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Impact of Oral Conditions on Quality of Life in
Peruvian Preschoolers in Rural and Urban Areas

Impacto de las alteraciones bucales en la calidad de vida de
preescolares peruanos de zonas rurales y urbanas

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ABSTRACT: The objective of this study is to determine the impact of oral conditions on the quality of life related to the oral health of preschool children in a rural and urban area of Cusco. The study was descriptive and cross-sectional, from a population of 179 preschoolers aged 3 to 5 years, from two public early childhood education institutions, and their respective parents or caregivers in the department of Cusco, Peru. We worked with the entire population that met the inclusion and exclusion criteria, seventy-four preschool children were selected for each area, deciding to have the same amount of children per group based on the smallest group. A clinical odonto-stomatological examination was carried out for oral conditions (dental caries, malocclusion, and dental trauma) according to the WHO's criteria and a survey that was used for sociodemographic characteristics. In addition, a validated Peruvian version of the ECOHIS questionnaire was used to obtain data on the impact on quality of life. All the variables of the total and individual scores of the ECOHIS domains were analyzed individually and the Kruskal-Wallis test was used to determine the association between variables. The oral conditions prevalence in preschool children in rural areas referring to dental caries was 100% (dmft index > 6), dental trauma 10.8%, and malocclusions 60.8%; for the urban area dental caries was 93.2% (dmft index > 6), dental trauma 9.5% and malocclusions 36.5%. Of the three oral conditions only the experience of dental caries was related to the OHRQOL of preschoolers in urban and rural areas.

KEYWORDS: Quality of life; Dental caries; Malocclusion; Dental trauma; Preschool; Peru.

RESUMEN: El objetivo de este estudio es determinar el impacto de las alteraciones bucales en la calidad de vida relacionada con la salud bucal de niños preescolares de una zona rural y urbana de Cusco. El estudio fue descriptivo y transversal, de una población de 179 preescolares de 3 a 5 años de edad, de dos instituciones públicas de educación inicial, y sus respectivos padres o cuidadores en el departamento de Cusco, Perú. Se trabajó con toda la población que cumplió con los criterios de inclusión y exclusión, se seleccionaron setenta y cuatro niños preescolares por cada área, decidiendo tener la misma cantidad de niños por grupo en base al grupo más pequeño. Se realizó un examen clínico odonto-estomatológico para detectar alteraciones bucales (caries dental, maloclusión y trauma dental) según los criterios de la OMS y una encuesta que se utilizó para las características sociodemográficas. Además, se utilizó una versión peruana validada del cuestionario ECOHIS para obtener datos sobre el impacto en la calidad de vida. Todas las variables de los puntajes totales e individuales de los dominios ECOHIS fueron analizadas individualmente y se utilizó la prueba de Kruskal-Wallis para determinar la asociación entre variables. La prevalencia de alteraciones bucales en niños preescolares de zonas rurales referida a caries dental fue del 100% (índice dmft > 6), traumatismo dental 10,8% y maloclusiones 60,8%; para la zona urbana la caries dental fue del 93,2% (índice dmft > 6), el traumatismo dental 9,5% y las maloclusiones 36,5%. De las tres alteraciones bucales, sólo la experiencia de caries dental se relacionó con la OHRQOL de los preescolares de las zonas urbana y rural.

PALABRAS CLAVE: Calidad de vida; Caries dental; Maloclusión; Traumatismo dental; Preescolar; Perú.

INTRODUCTION

The World Health Organization (WHO) states that oral conditions such as dental caries, periodontal disease, malocclusions, and dentoalveolar trauma, constitute a public health problem that most frequently affects developing countries, especially the poorest communities, being these the most prevalent oral diseases in children (1). In Peru, these oral conditions mainly affect early childhood, generating in them and their families a negative impact on their quality of life (2,3).

Preschool children (both rural and urban) are in a crucial period for their mental, emotional,

and social development. On the other hand, the assessment of health-related quality of life (HRQOL) integrates aspects directly linked to physical and mental functioning, and the state of well-being of individuals. For this reason, over the last 20 years, new oral health indicators have been developed to assess HRQOL, intended to be applied to children with various oral conditions and to be adjusted to different ages and adapted cross-culturally (4,5).

