



Original research

## Oral Hygiene in Secondary School Students in Ometepec, Guerrero: A Cross-Sectional Study

Sergio Paredes-Juárez<sup>1</sup>, Gerardo Yael de Jesús-Hilario<sup>2</sup>,  
Jaime García-Leyva<sup>3</sup>, Miguel Flores-Moreno<sup>4</sup>,  
Liliana Sarahí Salas-Franco<sup>5</sup>, Norma Luz Solano-González<sup>6</sup>,  
Sergio Paredes-Solís<sup>7</sup>

1. Centro de Investigación de Enfermedades Tropicales. Universidad Autónoma de Guerrero. México. <https://orcid.org/0000-0002-7334-1354>
2. Instituto de Estudios Superiores del Pacífico Sur. <https://orcid.org/0009-0009-8155-7778>
3. Centro de Investigación de Enfermedades Tropicales. Universidad Autónoma de Guerrero. México. <https://orcid.org/0009-0004-2394-3674>
4. Centro de Investigación de Enfermedades Tropicales. Universidad Autónoma de Guerrero. México. <https://orcid.org/0000-0003-3693-8968>
5. Centro de Investigación de Enfermedades Tropicales. Universidad Autónoma de Guerrero. México. <https://orcid.org/0000-0002-4226-4624>
6. Centro de Investigación de Enfermedades Tropicales. Universidad Autónoma de Guerrero. México. <https://orcid.org/0000-0002-5094-9068>
7. Centro de Investigación de Enfermedades Tropicales. Universidad Autónoma de Guerrero. México. <https://orcid.org/0000-0002-3015-3038>

**Correspondence author:**

Sergio Paredes-Juárez

E-mail: [sparedesj@uagro.mx](mailto:sparedesj@uagro.mx)

**Received:** 20 September 2025

**Accepted:** 8 January 2026

**Cite as:**

Paredes-Juárez S, de Jesús-Hilario GY, García-Leyva J, Flores-Moreno M, Salas-Franco LS, Solano-González NL, et al. Higiene oral en estudiantes de escuela secundaria en Ometepec, Guerrero: estudio transversal [Oral Hygiene in Secondary School Students in Ometepec, Guerrero: A Cross-Sectional Study]. *Rev Odontol Mex.* 2026; 30(1): 12-21. DOI: <https://doi.org/10.22201/fo.1870199xp.2026.30.1.93081>



## ABSTRACT

**Introduction:** Poor oral hygiene leads to a greater accumulation of dental biofilm, which can cause the development of oral diseases and physical, emotional, and psychological imbalances in individuals. Oral health is a key indicator of personal health. **Objective:** To estimate the frequency of poor oral hygiene and associated factors in secondary school students in Ometepepec, Guerrero. **Materials and methods:** A cross-sectional study conducted from October to December 2023 in students. Electronic devices were used to collect information through the ODK COLLECT application, on personal, sociodemographic data, whether they speak an indigenous language, eating habits and a section of questions about oral health practices. A clinical observation form was used to estimate the Simplified Oral Hygiene Index (OHI-S). Data were analysed using CIETmap software. Univariate analysis was performed to obtain simple frequencies; bivariate and multivariate analysis was performed using the Cochran-Mantel-Haenszel test to identify factors associated with OHI-S. Odds ratios and 95% confidence intervals were estimated. **Results:** A total of 774 students participated, 52% (400/774) were women, the rest were men. The 48% (373/774) had a poor OHI-S  $\geq 1.3$ . The factors associated with poor OHI-S were: belonging to the first grade of school (aOR 2.06, 95% CI 1.43-2.98), low socioeconomic level (aOR 1.96, 95% CI 1.43-2.68), frequent consumption of foods with high caloric value (aOR 1.87, 95% CI 1.22-2.86), not having received oral hygiene talks (aOR 1.69 95% CI 1.16-2.45), being male (aOR 1.52 95% CI 1.10-2.10), and having dental crowding (aOR 1.43, 95% CI 1.06-1.95). **Conclusion:** Five out of ten students presented a poor level of oral hygiene OHI-S  $\geq 1.3$ . Oral health promotion actions are required to reduce biofilm and dental calculus levels, in order to improve the OHI-S in students.

