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# Dental caries, parents educational level, family income and dental service attendance among children in Italy

## ABSTRACT

***Aim*** *The aim of this study was to verify whether socioeconomic determinants, such as parents' educational level, family income and dental service attendance by children, are associated with the presence of caries among an Italian population of children.*

***Materials and methods*** *An observational retrospective study was carried out in a population of children aged 4–14 years who visited the Paediatric Dentistry Department of the University of Perugia, Italy. Children were stratified according to familial socioeconomic level (father's and mother's educational level, family income) and dental service attendance of children. Age- and sex-adjusted odds ratios (ORs) with 95% confidence intervals (95% CIs) were calculated by means of multivariate logistic regression models.*

***Results*** *A sample of 231 children (mean age 8.1 yrs, SD 2.6; 127 males, 104 females) was recruited. One hundred and sixty three (70.46%) children in the study had caries. Caries presence in children was higher in children where the mothers' educational level was lower (OR =6.1; 95% CI = 3.1 to 12.7), in children where the fathers' educational level was lower (OR =2.9; 95% CI =1.6 to 5.5) and in children with lower family income (OR = 9.9; 95% 95% CI = 5.1 to 20.1). No statistically significant difference were observed in terms of caries presence between the children who were visited at least once by a dentist and children who were not previously seen by a dental practitioner (OR = 0.8; 95% CI = 0.4 to 1.6).*

***Conclusion*** *Socioeconomic level was an important predictor of caries presence among children. Both low income and low parental educational level were related to an increased presence of caries, whereas previous dental visits experience did not affect caries presence in children.*

***Keywords*** *Dental caries, socioeconomic factors, family history, income, dental visiting habits, children, parents*

## Introduction

After 1960, an evident decline of caries prevalence occurred in industrialised countries [Marthaler, 2004]; the habit in children and adolescents of brushing teeth with fluoride toothpaste was the most important factor in this decline [Walsh Tet al., 2010; Rasines, 2010; Buzalaf and Levy, 2011]. However, the decreased number of subjects with caries showed a heterogeneous distribution in the population, where in children from families with low socioeconomic level, or from immigrant families, showed higher levels of caries [Marthaler, 2004; Kim Seow, 2012]. Moreover, toothpaste and other fluoride-containing products used to reduce dental caries showed a lower-than-expected effectiveness as claimed in previously published literature [Hausen, 2004]. Dental caries still remains a common, chronic childhood disease in several developed countries despite its preventable nature [Clark and Slayton, 2014; Bernabé and Sheiham, 2014; Struzycka et al., 2014]. This could be explained by some negative habits of people, such as the unwillingness to perform daily tooth brushing in order to maintain a sufficient salivary fluoride concentration over time [Hausen, 2004]. Furthermore, individual habits seemed to be influenced by cultural norms strongly linked to socioeconomic determinants [Baelum, 2011]. To reach a better understanding about this problem, an observational retrospective study was performed in an Italian (Perugia) population of children.

The aim of this study was to assess whether variables such as family income, parents' educational level and children's previous dental visits are associated with the presence of caries among an Italian population of children aged 4–14 years.

## Materials and methods

### *Study population*

An observational retrospective study was carried out

| Socioeconomic characteristics | Question | Possible answers | Dichotomous variables |
|---|---|---|---|
| Yearly income of families | What is the annual household income? | Nonpaying due to low income ≤36,152 euros | Low income |
| | | >36,153 | Middle-high income |
| Educational level of parents | What is the educational level of parents? | Elementary | Low educational level |
| | | Middle school | |
| | | High school | High educational level |
| | | University | |
| Dental Service attendance of children | Did the child undergo at least one previous dental visit? | At least one visit | Yes |
| | | Never | No |

TABLE 1 Socioeconomic determinants of caries.

in a population of children, between 4 and 14 years of age, who underwent a dental examination in the Paediatric Dentistry Department of the University of Perugia between January and December 2012.

The design of this study was approved by the Ethics Committee of Umbria (CEAS Umbria), Italy.

### Data collection

The dental examinations were carried out by one dentist of the staff using the International Caries Detection and Assessment System (ICDAS) criteria, with a flat-surface mouth mirror, a dental explorer, compressed air and lamp lights. Radiographs were not used.

