



CLINICAL RESEARCH:

Knowledge, Attitudes and Practices Related to Oral Health in Participants of the Institutional Program for the Inclusion of People with Cognitive Disabilities in Higher Education at the University of Costa Rica

Conocimientos, actitudes y prácticas relacionadas con la salud oral en participantes del Programa Institucional de Inclusión de Personas con Discapacidad Cognitiva a la Educación Superior de la Universidad de Costa Rica

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ABSTRACT: People with cognitive disabilities face multiple challenges concerning oral health and frequently show oral tissue decay because of the barriers society imposes upon them, and due to financial issues, professional and family lack of knowledge, limitations regarding access to services, lack of empowering-driven actions, among others. Positive knowledge, attitudes and practices regarding oral health, developed during the course of a lifetime, help in preserving good health. The aim of the current study is to describe oral health knowledge, attitudes and practices in people with cognitive disabilities participating in the Institutional Program for the Inclusion of People with Cognitive Disabilities in Higher Education at the University of Costa Rica (PROIN, in Spanish), during 2021. A descriptive study with mixed focus was performed; a representative sample comprised of 86 students enrolled in PROIN was used for the quantitative approach, while the qualitative approach used a criteria sample along with an opinion sample, limiting size due to information overload. The survey, along with its corresponding questionnaire and the semi-structured interview, were used as data gathering techniques. It was evidenced that certain issues need to be readdressed, such as bleeding gums, the importance of preserving dental pieces, as well, the practice of flossing, which many students expressed difficulties doing. Good attitudes were



found, such as dentist visits; however, access barriers for this population must be overthrown. This article showed the importance of training professionals in disabilities as well as developing oral health promotion programs aimed at people with cognitive disabilities.

KEYWORDS: Oral health; Intellectual disability; Cognitive disability, Public health; Knowledge; Attitudes; Practices.

RESUMEN: La población con discapacidad cognitiva enfrenta múltiples retos en cuanto a la salud oral, presentado comúnmente un deterioro de los tejidos orales; esto como consecuencia a las barreras impuestas por la sociedad, factores económicos, desconocimiento de los profesionales y familiares, limitaciones en el acceso a la atención, falta de acciones para fomentar su autonomía, entre otras. Los conocimientos, actitudes y prácticas favorables en salud oral ayudan a conservar una buena salud, los cuales se desarrollan a lo largo de la vida. El objetivo del presente estudio es describir los conocimientos, actitudes y prácticas de salud oral en las personas con discapacidad cognitiva que participaron en el Programa Institucional de Inclusión de Personas con Discapacidad Cognitiva a la Educación Superior de la Universidad de Costa Rica (PROIN) durante el año 2021. Se realizó un estudio descriptivo con un enfoque mixto, para el enfoque cuantitativo se utilizó una muestra representativa de 86 estudiantes matriculados en PROIN y para la parte cualitativa se utilizó una muestra por criterio con un muestreo opinático, estableciendo el tamaño por saturación de la información. Se utilizaron como técnicas de recolección de datos la encuesta con su respectivo cuestionario y la entrevista semiestructurada. Se evidenció que existen temas que se deben reforzar, como lo es el sangrado de encías, la importancia de conservar las piezas dentales, así como la práctica de uso de hilo dental, donde la mayoría de los estudiantes expresaron tener dificultades para su utilización. Además, se encontró buenas actitudes con respecto a la visita al odontólogo, sin embargo, se debe derribar barreras de acceso que se presentan para esta población. Este estudio demostró la necesidad de capacitar a los profesionales en el tema de discapacidad y desarrollar programas de promoción de la salud oral específicos para personas con discapacidad cognitiva.

PALABRAS CLAVES: Salud oral; Discapacidad intelectual; Discapacidad cognitiva; Salud pública; Conocimientos; Actitudes; Prácticas.

INTRODUCTION

Globally, people with cognitive disabilities show unfavorable academic and health results, along with lesser financial participation and higher poverty rates when compared to people without disabilities (1). The aforementioned relates closely with social determinants of health, considered as the conditions in which people are born, grow, work, live, and age, and the wider set of forces and systems shaping the conditions of daily life, such as wealth, power and resource distribution, as well as policies in each region and their health systems (2).

