

# Association between dental caries and sociodemographic factors in children aged 5-12 years

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## ABSTRACT

Dental caries is a global public health issue, particularly in children, and is influenced by sociodemographic conditions. **Aim:** To assess the association between dental caries and sociodemographic factors in children aged 5-12 years in Victoria, Cabañas, El Salvador. **Materials and Method:** A cross-sectional, correlational study was conducted among 137 children (48.2% boys, 51.8% girls), measuring dental caries using DMFT and dmft indices, and oral hygiene using the O'Leary Plaque Index. Sociodemographic data were obtained through caregiver questionnaires. **Results:** Caries prevalence was 63.5%. DMFT increased with age (highest in 10–12-year-old girls: mean = 5.44), while dmft declined (lowest in 12-year-old girls: mean = 0.56). Most children (98.5%) had poor oral hygiene. A weak but significant negative correlation was found between income and dmft ( $\rho = -0.189$ ;  $p = 0.027$ ). No other significant association was observed between caries indices and maternal education, income, or plaque index. **Conclusions:** Caries patterns differed significantly according to age and sex. Despite the high prevalence, most sociodemographic variables showed no strong statistical association with caries. Preventive interventions should focus on age- and sex-specific risks.

**Keywords:** dental caries - dental plaque index - children - educational status - income

## Relación entre el diagnóstico de caries dental y los factores sociodemográficos en niños de 5 a 12 años

### RESUMEN

La caries dental infantil representa un problema de salud pública global, influenciado por factores sociodemográficos. **Objetivo:** Evaluar la relación entre caries dental y factores sociodemográficos en niños de 5 a 12 años en Victoria, Cabañas, El Salvador. **Materiales y Método:** Estudio transversal, correlacional, con 137 niños (48.2% niños, 51.8% niñas). Se emplearon los índices CPOD y ceod para medir caries, y el índice de placa de O'Leary para higiene oral. Se recolectaron datos sociodemográficos mediante cuestionarios. **Resultados:** La prevalencia de caries fue del 63.5%. El CPOD aumentó con la edad (mayor en niñas de 10–12 años: media = 5.44), mientras que el ceod disminuyó (menor en niñas de 12 años: media = 0.56). El 98.5% presentó mala higiene bucal. Se halló una correlación negativa débil pero significativa entre ingresos y ceod ( $\rho = -0.189$ ;  $p = 0.027$ ). No se encontraron asociaciones significativas con educación materna o el índice de placa. **Conclusiones:** Los índices de caries variaron significativamente por edad y sexo. Aunque la prevalencia fue alta, los factores socioeconómicos evaluados no mostraron asociación significativa. Se recomienda implementar estrategias preventivas enfocadas según edad y sexo.

**Palabras clave:** caries dental - índice de placa dental - niños - nivel educativo - ingresos

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## INTRODUCTION

Oral health is a global public health concern, particularly among vulnerable pediatric populations in low- and middle-income countries, where economic and social inequalities exacerbate disparities in access to care<sup>1</sup>. Despite being largely preventable, dental caries is the most prevalent chronic condition in childhood, impacting overall well-being and quality of life<sup>2</sup>.

According to the 2022 Global Oral Health Status Report from the World Health Organization (WHO), 514 million children suffer from caries in primary teeth and over 2 billion people have untreated caries in permanent teeth<sup>3</sup>. Urbanization, high consumption of sugary foods, limited fluoride exposure, inadequate oral hygiene practices, and insufficient access to dental services contribute significantly to this burden<sup>4-5</sup>.

Research from around the world has consistently demonstrated a strong association between sociodemographic determinants and caries prevalence in children. For example, studies from Japan, Brazil and Latin America have shown that low maternal education, household income, and socioeconomic status are associated with higher prevalence of dental caries<sup>6-8</sup>. Similarly, Vasireddy et al. found that children in the lowest income bracket in the U.S. were more than twice as likely to develop caries compared to those from higher-income families<sup>9</sup>. In Latin America, Ojeda and Villavicencio identified income as a barrier to access to dental care<sup>10</sup>. Recent evidence from Syria and Ethiopia highlights that school type, household size, parental education, and dietary behaviors are significantly associated with caries experience<sup>11-12</sup>. A recent national study in Peru reported that 76.2% of children aged 3 to 5 had dental caries<sup>13</sup>. In China, research in 2024 showed that 97% of caries in preschoolers were untreated, underscoring limited access to early treatment<sup>14</sup>. All these studies highlight the importance of identifying vulnerable populations in order to plan preventive interventions.

Despite the growing body of international literature, localized data are essential to guide effective community-based public health strategies. In El Salvador, data on dental caries and their association with social determinants are scarce. This study addresses this gap by examining the association between sociodemographic factors and dental caries in children aged 5-12 in Victoria, Cabañas, a region

with limited access to healthcare and high poverty levels.

This study employed validated caries indices DMFT (Decayed, Missing, and Filled Teeth for permanent dentition) and dmft (for primary dentition), as well as a structured caregiver questionnaire to explore how age, sex, maternal education and family income influence oral health status in children.

