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PAPER

Micro-environmental and socio-demographic determinants of childhood obesity

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AIM: To review the available data in Spain about the socio-demographic and home environmental determinants in children and adolescents.
METHOD: Review of the main studies conducted in Spain that have analysed the relationship between overweight and socio-economic and environmental determinants in children and adolescents.
RESULTS: In children aged 6–7 y from Aragón (Spain), the socio-demographic determinants of childhood overweight were size of municipality, year of examination, gender, and province; in adolescents aged 13–14 y, the socio-demographic determinants were year of examination, type of school, size of municipality, gender, and province; overweight showed a significant positive main effect with public schools and low municipality size. In a nationally representative sample of Spanish adolescents from 13 to 18.5 y (AVENA Study), there was a significant relationship between overweight and socio-economic status in males but not in females; in males, the lowest overweight prevalences were observed in both extreme socio-economic groups; moreover, overweight prevalences increased when socio-economic status decreased, from the high to the medium–low socio-economic group. The studied variables related with family environment did not show any significant effect in overweight prevalence.
CONCLUSION: Better knowledge of the relationship between social class and childhood obesity would lead to clearer hypotheses for the relationship in adults and might improve the preventive measures by identifying children at risk.
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Keywords: child; adolescents; socio-economic status; health determinant environment

Introduction

There is little need to add more arguments to characterize the worldwide childhood obesity epidemic.[1,2] The challenge for the future is prevention of paediatric obesity. The prevention and treatment of obesity among children and adolescents are important to reduce the risk of health complications in both childhood and adulthood.[3,4] Selection of risk groups would also be suitable for optimisation of economic resources.

Many studies have shown differences in the frequency of obesity among various social groups.[5] One way of conceptualising the interdependence among people, their health, and their environment is through ecological models.[6] Egger and Swinburn[7] have proposed an ecological model for understanding obesity, which incorporates environmental as well as biological and behavioural influences on obesity. An obesogenic environment has been defined as 'the sum of influences that the surroundings, opportunities, or conditions of life have on promoting obesity in individuals or populations'.[6] A micro-environmental setting is one where groups of people gather for specific purposes, which typically involve food, physical activity, or, frequently, both. These settings are relatively small, and are potentially influenced by individuals. This mainly includes homes, schools, and community groups.

The role of the home environment in the development of childhood obesity has been recognized for a long period of time; however, few studies have documented the extent to which the home environment contributes to childhood obesity. In US children, it has been observed that children with lower cognitive stimulation have significantly elevated risks of developing obesity, independent of other demographic and socio-economic factors.[8]

Current approaches to childhood obesity prevention have had limited success.[9] This is the reason why it seems important to detect special groups and home environment

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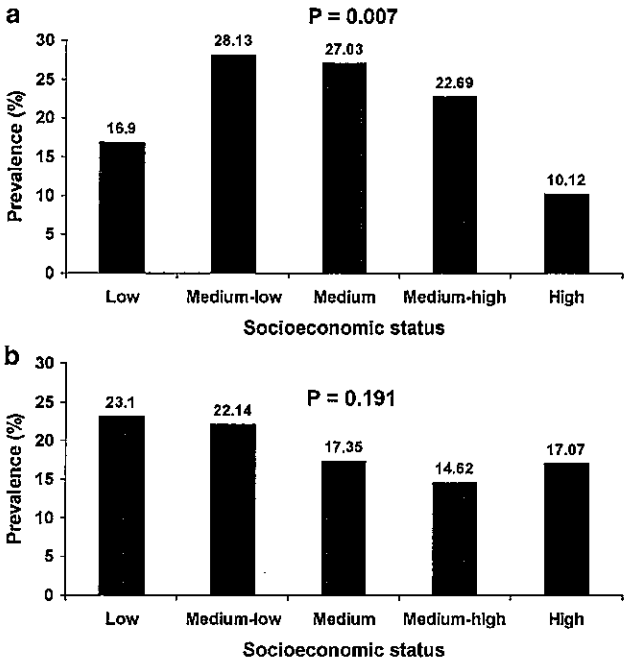

