

Dental caries lesions and impact on quality of life in adolescents living in urban and rural areas. A case study

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ABSTRACT

The concept of quality of life (QoL) developed from early studies on subjective wellbeing and satisfaction with life, interpreted as resulting from living conditions, and recognized by means of objective indicators. Indicators have been developed and validated to measure the relationship between quality of life and health. **Aim:** To determine, during an Educational Social Practice, the association between presence of dental caries lesions and its impact on quality of life of adolescents living in rural and urban areas in Argentina. **Materials and Method:** This was an observational cross-sectional study in (a) a rural area (Tres Isletas; Chaco Province/Schools No. 601 and 477) and (b) an urban area (Villa Soldati; Buenos Aires City/Nuestra Sra. Fátima School). The sample included 40 students from the urban area (UG) and 30 from the rural area (RG). A calibrated researcher (Kappa 0.80) collected the survey data and performed the clinical examinations. The following were recorded: (a) sociodemographic distribution in terms of age and gender; (b) presence of dental biofilm according to Silness and Løe; caries lesions according to ICDAS II/INTC criteria, and (d) DMFT, total and per component. Quality of life was assessed using the CPQ 11-14r. Statistical processing included calculation of frequency distribution of the variables ($X \pm DS$), and chi-square and Mann-Whitney tests to calculate association and comparisons between groups. **Results:** The sample included 47 girls (67.1%) and 23 boys (32.9%). Distribution according to sex and age did not differ significantly between sites (UG: 12.9 years \pm 0.5 and RG: 11.8 years \pm 1.1). No significant difference was found between sites for a) plaque biofilm ($p=0.759$); b) DMFT, total value and per component, or c) individual and grouped ICDAS scores. Percentage analysis of the CPQR 1-14 scores showed significant differences between groups for questionnaire total scores (26.9% \pm 2.2 in UG and 4.1% \pm 0.8 in RG) and for the different domains. **Conclusion:** Perceived impact on quality of life caused by dental caries lesions was significantly higher in urban than the rural group, although neither the dental caries process nor the amount of biofilm differed significantly between groups.

Key words: quality of life - dental caries - population groups

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Lesiones de caries dental e impacto sobre calidad de vida en adolescentes residentes en áreas urbanas y rurales. Estudio de caso

RESUMEN

El concepto de calidad de vida (CV) se desarrolló a partir de estudios tempranos sobre bienestar subjetivo y satisfacción con la vida, interpretado como resultante de las condiciones de vida empleando para su reconocimiento. Para medir su relación con la salud se han desarrollado y validado indicadores. **Objetivo:** Determinar la asociación entre presencia de lesiones de caries dental y el impacto que producen sobre la calidad de vida de adolescentes residentes en áreas rural y urbana República Argentina), en un caso de Práctica Social Educativa. **Materiales y Método:** Estudio observacional de corte transversal en (a) área rural (Tres Isletas; Provincia Chaco/escuelas N° 601 y N° 477) y (b) área urbana (Villa Soldati; CABA/ escuela Nuestra Sra. Fátima). La muestra incluyó 40 escolares residentes en área urbana (GU) y 30 residentes en área rural (GR). Un investigador calibrado (Kappa 0.80) realizó el relevamiento de datos y el examen clínico. Se registraron (a) distribución sociodemográfica en términos de edad y género; (b) presencia de biofilm dental según Silness y Løe; lesiones de caries según criterios ICDAS II/INTC (d) cálculo de CPOD total y por componente. La calidad de vida fue evaluada mediante cuestionario CPQ 11-14r. El procesamiento estadístico incluyó cálculo de distribución de frecuencias de las variables ($X \pm DS$) y las pruebas chi cuadrado y Mann-Whitney para calcular asociación y comparaciones entre grupos. **Resultados:** La muestra incluyó 47 mujeres (67,1%) y 23 hombres (32,9%). La distribución según sexo y edad no mostró diferencias significativas entre las sedes (GU: 12,9 años \pm 0,5 y GR: 11,8 años \pm 1,1). No se encontraron diferencias significativas entre las sedes al comparar a) biofilm de placa ($p=0,759$); b) CPOD, valor total y por componentes y c) códigos de ICDAS individuales y agrupados. El análisis porcentual del índice CPQR 1-14 reveló diferencias significativas en el puntaje total (26,9% \pm 2,2 en GU y 4,1% \pm 0,8 en GR) y en los respectivos dominios del instrumento. **Conclusión:** La percepción del impacto sobre la calidad de vida generado por las lesiones de caries dental resultó significativamente mayor en los escolares urbanos que en los rurales, aunque ni el proceso de caries dental ni la cantidad de biofilm encontrados en cada grupo, revelaron diferencias significativas.

