



CLINICAL RESEARCH:

Knowledge, Attitudes and Practices Related to Oral Health in First-Year University Students of the Paraíso Campus of the University of Costa Rica

Conocimientos, actitudes y prácticas relacionadas con la salud bucal en estudiantes universitarios de primer año del Recinto de Paraíso de la Universidad de Costa Rica

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ABSTRACT: People's knowledge, attitudes, and practices related to health are built throughout life, particularly during childhood and adolescence, and they reflect the practices of their family and social circle. The aim of this study was to identify the levels of knowledge, attitudes, and practices related to oral health of first-year university students at the Paraíso Campus of the University of Costa Rica. This was done through a questionnaire of closed questions that would allow oral health educational strategies to be established in the future for this population group. For this purpose, a cross-sectional descriptive study was conducted, where 70 first-year students of the Paraíso Campus participated in the first semester of the year 2019. For data collection, a survey of 22 closed questions on knowledge, attitudes, and practices about oral health was applied, and a score on oral health knowledge was subsequently performed, based on the answers to the questions. According to the results, the level of knowledge shown about oral health is low, since the average knowledge score (7.02 points) was less than half of the maximum score (17 points). The greatest deficiency in knowledge was evidenced in topics, such as, dental biofilm, gingivitis, use of fluorides, and the role of saliva. In addition, several practices that affect the condition of the oral cavity were identified, such as harmful habits, inadequate nutrition, and poor oral hygiene habits. In this study, a general lack of knowledge was identified regarding basic concepts of oral health in young university students, who are not clear about the role of some protective or risk factors related to the main oral diseases.

KEYWORDS: Oral health; Knowledge; Attitudes; Practices; University students; Costa Rica.



RESUMEN: Los conocimientos, actitudes y prácticas relacionados a la salud en las personas se construyen a través de la vida, particularmente durante la infancia y la adolescencia y reflejan las prácticas de su círculo familiar y social. El objetivo de este estudio fue identificar los niveles de conocimiento, las actitudes y las prácticas relacionadas a la salud bucodental en estudiantes universitarios de primer ingreso en el Recinto de Paraíso de la Universidad de Costa Rica, mediante un cuestionario de preguntas cerradas que permitirá a futuro establecer estrategias educativas en salud bucal para este grupo de población. Se trató de un estudio descriptivo transversal de tipo observacional en 70 estudiantes de primer ingreso del Recinto de Paraíso en el I semestre del año 2019. Para la recolección de datos se aplicó una encuesta de 22 preguntas cerradas sobre los conocimientos, las actitudes y las prácticas sobre la salud oral. A partir de las preguntas sobre conocimiento en salud bucal se creó un puntaje de conocimiento. Se pudo evidenciar que el nivel de conocimiento sobre la salud bucal es bajo, ya que el promedio del puntaje de conocimiento (7,02 puntos) es menos de la mitad del puntaje máximo (17 puntos). La mayor deficiencia en el conocimiento se evidenció en temas como el biofilm dental, gingivitis, uso de fluoruros y el rol de la saliva. Además, se identificaron varias prácticas que afectan la condición de la cavidad bucal, como los hábitos nocivos, una alimentación inadecuada y hábitos de higiene oral deficiente. En este estudio se identificó en general una falta de conocimiento respecto a conceptos básicos de salud bucal en personas jóvenes universitarias, quienes no tienen claro la función de algunos factores protectores o de riesgo relacionados con las principales enfermedades bucales.

PALABRAS CLAVE: Salud oral; Conocimientos; Actitudes; Prácticas; Estudiantes universitarios; Costa Rica.

INTRODUCTION

Biological, physical, emotional, and social aspects contribute to oral health (1). Among other considerations, this implies having a healthy dentition, being able to eat properly, not having injuries to the oral tissues or pain, as well as having an appearance that stimulates self-esteem. All these factors have a positive influence on the quality of life (2). According to Glick *et al.*, oral health should be defined from a multidimensional perspective, indicating that it “is multifaceted and includes the

ability to speak, smile, smell, taste, touch, chew, swallow, and convey a range of emotions through facial expressions with confidence and without pain, discomfort, and disease of the craniofacial complex” (3).

