



EDELWEISS PUBLICATIONS
OPEN ACCESS

<https://doi.org/10.33805/2572-6978.146>

Volume 4 Issue 2 | PDF 146 | Pages 8

Dental Research and Management

Research Article

ISSN: 2572-6978

An Approach to Assess Early Detection of Periodontal Disease in Young and Adult Individuals in Colombia for Prevention

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Citation: Rodriguez SVZ, Flórez MP, Bottacin FS, Reina HR, and Taba M Jr. An approach to assess early detection of periodontal disease in young and adult individuals in Colombia for prevention (2020) Dental Res Manag 4: 52-59.

Received: Sep 09, 2020

Accepted: Oct 16, 2020

Published: Oct 22, 2020

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Abstract

Aim: Studies have shown that the prevalence of the periodontal disease among young people is relatively low; however, periodontitis is a public health problem and prevalence among adults has been increasing. This study aimed to assess the prevalence of periodontitis among young adults and adults in Colombia and to propose an alternative approach for early detection of periodontitis. **Objectives:** To present an alternative approach for the prevention of periodontitis, two different classifications were used to estimate disease prevalence. In addition, periodontitis severity was associated with sociodemographic and clinical risk factors in a logistic regression model. **Material and methods:** Selected data from 9150 subjects evaluated in the IV National Oral Health Survey (ENSAB IV) from Colombia were used. The ages ranged from 18 to 79 years old.

Statistical analysis: Data were subjected to two different disease definition criteria and were evaluated by bivariate and multivariate analysis using a p-value of 5%. **Results:** The alternative classification approach elucidated an increase in the prevalence of periodontitis in young individuals (26.1%). According to the previous classification, 20.1% of young individuals and 94.3% of adults had mild to moderate periodontitis. The prevalence of moderate and severe cases was similar. Multivariate analysis of the variables age, gender, enrolment in the subsidized socioeconomic program and health care system, and tooth loss were associated with moderate and severe periodontitis ($p < 0.05$).

Conclusions: The early identification of mild cases in young individuals may help to identify potentially vulnerable groups. Early diagnosis of periodontitis and timely intervention in individuals with gingivitis, especially for those presenting risk factors, should be reinforced as an alternative approach to prevent disease progression and reduce the prevalence of adults with periodontitis in the future.

Keywords: Periodontitis, Risk Factors, Epidemiology.

Abbreviations: CAL-Clinical Attachment Level, BOP-Bleeding on Probing, PD-Probing Depth, CAL-Clinical Attachment Loss, CI-Confidence Intervals, ENSAB IV-IV National Oral Health Survey.

Introduction

Periodontitis is a chronic inflammatory disease and the increase of this disease in different countries has become a public health problem [1]. Disease progression affects not only the stomatognathic system, but also physical appearance and social relationships [2,3]. Studies have shown that sociodemographic factors may be determinants for the causes and progression of the disease [4-6].

A wide-ranging survey carried out in 191 municipalities in Colombia, between 2013 and 2014 (IV National Oral Health Surveillance), recorded dental health data and sociodemographic factors, health conditions, health behaviors, and self-reported oral health habits. A preliminary descriptive analysis indicated that 43.46% and 10.62% of

adults had moderate and severe periodontitis, respectively, with a lower prevalence in adolescents [7]. Gingivitis is a process associated with adults and young individuals. However, for younger individuals, gingivitis appears to be localized and not generalized, which may undermine the influence of the progression to periodontitis [8]. Observational data from a longitudinal study that lasted 26 years was conducted on male participants from 16 to 59 years old. The results demonstrated that study participants exhibited persistent gingival inflammation. Over time they experienced more loss of gingival insertion. The increase in age and the persistence of gingival inflammation were related to the presence of periodontal pockets [9].

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Despite the research about periodontal diseases, different criteria for periodontitis have been used in different population studies. For example, most studies use the presence of periodontal pocket, in addition, to attachment loss. Other authors have examined the interproximal attachment loss or compound criteria of the presence of at least one site with Clinical Attachment Level (CAL) \geq 3mm with Bleeding on Probing (BOP) and the presence of at least one site with CAL \geq 4 mm with BOP [10,11]. Some variances in the determination of prevalence may be expected when young and adult individuals are surveyed under the same criteria.