Regarding cognitive disabilities, there are functioning limitations that expresses in specific social setting, highlighting the importance for individual support tailored to each needs (3). There are, however, insufficient policies, guidelines and programs, such as, beliefs and prejudice towards this population; poor quality in the rendering of services from professionals, lack of information and accessibility, as well as lack of job opportunities (4).

Oral health is a major component of general health, since many or severe oral diseases will affect people's health and quality of life (5). The World Health Organization (WHO) has pointed out that people with disabilities are less likely to access dental health compared with people without disabilities. Barriers imposed by society, economic factors and the unawareness from professionals and families regarding the oral healthcare, are part of the main explanations (6).

Additionally, oral hygiene of people with cognitive disabilities is deficient, causing health problems, such as, cavities, periodontal disease and tooth loss. This is also linked to the degree

of disability, socioeconomic position and financial income (7).

Oral diseases are largely preventable, and despite of this, they continue to be a major public health challenge (8). Moreover, upstream health promotion strategies can be developed for the benefit of the people with cognitive disabilities (9).

The Institutional Program for the Inclusion of People with Cognitive Disabilities in Higher Education at the University of Costa Rica (PROIN) was created in 2009 due to the lack of social and academic development for people with cognitive disabilities in Costa Rica. This program promotes inclusion and quality of life improvement for this population. It is comprised of adults with moderate or high cognitive disability, i.e., people that require support in areas, such as, communication, personal care, daily life, social skills, use of community resources, self-reliance, health and security, functional academic skills, recreation and work. The degree of support varies according to the individual needs (10).

In 2014, the Dentistry School of the University of Costa Rica created the Dentistry Comprehensive Care Project for People with Disabilities (PRACIOD, for its Spanish acronym), aimed at raising awareness in the general population regarding disability issues, as well as in the importance of promoting and protecting oral health. In order to teach about oral health and drive inclusiveness for this population in the university, PRACIOD supports PROIN with an optional course on oral health.

The objective of this study is to describe the oral health knowledge, attitudes and practices in people with cognitive disabilities enrolled in PROIN during 2021.

METHODS

A descriptive study with a mixed approach, both quantitative and qualitative (11) was performed in the campus Rodrigo Facio of the University of Costa Rica, between February and August 2021.

The study population included the official list of the students enrolled in PROIN during the first semester of 2021 (N=102). The quantitative approach used a representative sample of 86 students; the sample size was estimated for a 95% interval confidence and 5% margin of error, plus 10% for possible non-answer, in a simple random probabilistic sample. Inclusion criteria were: being students in PROIN and agreeing to participate in the study. No exclusion criteria was considered, since PROIN has an internal selection processes for students. Admission requirements include having moderate or severe cognitive disability, being 18 to 35 years old, and having oral comprehension and expression, and good interpersonal relationships.

A semi-structured interview and a questionnaire created by the authors was applied in order to obtain information about the student's oral health. This was performed virtually through Zoom videoconference platform for each participant. It is worth noting that the students were already familiar with the platform thanks to its usage during all 2020.

The variables considered socio-demographic characteristics, age, gender (woman/men), province (San José/Alajuela/Cartago/Heredia/Guanacaste/Puntarenas/Limón), canton, public healthcare coverage (Yes/No) and type of dental clinic (public/private). Knowledge and attitudes included fear of visiting a dentist (No/Yes, a lot/Yes, a bit), importance of flossing (Very important/Somewhat important/Not important), importance of visiting a dentist when in pain (Yes/No), importance of visiting a dentist when gums bleed (Yes/No), impor-

tance of visiting a dentist for check-ups (Yes/No), importance of visiting a dentist when there is tooth fracture (Yes/No), importance of visiting a dentist for orthodontics (Yes/No), bad oral hygiene consequences (Cavities [Yes/No], bleeding gums [Yes/No], Bad breath [Yes/No], pain, loss of teeth [Yes/No]), importance of teeth and participation of oral health class (Yes/No). Practices included toothbrushing (After every meal/ Twice a day/ Three times a day/ Once a day), assistance needed when brushing teeth (Every day/ Someday/ Never), use of dental floss (Never/ Almosts never/ Some days/ Everyday), use of mouthwash (Never/ Almosts never/ Some days/ Everyday), last dentist appointment (Less than 6 months ago/ From 6 months to a year ago/ >1 year but < 2 years ago/ ≥ 2 years but < 5 years ago/ ≥ 5 years ago/ I do not remember or I do not know) and reason of last dentist appointment (Treatment follow-up/ Pain or problem in teeth, gums or mouth/ Routine check-up/ I do not remember).