According to the World Health Organization (WHO), oral diseases such as dental caries, periodontitis, and oral cancer are global health problems, especially among low-income countries (4). In addition, according to the Global Burden of Diseases 2017 study, oral pathologies repre-

sent the greatest scourge of diseases in the entire world, affecting 50% of the world's population. This study also shows the socioeconomic gap that is widening between low-income countries and high-income countries (5).

From the diseases determinants perspective, it has been shown that the level of knowledge may influence health behaviors, and, therefore, a high level of knowledge may be a protective factor against the main oral diseases. Previous evidence shows that health knowledge is part of health literacy (6), defined by the WHO as "the cognitive and social skills which determine the motivation and ability of individuals to gain access to, understand and use information in ways which promote and maintain good health"(7). Knowledge allows improving people's skills to make decisions related to health (8). In addition, the levels of knowledge on specific topics increase the chances of a strengthening in health (9).

It is important to consider that people's knowledge, attitudes, and practices related to health are built throughout life, particularly during childhood and adolescence, and reflect the practices of their family and social circle. Most oral diseases can be prevented, promoting oral health and allowing population groups to have the necessary resources to apply prevention measures. For an education program to be more successful, a prior diagnosis process is required to estimate the level of knowledge about the health issue that is intended to be addressed in said population (10).

In background, a study carried out by the University of Costa Rica applied an educational strategy on oral health promotion for high school adolescents from the Instituto de Alajuela. A subsequent evaluation to verify the effectiveness of this strategy showed that a greater number of students from the aforementioned institution, in relation to other schools, showed, in average,

better knowledge and practices, such as, carrying a toothbrush to school, knowing what dental plaque (dental biofilm) was and its effects, use of soft-bristled toothbrushes, and they stated that the most important time to perform oral hygiene was before going to bed (11).

The aim of this study was to identify the levels of knowledge, attitudes, and practices related to oral health of first-year university students at the Paraíso Campus of the University of Costa Rica (RP-UCR, by its Spanish acronym), through a questionnaire of closed questions that would allow educational strategies on oral health to be established for this population group in the future.

METHODS

STUDY DESIGN

This is a descriptive cross-sectional study on first-year university students from all majors at the RP-UCR.

PARTICIPANTS

Research participants were university students (men and women), first-year students, over 18 years of age, which were enrolled at the Paraíso Campus in the first semester of 2019. The data was obtained from a sample of 70 first-year students from the Atlantic Site's Paraíso Campus (N=70).

ETHICS AND DATA

An informed written consent was obtained directly from the participants, as they were of legal age. The consent form was signed by each participant, as well as by a witness and the researcher. This observational study was approved by the Scientific Ethics Committee (CEC) of the University of Costa Rica in session 112, which was held on 07/27/2018, and the official resolution was VI-5042-2018.

MEASUREMENTS

For data collection, a survey of 22 closed questions was applied; the instrument used was divided into four parts:

- General data (age, sex, race, place of origin).
- Knowledge on oral health, including questions about knowledge regarding dental plaque (dental biofilm), dental caries, periodontal diseases, use of fluorides, diet, oral cancer, and oral health learning and information). From these variables, a knowledge score was given. One point was awarded for each correct answer by the participant. The final knowledge score ranged from 0 (worst knowledge) to 17 (best knowledge).
- Attitudes towards oral health frequency and reasons of visits to the dentist.
- Practices on the use of toothbrush, dental floss, and mouthwashes, as well as their frequency of use.

STATISTICAL ANALYSES

Descriptive statistics of the variables on knowledge, attitudes, and practices were performed, and STATA V14 ® was used.

Bivariate statistics were made between the knowledge score and the variables on attitudes and practices. The objective of this analysis was to be able to determine if a better level of knowledge had an influence on some attitudes towards oral health. The bivariate analysis used the student test of Student, between the knowledge score (dependent variable) and the "attitudes and practices" variables (independent variables), which were also obtained from the applied questionnaire. The knowledge score variable had a normal distribution.

RESULTS

Table 1 shows the distribution of students according to their demographic and academic characteristics for the samples (N=70). The majority of the participants were male, which represented 60%; regarding the place of residence, the province of Cartago represents 78.57%, and the average age of the students is 19 years old.

Table 1. Distribution of students according to demographic and academic characteristics (N=70).