Considering the aforementioned periodontal clinical measurements, the degree of inflammation, accumulation of bacterial plaque, the presence of gingival calculus, bone loss, mobility, and recession are used to identify periodontal disease in the population. According to the number, the extent and depth of those risk factors, in addition to social, economic, educational, and lifestyle habits (self-care), are determining factors in the onset and progression of the disease [12]. Therefore, early identification of the disease is a preventative tool for ensuring healthy measures for the individuals who may present an onset of gingivitis.

Therefore, the purpose of this study was to investigate the prevalence of periodontitis in Colombian young and adult individuals, according to the classification used in the ENSAB IV, and to apply a reclassification of the disease based on additional criteria. Moreover, the objective was to investigate the association between periodontitis and sociodemographic determinants, including gender, age, social conditions, and access to health care.

Methods

This cross-sectional population-based study used secondary data from the Colombian Oral Health Survey-Project ENSAB IV 2013-2014 performed by the Ministry of Health. The ENSAB IV was conducted according to the Helsinki declaration and Council for International Organizations of Medical Sciences (CIOMS). Additionally, it was carried out in accordance with the Resolution 008430 of the ministry of health (Republic of Colombia 1993) minimal risk investigation. The ENSAB IV protocol was explained to all patients, and informed consent forms were signed before entry into the study [7].

Sampling

The database accessed for this study was the 2013-2014 Colombia IV National Oral Health Survey (ENSAB IV), a population-based, cross-sectional representative study with a target population of 20,538 individuals [7-13]. For the purpose of this study, data from participants between 18-79 years of age were selected. The total number of participants in this study was 9,150 (1,802 young people and 7,348 adults).

Variables analyzed

The periodontal parameters used in this study include Probing Depth (PD), hyperplasia or gingival retraction, Clinical Attachment Loss (CAL), and sociodemographic variables, such as age, gender, and socioeconomic conditions (the article 101.8 of the law n° 142/1994). The social strata were divided into six categories with consideration of socioeconomic conditions and housing environment. For the ENSAB IV, the strata were grouped into medium (level 4), medium-high (level 5), and the high stratum (level 6) [14]. The Social Security System of Colombia is composed of three groups: 1) the contributive regime comprised of employed people; 2) independent workers and pensioners, a subsidized regime for people without the resources to pay; and 3) a special regime comprised of workers from the Colombian oil company ECOPEPETROL, military forces, national police, teachers, and officials of public universities [15].

The geographic location by regions and clinical variables, such as chronic inflammatory disease and tooth loss (caries and other causes), were factored in as variables.

The geographic location variable was a modification from the initial study. In the present study, the Capital region includes the capital of the Colombian territory, Barranquilla, Bucaramanga, Cali, Cartagena, Cúcuta, Ibagué, and Medellín. Those cities have a dense population, economic movement and are strategic points of social migration. Moreover, the people who live in those cities have easy access to the health system.

The variable of chronic inflammatory diseases includes those with registered medication for cardiovascular or cerebrovascular diseases, diabetes mellitus, pulmonary or neurological diseases, hypertension, renal diseases, cancer, and/or obesity [16]. Participants of the associated subgroup were those who reported any chronic disease, without regulated medication, or those with risk factors for chronic inflammatory disease, such as hypercholesterolemia, with or without control.

Periodontal case definition and periodontal parameters

Information on the 28 teeth was included in the examination, and at six sites (mesio-buccal, buccal, disto-buccal, mesio-lingual, lingual, and disto-lingual) with a periodontal probe (North Carolina #15). PD was measured from the gingival margin to the base of the pocket and the position of the gingival margin from the enamel cement line to the gingival margin. Subsequently, with these measurements, the periodontal parameter CAL was generated. The prevalence and severity of periodontitis was determined by the number of people included in the categories, mild, moderate, and severe, based on the case-definition, detailed in the following section.

Classification of periodontitis by the ENSAB IV

Based on the case-definition given by CDC-AAP and updated by Page, Eke [17].

