

# Knowledge, Attitudes, and Practices on Oral Health Prevention Associated with Sociodemographic Factors of Adolescent Students from a Peruvian-Swiss Educational Institution

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## Abstract

**Aim:** Adolescents experience a period in their lives when major variations in their development occur, in addition to establishing practices and attitudes that will play an important role in their general health care, which will have an impact on their well-being and life quality in the future. Therefore, the aim of this study was to determine how knowledge, attitudes, and practices on oral health prevention are related to sociodemographic factors of adolescent students in a Peruvian-Swiss Educational Institution. **Materials and Methods:** This observational and cross-sectional study in 154 adolescent students obtained by stratified random sampling was carried out during November to December 2021. A questionnaire validated by the Peruvian Association of Preventive and Social Dentistry (APOPS) was employed. For statistical analysis a Pearson’s chi-square test was applied, in addition to a logit model using odds ratio (OR) to evaluate knowledge, attitudes and practices on oral health prevention with the variables age, sex, academic level, family structure, educational level of parent or guardian, and nationality. A significance level of  $P < 0.05$  was considered. **Results:** Of all the students, 44.81% presented insufficient knowledge, whereas 26.62% showed an unfavorable attitude and 1.95% reported incorrect practices. On the contrary, knowledge about oral health prevention was significantly associated with age group ( $P = 0.002$ ), academic level ( $P = 0.004$ ) and educational level of parent or guardian ( $P = 0.005$ ). Attitude toward oral health prevention was significantly associated with age group ( $P = 0.045$ ) and academic level ( $P = 0.044$ ). Oral health prevention practice was not significantly associated with any factor. Finally, students whose parent or guardian had non-university higher education were significantly 67% less likely (OR = 0.33; confidence interval [CI]: 0.15–0.73) to have poor knowledge of oral health prevention than those whose parent or guardian had university higher education ( $P = 0.007$ ). **Conclusion:** Knowledge and attitudes of the students about oral health prevention were associated with age and academic level. In addition, the educational level of parent or guardian was associated with knowledge, such that those students whose parent or guardian had non-university higher education were 67% less likely to have poor knowledge of oral health prevention than those whose parent or guardian had university higher education. Finally, the practice of oral health prevention was not associated with any of the sociodemographic factors considered in this study.

**Keywords:** Adolescent Students, Attitudes, Dentistry, Knowledge, Oral Health, Practice, Prevention, Sociodemographic Factors

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## INTRODUCTION

Oral health is a key indicator of overall well-being and life quality.<sup>[1]</sup> In contrast, oral diseases affect a limited area of the human body but their consequences impact the systemic balance of the organism.<sup>[2-4]</sup> Oral diseases are chronic and progressive in nature, and the most prevalent are dental

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caries, periodontal disease, and oral cancer.<sup>[1-5]</sup> They also constitute a major burden on the health care sector in many countries and affect people throughout their lives, causing pain, discomfort, disfigurement, and even death.<sup>[6]</sup>

Oral diseases affect approximately 3.5 billion people worldwide, with caries in permanent teeth being the most frequent disorder.<sup>[6-8]</sup> In addition, it has been reported that dental caries is the fourth most costly oral pathology to treat and affects between 60% and 90% of school children, constituting one of the most common chronic diseases today.<sup>[9]</sup> In Peru, dental caries is the most prevalent disease among the child population and from 5 years of age onwards, oral cavity problems are the main cause of consultation in Ministry of Health centers, since the last epidemiological study reported a dental caries prevalence of 90.4% in mixed dentition and 60.65% in permanent dentition, showing that dental caries continues to be a public health problem.<sup>[10]</sup>

Most current oral health systems have failed to reduce the burden of oral diseases and the inequities associated with them.<sup>[11]</sup> Most countries rely on treatment-centered models and do not sufficiently promote the prevention of risk factors.<sup>[12,13]</sup> These factors can be prevented or modified from childhood by educating and developing healthy behaviors every day, turning them into habits, forming a culture of self-care, and improving not only knowledge but attitude, which will be useful for life.<sup>[6]</sup> Therefore, efforts to integrate oral health and primary health care should incorporate interventions at multiple levels to improve access and quality of services, creating health care teams that provide patient-centered care as well as community settings that can reduce gaps in access to oral health care.<sup>[6,14]</sup>

Adolescents are one of the highest risk groups for oral disorders, as they undergo a series of changes, including hormonal changes, changes in dentition, jaw and dental structures growth, malocclusions, poor eating habits, and sometimes the consumption of harmful products such as alcohol and tobacco, piercings in the oral cavity, and poor oral hygiene practices. For all these reasons, dental care becomes a challenge.<sup>[14-16]</sup> Oral health problems directly or indirectly have a negative impact on life quality in adolescents, as they cause oral disorders, eating, chewing, smiling, and communication problems, which can limit their daily activities at school.<sup>[17]</sup>

In this context, the school becomes a strategic place for health promotion in students, reinforcing basic health measures, promoting a health culture through educational processes that help to obtain and put into practice the knowledge, skills, and attitudes necessary to protect oral health.<sup>[18-22]</sup>

