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ORIGINAL ARTICLE

ORAL HEALTH INFORMATION AND ACCESS TO DENTAL CARE IN PERUVIAN CHILDREN: A STUDY OF A NATIONAL HEALTH SURVEY DATABASE

Información sobre salud bucal y acceso a la atención dental en niños peruanos: un estudio de una base de datos de encuestas nacionales de salud

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ABSTRACT

Introduction: Certain diseases of the oral cavity are associated with adopting inadequate health behaviors, where oral health information plays an essential role in preventing these conditions.

Objectives: To analyze the association between access to dental care and oral health information in Peruvian children.

Material and Methods: This research employed a cross-sectional design utilizing data from the 2021 Demographic and Family Health Survey database. The study focused on records of children under 12 who provided information regarding their access to oral health information. Independent variables encompassed access to dental care, time since the last care, and the place of care, with additional inclusion of covariates. Descriptive evaluations of the variables were conducted, followed by bivariate and multivariate analyses using Poisson regression. The statistical significance was established at a 95% confidence level, with p-value <0.05.

Results: Access to oral health information was oral health was 44.66% (n=11262); on the other hand, access to dental care reached 55.77% (n=13007), 12.37% (n=1507) expressed that their care was within the last two years and the main place of care was the Peruvian Ministry of Health with 45.51% (n=7396). Natural region, area of residence, place of residence, altitude, wealth index, health insurance coverage, and age were associated with access to oral health information. Access to oral health information showed a significant association with access to dental care (aPR: 1.72; 95%CI:1.59-1.86; *p*<0.001).

Conclusions: Peruvian children's access to dental care services and the time elapsed since the last dental care are associated with receiving information on oral health. Receiving care at the Social Health Insurance system was negatively associated.

Keywords: *Health services accessibility; Dental care; Health education; Child; health surveys; Demography.*

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RESUMEN

Introducción: Ciertas enfermedades de la cavidad bucal se asocian con la adopción de hábitos de salud inadecuados, donde la información sobre salud bucal desempeña un papel esencial en la prevención de estas afecciones.

Objetivos: Analizar la asociación entre el acceso a la atención odontológica y la información sobre salud bucal en niños peruanos.

Material y métodos: Esta investigación empleó un diseño transversal utilizando datos de la base de datos de la Encuesta Demográfica y de Salud Familiar de 2021. El estudio se centró en los registros de niños menores de 12 años que proporcionaron información sobre su acceso a información sobre salud bucal. Las variables independientes abarcaron el acceso a la atención odontológica, el tiempo transcurrido desde la última atención y el lugar de la atención, con la inclusión adicional de covariables. Se realizaron evaluaciones descriptivas de las variables, seguidas de análisis bivariados y multivariados mediante regresión de Poisson. La significancia estadística se estableció con un nivel de confianza del 95%, con un umbral de valor p<0,05.

Resultados: El acceso a información sobre salud bucal fue del 44,66% (n=11262); Por otro lado, el acceso a atención odontológica alcanzó al 55,77% (n=13007), el 12,37% (n=1507) expresó que su atención fue en los últimos dos años y el principal lugar de atención fue el Ministerio de Salud del Perú con un 45,51% (n=7396). La región natural, el área de residencia, el lugar de residencia, la altitud, el índice de riqueza, la cobertura del seguro de salud y la edad se asociaron con el acceso a información de salud bucal. El acceso a información de salud bucal mostró una asociación significativa con el acceso a atención odontológica (aPR: 1,72; IC95%:1,59-1,86; p<0,001).

Conclusiones: El acceso de los niños peruanos a los servicios de atención odontológica y el tiempo transcurrido desde la última atención odontológica se asocian con recibir información sobre salud bucal. Recibir atención en el sistema de Seguro Social de Salud se asoció negativamente.