Variables	Answer options	N	%
Sex	Men	42	60%
	Women	28	40%
College major	Business Management	15	21.43%
	Ecological Tourism	13	18.57%
	Business Computing	25	35.71%
	English Teaching	15	21.43%
	Mathematics Teaching	1	1.43%
	Accounting	1	1.43%
Province of Origin	San José	8	11.43%
	Alajuela	2	2.86%
	Cartago	55	78.57%
	Heredia	1	1.43%
	Guanacaste	0	0%
	Puntarenas	3	4.28%
	Limón	1	1.43%
	Mean		Standard Deviation
Age		19	1.96

Table 2 shows the distribution of responses on knowledge about oral health. To obtain the distribution of the percentages, all the answers were taken into consideration, including those of "Do not know/No answer" (DK/NA).

For the question "What is dental plaque (dental biofilm)?", the answer was considered correct only if the option "accumulation of bacteria that adhere to the teeth" was marked affirmatively, which resulted in 22.86%. The other combinations of answers, which included "food residue", "it is a stain on the teeth", and "DK/NA", resulted in a total of 77.14%.

When asked about "How is dental plaque (dental biofilm) removed?", 64.29% of the students surveyed believed that dental biofilm is removed by brushing, while 52.86% of the sample did not know that dental biofilm can be removed by dental flossing, and 62.85% incorrectly believed that it can only be removed by the dentist. Likewise, more than half of the participants (51.43%) are unaware that dental plaque (dental biofilm) causes gingivitis.

Regarding the factors that may contribute to the development of dental caries, 58.57% of the participants thought affirmatively that the acids produced by bacteria in the mouth influence the appearance of carious lesions; however, 88.57% of the students did not know that the flow and composition of saliva are related to the development of caries. 91.43% of the participants was clear that sugar consumption as part of a regular diet is a factor for the development of dental caries.

When asked if dental caries could be a communicable disease, 1.43% of the participants considered that it is. On the other hand, 100% of them believed that this disease can be prevented. Furthermore, most students (88.57%) were clear that certain types of food have a greater influence on the occurrence of caries than others.

Even though the majority of those surveyed (77.14%) knew that fluorides help to prevent

dental caries, 40% mistakenly believed that they help to have white teeth; and, in the same way, 24.29% considered that they also help to prevent gingivitis.

87.14% of the students had received an explanation on the toothbrushing technique sometime in life, the vast majority by the dentist or dental assistant (85.71%), as well as information on oral hygiene.

Regarding knowledge on harmful habits that may favor the occurrence of oral cancer, 92.86% of those surveyed considered cigarette smoking and the use of other tobacco products as one of those habits; however, 57.15% did not consider that frequent alcohol intake may favor the occurrence of oral cancer.

Table 3 shows the results from the information provided by the surveyed about their attitudes and practices towards oral health. 94.29% had visited the dentist sometime in life. Just over half (51.43%) mentioned having visited the dentist in the last year.

When students were asked when was the last time they visited the dentist, only 41.43% reported having visited the dentist less than 6 months ago, 20% between 6 months and a year ago, and 38.56% more than a year ago. Regarding the frequency of visits to the dentist, 54.29% reported visiting the dentist every 6 months or once a year, while 34.29% said they only visited the dentist when they have some discomfort or pain, and 11.44% never visit the dentist.

University students were asked about the importance of having good oral health through two sub-questions: to the sub-question "Is oral health an important part of general health?", the

students responded 100% "Yes"; and to the other sub-question "Is it important for aesthetics?", 81.43% answered "Yes".

100% of students stated that they use a toothbrush to perform their oral hygiene, but only 50% said that they use dental floss, and 59% mentioned using mouthwash as part of their oral health hygiene routine.

When consulting the frequency of tooth brushing, 68.57% mentioned brushing more than twice a day, 22.86% once or twice a day, and 8.57% three to six times a week. Regarding dental floss frequency, 7.14% stated that they use dental floss more than twice a day, only

25.71% use it once or twice a day, 10% mentioned that they use it three to six times a week, 11.43% once a week, and 45.71% answered DK/NA.