- **Mild periodontitis:** CAL \geq 3mm of two or more proximal surfaces or a tooth with PB of \geq 5mm on proximal surfaces.
- **Moderate periodontitis:** CAL \geq 4mm of two or more proximal surfaces or two teeth with PD of \geq 5 mm on proximal surfaces.
- **Severe periodontitis:** CAL \geq 6 mm from two proximal surfaces or more and a tooth with PD of \geq 5 mm on proximal surfaces.

Alternative classification of periodontitis for the present study

Based on the case-definition suggested by Holtfreter et al., [18] with modifications for a clearer comparison of the classification used in the ENSAB IV.

- **Mild periodontitis:** CAL between 1 and 2.9mm of 2 or more teeth and PD between 1 and 3.9mm on proximal surfaces.
- **Moderate periodontitis:** CAL \geq 3mm of two or more teeth and PD of \geq 4mm on proximal surfaces.
- **Severe periodontitis:** CAL \geq 5mm from two or more teeth and PD of \geq 6mm on proximal surfaces.

Statistical Analysis

Data were analyzed by the statistical software STATA [13]. The study participants were divided according to the specified age groups, in accordance with the sociodemographic and clinical variables, using the contingency tables with absolute frequencies and percentages. The prevalence of periodontitis was reported as percentages with their respective 95% Confidence Intervals (95% CI).

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An exploration of the risk factors was performed using a regression model according to the reclassification of partial proportional odds with the ordinal response variable identified as the severity of the reclassification (healthy/mild, moderate, and severe) [19]. The categorical explanatory variables considered were the age group, gender, socioeconomic stratum, health affiliation, chronic inflammatory disease, region, and the loss of teeth due to cavities or other causes.

Statistical modeling was performed in two phases during this study. Initially, a bivariate analysis was performed, where each explanatory variable was associated with the response variable. Variables that were significant at the level of 0.10 (p-value<0.10) were considered in the multivariate model. Subsequently, a multivariate analysis was

performed with all the relevant variables identified in the bivariate analysis. The Odds Ratio (OR) was used as a measure of association, which was considered statistically significant when its p value was less than 0.05.

Results

The sample size for this study was 9,150 individuals, in which 19.6% were 18 years old and 80.3% were between 20 and 79 years old. The predominant age ranges in the adult group were between 20-34 years old (31.1%) and between 45-64 years old (22.8%). Most of the subjects were female (62.98%), belonged to the low-low socioeconomic stratum (40.6%), followed by the low stratum (38.8%), and were from the Capital (31.7%) (Table 1).

Socio-demographic Variables	Young [1802]		Adult [7348]		Total [9150]	
	n	%	n	%	n	%
Age						
18	1802	19.69	-	-	1802	19.6
20-34	-	-	2847	31.11	2847	31.1
35-44	-	-	1666	18.21	1666	18.2
45-64	-	-	2090	22.84	2090	22.8
65-79	-	-	745	8.14	745	8.1
Sex						
Male	762	8.33	2625	28.69	3387	37
Female	1040	11.37	4723	51.62	5763	62.9
Socioeconomic Classification						
Low-Low	656	7.17	3067	33.52	3723	40.6
Low	810	8.85	2744	29.99	3554	38.8
Medium-Low	292	3.19	1192	13.03	1484	16.2
Medium, medium-high and high	44	0.48	345	3.77	389	4.2
Health Affiliation System						
Contributive	520	5.68	2647	28.93	3167	34.6
Subsidized	1004	10.97	3913	42.77	4917	53.7
Another regime	60	0.66	290	3.17	350	3.8
Not affiliated	218	2.38	498	5.44	716	7.8
Region						
Atlantic	168	2.16	1014	11.8	1212	13.2
Capital	645	7.05	2258	24.68	2903	31.7
Central	205	2.24	938	10.25	1143	12.4
Oriental	225	2.46	941	10.28	1166	12.7
Orinoquia/Amazonia	289	3.16	1246	13.62	1535	16.7
Pacific	240	2.62	951	10.39	1191	13

Table 1: Characterization of socio-demographic data of young and adult people analyzed by the ENSAB IV, Colombia 2013-2014.