The number and location of caries were recorded on a specific clinical chart, while the patient history data (including socioeconomic and dental hygiene-behavioural items) was obtained from a specific questionnaire filled out by parents in the waiting room. All parents signed an informed consent at the children's first visit to allow their children's personal data to be used for the treatment and for research.

### Data extraction

Absolute and relative (percentage) frequencies of children with caries were retrieved from patients' clinical charts. The data relative to socioeconomic factors (family income and parents' educational level), dental hygiene-behaviour and previous dental visits were extracted from patient history questionnaires and were summarised as dichotomous variables: (I) low or high (>36,152 euros per year) family income; (II) low (elementary and middle school) or high (high school and university) parental educational level; and (III) at least one previous dental visit or not (Table 1). Data extraction was performed independently by two researchers. Any disagreements in data recording were resolved by consensus.

### Inclusion criteria

Eligibility for inclusion were: (a) children between the age of 4 and 14 years; (b) both parents available to fill in the questionnaire regarding the socioeconomic status; and (c) the presence, during the dental examination, of at least one parent able to understand Italian and answer to the questions on patient history.

Exclusion criteria were: the presence of organic or psychiatric syndromes, systemic illnesses and severe intellective or behavioural deficits; the presence of unclear or ambiguous data in the clinical chart or patient history, and the unavailability of one parent.

### Data analysis

Sex- and age-adjusted odds ratios (adjusted ORs) with 95% confidence intervals (95%CI) between the number of subjects with caries (where a cut-off was set to 1, i.e. >= 1vs 0) and each of the socioeconomic and dental hygiene factors were calculated. Adjusted odds ratios were measured by means of multivariate logistic regression models.

## Results

Overall, 269 children visited the Paediatric Dentistry Department during the duration of the study, of which 231 (85.9%) met all inclusion criteria (127 males, 104 females). Patient history data were obtained from all 231 pairs of parents. The children's age ranged from 4 to 14 years [mean age 8.11 (SD 2.6)]. One hundred and sixty three (70.6%) children in the study had caries, while 68 did not. Regarding the education level of parents, the mothers of 110 children had a low educational level, with a prevalence of 87.2% (n=96) of children with caries. Conversely, the mothers of 121 children had a high level of education and their offspring had a presence of caries of 55.4% (n=67). Moreover

| Population characteristics | | Total children 231 N. | Children with caries N. (%) | Unadjusted analysis Odds ratio (95% CI) | Age- and sex-adjusted analysis Odds ratio* (95% CI) |
|---|---|---|---|---|---|
| Age | ≤ 8 years | 122 | 70 (57.4%) | 1 (ref) | 1 (ref) |
| | > 8 years | 109 | 93 (85.3%) | 4.3 (2.3-8.4) | 4.3 (2.3-8.4) |
| Gender | Males | 127 | 90 (70.9%) | 1 (ref) | |
| | Females | 104 | 73 (70.2%) | 1.0 (0.6-1.7) | 1.1 (0.6-1.9) |
| Educational level of mother | High | 121 | 67 (55.4%) | 1 (ref) | 1 (ref) |
| | Low | 110 | 96 (87.2%) | 5.5 (2.7-11.4) | 6.1 (3.1-12.7) |
| Educational level of father | High | 109 | 65 (59.6%) | 1 (ref) | 1 (ref) |
| | Low | 122 | 98 (80.3%) | 2.8 (1.5-5.2) | 2.9 (1.6-5.5) |
| Income of families | High | 49 | 15 (30.6%) | 1 (ref) | 1 (ref) |
| | Low | 182 | 148 (81.3%) | 9.9 (4.6-21.5) | 9.9 (5.1-20.1) |
| Dental Service attendance of children | No previous visits | 121 | 76 (62.8%) | 1 (ref) | 1 (ref) |
| | At least 1 previous visit | 110 | 87 (79.0%) | 0.5 (0.2-0.8) | 0.8 (0.4-1.6) |

TABLE 2 Relationship among prevalence of children with caries and socioeconomic determinants.

