Epidemiology of periodontal diseases in Uruguay:

past and present

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Abstract

This article aims to review periodontal disease in Uruguay. International databases (PUBMED, SCOPUS, EBSCO, SciELO) were consulted. The search also included national sources (National Library of Dentistry, Documentation Center of the School of Dentistry, Ministry of Public Health, National Directorate of Health of the Armed Forces) which were searched manually. The studies found provided useful epidemiological information and allowed us to conduct a historical review of epidemiology concepts, etiopathogenesis and hegemonic currents in periodontics. Gingival disease is the most prevalent disease, while destructive periodontal conditions mainly affect adults. Age, geographical origin, social class and smoking are indicators strongly associated with these disorders. From the close reading of the articles collected we can make suggestions to be considered in future epidemiological surveys

Keywords: epidemiology, periodontal diseases, prevalence.

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Introduction and objectives of the review

Periodontal diseases are multifactorial, chronic and socially patterned conditions. Their study should include their clinical and pathophysiological presentation as well as their social pattern of production and development[1–3].

Epidemiological research is useful to design health policies, identify vulnerable populations, strategically reallocate resources to reduce risks, prevent damage and treat the most prevalent pathologies, as well as to suggest hypotheses to develop research lines. Oral diseases qualify as major public health problems around the world[4].

The aim of this work was to analyze the available information on epidemiological studies related to periodontal disease in Uruguay.

Methodology and literature search strategy

We arbitrarily decided to start the search in 1900 up to December 2015, as we knew that several works were in their publication phase and that they met the inclusion criteria proposed for this review. The steps followed are illustrated in Fig. 1 (Search Strategy).

Fig. 1 – SEARCH STRATEGY

Search date	From 1900 to December 2015. Five researchers (E.A., V. G., M. M., N.A., A.D.) reviewed and selected the papers. This team was advised by a professional with a Bachelor's Degree in Library Science (C.S.).
Inclusion criteria	Epidemiological studies of periodontal disease in Uruguay without restriction on account of type of study, language and age of the populations analyzed. They should also include the periodontal variables, diagnosis or indices used.
Search terms	PUBMED: ("Periodontitis"[Mesh] OR "Periapical Abscess"[Mesh] OR "Periodontal Diseases"[Mesh] OR "GingivalDiseases"[Mesh] OR "Periodontitis"[Mesh] OR "Chronic Periodontitis"[Mesh] OR "Aggressive Periodontitis"[Mesh] OR "Periapical periodontitis"[Mesh] OR "Periapical Abscess"[Mesh] OR "Periapical Granuloma"[Mesh] OR "Periodontitis, Aggressive"[All fields]) AND (epidemiol* OR incidence OR risk OR "Risk Factors") AND Urugua*[All Fields]. No filters were applied to the other bases.
Databases	Library of the School of Dentistry/UdelaR, MEDLINE, SCOPUS, Virtual Health Library, National Library of Dentistry, SciELO, EBSCO, Ministry of Public Health, National Directorate of Health of the Armed Forces).
Key journals consulted	Periodontology 2000, Journal of Periodontology, Annals of Periodontology, Journal of Clinical Periodontology, Odontoestomatología, Odontología Uruguaya, Anales de la Facultad de Odontología (UdelaR), (these last two are only indexed in the School of Dentistry Information Center).

In addition, interviews were conducted with national experts in the field to find out about publications which may not have been indexed. All of this was accompanied by a cite-by-cite follow-up of the papers obtained to expand the search. From the sources mentioned, 355 articles were recovered. Once the different stages of reading and selection were completed, 18 papers were included in the final review.

Development and discussion

Epidemiology is the study of the distribution and determinants of health-related states in specific populations and the application of this study to control health problems. Its objectives are to know the prevalence, extent and severity of the pathology, to elucidate its etiology (risk factors/indicators), to evaluate and design preventive and treatment strategies[5,6].

According to the latest national census of 2011, Uruguay has 3,286,314 inhabitants. Nearly 50% live in Montevideo and a similar percentage are female. Marked by a constant decrease in the birth rate, the national “demographic pyramid” reflects a greater number of people over 50 years old (compared to the 2004 census) as a result of an increase in life expectancy[7]. Data from the latest national survey reveal that 28.8% smoke, 90.8% eat less than five daily servings of fruits and vegetables, 38% are hypertensive and 64.7% are overweight or obese[8].

Since the beginning of the 20th century there have been reports about the study of oral health in Uruguay[9]. However, an “almost” exclusive approach to the problem is evident: “Dental Caries”. However, periodontal pathology has been rarely reviewed[10–12]. According to experts, this has had a significant impact on undergraduate and postgraduate teaching of Periodontics, with a small number of hours and teachers, which is detrimental to the interest in the field as well as to actually solving periodontal problems[13].

