

## **Association Between Use of Removable Partial Dentures and Presence of Crown and Root Caries in Institutionalized Elders in Bogotá \***

**Asociación entre uso de prótesis parcial removible y presencia de caries coronal y radicular en adultos mayores institucionalizados de Bogotá**

**Associação entre o uso de próteses parciais removíveis e a presença de cárie de coroa e raiz em idosos institucionalizados em Bogotá**

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## ABSTRACT

**Background:** The use of removable partial dentures (PPR) has been associated with the presence of dental caries. **Aim:** To explore in partially dentate institutionalized elderlies from Bogotá the correlation of the presence of dental caries with the use of PPR and, with practices its use and care. **Methods:** Three dentists assessed the presence of active/inactive coronal/radicular caries lesions using ICDAS visual criteria and, in PPR carriers, their care practices, using a questionnaire. A descriptive analysis and exploration of correlations were carried out using a bivariate model, with the presence of at least one coronal/radicular caries/active caries lesion as the outcome variable. **Results:** In a universe of 226 individuals aged  $80.1 \pm 9.3$  years, predominantly women (63.7 %), it was found that 69 used PPR in at least one maxilla. The latter had an average age of  $80.5 \pm 9.5$  years and  $8.4 \pm 5.9$  teeth. The prevalence of coronal caries lesions was 43.5 % and radicular 50.7 %, mainly active (80.0 % and 85.7 % respectively). PPR wearers had less coronal caries/active coronal caries than non-users. In the PPR group, the number of people who cleaned them daily and did not have active root caries was significantly higher than that of those who did not. The number of individuals without root caries who cleaned their PPRs  $\geq 2$  times per day was significantly higher than those who brushed less frequently ( $p < 0.05$ ). **Conclusion:** A correlation was found between PPR care practices and the presence of root caries.

**Keywords:** aging; Bogota, Colombia; chronic noncommunicable diseases; crown caries; dental caries; dentistry; elderly; partial denture; oral health; root caries.

## RESUMEN

**Antecedentes:** El uso de prótesis parcial removible (PPR) se asocia con presencia de caries dental. **Objetivo:** explorar en adultos mayores institucionalizados parcialmente dentados de Bogotá la correlación de la presencia de caries dental con el uso de PPR y, con prácticas de su uso y cuidado. **Métodos:** tres odontólogos valoraron presencia de lesiones de caries coronal/radicular activa/inactiva con criterios visuales ICDAS y, en portadores de PPR las prácticas de su cuidado, mediante cuestionario. Se realizó análisis descriptivo y exploración de correlaciones mediante modelo bivariado, con presencia de al menos una lesión de caries/caries activa coronal/radicular como variable desenlace. **Resultados:** Dentro de un universo de 226, se encontró que 69 usaban PPR en al menos un maxilar. Estos últimos, con predominio de mujeres (66.7 %), tenían un promedio de  $80.5 \pm 9.5$  años y de  $8.4 \pm 5.9$  dientes. La prevalencia de lesiones de caries coronal fue de 43.5 % y radicular de 50.7 %, principalmente activas (80.0 % y 85.7 %, respectivamente). Los que portaban PPRs tenían menos caries coronal/caries coronal activa que quienes no las usaban. En el grupo de PPRs, el número de personas que las limpiaban diariamente y no tenían caries radicular activa era significativamente mayor que el de quienes no lo hacían. El número de individuos sin caries radicular que limpiaba sus PPRs  $\geq 2$  veces por día era significativamente mayor que el de quienes tenían una frecuencia menor de cepillado ( $p < 0.05$ ). **Conclusión:** Se encontró correlación entre prácticas de cuidado de las PPR y la presencia de caries radicular.