Most of the subjects (89.0%) did not report confirmed chronic inflammatory diseases, but 7.4% of adults presented unclear inflammatory of the disease (Table 2). The prevalence of tooth loss (due to caries or other causes) was 21.7% of the young people and 75.8% in the adult group.

Clinical Variables	Young [1802]		Adults [7348]		Total [9150]	
	n	%	n	%	n	%
Chronic Inflammatory Disease						
Presence	10	0.1	305	3.33	315	3.4
Absence	1788	19.54	6350	69.49	8147	89
Dubious Association	4	0.04	684	7.47	688	7.5
Tooth loss						
Presence	392	21.7	5570	75.8	5962	65.1
Absence	1410	78.2	1778	24.2	3188	34.8

Table 2: Characterization of data according to clinical variables of young and adult people from the ENSAB IV, Colombia 2013-2014.

Prevalence, severity, and classifications of periodontitis

According to the previous ENSAB IV survey, most participants presented moderate, chronic periodontitis 36.8% (CI 95%: 35.9%; 37.8%), followed by subjects who did not show periodontitis 33.6% (CI 95%: 32.6%; 34.6%). In the reclassification, prevalence of the

moderate periodontitis was 40.2% (CI 95%: 39.2%; 41.2%), and 51.3% subjects displayed mild chronic periodontitis, evidencing early signs of the disease (CI 95%: 50.3%; 52.4%), as illustrated in (Figure 1).

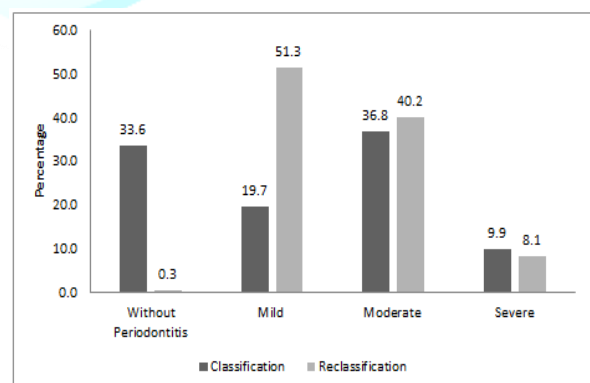


Figure 1: Distribution of sample according to the classification of the ENSAB IV and the reclassification for periodontitis.