Quantitative information was analyzed using descriptive statistics, according to the nature of each variable. Additionally, the Fisher or Pearson's Chi-Square test were used according to the expected frequencies (5% significance level) through STATA version 14. The qualitative analysis plan was descriptive and interpretative (12).

The qualitative approach used a criteria sample, with an opinion sample (12). Feasibility of contacts, accessibility and the student's interest to participate were considered for a total of 21 participants.

ETHICS AND DATA

The study had the approval of the Scientific Ethical Committee of the University of Costa Rica (CEC-154-2021). Informed consent was acquired directly from each participant, as they were of legal age, besides was obtained in the presence of a witness and the researcher.

RESULTS

Table 1 shows the descriptive statistics. Women comprised 53.49% of PROIN students, with an average age of 28.97 ($\pm 6,57$). Most students reside in the Greater Metropolitan Area; 76.74% live in San José. Regarding canton, San José Central and Desamparados prevail. On the other hand, 86.05% confirmed having public healthcare coverage and 56.76% of those confirmed visiting private dental practices (Table 1).

Regarding knowledge and attitudes, Table 2 shows how most students state the importance of visiting the dentist in case of pain, bleeding gums, check-ups, dental fractures and orthodontics. However, bleeding gums or orthodontics were considered less important when compared to the other issues.

Also, when discussing the consequences of poor oral hygiene, such as cavities, bleeding gums, bad breath and the loss of teeth, it is evident that most students know that one consequence of a poor oral hygiene is cavities, while pain and the loss of teeth are less frequent (Table 2).

On the other hand, 19.77% of the participants considered bleeding gums, while teeth brushing, normal. The 16,28% of the participants stated that it is not necessary to visit a dentist if gums bleed, which leads to believe in its normalization, instead of an indication of poor oral hygiene.

Moreover, 54.65% of the students stated their gums bleed some days or always, matching what one the participants said.

“My gum bleeds here -pointing at lower anterior teeth- when I eat and brush. I have not gone to the dentist.” (PROIN student 9).

Regarding oral health knowledge and concerning the function of the teeth, they stated they are for eating, chewing and talking, as the following student said.

“Well, to eat, to chew or to speak.” (PROIN student 12).

Additionally, other students showed greater knowledge in this topic, providing more complete and specific answers, considering the function of the teeth according to the tooth, as the following example shows:

“So the tooth is for chewing, others are for grinding, crushing and others for eating and once it is shredded maybe even for swallowing, but the first three teeth are the ones in the center, these three here are for crushing, the ones on this side are for grinding. To speak, to smile, a bunch of things.” (PROIN student 16).

Fifty-one point sixteen percent of the participants have taken the oral hygiene course given by PROIN and, out of those enrolled, 86.46% have taken the course once. The students showed there was a significant statistical correlation between taking the class and the knowledge of normalizing bleeding gums. (Fisher Test, $p=0,04$).

Most students were not afraid of visiting the dentist ($n=59$, 68.60%), while 91.86% stated that the treatment received was good or very good. However, during the qualitative approach, some said they feared the visit at some point, fear which they eventually overcame, as the following student states:

“First time I visited the dentist I feared the small machines, feared all equipment and all that, and eventually grew calmer, and losing my fear, and getting more comfortable.” (PROIN student 12).

Regarding oral health practices, 100% of the students use toothbrush and toothpaste. Participants stated to use these in their daily oral care, as described here:

“First I wash the toothbrush, then take the paste, place it, brush my teeth and wash the brush, then sometimes I take the mouthwash

(participant states the brand), gargle, close, throw and clean my mouth with a small wipe. I wash everything, even the tongue” (PROIN student 4).

Also, as shown in Table 3, 41.86% brush their teeth 3 times per day. The frequency between brushing and bleeding gums showed a correlation with statistical significance. (Fisher Test, $p=0,03$).

Table 1. Socio-demographic characteristics of the people with cognitive disabilities participating in the Institutional Program for the Inclusion of People with Cognitive Disabilities in Higher Education at the University of Costa Rica (n=86).