When asked for what purpose they use toothpaste, 68.57% mentioned that it leaves a good taste in their mouth, 75.71% because it makes brushing easier, 87.14% claimed that toothpaste prevents cavities and 61.43% use it out of habit. In addition, they were asked how often they smoked tobacco cigarettes, and 94.19% stated that they did not smoke; 2.86% mentioned that they used to smoke, but they currently do not smoke; 1.43% smoke six or fewer cigarettes a week, and 1.43% one to two cigarettes a day.

Table 2. Distribution of responses on oral health knowledge (N=70).

Variables	Answer options	Answers *	N	%
Concept of dental plaque (dental biofilm)	Affirmative answer only for: "Accumulation of bacteria that adhere to the teeth"	CA	16	22.86%
	Other combinations of answers, including: "Food residue", "It is a stain on the teeth" and DK/NA	IA	54	77.14%
Method to remove dental plaque (dental biofilm)?	Tooth brushing			
	No	IA	10	14.29%
	Yes	CA	45	64.29%
	DK/NA	IA	15	21.43%
	Dental floss			
	No	IA	16	22.86%
	Yes	CA	33	47.14%
	DK/NA	IA	21	30%
	Only a dentist can do it			
	No	CA	26	37.14%
Yes	IA	26	37.14%	
DK/NA	IA	18	25.71%	

Variables	Answer options	Answers *	N	%
Factors that may contribute to the development of dental caries	Acids produced by bacteria in the mouth			
	No	IA	10	14.29%
	Yes	CA	41	58.57%
	DK/NA	IA	19	27.14%
	The flow and composition of saliva			
	No	IA	36	51.43%
	Yes	CA	8	11.43%
	DK/NA	IA	26	37.14%
	Sugar consumption as part of the regular diet			
No	IA	1	1.43%	
Yes	CA	64	91.43%	
DK/NA	IA	5	7.14%	
Transmission of microorganisms that cause dental caries	No	IA	56	80%
	Yes	CA	1	1.43%
	DK/NA	IA	13	18.57%
Dental caries is preventable	No	IA	0	0%
	Yes	CA	70	100%
	DK/NA	IA	0	0%
Dental plaque (dental biofilm) causes gingivitis	No	IA	3	4.29%
	Yes	CA	34	48.57%
	DK/NA	IA	33	47.14%
Influence of diet on the occurrence of caries	No, it's not related.	IA	1	1.43%
	Yes, certain types of food have a greater influence on the occurrence of dental caries.	CA	62	88.57%
	Yes, all foods influence the occurrence of dental caries in the same way.	IA	6	8.57%
	DK/NA	IA	1	1.43%
Role of fluorides	To have white teeth			
	No	CA	17	24.29%
	Yes	IA	28	40%
	DK/NA	IA	25	35.71%
	To prevent gingivitis			
	No	CA	21	30%
	Yes	IA	17	24.29%
	DK/NA	IA	32	45.71%
	To prevent dental caries			
	No	IA	3	4.29%
Yes	CA	54	77.14%	
DK/NA	IA	13	18.57%	
Explanation received about dental care sometime in life	No	IA	9	12.86%
	Yes	CA	61	87.14%

Variables	Answer options	Answers *	N	%
Means by which the explanation about dental care was received	Dentist or Dental Assistant			
	No		8	11.43%
	Yes		60	85.71%
	DK/NA		2	2.86%
	A teacher at school			
	No		50	71.43%
	Yes		15	21.43%
	DK/NA		5	7.14%
	On the Internet			
	No		42	60%
	Yes		23	32.86%
	DK/NA		5	7.14%
	On TV			
	No		38	54.29%
	Yes		27	38.57%
DK/NA		5	7.14%	
On magazines or brochures				
No		50	71.43%	
Yes		15	21.43%	
DK/NA		5	7.14%	
Harmful habits that favor the occurrence of oral cancer	Cigarette smoking and use of other tobacco products			
	No	IA	1	1.43%
	Yes	CA	65	92.86%
	DK/NA	IA	4	5.71%
	Frequent alcohol intake			
	No	IA	10	14.29%
	Yes	CA	30	42.86%
	DK/NA	IA	30	42.86%

*CA: correct answers. IA: incorrect answers.

Table 3. Distribution of responses on attitudes and practices towards oral health (N= 70).