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Variable		ENSAB IV				Reclassification				
			Healthy	Mild	Moderate	Severe	Healthy	Mild	Moderate	Severe
Sex	Male	n	972	558	1359	498	8	1550	1437	392
		%	31.6	31	40.3	55	27.6	33	39	52.6
	Female	n	2103	1240	2012	408	21	3146	2243	353
		%	68.4	69	59.7	45	72.4	67	61	47.4
Age group	18	n	1239	362	192	9	0	1225	555	22
		%	40.3	20.1	5.7	1	0	26.1	15.1	3
	20-34	n	1358	716	708	65	0	1519	1224	104
		%	44.2	39.8	21	7.2	0	32.3	33.3	14
	35-44	n	293	417	776	180	2	705	781	178
		%	9.5	23.2	23	19.9	6.9	15	21.2	23.9
	45-64	n	145	254	1236	455	7	896	867	320
		%	4.7	14.1	36.7	50.2	24.1	19.1	23.6	43
	65-79	n	40	49	459	197	20	351	253	121
		%	1.3	2.7	13.6	21.7	69	7.5	6.9	16.2
Socioeconomic classification	Low-Low	n	1021	760	1473	470	11	1562	1768	383
		%	33.2	42.3	43.7	51.9	37.9	33.3	48	51.4
	Low	n	1367	683	1216	288	10	2016	1302	226
		%	44.5	38	36.1	31.8	34.5	42.9	35.4	30.3
	Medium-Low	n	564	279	532	108	7	902	475	99
		%	18.3	15.5	15.8	11.9	24.1	19.2	12.9	13.3
	Medium medium-high and high	n	123	76	150	40	1	216	135	37
		%	4	4.2	4.4	4.4	3.4	4.6	3.7	5
Health Affiliation System	Contributive	n	1145	634	1140	247	7	1853	1105	201
		%	37.2	35.3	33.8	27.3	24.1	39.5	30.0	27
	Subsidized	n	1512	944	1894	568	21	2267	2169	461
		%	49.2	52.5	56.2	62.7	72.4	48.3	58.9	61.9
	Another regime	n	126	80	125	19	0	223	113	14
		%	4.1	4.4	3.7	2.1	0	4.7	3.1	1.9
	Not affiliated	n	292	140	212	72	1	353	293	69
		%	9.5	7.8	6.3	7.9	3.4	7.5	8	9.3
Geographic Region	Atlantic	n	206	283	533	189	2	329	716	164
		%	6.7	15.7	15.8	20.9	6.9	7	19.5	22
	Capital	n	1058	597	1005	244	10	1591	1081	222
		%	34.4	33.2	29.8	26.9	34.5	33.9	29.4	29.8
	Central	n	403	204	440	96	4	624	433	82
		%	13.1	11.3	13.1	10.6	13.8	13.3	11.8	11
	Oriental	n	461	196	404	105	4	741	353	68
		%	15	10.9	12	11.6	13.8	15.8	9.6	9.1
	Orinoquia Amazonia	n	616	281	523	115	3	941	500	91
		%	20	15.6	15.5	12.7	10.3	20	13.6	12.2
	Pacific	n	331	237	466	157	6	470	597	118
		%	10.8	13.2	13.8	17.3	20.7	10	16.2	15.8
Chronic Inflammatory Disease	Dubious Association	n	62	86	404	135	7	336	249	95
		%	2	4.8	12	14.9	24.1	7.2	6.8	12.8
	Absence	n	2965	1666	2799	718	19	4214	3301	614
		%	96.4	92.7	83	79.2	65.5	89.7	89.7	82.4
	Presence	n	48	46	168	53	3	146	130	36
		%	1.6	2.6	5	5.8	10.3	3.1	3.5	4.8
Teeth Loss Due to Caries	Absence	n	2177	852	752	140	3	2358	1421	139
		%	70.8	47.4	22.3	15.5	10.3	50.2	38.6	18.7
	Presence	n	898	946	2619	766	26	2338	2259	606
		%	29.2	52.6	77.7	84.5	89.7	49.8	61.4	81.3
Teeth Loss Due to Other Causes	Absence	n	2632	1513	2770	691	24	3936	3073	573
		%	85.6	84.1	82.2	76.3	82.8	83.8	83.5	76.9
	Presence	n	443	285	601	215	5	760	607	172
		%	14.4	15.9	17.8	23.7	17.2	16.2	16.5	23.1

Table 3: Prevalence of periodontitis in the studied Colombian population according to sociodemographic determinants and two different classifications of the disease.

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Periodontitis was predominant in female subjects in both classifications. However, in the ENSAB IV, most women (69%) had mild, chronic periodontitis, while in the reclassification the majority of them (61%) had moderate, chronic periodontitis (Table 3). The male participants exhibited a prevalence of severe, chronic periodontitis for both classifications, 55% and 52.6% for the ENSAB IV and for the reclassification, respectively.

In the ENSAB IV, 50.2% of the subjects between 45-64 years old showed severe chronic periodontitis. In the reclassification, the same group exhibited 43% of prevalence for the same category. The ENSAB IV evidenced that 44.2% of the subjects between 20-34 years old were classified as without periodontitis and 39.8% with mild, chronic periodontitis. However, in the reclassification, no one in this group fit the category of without periodontitis but instead had a prevalence of 32.2% and 33.3% for mild and moderate periodontitis, respectively. Concerning socioeconomic stratification, 51.9% of the subjects belonging to the low-low stratum presented severe periodontitis in accordance with the ENSAB IV. Similar data (51.4%) were observed in the reclassification.

The subsidized regime had a higher prevalence for the severe category in both classifications (62.7% in the ENSAB IV and 61.9% in the reclassification). In this same regime, a difference between the two classifications in the without periodontitis category (49.2% ENSAB IV and 72.4% reclassification) was observed.

The data about geographic distribution indicated that the group from the Capital had the highest prevalence in categories of without periodontitis (34.4%) and severe periodontitis (33.2%), according to the ENSAB IV.