In addition, it is important to evaluate sociodemographic factors such as gender, age, academic level, family

structure, educational level of parent or guardian, and nationality,<sup>[6,8,23]</sup> since several studies have found an association between these factors and knowledge, attitudes, and practices on oral health prevention.<sup>[24-31]</sup>

Therefore, the aim of this study was to determine how knowledge, attitudes, and practices on oral health prevention are related to the sociodemographic factors of adolescent students from a Peruvian-Swiss Educational Institution. On the basis of previous studies,<sup>[25-31]</sup> the null hypothesis was that knowledge, attitudes and practices on oral health prevention are not significantly associated with sociodemographic factors of adolescent students in a Peruvian-Swiss educational institution. This manuscript was written according to the STrengthening the Reporting of OBservational studies in Epidemiology (STROBE) guidelines for observational studies.<sup>[32]</sup>

## MATERIALS AND METHODS

### Type of study and delimitation

This analytical, observational, and cross-sectional study was conducted among adolescent students of a Peruvian-Swiss educational institution in the Peruvian capital between November and December 2021. This study was approved by the Institutional Research Ethics Committee of the Universidad Privada San Juan Bautista with resolution No. 1251-2021-CIEI-UPSJB dated November 3, 2021. All participants understood and signed an informed consent.

### Population and participants selection

The total population consisted of 256 high-school students of the Private Educational Institution Colegio Pestalozzi, of which 47 were first-year students, 53 were second-year students, 52 were third-year students, 48 were fourth-year students and 56 were fifth-year students. The sample size was 154 participants ( $n = 154$ ), being calculated with the statistical program Epidat 4.2 using a formula to estimate a proportion with finite population, considering a significance level  $\alpha = 0.05$  and estimation error of 5%, and an expected proportion  $P = 50\%$ . The sample selection technique was stratified random for each academic year, being the distribution 28 students in first year, 32 students in second year, 31 students in third year, 29 students in fourth year and finally 34 students in fifth year, taking into consideration the eligibility criteria.

### Inclusion criteria

- Students enrolled during 2021.
- High-school students whose parents or guardians have signed the informed consent form.
- High-school students who have signed the informed consent form to participate in the study on a voluntary basis.
- High-school students between 12 and 17 years of age.

- Students from first to fifth grade of high-school education.
- Students of Peruvian or Swiss nationality.
- Students with parents of Swiss nationality.
- Students with parents of Peruvian nationality.

### Exclusion criteria

- Students with irregular class attendance.
- Students who did not complete the questionnaire.

### Variables

Dependent variables considered in this study were knowledge (insufficient/sufficient), attitudes (unfavorable/favorable) and practices (incorrect/correct) on oral health prevention.<sup>[33]</sup>

Independent variables were age group (12 to 14 years/15 to 17 years) and sex (female/male).<sup>[25,26,28,30]</sup>

Intervening variables were academic level (first/second/third/fourth/fifth year of high school), family structure (both parents/only with mother), educational level of parent or guardian (non-university higher education/university higher education) and nationality (Peruvian/Swiss).<sup>[25,27,31]</sup>

### Instrument application

To measure knowledge, attitudes and practices on oral health prevention, a questionnaire validated by the Peruvian Association of Preventive and Social Dentistry (APOPS) was used, called: “Knowledge, Attitudes and Practices of Oral Health Prevention in Different Life Stages,”<sup>[33]</sup> This questionnaire consisted of 24 items, distributed in three dimensions:

1. Knowledge about oral health prevention, consisting of 9 items whose evaluation criteria were: knows (1 point), does not know (0 points). It was considered as “Sufficient Knowledge” if the participant reached 5 or more points.
2. Attitudes on oral health prevention, consisting of 7 items measured through a Likert scale: Agree (3 points), Indifferent (2 points), Disagree (1 point). From 18 to 21 points were considered as “Favorable Attitudes”.
3. Practices on oral health prevention, consisting of 8 items whose evaluation criteria were: correct answer (1 point) and incorrect answer (0 points). From 4 to more points were considered as “Correct Practices”.

To assess instrument reliability, Cronbach’s alpha was applied in a previous pilot study with 30 participants and a significantly acceptable value was obtained for knowledge 0.82; (95% CI: 0.65–0.97), attitudes 0.76; (95% CI: 0.63–0.88) and practices 0.84; (95% CI: 0.73–0.94). In addition, the questionnaire was taken at two points in time within a 10-day interval to evaluate the response agreement analysis, altering the order of questions to avoid recall bias (test-retest).<sup>[34]</sup> Agreement according to

Cohen’s Kappa index was very good for knowledge ( $k = 0.81$ ; 95% CI: 0.72–0.89), attitudes ( $k = 0.88$ ; 95% CI: 0.82–0.93) and practices ( $k = 0.87$ ; 95% CI: 0.83–0.91).