It is difficult to accurately estimate the prevalence and incidence of chronic diseases that affect a large part of the world population, among other things because of the lack of consensus when defining “a case of disease”[14–17], which also happens with periodontal disease. Out of 3400 articles retrieved from a systematic review, whose aim was to analyze the definitions of periodontal diseases, only 15 were selected. This illustrates the varied criteria that exist for establishing a cut-off point when determining a case of periodontitis and/or gingivitis, including the main variable thresholds[18]. This complexity is reflected today

because the American Academy of Periodontics (AAP) as well as the European Federation of Periodontics (EFP) present dissimilar definitions of the disease[19–21].

Several indexes and registration systems were used over time. The paradigms on etiopathogenesis and the available diagnostic instruments determined them[22]. The Community Periodontal Index of Treatment Needs (CPITN) has been a tool widely used in epidemiological surveys in South America[23,24]. Considered a “partial” recording system (it only uses six teeth) and despite the modifications that were made later, this indicator has been questioned since it underestimates or overestimates the “amount of disease”, mainly regarding age[25,26].

As can be seen from the studies reviewed, most use convenience samples which, though easy to obtain, are biased, which makes them difficult to interpret. Probabilistic and population-based samples represent valid strategies when quantifying population diseases, but they require logistics, significant investments and time, which often makes it impossible to conduct them[27].

In addition to these difficulties, there is a lack of a detailed description of relevant methodological aspects in the papers published[28]. Not reporting the type of periodontal probe used, the intra and inter-examiner calibration stages, the sampling techniques used as well as the characteristics of the study population, undermine the truth of what is reported[29].

Based on the information obtained, the papers were grouped into: studies conducted from specific population groups and, on the other hand, nationwide studies.

Studies from specific population groups (Table 1)

Most of them were conducted in Montevideo[13,30–33], except one survey carried out in the Department of Canelones[34]. The convenience samples with the largest number of

individuals corresponded to multiple institutions within each location[35,36]. In addition, almost all of the surveyed population use public health services[13,30–40].

The pioneering studies date from the middle of the 20th century[13,30–33]. Several authors referred to the paradigm that considers that the causal factors were in direct contact with the tooth as “local”, while the etiology of the disease that was “remote” from the periodontium was described as “host-level”[41,42]. Most methodological designs, mainly observational, aimed at possible associations with risk factors/indicators (occlusal problems, vitamin deficiencies or hematological disorders)[13,31,32].

According to the hegemonic current of medicine, periodontal charts were discriminated between “Inflammatory” (Gingivitis and Periodontitis) and “Degenerative” (Gingivosis and Periodontosis). They were considered degenerative since they showed excessive clinical symptoms but with a small number of local irritants[43,44].

Studies published since 1970 can be grouped according to arbitrary age groups.

TABLE 1: STUDIES FROM SPECIFIC POPULATION GROUPS

Department	Population	Periodontal index	Risk indicator	Prevalence/ Extension and Severity	Association	Comments
Montevideo[13]	Patients of the School of Dentistry	Symptoms, visual signs of inflammation, PD	Age, sex	88% P Dis), (80% inflammatory origin), 33% incipient, 19.33% intermediate and 6.33% severe	P Dis increases with age. More prevalent in men than women	
Montevideo[30]	100 postgraduate patients, School of Dentistry.	Symptoms, visual signs of inflammation, PD	Hematological disorders	52% advanced and generalized PD, 23% advanced and localized PD, 12% incipient and generalized PD, 8% incipient and localized PD 5% no PD $\underline{>}$ 3mm	Association between PDis and various blood disorders.	
Montevideo[31]	20 patients of the	Symptoms, visual signs	Chlordidryc acid	Undetermined	Patients with P Dis show an	“Dystrophic” conditions-