**Research question:** What is the association between dental caries diagnosis and sociodemographic factors such as age, sex, maternal education and family income among children aged 5 to 12 years in Victoria, Cabañas, El Salvador?

**Hypothesis:** Sociodemographic factors, including age, sex, maternal education level and family income significantly influence the prevalence and severity of dental caries in children aged 5 to 12 years in Victoria, Cabañas, El Salvador.

**Null hypothesis (H<sub>0</sub>):** There is no significant association between dental caries diagnosis and the sociodemographic factors under study.

**Alternative hypothesis (H<sub>1</sub>):** There is a significant association between dental caries diagnosis and at least one of the sociodemographic factors (age, sex, maternal education or family income).

## MATERIALS AND METHOD

### Ethical considerations

Participants' rights were protected through informed consent signed by parents or guardians, verbal assent from children, voluntary participation, and guaranteed confidentiality. The study was approved by the Health Research Ethics Committee (ACTA No. 339).

### Study design

This was a quantitative, cross-sectional, observational, correlational study conducted in 2023 in Victoria, Cabañas, El Salvador. A total of 137 children aged 5 to 12 years (66 boys and 71 girls) participated. A non-probabilistic convenience sampling method was used, justified by logistical limitations in rural areas and the inability to construct a comprehensive sampling frame within the study timeframe.

### Inclusion and exclusion criteria

Children aged 5 to 12 years residing in Victoria, Cabañas, El Salvador, whose parents or guardians

signed the informed consent, were included. Exclusion criteria were presence of systemic diseases, ongoing orthodontic treatment, or absence on the day of the dental evaluation.

### Clinical assessment and data collection

Dental caries were diagnosed using the DMFT (Decayed, Missing, and Filled Teeth) and dmft indices for permanent and primary dentition, respectively, following the World Health Organization guidelines<sup>15</sup>. Three trained, calibrated examiners performed the clinical assessments. Dental plaque was assessed using the O'Leary Plaque Index<sup>16</sup> by four trained observers, applying a plaque disclosing agent to smooth tooth surfaces.

### Instruments

The instruments included standardized clinical records, dental charts, plaque index forms, and a validated questionnaire designed by experts in pediatric dentistry, public health and research. The questionnaire recorded the following sociodemographic information: age (in years), sex (male/female), maternal education level (no schooling, primary, secondary, higher), and monthly household income (<\$100, \$100-199, \$200-299, \$300-499 USD).

### Quality control and bias reduction

Calibration among observers was conducted before data collection. Kappa coefficients showed high interobserver agreement: 0.852 and 0.855 for caries diagnosis; 0.855 and 0.719 for plaque evaluation. To reduce information bias, surveys were administered

by trained personnel. Selection bias was minimized by including all children who met inclusion criteria and were available during the evaluation period.

### Statistical analysis

Data were analyzed using IBM SPSS Statistics version 23<sup>17</sup>. The Kolmogorov-Smirnov test was applied to assess the normality of the data, revealing non-normal distribution for most variables. Consequently, non-parametric tests were used: Mann-Whitney U for two-group comparisons, Kruskal-Wallis for multiple groups, and Spearman's rank correlation for ordinal variables. Descriptive statistics included frequency distributions, measures of central tendency, and cross-tabulations to assess the distribution of caries and plaque indices by age and sex.

## RESULTS

### Descriptive Analysis

#### DMFT, dmft, and plaque index values according to age and sex in children aged 5 to 12 years

A progressive increase in the DMFT index was observed with age, particularly among girls, whereas the dmft index decreased in older children, showing higher prevalence among those under 7 years of age. The plaque index remained high across all age groups, with worse outcomes in girls, reflecting a generalized pattern of poor oral hygiene (Table 1). The prevalence of caries in permanent teeth was 63.5%, with a Significant Caries Index (SCI) of 6.82, indicating higher rates in girls. The average plaque index was 74.97%, and the 75th percentile revealed

**Table 1. Mean, median, and 75th percentile values of DMFT, dmft and plaque index according to age and sex (n = 137)**

Age Group	Sex	Mean DMFT	Mean dmft	Mean PI (%)	Median DMFT	Median dmft	Median PI (%)	75th Perc. DMFT	75th Perc. dmft	75th Perc. PI (%)
5-6	Male	0.36	8.05	65.18	0	7.5	65.18	0.25	11.25	81.34
5-6	Female	0.43	7.93	77.71	0	8.5	86.16	0.25	10.25	90.31
7-9	Male	1.91	5.22	75.72	1	5	83.7	3	8	90
7-9	Female	2.43	6.1	80.57	2	6	89.13	3.5	9	99.38
10-11	Male	3.85	2.15	78.17	4	1	83.33	4.5	3.5	96.21
10-11	Female	5.44	1.41	82.75	4	1	87.5	8	2	95.65
12	Male	3.13	1	67.47	3	0	78.82	5.5	1.5	89.9
12	Female	4.33	0.56	71.26	4	0	78.13	5.5	1.5	96.88

**Note.** DMFT = decayed, missing and filled teeth in permanent dentition; dmft = same index for primary teeth. PI = plaque index based on stained surfaces. Data obtained from clinical assessments of 137 children in Victoria, Cabañas (2023).