### Procedure

The questionnaire was elaborated in the virtual platform Google Classroom® and was distributed synchronously to each student with the help of the tutor teacher, only considering the participants and parents/guardians who agreed to participate, confirming it by e-mail. With the permission of the school principal and the teacher on duty, the link to access the questionnaire was shared in the first 15 minutes of class through the Canvas® Learning platform. The teacher in charge at the time of survey was withdrawn from the virtual classroom, leaving supervision in charge of the main researcher to dispel any doubts regarding the development of questionnaire. The instructions for developing the questionnaire were at its beginning. However, everyone was free to refuse the assessment if they did not wish to complete it during its course. Only the researchers had access to data and no personal details such as telephone number, name and address were required. Only one submission was considered for each student. In addition, after the entire investigation was completed, the results were sent to those who requested them to the principal investigator via e-mail.

### Statistical analysis

The data were imported by Statistical Package for the Social Sciences (SPSS) version 28.0, using descriptive statistics to obtain the absolute and relative frequencies of categorical variables. For bivariate analysis, Pearson’s chi-square test with Yates correction for expected values less than 5 was applied. Risk factors were examined using a logistic regression model (logit model) with odds ratio (OR). All analyses were performed, considering a significance level of 5% ( $P < 0.05$ ).

### Ethical aspects

All participants gave informed assent and their parents or guardians gave informed consent. In addition, this study respected the bioethical principles for medical research on human subjects of the Declaration of Helsinki<sup>[35]</sup> (related to confidentiality, freedom, respect, and nonmaleficence) by storing the data in a portable device with a password to which only the researchers had access. This study was approved by the Ethics Committee of the Universidad Privada San Juan Bautista with resolution No. 1251-2021-CIEI-UPSJB.

### RESULTS

Of the total number of respondents, it was observed that the age groups 12 to 14 years and 15 to 17 years presented an equal distribution with 77 students for each group.

Female sex was the most frequent with 56.49% and the proportion of participation according to academic year was balanced between 18% and 22% of the total. In addition, it was observed that 74.68% of the students lived with both parents or guardians and 76.62% of the students had parents or guardians with non-university higher education. Finally, 83.77% of the students surveyed were Peruvian and 16.23% were Swiss [Table 1].

Statistically significant associations were obtained between the student's age group and K1 (Mention five foods that cause teeth damage), K3 (What elements

should be used to clean the mouth?) ( $P = 0.001$  and  $P = 0.005$ , respectively). Regarding the academic level of the students, there was a significant association with K1 ( $P < 0.001$ ), K3 ( $P = 0.025$ ), K5 (How often should one go to the dentist?) ( $P = 0.037$ ), K6 (At what age should one go to the dentist for the first time?) ( $P < 0.001$ ), and K8 (Mention a food containing fluoride) ( $P < 0.001$ ). Finally, the degree of education of the students' parent or guardian was significantly associated with K1 ( $P < 0.001$ ), K3 ( $P = 0.001$ ), K4 (What parts of the mouth should be cleaned daily?) ( $P = 0.031$ ), K5 ( $P = 0.020$ ), K6 ( $P = 0.034$ ) and K8 ( $P < 0.001$ ). [Table 2].

**Table 1: Sociodemographic characteristics of high-school students in a Peruvian-Swiss Educational Institution**

Variable	Category	Frequency	Percentage
Age group	12 to 14 years old	77	50.00
	15 to 17 years old	77	50.00
Sex	Female	87	56.49
	Male	67	43.51
Academic level	First year of high school	28	18.18
	Second year of high school	32	20.78
	Third year of high school	31	20.13
	Fourth year of high school	29	18.83
	Fifth year of high school	34	22.08
Family structure	Both parents	115	74.68
	Only with mother	39	25.32
Educational level of parent or guardian	Non-university higher education	39	25.32
	University higher education	115	74.67
Nationality	Peruvian	129	83.77
	Swiss	25	16.23

**Table 2: Knowledge of oral health prevention associated with sociodemographic factors**

Knowledge	Does not know	Knows	Age group	Sex	Academic level	Family structure	Educational level of parent or guardian	Nationality
	f (%)	f (%)	p	p	p	p	p	p
K1. Mention 5 foods that cause teeth damage.	82 (53.25)	72 (46.75)	0.001*	0.159	<0.001*	0.512	<0.001*	0.763
K2. What is the importance of tooth brushing?	6 (3.90)	148 (96.10)	0.677	1.000	0.319	0.985	0.329	1.000
K3. What elements should be used to clean the mouth?	59 (38.31)	95 (61.69)	0.005*	0.265	0.025*	0.459	0.001*	0.523
K4. What parts of the mouth should be cleaned daily?	30 (19.48)	124 (80.52)	0.684	0.666	0.564	0.261	0.031*	1.000
K5. How often should one go to the dentist?	68 (44.15)	86 (55.85)	0.516	0.604	0.037*	0.507	0.020*	0.648
K6. At what age should one go to the dentist for the first time?	101 (65.58)	53 (34.42)	0.127	0.747	<0.001*	0.345	0.034*	0.521
K7. What is the action of fluoride?	69 (44.80)	85 (55.20)	0.145	0.995	0.066	0.860	0.189	0.930
K8. Mention a food containing fluoride.	105 (68.18)	49 (31.82)	0.226	0.557	<0.001*	0.871	<0.001*	0.624
K9. Name a commercial product containing fluoride.	127 (82.46)	27 (17.54)	0.525	0.069	0.084	0.371	0.371	0.612

f = absolute frequency

\*Significant association ( $P < 0.05$ ) based on Pearson's Chi-square with Yates' correction for values below 5

