



Brief report

Association between excessive body fat and eating-disorder risk in adolescents: The AFINOS Study

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ABSTRACT

Background and objective: Overweight and obesity, together with eating disorders, are important public health concerns in adolescence. The aim of this study was to assess the association between excessive body fat and the risk of eating disorders.

Subjects and method: The sample consisted of 195 adolescents (97 girls) aged 13 to 18 years. Eating-disorder risk was evaluated by applying the SCOFF questionnaire. Body mass index, sum of 6 skinfolds, waist and hip circumferences and waist-hip and waist-height ratios were used to assess body fat.

Results: 24.7% of girls and 17.3% of boys were at risk of eating disorders, and 31.6% of boys and 21.6% of girls presented overweight (including obesity) according to Cole's cut-off points. Those adolescents classified above the 85th percentile on all the anthropometric measurements, as well as overweight adolescents, were at increased risk of developing an eating disorder (OR: 2.8–4.30, all $p < 0.01$).

Conclusion: Regardless of the anthropometric measurements used, adolescents with excessive body fat showed a higher risk of having eating disorders than those with normal weight.

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Asociación entre el exceso de grasa corporal y el desarrollo de trastornos del comportamiento alimentario en adolescentes. Estudio AFINOS

RESUMEN

Fundamento y objetivo: El sobrepeso y la obesidad, junto con los trastornos del comportamiento alimentario (TCA) en los adolescentes, constituyen un importante problema de salud pública. El objetivo del presente estudio ha sido evaluar la posible asociación entre un exceso de grasa y el riesgo de padecer TCA.

Sujetos y método: 195 (13–18 años) adolescentes (97 chicas) fueron analizados. El riesgo de padecer TCA se valoró mediante cuestionario SCOFF. La composición corporal se evaluó midiendo pliegues subcutáneos, circunferencias de cintura y cadera, peso y talla, calculándose los índices: masa corporal, cintura/cadera y cintura/altura.

Resultados: 24,7% de las chicas y 17,3% de los chicos presentaban riesgo de padecer TCA, mientras que 31,6% de los chicos y 21,6% de las chicas se clasificaron como sobrepeso u obesidad según la clasificación de Cole. Los adolescentes clasificados por encima del percentil 85 en las medidas de composición corporal y aquellos que presentaron sobrepeso u obesidad tuvieron mayor riesgo de desarrollar TCA (OR: 2,87 a 4,30, todas $p < 0,01$).

Conclusión: Independientemente de la medida antropométrica empleada, los adolescentes que presentaron un exceso de grasa corporal tuvieron un riesgo más alto de padecer TCA.

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Introduction

The pandemic rise in overweight and obesity is now very much a global concern that affects people of all ages in both urban and rural areas. The prevalence of paediatric obesity has tended to increase in developed countries over the last 20 years.¹ Indeed, recent estimates suggest that the prevalence of overweight/obesity in Spanish adolescents is now around 22%.²

An overweight status in adolescents has been associated with an increased risk of eating disorders such as anorexia nervosa, bulimia, self-induced vomiting and binge eating.^{3,4} These studies have commonly analysed the relationship between overweight and eating disorders on the basis of body mass index (BMI) values, although none investigated whether this relationship was supported using other body fat measures.⁵ BMI alone appears to be useful as an approximate classification of obesity status, although it cannot accurately predict a specific individual's percentage body fat⁶; therefore we considered that a more complete analysis of the variables associated with body fat and BMI was required. The aim of this study was to analyse the associations between different body fat measurements and the risk of developing eating disorders in a sample of adolescents.

Methods

Participants

The adolescents selected for this study participated in the AFINOS Study (Physical Activity as a Preventive Agent of the Development of Overweight, Obesity, Infections, Allergies and Cardiovascular Risk Factors in Adolescents).⁷ This study assessed the state of health and a selection of lifestyle indicators by self-report in a representative sample of adolescents aged between 13 and 18 years (~2000) from Madrid. In a subgroup of 232 subjects an exhaustive health status assessment was performed, including anthropometric parameters and biomarker determinations. In total, 195 adolescents (97 females) with valid data on body fat variables and correct answers in the SCOFF Questionnaire were involved in the current study.

All adolescents and their parents were informed of the nature of the study and provided written informed consent. The AFINOS Study was approved by the Ethics Committee of the Puerta de Hierro Hospital (Madrid, Spain) and the Bioethics Committee of the Spanish National Research Council.

Screening of eating disorders

The Spanish version of the SCOFF Questionnaire was used to assess eating disorders.⁸ This questionnaire is a screening instrument originally designed to be routinely used in all

individuals considered to be at risk of such disorders and consists of five questions related to deliberate vomiting, loss of control over eating, weight loss, body image distortion and the impact of food on life. Two or more positive answers to the questions indicate disordered eating behaviour.

Anthropometric measurements

Anthropometric measurements (height, weight, 6 skinfolds [subscapular, suprailiac, triceps, biceps, thigh, calf], waist circumference and hip circumference) were taken using the protocol in the AVENA Study (Food and Assessment of the Nutritional Status of Spanish Adolescents), as described elsewhere.⁷ BMI was calculated as the body weight (kg) divided by the square of the height (m). Waist-hip and waist-height ratios were also calculated. Adolescents were classified as non-overweight and overweight (including obesity) using BMI cut-off points according to age and sex.⁹ Participants at risk of excessive body fat were also classified by using the age- and sex-specific 85th percentile cut-off points for each of the other anthropometric measurements (sum of 6 skinfolds, waist circumference, waist-hip and waist-height ratios).