Variables	Answer options	Answers *	N	%
Has visited the dentist sometime in life	No	NR	4	5.71%
	Yes	R	66	94.29%
Has visited the dentist in the last year	No	NR	34	48.57%
	Yes	R	36	51.43%
Last visit to the dentist	Less than 6 months ago	R	29	41.43%
	Between 6 months and a year ago	R	14	20%
	Between 1 and 2 years ago	NR	15	21.43%
	Between 2 and 3 years ago	NR	2	2.85%
	More than 3 years ago	NR	6	8.57%
Frequency of visits to the dentist	DK/NA	NR	4	5.71%
	Every 6 months	R	27	38.58%
	Once a year	R	11	15.71%
	Only when there is discomfort or pain	NR	24	34.29%
	Never	NR	6	8.58%
Why they care about oral health	DK/NA	NR	2	2.86%
	It is an important part of general health			
	No	NR	0	0%
	Yes	R	70	100%
	DK/NA	NR	0	0%
Tools used to perform oral hygiene	For aesthetics			
	No	NR	7	10%
	Yes	R	57	81.43%
	DK/NA	NR	6	8.57%
	DK/NA	NR	0	0%
Tooth brushing frequency	Toothbrush			
	No	NR	0	0%
	Yes	R	70	100%
	DK/NA	NR	0	0%
	Dental floss			
No	NR	32	45.71%	
Yes	R	35	50%	
DK / NA	NR	3	4.29%	
Mouthwash	Mouthwash			
	No	NR	26	37.14%
	Yes	R	41	58.57%
	DK/NA	NR	3	4.29%
	DK/NA	NR	0	0%
Tooth brushing frequency	More than twice a day	R	48	68.57%
	1 to 2 times a day	R	16	22.86%
	3 to 6 times a week	NR	6	8.57%
	Once a week	NR	0	0%
	DK/NA	NR	0	0%

Variables	Answer options	Answers *	N	%
Flossing Frequency	More than twice a day	R	5	7.14%
	1 to 2 times a day	R	18	25.71%
	3 to 6 times a week	NR	7	10%
	Once a week	NR	8	11.43%
	DK/NA	NR	32	45.71%
Reason for using toothpaste	Makes brushing easier			
	No	R	10	14.29%
	Yes	NR	53	75.71%
	DK/NA	NR	7	10%
	To prevent dental caries			
	No	NR	3	4.29%
	Yes	R	61	87.14%
	DK/NA	NR	6	8.57%
	To have good breath			
	No	NR	15	21.43%
	Yes	R	48	68.57%
	DK/NA	NR	7	10%
	Out of habit			
	No	R	20	28.57%
	Yes	NR	43	61.43%
DK/NA	NR	7	10%	
Frequency of tobacco cigarette smoking	I don't smoke tobacco	R	66	94.29%
	I used to smoke, but I currently don't smoke	NR	2	2.86%
	6 or fewer cigarettes a week	NR	1	1.43%
	1 to 2 cigarettes a day	NR	1	1.43%
	3 to 5 cigarettes a day	NR	0	0%
	6 to 10 cigarettes a day	NR	0	0%
	11 or more cigarettes a day	NR	0	0%

*R: Recommended. NR: Not recommended.

Table 4 presents the descriptive statistics of the knowledge score (0-17 pts). An oral health knowledge score was established based on the answers to the knowledge questionnaire, except for the question about the means by which they received the explanation about dental care.

The knowledge score had a mean of 7.02 (S.D.1.99). The maximum score obtained

by the participants was 11, which only three people achieved.

Table 5 describes the bivariate statistics between the knowledge score and the attitudes and practices variables. There were no statistically significant differences between the average knowledge score and the different variables of attitudes and practices analyzed.

Table 4. Description of the knowledge score (0-17 pts).

Knowledge score	Frequency	Percentage
0	0	0%
1	0	0%
2	1	1.43%
3	3	4.29%
4	5	7.14%
5	6	8.57%
6	8	11.43%
7	16	22.86%
8	18	25.71%
9	6	8.57%
10	4	5.71%
11	3	4.29%
12	0	0%
13	0	0%
14	0	0%
15	0	0%
16	0	0%
17	0	0%

Table 5. Bivariate statistics between knowledge score and attitudes and practices variables.