Statistically significant associations were obtained between the students' age group and A4 (Toothpaste should be chosen only on a price basis). With respect to the students' academic level, there was a significant association with A3 (The dentist should be visited only when a tooth hurts), A4, A6 (Sweets should be replaced by fruits at meals), and A7 (People care about their oral health visit the dentist at least once a year) ( $P = 0.003$ ;  $P = 0.001$ ;  $P = 0.019$  and  $P = 0.001$ , respectively). In addition, the educational level of parent or guardian was significantly associated with A4 ( $P = 0.001$ ). Finally, the nationality of the students was significantly associated with A5 (To buy salt we should only look at the price) ( $P = 0.016$ ) [Table 3].

Statistically significant associations were obtained between the students' age group and P5 (When was your last visit to the dentist?) ( $P = 0.029$ ). Regarding the students' academic level, there was a significant association with P1 (What food did you eat yesterday between main meals?), P2 (What do you use to clean your mouth?), P6 (Do you use salt containing fluoride?) and P8 (With what criteria do you choose your toothpaste?) ( $P = 0.001$ ;  $P < 0.001$ ;  $P = 0.017$  and  $P = 0.010$ , respectively). In addition, the educational level of parent or guardian was significantly associated with P1 ( $P < 0.001$ ), P2 ( $P < 0.001$ ) and P6 ( $P = 0.024$ ). Finally, it could be observed that 100% of the students surveyed always use toothpaste when brushing their teeth [Table 4].

Of the 154 students surveyed, 44.81% (CI: 37.14%–52.86%) presented insufficient knowledge, while 26.62% (CI: 19.99%–34.01%) evidenced unfavorable attitude and finally 1.95% (CI: 0.00%–4.21%) reported incorrect practices. [Figure 1].

On the contrary, it was observed that knowledge about oral health prevention was significantly associated with age group ( $P = 0.002$ ), academic level ( $P = 0.004$ ) and the educational level of parent or guardian ( $P = 0.005$ ). In addition, attitude toward oral health prevention was significantly associated with age group ( $P = 0.045$ ) and academic level ( $P = 0.044$ ). Finally, the practice of oral health prevention was not significantly associated with any sociodemographic factor considered in this study. [Table 5].

When assessing knowledge, attitudes, and practices of the 154 high-school students of a Peruvian-Swiss Educational Institution, it could be observed that there was no significant correlation between them ( $P > 0.05$ ). [Table 6].

Knowledge and attitude toward oral health prevention was included in the multivariate logistic regression analysis (*logit* model) as a dependent variable, since previously oral health practice and prevention did not show any significant association with any sociodemographic factor analyzed [Table 5]. Consequently, from the analysis under an explanatory model, it could be observed that no sociodemographic factor included in this study was considered as an influential factor in the attitude on oral health in high-school students of a Peruvian-Swiss Educational Institution. Regarding educational level of parent or guardian, in the crude model it was shown to be an influential factor in the students' knowledge of oral health prevention. Thus, in the adjusted model it was observed that students whose parent or guardian had non-university higher education were significantly 67% less likely (OR = 0.33; CI: 0.15 - 0.73) to have deficient knowledge on oral health prevention than those whose

**Table 3: Attitudes on oral health prevention associated with sociodemographic factors**

Attitudes	Disagree	Indifferent	Agree	Age group	Sex	Academic level	Family structure	Educational level of parent or guardian	Nationality
	f (%)	f (%)	f (%)	p	p	p	p	p	p
A1. To avoid tooth decay, it is important to reduce sugar consumption.	1 (0.65)	37 (24.03)	116 (75.32)	0.370	0.648	0.560	0.213	0.828	0.524
A2. Toothbrush can be shared with family members.	24 (15.58)	9 (5.84)	121 (78.57)	0.225	0.354	0.148	0.512	0.737	0.365
A3. The dentist should be visited only when a tooth hurts.	1 (0.65)	12 (7.79)	141 (91.56)	0.124	0.517	0.003*	0.682	0.645	0.667
A4. Toothpaste should be chosen only on a price basis.	0 (0.00)	34 (22.08)	120 (77.92)	0.007*	0.387	0.001*	0.862	0.001*	0.784
A5. To buy salt we should only look at the price.	13 (8.44)	81 (52.60)	60 (38.96)	0.197	0.725	0.097	0.295	0.235	0.016*
A6. Sweets should be replaced by fruits at meals.	5 (3.25)	78 (50.65)	71 (46.10)	0.332	0.292	0.019*	0.068	0.022	0.943
A7. People care about their oral health visit the dentist at least once a year	24 (15.58)	72 (46.75)	58 (37.67)	0.895	0.551	0.001*	0.419	0.117	0.368

f = absolute frequency

\*Significant association ( $P < 0.05$ ) based on Pearson's Chi-square with Yates' correction for values below 5