	School of Dentistry	of inflammation, PD	and ammonia		acidifying diet lacking fruits, vegetables, hemoglobin and ascorbic acid.	paradentosis are mentioned
Montevideo[32]	Students of the School of Dentistry, male and female 20 – 24 years old	Symptoms, visual signs of inflammation, PD	Joint alterations, diet	>90% gingival inflammation, 44% mobility and 64% migration; PD ≤3mm=58%, PD 4 – 6mm=16% and PD >6mm=6%. Gingival injuries= 20%, Bone and Gingival injuries 76%, incipient bone injuries= 58%, intermediate bone injuries= 16% and deep bone injuries= 2%	96% joint problems. 95% inappropriate, acid diets (excess of meat or carbohydrates) close to 90%, lacking minerals=45% and vitamins 75%	As for joint alterations, authors conclude "that it is not possible to deduce an association"; regarding diet, "there is most probably an association". Gingivosis is mentioned (dystrophic alterations of soft tissues)
Montevideo[33]	200 private patients and patients of the School of Dentistry	GR, PD, Mobility and Migrations	Joint alterations	Unspecified	According to the authors "it is almost impossible to relate cause and effect"	
Canelones[34]	100 individuals, 9 – 18 years old (elementary school, high school and state clinics)	CPITN. (Four surfaces), (PI), (GI)	Age	1% (±1%) according to criteria established by the authors	Although the aim is to evaluate juvenile periodontitis, 8% shows Code 3 and 4.	According to the authors, the condition is more frequent between ages 12-14
Unspecified[35]	261 children (2 to 6 years old from 132 state schools and dental clinics and 129 in hospitals)	IAG, Follicles, GI and PI	Age, several diseases.	30.6% with IAG, prevalence in ages 2, 3, 4 was higher compared to 5 & 6 ($p<0.01$). GI. 83.9% GI. (it varies with age, 69.3% of expanded inflammation >3 teeth. PI. 98.8% , Follicles 7.6% of the population	No association between general diseases and gingival signs. IAG higher in hospitalized patients ($p<0.001$) and specifically infectious ($p<0.01$). GI was higher in those with inflammation of the attached gingiva ($p<0.01$). No association between PI and GI.	
Montevideo[36]	1162 individuals, 18-75 years old (36.9 +12.7). 7	CPITN	Age	≥ 50% showed PD between 4 – 6mm; <8% advanced PD; <13% show	As age increases, there are more people with PD >6mm as well as CAL.	calibrated

	urban and suburban centers.			generalized PD; CAL 2mm= 8.2%; CAL = 3 – 5 mm = >50%. CAL>6mm = 40%,. ≥ 90% PI, GI and BoP.		
Montevideo[37]	76 HIV (1 – 17 years old, 7.5±3.0) vs. 86 healthy (3 – 12 years old, 6.5± 2.88) C.H.P.R.	Gingivitis (WHO)		Gingivitis: 75% of the population		
Montevideo[38]	39 have coagulopathies CHPR (2 – 15 years old; 8.62+ 4.20) vs. 78 healthy (3 – 12 years old, 6.5± 2.88)	Gingivitis (unspecified index)		Gingivitis: 43% of the population		
Montevideo[39]	68 asthmatic children between 0 - 14 years old (49 children that use inhalers) C.H.P.R.	Gingivitis: PI, inflammation of the gingiva and soft tissue dehydration	Use of inhaler for non-infectious respiratory diseases	Gingivitis: 83.7% of the population		
Montevideo[40]	72 persons, 15-35 years old, 57 M and 15 W	CPI	Drug addiction	16.6% gingival health, 65.3% gingivitis and 18.1% periodontitis	People between 25 to 35 years old show less gingival health when compared to those included in the range of 15 to 25 (4 to 8), and show a greater number of individuals with periodontitis (12 to 1)	0.9 kappa calibrated examiners

References: HIV - Human Immunodeficiency Virus; CHPR - Pereira Rossell Hospital; MEC - Ministry of Education and Culture; GI – Gingival Inflammation Index (Löe and Silness); PI – Plaque Index (Löe and Silness); BoP - Bleeding on probing; PD – Probing Depth; CAL – Clinical Attachment Loss; JP - Juvenile Periodontitis; CPITN – Community

Periodontal Index of Treatment Needs; CPI – Community Periodontal Index; WHO – World Health Organization; GR – Gingival Recession; IAG – Inflammation of the Attached Gingiva; M – Man; W – Woman, PDis - Periodontal disease.

Epidemiological studies in children and/or adolescents

The degree of inflammation of the gingival tissues as well as the biofilm deposits were the most evaluated periodontal conditions. Plaque-induced gingival disease (ex chronic gingivitis) reached figures between 43% and 84%. In addition, when age is stratified, greater pathology can be seen in older people [35,37–39].

The advent of the CPITN allowed for the evaluation of the attachment apparatus. This index was used in 100 young people of which only 1% showed localized aggressive periodontitis (Code 4 - PD > 6mm in incisors and molars)[34].

Epidemiological studies in adults

Rötemberg et al. found in 2015 that bleeding on probing reached 65%, while periodontitis was below 20%. When stratified by age groups, the 25-35 group had worse periodontal records compared to the group aged 25 or less. We must highlight, in this last case, that the definition of “case of periodontitis” was not reported[40].

Haskel et al. found in 1988 that dental plaque and gingival inflammation reached 95% of the records. However, only 8% recorded a probing depth > 6mm; 87% of the total localized periodontitis. Attachment loss should be considered with age to have a better understanding. Between the ages of 20 - 29, the mean was 2.80mm (±2.50mm) and for those aged 60 or more, it was 6.02mm (±2.09mm). In turn, sites with attachment loss lower than 2mm were found mainly in younger people (<20 years and 20 - 29 years) and 4% were in the group aged >60. In addition, attachment loss >6mm increased noticeably from 1.8% (<20 years) to 44.3% (>60 years)[36].

National studies (Table 2)

This table includes representative studies at a national level or involving several departments. Five of these six works focused on children and adolescents, while the others considered adults and seniors. Most of them involved calibration procedures and random assignment in the selection of individuals[45–49].

