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# Obesity and Insulin Resistance: Differences between pubertal and prepubertal children

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## Background

The presence of insulin resistance in obese children is strongly related to severity of obesity. Furthermore, insulin resistance is exacerbated during puberty, mainly due to increased sex steroids and growth hormone secretion.

## Objective

To compare obesity and insulin resistance indicators between pre-adolescent and adolescent children.

## Methods

✓ 54 pre-adolescent and 41 teenage obese children were analyzed. (Table1)

✓ Mean age of prepubertal subjects was 9.8 ± 2.1 and mean age of pubertal subjects was 11.8 ± 1.8 years respectively. (Table 2)

✓Homeostasis Model Assessment for insulin resistance (HOMA-IR) and Matsuda indices were used as predictors of insulin resistance.

✓After overnight fasting, oral glucose tolerance test (OGTT) was performed and HOMA-IR and Matsuda indices were calculated [Matsuda index: 10000/ √ (FPG x FIL) x (mean glucose x mean insulin)].

✓Waist circumference, Waist to height ratio and BMI were calculated.

✓$x^2$ and Fisher's exact test methods were used to compare the percentages. Student's t-test was used to compare mean values and linear regression analysis to adjust the results by gender.

## Results

✓ Mean BMI was 31.3 (SD=5.5) in the pubertal group and 28.4 (SD=3.5) in the pre pubertal group (p=0.002). (Table 2)

✓Glucose levels were similar between the two groups, while greater insulin levels were found in the pubertal group (p=0.003) even after adjusting for sex (p=0.007). (Table 2)

✓Moreover, the Area Under the Curve (AUC) for insulin was found to be higher in the pubertal group (p=0.010).

✓Increased levels of HOMA-IR (p<0.001) and lower levels of Matsuda index (p=0.010) were found in the pubertal group as compared to the prepubertal group, respectively (Table 3).

✓The prevalence of HOMA-IR ≥3 was double in pubertal subjects as compared to prepubertal ones (70% vs. 32%, p<0.001). (Table 4)

✓Furthermore, cases with Matsuda index less than 2.5 were more frequent in the pubertal group (55% vs. 26.9%, p=0.006) (Table 4). The aforementioned results were significant after adjustment for gender differences.

HbA1c and WHtR were not significantly different between the two groups (Table 3).

✓There were no statistically significant gender differences of all analyzed parameters in both groups (Tables 5 and 6)

Table 1

| | Puberty | | | |
|---|---|---|---|---|
| | NO | | YES | |
| | N | % | N | % |
| Boys | 32 | 59,3 | 15 | 36,6 |
| Girls | 22 | 40,7 | 26 | 63,4 |

Table 2

| | Puberty | | | | |
|---|---|---|---|---|---|
| | NO | | YES | | |
| | Mean | SD | Mean | SD | p |
| Age | 9,8 | 2,1 | 11,8 | 1,8 | <0,001 |
| BMI | 28,4 | 3,5 | 31,3 | 5,5 | 0,002 |
| Gluc | 84,5 | 10,2 | 85,8 | 7,3 | 0,480 |
| Ins | 15 | 11,7 | 23,3 | 13,7 | 0,003 |

Table 3

| | Puberty | | | | |
|---|---|---|---|---|---|
| | NO | | YES | | |
| | Mean | SD | Mean | SD | P |
| HOMA-IR | 2,9 | 2,4 | 5,1 | 3,1 | <0,001 |
| Matsuda index | 3,83 | 1,98 | 2,81 | 1,69 | 0,01 |
| HbA1c | 5,3 | 0,4 | 5,3 | 0,4 | 0,513 |
| WHtR | 0,4 | 0,3 | 0,4 | 0,3 | 0,517 |

Table 4

| | | Puberty | | | |
|---|---|---|---|---|---|
| | | NO | | YES | |
| | | N | % | N | % |
| HOMA-IR≥3 | NO | 34 | 68,0 | 12 | 30,0 |
| | YES | 16 | 32,0 | 28 | 70,0 |
| Matsuda ≤2.5 | NO | 38 | 73,1 | 18 | 45,0 |
| | YES | 14 | 26,9 | 22 | 55,0 |

Table 5

| | Gender | | | | |
|---|---|---|---|---|---|
| | Boys | | Girls | | |
| | Mean | SD | Mean | SD | P |
| HOMA-IR | 2,4 | 1,5 | 3,6 | 3,3 | 0,089 |
| Matsuda index | 3,97 | 2,06 | 3,64 | 1,88 | 0,552 |
| HbA1c | 5,2 | 0,4 | 5,3 | 0,4 | 0,318 |
| WtH ratio | 0,4 | 0,3 | 0,3 | 0,3 | 0,329 |
| PUBERTY = NO | | | | | |

Table 6

| | Gender | | | | |
|---|---|---|---|---|---|
| | Boys | | Girls | | |
| | Mean | SD | Mean | SD | P |
| HOMA-IR | 4,7 | 3,3 | 5,3 | 3 | 0,562 |
| Matsuda index | 3,02 | 1,65 | 2,68 | 1,73 | 0,540 |
| HbA1c | 5,3 | 0,5 | 5,3 | 0,4 | 0,996 |
| WtH ratio | 0,3 | 0,3 | 0,5 | 0,3 | 0,177 |
| PUBERTY = YES | | | | | |

## Conclusion

Insulin resistance is more evident in obese adolescents.
Therefore, early childhood obesity needs to be tackled, as insulin resistance increases in adolescence with an increased risk of being persistent in adulthood.

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