figure2).

The average changes in the percentage of excess weight over the ideal weight for height over time are shown in figure3.

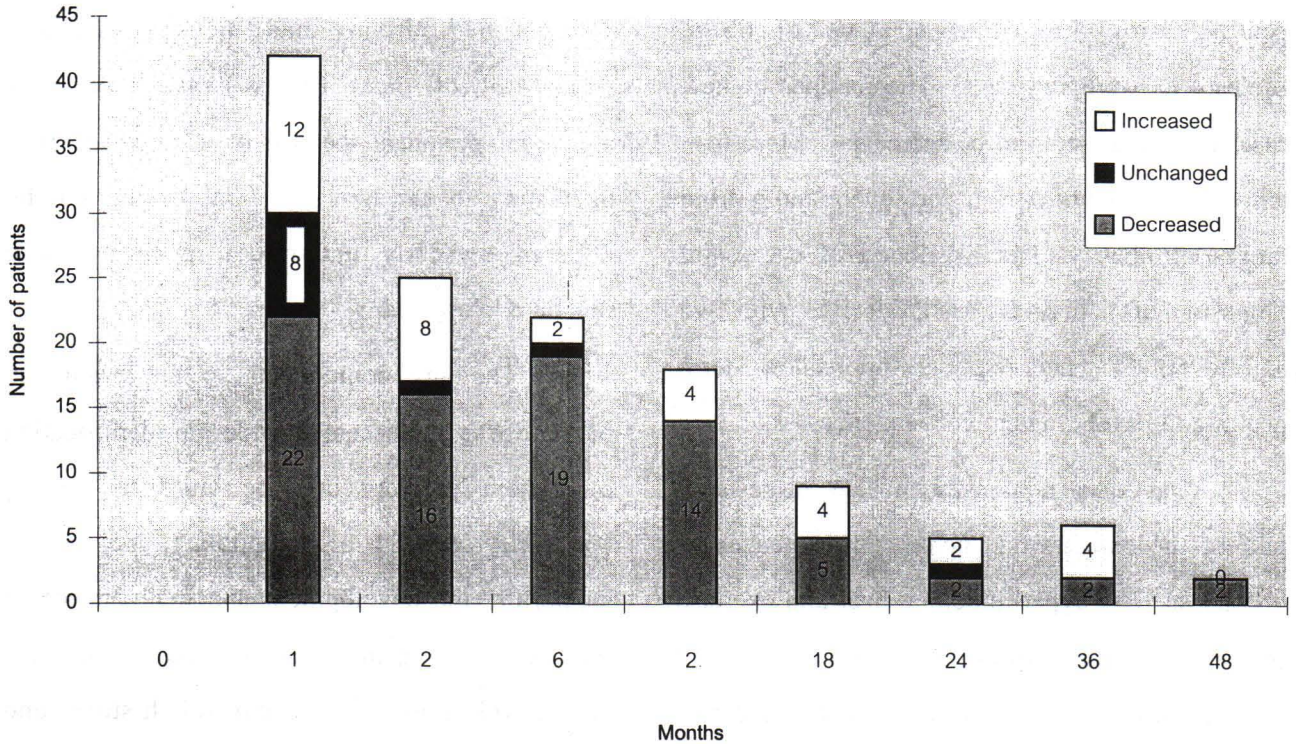


Figure 2. Number of patients with decreased, unchanged or increased in percentage of excess weight over the ideal weight for height at months of follow-up visit.