Palabras clave: *Accesibilidad a los servicios de salud; Atención odontológica; Educación en salud; Niños; Encuestas epidemiológicas; Demografía.*

INTRODUCTION

Approximately half of the world's population suffers from diseases of the oral cavity, and 3 out of 4 of those affected live in low- and middle-income countries, with an increase in the global burden of this type of disease. Accordingly, inequities in timely access to dental health services are persistent, with greater emphasis on the most disadvantaged and vulnerable communities.[1] Factors related to the potential use of dental services include travel time, choice of provider, convenience, quality, and cost of care.[2] In Peru, the characteristics related to children's access to dental care have been evaluated, with the primary determinants being wealth index, educational level of caregivers, natural region of residence, and age.[3]

On the other hand, some diseases of the oral cavity are associated with the adoption of inadequate health behaviors, which in part can be prevented by adopting healthy lifestyles; given this, the emergence of health education (HE) as a strategy to promote positive changes in the short term stands out. Oral HE is an instructive process that seeks to produce or modify people's attitudes through the delivery of information that generates knowledge to maintain or improve health, highlighting that patients' self-management is encouraged to relieve

the tension of the health system.[4,5] However, some reports state that this intervention is ineffective against dental caries.[6,7] The World Health Organization estimates that the global average prevalence of dental caries in deciduous teeth is 43%. This percentage rises to 46% in middle-income countries, while the highest cases are concentrated in lower-middle-income nations.[8]

Critical factors associated with limited access to dental care include inadequate daily health practices, limited use of fluoridated water, and limited knowledge about oral health.[9] Conversely, the association between the utilization of dental health services and this latter factor remains limited in Peru. In recent years, only slightly more than half of the national population has received information on oral care and hygiene.[10]
It is crucial to generate further scientific evidence that comprehensively investigates this issue, its underlying characteristics, and whether access to oral health services is a contributing factor. Therefore, this research aimed, from a confirmatory study perspective, to analyse the association between access to dental care and oral health information among Peruvian children.

MATERIALS AND METHODS

Study design, selection, and description of participants

A cross-sectional study was carried out using a population extracted from the 2021 Demographic and Family Health Survey (ENDES) database, conducted annually by the National Institute of Statistics and Informatics (INEI) of Peru. On this occasion, only the records corresponding to children under 12 years old were considered, amounting to a total of 143,486 records; however, some subjects did not respond to the study variables, so the final sample size reached 24,643 records linked to the response about access to information on oral health. Regarding the selection criteria, records that included responses to variables irrelevant to the study and those with incomplete or incorrect information were excluded.

Regarding the variables considered in this study, access to oral health information on oral health was defined as a dependent variable. In contrast, access to dental care (yes/no), time since last dental care (less than 2 years/from 2 to more years), and the place of dental care were considered as independent variables; about the latter, it should be mentioned that in Peru, there are public health facilities such as the Ministry of Health (MINSA), Social Health Insurance (EsSALUD), the Armed Forces (FF.AA) and police (PNP); and those concerning the private sector.

In addition, some covariates were incorporated, such as natural region, which included Metropolitan Lima, the rest of the coast, highlands, and jungle; area of residence, divided into urban and rural areas; place of residence, which could be classified as capital, city, town or countryside; altitude, defined as less than 2500 meters above mean sea level (MAMSL) or from 2500 MAMSL and above; wealth index, conceptualized as the accumulative capacity of each household, evaluated from its willingness to use goods and services; where, using a formula used by the Demographic and Health Surveys Pro-gram of the United States, a valuation was assigned to each household, and the same to each of its inhabitants, allowing them to be classified in quintiles, from very poor to very rich.[11,12]
Finally, health insurance coverage, sex, and

age were included, the latter organized as 0 to 5 and 6 to 11 years.

Procedures, techniques, and statistics

The databases analyzed were downloaded from the official INEI website (https://proyectos.inei.gob.pe/microdatos/). With this unified database, the incomplete records were purged. Then, the statistical analysis was performed, establishing a confidence level of 95% and a value of $p<0.05$ as an indicator of statistical significance in all tests. First, a descriptive evaluation of each variable was carried out to obtain their absolute and relative frequencies; then, a bivariate analysis was performed to evaluate the association of the study variables using the Chi-square test.

Table 1.
Access to oral health information, access to dental care and characteristics of children under 12 years old in Peru, 2021.

Variables		Absolute frequency (No)	Relative frequency (%)
Access to oral health information	Yes	11262	44.66
	No	13381	55.34
Access to dental care	Yes	13007	55.77
	No	11636	44.23
Time since last dental care	Less than 2 years	1507	12.37
	From 2 to more years	11431	87.63
Place of dental care	Ministry of Health	7396	45.51
	Social Security (EsSalud)	1400	12.28
	Armed Forces/Police Forces	31	0.48
	Private sector	4170	41.73
Natural region	Metropolitan Lima	1635	29.65
	Rest of coast	4064	28.53
	Highlands	4344	25.57
	Jungle	3563	16.24
Area of residence	Urban	9311	77.53
	Rural	4295	22.47
Place of residence	Capital	1635	29.65
	City	3955	21.82
	Town	3721	26.06
	Countryside	4295	22.47
Altitude	Less than 2500 MAMSL	9958	78.71
	From 2500 MAMSL and above	3648	21.29
Wealth Index	Very poor	3577	20.12
	Poor	3420	23.13
	Medium	2606	22.56
	Rich	1964	18.88
	Very rich	1349	15.31
Health insurance coverage	With insurance	20363	77.75
	Without insurance	4280	22.25
Sex	Male	12607	69.03
	Female	12036	30.97
Age	From 0 to 5 years old	12670	47.53
	From 6 to 11 years old	11973	52.47