In Lima, Peru, the prevalence of caries in children under 71 months of age in urban-marginal communities was 62.3% and is currently considered a public health problem, mainly due to its consequences on the quality of life, the health of

children and their parent's economy (6,7). Trauma to deciduous teeth is common in childhood, with a prevalence of 30%, having an impact on their quality of life, depending on its severity and sequelae, both for deciduous and permanent dentition (8). On the other side, dental malocclusion is also one of the most prevalent oral conditions (after caries and periodontal disease), these are alterations that affect a large sector of the population and cause both masticatory function and esthetic disorders, which are the cause of possible functional and psychological imbalances. Studies in Peru have shown that 63.8% of childhood had at least one type of dental malocclusion and 23% were dissatisfied with dental function or appearance (9,10). Children in rural areas live in a precarious situation due to poverty and not being able to satisfy their basic needs, such as good nutrition, access to health services, or schooling. Besides, children living in urban areas are exposed to citizen insecurity, road accidents, and family violence. The high levels of the precariousness of housing, as well as overcrowding, determine a context of increased vulnerability for their physical and mental health. Although it would be expected that in the urban areas the living conditions are better, it has been proven that this is not entirely true (11).

The oral conditions prevention is a fundamental strategy in this group of patients, so a comprehensive approach to the problem is necessary, evaluating the impact that oral conditions have on the quality of life of children. This is important in order to initiate primary oral health care programs, based on their rural and urban sociodemographic context. Therefore, this study's purpose was to determine the impact of oral conditions on the quality of life related to oral health of preschool children in rural and urban areas of Cusco.

MATERIALS AND METHODS

The study population consisted of preschool children aged 3 to 5 years enrolled in two public

early childhood education institutions (ECEI) and their respective parents or caregivers, belonging to a rural and urban area in the Cusco region of Peru. For the rural area, ECEI N°469 in the Ccorao community, located in the San Sebastián District, and for the urban area, ECEI Niño Jesús, located in the Cusco District, were selected. The sampling frame was the register of students enrolled in the ECEIs in 2019, established in the Ministry of Education's database. The two public kindergartens had a total of 179 preschoolers, 148 children were chosen: 74 from the rural area and 74 from the urban area. Due to the small size of the population, it was decided to work with all of the preschoolers who met the inclusion and exclusion criteria, therefore, there was no need to perform a sample calculation; it was decided to have the same sample size for each group based on the smallest group (Figure 1). Children whose parents signed the informed consent for their participation in the study were included, and those with systemic and neurological diseases were excluded.

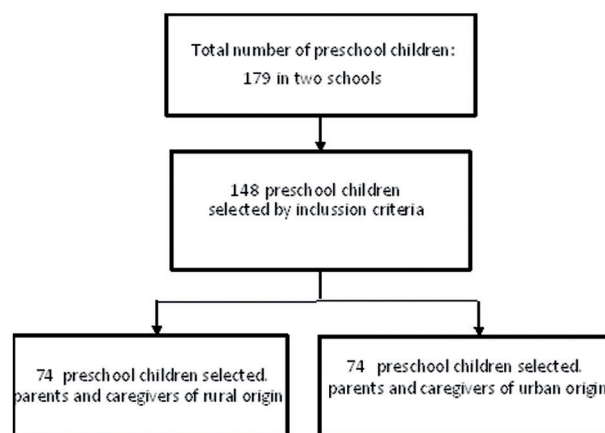


Figure 1. Diagram of inclusion of participants in the analysis.