TABLE 2: NATIONAL STUDIES

Sample	Periodontal index used	Risk indicator	Prevalence/ Extension and Severity	Variable association	Comments
9000 children of the M.E.C. clinics, 64 geographical locations (30 outside the capital and 34 in Montevideo); 72% in the metropolitan area, 16.6% in the suburban area, 9.40% in concentrated rural areas and 2% in isolated rural areas[45].	Gingivitis	Geographical areas	40.6% gingivitis in urban centers, 45% gingivitis rural areas outside the capital		
3457 (2281 outside the capital and 1176 in Montevideo) Schools in Montevideo: CATEGORY 1 (low socio-economic status) CATEGORY 2 School entry 1848	Gingivitis (WHO) Oral hygiene (WHO)	age, sex, school grade and geographical area:	Gingivitis: 6 years – 31.5%; 7 years - 38.5%, 11 years – 50.6% and 12 years- 57.7% School entry School completion Gingival pathology Gingival pathology 0 – 65.5% 0 – 45.1% 0.1 - 1 – 33.0% 0.1 – 1 – 46.7% 1.1 - 2 – 1.5% 1.1 – 2 – 8.3% Plaque scores Plaque scores 0 – 1.4% 0 – 1.9% 1 – 32%	Correlation between gingival condition and oral hygiene. There were no differences between sex and gingival alterations either at school entry or completion.	Calibrated examiners (error 0.5%)

children (5-9 years old) School completion 1609 children (10-17 years old)[46].			1 – 30.8% 2 – 55% 2 – 56.3% 3 – 11.6% 3 – 10.9% Rural areas show a higher plaque rate (2 – 70.3% and 3 – 13.7%), Montevideo being the area with the lowest plaque rate (2.6%).		
Convenience sample, 13 private institutes School entry population (1st grade) 334, school completion population (6th grade) 297. Total 631. 5 – 13 years old [47]	WHO criteria: 0 – Healthy, 1 – BoP y 2 – Calculus	Age, sex, geographical regions	At age 6 – 0.0%; at 7 - 10.6%, at 11 – 18.2% and at 12 – 18% had BoP. School entry: BoP 0 – 88.6%, 0.1 – 1.0 – 11.4%, 1.1-2.0 – 0.0%. Plaque: 0 – 9.9%, 1/3 – 47.6%, 2/3 – 37.7%, 3/3 – 4.8%. School completion: BoP 0 – 82.4%, 0.1-1.0 – 16.9%, 1.1 – 2.0 -0.7%. Plaque: 0 – 14.1%, 1/3 – 56.6%, 2/3 – 27.9% y 3/3 – 1.3%.	Gingival alterations/sex Men - 9.8%; Women - 8.3%. There are no differences either in gingival conditions or plaque amount in the different geographical regions. The more plaque, the greater the gingival alterations.	Calibrated examiners (error 0.5%)
1544 school-age children (12 year old), urban schools, Area 1 – Montevideo, Area 2 – departments with no dry border with Brazil, and Area 3 - departments with dry border with Brazil)[48].	Gingivitis: marginal BoP	Geographical area, socioeconomic level (INSE). INSE categories: AB – C1 (upper + upper middle class), C2 (middle upper class), C3 (middle middle class), D – E (middle lower + lower middle + lower lower class).	93% of the population studied has gingivitis.	No association with use of toothbrush, dental floss, dental assistance. There is a connection between gingivitis and the geographical area: Area 1 – 3.06 (2.91-3.22); Area 2 – 3.42 (3.30 – 3.54) and Area 3 – 3.85 (3.64 – 4.07) (p<0.002). There is a connection between gingivitis and socioeconomic status: AB and C1 – 2.93 (2.44 – 3.42); C2 – 3.22 (2.92 – 3.51); C3 – 3.10 (2.90 – 3.29); D and E - 3.47 (3.36 – 3.58), p< 0.001).	
418 individuals, 15 to 24 years (18 departments, except	CPI	Sex, age	27.9% (22.8% - 32.69%) Healthy; 6.5% (3.8% - 9.2%) BoP; 42.6% (37.1% - 48%) Calculus; 18.3% (13.8% - 22.7%) PD 4 – 5mm; 0.2% (0% - 0.6%) PD ≥6mm.		PD calibration 0.6 – 1.0 inter and intra-examiner

the capital)[49].					
Age: 35 – 44, n=358/ 65 – 74, n=411[59].	CPI	Sex, age, area, socioeconomic status, health insurance, tobacco, alcohol and oral hygiene habits	40.8% (35.9 – 46) BoP; 21.8% (17.9 – 26.3) moderate periodontitis; 9.12% (6.8 – 12.1) severe periodontitis	Households with no member with university studies showed the worst periodontal conditions. The lack of dental assistance was connected with moderate periodontal disease. Smoking was connected with the worst periodontal health conditions in the elderly.	PD calibration 0.6 – 1.0 inter and intra-examiner.

