OVERWEIGHT AND CONSTIPATION IN ADOLESCENTS

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ABSTRACT

Goals: To analyze the prevalence of constipation and its association with overweight in adolescents.

Background: The association between overweight and gastrointestinal symptoms has been studied in the last years. However, there are few studies that evaluate the association between overweight and constipation exclusively in adolescents.

Study: A transversal study with 1,081 adolescents who were enrolled in five schools in the city of Sao José dos Campos, Sao Paulo. Constipation was characterized by the elimination of hardened stools with the round or cylindrical format with markings associated with the occurrence of pain and/or difficulty or fear of defecation. Other factors such as the presence of blood surrounding the hardened stools; interval between defecations greater than or equal to three days and the presence of fecal escape were also constipation indicators. Overweight was defined when the body mass index (BMI) was equal to or higher than the 85 percentile for age and gender.

Results: Constipation occurred in 19.0% of the adolescents. In those aged between 14 and 18 years, constipation was more frequent in the female gender (26.6%, p<0.01). Between 10 and 14 years, a statistically significant difference was not observed. An association between overweight and constipation without fecal escape was not observed (odds ratio=0.68; p=0.20), but between overweight and constipation with fecal escape an association was observed (odds ratio=6.31; <0.01).

Conclusions: Prevalence towards constipation was high among the adolescents. There was no association between overweight and constipation without fecal escape, however it was verified between overweight and constipation with fecal escape.

Key Words: Constipation, Overweight, Adolescent Health
INTRODUCTION

Evidence exists that prevalence towards overweight and obesity have been increasing worldwide\textsuperscript{1}. It has been verified that overweight in adolescents is associated with health risk factors in adulthood, since these situations tend to be maintained and relate themselves to secondary conditions such as type 2 diabetes mellitus, dyslipidemia, arterial hypertension and osteoarthritis\textsuperscript{1}.

As well as this, some authors have associated gastrointestinal symptoms with overweight\textsuperscript{2} or obesity\textsuperscript{3,4,5,6,7} both in children and in adults, emphasizing that only in one adolescent article were they evaluated with exclusivity\textsuperscript{7}. Research with a population sample, carried out at the start of the 1980s decade, evaluated a group aged between 6 and 12 years and found constipation in 23.2\% of those who were obese and in 12.4\% of those with regular weight\textsuperscript{3}. A statistically significant association between obesity and constipation was also observed.\textsuperscript{3} On the other hand, at a pediatric center for tertiary level attention, an association between body mass index and the presence of constipation was not found\textsuperscript{6}. The same occurred with adolescents at public and private school in the city of Sao Paulo\textsuperscript{7} and in the adult population in the district of Olmsted, Minnesota\textsuperscript{5}.

Constipation is frequent in the pediatric population\textsuperscript{8}. In Brazil research has demonstrated an elevated prevalence towards constipation in unweaned infants, preschool and school children, with the levels varying between 14.7\% and 36.6\%\textsuperscript{9-12}. A study carried out in the city of Sao Paulo showed a high level of constipation in adolescents, evidence that this is also a prevalent condition in this age group\textsuperscript{7}.

Fecal escape is frequently found in specialized casuistic clinics (71.6\%)\textsuperscript{13} indicating the seriousness of the patients attended with chronic constipation. On the other hand, little information exists concerning the occurrence of fecal escape in the
general population. In schools in the city of Rio de Janeiro, fecal escape was observed in 19.0% of the children with constipation\textsuperscript{14}.

Considering that few articles exist that evaluate the intestinal habits of adolescents and their association with overweight, this study’s proposal was to analyze the prevalence of constipation with and without fecal escape and its association with overweight in adolescence.
MATERIALS AND METHODS

A transversal study involving adolescents aged between 10 and 18 years, carried out at five public or private schools in the city of Sao José dos Campos, State of Sao Paulo, Brazil. After obtaining permission to carry out the project from the directors of each school, the research was detailed to pedagogic supervisors or teachers of these institutions. These people were responsible both for the delivery of the sealed envelop that contained the questionnaire, the free consent form for parents/guardians and for any clarification, for each pupil in the classroom, both for guidance in completing the questionnaire and the consent form to be signed by those responsible. Consequently there was no contact between the researchers and the pupils and/or those responsible for them. Some 2,500 questionnaires were issued and 1282 (51.3%) were returned. Of these 201 (18.6%) were excluded because of incomplete or inadequate completion. To this end, the sample was composed of 1,081 adolescents.