STUDY VARIABLES

The quality-of-life variable in relation to oral health (OHRQOL) was studied through the Early Childhood Oral Health Impact Scale (ECOHis) questionnaire, cross-culturally adapted and validated for the Peruvian reality as a scale of impact on

early childhood health (12), which is a questionnaire of perceptions for parents and caregivers of children ages 3 to 5. This questionnaire consists of 13 questions and has two sections: the first one, about the impact on the child, and the second, one about the impact on the family. In the first, there are four domains: Oral Symptoms, Functional Limitations, Psychological Alteration, Children's Self-Image, and Social Interaction; in the second section, there are two domains: Family Concern and Family Limitations. The total score obtained with the ECOHIS is the sum of the scores for each item, with values ranging from 0 to 52. For the section impact on the child, the score ranges from 0 to 36 and for the section impact on the family the score ranges from 0 to 16. A high ECOHIS score indicates a greater impact and worse OHRQOL (8). The variables evaluated were: Experience of Dental Caries, Dental Treatment Needed, Prevalence and Type of Malocclusion, and Prevalence and Severity of Dental Trauma. Prior to data collection, two dental surgeons were trained at all variable levels by the researcher (MPA), research professor, and pediatric dental specialist with extensive experience in the field. The dental equipment used in the training was: artificial light source, a mouth mirror, and a probe with an inactive tip. A concordance between the observers and the expert of more than 90% was obtained, evaluated by means of the Intraclass Correlation Coefficient (ICC).

For the recording of dental caries in deciduous dentition the dmft index was used, classifying the severity according to the criteria described by Hallet *et al.* (13) as: dmft 0=no caries experience; dmft 1 to 5=low caries experience; dmft 6 or more=high caries experience. The need for treatment was evaluated individually for each tooth present according to the WHO's criteria (13): Restoration of One Surface, Two or More Surfaces, Restoration and Pulp Therapy, and Dental Extraction. Malocclusion was also evaluated according to the WHO's criteria (14): Experience (absence or presence) and Severity (0=no anomalies, 1=slight

anomalies, 2=moderate anomalies, 3=severe anomalies). Dental trauma to upper anterior incisors was evaluated according to the classification proposed by Glendor *et al.* (15): No Injuries, Uncomplicated Injuries (where the pulp tissue was not exposed and the tooth was not displaced), and Complicated Injuries (including pulp tissue exposure and/or tooth displacement) (16).

The following sociodemographic characteristics were considered: child's age (years completed); child's sex (male or female); origin (rural or urban area); father's schooling degree (illiterate, primary, secondary, higher); type of house (own house or not); number of salaries (up to 1 salary, from 2 to more salaries); family income (calculated by adding the monthly salaries of the family members and dividing by the Peruvian Minimum Wage-PMW [one PMW=850 nuevos soles per month]); and family structure (evaluated by asking with whom the child lives: mother, both parents, with the whole family).

STATISTICAL METHODS

Descriptive statistics, frequency, and percentages, were used for qualitative variables and summary measures (mean, standard deviation, and minimum and maximum values) for the ECOHIS scores, by domain and total. The Kruskal-Wallis test let to relate the experience of dental caries with the impact on OHRQOL, accompanied by the Dunn-Bonferroni post hoc test, and the Mann-Whitney U test, to make the same relation but with malocclusion and experience of dentoalveolar trauma, in urban and rural areas. The significance level was 5%.

RESULTS

Regarding the sociodemographic characteristics of the children evaluated, in the rural area, the most frequent age group was: 5 years old (n=50,67.6%), male sex (n=42,56.8%), father's secondary schooling (n=55,74.3%), not owning

their home (n=47,63.5%), nuclear family type: the child lived with both parents (n=61,82.4%), and the family had only one salary and an income of 850 soles or less (n=74,100%). In the urban area children aged 4 years (n=28,37.8%), female sex (n=47,63.5%), higher education level of the father (n=69,93.2%), own home (n=44,59.5%), child living with both parents (n=71,95.9%), family income depended on a single salary (n=46,62.2%) and with an income less than or equal to 850 soles (n=46,62.2%) were more frequent (Table 1).

The oral condition most frequently found in the children, in the rural area, is dental caries of all types. There was a high caries experience (dmft>6) predominating in 60 children (81.1%) and the need for restoration of at least one surface in 67 children (90.5%). In addition, the majority presented malocclusion (n=45,60.8%), with moderate anomalies being the most frequent (n=27,36.5%). Eight children (10.8%) presented dentoalveolar trauma.