References: HIV – Human Immunodeficiency Virus, CHPR - Pereira Rossell Hospital; MEC - Ministry of Education and Culture; GI – Gingival Inflammation Index (Löe and Silness); PI – Plaque Index (Löe and Silness); BoP Bleeding on probing; PD – Probing Depth; CAL – Clinical Attachment Loss; JP - Juvenile Periodontitis; CPITN – Community Periodontal Index of Treatment Needs; CPI – Community Periodontal Index; WHO – World Health Organization; GR – Gingival Recession; IAG – Inflammation of the Attached Gingiva.

Population samples in children and adolescents

The World Health Organization stratifies people by age to conduct epidemiological studies. In addition, it considers schools as “ideal” centers in terms of sample collection, and specifies that 5 and 12 are key ages since they mark school entry and completion in the formal educational system as well as the beginning and end of the permanent arch[50].

In these cases, only the superficial periodontium was evaluated, and bleeding on probing was the indicator that made it possible to assess the presence of gingival disease[51]. Additionally, the presence of dental biofilm and tartar was assessed. Regardless of the recording methodology used, there is a close connection between biofilm and gingival disease, which is corroborated in the world literature[52–54]. In terms of prevalence, gingivitis (bleeding on probing) reaches 93% of the children surveyed[48].

The most considered independent variables are age, geographical origin and socioeconomic status. The information collected reveals a directly proportional relation between chronological age and gingival pathology, both regarding frequency and severity, which is appreciated when analyzing the formal education entry/completion figures and making cutoffs in certain age groups[46,47]. The accumulation of dental plaque, eruption and dental exfoliation, the dental change and hormonal influences explain gingival inflammation[55].

Geographical location shows a “disease gradient” since there is a higher prevalence of gingival pathology as we move away from the capital city or urban centers, with the most serious cases occurring in rural areas, except in private schools[45,46,48].

The world literature clearly demonstrates the relationship between oral diseases and socioeconomic status[24,56,57]. In Uruguay, this variable was analyzed based on the categorization of public or private schools and through previously tested surveys[46,47,58]. From the above it appears that in lower income populations the highest levels of gingivitis and dental biofilm are recorded[46–48].

The sex variable has not been sufficiently reviewed. A survey shows that men are more prone to gingivitis than women (9.8% versus 8.3%) [46,47].

Uruguayan adolescents have been “partially” examined so far. In the First National Survey of Oral Diseases of Uruguay, 418 people between 15 and 24 years old were surveyed. About 30% of them are “healthy” and 20% had an incipiently increased and mean probing depth (4-5mm). However, according to reports, these results are included in the age group up to 24 years old[49].

Population samples on adults and the elderly

Lorenzo et al. 2015[59] published data from the first national survey on the most common oral pathologies including peridontopathies. People over 35 were evaluated from 2 probabilistic and representative samples from the whole country. They applied WHO methodological for

epidemiological surveys to be able to make international comparisons. Therefore, a partial recording system was used, evaluating 10 index teeth in 3 sites from vestibular (DV, V, MV) and 3 from lingual/palatal (DP, P, MP) recording probing depth, tartar, bleeding on probing and attachment loss. The following were defined as “case of periodontitis”: Moderate Periodontitis - IPC> 2 (probing depth> 4mm) and CAL> 0 (CAL> 4mm); Severe Periodontitis - IPC> 2 (probing depth> 4mm) and CAL> 1 (CAL> 6mm).

The logistic regression models applied allow us to conclude that bleeding on probing and the moderate and severe forms of periodontitis were associated with worse socioeconomic status (p = 0.018). The authors used the presence of at least one member with university studies in the household as a socioeconomic indicator. There are several ways to find the relationship between socioeconomic factors and periodontal disease[60]. Zini et al. explain the socioeconomic influence on severe forms of peridontitis due to an increased tendency to tobacco smoking and to less efficient control of dental biofilm among those with lower income[61]. At the same time, lower income classes have an inadequate response to stressful daily situations, which has an impact at a biological level with an inadequate response to microbial aggression by periodontopathic pathogens[62]. The worst conditions were found in those who never used dental services (p=0.032). This was confirmed in residents of the Municipality of Guarulhos, Brazil[63]. According to Frias et al., the low demand for dental services is linked to the perception of oral health problems by the respondents, their income and their age.

The relationship between smoking and periodontal disease has been long proven, mainly due to the deleterious effect on periodontal tissues and the modulating effect on the host response[64]. In this case, the statistical association is only seen in the higher age group who smoked more than 10 cigarettes a day since they had greater bleeding on probing and greater periodontitis compared to those who did not smoke at all or did not smoke daily (p

<0.001). This finding is linked to how questions are posed in the methodology applied in this survey as well as the lower response rate of the adults age group.