The questionnaire contained multiple choice questions, formulated in simple language and of easy comprehension, which had been validated in a prior pilot study with adolescents of the same age group. The questions covered the intestinal habit (frequency of defecation, pain or difficulty, fear of defecation, time spent in the defecation act), characteristics of the stools (consistency, format, presence of blood), abdominal pain, complications of constipation (fecal escape, enuresis, retention behavior), presence of other illnesses and the use of medication. The adolescents also provided information on: age (in years), date of birth, gender, weight (in kilograms) and height (in meters). Previous studies\textsuperscript{15,16,17} with adolescents found elevated correlation between reported and measured values for weight and height, showing that the referred information on these variables is valid as a form of approximation to the measured values, and can therefore be used in substitution of the compared measurements, for the
diagnosis of the nutritional study on adolescents starting from the body mass index (BMI).

The definition of constipation took into consideration international proposals\textsuperscript{18-22} being characterized by the elimination of hardened stools with the round or cracked cylindrical format associated with the occurrence of pain and / or difficulty or fear of defecation. Other characteristics such as the presence of blood surrounding the stool; or defecation intervals greater or equal to three days; or the presence of fecal escape were also considered as indicative of constipation. The adolescents who had not completed any of these criteria were considered as not suffering from constipation.

The classification of the nutritional study was based on the BMI, calculated starting from the body weight divided by the square of the height, interpreted in accordance with age and gender. This index is internationally recommended for the individual and collective diagnosis of a nutritional study in adolescence\textsuperscript{23}. As reference standards, data from the Center for Disease Control and Prevention (2000) was used\textsuperscript{24}. Overweight was defined as the BMI equal to or higher than the 85 percentile\textsuperscript{23}. Adolescents with a BMI below the P\textsubscript{85} percentile were considered as not being overweight.

As to age, the studied population was divided into two categories: under 14 years or 14 years and over. The results were expressed in medians and standard deviations. For the statistical analysis the chi-squared tests, ($\chi^2$), Fisher exact and the t of Student were used, setting at 5.0% the rejection level for the hypothesis of invalidity. The SigmaStat (Systat Software, Inc., San Jose, CA/USA) was used for the statistical calculations. The magnitude of the association between variables was estimated using odds ratio (OR), with a confidence interval (CI) of 95.0%, calculated using the EPI-INFO software (Centers for Disease Control and Prevention).
The study was carried out after approval by the Research Ethics Committee of the Federal University of Sao Paulo (1545/03 - March 12, 2003).
RESULTS

In total 1,081 questionnaires were analyzed of which 45.9% (496) had been completed by adolescents of the male gender and 54.1% (585) by adolescents of the female gender. The average age (±standard deviation) of the studied population was equal to 14.4±2.2 years.

Constipation was discovered in 19.0% (205/1081) of the adolescents and occurred more frequently in the female gender, with an increase in the proportion female : male in accordance with the increase in age group (1.4:1.0, for those aged below 14 years versus 2.2:1.0 for those aged 14 years or over). Fecal Escape was found in 12.3% (25/203) of the adolescents with constipation, being more frequent in the male gender aged below 14 years (Table 1).

In accordance with the body mass index, 13.6% (147/1081) of the adolescents demonstrated overweight that occurred more frequently in the under 14 years males. In the adolescents 14 years or over, the prevalence towards overweight was similar in both genders and lower than that observed with those under 14 years (Table 2).

There was no statistically significant difference between the averages (±standard deviation) of the BMI of the adolescents with (19.80±3.56 Kg/m²) and without (19.75±3.33 Kg/m²) constipation (p=0.84). As well, a statistically significant association between overweight and constipation without fecal escape was not found (Table 3).