In children from the urban area there was a high caries experience (n=43,58.1%) and the need for restoration of at least one surface treatment (n=64,86.5%). Most of them did not present malocclusion, however, among those who did, moderate anomalies were more frequent (n=21,28.4%) and seven children presented dentoalveolar trauma, with uncomplicated lesions being the most frequent (n=5,6.8%) (Table 2).

For rural areas, the maximum total score of the ECOHIS was 30 and the minimum was 13, with

an average of 25.5 ± 6.14 . Regarding the Functions Domain, the highest average was 7.96, in the questions referring to the impact on the child for: difficulties in drinking hot or cold beverages, difficulties in eating some foods, difficulties in pronouncing some words, and loss of days of attendance to preschool activities. In second place was the Psychological Domain with 4.35, in the questions referring to sleeping problems and getting angry or frustrated due to dental problems or dental treatments (Table 3).

For the urban area, the maximum total score of the ECOHIS was 31 and the minimum was 13, the average being 22.3 ± 6.82 . In the Function Domain, the highest average was 6.70 for the questions about the impact on the child for: difficulties in drinking hot or cold drinks, difficulties in eating some foods, difficulties in pronouncing some words, and loss of days of attendance to their preschool activities. In second place was the Family Domain with 3.50, in the questions referring to taking time from work and affecting the economy in their family because of dental problems or dental treatments (Table 3).

When the OHRQOL (ECOHIS questionnaire) was related to oral conditions (dental caries, malocclusion, and dental trauma) a statistically significant relationship was found only with dental caries ($p < 0.001$) in both urban and rural areas, showing a greater negative impact on OHRQOL in children with high experience of dental caries (Table 4).

Table 1. Sociodemographic characteristics of children evaluated.

Sociodemographic characteristics	Rural area		Urban area	
	n	%	n	%
Child's age				
3 years	0	0	20	27.0
4 years	24	32.4	28	37.8
5 years	50	67.6	26	35.2
Child sex				
Female	32	43.2	47	63.5
Male	42	56.8	27	36.5
Father's education level				
Illiterate	1	1.4	0	0
Primary	10	13.5	0	0
Secondary	55	74.3	5	6.8
Higher	8	10.8	69	93.2
Own house				
No	47	63.5	30	40.5
Yes	27	36.5	44	59.5
With whom does the child live				
Mother	3	4.1	3	4.1
Mother and Father	61	82.4	71	95.9
With the whole family	10	13.5	0	0
Number of salaries				
1 salary	74	100	46	62.2
From 2 to more salaries	0	0	28	37.8
Family income				
Less than or equal to 850 soles	74	100	46	62.2
Greater than 850 soles	0	0	28	37.8

Table 2. Oral alterations of evaluated children.

Variables	Rural area		Urban area	
	n	%	n	%
Tooth decay experience				
No caries experience (ceod = 0)	0	0	5	6.8
Low caries experience (ceod 1-5)	14	18.9	26	35.1
High caries experience (ceod > 6)	60	81.1	43	58.1
Need for treatment				
No need for treatment	0	0	8	10.8
In need of treatment	74	100.0	66	89.2
Restoration of 1 surface	67	90.5	64	86.5
Restoration of 2 surfaces or more	49	66.2	32	43.2
Pulp restoration and therapy	36	48.6	20	27.0
Tooth extraction	21	28.4	9	12.2
Malocclusion prevalence				
Absence	29	39.2	47	63.5
Presence	45	60.8	27	36.5
Type of malocclusion				
Absence	29	39.2	47	63.5
Light anomalies	8	10.8	0	0
Moderate anomalies	27	36.5	21	28.4
Severe Anomalies	10	13.5	6	8.1
Dental trauma prevalence				
Absence	66	89.2	67	90.5
Presence	8	10.8	7	9.5
Severity of dental trauma				
Absence of lesions	66	89.2	67	90.5
Uncomplicated injuries	8	10.8	5	6.8
Complicated injuries	0	0	2	2.7

Table 3. Score of the impact of quality of life in relation to oral health (ECOHis).