Limitations and strengths of the review

The papers prior to 2000 have methodological deficiencies, which is a limitation since the conclusions drawn from them have insufficient evidence.

There are no sampling techniques, recording systems or standardized indices, which hinders comparisons among the different studies. Additionally, most of the information on epidemiology is descriptive with an insufficient analytical perspective, which complicates the determination of risk factors.

However, of the 18 papers that were finally included, 70% can only be found in national databases, which should be understood as a strength that demonstrates the extensive and exhaustive search, supplemented by a reference follow-up of each paper retrieved. This has made it possible to compile the history of periodontal disease in Uruguay, thus developing a substantial source of information for future systematic reviews.

Conclusions

- Gingival disease is the most prevalent periodontal pathology;
- Periodontitis affects mainly adults and the elderly, which is similar to what happens in the other Latin American countries;
- Adolescents have been poorly characterized;
- Age, geographical origin, socioeconomic status and tobacco consumption have been associated with periodontal disease.

We suggest that future surveys include: a special chapter for adolescents; full mouth record systems to reduce the underestimation of periodontal disease; gingival recession as a primary variable since it has an impact on the quality of life; analysis of the risk factors associated with periodontitis to identify more vulnerable populations; the perception that

patients have about their oral health from questionnaires previously validated for our population.

REFERENCES

1. Sheiham A, Nicolau B. Evaluation of social and psychological factors in periodontal disease. Periodontol 2000. 2005; 39 (1): 118–31.
2. Lencová E, Broukal Z, Dusková J. Psychosocial, behavioural and oral health indicators-review of the literature. Prague Med Rep. 2006; 107 (3): 305–16.
3. Thomson W, Sheiham A, Spencer A. Sociobehavioral aspects of periodontal disease. Periodontol 2000. 2012; 60 (1): 54–63.
4. World Health Organization. The World Oral Health Report 2003. Continuous improvement of oral health in the 21st century – the approach of the WHO Global Oral Health Programme. Geneva: WHO; 2003.
5. Gordis L. Epidemiología. 4th ed. Barcelona: Revinter Ltda; 2009. 372 p.
6. World Health Organization. WHO | Epidemiology [Internet]. WHO. 2016 [cited 2016 May 19]. Available from: http://www.who.int/topics/epidemiology/en/
7. Uruguay. Instituto Nacional de Estadística. Censos 2011 [Internet]. Montevideo: Instituto Nacional de Estadística; 2015 Sep. Available from: http://www.ine.gub.uy/censos2011/index.html
8. Uruguay. Ministerio de Salud Pública. 2DA_ENCUESTA_NACIONAL_final2_digital.pdf [Internet]. Cited: 2017 Apr 06. Available from: http://www.msp.gub.uy/sites/default/files/archivos_adjuntos/2DA_ENCUESTA_NACIONAL_final2_digital.pdf
9. Pucci F. Plan de acción de la sección odontología: estudio comparativo del estado de salud bucal de los estudiantes de enseñanza secundaria examinados durante los años 1925 - 1926. Rev Odontológica. 1926; 7: 380–5.
10. Maglione J. Seminario sobre Salud Bucal: relatos y conclusiones. Montevideo: Ministerio de Salud Pública; 1983.
11. International College of Dentists. Un sexenio de prevención escolar 1987 - 1992. International College of Dentist Section Fourth Magazine. 1995; 19–22.
12. Uruguay. Ministerio de Salud Pública. Encuesta de salud bucal en escolares de 11 a 14 años. Sector Público. Uruguay: Ministerio de Salud Pública; 1999.
13. Mazzoni J, Bertucci A, Moreira I. Diagnóstico paradencial precoz. Consecuencia de la prescindencia del mismo. An Fac Odontol. 1956; 3 (2): 25–35.
14. Huang PL. A comprehensive definition for metabolic syndrome. Dis Model Mech. 2009; 2 (5–6): 231–7.
15. Danaei G, Finucane MM, Lu Y, Singh GM, Cowan MJ, Paciorek CJ, Lin JK, Farzadfar F, Khang YH, Stevens GA, Rao M, Ali MK, Riley LM, Robinson CA, Ezzati M, Global Burden of Metabolic Risk Factors Chronic Diseases Collaborating Group (Blood Glucose). National, regional, and global trends in fasting plasma glucose and diabetes prevalence since 1980: systematic analysis of health examination surveys and epidemiological studies with 370 country-years and 2.7 million participants. Lancet. 2011; 378 (9785): 31–40.
16. Chen L, Magliano DJ, Zimmet PZ. The worldwide epidemiology of type 2 diabetes mellitus–present and future perspectives. Nat Rev Endocrinol. 2012; 8 (4): 228–36.
17. Burguete-García A, Valdés-Villalpando Y, Cruz M. [Definitions for the diagnosis of metabolic syndrome in children]. Gac Médica México. 2014; 150 (1): 79–87.