Similar results were observed in the reclassification. In the Atlantic and Pacific regions, participants scored under the category severe, in accordance with the ENSAB IV. In contrast, under the reclassification, the participants scored as moderate in the Pacific region, and in the Atlantic, participants scored as severe.

Risk factors for periodontitis in accordance with the reclassification

All the variables maintained a statistical significance in the reclassification of periodontitis. However, in the multivariate analysis, the chronic inflammatory disease variable was not considered, because it did not have a statistical significance. In general, the greatest risk for periodontitis was observed in adult males between 35-79 years old, who belong to a low socioeconomic status and are affiliated to a

subsidized health system. The risk for periodontitis is even greater for those residing in the Atlantic and Pacific regions of the Colombian territory. Severe periodontitis increased for those in the group between 65-79 years old, followed by the group between 35-44 years old (Table 4).

Variable		Bivariate				Multivariate			
		Moderate Periodontitis		Severe Periodontitis		Moderate Periodontitis		Severe Periodontitis	
		OR	IC95%	OR	IC95%	OR	IC95%	OR	IC95%
Sex	Female	1		1		1		1	
	Male	1.4	1.3;1.5 [†]	2	1.7;2.3 [†]	1.4	1.3;1.6 [†]	1.6	1.4;1.9 [†]
Age group	18	1		1		1		1	
	20-34	1.8	1.6;2.1 [†]	3	1.9;4.8 [†]	1.8	1.6;2.1 [†]	2.8	1.7;4.5 [†]
	35-44	2.8	2.5;3.3 [†]	9.6	6.1;15.1 [*]	2.6	2.2;3.1 [†]	7.8	4.9;12.6 [†]
	45-64	2.7	2.4;3.1 [†]	14.6	9.4;22.6 [*]	2.4	2.0;2.9 [†]	10.9	6.8;17.4 [†]
	65-79	2.1	1.7;2.5 [†]	15.6	9.8;24.9 [*]	1.7	1.4;2.1 [†]	10.9	6.6;18.0 [†]
Socioeconomic classification	Low-Low	1		1		1		1	
	Low	0.5	0.5;0.6 [†]	0.5	0.4;0.7 [†]	0.7	0.6;0.8 [†]	0.7	0.6;0.9 [†]
	Medium-Low	0.4	0.4;0.5 [†]	0.6	0.4;0.7 [†]	0.5	0.5;0.6 [†]	0.7	0.5;0.9 [†]
	Medium medium-high and high	0.5	0.4;0.7 [†]	0.9	0.6;1.3	0.7	0.5;0.9 [†]	0.9	0.6;1.3 [†]
Health Affiliation System	Contributive	1		1		1		1	
	Subsidized	2	1.4;1.7 [†]	1.5	1.2;1.8 [†]	1.4	1.3;1.6 [†]	1.6	1.3;1.9 [†]
	Another regime	0.8	0.6;1.0	0.6	0.3;1.0	0.7	0.6;1.0 [†]	0.5	0.3;0.9 [†]
	Not affiliated	1.4	1.2;1.7 [†]	1.5	1.1;2.0	1.4	1.2;1.7 [†]	1.9	1.4;2.6 [†]
Geographic Region	Atlantic	1		1		1		1	
	Capital	0.3	0.2;0.3 [†]	0.5	0.4;0.6 [†]	0.4	0.3;0.5 [†]	0.7	0.5;0.9 [†]
	Central	0.3	0.2;0.3 [†]	0.4	0.3;0.6 [†]	0.3	0.2;0.4 [†]	0.4	0.3;0.6 [†]
	Oriental	0.2	0.1;0.2 [†]	0.3	0.2;0.5 [†]	0.2	0.2;0.29 [†]	0.4	0.3;0.5 [†]
	Orinoquia/Amazonia	0.2	0.2;0.2 [†]	0.4	0.3;0.5 [†]	0.2	0.1;0.2 [†]	0.3	0.2;0.5 [†]
	Pacific	0.5	0.4;0.6 [†]	0.7	0.5;0.9 [†]	0.6	0.5;0.7 [†]	0.7	0.5;0.9 [†]
Chronic Inflammatory Disease	Dubious Association	1		1					
	Absence	0.9	0.7;1.0	0.5	0.4;0.6 [†]				
	Presence	1.1	0.8;1.4	0.8	0.5;1.2				
Teeth Loss Due to Caries	Absence	1		1		1		1	
	Presence	1.8	1.6;1.9 [†]	4	2.9;4.3 [†]	1.3	1.2;1.5 [†]	1.5	1.2;1.9 [†]
Teeth Loss Due to Other Causes	Absence	1		1		1		1	
	Presence	1	0.9;1.2 [†]	1.5	1.2;1.8 [†]	1.1	1.0;1.3 [†]	1.5	1.2;1.8 [†]