**Keywords:** Oral Health, Oral Hygiene Index, Biofilm

## INTRODUCCIÓN

Oral diseases are public health problems due to their high prevalence worldwide, affecting low- and middle-income countries<sup>1</sup> Poor oral hygiene is the main cause of the increase in the number of cases of oral pathologies<sup>2</sup>. The prevalence of oral diseases varies among different age groups and countries around the world. In Mexico, the Epidemiological Surveillance System for Oral Pathologies (*SIVEPAB* by its acronym in Spanish) indicates that five out of ten children and adolescents aged 6 to 19 had biofilm or calculus on their teeth and that only one in four children and adolescents aged 2 to 19 had no dental caries<sup>3</sup>.

The Simplified Oral Hygiene Index (OHI-S) is used to assess oral hygiene. The most commonly used OHI-S cut-off point is 1.3, with lower values indicating better oral hygiene and higher values suggesting poor oral hygiene<sup>4</sup>. The OHI-S is a determining factor in the periodontal condition of young people, and it has also shown significant results according to the frequency of tooth brushing<sup>6</sup>. This index found a significant difference in oral hygiene between young men and women<sup>7</sup>. In addition, it is useful for identifying factors associated with oral hygiene and differences between population groups.

The presence of biofilm or calculus adhering to the teeth is an indicator of poor oral hygiene and is considered a risk factor for oral health<sup>8</sup>. Biofilm is made up of bacteria and glycoproteins that adhere to the surface of the teeth, causing dental disease over time<sup>9</sup>. The main cause of cavities is the accumulation of dental biofilm generated by poor oral hygiene<sup>2</sup>. Dental crowding

is a factor associated with increased dental biofilm accumulation<sup>10</sup>. Misaligned teeth are linked to gingivitis due to poor oral hygiene. Socioeconomic status and lack of access to dental care are also risk factors for developing oral diseases<sup>11</sup>.

Currently, preventive measures for oral health are aimed at caring for teeth from early childhood and even from gestation<sup>12</sup>. The presence of sugars in milk formulas poses a risk to primary teeth<sup>13</sup> while breastfeeding offers protection against caries<sup>14</sup>. Adopting proper oral hygiene habits and reducing the intake of foods high in carbohydrates are important for preventing the development of cavities<sup>15</sup>. These types of foods are preferred by adolescents, who, when ingesting fermentable carbohydrates, generate acidic conditions that lead to the appearance of caries.

Ninety-one per cent of the university student population in Guerrero has cavities, and 16% has deficient oral hygiene. It is essential to know the epidemiological indicators and identify vulnerable groups in the state of Guerrero in order to provide better dental care and carry out more effective interventions. The prevalence and risk factors for dental biofilm in secondary school adolescents in the Costa Chica region of Guerrero are unknown. The objective of the study was to estimate the frequency of poor oral hygiene and associated factors in secondary school students in Ometepec, Guerrero.

## **MATERIALS AND METHODS**

A cross-sectional study was conducted from October to December 2023 with students from the morning and afternoon shifts at the Cuauhtémoc Public Secondary School in the city of Ometepec, Guerrero, Mexico. The study was conducted in accordance with the guidelines established by the ethics committee of the *Centro de Investigación de Enfermedades Tropicales (CIET)* by its acronym in Spanish, Centre for Tropical Disease Research), approved on 28 February 2023, file number 2023-003. The educational institution authorised the study, and parents or guardians provided informed consent. Students responded freely and voluntarily. The decision of any student who refused to participate was respected, as was the decision of any student who chose not to answer a question or complete the form.

A measurement instrument and an oral cavity assessment were used to estimate the Simplified Oral Hygiene Index (OHI-S). A total of 840 officially enrolled students were included. With this study universe, it was possible to detect the effect with a 95% confidence level and an association with an odds ratio of 1.5. The OHI-S was measured for students before breakfast for the morning shift and before lunch for the afternoon shift.

The inclusion criteria were students from the Cuauhtémoc Public Secondary School who were present on the day of the survey, aged 11 to 15 years, who agreed to participate and provided informed consent. Students undergoing orthodontic treatment or with unerupted index teeth were excluded, along with students who did not agree to an oral examination or who did not answer questions relevant to establishing associations.

Five dental students and three dentists were trained to perform oral examinations. The Kappa test was used to standardise the OHI-S measurement, and all had a Kappa greater than 85%. The measurement was performed in accordance with NOM-013-SSA2-2015 for the prevention and control of oral diseases<sup>17</sup>. The equipment used during the oral cavity examination included disposable gloves, tongue depressors, disclosing tablets, water and disposable cups, a hand lamp, surgical drapes, disposable drapes, individual toothbrushes, and toothpaste. The

measurement instrument was a self-administered electronic questionnaire in the *ODK COLLECT* application (Get ODK Inc., San Diego, USA). The form was designed by reviewing instruments used in previous studies<sup>18,19</sup>.

