Overweight and Obesity in Adolescence as A Risk Factor of Metabolic Syndrome

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Abstract Metabolic syndrome become one of risk of degenerative disease, like coronary heart disease (CHD) and Diabetes mellitus (DM). Metabolic syndrome characterized by occurrence of 3 of these symptoms : high blood pressure, decrease of HDL-cholesterol level, increase of LDL-cholesterol level, increase of triglyceride level, increase of fasting glucose level, increase of waist-hip ratio. Metabolic syndrome is often related to obesity. Adolescent with obesity has more risk to be obese adult and has more risk to be suffered from metabolic syndrome and degenerative disease. This study aimed to identify overweight and obese prevalence in adolescence as a risk factor of metabolic syndrome. This was an observational research conducted in Junior High School in Jember. Two hundred and ninety four High School students were participated as subjects in this research. Their body weight, height, and BMI/Age were measure as research variables. Prevalence of overweight in male and female adolescence are 13.3% and 18.4% respectively. prevalence of obesity in male and female adolescence are 11.2% and 7.2% respectively. Both, male and female adolescence, who have nutritional status overweight and obesity have same risk of emergence of metabolic syndrome in future.

Introduction

Metabolic syndrome is a risk factor for degenerative diseases, especially coronary heart disease and diabetes mellitus.1 Metabolic syndrome is generally experienced by individuals in old age,2 this is because of decreasing in organ function and lack of physical activity in old age.3 Metabolic syndrome is characterized by the emergence of three of the following conditions, increase in blood pressure, HDL cholesterol levels, LDL cholesterol levels, triglyceride levels and an fasting blood glucose levels, and waist circumference ratio above normal values.4 Metabolic syndrome mostly associated with the incidence of obesity.5 Obesity still be a health problems around the world, especially in developed countries and starting to become a problem in developing countries. Obesity is not only experienced by adults and older people, but has begun to be experienced by adolescence. Obesity in adolescent will present until they enter adulthood and old age. Based on Riskesdas 2007 the prevalence of overweight in children and adolescents in East Java was 17.6%, while in Jember it was 13.5%. Overweight and obese adolescence have greater risk to be obese in adulthood and old age. Without any health action, this condition will cause health risk in the future.
Early detection of the risk of metabolic syndrome in adolescence is very important action to prevent the occurrence of coronary heart disease, diabetes mellitus and other degenerative diseases. Early detection of the risk of metabolic syndrome can be done by assessing the nutritional status of adolescents. Body Mass Index (BMI)/Age is one of indicator than can be used to assess adolescence nutritional status. Body Mass Index (BMI)/Age can show whether individuals are in normal nutritional status, underweight or overweight.

This study aimed to identify overweight and obese prevalence in adolescence as a risk factor of metabolic syndrome.

Method
This was an observational research using cross-sectional design. Two hundred and ninety four Junior High School students were participated as subject in this research. Subjects recruited by total sampling technique.

Anthropometric measurement, body weight and height, were taken by enumerator. All subjects were measured in their school. Data were collected, including date of birth, at the same time. Body weight were measured using bathroom scale with precision 0,1 kg, height were measure using stature meter with precision 0,1 cm, BMI were calculated based on formula : weight (kg)/height (m)², and BMI/Age were calculated based on anthropometric standar of BMI/Age for age 2-18 years for each sex. Nutritional status were categorized based on BMI/Age Z-Score : Severe thin (<-3 SD), Thin (-3 - -2 SD), Normal (-2 – 1 SD), Overweight (1 – 2 SD), Obese (> 2 SD)

Result and Discussion
The risk of metabolic syndrome mostly associated with obesity and overweight. It is widely known that obese people have a high risk of insulin resistance and metabolic complications such as type 2 diabetes mellitus (T2DM), hypertriglyceridermia, decreased high density lipoprotein cholesterol, hypertension and cardiovascular disease. Obesity is not only found in adults, but also in children. In the UK, the prevalence of overweight in children has increased since 20 years ago and was expected to become obese and overweight in young adults. From a sample of 297 adolescents in this study showed that the percentage of children who were obese was 9.2% while teenagers with excess weight were 16%. This finding shows that there are increasingly children’s food consumption intakes.