MAMSL: Meters above mean sea level.

In the case of multivariate analysis, Poisson regression was used to obtain crude prevalence ratios (PR) and adjusted prevalence ratios (aPR). It is noteworthy to highlight the utilization of the svy command, which enabled the generation of representative estimates by adhering to the survey design. This design involved recognizing sampling patterns based on strata, primary sampling units, and weights.

Ethics

Approval for conducting this research was granted by the Institutional Ethics Committee of the Universidad Peruana Cayetano Heredia (CIE-UPCH) on August 3, 2021. It is essential to clarify that the databases used are accessible to the public, and the information contained within them is coded to ensure the confidentiality and anonymity of the survey participants.

Table 2.

Access to oral health information according to access to dental care, time since last dental care, place of dental care and characteristics of children under 12 years old in Peru, 2021.

Variables		Access to oral health information				*p*-value*
		Yes		No		
		n	%	n	%	
Access to dental care	Yes	7474	54.41	5533	45.59	<0.001
	No	3788	32.37	7848	67.63	
Time since last dental care	Less than 2 years	1154	74.68	353	25.32	<0.001
	From 2 to more years	6295	51.77	5136	48.23	
Place of dental care	Ministry of Health	4240	52.51	3156	47.49	<0.001
	Social Security (EsSalud)	676	42.15	724	57.85	
	Armed Forces/Police Forces	17	29.47	14	70.53	
	Private sector	2536	60.55	1634	39.45	
Natural region	Metropolitan Lima	815	48.76	820	51.24	<0.001
	Rest of coast	1717	40.43	2347	59.57	
	Highlands	2194	47.76	2150	52.24	
	Jungle	1465	39.72	2098	60.28	
Area of residence	Urban	4276	46.15	5035	53.85	<0.001
	Rural	1915	39.51	2380	60.49	
Place of residence	Capital	815	48.76	820	51.24	<0.001
	City	1773	45.86	2182	54.14	
	Town	1688	43.43	2033	56.57	
	Countryside	1915	39.51	2380	60.49	
Altitude	Less than 2500 MAMSL	4330	43.7	5628	56.30	0.011
	From 2500 MAMSL and above	1861	48.21	1787	51.79	
Wealth index	Very poor	1531	39.98	2046	60.02	<0.001
	Poor	1476	40.20	1944	59.80	
	Medium	1177	44.81	1429	55.19	
	Rich	968	45.67	996	54.33	
	Very rich	784	60.46	565	39.54	
Health insurance coverage	With insurance	9488	45.88	10875	54.12	0.001
	Without insurance	1774	40.38	2506	59.62	
Sex	Male	5727	45.71	6880	54.29	0.058
	Female	5535	42.32	6501	57.68	
Age	From 0 to 5 years old	5857	47.41	6813	52.59	0.001
	From 6 to 11 years old	5405	42.16	6568	57.84	

MAMSL: Meters above mean sea level. **n:** Absolute frequency. **%:** Relative frequency. ***p*:** Statistical significance

Table 3.
Association between access to oral health information and access to dental care in children under 12 years old in Peru, 2021.