Information was obtained on sociodemographic data such as age, gender, socioeconomic status, and whether the student spoke an indigenous language. Another set of questions related to the parents' level of education and eating habits. To identify factors associated with oral hygiene, questions were asked about oral health practices, toothbrushing technique and frequency, use of dental floss and mouthwash, fluoride application, and number of visits to the dentist per year.

Each student was given a disclosing tablet to dissolve in their mouth so that the tooth surfaces could be stained with dental biofilm. The pigmented areas were recorded on the form. The vestibular surfaces of the right maxillary first molar (16), right maxillary central incisor (11), left maxillary first molar (26), and left mandibular central incisor (31) were observed. The lingual surfaces of the left mandibular first molar (36) and the right mandibular first molar (46) were also observed. In addition, the presence of dental crowding, characterised by misalignment of the teeth due to insufficient space in the jaws, was recorded<sup>10</sup>.

Oral hygiene was assessed using the OHI-S form developed by Greene & Vermillion<sup>20</sup>. Students were considered to have poor oral hygiene if they obtained a score of  $\geq 1.3$  in the sum of the averages of the dental biofilm and dental calculus measurements. Students were considered to have good oral hygiene if they obtained a result  $\leq 1.2$  in the sum of the averages of the dental biofilm and dental calculus measurements. The other variables studied included: gender, age, school grade, whether they spoke an indigenous language, head of household, socioeconomic status, whether they considered themselves to have bad breath, dental crowding, whether they had received oral health talks, frequency of consumption of high-calorie foods, frequency of flossing, frequency of mouthwash use, fluoride application, frequency of tooth brushing, and the last time they had visited the dentist.

The database analysis was performed using the CIETmap software (CIET, New York, USA). It began with univariate analysis to obtain simple frequencies of the study variables. Bivariate analysis was performed to estimate unadjusted associations, using the odds ratio estimate and 95% confidence intervals with the Miettinen-Nurminen method. Only variables that reached significance are included in the table of bivariate analysis results. Multivariate analysis was performed using the Cochran-Mantel-Haenszel test. The saturated model included variables with statistical significance identified in the bivariate analysis. Variables that did not reach 95% confidence were eliminated one by one until the final model was obtained. To assess effect modifiers, the chi-square test of heterogeneity ( $X^2_{Het}$ ) was used, referring to the ' $p$ ' value with Zelen's proposal<sup>22</sup>.

The oral examination was non-invasive and at no time posed a risk to the students' health. Each student was informed of their dental health diagnosis. At the end of the evaluation, each student was given a toothbrush, toothpaste, and mouthwash to remove the dental biofilm present at the time of the oral hygiene index evaluation.

## RESULTS

Of the 840 students enrolled, 774 participated. Of the 66 students who did not participate, 30 were absent, 34 had orthodontic appliances, and two were excluded from the study because

their age was outside the inclusion criteria range. The average age of the participants was 13 years (SD 0.9, range 11 to 15 years). Fifty-two per cent (400/774) of the students were female. Twenty-one per cent (160/774) self-identified as indigenous. Table 1 shows other sociodemographic characteristics of the students.

**Table 1. General and family characteristics of secondary school students from Ometepec, Guerrero, Mexico**

Feature	Category	n=774	%
School Grade	First	304	39
	Second	268	35
	Third	202	26
Speak an indigenous language	Tu'un savi	68	9
	Ñommdaa	8	1
	Náhuatl	6	1
	Me'phaa	48	6
	None	644	83
Head of household	Father	88	12
	Mother	164	21
	Both	412	53
	Neither	110	14
Socioeconomic Level	High (A/B)	140	18
	Upper Medium (C+)	148	19
	Typical Medium (C)	158	21
	Emerging Medium (C-)	142	18
	Typical Low (D+)	72	9
	Extreme Low (D)	100	13
	Very Extreme Low (E)	14	2

Only 14% (108/774) of students reported consuming candy daily, 37% (288/774) occasionally, 44% (338/774) rarely, and 5% (40/774) not consuming. 25% (194/774) of students consume sugary drinks and soft drinks on a daily basis. 14% (106/774) of students consume sweets and chocolates on a daily basis. 79% (610/774) of the students received talks on oral hygiene. 68% (418/610) of them received the talk at a health institution, 11% (86/610) from a private dentist, 10% (76/610) from a family member, and 4% (30/610) from another source.