Socio-demographic characteristics	Frequency	Percentage
Age* (Median value and interquartile range)		28 (24-33)
Gender		
Women	46	53.49
Men	40	46.51
Province		
San José	66	76.74
Cartago	9	10.47
Heredia	9	10.47
Alajuela	1	1.16
Limón	1	1.16
Public Healthcare Coverage		
Yes	74	86.05
No	3	3.49
N/A	9	10.47
Type of Dental Clinic		
Private	51	59.30
Public	34	39.53
N/A	1	1.16

* Shapiro-Francia $p=0,03$.

Table 2. Knowledge and attitudes regarding oral health of the people with cognitive disabilities participating in the Program for the Inclusion of People with Cognitive Disabilities in Higher Education at the University of Costa Rica (n=86).

Knowledge and attitudes regarding oral health	Frequency	Percentage
Fear of visiting a dentist		
No	59	68.60
Yes, a lot	9	10.47
Yes, a bit	18	20.93
Importance of flossing		
Very important	53	61.63
Somewhat important	15	17.44
Not important	16	18.6
N/A	2	2.33
Importance of visiting a dentist when in pain		
Yes	77	89.53
No	9	10.47
Importance of visiting a dentist when gums bleed		
Yes	72	83.72
No	14	16.28
Importance of visiting a dentist for check-ups		
Yes	77	89.53
No	9	10.47
Importance of visiting a dentist when there is tooth fracture		
Yes	77	89.53
No	9	10.47
Importance of visiting a dentist for orthodontics		
Yes	62	72.09
No	24	27.91
Identifying bad oral hygiene consequences		
Cavities		
Yes	80	93,02
No	6	6,98
Bleeding gums		
Yes	74	86,05
No	12	13,95
Bad breath		
Yes	75	87,21
No	11	12,79
Pain		
Yes	66	76,74
No	20	23,26
Loss of teeth		
Yes	71	82,56
No	15	17,44
Participation in the Oral Health Class		
Yes	44	51.16
No	42	48.84

Table 3. Oral health practices in people with cognitive disabilities who are part of the Institutional Program for the Inclusion of People with Cognitive Disabilities in Higher Education at the University of Costa Rica, 2021 (n=86). Oral health practices Frequency Percentage

Oral health practices	Frequency	Percentage
Toothbrushing		
After every meal	25	29.07
Twice a day	21	24.42
Three times a day	36	41.86
Once a day	4	4.65
Assistance needed when brushing teeth		
Every day	1	1.16
Some days	78	90.70
Never	7	8.14
Use of dental floss		
Never	41	47.67
Almost never	3	3.49
Some days	31	36.05
Everyday	11	12.79
Use of mouthwash		
Every day	38	44.19
Some days	26	30.23
Almost never	5	5.81
Never	17	19.77
Last dentist appointment		
Less than 6 months ago	21	24.41
From 6 months to a year ago	9	10.47
>1 year but < 2 years ago	22	25.58
≥ 2 years but < 5 years ago	14	16.28
≥ 5 years ago	14	16.28
I do not remember / I do not know	6	6.98
Reason of last dentist appointment		
Treatment follow-up	15	17.44
Pain or problem in teeth, gums or mouth	34	39.53
Routine check-up	35	40.70
I do not remember	2	2.33

In regard to the assistance that PROIN students require while toothbrushing, a 90.7% stated never requiring help to do it. Despite being a daily practice, it can represent certain difficulty to some people and they may require help from another person (9.3%), which can be seen as a barrier if help is not available, just like the following statement provided by a student:

"I brush my teeth in the morning and at night. My mother has to help me because it is difficult for me." (PROIN student 10).

It is important to highlight that students' mothers play a vital role in oral health support, toothbrushing and dentist visits (87.5 %), as illustrated by the following case:

"I go to the dentist, I go with my mom." (PROIN student 12).

On one hand, 61.63% of students consider it is very important to use dental floss on a daily basis. However, 41.67% never includes it as part of their dental hygiene. Among the reasons stated for not doing so, 54.35% stated it was difficult to use, their lack of knowledge on how to use it, and its high price.

The aforementioned figures match the barriers to dental floss use quoted in the interview:

"I do not use dental floss because I forget. It is difficult; for me it is." (PROIN student 13).

"I also have a little difficulty using floss, but my mother helps me use it." (PROIN student 21).

"Because we cannot afford it, and it is difficult to use." (PROIN student 9).