The median (±standard-deviation) of the BMI for the adolescents with constipation with fecal escape (21.20±3.74 Kg/m²) was higher than for those with constipation without fecal escape (19.54±3.48 Kg/m²; p=0.02). A statistically significant association between overweight and fecal escape in the adolescents with constipation was observed (Table 4).
DISCUSSION

Constipation was observed in 19.0% of the adolescents, a result that was not very far away from those found in Rio Grande do Sul (22.9%) and Sao Paulo (24.4%). When considering the age group, the study’s results allowed us to demonstrate a predominance towards constipation in the female gender that occurs starting from 14 years of age. This data contrasts with that observed in specialized pediatric clinics where constipation is more frequent in the male gender. It is important to emphasize that other studies that show at which moment of adolescence the appearance towards a predominance of constipation in the female gender occurs do not exist. Consequently, the standard of distribution of constipation observed in this study, according to gender, corresponds to that observed in other studies of a proportional base with children and adolescents or adults.

At the tertiary level attention centers, it is common to find constipation complications, with fecal escape which is the reason for procuring specialized assistance. At these localities the prevalence can reach 77.0%. A British study, involving children and adolescents at primary schools aged between 5 and 6 years and 11 and 12 years, found fecal escape in 4.1% and 1.6%, respectively. In the present study the result was not very different, considering that fecal escape was found in 2.3% of the total of adolescents studied.

Overweight was found in 13.6% of the adolescents evaluated. In Brazil, during the years 2002 and 2003, the Family Budget Research revealed this nutritional diagnosis in 12.3% of adolescents. There was also agreement with the literature in relation to a higher frequency of overweight in adolescents of the male gender aged below 14 years.
The primordial objective of this study was to evaluate any association between overweight and constipation, accompanied or not by fecal escape in adolescents. Constipation without fecal escape was observed in 12.7% of the overweight adolescents. There was no association between overweight and constipation without fecal escape (OR = 0.68, 95% CI: 0.38-1.20). However, between overweight and constipation with fecal escape an association was confirmed (OR=6.31, 95% CI: 2.23-17.94). The only study that evaluated just adolescents also did not provide evidence of an association between overweight, although, the occurrence of fecal escape is not mentioned\(^7\).

A comparative analysis carried out in Iowa, between children and adolescents with chronic constipation and a control group assisted in the service of primary attention, showed an association between chronic constipation and overweight in the age group between 4 and 17 years. When only considering the adolescents, this association had been maintained, calling attention to the high prevalence of obesity both in the male gender (40.0%) and female gender (24.0%), in relation to the control group, who presented results of 19.0% and 11.0% respectively\(^4\). This data is in disagreement with that obtained in the present study, although, it is worth pointing out that the patients studied in Iowa were serious cases of constipation attended to at specialized clinics, whilst in the present study the adolescents were recruited in schools, which places them more in the situation of the general population than in cases occurring at health service clinics. A study carried out at a specialized clinic in Illinois, United States, did not reveal an association between fecal escape and constipation, in spite of having found a higher frequency of overweight in children with constipation, in relation to the control group\(^2\). Thus, while in the controlled studies with patients suffering from serious constipation an association between overweight and constipation was
demonstrated, in the present study, whose description of constipation had as its base an enquiry applied to adolescents of a community, the absence of this association could be a consequence of the probable difference in gravity of the constipation. In this context, in two other North American studies carried out on samples of the adult population, there was also no verification of an association between constipation and overweight.

On the other hand, a study carried out in Boston demonstrated a prevalence towards constipation of 23.0% in obese children and adolescents. The authors, in spite of not having made use of a control group, considered that the constipation level was greater than that expected and that the result could be related to differences in diet, in the practice of physical activities, in behavior and in endocrinological responses, in spite of not having measured these variables.

It must be assumed that constipation and overweight have a negative impact on the quality of life of these adolescents. Fecal escape could cause low self-esteem, depression, anxiety and other affective disorders in the patients. On the other hand, obese adolescents also show conflicting sentiments in relation to their body, manifesting an explicit apprehension when looking at themselves in the mirror, due to their corporal dissatisfaction, as well as having lived through negative experiences in their social relationships. To this end it is important to recognize that the precocious identification and treatment of these clinical conditions are fundamental in avoiding these serious consequences.