The 53% (410/774) of the students reported brushing their teeth twice a day; 31% (236/774) three times a day; 14% (108/774) once a day, and 2% (20/774) do not brush them. 75% (582/774) of the students answered that they brush their tongue, 12% (92/774) do not, and 13% (100/774) brush it occasionally. 74% (570/774) of students reported not using dental floss. 60% (460/774) of students reported not using mouthwash. 56% (436/774) of students presented with dental crowding. 42% (326/774) of students visited a dentist in the past year.

### Factors associated with a poor Simplified Oral Hygiene Index (OHI-S) $\geq 1.3$

52% (401/774) of the students had OHI-S  $\leq 1.2$ , the remaining 48% (373/774) had OHI-S  $\geq 1.3$ . The proportion of men with OHI-S  $\geq 1.3$  was 53% (198/374), in women it was 44% (174/400), the difference was significant ( $p < 0.01$ ). Table 2 shows only the factors associated with statistical significance in the bivariate analysis and the estimation of the strength of association to OHI-S.

**Table 2. Bivariate analysis of factors associated with poor OHI-S  $\geq 1.3$  in secondary school students from Ometepec, Guerrero, Mexico**

Factor	Categories	OHI-S $\geq 1.3$		uOR <sup>1</sup>	95%CI <sup>2</sup>
		n=	%		
He/She thinks he/she has bad breath	Yes	72/114	63	2.04	1.36 – 3.07
	No	301/660	46		
Dental crowding	Yes	243/436	56	2.01	1.51 – 2.69
	No	130/338	38		
Socioeconomic Level	Low level	188/328	57	1.89	1.42 - 2.53
	High level	185/446	41		
He/She has received oral health talks	No	99/164	60	1.87	1.32 – 2.65
	Yes	274/610	45		
Consumption of foods with high caloric value	Yes	66/108	61	1.84	1.22 – 2.77
	No	307/666	46		
School Grade	First and second	295/572	51	1.69	1.22 – 2.35
	Third	78/202	39		
Age	11 to 13 years old	285/5608	51	1.48	1.08 – 2.04
	14 to 15 years old	8/214	41		
Gender	Man	198/374	53	1.48	1.11 – 1.96
	Woman	174/400	43		
Speak an indigenous language	Yes	92/160	58	1.60	1.13 - 2.28
	No	281/614	46		
Frequency of dental floss	Low frequency	325/708	46	0.32	0.19 - 0.55
	Frequent use	48/66	73		
Frequency of mouthwash use	Low frequency	68/116	59	0.54	0.34 – 0.86
	Frequent use	86/198	43		
Fluoride application	No	113/200	57	0.67	0.48 – 0.94
	Yes	190/408	47		

<sup>1</sup>uOR= unadjusted odds ratio, <sup>2</sup>95%CI= 95% confidence intervals

The multivariate analysis included variables with a significant association in the bivariate analysis. In the final model, six factors were maintained, the greatest strength of association was found in the factor of attending the first and second grade of school (aOR 2.06, 95% CI 1.43 – 2.98). The remaining factors associated with independent effect are shown in Table 3.

**Table 3. Final model of the multivariate analysis of factors associated with deficient OHI-S  $\geq 1.3$  in secondary school students from Ometepec, Guerrero, Mexico**

Factor	uOR <sup>1</sup>	aOR <sup>2</sup>	X <sup>2</sup> het <sup>3</sup>	95%CI <sup>4</sup>	p <sup>5</sup>
Study in 1st and 2nd grade	1.64	2.06	14.84	1.43 - 2.98	0.99
Present dental crowding	1.98	1.96	17.79	1.43 – 2.68	0.99
Frequent consumption of high-calorie foods	1.68	1.87	8.29	1.22 - 2.86	0.99
He/She has not received any oral hygiene instruction	2.01	1.69	7.63	1.16 – 2.45	0.99
Low socioeconomic level	1.85	1.52	6.60	1.10 - 2.10	0.97
Man	1.42	1.43	5.33	1.06 – 1.95	0.99