18. Savage A, Eaton K, Moles D, Needleman I. A systematic review of definitions of periodontitis and methods that have been used to identify this disease. J Clin Periodontol. 2009; 36 (6): 458–467.
19. Tonetti MS, Claffey N, on behalf of the European Workshop in Periodontology group C. Advances in the progression of periodontitis and proposal of definitions of a periodontitis case and disease progression for use in risk factor research. J Clin Periodontol. 2005; 32 (6): 210–213.
20. Page R, Eke P. Case definitions for use in population-based surveillance of periodontitis. J Periodontol. 2007; 78 (7): 1387–1399.
21. Eke P, Page R, Wei L, Thornton-Evans G, Genco RJ. Update of the case definitions for population-based surveillance of periodontitis. J Periodontol. 2012; 83 (12): 1449–54.
22. Baelum V, López R. Periodontal disease epidemiology - learned and unlearned? Periodontol 2000. 2013; 62 (1): 37–58.
23. Dye B. Global periodontal disease epidemiology. Periodontol 2000. 2012; 58 (1): 10–25.
24. Oppermann R, Haas A, Rösing C, Susin C. Epidemiology of periodontal diseases in adults from Latin America. Periodontol 2000. 2015; 67 (1): 13–33.
25. Susin C, Kingman A, Albandar J. Effect of partial recording protocols on estimates of prevalence of periodontal disease. J Periodontol. 2005; 76 (2): 262–267.
26. Bassani D, da Silva C, Oppermann R. Validity of the “Community Periodontal Index of Treatment Needs” (CPITN) for population periodontitis screening. Cad Saúde Pública. 2006; 22 (2): 277–83.
27. Raggio Luiz R, Leal Costa AJ, Nadanovsky P. Epidemiologia & Bioestatística em Odontología. Sao Paulo: Atheneu; 2008. 469 p.
28. von Elm E, Altman D, Egger M, Pocock S, Gøtzsche P, Vandenbroucke J, et al. [The Strengthening the Reporting of Observational Studies in Epidemiology [STROBE] statement: guidelines for reporting observational studies]. Gac Sanit SESPAS. 2008; 22 (2): 144–50.
29. Holtfreter B, Albandar J, Dietrich T, Dye B, Eaton K, Eke P, et al. Standards for reporting chronic periodontitis prevalence and severity in epidemiologic studies: Proposed standards from the Joint EU/USA Periodontal Epidemiology Working Group. J Clin Periodontol. 2015; 42 (5): 407–12.
30. Moreira I. Signos y síntomas de las paradenciopatías y análisis hematológicos. Odontol Urug. 1955; 40 (9): 740–9.
31. Moreira I. Enfermedad paradencial y alimentación acidificante. An Fac Odontol. 1957; 6 (3): 211–6.
32. Moreira I. Paradenciopatías en jóvenes. An Fac Odontol. 1958; 7 (4): 77–86.
33. Bertucci A. Semiología paradencial y factores articulares. An Fac Odontol. 1958; 4 (7): 17–30.
34. Campi M, Esquenasi J, Alonso M. Prevalencia de la Periodontitis juvenil en un grupo de jóvenes en la ciudad de Canelones. Odontol Urug. 1996; 1 (14): 5–11.
35. Haskel E, Puppo de Guerra M. Alteraciones gingivales de la dentición temporaria. Odontol Urug. 1977; 1 (28): 13–22.
36. Haskel E, Patricia A, Braun E, Esquenasi J, Legnani R, Lorenzo E. Epidemiología de la Enfermedad Periodontal. Odontol Urug. 1988; 38 (1): 8–15.