**Palabras clave:** adulto mayor; Bogotá, Colombia; caries coronal; caries dental; caries radicular; dentadura parcial; enfermedades crónicas no transmisibles; envejecimiento; odontología; salud bucal; salud oral

## RESUMO

**Antecedentes:** O uso de próteses parciais removíveis (PRP) está associado à presença de cárie dentária. **Objetivo:** explorar a correlação da presença de cárie dentária com o uso de PPR e seu uso e práticas de cuidado em idosos institucionalizados parcialmente dentados em Bogotá. **Métodos:** três dentistas avaliaram a presença de lesões de cárie coronais/radiculares ativas/inativas com critérios visuais do ICDAS e, em portadores de PPR, suas práticas de cuidado, por meio de um questionário. Uma análise descritiva e exploração de correlações foram realizadas usando um modelo bivariado, com a presença de pelo menos uma lesão coronal/radicular/cárie ativa como variável de resultado. **Resultados:** Dentro de um universo de 226, 69 foram encontrados para usar PPR em pelo menos uma mandíbula. Estes últimos, com predominância de mulheres (66,7%), tinham idade média de  $80,5 \pm 9,5$  anos e  $8,4 \pm 5,9$  dentes. A prevalência de lesões de cárie coronal foi de 43,5% e radicular de 50,7%, principalmente ativas (80,0% e 85,7%, respectivamente). Os usuários de PPR tiveram menos cáries coronais/cáries ativas do que os não usuários. No grupo de PPRs, o número de pessoas que os limpavam diariamente e não tinham cárie radicular ativa foi significativamente maior do que aqueles que não tinham. O número de indivíduos sem cárie radicular que limpavam seus PPRs  $\geq 2$  vezes ao dia foi significativamente maior do que aqueles que escovaram com menos frequência ( $p < 0,05$ ). **Conclusão:** Foi encontrada uma correlação entre as práticas de cuidado PPR e a presença de cárie radicular.

**Palavras-chave:** Bogotá Colômbia; cárie de coroa; cárie; cárie radicular; envelhecimento; idoso; doenças crônicas não transmissíveis; odontologia; prótese parcial; saúde bucal; saúde oral

## INTRODUCTION

The prevalence of edentulism has decreased (1-5), with a 45 % reduction both in the global prevalence of total tooth loss standardized by age, and in its incidence rate in the last 2 decades (6). However, pathologies that are mainly related to dental loss (periodontal disease and dental caries) continue to be highly prevalent (7,8). According to the World Health Organization (WHO), a minimum number of 10 teeth per arch is required to achieve functional mastication (9,10). A decrease below this number, due to a decrease in occlusal pairs, generates nutritional disorders. and in the quality of life related to oral health (11). In the Colombian population, according to the IV National Study of Oral Health, the average number of teeth present was 8.0 (12) and in the institutionalized population it was found that this number was  $10.8 \pm 7.3$  (13).

Faced with the decrease in dental formula, the use of removable partial dentures (PPRs) is an option to restore masticatory function (14-16). Regarding these, it is suggested that they have the potential to negatively affect oral health by promoting the accumulation of biofilm in the absence of good oral hygiene measures (17) and therefore increase the risk of developing carious lesions (18). However, the evidence of the impact of the use of PPRs on the presence of caries lesions is divergent.

In the Colombian institutionalized older adult population, there are no known studies in this regard, which led to seeking to know if there is an association between the use of removable partial dentures and the presence of crown and root caries in Colombian older adults? It was proposed to explore, in an institutionalized older adult population of Bogotá, the association of the use of PPR with the presence of coronal and root caries. The results of this study could contribute to the development of studies focused on caries prevention mechanisms and lifestyle factors and care practices in older adults with PPRs.

## MATERIALS AND METHODS

The correlation of the use of PPR and care practices with the presence of at least one carious lesion or active coronal/radicular carious lesion was explored, within a cross-sectional descriptive observational study, which was approved by the Committee on Ethics in Research of the El Bosque University (Act 012-2016) (13). This study included older adults (>59 years) residing in geriatric institutions in the city, who voluntarily agreed to participate and signed the informed consent. Those with severe mental disability, limited opening or terminal illness were excluded.