		Access to oral health information					
	Variables	**PR**	**95%CI**	***p*-value**	**aPRa**	**95%CI**	***p*-value**
Access to dental care	No	Ref.			Ref.		
	Yes	1.68	1.56-1.81	<0.001	1.72	1.59-1.86	<0.001
Time since last dental care	Less than 2 years	Ref.			Ref.		
	From 2 to more years	1.44	1.32-1.57	<0.001	1.36	1.24-1.48	<0.001
Place of dental care	Ministry of Health	Ref.			Ref.		
	Social Security (EsSalud)	0.80	0.67-0.96	0.013	0.78	0.64-0.94	0.008
	FF.AA. / PNP	0.56	0.22-1.45	0.232	0.60	0.23-1.59	0.306
	Private sector	1.15	1.06-1.26	0.001	0.60	0.29-1.59	0.306
Natural region	Metropolitan Lima	Ref.					
	Rest of coast	0.83	0.74-0.93	0.001	-	-	-
	Highlands	0.98	0.88-1.09	0.695	-	-	-
	Jungle	0.81	0.73-0.91	<0.001	-	-	-
Area of residence	Urban	Ref.					
	Rural	0.86	0.79-0.93	<0.001	-	-	-
Place of residence	Capital	Ref.					
	City	0.94	0.85-1.05	0.257	-	-	-
	Town	0.89	0.80-0.99	0.036	-	-	-
	Countryside	0.81	0.77-0.90	<0.001	-	-	-
Altitude	Less than 2500 MAMSL	Ref.					
	From 2500 MAMSL and above	1.10	1.02-1.19	0.010	-	-	-
Wealth index	Very poor	Ref.					
	Poor	1.10	0.91-1.12	0.917	-	-	-
	Medium	1.12	1.01-1.25	0.038	-	-	-
	Rich	1.14	1.02-1.28	0.022	-	-	-
	Very rich	1.51	1.36-1.68	<0.001	-	-	-
Health insurance coverage	With insurance	Ref.					
	Without insurance	0.88	0.80-0.97	0.008	-	-	-
Sex	Male	Ref.					
	Female	0.93	0.85-1.00	0.061	-	-	-
Age	From 0 to 5 years old	Ref.					
	From 6 to 11 years old	0.89	0.83-0.96	0.002	-	-	-

PR: Prevalence ratio. **aPR:** Adjusted prevalence ratio. **95% CI:** 95% confidence interval. **p:** Statistical significance. **a:** Adjusted by natural region, area of residence, place of residence, altitude, wealth index, health insurance coverage and age.

RESULTS

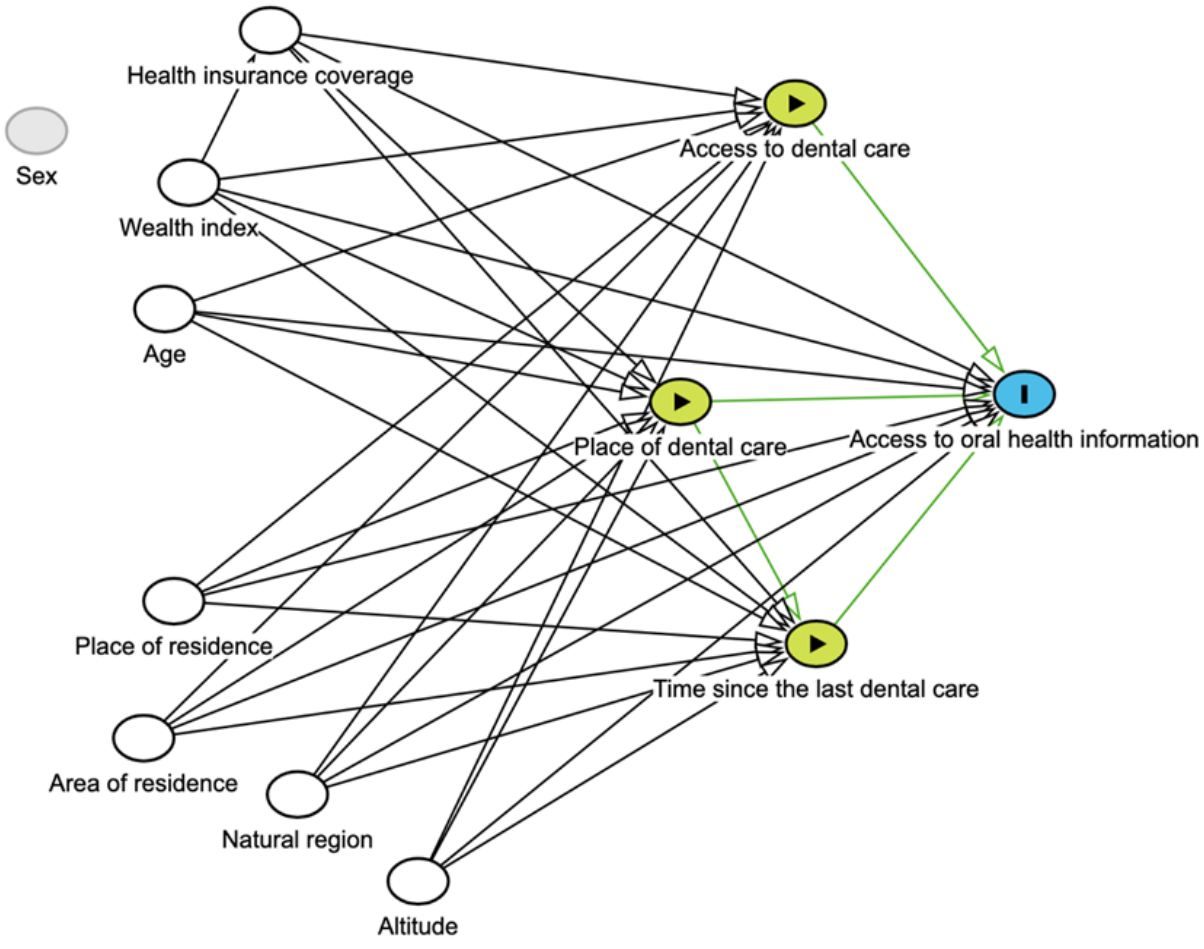
Access to information about oral health was 44.66% (n= 11,262); on the other hand, access to dental care reached 55.77% (n= 13,007), 12.37% (n= 1507) expressed that their care was within the last two years, and the main place of care was the Peruvian Ministry of Health with 45.51% (n=7396) (Table 1). According to the bivariate analysis, access to dental care, time since the last dental care, and place of care were associated with access to oral health information (p<0.05). Based on the natural region, only 48.76% (n=815) of children in Metropolitan Lima had access to oral health information.