37. Alvarez L, Hermida L, Cuitiño E. Situación de salud oral de los niños uruguayos portadores del virus de la inmunodeficiencia humana. Arch Pediatr Urug. 2007; 73 (1): 23–8.
38. Hermida L, Alvarez L, Lewis W, Gabriel L, Boggia B, Segovia A, et al. Situación de salud oral de niños uruguayos portadores de coagulopatías hereditarias, Centro Hospitalario Pereira Rossell, Montevideo, Uruguay. Univ Odontológica. 2011; 64 (30): 31–5.
39. Huartamendia R, Nappa A, Queirolo R. Problemas de salud bucal relacionados al uso de medicamentos por vía inhalatoria en trastornos respiratorios. Odontoestomatología. 2012; 14 (20): 4–16.
40. Rötemberg E, Salveraglio I, Kreiner M, Piovesan S, Smaisik K, Ormaechea R, et al. Estado dental y periodontal de población en tratamiento por consumo de drogas. Estudio piloto. Odontoestomatología. 2015; 17 (25): 34–9.
41. Nunn M. Understanding the etiology of periodontitis: an overview of periodontal risk factors. Periodontol 2000. 2003; 32 (1): 11–23.
42. Hujoel P, Zina L, Cunha-Cruz J, Lopez R. Historical perspectives on theories of periodontal disease etiology. Periodontol 2000. 2012; 58 (1): 153–60.
43. Armitage G. Classifying periodontal diseases – a long-standing dilemma. Periodontol 2000. 2002; 30 (1): 9–23.
44. Armitage G. Learned and unlearned concepts in periodontal diagnostics: a 50-year perspective. Periodontol 2000. 2013; 62 (1): 20–36.
45. Olano O. Condición de la salud bucal en el Uruguay. Odontol Urug. 1983; 1 (33): 5–15.
46. Uruguay. Ministerio de Salud Pública. Valoración de la Salud Bucal de la población escolar. Sector Público. Uruguay: Comisión Honoraria de Salud Bucal; 1991-1992.
47. Uruguay. Ministerio de Salud Pública. Valoración de la Salud Bucal de la población escolar. Sector Privado. Uruguay: Comisión Honoraria de Salud Bucal; 1992.
48. Angulo M, Bianco P, Cuitiño E, Silveira A. Relevamiento y análisis de Caries Dental, Fluorosis y Gingivitis en adolescentes escolarizados de 12 años de edad en la República Oriental del Uruguay. 2010.
49. Lorenzo S. Enfermedad Periodontal en la población joven y adulta uruguaya del Interior del país. Relevamiento Nacional. 2010-2011.
50. World Health Organization. Oral Health surveys Basic Methods. 2013.
51. World Health Organization. Oral health surveys: basic methods [Internet]. World Health Organization; 1987. Available from: https://books.google.com.br/books?id=WPRpAAAAMAAJ
52. Loe H, Theilade E, Jensen S. Experimental Gingivitis in man. J Periodontol. 1965; 36 (3): 177–87.
53. Weidlich P, Lopes De Souza MA, Oppermann RV. Evaluation of the dentogingival area during early plaque formation. J Periodontol. 2001; 72 (7): 901–910.
54. Gomes S, Corvello P, Romagna R, Müller L, Angst P, Oppermann R. How do peri-implant mucositis and gingivitis respond to supragingival biofilm control - an intra-individual longitudinal cohort study. Eur J Oral Implantol. 2015; 8 (1): 65–73.

55. Jenkins WM, Papapanou PN. Epidemiology of periodontal disease in children and adolescents. Periodontol 2000. 2001; 26:16–32.
56. Susin C, Dalla Vecchia C, Oppermann R, Haugejorden O, Albandar J. Periodontal attachment loss in an urban population of Brazilian adults: effect of demographic, behavioral, and environmental risk indicators. J Periodontol. 2004; 75 (7): 1033–1041.
57. Bastos JL, Boing AF, Peres KG, Antunes JLF, Peres MA. Periodontal outcomes and social, racial and gender inequalities in Brazil: a systematic review of the literature between 1999 and 2008. Cad Saude Publica. 2011;27 (2):141-153.
58. Llambí C, Piñeyro L. Informe INSE_FINAL_marzo - Indice-de-nivel-socioeconómico.pdf [Internet]. http://www.cinve.org.uy/informesproyectos/indice-de-nivel-socioeconomico-inse/. Cited: 2015 Dec 22. Available from: http://www.cinve.org.uy/wp-content/uploads/2012/12/Indice-de-nivel-socioecon%C3%B3mico.pdf
59. Lorenzo SM, Alvarez R, Andrade E, Piccardo V, Francia A, Massa F, Correa MB, Peres MA. Periodontal conditions and associated factors among adults and the elderly: findings from the first National Oral Health Survey in Uruguay. Cad Saúde Pública. 2015; 31 (11): 2425–36.

60. Boillot A, El Halabi B, Batty GD, Rangé H, Czernichow S, Bouchard P. Education as a predictor of chronic periodontitis: a systematic review with meta-analysis population-based studies. PloS One. 2011; 6 (7): e21508.
61. Zini A, Sgan-Cohen HD, Marcenes W. Socio-economic position, smoking, and plaque: a pathway to severe chronic periodontitis. J Clin Periodontol. Mar 2011; 38 (3): 229–35.
62. Borrell LN, Crawford ND. Socioeconomic position indicators and periodontitis: examining the evidence. Periodontol 2000. Feb 2012; 58 (1): 69–83.
63. Frias AC, Antunes JLF, Fratucci MVB, Zilbovicius C, Junqueira SR, de Souza SF, Yassui EM. [Population based study on periodontal conditions and socioeconomic determinants in adults in the city of Guarulhos (SP), Brazil, 2006]. Rev Bras Epidemiol Braz J Epidemiol. 2011; 14 (3): 495–507.
64. Johannsen A, Susin C, Gustafsson A. Smoking and inflammation: evidence for a synergistic role in chronic disease. Periodontol 2000. Feb 2014;64 (1): 111–26.

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