Palabras claves: calidad de vida - caries dental - grupos de población

INTRODUCTION

The Department of Preventive and Community Dentistry at Buenos Aires University's School of Dentistry (FOUBA) coordinates education, clinical care and research within the different subjects taught. In doing so, it undertakes to generate knowledge, implement that knowledge in real scenarios, and develop competencies that will ensure the quality of care provided and the safety of the population covered. Developing protocols to implement knowledge in real scenarios involves specific steps, which include the identification of problems and potential evidence-based solutions, and the analysis of the local and institutional situations. It is also necessary to know about the association between oral health problems and the impact on quality of life perceived by the social actors involved.

It has been demonstrated that people or communities have a perception of the impact of diseases on quality of life, lifestyle, and even on availability of care^{1,2}. Within this framework, models have been developed on care of dental caries lesions interpreted as therapeutic expression of NCCD (non-communicable chronic diseases), even based on knowledge of genetics and epigenetics. These models have oriented diagnosis and therapy approaches.

The concept of quality of life (QoL) developed from early studies on subjective wellbeing and satisfaction with life³, interpreted as resulting from living conditions, and recognized by means of objective indicators⁴. However, this concept was criticized by Shen and Lai⁵, who incorporated cultural, economic and political criteria. Bishop et al.⁶, Michalos⁷, and Caqueo et al.^{8,9} related quality of life to subjective wellbeing and satisfaction with life¹⁰⁻¹², and Cummins¹³ recognizes social psychology studies as a theoretical framework¹⁴⁻²¹.

The WHO currently interprets quality of life as an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns. It is a multi-dimensional concept influenced by the person's physical health, psychological status, level of independence, social relations, and relationship with the environment, and constitutes a dynamic process ruled by the values and criteria of wellbeing, satisfaction and multidimensionality, and includes subjective/objective contents²²⁻²⁵.

Indicators have been developed and validated to measure the relationship between quality of life and health. The Child Perception Questionnaire CPQ11-14²⁶ assesses self-perceived oral health status in early adolescents. It is organized into four domains: oral symptoms (OS), functional limitation (FL), emotional wellbeing (EW) and social wellbeing (SW). The original version consists of 47 multiple choice questions, and based upon it, abbreviated versions containing 16 and 8 items have been developed and duly validated (**ISF-16** and **ISF-8**, respectively)²⁷⁻³⁰. Evidence shows the negative association between the extent of the pathology and quality of life estimated by the OHRQoL³¹ questionnaire, and that treatment of dental caries lesions improves perceived quality of life in children and adolescents³². The aim of this study was to determine the association between dental caries lesions and perceived impact on quality of life in a case of educational social practice conducted in rural and urban areas in Argentina on students in the 6th grade of basic schooling.

MATERIALS AND METHOD

Analysis of the situation in the territorial context: Tres Isletas (Chaco Province, Argentina) and Villa Soldati (Comuna 8, Buenos Aires City, Argentina)

Tres Isletas, population is 16,976 (INDEC, 2010), is a town in the center-north of Chaco Province (Argentina) and is the municipal seat of Maipú Department. It is accessed via the paved Carretera 95 (national) and Carretera 9 (provincial), while the other access roads are unpaved (Ruta Provincial 46 and Ruta Provincial 27). The town is located in the warm tropical zone with dry season, with mean annual temperature 21 °C. Healthcare is available at "Nueva Alianza" Healthcare Center and Hospital "Jorge O. Vázquez".

The district Comuna 8 in Buenos Aires City comprises the neighborhoods Villa Soldati, Villa Riachuelo and Villa Lugano, among which Villa Soldati has the second highest population density, with surface area 8.6 Km² and population 46,779 (2010). The district's urban fabric is characterized by fragmentation. It has reasonable road infrastructure, with public transportation, highways and large avenues.

Villa Soldati has two level 1 healthcare centers (CESAC No. 6 and No. 24) dependent on the

programmatic area of Hospital Piñeiro. CESAC 6 provides healthcare activities including clinical medicine, nursing, pharmacy, speech and hearing therapy, general medicine, nutrition, obstetrics, dentistry, pediatrics, psychology, educational psychology, OBGYN, and includes social work. CESAC No. 24 provides, among other specialties, anthropology, nursing, speech and hearing therapy, gynecology, physiotherapy, education, general and/or family medicine, nutrition, obstetrics, dentistry and social work.

Institutional intervention scenarios

The educational social practices in the rural area were conducted at two government-run rural schools in Tres Isletas, Maipú Department, Chaco Province: (a) School No. 601 for Personalized Special Education (Paraje Lalelay) and (b) School No. 477 (M. M. Güemes) for Basic General Education.