ECOHis	Rural area			Urban area		
	Mean \pm SD	minimum	máximum	Mean \pm SD	minimum	maximum
Symptom domain	2.58 \pm 0.79	1	3	2.18 \pm 0.86	1	3
Function Domain	7.96 \pm 1.95	4	10	6.70 \pm 2.16	4	12
Psychological domain	4.35 \pm 1.17	2	5	3.32 \pm 1.1	2	5
Self-image/social domain	3.62 \pm 0.78	2	4	3.19 \pm 1.0	1	5
Family concern domain	3.62 \pm 0.78	2	4	3.43 \pm 1.11	2	6
Family limitations	3.45 \pm 0.81	2	4	3.50 \pm 1.28	1	6
Total ECOHis score	25.5 \pm 6.14	13	30	22.3 \pm 6.82	13	31

Table 4. Relationship between oral alterations and the impact on quality of life in relation to oral health (ECOHIS).

Area	Oral alteration	ECOHIS			Valor p†
		n	Mean	SD	
Urban	Experience of dental caries*				<0.001
	No caries experience (ceod = 0)	5	13a	0	
	Low caries experience (ceod 1-5)	26	15.65 ^a	4.62	
	High caries experience (ceod > 6)	43	27.44 ^b	1.84	
	Malocclusion prevalence				0.104
	Absence	48	21.73	6.67	
	Presence	26	23.42	7.08	
	Dental trauma prevalence				0.379
	Absence	67	21.99	7.02	
	Presence	7	25.57	3.26	
Rural	Experience of dental caries				<0.001
	No caries experience (ceod = 0)	0	-	-	
	Low caries experience (ceod 1-5)	14	13	0	
	High caries experience (ceod > 6)	60	28.52	0.68	
	Malocclusion prevalence				0.480
	Absence	30	23.97	7.31	
	Presence	44	26.68	5	
	Dental trauma prevalence				0.682
	Absence	66	25.45	6.25	
	Presence	8	26.63	5.53	

*Different letters indicate statistically significant differences.

† Kruskal-Wallis and U de Mann-Whitney tests were applied.

DISCUSSION

Regarding the socio-demographic characteristics in the rural area, the children's family income corresponds to a low socioeconomic status: levels D and E (poor and extremely poor population), according to National Census and the 2018 National Household Survey (ENAHU) in Peru. In the urban area the family income belongs to a low socioeconomic status, level D+ and D (lower middle and poor population).

In this regard, López *et al.* (17) reported that most children aged 3 to 5 years in the city of Lima had early childhood caries, and Cabrera *et al.* (18) found significantly higher levels of caries, generalized gingivitis, mucosal alterations, and a higher need for treatment in the rural sector compared to the urban sector. These results could be attributed to the lack of economic resources and less access to health services for children in rural areas.

The present research found that dental caries has a negative impact on OHRQOL in urban and rural areas, while the variables malocclusion and dental trauma do not. These results can be attributed to the low prevalence of these two oral conditions found in this group of preschoolers and also because of parent's perception about two oral conditions: these would not cause concern or pain in their children.

Some studies in Peru have found similar results to ours, in reference to dental caries. Hincho *et al.* (19) established that early childhood caries caused a negative impact on OHRQOL, this coincidence may be due to the similar sociodemographic characteristics and the high prevalence of caries found, but this relationship requires further exploration in other contexts and populations, taking into consideration variables of other oral conditions. However, we consider that there is evidence to believe that oral conditions have a negative impact on the quality of life of preschool

children and their families, although the population is not representative. We recommend that similar studies take place in order to assess the quality of life in relation to oral health, for the improvement of public health policies in Peru.