Clinical evaluations were carried out with basic examination instruments (mirror and WHO probe), in geriatric institutions chairs, with a white light source and in the absence of compressed air. Three dentists calibrated in the International Caries Detection and Assessment System – ICDAS (inter/intra examiner reproducibility kappa > 0.7) assessed and classified, according to these criteria, the presence of dental caries (localized destruction of the hard tissues of the tooth). and its state of activity, without using compressed air (ICDASepi). According to caries severity, coronal lesions were classified as: initial lesion: first visible or detectable change in enamel seen as caries opacity or visible discoloration - white and/or brown stain lesion - not consistent with appearance clinical evidence of healthy enamel (ICDAS codes 1 or 2) and not without evidence of surface breakdown or underlying shadow in dentin; moderate lesion: white or brown stain lesion, with localized enamel breakdown, without visible exposed dentin (ICDAS code 3), or an underlying shadow of dentin (ICDAS code 4), originating from the tested surface and severe lesion: detectable cavity in Opaque or discolored enamel with visible dentin (ICDAS codes 5 or 6). In the root, according to the severity of caries, lesions are classified as: initial lesion: color change without cavitation -loss of tissue < 0.5 mm- and moderate/severe lesion: presence of cavitation  $\geq 0.5$  mm. Lesions that presented a white/yellowish color in the enamel, were opaque with loss of shine, rough

when the round tip of the probe passed smoothly, and were located in biofilm retention areas were considered active; Likewise, dentin lesions, which were perceived as soft or leathery on soft probing, covered or not by thick biofilm before cleaning (19,20).

The use of PPR was recorded and the cleaning of PPR, frequency of cleaning and removal of PPRs to sleep were inquired.

## Statistical Analysis

A descriptive analysis was carried out under a bivariate model. The statistical significance of the bivariate correlation was determined with the Pearson  $\chi^2$  test. Values  $p < 0.05$  were considered significant. Data analysis was performed with the Stata software version. 14.

## RESULTS

In 226 elderly people with teeth assessed in geriatric institutions within a macro-study on oral health status against caries and associated factors, it was found that 69 used PPR in at least one of the jaws. This group of individuals, of which more than half were women (66.7 %), had an average age of  $80.5 \pm 9.5$  years, distributing more than half of the population in the range of  $\geq 80$  years, although without statistically significant differences. Table 1 includes the demographic characteristics of the assessed population. The average number of teeth present in the mouth in this population was  $8.4 \pm 5.9$ .

TABLE 1  
Demographic characteristics of non-carriers and carriers of removable partial dentures (n=226)

Characteristic/ ears	Not PPR carriers n=157		PPR carriers n=69	
	N	%	n	%
<b>Sex</b>				
Female	144	63.7	46	66.7
Male	82	36.3	23	33.3
<b>Age</b>				
60-69	34	15.0	11	15.9
70-79	59	26.1	16	23.2
80-89	101	44.7	30	43.5
$\geq 90$	32	14.2	12	17.4

In the 69 older adults who used PPR, these were used mainly in the lower jaw (53.6 %), followed by uses in the upper jaw and in both arches, in similar percentages (23.2 %). In raw data, the number of PPRs used per maxilla is found in Table 2. Regarding the material, the PPRS used were mainly acrylic in both the upper (n= 50; 72.5 %) and lower (n= 35; 50.7 %).

**TABLE 2**  
Distribution of the use of removable partial dentures and denture material per arch

Characteristic	Maxillary arch n (%)	Mandibular arch n (%)
<b>Use</b>		
Yes	32 (46.4)	52 (75.4)
No	37 (53.6)	17 (24.6)
<b>Material</b>		
Acrylic	50 (72.5)	35 (50.7)
Combined (acrylic and cobalt-chrome)/skeletal	8 (11.6)	24 (34.8)
Does not have	11 (15.9)	10 (14.5)