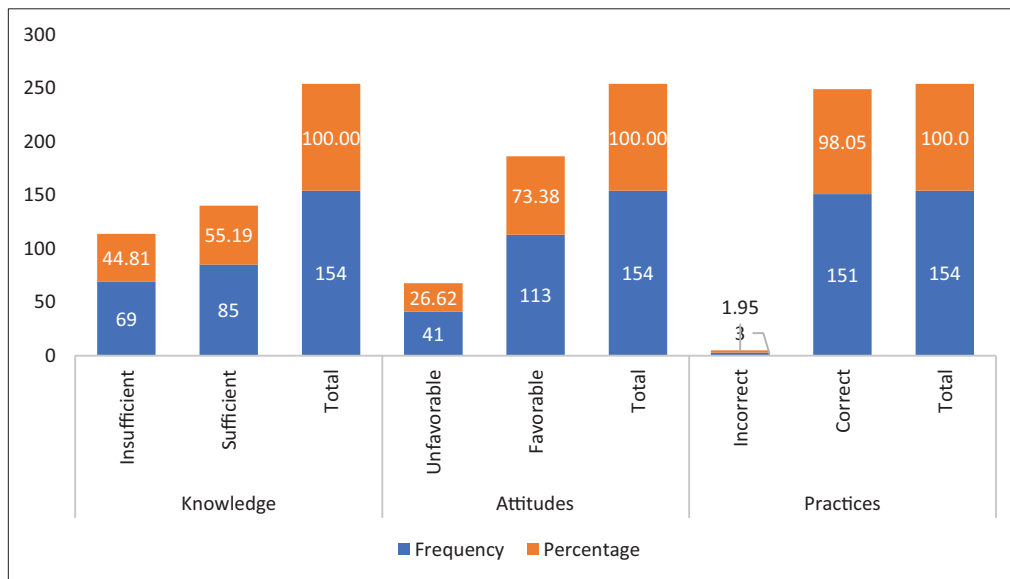
**Table 4: Oral health prevention practices associated with sociodemographic factors**

Practices	Incorrect	Correct	Age group	Sex	Academic level	Family structure	Educational level of parent or guardian	Nationality
	f (%)	f (%)	p	p	p	p	p	p
P1. What food did you eat yesterday between main meals?	90 (58.44)	64 (41.56)	0.327	0.781	0.001*	0.228	<0.001*	0.863
P2. What do you use to clean your mouth?	59 (38.31)	95 (61.69)	0.068	0.912	<0.001*	0.244	<0.001*	0.276
P3. How many times a day do you brush your teeth?	1 (0.65)	153 (99.35)	1.000	1.000	0.428	1.000	1.000	1.000
P4. At what time of the day do you brush your teeth?	9 (5.84)	145 (94.16)	1.000	0.686	0.191	0.862	0.538	0.371
P5. When was your last visit to the dentist?	11 (7.14)	143 (92.86)	0.029*	0.857	0.335	1.000	0.355	0.808
P6. Do you use salt containing fluoride	95 (61.69)	59 (38.31)	0.246	0.823	0.017*	0.687	0.024*	0.795
P7. Do you always use toothpaste to brush your teeth? <sup>a</sup>	0 (0.00)	154 (100.00)						
P8. With what criteria do you choose your toothpaste?	149 (96.75)	5 (3.25)	0.173	1.000	0.010*	0.807	0.423	1.000

f: absolute frequency

\*Significant association ( $P < 0.05$ ) based on Pearson's chi-square with Yates correction for values less than 5.

<sup>a</sup>Statistic was not calculated for this item since it is a constant



**Figure 1:** Frequency of knowledge, attitudes and practices on oral health prevention

parent or guardian had university higher education ( $P = 0.007$ ). [Table 7].

## DISCUSSION

Adolescence is a period when the main variations in development occur, establishing attitudes that will form an important part of general and oral health care, which will have an impact on future well-being and life quality.<sup>[36,37]</sup> Oral cavity diseases, like other illnesses, have biological, psychosocial, and emotional effects.<sup>[38]</sup> Because

of this, it is important at this stage to acquire knowledge, and develop attitudes and practices in oral health, since these habits will be present during the growth process and will have a profound impact throughout their individual development.<sup>[39]</sup> Therefore, aim of this study was to establish the relationship of knowledge, attitudes and practices on oral health prevention with sociodemographic factors of adolescent students.

In this study, the findings showed that 44.81% had insufficient knowledge, which is in agreement with findings

**Table 5: Association of knowledge, attitudes and practices on oral health prevention with sociodemographic factors of high-school students from a Peruvian-Swiss Educational Institution**