Variable	Answer Options	N (%)	Knowledge Score Average	SD	p
Has visited the dentist sometime in life	No	4	6.25	0.96	NS
	Yes	66	7.08	2.04	
Has visited the dentist in the last year	No	34	6.68	1.90	NS
	Yes	36	7.36	2.05	
Last visit to the dentist	Less than 1 year	43	7.35	2.06	NS
	More than 1 year or DK/NA	27	6.52	1.83	
Frequency of visits to the dentist	At least once a year	38	7.34	2.16	NS
	More than 1,2,3 years or DK/NA	32	6.66	1.75	
Why they care about oral health	For aesthetics				NS
	No	13	6.31	2.21	
	Yes	57	7.19	1.93	
Tooth brushing frequency	1,2, or more times a day	64	6.94	1.91	NS
	From 1 to 6 times a week or DK/NA	6	8	2.83	
Flossing Frequency	1, 2, or more times a day	23	7.26	1.98	NS
	From 1 to 6 times a week or DK/NA	47	6.91	2.02	
Tools used to perform oral hygiene	Dental floss				NS
	No	32	7.03	1.92	
	Yes	35	7.23	2.01	
	Mouthwash				
Reason for using toothpaste	No	26	7.04	1.82	NS
	Yes	41	7.22	2.03	
	Makes brushing easier				
	No	10	6.5	1.78	
	Yes	53	7.30	2.03	
	To prevent dental caries				
Tobacco cigarette smoking	No	3	6.66	1.53	NS
	Yes	61	7.20	1.99	
	Out of habit				
	No	20	7.15	1.90	
	Yes	43	7.07	2.13	

DISCUSSION

The application of the questionnaire completed by first-year university students presented a clearer picture of their level of knowledge, attitudes, and practices about oral health, through the creation of a score based on questions on knowledge. In this aspect, the level of knowledge about oral health demonstrated was low, since the average (7.02 points) is less than half of the maximum score (17 points). The greatest deficiency in knowledge could be determined in topics such as dental biofilm, gingivitis, use of fluorides, and the role of saliva as a protective factor of the oral cavity. In addition, several actions that affect the condition of the oral cavity were identified among this population group, such as harmful habits, inadequate nutrition, and poor oral hygiene habits.

Health education is one of the main ways to integrate health-related knowledge, in order to promote self-care both individually and collectively, and should start early in the undergraduate years and take advantage of multiple forms of teaching and knowledge systems to create effective reinforcements of transdisciplinary thinking and holistic approaches (12).

As a pillar of health promotion, health education allows an empowered population to modify their habits to maintain or improve their conditions. Therefore, identifying the level of knowledge of a population regarding a health issue may allow a subsequent application of successful educational interventions (10).

A study conducted by Ferreira *et al.* (13), in which 101 students enrolled in the last year of the Pedagogy course at the Federal University of Paraíba in Brazil participated, showed that 83% of them had received information on preventive dentistry previously, being the dentist the answer to the question on the means by which they had received this information in 64% of the cases. In

the study herein, on the other hand, participants recognized the dentist or dental assistant for instructing them about dental care (85.71%).

Most of the students who were part of the research study by Ferreira *et al.* were unaware of aspects such as the constitution and removal of dental biofilm, and 77% of the participants believed that the dentist is the one who should remove dental biofilm, when in fact anyone can remove it on their own with proper personal oral hygiene (13). On the other hand, RP-UCR students considered that dental biofilm can be removed by toothbrushing (64.29%).

In relation to sweet food consumption, 41% of the students in the study by Ferreira *et al.* believed sweet foods should be totally restricted (13). For their part, the participants of the RP-UCR considered sugar intake to be a factor that can contribute to the development of dental caries (91.43%).

In another investigation carried out in 2015 at the Universidad del Pacífico in Paraguay, about half (51.9%) of the participating population correctly answered one to four of the 10 questions about dental caries prevention. Given this scenario, the authors recommend promoting oral health and increasing knowledge on the subject to prevent the progression of the disease (10). In our research, the level of knowledge recorded is also low, since the knowledge score had an average of 7.02 (SD 1.99) out of a total of 17 possible points.