In the PPR carriers, with ICDAS visual criteria, it was found for coronal caries that the entire population had caries experience, with an average modified superficial COP of  $102.2 \pm 21.2$ , with dental losses contributing the most to this indicator. ( $90.9 \pm 26.0$ ), followed by filled surfaces ( $9.1 \pm 12.1$ ) and with caries ( $2.2 \pm 5.4$ : initial  $0.3 \pm 0.5$ ; moderate  $0.1 \pm 0.4$ ; severe  $0.1 \pm 0.4$ ). On the other hand, slightly less than half of the individuals (43.5 %) had at least one coronal carious lesion, of which the majority was in an active state (80.0 %). Likewise, more than half of this population had caries experience (53.6 %), including filled and carious surfaces, with an average of  $2.0 \pm 2.9$  distributed in caries lesions ( $1.5 \pm 4.0$ : initial  $0.6 \pm 1.7$ ; moderate  $0.3 \pm 0.9$ ; severe  $0.6 \pm 1.4$ ) and obturated ( $0.6 \pm 1.3$ ). Half of the older adults who used PPR had at least one root caries lesion (50.7 %), most of them being active (85.7 %).

The bivariate analysis of the use of PPR and care practices/use of these versus dental caries, showed statistically significant differences ( $p < 0.05$ ). In the population of 226 older adults, it was found that PPR carriers had less coronal caries/active coronal caries than those who did not use them, while in root caries no significant associations were found in this regard (Table 3).

**TABLE 3**  
Correlation between the use of removable partial dentures and the presence of caries (n=226) in older adults

PPR use	Coronal caries		Worth P	Active coronal caries		Worth P	Root caries		Worth P	Active root caries		Worth P
	Yes	No		Yes	No		Yes	No		Yes	No	
Yes	30 (43.5)	39 (56.5)	<b>0</b>	24 (34.8)	45 (65.2)	<b>0</b>	35 (50.7)	34 (49.3)	<b>0</b>	30 (43.5)	39 (56.5)	<b>0.5</b>
No	93 (59.2)	64 (40.8)	<b>28</b>	91 (57.9)	66 (42.0)	<b>1</b>	69 (43.9)	88 (56.0)	<b>1</b>	61 (38.8)	96 (61.1)	<b>1</b>

In the group of PPRs carriers (n= 69), it was found that the number of people who cleaned them daily and did not have active root caries was significantly higher than that of those who did not clean them and did not present this pathology. Likewise, the number of individuals who did not have root caries and cleaned their PPRs with a frequency equal to or greater than twice a day was significantly higher than that of those who had a lesser frequency of cleaning (table 4).

TABLE 4  
Correlation in older adults with PPR between their care practices and dental caries (n=69)

Presencia de $\geq 1$ lesión de caries coronal			P	Presencia de $\geq 1$ lesión de caries coronal activa			P	Presencia de $\geq 1$ lesión de caries radicular			P	Presencia de $\geq 1$ lesión de caries radicular activa			P
Ye	N			Ye	N		Ye	N		Ye	N		Ye	N	
s	o			s	o		s	o		s	o		s	o	
<b>PPR cleaning</b>															
Ye	23	28	0	19	3		20	3		22	2				
s			.		2	0.		1	0.		9				<b>0.</b>
No	7	11	6	5	1	4	10	8	2	13	5				<b>03</b>
			4		3	6			2						<b>4</b>
			8			8			9						
<b>Frecuencia diaria de limpieza de PPR</b>															
$\geq 2$	25	29	0	20	3		24	3		22	3				
			.		4	0.		0	<b>0.</b>		2				0.
<2	5	10	3	4	1	4	11	4	<b>0</b>	8	7				38
			7		1	5			<b>4</b>						4
			0			6			<b>8</b>						
<b>Retiro nocturno de la PPR</b>															
Ye	14	14	0	10	1		13	1		15	1				
s			.		8	0.		5	0.		3				0.
No	16	25	3		2	8			6						69
			6	14	7	9	17	2	8	20	2				6
			6			3		4	3		1				

In this study, an exploration by dental arch was also carried out, of the correlation between the PPR material (acrylic or combined) and the accumulation of biofilm, but no statistically significant differences were found between the two types of material compared to the accumulation. of biofilm ( $p=0.81$  in the maxillary arch and  $p=0.98$  in the mandibular arch).