Variable	Category	Knowledge		p	OR (95% CI)	Attitude		p	OR (95% CI)	Practice		p	OR (95% CI)
		Insufficient f (%)	Sufficient f (%)			Unfavorable f (%)	Favorable f (%)			Incorrect f (%)	Correct f (%)		
Age group	12 to 14 years old	44 (28.57)	33 (21.43)	0.002*	2.77 (1.43 – 5.34)	26 (16.88)	51 (33.12)	0.045*	2.02 (0.18 – 21.60)	2 (1.30)	75 (48.70)	1.000	2.10 (1.01 – 4.39)
	15 to 17 years old	25 (16.23)	52 (33.77)			15 (9.74)	62 (40.26)			1 (0.65)	76 (49.35)		
Sex	Female	37 (24.03)	50 (32.47)	0.517	0.80 (0.42 – 1.53)	21 (13.64)	66 (42.86)	0.426	1.55 (0.13 – 17.49)	2 (1.30)	85 (55.19)	1.000	0.74 (0.36 – 1.53)
	Male	32 (20.78)	35 (22.73)			20 (12.99)	47 (30.52)			1 (0.65)	66 (42.86)		
Academic level	First year of high school	20 (12.99)	8 (5.19)	0.004*	a	11 (7.14)	17 (11.04)	0.044*	a	0 (0.0)	28 (18.18)	0.270	a
	Second year of high school	13 (8.44)	19 (12.34)			11 (7.14)	21 (13.64)			2 (1.30)	30 (19.48)		
	Third year of high school	17 (11.04)	14 (9.09)			5 (3.25)	26 (16.88)			1 (0.65)	30 (19.48)		
	Fourth year of high school	8 (5.19)	21 (13.64)			10 (6.49)	19 (12.34)			0 (0.0)	29 (18.83)		
	Fifth year of high school	11 (7.14)	23 (14.94)			4 (2.60)	30 (19.48)			0 (0.0)	34 (22.08)		
Family structure	Both parents	49 (31.82)	66 (42.86)	0.347	0.70 (0.34 – 1.46)	30 (19.48)	85 (55.19)	0.796	0.16 (0.01 – 1.84)	1 (0.65)	114 (74.03)	0.321	0.89 (0.39 – 2.02)
	Only with mother	20 (12.99)	19 (12.34)			11 (7.14)	28 (18.18)			2 (1.30)	37 (24.03)		
Educational level of parent or guardian	Non-university higher education	10 (6.49)	29 (18.83)	0.005*	0.32 (0.14 – 0.73)	6 (3.89)	33 (21.43)	0.066	1.48 (0.13 – 16.86)	2 (1.30)	38 (24.67)	1.000	0.41 (0.16 – 1.08)
	University higher education	59 (38.31)	56 (36.36)			35 (22.73)	80 (51.95)			1 (0.65)	113 (73.38)		
Nationality	Peruvian	57 (37.01)	72 (46.75)	0.726	0.85 (0.36 – 2.02)	37 (24.03)	92 (59.74)	0.189	0.97 (0.95 – 1.00)	3 (1.95)	126 (81.82)	1.000	2.11 (0.67 – 6.57)
	Swiss	12 (7.79)	13 (8.44)			4 (2.60)	21 (13.64)			0 (0.0)	25 (16.23)		

f = absolute frequency, OR = odds ratio

\*Based on Pearson's Chi-square with Yates correction for values less than 5

\*Significant association ( $P < 0.05$ )

\*The risk estimation statistics cannot be calculated, since it is not a 2 × 2 table

of Deng *et al.*,<sup>[39]</sup> who reported similar percentages. In relation to attitudes, 26.62% had an unfavorable attitude, agreeing with Deng *et al.*,<sup>[39]</sup> but differing from Arhens *et al.*,<sup>[36]</sup> who obtained 87.7% of adolescents surveyed with unfavorable attitude and 85.4% with inadequate practices. This could be due to the fact that it was carried out in public institutions, since it has been reported that students from private schools outperform students from public schools in some attention and memory tasks.<sup>[40]</sup> Therefore, having less favorable conditions for adopting and developing behaviors could generate a lack of motivation in oral health care.

In this study, age was significantly associated with oral health prevention knowledge, being the youngest group the one with insufficient knowledge, similar to that reported

by Silwal *et al.*<sup>[30]</sup> and Wahengbam *et al.*<sup>[17]</sup> and concordant with findings by Larsen and Luna,<sup>[41]</sup> who mentioned that transition from adolescence to adulthood is characterized by improvements in higher order cognitive abilities and the corresponding refinements in structure and function. However, our results differ from those found by Lawal and Oke<sup>[25]</sup> who reported that younger students present a higher knowledge level than their counterparts, which may be due to the fact that their study was conducted in disparate samples of age groups, in which the 12 to 15 year-old range represented 62.3% of the sample considered, unlike this study in which age groups were equal.

In reference to the academic level of adolescents, this study showed that there is association with knowledge and attitudes about oral hygiene, which is discordant with the findings of Arhens *et al.*<sup>[36]</sup> who found no association between attitudes and academic level, which may be due to the fact that they evaluated adolescents from a public institution aged 14 to 16 years, and in these institutions the educational level, socioeconomic conditions and family environment are less favorable than conditions offered by private schools.<sup>[42,43]</sup>

It has been reported that normally constituted families favor the vital and educational development of their

**Table 6: Correlation between knowledge, attitudes, and practices on oral health prevention**

Variables	<sup>a</sup> Rho	<sup>*</sup> P Value
Knowledge—Attitudes	0.019	0.819
Knowledge—Practices	-0.033	0.689
Attitudes—Practices	0.021	0.792