<sup>1</sup>uOR= unadjusted odds ratio, <sup>2</sup>aOR= adjusted odds ratio, <sup>3</sup>X<sup>2</sup> het<sup>3</sup>= X<sup>2</sup> for heterogeneity, <sup>4</sup>95%CI= 95% confidence intervals, <sup>5</sup>p = p-value of X<sup>2</sup> for heterogeneity

## DISCUSSION

The frequency and associated factors of poor oral hygiene were estimated in secondary school students in Ometepec, Guerrero. Five out of ten students presented a poor level of oral hygiene (OHI-S  $\geq 1.3$ ). The factors associated with presenting OHI-S  $\geq 1.3$  were: being in the first and second grade of school, low socioeconomic level, frequent consumption of foods with high caloric value, not having received oral hygiene talks, being male and having dental crowding.

A prevalence of OHI-S  $\geq 1.3$  of 48% was found in the students. Similar results have been reported in young people aged 12 to 15, and this is attributed to adolescents' lack of knowledge and information about oral health<sup>23</sup>. However, in our study, the number of students with good OHI-S  $\leq 1.2$  slightly predominates with 52%, a result similar to that reported by another author in adolescents aged 10 to 15 years<sup>24</sup>. We believe that the results found are due to the fact that the students are adolescents, a stage characterised by more interaction with their peers, which influences greater care for their oral hygiene. It is important to educate students and implement actions that motivate them to practice proper oral hygiene.

Studying in first and second grade was associated with poor oral hygiene compared to third grade students. During the analysis, first and second grade students showed a similar percentage of poor oral hygiene. This result could be explained by the fact that students in the initial grades have not yet received sufficient information about oral health, compared to students at the end of the course. Third-grade students could be better informed and attend more oral health campaigns conducted by health institutions and medical students. It is possible that third-grade students have more interaction with students of the opposite sex, which could motivate them to improve their oral hygiene. The transition from childhood to early adolescence can negatively impact oral health<sup>25</sup>. Adolescents may show interest in maintaining good self-esteem and improving their oral health practices in order to improve interpersonal relationships at school or in dating, influencing more frequent brushing and better oral health<sup>26</sup>.

Economic status and lack of access to dental care are risk factors for developing oral diseases<sup>27</sup>. An association was found between low socioeconomic status and the presence of OHI-S  $\geq 1.3$ . Socioeconomic status influences the well-being of adolescents<sup>28</sup>. Therefore, it is necessary to reduce social inequalities by providing resources and universal healthcare services, as well as carrying out effective oral health promotion activities that help to achieve goals in this area, regardless of the socioeconomic level to which they belong.

An association was detected between frequent consumption of high-calorie foods and an oral hygiene level  $\geq 1.3$ . Dietary habits significantly influence the appearance of dental conditions such as caries and periodontal disease<sup>29</sup>. Adolescence is a time of nutritional risk due to the frequent and excessive consumption of high-calorie foods and soft drinks<sup>30</sup>. Infrequent brushing and carbohydrate consumption are associated with the formation of dental biofilm and dental calculus<sup>31</sup>. Diet is an important factor that can have a significant impact on oral health.

An association was detected between not receiving oral hygiene talks and a poor level of oral hygiene  $\geq 1.3$ , as previously reported<sup>32</sup>. The result may be due to the lack of use of public dental services by the population<sup>33</sup>, and that is why access to dental services in children is necessary to improve oral hygiene habits and attitudes during adolescence.

Men have a higher risk of having a poor oral hygiene level  $\geq 1.3$ , while women have better oral hygiene compared to men<sup>34</sup>. Male adolescents use dental health services less frequently, which may be explained by their parents' level of education<sup>35</sup>. The result could also indicate that females are more conscious of their oral hygiene and aesthetics and, therefore, place greater importance on oral hygiene compared to males. It is for the above reasons that the need to

create differentiated oral health promotion strategies for these two groups of adolescents is demonstrated<sup>36</sup>.

This study found an association between dental crowding and an OHI-S score  $\geq 1.3$ , which is similar to another research<sup>37,38</sup>. Dental crowding hinders cleaning by brushing, promotes plaque accumulation, and increases the likelihood of gingivitis. The OHI-S score is lower in young people without dental crowding<sup>37</sup>. On the other hand, interdental space facilitates tooth cleaning and is associated with a lower OHI-S score. Malocclusions in adolescents increase the risk of caries<sup>38</sup>.