122 children of fathers with a low educational level presented a percentage caries of 80.3% (n=98), while 109 children of fathers with a high educational level showed a presence of caries of 59.6% (n=65). The relative frequency of children affected by caries was higher in subjects whose mother had a low educational level compared to subjects whose mother had a high educational level (OR = 6.1; 95%,CI= 3.1-12.7). Likewise, children of fathers with a low educational level had a more frequent presence of caries rather than subjects of fathers with a high educational level (OR =2.9; 95%, CI =1.6 to 5.5) (Table 2).

Concerning the family income, 182 children came from low income families (<36,153 euros per year), of which 148 (81.4%) had caries, while among the 49 children from medium-high income households, 15 (30.6%) had caries. The children from low income families had a higher frequency of caries rather than children from medium-high income households (OR= 9.9; 95% CI =5.1 to 20.1) (Table 2).

Regarding previous access to dental care, 110 children visited a dentist at least once, of which 87 (79%) had caries. Conversely, among the 121 children who never visited a dentist, 76 (62.8%) had caries. The presence of caries was not statistically significantly correlated with previous dental visit children's experience (OR = 0.8; 95% CI = 0.4 to 1.6) (Table 2).

## Discussion

This study was carried out in a population of children, aged 4 to 14 years, to assess whether there was a relation between the number of subjects with caries and the three following factors: family income, parents' educational level and children's previous visits to a dentist. The data collected in this study show that both the low family income and low educational level of either parent were related to the presence of children's caries. These results are in agreement with the results of similar studies, which revealed an association between the presence of children's caries and the socioeconomic level of parents [Kumar, 2016; Schwendicke, 2015; Veiga, 2015; Schwendicke, 2015] especially of the mother [Kim Seow, 2012], and/or low family income [Kim Seow, 2012; Hooley, 2012; Girish Babu and Doddamani, 2012; Vadiakas, 2008; Schwendicke et al., 2015]. Children belonging to low income families often had a diet characterised by poor nutrition and rich in sugars and fats, which predispose children to the development of caries and obesity [Mobley et al., 2009]. A diet rich in sugar-laden drinks and foods, totaling an amount greater than 10% of overall daily dietary energy intake (18.25 kg/person/year), in fact, is strongly related to the universal increase of the prevalence and indices of caries in populations. For this reason, the 2015 World Health Organization (WHO) guidelines recommend limiting sugar intake to less than the above mentioned threshold or preferentially less than 5% (9.08 kg/person/year) of total dietary energy [Riggs et al., 2015; Dyer et al., 2014; Shyama et al., 2015]. In addition, this recommendation is based on the fact that the deleterious effects of excessive intake of sweet foods and beverages are only limited, but not completely prevented, by fluoride exposure through fluoridated drinking water and daily toothpaste use [Riggs et al., 2015; Dyer et al., 2014; Shyama et al., 2015]. This increased sugar intake, which is dangerous for oral health, is particularly common in children of immigrant populations (from developing and

industrialised countries) who change their traditional dietary behaviours and beliefs through an unavoidable acculturation process [Riggs et al., 2015]. Poor economic level is also linked to a reduced frequency of dental visits, with an associated lack of prevention and treatment of caries [Dyer et al., 2014]. Moreover, we found that previous access to dental care by children was not associated with a decrease of caries presence if age and gender were taken into account. In other words, dental attendance did not affect the children caries experience. This can be explained by the common habit of parents of bringing their children to the dentist only when the children have a toothache or at least one caries, thus neglecting preventive oral examination and prophylactic interventions [Shyama et al., 2015; Gussy et al., 2006]. The absence of effectiveness of children's dental attendance in terms of caries decrease might also be also due to the fact that dental care alone does not reduce the incidence of caries if carried out without a dental care campaign promoting good oral hygiene habits and balanced sugar intake [Bracksley-O'Grady et al., 2015; Drugan and Downer, 2011]. Despite the demonstrated effectiveness of prevention in dentistry, there is no clear evidence of its comprehension and application by dentists in their daily clinical activity [Bernabé and Sheiham, 2014; Baelum, 2011; Bracksley-O'Grady et al., 2015]. The relationship between socioeconomic familial level and dental hygiene and caries highlighted in this study, as well as in the literature [Schwendicke et al., 2015], should encourage more effective prevention strategies particularly addressed to lower socioeconomic classes. Our data demonstrate that dental service attendance by children is not a protective factor against the development of caries and, therefore, should stimulate further study on the effectiveness of the current approach to dental care.

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