Figure 2 Impact of socio-economic status on overweight and obesity prevalences in Spanish adolescents: (a) males; (b) females.

of both parents. Family environment was assessed by the number of persons living at home, number of children at home, person who usually bayed the foods, person who prepared the foods at home, number of family members who were present when the adolescent arrived at home, and parental history of obesity by means of BMI calculated from reported weight and height. Logistic regression was applied through a stepwise method to study the relationship between overweight and obesity and the variables described before. For logistic models, ORs and 95% CIs are reported.

In male adolescents, the variables that showed significant differences between overweight and non-overweight individuals were age, maternal occupation, maternal employment status, maternal education level, maternal obesity, and paternal obesity. All the variables were related with the mother, except age and history of paternal obesity. The logistic regression model included maternal education, and history of obesity in the father and mother. The OR of being overweight in adolescents whose mothers had only attended elementary school was 1.70 (95% CI 1.03–2.79), when compared with those with mothers with a University degree. The OR for paternal and maternal obesity history, when compared with lean fathers and mothers, was 4.13 (95% CI 1.80–9.43) and 4.66 (95% CI 1.52–14.23), respectively. The variables related with family environment did not show any significant effect in overweight prevalence.

In females, the variables that showed significant differences between groups were age, maternal education level, and maternal obesity. The logistic regression model only included age and maternal history of obesity. Adolescents aged 13 y showed an OR of being overweight of 2.50 (95% CI 1.26–4.97) when compared with those aged 17 y. The OR for maternal obesity history, when compared with lean mothers, was 3.49 (95% CI 1.42–8.59). The variables related with family environment did not show any significant effect in overweight prevalence.

When we considered the global indicator of socio-economic status, we observed gender-related differences with overweight. There was a significant relationship between overweight and socio-economic status in males, but not in females. In males, the lowest overweight prevalences were observed in both extreme socio-economic groups. Moreover, overweight prevalences in males increased when socio-economic status decreased, from the high to the medium–low socio-economic group (Figure 2).

We have also performed a logistic regression analysis in the whole group of male and female adolescents. The variables included in the model were age, gender, maternal education, and parental history of obesity. Adolescents aged 13 y showed an OR of being overweight of 1.81 (95% CI 1.12–2.93) when compared with those aged 17 y. In female adolescents, the OR of being overweight, when compared with males, was 1.54 (95% CI 1.16–2.03). The OR of being overweight in adolescents when the mothers had only elementary school training was 1.92 (95% CI 1.29–2.85), as compared with those with mothers with a University degree. The odds ratio for both paternal and maternal obesity history, when compared with no obesity history, was 4.47 (95% CI 1.29–15.53). The variables related with family environment did not show any significant effect in overweight prevalence.

Socio-demographic determinants

The results of the Aragón School Health Examination Surveys showed that children and adolescents living in rural areas (municipalities with less than 10 000 inhabitants) had higher odds of being overweight than those living in urban areas. We have also observed that adolescents from public schools had higher odds of being overweight than those attending private schools.[10] In adolescents from the AVENA Study, the main socio-economic determinant of overweight status was maternal education level.

In a pooled analysis of four cross-sectional nutrition surveys conducted in Spain, it has been observed that, among adult men, the OR for the prevalence of obesity in rural areas was 1.87 (95% CI 1.86–1.89) when compared with the cities.[14] The results were very similar to those observed in children and adolescents from Aragón.[10] Logistic regression analysis adjusted for age showed higher obesity rates among less educated people; ORs were 1.80 (95% CI 1.78–1.81) in men and 2.36 (95% CI 2.29–2.42) in women. The relationship between the level of education and the risk of obesity has been confirmed in adults from southeast Spain (OR 3.8).[15] This finding was also observed in adolescents from

were black children, children with nonworking parents, children with nonprofessional parents, and children whose mothers did not complete high school.