## DISCUSSION

Even with the decrease reported globally for edentulism, dental floss continues to be a constant in older adults, with its peak incidence at 65 years of age (21). In the present study, institutionalized older adults with PPRs were considered, in which the average number of teeth per individual was less than 50 % of that required for functional mastication (20 teeth) (9,10), similar to what was found in the reference Colombian population (12). One of the main causes of dental loss, dental caries (7.8), in the population carrying PPRs at the time of the examination, it was found to affect half of the population, in the case of root caries and a slightly smaller proportion. in the case of coronal caries. Taking into account the negative impact that dental caries has on quality of life and its high economic burden (22), the level to which the older adult population included in this study is affected is considerable. This may be reflecting gaps in the coverage established in the health plan and offered by the services in Colombia. Two elements that could be evidencing the above could be those identified in Resolution No. 3280 of 2018: 1) people over 19 years of age are explicitly not considered within systematic caries prevention programs, such as the biannual application of fluoride in varnish and, 2) in the case of the elderly population, biennial care is established that includes prophylaxis and plaque removal, including scaling only when necessary, at the discretion of the dental professional (23).

The deterioration in chewing ability that occurs with tooth loss is associated with reduced nutrient intake and poor nutritional status. In this regard, it is described that the restoration of function with the use of PPRs has a positive impact on nutritional status (14). These, due to their low cost compared to other oral rehabilitation options, constitute the selected dental replacement alternative when the economic factor is decisive (24).

According to the bivariate model used in this study, those using PPRs were not found to have more coronal caries/active coronal caries. This result coincides with what was described in the review by Thomson, 2004 on caries experience in older adults and associated factors (25).

Prostheses are considered “biofilm traps” (26), on which biofilm forms shortly after being introduced into the mouth, as occurs on the surface of teeth (27). Starting from the fact that this study includes older adults, considering that gingival recessions are frequent in this type of population and that with them, both the gingival margin and the surfaces at risk of caries are located on the root surface (28), the relationship of the PPRs is mainly with these surfaces and not with the coronal ones.

On the other hand, the mere presence of biofilm does not necessarily lead to the formation of caries, but as it is an important factor, its control through regular hygiene contributes to the maintenance of good oral health (26). Puskar and Blažiče (2005) addressed this topic in a 12-month clinical trial, which included 90 subjects aged 58 on average, carriers of PPRs, in whom a low plaque index was observed, which they explained as a result of education, maintenance of oral hygiene and prostheses, and professional follow-up in subjects without (29) and with systemic conditions (30).

In this study, the type of material was not related to a greater accumulation of plaque, although a previous study had suggested a greater risk of oral diseases caused by plaque in wearers of acrylic PPRs (29).

Regarding PPRs care practices, it was found that those with better care practices (daily cleaning and cleaning frequency  $\geq 2$  brushings per day) had less root caries/active root caries. This correlation between the hygienic practices of the PPRs and the presence of root caries was described in previous studies (26,31), in relation to the absence of satisfactory oral hygiene measures that allow the accumulation of plaque and its permanence without alteration. (26). These failures are explained by the lack of knowledge regarding hygienic practices themselves (26,32).

The nocturnal removal of the PPRs, in this study, did not show a correlation with the dental caries variables. This finding coincides with those reported by Turgut-Cankaya *et al.* 2020, in a Turkish elderly population, in which, when exploring the association between hygiene practices and knowledge imparted verbally or in writing, it was suggested that, more than the nocturnal use of prostheses, the recommendations given and hygienic habits seem to have the greatest impact on the maintenance of oral health (33).

The results of this study make it possible to recommend, when faced with an elderly patient in whom a PRP is installed: 1) that both he and his caregiver (in the case of being dependent to some degree) be guided in the adoption of care practices oral health compatible with health and 2) that the dental professional establish for him a care and follow-up plan based on individual risk (34).

Based on the results of this research, it is suggested that follow-up studies be carried out in the Colombian population, based on individual risk, to identify lifestyle factors related to root and coronal dental caries. Likewise, the development of risk and injury intervention studies, focused on controlling the establishment and progression of dental caries with conservative approaches.

## CONCLUSIONS

In the institutionalized elderly population studied, a correlation was found between PRP care practices and the presence of root caries, probably related to failures in oral hygiene practices and removable partial dentures.

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