This proportion decreases across other regions, with 40.43% (n=1717) of children in the remaining coastal areas, 40.76% (n=2194) in the highlands, and 39.72% (n=1465) in the jungle reporting access. Furthermore, when considering the area of residence, 46.15% (n=4276) of children residing in urban areas accessed this information, compared to 39.51% (n=1915) of those living in rural areas.

Likewise, natural region, area of residence, place of residence, altitude, wealth index, health insurance coverage, and age were associated with the variable access to oral health information (p<0.05) (Table 2).

Concerning the adjusted multivariate analysis, access to oral health information showed a significant association with access to dental care (aPR: 1.72; 95%CI: 1.59-1.86; p<0.001) and time since the last dental care (aPR: 1.36; 95%CI: 1.24-1.48; p<0.001); in addition, within the place of care, Social Health Insurance showed a significant asso-ciation (aPR: 0.78; 95%CI: 0.64-0.94; p<0.008), while the Armed Forces/ PNP (aPR: 0.60; 95%CI: 0.23-1.59; p<0.306) and the private sector (aPR: 0.60; 95%CI: 0.29-1.59; p<0.306) presented non-significant values. All the previously mentioned variables underwent adjustments for the characteristics where the association was identified (Table 3).

Figure 1.
Directed Acyclic Graph (DAG) with variable adjustment for the association between access to oral health information and access to dental care in Peruvian children.



DISCUSSION

Health literacy includes competencies individuals acquire for adequate development in a healthy environment, including the reception and understanding of information that will promote their health and well-being.[13] A relationship between oral health literacy (OHL) and oral health status has been documented, showing that a low level of OHL is associated with limited use of health services and poor oral health; in addition, poor oral health information represents an obstacle to prevention, diagnosis and timely treatment of oral pathologies, as well as a considerable economic impact due to the high costs involved.[14]
Likewise, the high prevalence of insufficient OHL among the most vulnerable communities may contribute to aggravating health care disparities.[15]

The findings of this research show that access to dental care in Peru is positively associated with receiving information on oral health in children under 12 years old. However, the number of children in this age group who promptly attend dental services has shown a downward trend over the last four years, and coincidentally, the receipt of information on proper oral health practices has demonstrated a similar situation.[16]

Concerning this, Torres-Mantilla *et al.*,[17] evaluated the use of oral health services in Peruvian children using the 2019 ENDES survey. In this analysis, they reported that only about one-third of the population studied used dental services, while less than half received information on hygiene or oral health care. The authors considered that providing this knowledge and being affiliated with an insurance company increases the probability of accessing dental health care.[17]

According to the study design used in both publications, it can be understood that the relationship and influence of both variables (access to oral health services - oral health information) are bidirectional. In addition, Garcés-Elías *et al.*,[10] determined the impact of the COVID-19 pandemic on access to oral health information in children living in Peru using the database of a nationally representative demographic survey.