A cross-sectional study conducted among pre-university students in the city of Mysore, India, between 2009 and 2010, concluded that the students had good knowledge about the basic oral health measures necessary to maintain adequate oral health, but their attitudes and practices towards oral health were not adequate. For example, 88% of the participants knew that proper brushing prevents tooth decay and gum problems,

but the majority of students (90%) agreed that they visited the dentist only when they had pain, and cleaned their teeth just once a day. 89% of students knew that sweets and sticky foods cause tooth decay, and the majority of students (88%) knew that dental health is reflected in general health (14), which is similar to the data collected from RP-UCR students, where 100% of the participants believed that having good oral health is an important part of general health.

Most of the Mysore City study participants (90%) considered drinking alcohol and smoking to be harmful to dental health, as well as that they may cause cancer (14). A similar percentage of participants (92.86%) at RP-UCR considered that cigarette smoking and the use of other tobacco products may favor the occurrence of oral cancer; however, only 42.86% believed that alcohol may also predispose individuals to the occurrence of oral cancer.

Another research on knowledge of oral health problems among low-income people in Baltimore, United States showed that 91% of respondents knew that sugar causes dental caries, while 82% understood that the best way to prevent dental caries was brushing and flossing every day. However, only 15% knew how often to floss, and only 21% knew that dental biofilm was made up of germs (15). Similarly, in the study herein, only 22.86% of participants knew of the presence of bacteria in the composition of dental biofilm.

In a study on the beliefs regarding caries and oral hygiene that school adolescents have in the Department of Valle del Cauca, Colombia, the results regarding the etiology of caries showed that 65% believed that dental caries is due to poor oral hygiene, 18% due to bacteria, 7% due to sugar consumption, and 10% do not know. Furthermore, 99.8% responded that they brush their teeth, brushing frequency averaged three times per day, 55% use dental floss, and 51% use mouthwash.

(16). These data are very similar to those reported in this study.

On the other hand, in a qualitative research study carried out in Sweden on the perceptions of oral health of adolescents between 15 and 18 years of age, the respondents showed that tooth-brushing is the main tool they use for oral health care. Most of them knew that other factors, such as flossing and eating habits, could be factors that influence the improvement of oral health, but found them difficult to use (17).

Another study on attitudes about oral health in Swedes aged 20-25 years found that a high proportion of respondents considered that they are in great need of dental care. A high percentage of participants indicated that they were satisfied with their dental function, but few people were satisfied with the appearance of their teeth. Most respondents had adopted good oral hygiene habits, but flossing was infrequent (18).

One of the limitations of this study is the size of the sample, which could have resulted in the absence of statistically significant differences when associating the knowledge score and the variables of attitudes and practices, so further research with a larger sample is recommended.

Among the strengths of this study, it is worth mentioning that this is the first study of its kind to be carried out in Costa Rica. Additionally, important data and information was obtained to validate the questionnaire used, as well as to be able to replicate it with a sample that is more consistent and, ideally, representative of the population.

CONCLUSION

In this study, a general lack of knowledge regarding basic concepts of oral health was identified among young university students. First of all, students were not clear about the role of some

protective or risk factors related to the main oral diseases. Moreover, students lack knowledge about the role of microorganisms in oral health and how imbalance or dysbiosis may cause the appearance of diseases, such as, caries and periodontal disease, among others. Therefore, it is important for educational activities to include clarification on the role of fluorides to prevent the appearance of dental caries, as well as an explanation on which daily use products contain fluorides and how fluorides may be administered by the dentist.

The findings of this study will allow a tailored and specific strategy to be created to satisfy the needs of the student population at RP-UCR, aimed at recommending positive practices to improve this population's oral health conditions and to prevent the appearance of the most frequent oral diseases. In addition, this strategy will enable this population to counteract the negative effects of these diseases, in case they are already present, and to adopt appropriate therapeutic measures.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

SUBMISSION DECLARATION AND VERIFICATION

This manuscript has not been published previously, it is not under consideration for publication elsewhere, and the publication is approved by all authors. If accepted, this work will not be published elsewhere in the same form, in English or in any other language, including electronically without the written consent of the copyright-holder.