In summary, the present study found an elevated prevalence towards constipation and overweight in adolescents, demonstrating the necessity to include adolescents in programs that combat these problems, which compromise their health.
and quality of life. An association between constipation and overweight was not observed, although fecal escape was more frequent in overweight adolescents.
REFERENCES


Table 1. Constipation and fecal escape in adolescents in accordi ng with age and gender.

<table>
<thead>
<tr>
<th></th>
<th>No</th>
<th>Yes</th>
<th>% Yes</th>
<th>p</th>
<th>OR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Constipation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 14 years</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>189</td>
<td>33</td>
<td>14.9</td>
<td>0.40*</td>
<td>0.79(0.47-1.32)‡</td>
</tr>
<tr>
<td>Female</td>
<td>217</td>
<td>48</td>
<td>18.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥ 14 years</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>235</td>
<td>39</td>
<td>14.2</td>
<td>&lt;0.01*</td>
<td>0.46(0.29-0.71)‡</td>
</tr>
<tr>
<td>Female</td>
<td>235</td>
<td>85</td>
<td>26.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fecal escape</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 14 years</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>24</td>
<td>8</td>
<td>25.0</td>
<td>0.56*</td>
<td>1.63(0.47-5.60)‡</td>
</tr>
<tr>
<td>Female</td>
<td>39</td>
<td>8</td>
<td>17.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥ 14 years</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>36</td>
<td>3</td>
<td>7.7</td>
<td>0.58*</td>
<td>1.10(0.20-5.34)‡</td>
</tr>
<tr>
<td>Female</td>
<td>79</td>
<td>6</td>
<td>7.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Chi-squared test; †Fisher exact; ‡Odds Ratio (95% CI)

Statistical analysis to compare, according to age group (<14 years versus ≥ 14 years), the occurrence of:

1. Constipation: Male: p=0.94; Female: p=0.01 (Chi-squared test)
2. Fecal Escape: Male: p=0.04; Female: p=0.07 (Fisher exact)
Table 2. Overweight in adolescents in according with age and gender.

<table>
<thead>
<tr>
<th></th>
<th>No</th>
<th>Yes</th>
<th>% Yes</th>
<th>p</th>
<th>OR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Overweight</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>&lt; 14 years</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>169</td>
<td>53</td>
<td>23.9</td>
<td>0.02*</td>
<td>1.71(1.06-2.77)*</td>
</tr>
<tr>
<td>Female</td>
<td>224</td>
<td>41</td>
<td>15.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>≥ 14 years</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>248</td>
<td>26</td>
<td>9.5</td>
<td>0.76†</td>
<td>1.14(0.62-2.07)*</td>
</tr>
<tr>
<td>Female</td>
<td>293</td>
<td>27</td>
<td>8.4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Chi-squared test; †Odds Ratio (95% CI)

Statistical analysis to compare, according to age group (<14 years versus ≥ 14 years), the occurrence of:

1. Overweight: Male: <0.01; Female: p=0.01 (Chi-squared test).
Table 3. Constipation without fecal escape in male and female adolescents in accordance with overweight.

<table>
<thead>
<tr>
<th>Constipation</th>
<th>No</th>
<th>Yes</th>
<th>% Yes</th>
<th>p</th>
<th>OR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Overweight</strong></td>
<td>757</td>
<td>161</td>
<td>17.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>117</td>
<td>17</td>
<td>12.7</td>
<td>0.20 *</td>
<td>0.68(0.38-1.20) *</td>
</tr>
<tr>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Chi-squared test; †Odds Ratio (95% CI)

Two adolescents were excluded from this analysis for not answering the question on the occurrence of fecal escape.
Table 4. Constipation with fecal escape in male and female adolescents in accordance with overweight.

<table>
<thead>
<tr>
<th>Fecal Escape</th>
<th>No</th>
<th>Yes</th>
<th>% Yes</th>
<th>P</th>
<th>OR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Overweight</strong></td>
<td>Yes</td>
<td>17</td>
<td>10</td>
<td>37.0</td>
<td>&lt;0.01*</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>161</td>
<td>15</td>
<td>8.5</td>
<td>6.31(2.23-17.94)*</td>
</tr>
</tbody>
</table>

* Fisher exact; *Odds Ratio (95% CI)

Two adolescents were excluded from this analysis for not answering the question on the occurrence of fecal escape.