[†]p-value<0.10 statistically significant difference, ^{*}p-value<0.05 statistically significant difference.

Table 4: Bivariate and multivariate analysis of sociodemographic determinants associated with the severity of periodontitis according to the reclassification.



Discussion

Clinical and sociodemographic data from the nationwide Colombia ENSAB IV were combined in this study to analyze the prevalence of periodontal disease and the risk factors related to social conditions and

health care access in different regions. This study evidenced high prevalence of periodontitis. Considering the alternative classification criteria based on previous epidemiological studies, the prevalence of mild periodontitis may be even higher [18]. In general, the prevalence of moderate and severe conditions appeared to be similar under the two classifications. The category of mild periodontitis could be interpreted as a non-established disease because without significant attachment loss to ensure that periodontitis is clinically evident [20]. There are also no deep periodontal pockets. Despite this, and in agreement with the new classification of periodontitis, stage I is the consequence of a continuous inflammation in the periodontium.

Diagnosis at an early age is crucial for subjects who are susceptible to periodontitis [21]. Moreover, based on the high prevalence of established moderate and severe conditions of the disease in older adults, awareness of the disease must be increased to detect mild cases and to ensure appropriate understanding of the prevalence and risks of the disease.

In the young people (18 years old) and younger adults (20-34 years old), the mild category of periodontitis prevailed. For adults between 35 and 44 years old, the moderate category was more prevalent. These younger age groups should be the focus of preventive care for both prevention and treatment of early signs of periodontal disease. A comprehensive and effective preventive approach may decrease the high incidence rate of severe periodontitis in adults, mainly from 45 years of age and older. A review described that the prevalence of severe periodontitis is reached around the age of 40, remaining stable through adulthood, but with high prevalence of the disease in the elderly [22].

Moderate and severe periodontitis was greater in adults (more than 84.9%) in both classifications, and this result was similar with other studies [6,23,24]. The high prevalence reported here and in the previous studies evidenced that periodontitis aggravates with age. This could be explained by the chronic nature of the disease and by the lack of more effective, preventive programs in accordance with the characteristics of the population.

The relationship of the disease with increasing age has been reported by several studies [24-26]. This could be attributed to several factors, including deficiency in oral hygiene practices, a lack of state funding for oral public services, as well as a lack of interdisciplinary programs and policies directed to populations with high disease burden [27].

On the other hand, a predominant factor in this situation is the ageing of the population worldwide, which tilts the burden towards the older adult population. This is also evident in the Colombian population, according to estimates for the year 2035 from the national administrative department of statistics, which balances the amount of young population with the elderly [28].

In this study, mild periodontitis was prevalent in female participants, both in the ENSAB IV (69%) and in the reclassification (61%) contradicting the work of Gomez, which found greater attachment loss in men than in women on interproximal surfaces [29]. The literature indicates that women have better oral hygiene habits than men. For example, women tend to use floss more frequently; a behavior that is linked to a lower prevalence of periodontitis [30]. This behavior may also be associated with the absence of periodontitis in women in both the classification of the ENSAB IV (68.4%) and in the reclassification

(72.4%). However, severe periodontitis was more frequent in males, which was corroborated in the bivariate analysis, where individuals of the men were twice as likely to develop severe periodontitis compared to female participants.