AUTHOR CONTRIBUTION STATEMENT

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REFERENCES

1. Aranguren Reyes O.C. Calidad de vida y salud bucal en niños de 11-14 años de la Comunidad de niños Sagrada Familia, 2021 . Universidad César Vallejo, Lima, Perú; 2022.
2. Gómez Ríos N.I., Morales García M.H. Determinación de los Índices CPO-D e IHOS en estudiantes de la Universidad Veracruzana, México. *Rev Chil Salud Pública*. 2012; 16 (1): 26-31.
3. Glick M., Williams D.M., Kleinman D.V., Vujicic M., Watt R.G., Weyant R.J. A new definition for oral health developed by the FDI World Dental Federation opens the door to a universal definition of oral health. *Am J Orthod Dentofac Orthop*. 2017; 151 (2): 229-31.
4. World Health Organizations. Oral health surveys: basic methods. 5th ed. France: World Health Organization; 2013.

5. GBD 2017 Disease and Injury Incidence and Prevalence Collaborators. Global, regional, and national incidence, prevalence, and years lived with disability for 354 Diseases and Injuries for 195 countries and territories, 1990-2017: A systematic analysis for the Global Burden of Disease Study 2017. *Lancet* . 2018; 392 (10159): 1789-858.
6. Gellert P., Tille F. What do we know so far? The role of health knowledge within theories of health literacy. *Eur Heal Psychol* . 2015; 17 (6): 266-74.
7. Dodson S., Good S., Osborne R. Health Literacy Toolkit for Low- and Middle-Income Countries A series of information sheets to empower communities and strengthen health systems. . Vol. 18, Osteoarthritis and Cartilage. New Delhi: World Health Organization, Regional Office for South-East Asia; 2015.
8. Sørensen K., Van Den Broucke S., Fullam J., Doyle G., Pelikan J., Slonska Z., et al. Health literacy and public health: A systematic review and integration of definitions and models. *BMC Public Health* . 2012; 12 (1): 80.
9. Espinoza-Aguirre A., Fantin R., Barboza-Solís C. Salinas-Miranda A. Conocimientos sobre tabaco y sus riesgos a la salud en Costa Rica: un análisis estructural. *Acta Med Costarric* . 2021; 63 (1): 36-42.
10. Díaz C., Pérez N., Sanabria D., Ferreira M., Cueto N., Urquhart D., et al. Nivel de conocimiento sobre prevención de caries dental en universitarios. *CES Odontol* . 2016; 29 (1): 14-21.
11. Campos Arias F. Promoción de la salud bucal en el adolescente Estudio comparativo inter-colegial, Alajuela 2009. *ODOVTOS-International J Dent Sci*. 2010; 12: 15-21.
12. Villanueva-Cabezas J.P., Winkel K.D., Campbell P.T., Wiethoelter A., Pfeiffer C. One Health education should be early, inclusive, and holistic. *Lancet Planet Heal* . 2022; 6 (3): e188-9.
13. Ferreira J.M.S., Massoni A.C. de L.T., Forte F.D.S., Sampaio F.C. Conhecimento de alunos concluintes de Pedagogia sobre saúde bucal. *Interface-Comun Saúde, Educ* . 2005; 9 (17): 381-8.
14. Reddy V., Bennadi D., Gaduputi S., Nandita K., Siluvai S., Venkata C., et al. Oral health related knowledge, attitude, and practice among the pre-university students of Mysore city. *J Int Soc Prev Community Dent* . 2014; 4 (3): 154.
15. Macek M.D., Manski M.C., Schneiderman M.T., Meakin S.J., Haynes D., Wells W., et al. Knowledge of Oral Health Issues Among Low-Income Baltimore Adults: A Pilot Study. *J Dent Hyg* . 2011; 85 (1): 49-56.
16. Tascón J.E., Cabrera gustavo A. Creencias sobre caries e higiene oral en adolescentes del Valle del Cauca. *Colomb Med* . 2005; 36 (2).
17. Ostberg A.-L., Jarkman K., Lindblad U., Halling A. Adolescents' perceptions of oral health and influencing factors: a qualitative study. *Acta Odontol Scand* . 2002; 60 (3): 167-73.
18. Stenberg P., Håkansson J., Åkerman S. Attitudes to dental health and care among 20 to 25-year-old Swedes: Results from a questionnaire. *Acta Odontol Scand*. 2000; 58 (3): 102-6.