**Table 2. Distribution of DMFT index categories according to age group and sex in children aged 5 to 12 years (n = 137)**

Age Group	Sex	Very Low (0–1.1)	Low (1.2–2.6)	Moderate (2.7–4.4)	High (4.5–6.5)	Very High (≥6.6)	Total
5-6	Male	20 (30.3%)	1 (1.5%)	1 (1.5%)	0 (0.0%)	0 (0.0%)	22
7-9	Male	12 (18.2%)	3 (4.5%)	5 (7.6%)	2 (3.0%)	1 (1.5%)	23
10-11	Male	1 (1.5%)	3 (4.5%)	6 (9.1%)	2 (3.0%)	1 (1.5%)	13
12	Male	2 (3.0%)	1 (1.5%)	3 (4.5%)	2 (3.0%)	0 (0.0%)	8
	<b>Total</b>	<b>35 (53.0%)</b>	<b>8 (12.1%)</b>	<b>15 (22.7%)</b>	<b>6 (9.1%)</b>	<b>2 (3.0%)</b>	<b>66</b>
5-6	Female	13 (18.3%)	0 (0.0%)	1 (1.4%)	0 (0.0%)	0 (0.0%)	14
7-9	Female	8 (11.3%)	5 (7.0%)	5 (7.0%)	2 (2.8%)	1 (1.4%)	21
10-11	Female	5 (7.0%)	2 (2.8%)	7 (9.9%)	5 (7.0%)	8 (11.3%)	27
12	Female	1 (1.4%)	1 (1.4%)	3 (4.2%)	3 (4.2%)	1 (1.4%)	9
	<b>Total</b>	<b>27 (38.0%)</b>	<b>8 (11.3%)</b>	<b>16 (22.5%)</b>	<b>10 (14.1%)</b>	<b>10 (14.1%)</b>	<b>71</b>
	<b>Overall Total</b>	<b>62 (45.3%)</b>	<b>16 (11.7%)</b>	<b>31 (22.6%)</b>	<b>16 (11.7%)</b>	<b>12 (8.8%)</b>	<b>137</b>

**Note.** DMFT = Decayed, Missing and Filled Teeth index in permanent dentition. Categories were classified following WHO guidelines for epidemiological comparisons. Percentages refer to the proportion of the total sample within each sex and age group.

a subgroup with alarmingly high values across all indices, suggesting the need for specialized dental care.

#### Association among age, sex and DMFT index

In the 5-6-year age group, 24.1% of the children had very low DMFT indices. In the 7-9-year group, 14.6% maintained low DMFT values, although 1.5% reached very high levels. Among children aged 10–12 years, the proportion of moderate to very high DMFT indices increased markedly, especially in girls, indicating a progression of caries in permanent teeth with age and sex-related differences in prevalence (Table 2).

#### Association among age, sex and dmft index

In the 5–6-year age group, a high proportion of children had very high dmft scores, with 21.2% of boys and 14.1% of girls being included in this category. Similarly elevated values were observed in the 7–9-year age group, although a slight reduction was noted. Among older children, especially 12-year-old girls, the dmft index declined progressively, reflecting the natural shedding of primary teeth and a reduced impact of caries on deciduous dentition at older ages (Table 3).

#### Association between DMFT index and mother's education level

Children whose mothers had only received primary

education exhibited the highest proportion of very low DMFT indices (31.4%). However, paradoxically, this group also concentrated the most cases of caries, indicating a high overall prevalence of caries despite the distribution. A downward trend in DMFT values was observed as maternal education level increased, suggesting that higher maternal education may have a protective influence on permanent dentition. Nonetheless, statistical analysis did not reveal a significant correlation between maternal education and DMFT index ( $Rho = 0.070$ ,  $p = 0.418$ ). This may be influenced by the homogeneity of the study population or by uncontrolled confounding variables (Table 4).

#### Association between dmft index and mother's education level

Children whose mothers had no schooling or only basic education exhibited higher dmft indices. Specifically, 22.6% of the children in the primary education group had a “very high” dmft index, indicating greater vulnerability to dental caries in primary dentition when maternal education is limited. In contrast, children whose mothers had secondary, or university-level education tended to have lower dmft values. However, the statistical analysis revealed no significant correlation between maternal education level and the dmft index ( $Rho = 0.070$ ;  $p = 0.418$ ). This lack of association could be attributed to the limited variability in educational