The present study, as it is cross-sectional, may have limitations regarding temporality bias. However, we consider that the associated factors do not precede poor oral hygiene, so our results are not affected by this bias. Furthermore, the study was conducted at a public secondary school in the city of Ometepec, Guerrero, and included almost all students. The results are only representative of the study population. A strength of the study is that a student response rate of 92% (774/840) was obtained for the application of the form and evaluation of the OHI-S, so the internal validity is good. Our findings also have limitations in terms of external validity and cannot be generalised to public secondary schools in the region.

## CONCLUSIONS

One out of every two students had a poor oral hygiene indicator (OHI-S  $\geq 1.3$ ). Factors associated with OHI-S  $\geq 1.3$  were being in the first two grades of school, dental crowding, frequent consumption of high-calorie foods, not receiving oral hygiene instruction, and low socioeconomic status. According to these results, dental health interventions for these students should focus on talks about oral hygiene and reducing the consumption of high-calorie foods in the early years of secondary education.

## BIBLIOGRAPHIC REFERENCES

1. Organización Mundial de la Salud. *Informe sobre la situación mundial de la salud bucodental: hacia la cobertura sanitaria universal para la salud bucodental de aquí a 2030: resumen ejecutivo*. Disponible en: <https://www.who.int/es/publications/i/item/9789240061569>
2. Franco-Giraldo A. La salud bucal, entre la salud sistémica y la salud pública. *Univ. Salud*. 2021; 23(3): 291-300. DOI: <https://doi.org/10.22267/rus.212303.243>
3. Secretaría de Salud. *Resultados del Sistema de Vigilancia Epidemiológica de Patologías Bucales SIVE-PAB 2023*. Disponible en: <https://www.gob.mx/salud/documentos/informes-sivepab-2023>
4. Ojahanon PI, Akionbare O, Umoh AO. The oral hygiene status of institution dwelling orphans in Benin City, Nigeria. *Niger. J. Clin. Pract.* 2013; 1(16): 41-44. DOI: <https://doi.org/10.4103/1119-3077.106732>
5. Al-Hassan SI, Kazlak MM, Kateeb E. Prevalence and socio-behavioural determinants of periodontal disease among adolescents in the northern West bank: a cross-sectional study. *BMC Oral Health*. 2025; 25(1): 1666. DOI: <https://doi.org/10.1186/s12903-025-07083-y>
6. Kumari A, Marya C, Oberoi SS, Nagpal R, Bidyasagar SC, Taneja P. Oral hygiene status and gingival status of the 12- to 15-year-old orphanage children residing in Delhi state: a cross-sectional study. *Int J Clin Pediatr Dent*. 2021; 14(4): 482-487. DOI: <https://doi.org/10.5005/jp-journals-10005-1989>
7. Shahin S, Gaffar BO, Nazir MA, AlHussain I, Alghamdi W, Alhumaid J. Predictors of dental caries among inmates in the Eastern Province of Saudi Arabia: a cross-sectional study. *BMC Oral Health*. 2025; 25(1): 1527. DOI: <https://doi.org/10.1186/s12903-025-06884-5>