Our results showed a low frequency of dentoalveolar trauma in children in rural and urban areas, less than 10%, not coinciding with Viegas *et al.*'s (20) study, where they found a high prevalence of dental trauma in Brazilian preschoolers. Our results could be explained because the evaluation applied was limited to the clinical-visual examination and may underestimate the dentoalveolar trauma presence, because radiographic examinations were not used. On the other hand, there are very few studies that demonstrate that dental trauma negatively impacts OHRQOL (21).

For dental malocclusion, preschool children in the urban area had a prevalence of 35.1%, a result similar to that found by Abanto *et al.* (22) in Brazilian preschoolers (24.2%). However, children in rural areas had a higher prevalence (59.5%), which may be due to the type of diet and oral habits of this children or to the lack of supervision by parents and/or caregivers. Changes in the deciduous dentition occur slowly, and the problems that arise often go unnoticed by both children and parents. Most of them are unaware of the aesthetic, psychological and economic consequences that can result from these malocclusions at a later age. On the other hand, the type of diet based on soft foods could limit the growth of jaws and cause dental malocclusions.

In the evaluation of the OHRQOL, in the section impact on the child, it was found that the Functional Limitations Domain impacted negatively on the quality of life of children in rural and urban areas, which means that these children presented limitations in eating some foods and drinking hot or cold beverages, as well as problems in pronouncing some words and loss of school attendance

(associated with dental caries problems). This coincides with Carvalho *et al.* (23), who found that the presence of early childhood caries causes a negative impact on the function and social domain of the OHRQOL.

In addition, it was found that in the rural area, the Psychological Domain represented the second most negative impact on the OHRQOL. This indicates that children with dental caries report problems sleeping and occasionally feel frustrated due to dental problems or dental treatment, which is in agreement with López *et al.* (17). These authors found, through the ECOHIS, for the Psychological Domain, an association with a negative impact on quality of life. This could be due to the fact that dental caries is more serious and complex, requires treatment in the dental office under local anesthesia and the children would not have a good experience during the process, showing rejection and lack of cooperation for their dental treatment. However, they do not report much negative impact in the Domain of Symptoms (dental pain), perhaps because they are more resilient to some types of pain than other children, or because they avoid going to the dentist.

Regarding the urban area, in the section impact on the family, the Family Domain had the second highest negative impact on the OHRQOL, indicating that the children's family's worktime and their economy is being affected due to dental problems or dental treatment. Coinciding with Carvalho *et al.*'s (23) study, who found evidence that parents or caregivers of young children have a negative impact on their quality of life due to dental problems and dental treatment experiences.

The present research has the limitations inherent to survey-based studies due to the possibility of information bias on the part of parents or caregivers. On the other hand, the samples of this study do not represent the rural and urban areas of the entire Cusco region, however, the results found constitute particular evidence to be taken into account to be contrasted with those of other investigations.

CONCLUSION

It is concluded that of the three oral conditions, only the experience of dental caries was related to the OHRQOL of preschoolers in urban and rural areas, with a greater negative impact on OHRQOL in children with a high experience of dental caries.

ETHICAL ASPECTS

The study was approved by the Research Ethics Committee of the Hospital Antonio Lorena del Cusco -Peru, with code N° 001-2019-ETHICS COMMITTEE-HAL, requests for permission and authorization to carry out the research were submitted to the directors of the ECEI involved, in addition, informed consent was given to the parents and/or guardian of the child for their participation in the questionnaire and authorization of the odontostomatological clinical examination of their minor children.

Conflict of Interest: The authors declare no conflict of interest.

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AUTHOR CONTRIBUTION STATEMENT

Conceptualization and design: M.P.A.
 Literature review: M.P.A.
 Methodology and validation: M.P.A.
 Formal analysis: M.P.A. and M.A.M.V.
 Investigation and data collection: I.N.P.
 Resources: I.N.P.
 Data analysis and interpretation: I.N.P.
 Writing-original draft preparation: M.A.M.V. and E.V.C.
 Writing-review & editing: M.A.M.V. and E.V.C.
 Supervision: E.V.C.
 Project administration: M.P.A.
 Funding acquisition: I.N.P.

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