Table 1. Characteristic of subject

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Age</th>
<th>Sex</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>13.4±0.88</td>
<td>Male</td>
<td>143</td>
<td>48.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Female</td>
<td>151</td>
<td>51.4</td>
</tr>
</tbody>
</table>

However, this condition needs to be worried because obesity and overweight in Indonesia are increasing year by year. The National Health Research Data 2016 revealed that 20.7% of Indonesia's populations were overweight. This figure increased from 15.4% in 2013. Global Burden of Diseases published in scientific journal, Lancet, in 2014 Indonesia was in ranked 10th in the list...
of countries with the highest obesity rates in the world. The numbers of children with obesity in Indonesia become triples. They have the potential to be suffered from various types of diseases after adulthood, including diabetes, heart disease and cancer.

This study showed the result that obesity and overweight are different between male and female adolescence (Table 2). Obesity was more common in boys (11.2%) than in girls (7.2%). This result is in line with Supiati’s research which states that obesity in boys is greater than girls, 6.5% and 4.5% respectively. The study also found that eating behavior contributed to the occurrence of obesity in boys. Subjects who have healthy eating behavior have chance to avoid obesity 8.3 times compared to children who eat unhealthily food. The results of overweight in different genders experience differences with obesity.

Table 2. Overweight and obesity prevalence of subjects

<table>
<thead>
<tr>
<th>Nutritional Status</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>294</td>
<td>100</td>
</tr>
<tr>
<td>Severe thin</td>
<td>5</td>
<td>1.7</td>
</tr>
<tr>
<td>Thin</td>
<td>15</td>
<td>5.1</td>
</tr>
<tr>
<td>Normal</td>
<td>200</td>
<td>68</td>
</tr>
<tr>
<td>Overweight</td>
<td>47</td>
<td>16</td>
</tr>
<tr>
<td>Obese</td>
<td>27</td>
<td>9.2</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Male</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Severe thin</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Thin</td>
<td>7</td>
<td>4.9</td>
</tr>
<tr>
<td>Normal</td>
<td>100</td>
<td>69.9</td>
</tr>
<tr>
<td>Overweight</td>
<td>19</td>
<td>13.3</td>
</tr>
<tr>
<td>Obese</td>
<td>16</td>
<td>11.2</td>
</tr>
<tr>
<td>Total</td>
<td>143</td>
<td>100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Female</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Severe thin</td>
<td>4</td>
<td>2.6</td>
</tr>
<tr>
<td>Thin</td>
<td>8</td>
<td>5.3</td>
</tr>
<tr>
<td>Normal</td>
<td>101</td>
<td>66.4</td>
</tr>
<tr>
<td>Overweight</td>
<td>28</td>
<td>18.4</td>
</tr>
<tr>
<td>Obese</td>
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<td>100</td>
</tr>
</tbody>
</table>

The data of this study showed that overweight are more common in girls (18.4%) than in boys (13.3%). Similar result was showed by research in India which states that obesity is more common in adolescent boys while being the most overweight in adolescent girls. The prevalence of overweight children aged 12-15 years in India was 9.9% (9.3% boys and 10.5% girls) while obesity was 4.8% (boys 5.2% and 4.3% girls). The difference condition of overweight and obesity in men and women caused by biological evidence of body fat patterns, REE (Resting Energy Expenditure), and energy needs. According to Goran, TEE (Total Energy Expenditure) correlates strongly with body weight. TEE boys at puberty are higher than girls. Whereas in girls, puberty causes a condition of hormonal and psychological imbalance, so most girls begin to feel embarrassed if they are found to eat most. This condition is thought to reduce the rate of obesity of female adolescents from childhood into adolescence.
This study results obtained the risk of the emergence of metabolic syndrome in both, male and female adolescence, are similar. The presence of obesity and overweight indicates that the subject has at least one risk of metabolic syndrome. However, the results of research in the US showed that the prevalence of metabolic syndrome was higher in male adolescents (5.1%) than female adolescents (1.7%)\textsuperscript{14}. Research on metabolic syndrome in adolescents in the Mediterranean region also stated that the prevalence of metabolic syndrome significant especially in groups of male adolescents who are obese\textsuperscript{15}.

**Conclusion**

Prevalence of overweight in male and female adolescence are 13.3\% and 18.4\% respectively. Prevalence of obesity in male and female adolescence are 11.2\% and 7.2\% respectively. Both, male and female adolescence, who have nutritional status overweight and obesity have same risk of emergence of metabolic syndrome in future.

**Acknowledgement**

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