**Table 3. Distribution of dmft index categories according to age group and sex in children aged 5 to 12 years**

Age Group	Sex	Very Low (0–1.1)	Low (1.2–2.6)	Moderate (2.7–4.4)	High (4.5–6.5)	Very High (≥6.6)	Total
5-6	Male	1 (1.5%)	2 (3.0%)	0 (0.0%)	5 (7.6%)	14 (21.2%)	22
7-9	Male	5 (7.6%)	1 (1.5%)	5 (7.6%)	2 (3.0%)	10 (15.2%)	23
10-11	Male	7 (10.6%)	0 (0.0%)	4 (6.1%)	2 (3.0%)	0 (0.0%)	13
12	Male	7 (10.6%)	1 (1.5%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	8
	<b>Total</b>	<b>20 (30.3%)</b>	<b>4 (6.1%)</b>	<b>9 (13.6%)</b>	<b>9 (13.6%)</b>	<b>24 (36.4%)</b>	<b>66</b>
5-6	Female	1 (1.4%)	0 (0.0%)	1 (1.4%)	2 (2.8%)	10 (14.1%)	14
7-9	Female	4 (5.6%)	0 (0.0%)	1 (1.4%)	6 (8.5%)	10 (14.1%)	21
10-11	Female	16 (22.5%)	5 (7.0%)	4 (5.6%)	2 (2.8%)	0 (0.0%)	27
12	Female	7 (9.9%)	2 (2.8%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	9
	<b>Total</b>	<b>28 (39.4%)</b>	<b>7 (9.9%)</b>	<b>6 (8.5%)</b>	<b>10 (14.1%)</b>	<b>20 (28.2%)</b>	<b>71</b>
	<b>Overall Total</b>	<b>48 (35.0%)</b>	<b>11 (8.0%)</b>	<b>15 (10.9%)</b>	<b>19 (13.9%)</b>	<b>44 (32.1%)</b>	<b>137</b>

**Note.** dmft = decayed, missing and filled teeth in primary dentition. Classification follows WHO criteria. Percentages represent the proportion of the total sample in each subgroup.

**Table 4. Distribution of DMFT index categories according to mother's education level (n = 137)**

DMFT Category	No Schooling	Early Childhood Education	Primary Education	Secondary Education	Higher Education	Total
Very Low (0–1.1)	5 (3.6%)	1 (0.7%)	43 (31.4%)	11 (8.0%)	2 (1.5%)	62
Low (1.2–2.6)	0 (0.0%)	1 (0.7%)	7 (5.1%)	8 (5.8%)	0 (0.0%)	16
Moderate (2.7–4.4)	2 (1.5%)	3 (2.2%)	19 (13.9%)	5 (3.6%)	2 (1.5%)	31
High (4.5–6.5)	0 (0.0%)	1 (0.7%)	12 (8.8%)	3 (2.2%)	0 (0.0%)	16
Very High (≥6.6)	1 (0.7%)	0 (0.0%)	5 (3.6%)	5 (3.6%)	1 (0.7%)	12
<b>Total</b>	<b>8 (5.8%)</b>	<b>6 (4.4%)</b>	<b>86 (62.8%)</b>	<b>32 (23.4%)</b>	<b>5 (3.6%)</b>	<b>137</b>

**Note.** DMFT = decayed, missing and filled teeth in permanent dentition. Education levels were self-reported by parents and categorized according to national standards. Percentages represent proportions relative to the total sample.

levels within the sample or to the influence of other unmeasured factors such as access to dental care or hygiene habits supervised by caregivers (Table 5).

#### Association between DMFT index and family income

Children from families earning less than \$100 per month showed a higher proportion of moderate

**Table 5. Distribution of dmft index categories according to mother's education level (n = 137)**

dmft Category	No Schooling	Early Childhood Education	Primary Education	Secondary Education	Higher Education	Total
Very Low (0–1.1)	1 (0.7%)	1 (0.7%)	28 (20.4%)	15 (10.9%)	3 (2.2%)	48
Low (1.2–2.6)	0 (0.0%)	2 (1.5%)	6 (4.4%)	3 (2.2%)	0 (0.0%)	11
Moderate (2.7–4.4)	2 (1.5%)	0 (0.0%)	11 (8.0%)	2 (1.5%)	0 (0.0%)	15
High (4.5–6.5)	2 (1.5%)	1 (0.7%)	10 (7.3%)	6 (4.4%)	0 (0.0%)	19
Very High (≥6.6)	3 (2.2%)	2 (1.5%)	31 (22.6%)	6 (4.4%)	2 (1.5%)	44
<b>Total</b>	<b>8 (5.8%)</b>	<b>6 (4.4%)</b>	<b>86 (62.8%)</b>	<b>32 (23.4%)</b>	<b>5 (3.6%)</b>	<b>137</b>

**Note.** dmft = decayed, missing and filled teeth in primary dentition. The data reflects maternal education levels and their association with caries prevalence in children. Percentages indicate the proportion of each group relative to the full sample.

(22.6%) and very high (8.8%) DMFT indices, indicating a greater burden of caries in permanent dentition among lower-income groups. In contrast, children from families with monthly incomes between \$300 and \$500 demonstrated significantly better oral health, with 45.3% presenting a “very low” DMFT index. Nevertheless, Spearman’s

correlation analysis showed no statistically significant association between family income and DMFT index ( $Rho = 0.030$ ;  $p = 0.730$ ). This lack of significance may reflect the relative homogeneity of the sample or the influence of confounding factors such as dietary habits or previous access to preventive dental care (Table 6).