Conclusions

In Spanish children and adolescents, overweight and obesity tend to be higher in rural than in urban areas. In adolescents from a nationally representative sample of Spanish adolescents, it has been observed that the main determinant of overweight status was maternal education level. Between the micro-environmental factors analysed, only family history of obesity determines the risk of overweight in the offspring. This finding would be related not only with the genetic susceptibility but also with the presence of 'obesogenic families', with common diet and physical activity patterns.

Better knowledge of the relationship between social class and childhood obesity would lead to clearer hypotheses for the relationship in adults, and might improve preventive measures by identifying children at risk. If overweight is found to be more prevalent among some groups of children and adolescents, it may be appropriate to allocate health promotion resources differentially to those groups. Tackling childhood obesity is relevant to improving and sustaining child health, preventing cardiovascular disease, and addressing health inequalities.

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References

1 Moreno LA, Sarría A, Fleta J, Rodríguez G, Bueno M. Trends in body mass index and overweight prevalence among children and adolescents in the region of Aragón (Spain) from 1985 to 1995. *Int J Obes Relat Metab Disord* 2000; 24: 925–931.
2 Lissau I. Childhood obesity epidemic: answer from EU countries. *Int J Obes Relat Metab Disord* 2004; 28 (Suppl): S10–S15.
3 Moreno LA, Pineda I, Rodríguez G, Fleta J, Sarría A, Bueno M. Waist circumference for the screening of the metabolic syndrome in children. *Acta Paediatr* 2002; 91: 1307–1312.
4 Tresaco B, Bueno G, Moreno LA, Garagorri JM, Bueno M. Insulin resistance and impaired glucose tolerance in obese children and adolescents. *J Physiol Biochem* 2003; 59: 217–223.
5 Zhang Q, Wang Y. Socioeconomic inequality of obesity in the United States: do gender, age, and ethnicity matter? *Soc Sci Med* 2004; 58: 1171–1180.
6 Swinburn B, Egger G, Raza F. Dissecting obesogenic environments: the development and application of a framework for identifying and prioritising environmental interventions for obesity. *Prev Med* 1999; 29: 563–570.
7 Egger G, Swinburn B. An ecological approach to the obesity pandemic. *BMJ* 1997; 315: 477–480.
8 Strauss RS, Knight J. Influence of the home environment on the development of obesity in children. *Pediatrics* 1999; 103: e85.
9 Campbell K, Waters E, O'Meara S, Summerbell C. Interventions for preventing obesity in childhood. A systematic review. *Obes Rev* 2001; 2: 149–157.
10 Moreno LA, Sarría A, Fleta J, Rodríguez G, Pérez-González JM, Bueno M. Sociodemographic factors and trends on overweight prevalence in children and adolescents in Aragón (Spain) from 1985 to 1995. *J Clin Epidemiol* 2001; 54: 921–927.
11 Cole TJ, Bellizzi MC, Flegal KM, Dietz WH. Establishing a estandar definition for child overweight and obesity worldwide: international survey. *BMJ* 2000; 320: 1240–1243.
12 Moreno LA, Sarría A, Popkin BM. The nutrition transition in Spain: a European mediterranean country. *Eur J Clin Nutr* 2002; 56: 992–1003.
13 González-Gross M, Castillo MJ, Moreno LA, Nova E, González-Lamuño D, Pérez-Llamas F, Gutiérrez A, Garaulet M, Joyanes M, Leiva A, Marcos A. Alimentación y valoración del estado nutricional de los adolescentes españoles (Estudio AVENA). Evaluación de riesgos y propuesta de intervención. I. Descripción metodológica del proyecto. *Nutr Hosp* 2003; 18: 15–28.
