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Original article

Relationship between caries, body mass index and social class in Spanish children

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ABSTRACT

Objective: To determine the association between caries, body mass index (BMI) and social class in child population of the Valencia region (Spain) at 6, 12 and 15 years, and study.
Methods: In a cross sectional study of 1326 children aged 6 (n = 488), 12 (n = 409) and 15 years (n = 433) who took part in the 2010 Oral Health Survey of the Valencia region, the ICDAS II criteria were employed for diagnosing and coding all the teeth examined. The quantitative BMI values on a continuous scale were grouped into 3 categories (normal weight, overweight, obese) based on a table adjusted for age and gender. The highest-ranking occupation of the parents was taken to indicate the social class of the child.
Results: The mean BMI was 17.21 at 6 years, 21.39 at 12 years and 22.38 at 15 years. No significant differences in caries indexes (DMFT or dft) by degree of obesity stratified by social class were found in any of the age groups studied. There was no significant correlation between BMI and DMFT-dft in any of the age groups.
Conclusions: Obesity is not associated with dental caries in schoolchildren of this population

Relación entre la caries, el índice de masa corporal y la clase social en niños españoles

Palabras clave:
Caries dental
Niños
Sobrepeso
Obesidad
Índice de masa corporal

RESUMEN

Objetivo: Determinar la asociación entre la caries, el índice de masa corporal (IMC) y la clase social en la población infantil de la Comunidad Valenciana (España) a los 6, 12 y 15 años de edad.
Método: Se realizó un estudio transversal con una muestra de 1326 niños/as de 6 años (n = 488), 12 años (n = 409) y 15 años (n = 433) de edad. Se emplearon los criterios del ICDAS II para el diagnóstico y la codificación de todos los dientes examinados. Los valores cuantitativos del IMC se agruparon en tres categorías (peso normal, sobrepeso y obesidad) según una tabla ajustada por edad y sexo. Para determinar la clase social se consideró la ocupación de mayor nivel de los padres.
Resultados: La media del IMC fue de 17,21 a los 6 años, de 21,39 a los 12 años y de 22,38 a los 15 años. No se observaron diferencias significativas en los índices de caries (DMFT o dft) por grado de obesidad y estratificado según clase social en ninguno de los grupos de edad. No hubo correlación significativa entre el IMC y el DMFT-dft en ninguno de los grupos.
Conclusiones: La obesidad no está asociada con la caries dental en los niños y las niñas de la muestra estudiada.

Introduction

In recent decades, changes in lifestyle and diet have been accelerated by industrialization, urbanization, economic development and market globalization. Their impact on health and nutrition has been significant, notably through higher carbohydrate intake and lower physical activity levels, particularly among the younger members of the population. As a result, the prevalence of child obesity has shot up throughout the world and has become a serious public health problem with grave consequences.[1] A high body mass index (BMI) is a complex metabolic condition involving behavioral, environmental and genetic components.[2] Previous studies have shown a positive association between dental caries and BMI. Overweight or obese children have a greater likelihood of suffering dental caries than those of normal weight.[3,4] The relationship between dental caries and body weight is such that dietary interventions designed to reduce the incidence of dental caries may also reduce the development and persistence of excess weight.[5]

Other factors that might influence the association between caries and obesity, such as social class, have also been studied. When both obesity and poverty are present, caries levels may rise.[6]

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Caries and obesity are multi-faceted conditions, influenced by a diversity of factors: psychosocial, behavioral and genetic aspects, eating habits, educational level and social class all play a part.[2,7–10] Furthermore, sugar intake is a decisive factor for both.[11] The challenge in studying this association lies in measuring the confounders or effect modifiers (diet, socioeconomic status, age, and so on) fully and in a standardized manner.[12,13] Tooth decay causes in the human dentition irreversible destruction with masticatories implications and other related quality of life. Preventing tooth decay in children ages remains a priority in public health in industrialized countries.[14]

The aim of this study was to analyze the relationship between caries, body mass index (BMI) and social class in 6, 12 and 15-year-old children of the Valencia region (Spain).