**Table 6. Distribution of DMFT index categories according to family monthly income (n = 137)**

DMFT Category	< \$100.00	\$100.00–\$199.99	\$200.00–\$299.99	\$300.00–\$499.99	Total
Very Low (0–1.1)	27 (19.7%)	20 (14.6%)	10 (7.3%)	5 (3.6%)	62
Low (1.2–2.6)	8 (5.8%)	3 (2.2%)	5 (3.6%)	0 (0.0%)	16
Moderate (2.7–4.4)	13 (9.5%)	11 (8.0%)	4 (2.9%)	3 (2.2%)	31
High (4.5–6.5)	6 (4.4%)	2 (1.5%)	2 (1.5%)	6 (4.4%)	16
Very High ( $\geq 6.6$ )	7 (5.1%)	3 (2.2%)	2 (1.5%)	0 (0.0%)	12
<b>Total</b>	<b>61 (44.5%)</b>	<b>39 (28.5%)</b>	<b>23 (16.8%)</b>	<b>14 (10.2%)</b>	<b>137</b>

**Note.** DMFT = decayed, missing and filled teeth in permanent dentition. This table shows how caries severity varies according to household monthly income. The “Very Low” category was most prevalent among children from families earning \$300.00–\$499.99.

**Association between dmft index and family income**

The cross-tabulation between the dmft index and monthly income ranges showed that children from families earning less than \$100 per month exhibited higher rates of “very high” (18.2%) and “high” (6.6%) dmft indices, indicating a greater prevalence of caries in primary teeth. In contrast, children from families with incomes between \$300 and \$500 showed lower caries levels, with a greater proportion falling into the “very low” category (5.1%). Overall, 35.0% of the children had a “very low”

dmft index, while 32.1% showed a “very high” value, suggesting a polarized distribution of caries in primary dentition. Spearman’s correlation revealed a weak but statistically significant negative association between family income and the dmft index ( $Rho = -0.189$ ;  $p = 0.027$ ), indicating that lower income levels are associated with higher caries prevalence in deciduous teeth. These findings underscore the importance of implementing targeted preventive strategies for low-income populations (Table 7).

**Table 7. Distribution of dmft index categories according to family monthly income (n = 137)**

dmft Category	< \$100.00	\$100.00–\$199.99	\$200.00–\$299.99	\$300.00–\$499.99	Total
Very Low (0–1.1)	15 (10.9%)	18 (13.1%)	8 (5.8%)	7 (5.1%)	48
Low (1.2–2.6)	3 (2.2%)	3 (2.2%)	2 (1.5%)	3 (2.2%)	11
Moderate (2.7–4.4)	9 (6.6%)	3 (2.2%)	3 (2.2%)	0 (0.0%)	15
High (4.5–6.5)	9 (6.6%)	6 (4.4%)	3 (2.2%)	1 (0.7%)	19
Very High ( $\geq 6.6$ )	25 (18.2%)	9 (6.6%)	7 (5.1%)	3 (2.2%)	44
<b>Total</b>	<b>61 (44.5%)</b>	<b>39 (28.5%)</b>	<b>23 (16.8%)</b>	<b>14 (10.2%)</b>	<b>137</b>

**Note.** dmft = decayed, missing and filled teeth in primary dentition. The data indicates a higher prevalence of severe caries in children from lower-income families, particularly those earning less than \$100.00 per month.

**Association between DMFT index and plaque index**

Analysis of the association between the DMFT index and plaque index revealed that most children (98.5%) had poor oral hygiene, as defined by plaque coverage exceeding 30%. Among these children,

although 45.3% presented “very low” DMFT values, a considerable proportion also exhibited moderate (22.6%), high (11.7%) and very high (8.8%) DMFT indices (Table 8). These results indicate a heterogeneous distribution

**Table 8. Distribution of DMFT index categories according to oral hygiene (plaque index) in children aged 5–12 years (n = 137)**

DMFT Category	Good (<20%)	Acceptable (20%–30%)	Poor (>30%)	Total
Very Low (0–1.1)	0 (0.0%)	0 (0.0%)	62 (45.3%)	62
Low (1.2–2.6)	0 (0.0%)	0 (0.0%)	16 (11.7%)	16
Moderate (2.7–4.4)	0 (0.0%)	0 (0.0%)	31 (22.6%)	31
High (4.5–6.5)	1 (0.7%)	1 (0.7%)	14 (10.2%)	16
Very High (≥6.6)	0 (0.0%)	0 (0.0%)	12 (8.8%)	12
<b>Total</b>	<b>1 (0.7%)</b>	<b>1 (0.7%)</b>	<b>135 (98.5%)</b>	<b>137</b>

**Note.** DMFT = decayed, missing and filled permanent teeth. Poor oral hygiene was nearly universal (98.5%), with the highest caries burden found in children with plaque indices above 30%.

of caries severity despite uniformly poor hygiene conditions. The absence of a statistically significant correlation between DMFT and the plaque index ( $Rho = 0.148$ ;  $p = 0.084$ ) suggests that while plaque accumulation is widespread, it may not fully explain the variation in caries prevalence in permanent dentition. Additional factors such as diet, fluoride exposure and previous access to dental care may contribute to this disparity and should be further explored in future research.