Data analysis

Data were analysed using the SPSS statistical software package (v.17.0) for Windows. Statistical differences by sex in the sample were analysed using the chi-square test for qualitative variables (prevalence of overweight/obesity and risk of eating disorders) and by one-way analysis of variance (ANOVA) for continuous variables. A logistic regression analysis was performed to examine the association between indicators of excess body fat and risk of eating disorders.

Results

Table 1 shows the main characteristics of the sample. Statistically significant differences by sex were found for the variables weight, height, waist circumference and waist-height ratio ($p < 0.01$).

According to the SCOFF Questionnaire for disordered eating behaviour, 20.9% of the adolescents obtained scores above the threshold value, whereas 26.7% of the adolescents were classified as overweight or obese.

Table 2 shows the results of a binary logistic regression analysis performed to assess increased risk of developing eating disorders. Those adolescents classified as overweight and above the 85th percentile on the anthropometric measurements (sum of 6 skinfolds, waist circumference, waist-height ratio and waist-hip ratio) showed a higher risk of developing eating disorders (OR: 2.87–4.30, all $p < 0.01$) than those with normal weight.

Table 1
Anthropometric characteristics and risk of developing an eating disorder in adolescents.

	All (n = 195)	Boys (n = 98)	Girls (n = 97)	p
Age (years)	15.3 (1.2)	15.2 (1.2)	15.4 (1.2)	0.202
Weight (kg)	60.81 (2.0)	63.0 (12.6)	57.1 (8.7)	< 0.001
Height (cm)	166.7 (8.6)	171.2 (8.1)	162.0 (6.3)	< 0.001
Body mass index (kg/m ²)	21.8 (3.4)	21.8 (3.8)	21.7 (3.0)	0.779
Overweight/obesity (%)	26.7	31.6	21.6	0.148
Sum of 6 skinfolds (mm)	100.7 (36.3)	88.01 (36.3)	113.4 (31.6)	< 0.001
Waist circumference (cm)	73.5 (9.4)	75.3 (10.0)	71.6 (8.5)	0.010
Waist-hip ratio	0.79 (0.1)	0.83 (0.1)	0.75 (0.6)	< 0.001
Waist-height ratio	0.44 (0.5)	0.44 (0.6)	0.44 (0.5)	0.802
SCOFF questions (positive answers)	0.86 (1.0)	0.7 (0.9)	1.0 (1.1)	0.131
At risk of eating disorder (%)	20.9	17.3	24.7	0.205

Values are mean \pm standard deviation or percentage. At risk of developing an eating disorder: 2 or more positive answers in the SCOFF questionnaire.

Table 2

Odds ratios and 95% confidence intervals for risk of adolescents with excessive body fat developing an eating disorder.

Body fat variables		n	OR	95% CI	p
Cole's cut-offs ⁹	Non-overweight	144	1	Ref.	0.004
	Overweight/obesity	51	2.87	1.39-5.93	
Sum of 6 skinfolds	< 85th percentile	165	1	Ref.	0.005
	> 85th percentile	29	3.31	1.43-7.67	
Waist circumference	< 85th percentile	164	1	Ref.	0.008
	> 85th percentile	30	3.10	1.35-7.14	
Waist-hip ratio	< 85th percentile	165	1	Ref.	0.005
	> 85th percentile	29	3.31	1.43-7.67	
Waist-height ratio	< 85th percentile	171	1	Ref.	0.002
	> 85th percentile	23	4.30	1.74-10.68	

CI: confidence interval; OR: odds ratio..

Discussion

The results of the present study support the proposed relationship between overweight and the risk of developing eating disorders. Several authors have suggested that overweight children and adolescents may be at greater risk of developing a full manifestation of eating disorders than those with normal weight.^{3–5} This phenomenon may be due to the fact that overweight/obese adolescents have been reported to have higher levels of weight-related teasing and other behaviours that could affect negatively their self-esteem. Weight-related teasing has been shown to be associated with disordered eating behaviours, suggesting that it may have a potential relevance for developing both obesity and eating disorders.⁴

Most previous studies in adolescents examined the relationship between overweight or obesity and eating disorders using BMI cut-off points. However, since BMI is an indirect measurement of body fat and should be limited to overweight and obesity screening in puberty, the above-mentioned studies have certain limitations.⁶

Scientific evidence with regard to the relationship between different anthropometric measurements and the probability of an increased risk of developing eating disorders in non-clinical samples of adolescents is therefore somewhat scarce. Indeed, to the best of our knowledge, only one previous study involving 329 girls and 96 boys, aged 12–18 years,⁵ has addressed the link between different anthropometric measurements of body fat and eating disorders. The results of that study in adolescent girls suggested that an increase in BMI and fat mass (as measured by bioimpedance) increased the odds of being at risk of developing an eating disorder (OR: 1.12 and 1.04, $p=0.001$ and 0.028, respectively) and that a high waist-hip ratio was related to a lower risk (OR: 0.50; $p=0.022$). No significant associations were found between anthropometric or body-composition variables and the risk of eating disorders in boys, probably due to the low number of subjects included. In contrast, adolescents in our study above the 85th percentile for waist-hip ratio had an increased risk of eating disorders, as was also the case with the other body-fat variables studied. These contradictory results suggest the convenience of additional studies to assess possible relationships between waist-hip ratio and eating disorder risk in future research involving a higher number of participants than in the current study.

The main limitation of our study is its cross-sectional design, which does not permit causal relationships to be established. Furthermore, the small sample size does not allow the results to be generalized, although the prevalence rates of overweight and risk

of developing an eating disorder are similar to those found in other Spanish studies.^{2,10}

In conclusion, the present findings support the early detection of eating disorders in overweight adolescents. Hence, it is important and necessary to develop educational and public health strategies to identify, prevent and treat these health problems from a wide perspective.

Conflict of interest

The authors declare no conflicts of interest.

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