Methods

Study design and study group

This was a cross-sectional study. The 6, 12 and 15-year-old child population of the Valencia region of Spain comprises around 40,000 children in each age group, who attend 1200 primary and secondary schools. To measure their BMI to a level of precision of 0.04 with an estimated standard deviation in the mean BMI of around 3 or 4 depending on the age group, at a 95% confidence level, it was estimated that the minimum sample size should be 400 children from each age group. Cluster sampling was provided by the public health authority of Valencia. From 1200 schools in the region, 79 clusters were selected at random, with between 15 and 20 children in each. The sample size was 1326. Of these children, 484 were 6 years old, 409 were 12 years old and 433 were 15 years old.

Clinical examination

The three examiners were calibrated for ICDAS II caries criteria. First they carried out a calibration online (https://www.icdas.org/icdas-e-learning-course), then they performed an exercise with 10 children. The reliability of their measurements was assessed by reference to a gold standard (an experienced examiner). The weighted Kappa values of the 3 examiners all exceeded 0.85.

The World Health Organization (WHO) recommendations were followed during the clinical examinations in the schools. A 60 W lamp was used as the light source. The intraoral examinations were performed with a no. 5 plain mouth mirror and a WHO type periodontal probe, both sterilized. They were carried out in November and December 2010.[15]

Parental consent

Permission to conduct the study was obtained from the school authorities and from the head teachers of the schools involved. Signed informed consent to examine the children and to obtain information was also obtained from the parents of the children prior to the oral health examination. The study was approved by the Human Research Ethical Committee of the University of Valencia (approval #H1352114553202) and complied with the recommendations of the Declaration of Helsinki.

Caries

The ICDAS II criteria were employed for diagnosing and coding all the teeth examined.[16] The ICDAS II codes classify each decayed tooth in 6 stages of caries, ranging from sound (code 0) to extensive cavity with visible dentin (code 6).

The outcome quantitative variables of caries indexes considered in temporary dentition at 6 years of age were:

- d_{1-6} ft: decayed codes ICDAS II 1 to 6 and filled teeth count.
- d_{4-6} ft: decayed codes ICDAS II 4 to 6 and filled teeth count.

The outcome quantitative variables of caries indexes considered in permanent dentition at 12 and 15 years were:

- D_{1-6} MFT: decayed codes ICDAS II 1 to 6, missing and filled teeth count.
- D_{4-6} MFT: decayed codes ICDAS II 4 to 6, missing and filled teeth count.

Body mass index

To measure the BMI, the height and weight of each child were recorded at the same time of the clinical examination. The BMI was calculated by dividing the weight in kilograms by the height in meters squared: BMI = weight (kg)/height $(m)^2$. The measurements were performed by three examiners previously trained with the completion of weighing and calculation of BMI with a standardized procedure. The children wore lightweight clothes and no footwear while being weighed. Two consecutive weightings were made and a weighted average was recorded. Height was also measured without footwear. The instruments used were a SECA Robusta 813® weighing scale and a height measuring rod from the same manufacturer. BMI was expressed as quantitative variable and also the BMI values on a continuous scale were grouped into 3 categories–taking the percentiles 85 and 97 as indicative of overweight and obesity respectively (http://www.who.int/growthref/who2007_bmi_for_age/en/).

Social class

In addition to age and gender, information was obtained on social status, using the classification based on parental occupation validated in Spain.[17] The highest-ranking occupation of the parents was taken to indicate the social class of the child. The classifications were:

I: professionals, senior management and senior technical grades.
II: other executives, middle-level technical grades, small employers and self-employed without higher education.
III: middle management.
IVa: skilled manual workers.
IVb: partly-skilled manual workers.
V: unskilled workers.

The social classes were recoded, classifying classes I and II as high social class, class III as middle class and classes IVa. IVb and V as low social class.

Statistical analysis

The data were analyzed with the SPSS 22.0® statistics application. Descriptive statistics with means and 95% confidence intervals were calculated for quantitative variables: BMI and caries indexes. Student's t-test, ANOVA and linear trend test were used to study differences between means in bivariate statistics. The Pearson correlation coefficient was used to test for linear relationships between quantitative variables. The significance level was set at $p < 0.05$. Prior to the use of means comparison tests, the normal distribution was tested by the Kolmogorov-Smirnov test.

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