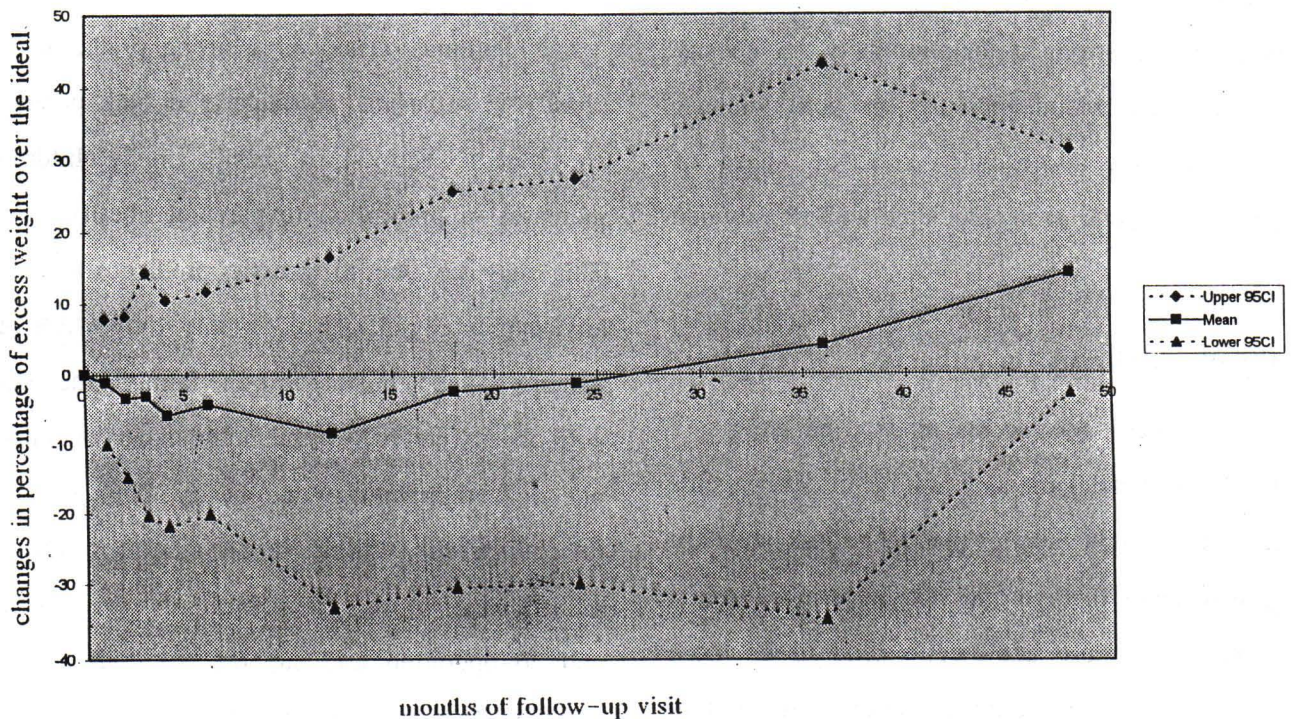


Figure 3. Average changes in percentage of excess weight over the ideal weight for height at months of follow-up visit.

Discussion

In this study the sex ratio of obese adolescents (M:F=39:41) was different from general information that 60-70% of obese adolescents were female.⁽¹²⁾ The number of new cases each year seem to be increasing. More than half of our patients were in the severe and morbid ranges of obesity. The likelihood of successful remission of pediatric obesity decline with age and severity^(6,12) and risk the serious long-term health and psychological consequences.

Our data demonstrated that more than half of the patients had health consequences of obesity such as hyperlipidemia, heat and exercise intolerance and arthralgia. Seven cases had elevated blood pressure in the mild and moderate range.

In the analysis of data from four population surveys in the United States suggested that there was a strong association between obesity and elevated blood pressure for both younger children and adolescents and the share of pediatric hypertension associated with obesity had increased.⁽²⁾

Effects of obesity on puberty

Obese adolescents tend to be taller and larger in skeletal mass.⁽¹²⁾ 94.9% of our patients had the height above the mean on standard growth chart for age and sex. In term of sexual maturation, obese adolescents tend to be more precocious in attaining menarche and sexual

maturation.⁽¹²⁾ 63% of our patients were in SMRII, III, IV, or V of pubertal development at the beginning of the treatment. 18 of 41 female patients had already had menstruation and almost all of them (17/18) had their first menstrual period at the age of ≤ 12 years. It is interesting to see how the final height will be effected by early maturation in these obese female adolescents.

The key components in the evaluation of the obese adolescent include the identification of factors predisposing the child to obesity (primarily genetic or metabolic) and factors supporting the development and maintenance of the obese state (primarily environmental, familial and psychologic).⁽⁸⁾ By careful history and physical examination showed that none of our patients had underlying syndrome or metabolic conditions.

Parental obesity is a strong predictor of obesity in offspring, particularly if both parents are obese.⁽⁸⁾ The risk of obesity among children increases in proportion to parental obesity.^(12,14) This may be due to genetic predisposition or environmentally influenced. In this study 77.5% of patients (62/80) had at least one family's member with obesity and half of this numbers (31/62) had one or both parents with obesity. Any attempt to change the child's dietary habit required modification of the family's food environment and co-operation and support from all family members (a family-oriented approach).⁽¹⁴⁾

Approximately 80% of obese adolescents become obese adults. Although only one third of obese adults were obese during childhood, from one half to three fourths of adults in excess of 60% above ideal body weight were obese as children⁽¹⁴⁾, suggesting that childhood obesity may account for a disproportionate share of severe obesity in adolescent. Obesity that begins during childhood is likely to persist into adulthood, the earlier obesity occurred (age less than or equal to 4 years) the more severe were they than that the later one (age greater than 4 year)