They identified that the information collection decreased compared to the previous year, ascribing it to a possible effect of the health emergency and the provisions to contain the infection, which were established in the country in March 2020. Consequently, it can be identified that these restrictions not only aggravated the provision of timely dental care but also impacted the delivery of preventive services, including oral health information and counseling, where health facilities share these responsibilities.

In addition, this research found that the likelihood of accessing information increases when there is less delay in receiving dental care. In this regard, a study in India compared the perception of oral health, attitudes, and barriers to dental services in healthy children and children with different abilities. There were marked differences between the two groups regarding dental access and the frequency of previous dental care; however, although both populations faced various barriers to obtaining dental care, none received it promptly, delaying it for more than a year. The results appeared adequate concerning oral health knowledge and attitudes but highlighted discrepancies in oral hygiene practices;[18] this could be associated with delayed access to dental care and, consequently, less access to oral health information.

Likewise, Kyoon-Achan *et al.*,[19] reported, through a qualitative approach, the main challenges experienced by the indigenous population in Canada regarding the oral health of children under six years old, visualizing difficulties in accessing dental care about appointment scheduling and waiting lists, cost of procedures and poor insurance coverage. In addition, the interviewees mentioned that the only source of information on oral health was the health facilities, which would make access difficult due to the abovementioned factors.

The role played by the place of dental care on access to information was another significant aspect of this study, highlighting that those who attended the Peruvian Ministry of Health have a higher probability of receiving information related to oral health compared to other types of establishments, whether they are also in the public or private sector. In this regard, the Seguro Integral de Salud (SIS) is an entity attached to MINSA, which acts as an institution that administers health insurance funds, giving priority protection to the population living in poverty and extreme poverty in Peru.[20]
It should be mentioned that dental care is included in its coverage. As of 2019, the Peruvian government established the affiliation to the SIS of all residents of the country who do not have health insurance, regardless of their socioeconomic level.[21] However, developing countries, such as Peru, need more resources to implement strategies such as universal health insurance. Hence, implementing policies like the one mentioned above is complex and gradual.

This research was developed after the COVID-19 pandemic so that both access to oral health and oral health information in Peru could have been influenced by the significant impact that the health emergency had on countries at the international level, which could be reflected in the results of this study and therefore in the leading oral health indicators of the country.
The study has several limitations that warrant consideration. First, its cross-sectional design precludes the ability to infer causality from the associations or results observed. Second, the reliance on a database derived from nationwide surveys introduces potential inaccuracies due to the self-reported nature of the data.

Additionally, the study's low response rate further limits the generalizability of the findings and calls for careful interpretation of the results. However, this study contributes to the understanding of this problem that has been poorly evaluated according to the evidence available at the national level. Despite its limitations, the ENDES has demonstrated significant utility as a valuable tool across multiple disciplines, providing a comprehensive assessment of the health landscape within the country. Moreover, it has been consistently employed for over a decade, delivering essential data to inform research and policy development.

Finally, access to oral health information is an essential tool that contributes to maintaining adequate oral health. It provides individuals with knowledge that they will internalize to make appropriate decisions that positively affect their dental health and quality of life.
However, according to the findings, the Peruvian health authority should first guarantee timely access to dental services, especially in vulnerable populations such as children, whose situation is more complex because the responsibility for their health lies with their parents or caregivers.

It is recommended that policies aimed at improving these indicators involve the work of the dentist's parents and other participants, such as other healthcare human resources and personnel working in schools or other civil organizations. The findings of this study indicate that Peruvian children's access to dental care and the time elapsed since their last dental visit were positively associated with receiving oral health information.

Conversely, receiving dental care at the Social Security was negatively associated with obtaining such information. This association is influenced by specific contextual factors, including natural region, area of residence, place of residence, altitude, wealth index, health insurance coverage, and age.

CONFLICT OF INTERESTS

The authors declare no conflicts of interest.

ETHICS APPROVAL

The study received approval of the Institutional Ethics Committee of Universidad Peruana Cayetano Heredia (CIE- UPCH) SIDISI code No. 201950.

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AUTHORS' CONTRIBUTIONS

Natalie Hadad-Arrascue: Conceptualization, investigation, visualization, manuscript writing-original draft, writing-review & editing.

María Claudia Garcés-Elías: Data acquisition, curation, formal analysis, manuscript writing-original draft, manuscript writing-review & editing.

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