**Association between dmft index and plaque index**  
Among children with poor oral hygiene (defined as a plaque index greater than 30%), 32.1% exhibited a “very high” dmft index, indicating high prevalence of dental caries in primary teeth within this group. However, 33.6% of these children had a “very low” dmft index despite poor hygiene (Table 9). These findings suggest that while oral hygiene is an important factor, it is not the sole determinant of caries prevalence in primary dentition. The lack

**Table 9. Distribution of dmft Index Categories According to Oral Hygiene (Plaque Index) in Children Aged 5–12 Years (n = 137)**

dmft Category	Good (<20%)	Acceptable (20%–30%)	Poor (>30%)	Total
Very Low (0–1.1)	1 (0.7%)	1 (0.7%)	46 (33.6%)	48
Low (1.2–2.6)	0 (0.0%)	0 (0.0%)	11 (8.0%)	11
Moderate (2.7–4.4)	0 (0.0%)	0 (0.0%)	15 (10.9%)	15
High (4.5–6.5)	0 (0.0%)	0 (0.0%)	19 (13.9%)	19
Very High (≥6.6)	0 (0.0%)	0 (0.0%)	44 (32.1%)	44
<b>Total</b>	<b>1 (0.7%)</b>	<b>1 (0.7%)</b>	<b>135 (98.5%)</b>	<b>137</b>

**Note.** dmft = decayed, missing and filled primary teeth. Although most children had poor hygiene (98.5%), nearly one-third (33.6%) had a low dmft index, indicating that hygiene alone does not explain caries patterns in primary teeth.

of a significant correlation between plaque index and dmft ( $Rho = -0.005$ ;  $p = 0.953$ ) reinforces this interpretation. Other variables such as sugar intake frequency, fluoride use, caregivers’ educational level, and access to dental care probably play a critical role in shaping children’s caries experience.

### Inferential Analysis

Statistical analysis of DMFT and dmft indices according to sociodemographic variables and plaque index.

This inferential analysis explored how the DMFT and dmft indices vary in relation to key sociodemographic factors, including sex, age, maternal education level, family income and plaque index (PI) (Table 10).

- **Sex:** The Mann-Whitney U test revealed a statistically significant difference in DMFT scores according to sex ( $U = 1813.000$ ;  $p = 0.019$ ), with girls showing higher caries experience in permanent teeth. In contrast, differences in dmft scores were not significant ( $U = 1977.000$ ;  $p =$

**Table 10. Inferential statistical analysis of DMFT and dmft indices according to sociodemographic and clinical variables in children aged 5–12 years (n = 137)**

Analysis	Dependent Variable	Independent Variable	Test Used	Statistic	p-value	Interpretation
Mann–Whitney U Test	DMFT	Sex	U	1813	0.019	Significant difference: girls had higher DMFT than boys.
Mann–Whitney U Test	dmft	Sex	U	1977	0.112	No significant difference in dmft according to sex.
Kruskal–Wallis Test	DMFT	Age group	H	52.588	<0.001	Significant increase in DMFT with age.
Kruskal–Wallis Test	dmft	Age group	H	65.686	<0.001	Significant decrease in dmft with age.
Spearman's Correlation	DMFT	Mother's education level	Rho	0.07	0.418	No significant correlation.
Spearman's Correlation	dmft	Mother's education level	Rho	0.07	0.418	No significant correlation.
Spearman's Correlation	DMFT	Monthly family income	Rho	0.03	0.73	No significant correlation.
Spearman's Correlation	dmft	Monthly family income	Rho	–0.189	0.027	Weak but significant negative correlation: lower income linked to higher dmft.
Spearman's Correlation	DMFT	Plaque Index	Rho	0.148	0.084	No significant correlation.
Spearman's Correlation	dmft	Plaque Index	Rho	–0.005	0.953	No significant correlation.

**Note.** DMFT = decayed, missing and filled permanent teeth; dmft = primary teeth; p-values < 0.05 considered statistically significant. The results indicate associations of sex and age with DMFT, and a weak inverse association between income and dmft.

0.112), suggesting that sex did not play a major role in caries prevalence in primary teeth.