The practices in the urban area were conducted at the school Nuestra Sra. de Fátima (Villa Soldati; Comuna 8, Buenos Aires City), a privately managed, coeducational, extended-shift religious school, which depends on Buenos Aires City's Ministry of Education

The study sites had not participated previously in educational extension programs provided by the Department of Preventive and Community Dentistry run by Buenos Aires University's School of Dentistry (FOUBA).

Sample

The sample consisted of 40 6th graders from Nuestra Sra. de Fátima school (Urban Group: UG) and 30 6th graders from the schools in Tres Isletas (Rural Group: RG).

Diagnosis and statistical analysis

On-site research was conducted by a single researcher calibrated for gathering data (Kappa: 0.80)

Analysis of sociodemographic distribution

Sociodemographic distribution in terms of age and gender was analyzed in both groups. The frequency distribution of the variables in the CPQR 11-14 questionnaire was established, including identification of students' language comprehension level according to reports from local teams of teachers (Argentine Ministry of Education and Sport, 2016).

Analysis of dental plaque biofilm and dental caries lesions

Each child was diagnosed for plaque biofilm according to the de Silness/Loe Index³³, and for dental caries lesions according to the DMFT index. Lesions per tooth were recorded according to the ICDAS² and INTC³⁴ criteria.

Results from the two sites were compared using Mann-Whitney's U test.

Analysis of perceived impact of caries lesions on Quality of Life

Data on quality of life were gathered in compliance with ethical and legal requirements. The questionnaire CPQ 11-14 (abbreviated version 8) validated in Spanish and adjusted for semantic equivalence was applied. No suggestions were provided on how it should be completed.

Perceived impact of dental caries on quality of life was recorded and analyzed for both groups, per domain and per item, applying the independence test (chi-square).

RESULTS

Analysis of the sample

The total sample included 47 girls (67.1%) and 23 boys (32.9%) (Table 1).

Table 1. Distribution of total sample according to zone of residence and gender.

		n	%
GENDER	Male	23	32.9%
	Female	47	67.1%
	TOTAL	70	100.0%
ZONE OF RESIDENCE	BUENOS AIRES CITY	40	57.1%
	TRES ISLETAS	30	42.9%
	TOTAL	70	100.0%

Mean age was 12.9 years \pm 0.5 in the urban area and 11.8 years \pm 1.1 in the rural area. In the urban area, mean age was 13 years \pm 0.3 for girls and 12.9 years \pm 0.7 for boys. In the rural area, mean age was 11.9 years \pm 1.1 for girls and 11.8 years \pm 0.9 de for boys (Table 2).

Distribution per sex did not differ significantly between sites.

Table 2. Age according to zone of residence and gender

SAMPLE				AGE		
ZONE OF RESIDENCE	n	GENDER	n	Mean	Median	Standard error
BUENOS AIRES CITY	40	Male	11	12.9	13.0	0.7
		Female	29	13.0	13.0	0.3
TRES ISLETAS	30	Male	12	11.8	11.5	0.9
		Female	18	11.9	11.5	1.1

Analysis of dental plaque biofilm and dental caries lesions

Plaque biofilm values (Silness/Loe Index) did not differ significantly ($p=0.759$) between sites.

Subjects' caries history (DMFT and components D, M or F) did not differ significantly between sites, as shown by the Z value (Table 3).

Table 3. Comparison of dental caries lesions (DMFT) between sites

STATISTICAL TECHNIQUE	INDICATOR			
	D/DMFT	M/DMFT	F/DMFT	DMFT
Mann-Whitney's U test	565.500	562.000	530.000	585.500
Wilcoxon's W	1030.500	1382.000	1350.000	1050.500
Z	-0.412	-0.866	-1.010	-0.173
Asymptotic Sig. (bilateral)	0.680	0.386	0.312	0.863

No significant difference was found between groups for dental caries lesion values, including ICDAS levels 1 and 2 (Tables 4 and 5).

There were significant differences between sites for perceived impact of dental caries lesions on quality of life, both considering the average CPQ 11-14 scores, which were 26.9% for UG and 4.1% for RG, and per domain.

Mean scores on the scale, recorded per domain and per item, differed significantly (Table 6).

DISCUSSION

Social determinants of health are recognized as factors, conditions or circumstances that influence the level of health in individuals and populations, condition general health, and affect and influence the oral component. They have been conceptualized³⁵ with translation to health systems³⁶ by authors who have analyzed the consequences of social determinants on the creation of inequities. Lask and Fosson³⁷ recognized situations that generated predisposing, precipitating, perpetuating and protective factors, and Frenk³⁸ posed the existence of basic, structural and immediate context determinants.