The study participants who belonged to the subsidized regime and those who did not adhere to the health system had a higher prevalence of severe periodontitis under both classifications. The data results were confirmed by the bivariate analysis, where these same participants presented a greater probability of developing severe periodontitis compared to those in the taxable regime category. In alignment with the bivariate analysis results, Acosta [31] affirmed that in Colombia, individuals belonging to the taxable regime had better general health than the other regimes. However, in the reclassification of the present study, 72.4% of the individuals of the subsidized regime did not present periodontitis. These data highlighted the importance of raising awareness of preventive measures by offering greater public dental services and easy access to the population. Our study findings agreed with Botero et al., [32] who evidenced that the elevated prevalence of the periodontal disease in young people in Latin America was related to the difficulty of accessing the health system and to the low socioeconomic conditions. Nevertheless, an ecological study reported that high-income countries had a higher prevalence of 4-5mm and 6 mm periodontal pockets, evaluated using the Community Periodontal Index of Treatment Needs [24].

The Atlantic and Pacific regions had a higher prevalence of severe and moderate periodontitis in both classifications. This was due to low socioeconomic conditions and lack of access to health services in these regions, especially in rural areas. Another possible explanation may be the local diet of the population. Acosta [33] reported that the Pacific region of Colombia exhibited micronutrient deficiency and high consumption of lipids and carbohydrates. High consumption of saturated fats, processed carbohydrates, and few fruits and vegetables are factors that influence the development or progression of severe periodontitis [33,34].

Some chronic inflammatory diseases, such as diabetes, obesity, and cardiovascular diseases are also known factors for periodontitis [35-36]. However, based on the strategy used we could not show any compelling association between these systemic conditions and the severity of periodontitis. One explanation could be that study participants reported their health conditions, which could lead to biases as to whether they had the disease, or they may not have been diagnosed yet. In contrast, considering the current evidence on periodontitis, a joint effort is paramount among teams of doctors and dentists to survey early signs of periodontal and systemic conditions for early diagnosis and treatment.

The prevalence of periodontitis was higher in participants who reported tooth loss, due to caries, than those who did not. These findings aligned with studies that evidenced a positive association between periodontitis and caries [37,38]. Both conditions are infectious diseases with shared sociodemographic factors, behaviors, and lifestyles that influence appearance and progression of the disease [39,40]. Furthermore, the presence of defective restorations is a risk factor for increased plaque accumulation that could induce gingival inflammation and ultimately affect the progression of attachment loss [37,41].

In summary, the study results evidenced that the participants between 20 and 44 years old represented a focus group for prevention and control, which may reduce the onset of the disease and lessen the burden of periodontitis in individuals from 45 to 79 years old. These study results should motivate funding for enhanced access to quality dental service, recordkeeping of this periodontal condition in young people, and highlight needs of the population that face socioeconomic conditions which increase the probability of developing more serious

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conditions of periodontal disease. Early intervention and timely diagnoses in individuals with gingivitis may help reduce the increasing prevalence of periodontitis.

Furthermore, the identification of mild cases in young subjects, using an alternative classification, may help identify potentially vulnerable groups. In addition, it is necessary to further emphasize this topic within the academia, study centers, and health care institutions to integrate the current knowledge of the disease and help this knowledge reach affected populations, positively influencing behavioral attitudes that help prevent the disease. Consequently, dentists, doctors, and nutritionists should work together on strategies that promote this self-care, recognizing that periodontitis can impact general health. The present study had some limitations. The sample weights were not established to make the prevalence estimates. However, the identification of mild cases in young subjects, using an alternative classification may help to identify potentially vulnerable groups.

Conclusions

The prevalence of periodontitis regardless of disease definition criteria was high. The alternative approach showed a higher prevalence of mild periodontitis in young people. Therefore, these results can provide insights for a critical analysis of the periodontal situation of the young population and may help to identify the potentially vulnerable group and risk factors to reduce the prevalence of periodontitis in the future.

Acknowledgments

The Colombian Ministry of Health provided the database for this study. There is no conflict of interest declared.

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Citation: Rodriguez SVZ, Flórez MP, Bottacin FS, Reina HR, and Taba M Jr. An approach to assess early detection of periodontal disease in young and adult individuals in Colombia for prevention (2020) *Dental Res Manag* 4: 52-59.



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