Although obesity arises from an excess of caloric intake over caloric expenditure, the mechanisms promoting that imbalance in a given patient may include excessive caloric intake, inadequate physical activity, or a combination of factors.^(7,8) With careful dietary history, our data showed that 33.8% of the patients ate 4 or more meals per day. And the data also demonstrated excessive caloric intake, usually as a result of food selection and method of preparation. The patients consumed large percentage of energy from fat. The first group of the foods that 68.8% of the patients preferred to eat was fried foods or high-fat items. The other favorite foods were carbonated beverages and "junk" food. 17.5% of the patients loved to eat every-kind of food. If we combined this group of patient with 68.8% of the patient, the total number of patients who preferred to eat fired foods or high-fat items would increase to 86.3%

In recalling of physical activity, it revealed that more than half of the patients exercised only 1-2 hours/week during gym-class at school. The inactivity may be contributing to obesity because many obese patients are relatively less active than their leaner peers.⁽⁸⁾

4 of 7 patients whose parents' job involved preparing, serving and selling foods at home were in the morbid range of obesity. This may be due to the patients lived within the food environment influenced heavily by parents. Identification of environmental causes may permit us to function effectively to prevent the advance of the diseases.

Result of treatment

Therapy for obesity is extremely difficult at any age. Early adolescent often harder to treat than late adolescents because less motivation is present.⁽¹²⁾ Most doctors feel that the treatment of obesity is unsatisfactory. In general, treatment is palliative, not curative, with current treatment not usually producing a permanent remission.⁽¹²⁾ Approximately two thirds of persons who lose weight will regain it within one year, and almost all persons who lose weight will regain it within five years.⁽⁷⁾ In general, maintaining a reduced weight through exercise and a diet is more likely to be successful in persons with mild obesity than in those with severe obesity.⁽⁷⁾ Weight control measures are directed toward the education of the family and patient about the child's energy and

nutrient needs and about the importance of regular exercise. In adolescents, the success of weight control measures depends chiefly on the motivation of the individual. And the motivation is also helped by frequent clinic attendance

The stage of growth and maturation need to be considered when formulating a controlled diet for adolescent and linear growth rates need to be monitor regularly. And it must be kept in mind that weight loss during the growth spurt may have undesirable metabolic effects. In our patients, the result of therapy were still disappointing. Most of the patients did not attend the clinic regularly and the drop out rate was high. The reasons for this were multifactorial. The most important factor causing a high drop out rate was the inconvenience in continuing participation. The clinic was open only in the afternoon so it was inconvenience for almost all the patients who were students in secondary-school and also inconvenience for the working-parents. The frequent and regular follow up visit could not be arranged due to busy school-hours schedules. The appointments were arranged according to the patient's convenience such as during summer break or after the examination. Thus the motivation to loose weight which may help by frequent clinic attendance could not be anticipated. Follow-up and maintenance programs were often under prioritized. The patients often say that they lack the "will power" to stick to a diet and exercise program, we need to convince them that losing

weight is just one of the things that must be done, and that the suggested diet and exercise are the most acceptable version of those that will achieve the objective.⁽⁴⁾

Even with a high drop out rate and the irregularity of the follow-up schedules, the number of patients with decrease percentage of excess weight over ideal weight for height are out number the patients whose weight remained unchanged or increased at 1, 2, 6, 12 and 18 months follow-up visits. This may show that short-term successful management of obesity can be achieved and will depends on motivation and education and participation in a healthy balanced diet and exercise program without any drug treatment. Since anorectic drugs may have no role or long-term effectiveness in weight reduction in adolescents. And many studies^(4,15,16) showed that pharmacotherapy produced rapid regaining of weight after treatment and we must consider whether the benefits from the use of anorectic drugs outweigh the risks.⁽⁴⁾ To date no studies have shown efficacy of anorectic drugs in adolescents.⁽¹²⁾

Conclusion

Obese adolescents who came to adolescent clinic during the past 6 years were increasing. Most of them had the height above the mean on standard growth chart for age and sex and were in the process of pubertal development. More than half of the patients were in the severe and

morbid range of obesity, had at least one family's member with obesity, consumed large percentage of energy from fried foods or high-fat items and exercised only 1-2 hours/week. The result of therapy in our patients were disappointing. The pediatrician should be able to identify the obese child, establish the risk factors that predispose and maintain the child in obese state, and gradually change eating and activity pattern in order to achieve appropriate body weight while maintaining nutritional adequacy for growth and development.

More effort should be emphasized in preventing obesity than is currently practiced and an early intervention may help influence the development of appropriate eating and activity pattern and attitude.

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