Eid et al.³⁹ demonstrated that: a) Egyptian adolescents with $DMFT \leq 3$ or $DT = 0$ had significantly

Table 4. Active dental caries lesions (ICDAS II) at both sites

DENTAL CARIES LESIONS	SITES											
	BUENOS AIRES CITY				TRES ISLETAS				TOTAL			
	Mean	Median	Standard deviation	Standard error	Mean	Median	Standard deviation	Standard error	Mean	Median	Standard deviation	Standard error
ICDAS 1	0.1	0.0	0.6	0.109	0.0	0.0	0.2	0.031	0.1	0.0	0.4	0.047
ICDAS 2	0.8	0.0	1.7	0.310	1.1	0.0	1.8	0.126	0.9	0.0	1.7	0.203
ICDAS 3	3.4	3.0	2.9	0.521	3.0	2.5	3.3	0.521	3.2	3.0	3.1	0.370
ICDAS 4	0.8	0.0	1.9	0.346	0.4	0.0	1.1	0.173	0.6	0.0	1.6	0.191
ICDAS 5	1.1	0.0	1.5	0.273	1.5	1.0	1.8	0.284	1.3	1.0	1.6	0.191
ICDAS 6	1.7	0.0	3.2	0.584	2.0	0.0	3.3	0.521	1.9	0.0	3.2	0.382

Table 5. Results of comparison between active dental caries lesions recorded at the two sites.

Statistical technique	Comparison between active dental caries lesions recorded at the two sites					
	ICDAS 1	ICDAS 2	ICDAS 3	ICDAS 4	ICDAS 5	ICDAS 6
Mann-Whitney's U test	589.000	556.000	528.000	546.500	502.000	562.500
Wilcoxon's W	1054.000	1376.000	993.000	1011.500	1322.000	1382.500
Z	-0.372	-0.626	-0.866	-0.936	-1.243	-0.514
Asymptotic Sig. (bilateral)	0.710	0.531	0.387	0.349	0.214	0.607

Table 6. Correlation between mean scores for total CPQr and domains at the sites.

CPQr 11-14	SITES	N of the sample	Mean	Standard Deviation	Standard Error	p
Oral Symptoms	Buenos Aires City	40	3.23	1.75	0.28	0.001
	Tres Isletas	30	1.30	1.37	0.25	
	Total	70	2.40	1.85	0.22	
Functional Limitation	Buenos Aires City	40	2.38	1.92	0.30	0.001
	Tres Isletas	30	0.13	0.43	0.08	
	Total	70	1.41	1.85	0.22	
Emotional well-being	Buenos Aires City	40	1.78	1.85	0.29	0.001
	Tres Isletas	30	0.07	0.25	0.05	
	Total	70	1.04	1.64	0.20	
Social well-being	Buenos Aires City	40	1.23	2.01	0.32	0.001
	Tres Isletas	30	0.00	0.00	0.00	
	Total	70	0.70	1.63	0.19	
Total	Buenos Aires City	40	8.60	4.54	0.72	0.001
	Tres Isletas	30	1.30	1.37	0.25	
	Total	70	5.47	5.07	0.61	

lower CPQ scores₁₁₋₁₄, with values of $p < 0.01$ and $p < 0.0001$, respectively; **b**) untreated caries lesions were associated with mothers' lower socioeconomic and educational level, and with less regular dental appointments, determining a significant negative impact on 11- to 14-year-olds' QoL³².

Cadenas de Llano-Pérula et al.⁴⁰ evaluated prevalence of caries and malocclusion in urban and rural areas in Perú and compared them to perceived oral health. They found that caries experience and untreated caries lesions were associated with lower socioeconomic level, lower level of maternal education and less frequent toothbrushing, leading to a significant negative impact on students' QoL.

In a critical review on low income and poor oral health, Singh et al.⁴¹ summarized evidence on associations between individual/family income and oral health and the inequalities related to those variables. Studies in the US, Japan and Brazil have shown associations between unequal income in given areas and poor oral health, even though that evidence is not conclusive due to the differences in

context and in dental care.

The findings in the current study support the importance of including, in educational social practice projects or studies on populations, an analytical component including family sociodemographic variables, mapping analysis to identify causes and effects of the problem under study, and adequate prioritization of alternatives for solutions. The findings also support the importance of recognizing the perception of dental caries lesions as one of the factors involved in healthcare and provide a basis for the need to increase relevant learning among young adolescents in rural or marginal urban areas by means of intersectoral association between academia and healthcare services.

CONCLUSIONS

Perceived impact of oral health on quality of life was significantly higher among urban than rural students, although no significant difference was found between groups either in the dental caries process or in quantity of biofilm.

DECLARATION OF CONFLICTING INTERESTS

The authors declare no potential conflicts of interest regarding the research, authorship, and/or publication of this article.

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