A common oral and dental health practice in this demographic is the use of mouthwash. A total of 44.19% stated using mouthwash on a daily basis.

Twenty five point fifty eight percent of students visited a dentistry professional at least once, but less than twice, in a period of over 12 months. In regards to the reason for their last dentist appointment, 39.53% stated they attended due to pain or oral problem. Among the motives for not visiting the dentist, the students explained in their interviews that one of the main reasons was the pandemic, because the availability of oral health services was reduced in both public and private dental practices. The pandemic also affected their household incomes, as reported by these students:

"I always had a good experience, never missed an appointment, because I called the clinic. Before the pandemic we could book appointments by phone, but now, as you see, going to a dentist now is difficult because of Covid." (PROIN student 5).

"Due to all that has happened with the pandemic... I was supposed to go to the doctor for a dental check-up and cleaning, and because of the pandemic the clinic was closed and besides there is no money for it." (PROIN student 8).

A statistically significant relationship was found between the last dentist visit and having public health insurance (Fisher's exact test, $p=0.04$). Concerning their last dentist visit, 61.63% reported having very good experiences in the service received. However, while gathering more specific information through qualitative interviews, it became obvious that although the experience was positive overall, there is still room for improvement, as stated by the following student:

“When I went to the dentist with my mom, when she called me, I asked her if my mom could come with me, and then she closed the door and said my mom could not enter the room, that only I could. Then, when she started the treatment, she covered my mouth and told me not to scream. She said if I screamed, I would be sorry for it. And that is why I did not go back to my family dentist, because she was very mean. She took out the wrong molar; it made me feel very sad, scared and nervous. Now I go to a different dentist, one who is a very good and special person because he has experienced treating children and has had the patience that the other dentist did not have.”
(PROIN student 3).

As it can be observed from the case mentioned above, this demographic can be subject to infantilization, which limits their access to dental services. In addition, to improve the quality of the experience in dentist visits, it is important to help the patient become familiar with the dental professional and routine procedures, which can even combat fear, as narrated by the following student:

“They always do a cleaning; at first I was afraid, but then I got used to it. (PROIN student 12).”

On the other hand, 30.23% of students explained they have had permanent teeth extracted before, excluding their third molars (Shapiro-Francia test $p < 0,05$) the median being 2 (RI 2.5-1.0). Out of these students, 65.38% state no replacement was made for the missing dental pieces. The following student narrates his experience with the loss of dental pieces and their subsequent replacement:

“I now have a fixed bridge and I like eating a bit of everything. Before I did not have those teeth; now I can have a picture taken and smile comfortably. Previously, I felt ashamed to smile; I would feel embarrassed often. I have always enjoyed having pictures taken, but I felt uncomfortable.” (PROIN student 12).

DISCUSSION

This study showed a good knowledge, attitudes and practices related to oral health among PROIN students. However, certain issues need to be readdressed, such as bleeding gums, the importance of preserving dental pieces, as well as, the practice of flossing, which many students expressed difficulties doing. Good attitudes were found, such as dentist visits; still, access barriers for this population must be overthrown.

The information provided above matches previous evidence; tooth loss reported by PROIN students and the failure to replace them is concerning due to the impact it has on their quality of life, from the physiological, psychological and social points of view (13). González *et al.* (14) showed that tooth loss result in difficulties to chew and, consequently, it can affect digestion, cause difficulties to socialize in a comfortable way because their diction and phonation can be altered, plus aesthetic consequences that can affect the emotional state, self-esteem and even influence their social relationships.

It is worth to note the positive attitude of PROIN students towards the importance of dentist appointments, although some of them stated their

last dentist visit was due to pain or oral issue, which is something very common in the general population. Most people go to the dentist only when their teeth or oral structures are already damaged or when they are experiencing pain (15). Nonetheless, the current paradigm lies on the benefits of prevention of oral health issues and their complications, obtaining a greater well-being through appropriate and timely dental care services, while representing a lower financial investment (15).

Over time, people with disabilities have received little oral health care and, in some cases, the service has not been provided appropriately. Navas y Mogollón (16) state that people with cognitive disabilities are less likely to receive dental care than people with no disabilities; in fact, they note that, in some cases, the care provided to these people is not the same quality or not provided correctly. In addition, the comprehensive health aspects for this demographic group do not include their oral rehabilitation (16).