- **Age:** The Kruskal-Wallis test indicated statistically significant differences in both DMFT ( $H = 52.588$ ;  $p < 0.001$ ) and dmft ( $H = 65.686$ ;  $p < 0.001$ ) across age groups. These results reflect the expected pattern: DMFT increases with age, while dmft decreases, consistently with the natural shift from primary to permanent dentition.
- **Maternal education level:** Spearman's correlation showed no statistically significant association between the mother's level of education and either the DMFT ( $Rho = 0.070$ ;  $p = 0.418$ ) or the dmft index ( $Rho = 0.070$ ;  $p = 0.418$ ). These findings suggest that, within this sample, maternal education was not a key determinant of caries status.
- **Family income:** The correlation between family income and DMFT was not significant ( $Rho = 0.030$ ;  $p = 0.730$ ). However, a weak but statistically significant inverse correlation was

observed between family income and dmft ( $Rho = -0.189$ ;  $p = 0.027$ ), indicating that children from lower-income families were more likely to present higher caries prevalence in their primary teeth.

- **Plaque index:** No significant correlation was found between the plaque index and DMFT ( $Rho = 0.148$ ;  $p = 0.084$ ) or between PI and dmft ( $Rho = -0.005$ ;  $p = 0.953$ ). Thus, in this sample, oral hygiene measured by plaque accumulation did not have a direct statistical association with caries prevalence in either dentition.

#### *Summary of Findings*

- **DMFT index** was significantly influenced by **sex** and **age**, with higher values in girls and older children.
- **dmft index** was significantly affected by **age** and showed a weak but meaningful association with **family income**.
- **Maternal education** and **plaque index** were not significantly associated with either the DMFT or dmft caries index.

- The lack of statistical significance in some variables (e.g., DMFT vs. income) may be explained by sample homogeneity or unmeasured confounders.

These results underscore the importance of **targeted interventions** for specific age and socioeconomic groups. Future studies should consider additional determinants such as dietary habits, fluoride exposure, and access to dental services to better understand and reduce caries risk in children.

## DISCUSSION

The results of this study are consistent with global trends described by the World Health Organization, which report a high prevalence of dental caries, particularly in low- and middle-income countries. A substantial burden of caries was identified in both primary and permanent dentition, aligning with WHO estimates indicating that 514 million children are affected by caries in primary teeth and more than 2 billion people have untreated caries in permanent teeth.<sup>3</sup> Factors such as urbanization, limited fluoride exposure, and restricted access to dental care continue to be major contributors to this burden.<sup>3</sup>

### *Socioeconomic factors and caries prevalence*

Our findings are consistent with studies highlighting the influence of parental income and educational level on dental caries prevalence.<sup>4-8</sup> However, no statistically significant associations were observed between these variables and caries indices in the present study, which may be partially explained by the relative homogeneity of the study population. In contrast, international reports, including the 2024 CDC Oral Health Surveillance Report<sup>18</sup> and analyses based on U.S. national data<sup>19</sup>, have documented strong associations between low income, gaps in health insurance coverage, and higher prevalence of untreated dental caries.

### *Regional differences in caries prevalence*

This study observed an increase in caries prevalence with age. Fernández-de-Quezada et al.<sup>20</sup> reported similar patterns among 12-year-old children in El Salvador, while Danke et al.<sup>21</sup> documented declining trends in caries-free prevalence among younger children in Chile. Additionally, high caries rates reported in Syria<sup>11</sup> and Ethiopia<sup>12</sup> support the notion that regional and contextual factors play a significant role in shaping the burden of dental caries across populations.

### *Maternal education and caries prevalence*

Although no statistically significant association between maternal education level and caries prevalence was observed in the present study, previous research has consistently demonstrated its relevance. Studies by Kumar et al.<sup>5</sup>, Kato et al.<sup>6</sup>, Lopes et al.<sup>7</sup>, and Carvalho et al.<sup>8</sup> have shown that higher maternal education levels are associated with a reduced risk of dental caries in children. The absence of such an association in this study may be partly explained by limited variability in educational attainment among participants, suggesting that the influence of maternal education may be less evident in relatively homogeneous populations, despite its recognized importance in other settings.

### *Parental income and caries prevalence*

The pattern observed in this study—namely, a higher prevalence of dental caries among children from lower-income families—is consistent with population-based evidence reported in national oral health surveys and epidemiological research. In Spain, data from the 2020 Oral Health Survey revealed persistent social gradients in caries experience among children, with a higher burden observed in socially disadvantaged groups.<sup>22</sup> Similar patterns have been documented in local studies conducted in low socioeconomic settings.<sup>23</sup> Furthermore, de Lucena et al.<sup>24</sup> and Folleyan et al.<sup>25</sup> demonstrated that structural socioeconomic inequalities significantly influence children's oral health, although the magnitude of these effects may vary across contexts. In Peru, a national study published in 2024 reported that 76.2 % of children aged 3 to 5 years presented dental caries, underscoring the need for public programs targeting vulnerable populations.<sup>13</sup>

Likewise, an ecological analysis conducted across European Union countries found that the burden of early childhood caries was significantly associated with structural socioeconomic indicators, including poverty risk, gross domestic product per capita, urbanization, and sugar consumption.<sup>26</sup> These findings highlight that socioeconomic inequities act as upstream determinants of caries burden, even within highly developed regions.