<sup>a</sup>Based on Spearman correlation

<sup>\*</sup>Significant correlation (*P* < 0.05)

**Table 7: Multivariate logistic regression model of knowledge and attitude on oral health prevention, according to associated factors**

Sociodemographic factors		Crude model								Adjusted model			
		Knowledge				Attitude				Knowledge			
		p-value	OR	95% CI		p-value	OR	95% CI		p-value	OR	95% CI	
				LL	UL			LL	UL			LL	UL
Age group	12 to 14 years old	0.229	2.530	0.558	11.473	0.254	3.917	0.375	40.900				
	15 to 17 years old		Ref.				Ref.						
Sex	Female	0.628	0.839	0.411	1.710	0.230	0.620	0.284	1.354				
	Male		Ref.				Ref.						
Academic level	First year of high school	0.598	1.987	0.155	25.415	0.763	0.624	0.029	13.361				
	Second year of high school	0.138	6.400	0.550	74.514	0.887	0.805	0.041	15.775				
	Third year of high school	0.389	2.401	0.327	17.603	0.754	1.519	0.111	20.810				
	Fourth year of high school	0.071	5.562	0.864	35.788	0.101	0.219	0.036	1.343				
	Fifth year of high school		Ref.				Ref.						
Family structure	Both parents	0.174	0.561	0.243	1.292	0.695	0.838	0.347	2.025				
	Only with mother		Ref.				Ref.						
Educational level of parent or tutor	Non-university higher education	0.041*	0.178	0.034	0.932	0.877	1.126	0.250	5.063	0.007*	0.327	0.146	0.733
	University higher education		Ref.				Ref.						
Nationality	Peruvian	0.752	0.861	0.340	2.183	0.166	2.292	0.708	7.418				
	Swiss		Ref.				Ref.						

OR= odds ratio, 95% CI= 95% confidence interval

Logit model: all variables were entered in the statistical analysis of crude multivariate model. Subsequently, model was adjusted only with the associated factors (*\*P* < 0.05) according to the omnibus test of model coefficient



children.<sup>[42]</sup> In this regard, Herrera<sup>[44]</sup> found a statistically significant relationship between family functioning and diseases of the oral cavity, reporting that in dysfunctional families there was a higher prevalence of dental caries, edentulism, bruxism, as well as a higher percentage of inadequate practices such as poor oral hygiene, excessive sugar consumption and visits to the dentist only in case of dental emergencies. Likewise, Dutra *et al.*<sup>[45]</sup> found that a greater level of family cohesion has positive influence on dental caries prevention. However, in this study, regarding family structure, no significant association was found with knowledge, attitudes and practices on oral health prevention. Even so, it was descriptively observed that most of adolescents who lived with both parents showed sufficient knowledge, favorable attitudes and adequate practices in comparison to those who lived alone with their mother, which could be due to the fact that single-parent families, despite having fewer members, experience more family conflicts due to multiple factors such as economic and social resources, lack of another parent to help with discipline and control of health care, and other tensions associated with this mode of upbringing.<sup>[31]</sup>

Regarding educational level of parent or tutor, a statistically significant association was found with knowledge of oral health prevention. Likewise, according to explanatory model, adolescents who had parents or guardians with non-university higher education were less likely to have insufficient knowledge, while there was no significant association with attitudes and practices on oral health prevention. These results could be explained by the findings of Jurišić *et al.*<sup>[46]</sup> who found that parents with university education were less concerned about their children's oral health than parents with less educational level. Regarding knowledge, our results are different from those reported by Wahengbam *et al.*,<sup>[17]</sup> probably because they assessed in several districts of an Indian state, unlike this study that included only a Peruvian city. It is possible that diversity of citizenship or differences in cultural habits within a geographic region may explain these differences in findings.<sup>[23]</sup> On the contrary, results on practices are not in agreement with Lapresa *et al.*,<sup>[47]</sup> who reported that the children of mothers with higher educational levels presented better oral health habits, with higher rates of visits to dental services, lower frequency of intake of sugary soft drinks and snacks, and higher frequency of daily toothbrushing. This discordance could be caused by the fact that Lapresa *et al.*<sup>[47]</sup> included infants, children and adolescents aged 2 to 15 years in their study, which could have positively influenced their results. By including infants, the results may have been biased because mothers are more focused on constant monitoring of preschoolers' attitudes and practices.<sup>[48]</sup> On the contrary, this study evaluated adolescents between 12 and 17 years of age who are in a complicated period of their development, making it more difficult for their

parents or guardians to closely monitor their oral health practices.<sup>[16,49]</sup> Likewise, Bombert *et al.*<sup>[27]</sup> also differed from our results, since they reported that educational level of parents or guardians was an influential factor in frequency of daily toothbrushing and flossing. This discrepancy could be explained by the fact that Bombert *et al.* only assessed adolescents aged 12 years,<sup>[27]</sup> an age at which it is relatively easy for the parent or guardian to control their children's oral hygiene habits, as their autonomy is not yet fully developed.<sup>[50]</sup> Another possible explanation for our findings, referring to the fact that children of parents with non-university higher education were less likely to have deficient knowledge about their oral health than those of parents with university studies, could be due to the fact that those university educated parents, due to the greater work opportunities they have and work overload generated by accepting more hours of work or more responsible positions, would find it difficult to spend time with their children to teach them self-care practices for their health in general. It is known that participation and involvement of parents in the educational process at home and at school is of vital importance for good learning development.<sup>[51-53]</sup>