14 Aranceta J, Pérez-Rodrigo C, Serra-Majem L, Ribas L, Quiles J, Vioque J, Foz M, Spanish Collaborative Group for the Study of Obesity. Influence of sociodemographic factors in the prevalence of obesity in Spain. The SEEDO'97 Study. *Eur J Clin Nutr* 2001; 55: 430–435.
15 Soriguer F, Rojo G, Esteva I, Ruiz de Adana MS, Catala M, Merelo MJ, Beltran M, Tinahones FJ. Prevalence of obesity in south-east Spain and its relation with social and health factors. *Eur J Epidemiol* 2004; 19: 33–40.
16 Gutiérrez-Fisac JL, Regidor E, Rodríguez C. Trends in obesity differences by educational level in Spain. *J Clin Epidemiol* 1996; 49: 351–354.
17 de Spiegelare M, Dramaix M, Hennart P. Social class and obesity in 12-year-old children in Brussels: influence of gender and ethnic origin. *Eur J Pediatr* 1998; 157: 432–435.
18 Langnäse K, Mast M, Müller MJ. Social class differences in overweight of prepubertal children in northwest Germany. *Int J Obes Relat Metab Disord* 2002; 26: 566–572.
19 Gortmaker SL, Must A, Perrin JM, Sobol AM, Dietz WH. Social and economic consequences of overweight in adolescence and young adulthood. *N Engl J Med* 1993; 329: 1008–1012.
20 Gordon-Larsen P, Adair L, Popkin BM. The relationship of ethnicity, socio-economic factors, and overweight in US adolescents. *Obes Res* 2003; 11: 121–129.
21 Booth ML, Macaskill P, Lazarus R, Baur LA. Sociodemographic distribution of measures of body fatness among children and adolescents in New South Wales, Australia. *Int J Obes Relat Metab Disord* 1999; 23: 456–462.
22 Amstrong J, Dorosty AR, Reilly JJ, Child Health Information Team, Emmett PM. Coexistence of social inequalities in undernutrition and obesity in preschool children: population based cross sectional study. *Arch Dis Child* 2003; 88: 671–675.
23 de Spiegelare M, Dramaix M, Hennart P. Socioeconomic status and changes in body mass from 3 to 5 years. *Arch Dis Child* 1998; 78: 477–478.
24 Goodman E, Adler NE, Daniels SR, Morrison JA, Slap GB, Dolan LM. Impact of objective and subjective social status on obesity in a biracial cohort of adolescents. *Obes Res* 2003; 11: 1018–1026.
25 Burke V, Beilin LJ, Dunbar D. Family lifestyle and parental body mass index as predictors of body mass index in Australian children: a longitudinal study. *Int J Obes Relat Metab Disord* 2001; 25: 147–157.
26 Johnson SL, Birch LL. Parents' and childrens' adiposity and eating styles. *Pediatrics* 1994; 94: 653–661.
27 Oliveria SA, Ellison RC, Moore LL, Gillman MW, Garrahie EJ, Singer MR. Parent-child relationships in nutrient intake: the Framingham children's study. *Am J Clin Nutr* 1992; 56: 593–598.
28 Borah-Giddens J, Falciglia GA. A meta-analysis of the relationship in food preferences between parents and children. *J Nutr Educ* 1993; 25: 102–107.
29 Moore LL, Lombardi DA, White MJ, Campbell JL, Oliveria SA, Ellison C. Influences of parents' physical activity levels on activity levels of young children. *J Pediatr* 1991; 118: 215–219.
30 Krahnstoever Davison K, Birch LL. Obesigenic families: parents' physical activity and dietary intake patterns predict girls' risk of overweight. *Int J Obes Relat Metab Disord* 2002; 26: 1186–1193.
31 Faith MS, Keller KL, Johnson SL, Pietrobelli A, Matz PE, Must S, Jorge MA, Cooperberg J, Heymsfield SB, Allison DB. Familial aggregation of energy intake in children. *Am J Clin Nutr* 2004; 79: 844–850.