Complementarily, evidence from Mexico indicates that socioeconomic and contextual factors significantly influence oral health-related behaviors among schoolchildren. A multi-site study conducted

in several Mexican cities reported significant associations between socioeconomic position and toothbrushing frequency in children aged 6 to 12 years, highlighting the role of family environments and broader structural conditions in shaping daily oral hygiene practices.<sup>27</sup> These findings support the concept that socioeconomic inequities operate as upstream determinants of caries risk and reinforce the need for comprehensive interventions that address both individual behaviors and the social context in which they occur.

Similarly, a study conducted in Chile reported a higher prevalence of dental caries among schoolchildren from more disadvantaged social backgrounds, particularly among those attending public schools and with limited access to dental services.<sup>21</sup> This pattern is consistent with the findings of the present study and further underscores the influence of social determinants and institutional settings on children's oral health outcomes.

#### *Oral hygiene and dental caries*

Although the statistical correlations observed in the present study were weak, from a clinical perspective an association between oral hygiene-related behaviors and caries prevalence was evident in the studied population. Similar patterns have been described in pediatric populations, where dental caries remains highly prevalent and is associated with plaque accumulation, the age at initiation of toothbrushing, and inadequate oral hygiene practices.<sup>14,28</sup>

#### *Plaque index and associated factors*

In the present study, higher plaque accumulation was observed among girls. Although sex-related differences in plaque accumulation have been inconsistently reported in the literature, this finding may reflect variations in oral hygiene practices, caregiver supervision, and family-related contextual factors within the study population. From a clinical perspective, these differences could also be influenced by behavioral patterns and household dynamics that shape daily oral hygiene routines during childhood.

#### *Public health implications*

In agreement with the findings of the present study, Borrell and Talih<sup>29</sup> demonstrated the usefulness of equity-sensitive indicators, such as the symmetrized

Theil index, to quantify disparities in dental caries among children and adolescents in the United States. Their work highlights that socioeconomic inequalities constitute a measurable and persistent determinant of oral health, even in high-income countries. This evidence supports the importance of monitoring health inequalities as a basis for guiding targeted public health interventions.

Similarly, Almerich-Torres et al.<sup>30</sup> reported that dental caries in schoolchildren was not significantly associated with body mass index when analyses were stratified by social class, suggesting that socioeconomic conditions may play a more relevant role than nutritional status alone. This finding is consistent with the results of the present study, in which dental caries prevalence was higher among children from economically disadvantaged families, reinforcing the need for integrated, equity-focused public health strategies.

Overall, this study highlights the need for targeted oral health interventions, particularly in settings with limited resources. The importance of improving education, access to care, and preventive strategies is consistent with evidence from multicenter and population-based studies conducted in low- and middle-income countries.<sup>24-26</sup> To be effective, future programs should be designed with careful consideration of the sociodemographic context in which children live.

#### *Limitations and future directions*

This study presents certain limitations that should be acknowledged. First, the use of a non-probabilistic sampling strategy restricts the external validity of the findings and limits their generalizability to other populations. Additionally, the relative socioeconomic homogeneity of the study sample may have reduced the ability to detect statistically significant associations between sociodemographic variables and caries outcomes. The reliance on self-reported information from caregivers also introduces the possibility of information bias.

Future research should prioritize longitudinal study designs to better assess caries progression over time and to establish temporal relationships between sociodemographic factors and oral health outcomes. Moreover, the inclusion of additional variables—such as dietary patterns, fluoride exposure, access to preventive dental services, and community-level determinants—would contribute to a more

comprehensive understanding of caries risk and inform the development of targeted public health interventions.

## CONCLUSIONS

This study confirmed a high prevalence of dental caries among children aged 5–12 years in Victoria, Cabañas, with a higher burden observed among girls and children from lower-income families. Although no statistically significant associations were identified between maternal education or family income and caries prevalence, the observed trends suggest that socioeconomic vulnerability may still influence oral health outcomes in this population. In addition, a clinically relevant association was identified between poor oral hygiene, as measured by the plaque index, and dental caries occurrence, particularly among girls, despite the absence of statistically significant correlations.

From a public health perspective, these findings underscore the importance of implementing early, age- and sex-specific preventive strategies. The results highlight the need for culturally adapted interventions targeting vulnerable sociodemographic

groups, with particular emphasis on oral hygiene education and community-based prevention programs.

The study's limitations include the use of a non-probabilistic sample and the relative sociodemographic homogeneity of the population, which may have limited the detection of statistically significant associations. Consequently, future research should employ longitudinal designs and include more diverse populations to better elucidate the relationships between socioeconomic conditions, oral hygiene practices, and caries progression.

In light of these findings, expanding access to preventive oral health services through school-based programs, mobile dental units, and public health campaigns is essential to reduce caries risk in underserved communities. Policymakers should prioritize the integration of oral health into primary healthcare and educational settings. Furthermore, longitudinal research exploring genetic, environmental, and behavioral determinants is needed to strengthen the evidence base for the development of sustainable, equitable, and effective oral health interventions.

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## CONFLICTS OF INTEREST

The authors declare no potential conflicts of interest regarding the research, authorship, and/or publication of this article.

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