8. Secretaría de Salud. *Resultados del Sistema de Vigilancia Epidemiológica de Patologías Bucales SIVE-PAB 2021*. Disponible en: <https://www.gob.mx/salud/documentos/informes-sivepab-2021>
9. Morón M. Los biofilms orales y sus consecuencias en la caries dental y enfermedad periodontal. *Cienc Innov Salud*. 2021. e134: 269-277 DOI: <https://doi.org/10.17081/innosa.134>
10. Sánchez-Pérez L, Sáenz-Martínez L, Alfaro-Moctezuma P, Osorno-Escareño C. Comportamiento del apiñamiento, gingivitis, higiene oral, caries, flujo salival y bacterias en escolares de 8 y 10 años. *Rev ADM*. 2013; 70(2): 91-97. Disponible en: <https://www.medigraphic.com/cgi-bin/new/resumen.cgi?IDARTICULO=41184>
11. Baldani MH, Antunes JLF. Inequalities in access and utilization of dental services: a cross-sectional study in an area covered by the Family Health Strategy. *Cad Saúde Pública*. 2011; 27 (supl.2): s272-s283. DOI: <https://doi.org/10.1590/s0102-311x2011001400014>
12. Han SY, Chang CL, Wang YL, Wang CS, Lee WJ, Vo TTT, et al. A narrative review on advancing pediatric oral health: comprehensive strategies for the prevention and management of dental challenges in children. *Children*. 2025; 12(3): 286. DOI: <https://doi.org/10.3390/children12030286>
13. Colombo S, Paglia L. Childhood obesity, sugar, and early childhood caries: the sweet trap. *Eur J Paediatr Dent*. 2024; 25(4): 254-255. DOI: <https://doi.org/10.23804/ejpd.2024.25.04.01>
14. Shrestha SK, Arora A, Manohar N, Ekanayake K, Foster J. Association of breastfeeding and early childhood caries: a systematic review and meta-analysis. *Nutrients*. 2024; 16(9): 1355. DOI: <https://doi.org/10.3390/nu16091355>
15. Ballesteros-Ramírez S, Manzano-Saldarriaga S, Emilsen-Pabón G. Factores de riesgo de la caries de la infancia temprana relacionados a hábitos de crianza en Latinoamérica. *Rev. Odontol. Basadrina*. 2022; 6(1): 33-40. DOI: <https://doi.org/10.33326/26644649.2022.6.1.1269>
16. Romero-Castro NS, Paredes-Solís S, Legorreta-Soberanis J, Reyes-Fernández S, Flores-Moreno M, Andersson N. Prevalencia de gingivitis y factores asociados en estudiantes de la Universidad Autónoma de Guerrero, México. *Rev Cubana Estomatol*. 2016; 53(2): 9-16. Disponible en: <https://www.medigraphic.com/pdfs/revcubest/esc-2016/esc162c.pdf>
17. Secretaría de Salud. Norma Oficial Mexicana NOM-013-SSA2-2015. Para la prevención y control de enfermedades bucales. Secretaría de Salud. 2016. Disponible en: <http://www.cenaprece.salud.gob.mx/programas/interior/saludbucal/descargas/pdf/NORMA013.pdf>
18. Reyna-Rosales K, Paredes-Solís S, Flores-Moreno M, Rios-Rivera CE, Paredes-Juárez S, Andersson N. Caries en primeros molares permanentes y factores asociados a ésta en escolares de Acapulco. *Rev Cubana Estomatol*. 2021; 58(2). Disponible en: [https://www.researchgate.net/publication/352283184\\_Caries\\_en\\_primeros\\_molares\\_permanentes\\_y\\_factores\\_asociados\\_a\\_esta\\_en\\_escolares\\_de\\_Acapulco](https://www.researchgate.net/publication/352283184_Caries_en_primeros_molares_permanentes_y_factores_asociados_a_esta_en_escolares_de_Acapulco)
19. Vazquez-Soto RY, Flores-Moreno M, García-Verónica A, Paredes-Juárez S, Rios-Rivera CE, Paredes-Solís S et al. Factores asociados a caries e IHOS DI-S deficiente en preescolares de Acapulco, México. *Rev Odont Mex*. 2023; 27(3): 3-14. DOI: <https://doi.org/10.22201/fo.1870199xp.2023.27.3.84224>
20. Greene JG, Vermillion JR. The simplified oral hygiene index. *J Am Dent Assoc*. 1964; 68(1), 7-13. DOI: <https://doi.org/10.14219/jada.archive.1964.0034>
21. Mantel N, Haenszel W. Statistical aspects of the analysis of data from retrospective studies of disease. *J Natl Cancer Inst*. 1959; 22(4): 719-748. DOI: <https://doi.org/10.1093/jnci/22.4.719>
22. Zelen M. The analysis of several 2x2 contingency tables. *Biometrika* 1971; 58(1): 129-137. DOI: <https://doi.org/10.1093/biomet/58.1.129>
23. Estévez-Arbolay M, Pérez-García LM, Morgado-Marrero DE, Jiménez-Marín O, Carmona-Pérez SM. La educación de adolescentes en higiene bucal mediada por las Tecnologías de la Información y las comunicaciones. *Gac Méd Espirit*. 2021; 23(3): 113-122. Disponible en: <https://revgmespirituana.sld.cu/index.php/gme/article/view/2341/2361>