In this study, Peruvian and Swiss adolescent students were considered, since a disparity in oral health and health literacy has been reported between people from high, middle and low income countries.<sup>[6,8]</sup> It was also decided to include the variable nationality because it has been reported that an individual's behavior is often influenced by his or her culture, that is, the knowledge he or she has of the construction of his or her reality and what is accepted in his or her society.<sup>[23]</sup> However, in this study no statistically significant differences were found in knowledge, attitudes and practices on oral health prevention between Peruvian and Swiss adolescents, perhaps due to the fact that the greater percentage of the population studied was Peruvian. For this reason, it is recommended that future studies make comparisons of these variables with similar sample sizes among students of different nationalities

Importance of this study lies in the identification of some sociodemographic factors associated with knowledge, attitudes and practices in an adolescent population, which provides important information for health authorities and educational community, in order to establish strategies, projects, programs and plans for oral health prevention in this complex period of development, with the firm purpose of improving oral health conditions and thus general wellbeing. In addition, in this study it was observed as a novelty in comparison to other studies,<sup>[22,29,30,36]</sup> that the educational level of parent or guardian had an inverse influence to that reported previously,<sup>[17,27,47]</sup> which suggests the need for active involvement of parents or guardians in the teaching-learning process and formation of oral health habits, regardless of their educational level.

Another interesting finding of this study was that the frequency of sufficient knowledge (55.19%) was lower than favorable attitudes (73.38%) and these were lower than correct practices (98.05%). This probably shows that students sometimes only perform oral hygiene practice automatically initiated by stimuli and established as a habit to be maintained in the long term, with little or no conscious processing of the importance of doing so. Perhaps the parents focused on repeating to them what they should do from an early age, rather than explaining and giving reasons why they should do it,<sup>[54]</sup> which may be the reason why no significant association was found between knowledge, attitudes, and practices on oral health prevention in adolescent students.

One limitation of this study was the inability to assess the respondents in person, since at the time of survey, the country was in national emergency and social isolation was mandatory. Another limitation was not being able to make a comparison with adolescents from other private, public and rural institutions. Likewise, parents were not interviewed in order to assess their socioeconomic status, family functionality and involvement in the teaching-learning process in relation to oral health prevention. Finally, the cross-sectional design does not allow us to evaluate the dynamism and sustainability over time of knowledge, attitudes and practices. It should be noted that this type of study may present potential selection biases, since students presented different sociodemographic characteristics, so possible confounding variables such as academic level, family structure, educational level of parent or tutor and nationality were controlled.<sup>[6,8,23-31]</sup> It should also be recognized as a limitation that the associations of sociodemographic factors with knowledge, attitudes and practices found in this study do not necessarily constitute evidence of causality.

Based on results obtained, it is recommended to continue monitoring the oral hygiene habits of adolescents since, due to the complexity of their life stage, they are likely to neglect self-information on good oral health practices, as they may be more focused on external care of their appearance or other material priorities typical of teenagers.<sup>[36,46]</sup> It is also recommended to implement prevention programs for this population highly vulnerable to physical and psychosocial changes, encouraging self-care due to the high prevalence of oral diseases. In addition, new programs and actions should be implemented in schools that contribute to strengthening the relationship with families in order to make visible the relevance they have in learning and establishing attitudes and habits.

## CONCLUSION

In summary, with limitations of this cross-sectional study, it was observed that students' knowledge and attitudes about oral health prevention were associated with age

and academic level. In addition, educational level of the parent or guardian was associated with knowledge of the students, such that those whose parents or guardians had non-university higher education were 67% less likely to have deficient knowledge of oral health prevention than those whose parents or guardians had university higher education. Finally, the practice of oral health prevention was not associated with any sociodemographic factor considered in this study.

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## Conflicts of interest

There are no conflicts of interest..

## Authors' contributions

CAR conceived the research idea. CAR, MLC, NCL, and GBV elaborated the manuscript. CAR, ACP, and MLC collected and tabulated the information. CAR carried out the bibliographic search. CFCR interpreted the statistical results. CCR, NCL, GBV, and CFCR helped in the development from the discussion. MLC, GBV, NCL, CCR, and LCG performed the critical revision of the manuscript. All authors approved the final version of the manuscript.

## Ethical policy and institutional review board statement

This study respected the bioethical principles for medical research on human beings of the Declaration of Helsinki, related to confidentiality, freedom, respect and non-maleficence. It was also approved by the Institutional Research Ethics Committee of the Universidad Privada San Juan Bautista with resolution No. 1251-2021-CIEI-UPSJB dated November 3, 2021. All participants understood and signed an informed consent.

## Patient declaration of consent

Not applicable.

## Data availability statement

The data that support the study results are available from the author (Dra. Marysela Ladera-Castañeda, e-mail: marysela.ladera@upsjb.edu.pe) on request.

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