In terms of attending private dental practices, this article goes along with the overall private care usage in the country. According to Castillo and Murillo (17), by the year 2006, 73% of all dentist visits happened at private practices and only 27% were provided by the public healthcare system (the Costa Rican social security fun, CCSS for its Spanish acronym) in hospitals, clinics and health departments.

The pandemic was mentioned among the barriers to dental care services, widely affecting the oral health area. On this topic, Segura (18) explains that dental care through CCSS was reduced due to the COVID pandemic, with emergencies and imperative oral needs being the only services provided at the beginning of this health emergency.

Although this article did not identify fear as one of the barriers to dentist visits by PROIN students, it was mentioned that fear was present at a certain point and it is important to address it. As explained by Márquez *et al.* (19), many people mention fear as a motive to avoid going to dental appointments regularly, and this feeling can even hinder dental care in a great number of people, even keeping them from getting the dental treatment needed altogether.

On the other hand, it was concluded that the patient's mother is the main support person in different scenarios of oral health care, revealing that, culturally, mothers have had the responsibility to meet their family needs (20).

Another finding worth highlighting is the issue of bleeding gums since it is considered an important clinical sign of periodontal disease: a chronic swelling in the gums caused mostly by a build-up of supragingival and subgingival biofilm (21), which can be prevented with good oral hygiene practices.

Concerning the use of dental floss daily, Varela *et al.* (22) also conclude that most participants do not use it, even though it is the most effective interdental cleaning practice. Dental floss is essential to keep a proper oral hygiene by eliminating dental biofilm and food remains from the interdental space, an area that is difficult to reach through tooth brushing; this is the reason why dental floss must complement tooth brushing (23).

Similarly, add-ons like the dental floss holder have been made available to facilitate dental floss use because it has been noted that this task can be difficult to most people. These accessories have proven to be helpful to people learning how to floss, to those with limited dexterity, to people in

charge of cleaning another person's teeth and to people with a disability (22). In some cases, interdental brushes have proven to be effective when implemented to keep these areas clean. However, its use depends on the particular characteristics of the patient (24).

Developing training spaces for promoting oral health in people with cognitive disabilities is essential to improve knowledge, healthy attitudes, and proper oral health practices to benefit their quality of life; it is vital to provide them with the necessary tools to achieve an optimal condition. Both, experience and research, have demonstrated that the implementation of proper educational techniques, people with cognitive disabilities are able to acquire skills, and that is why all the necessary support must be provided for them (26).

One of the limitations of this study is the self reported, there was no clinical verification of oral health conditions, therefore, the results must be read in the light of this information collection technique.

Among the strengths of this study are the use of the mixed approach, helping to strengthen the investigative process, and the contribution of oral health information for the population with disabilities, as well this study represents a precedent at the local level for the benefit of the health and quality of life for the population with cognitive disabilities.

CONCLUSION

Actions are currently taken to promote oral health in people with cognitive disabilities in Costa Rica, e.g. the ones taken by the University of Costa Rica Dentistry School and PROIN. However, more initiatives have to be developed to drive autonomy and empowerment in people with cognitive disabilities, insomuch as to influence their oral health: increasing their knowledge in oral health, driving

positive attitudes and providing tools for their healthy practices. In addition, health professionals must be trained about disabilities in order to provide them with the necessary tools to properly address this population. Along with interdisciplinary work, it could improve and create a positive environment for oral health, both for people with disabilities as for those who surround them.

The oral health course provided by PROIN in collaboration with the Dentistry School could play an important role as a knowledge enabler concerning oral health. Therefore, it is important to drive the PROIN student's participation in it. It is also essential to drive practices such as flossing and frequent visits to the dentist.

Developing personal attitudes for a better personal health control is vital. Thus, the diverse participants must be trained in order to build oral health multipliers. Work must be focused on the individual and their background, considering that everybody has different characteristics.

The findings in this study could help to develop a strategy to improve the oral health of people with cognitive disabilities, since it requires specific oral health programs that include health promotion, disease prevention and comprehensive care in order to satisfy the needs of this population. Dental care is an important part of the right to health because having a healthy mouth is strictly related to having a healthy body.

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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.

AUTHOR CONTRIBUTION STATEMENT

Conceptualization and design: A.G.H.; J.T.M and R.A.P

Literature review: A.G.H. and J.T.M.

Methodology and validation: A.G.H.; J.T.M. and R.A.P

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