24. Jáuregui-Lucero JM, Vásquez-Palacios AC, Sacoto-Figueroa FK. Oral hygiene index in 12-year-old schoolchildren of the Checa parish in Canton Cuenca, Province of Azuay, Ecuador, 2016. *Odontoes-tomatología*. 2019; 21(34): 27-32. DOI: <https://doi.org/10.22592/ode2019n34a4>
25. Cerón-Bastidas XA. Relación de calidad de vida y salud oral en la población adolescente. *CES Odont*. 2018; 31(1): 38-46. DOI: <https://doi.org/10.21615/cesodon.31.1.4>
26. Pazos CTC, Austregésilo SC, de Goes PSA. Autoestima e comportamentos de saúde bucal em adolescen-tes. *Cien Saude Colet*. 2019; 24: 4083-4092. DOI: <https://doi.org/10.1590/1413-812320182411.02492018>
27. Cançado-Figueiredo M, Wisniewski F, Correa-Furtado T, Vaz-Silva J, Pereira-Silvestre EM, Concha-Melgar X. Oral health and socioeconomic indicators of adolescents living in a region of extreme poverty. *Rev Fac Odontol Univ Antioq*. 2018; 29(2): 311-328. DOI: <https://doi.org/10.17533/udea.rfo.v29n2a4>
28. Tuchtenhagen S, Ortiz FR, Ardenghi TM, Antunes JLF. Oral health and happiness in adolescents: a cohort study. *Community Dent Oral Epidemiol*. 2021; 49(2): 176-185. DOI: <https://doi.org/10.1111/cdoe.12589>
29. Tudoroniú C, Popa M, Iacob SM, Pop AL, Násui, BA. Correlation of caries prevalence, oral health be-havior and sweets nutritional habits among 10 to 19-year-old Cluj-Napoca Romanian adolescents. *Int. J. Environ. Res. Public Health* 2020; 17(18): 6923. DOI: <https://doi.org/10.3390/ijerph17186923>
30. Alcaina-Lorente A, Saura-López V, Pérez-Pardo A, Guzmán-Pina S, Cortés-Lillo O. Salud oral: influen-cia de los estilos de vida en adolescentes. *Rev Pediatr Aten Primaria*. 2020; 22: 251-261. Disponible en: <https://www.redalyc.org/journal/3666/366669639003/>
31. Zhang M, Lan J, Zhang T, Sun W, Liu P, Wang Z. Oral health and caries/gingivitis-associated factors of adolescents aged 12–15 in Shandong province, China: a cross-sectional oral health survey. *BMC Oral Health*. 2021; 21(1): 288. DOI: <https://doi.org/10.1186/s12903-021-01640-x>
32. Ávalos-Márquez JC, Huilca-Castillo N, Picasso-Pozo MA, Omori-Mitumori E, Gallardo-Schultz A. Nivel de conocimientos en salud oral relacionado con la calidad de la higiene oral en escolares de una población peruana. *KIRU*. 2015; 12(1): 61-65. Disponible en: <https://pesquisa.bvsalud.org/portal/resource/pt/lil-786671>
33. Onyejaka NK, Folayan MO, Folaranmi, N. Barriers and facilitators of dental service utilization by children aged 8 to 11 years in Enugu State, Nigeria. *BMC Health Serv. Res*. 2016; 16(1): 93. DOI: <https://doi.org/10.1186/s12913-016-1341-6>
34. Oyedele TA, Folayan MO, Chukwumah NM, Onyejaka NK. Social predictors of oral hygiene status in school children from suburban Nigeria. *Braz. Oral. Res*. 2019; 33: e022. DOI: <https://doi.org/10.1590/1807-3107bor-2019.vol33.0022>
35. Goswami S, Tseveenjav B, Kaila M. Non-utilization of oral health services and associated factors among children and adolescents: an integrative review. *Acta Odontol Scand*. 2023; 81(2): 105-118. DOI: <https://doi.org/10.1080/00016357.2022.2095020>
36. Soares-Luís HP, Assunção VA, Soares-Luís LF. Oral health habits, attitudes and behaviors of Portu-guese adolescents. *Int J Adolesc Med Health*. 2016; 28(1): 39-43. DOI: <https://doi.org/10.1515/ijamh-2014-0069>
37. Salim NA, Alamoush RA, Al-Abdallah MM, Al-Asmar AA, Satterthwaite JD. Relationship between dental caries, oral hygiene and malocclusion among Syrian refugee children and adolescents: a cross-sectional study. *BMC Oral Health*. 2021; 21(1): 629. DOI: <https://doi.org/10.1186/s12903-021-01993-3>
38. Singh A, Purohit B. Is malocclusion associated with dental caries among children and adolescents in the permanent dentition? A systematic review. *Community Dent Health*. 2021; 38(3): 172-177. DOI: [https://doi.org/10.1922/CDH\\_00340Singh06](https://doi.org/10.1922/CDH_00340Singh06)