



Scientific Research Report

Periodontal Care and Treatment Provision by General Dentists in France

Yoann Maitre^{a*}, Paul Tramini^a, Marie-Alix Fauroux^b, Damien Offner^c, Frédéric Denis^d, Kenneth Eaton^e^a Service de Santé Publique Bucco-dentaire, Université de Montpellier, France^b Service de Médecine Orale Chirurgie Orale, Université de Montpellier, France^c Faculté de Chirurgie Dentaire, Université de Strasbourg, Pôle de Médecine et Chirurgie Bucco-Dentaires, Hôpitaux Universitaires de Strasbourg^d Faculté de Chirurgie Dentaire, Université de Nantes, France, France and EA 75-05 Éducation, Éthique, Santé, Faculté de Médecine, Université de Tours, France^e University College London and University Kent, UK

ARTICLE INFO

Article history:

Received 1 December 2021

Received in revised form

28 January 2022

Accepted 2 February 2022

Available online 12 April 2022

Key words:

Periodontal care and treatment

General dentists

France

National survey

ABSTRACT

Aim: In many countries, periodontal surgery is mainly provided by periodontists. This specialty is not recognised in France, where periodontal care and treatment are principally the responsibility of general dentists (GDs). The objective of this study was to investigate the periodontal care provided and factors associated with the treatment of periodontal diseases, including periodontal surgery, by GDs in France.

Methods: A national cross-sectional survey of GDs practicing in the French metropolitan area was conducted in 2019. A self-administered questionnaire was sent by mail to the GDs selected by stratified simple random sampling. It included questions on respondents' sociodemographic characteristics and their periodontal practice. A multivariate logistic regression model was employed to identify the factors associated with the practice of periodontal surgery by GDs.

Results: Three hundred eighty-five GDs responded (response rate, 23.4%). Their mean age was 45.2 years; 51.2% were male and 83.6% were in private practice. They reported performing selective periodontal examinations such as pocket probing on average for 34.2% of their patients, but only 5.5% of them performed them systematically. Several variables were significantly associated with the provision of periodontal surgical procedures such as the gender of the GDs, full mouth periodontal probing, implantology practice, insufficient fees, or uncertainty about treatment procedure. This survey confirmed the referral of patients for periodontal surgery by a minority of practitioners. It also highlighted insufficient screening and diagnostic procedures for periodontal diseases by GDs.

Conclusions: There is a need to improve French GDs' periodontal skills and knowledge and to address other barriers that currently limit their ability to deliver comprehensive periodontal care.

© 2022 The Authors. Published by Elsevier Inc. on behalf of FDI World Dental Federation.

This is an open access article under the CC BY-NC-ND license

[\(http://creativecommons.org/licenses/by-nc-nd/4.0/\)](http://creativecommons.org/licenses/by-nc-nd/4.0/)

Introduction

Periodontal diseases (PDs) affect between 5% and 15% of populations in their most severe forms.¹ They are considered to be a significant health burden because, left untreated or with

inadequate treatment, they affect the oral and general health of the patient as well as quality of life.²

In many countries, advice on complex cases and, when required, periodontal surgery is mainly provided by periodontists. This specialty is not recognised in some other countries such as France, and all aspects of periodontal care and treatment are principally the responsibility of general dentists (GDs).³ Some GDs have chosen to treat only patients with periodontal problems. These “periodontally oriented

* Corresponding author. 545 Avenue du Pr. J.L. Viala, 34090 Montpellier, France.

E-mail address: maitreyoann@yahoo.fr (Y. Maitre).

<https://doi.org/10.1016/j.identj.2022.02.002>

0020-6539/© 2022 The Authors. Published by Elsevier Inc. on behalf of FDI World Dental Federation. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>)

practitioners” are considered by health professionals and patients as periodontists or specialists even if this title is not official. Several studies suggest that GDs provide a wide range of care as part of restoring oral health; they essentially provide nonsurgical periodontal therapy,⁴ and surgical periodontal procedures are uncommon for the treatment of PDs.⁵ In France, studies on the provision of specific dental procedures by GDs are rare and mainly address caries management^{6,7} and endodontic care.⁸ Besides producing data related to the most common periodontal treatments (scaling, subgingival debridement), few studies have explored the periodontal practice of GDs, including periodontal surgery and implant placement. There was therefore a need to identify how periodontal diseases are managed in general practice dentistry in France and to evaluate the provision of periodontal care and referral to “specialists.” According to the outcome of other studies,⁴ we hypothesised that there is a need to improve good practice in the management of periodontal disease amongst French GDs. The aim of this study was therefore to investigate the periodontal care activity and factors associated with the management of periodontal diseases by GDs in mainland France.

Methods

A national cross-sectional survey of GDs practicing in the French metropolitan area in 2018 was conducted between October 2018 and February 2019. The baseline population was drawn from the national register of health professionals (RPPS) by stratified simple random sampling (SSRS). The region of practice according to the French regional administrative division and the departmental density of dentists per 100,000 inhabitants were used as strata. The density of dentists in this subdivision of the French administrative region was defined according to available national data⁹: low (<60 GDs), moderate (60 to <75 GDs), and high (≥ 75 GDs).

The sample size calculation was made using the Australian Statistics Bureau’s sample size calculator for the French GD population in the RPPS ($N = 38,946$) based on a confidence interval of 0.05 and a confidence level of 95%.¹⁰ It indicated that a sample size of 381 practitioners would be representative. By taking into account the estimated eligibility (95%) and validity (90%) rates of the RPPS database and a response rate of 25%, the final survey population size drawn by SSRS was set at 1801. A self-administered questionnaire was distributed in 2 phases: an initial mail-out in October 2018 and a second distribution by email in February 2019. The second step of the data collection was limited to nonresponders to the initial distribution whose email addresses were available in the RPPS database.

The questionnaire began with a description of the aims of the survey. It specified that participation was voluntary and that the data processing would be anonymous. A letter was also sent to all those who were invited to complete the questionnaire. It described the survey and invited recipients to take part. It was accompanied by a postage-paid return envelope to increase the response rate.¹¹ Returned surveys were coded and entered into Excel version 2016 (YM). Two independent operators (PT and MAF) double-checked them by

hand for data entry errors. A principal components method for mixed data (imputeFAMD) was used to impute missing values.¹²

The questionnaire used for this survey was developed in 2014 by the Special Interest Working Group for Periodontology of the European Association of Dental Public Health to study periodontal care provisions and management of periodontal diseases in general dentistry.⁴ The questionnaire can be accessed here: <https://www.eadph.org/download/treatment-of-periodontal-diseases-by-general-dental-practitioners-questionnaire>. It was translated from English into French and back-translated into English by a professor of periodontology at the University of Montpellier to control the reliability of translation. It was then piloted amongst 10 dentists to validate the understanding of the questions and the formatting of the French version of the questionnaire. The questionnaire included several areas of inquiry such as the sociodemographic characteristics of respondents and their periodontology practice.

A descriptive analysis of the collected data was conducted to assess the management of periodontal diseases by GDs. Count and frequencies were used for categorical variables and means associated with standard deviations for quantitative variables. In accordance with the Hosmer and Lemeshow recommendations,¹³ a multivariate logistic regression model was constructed to identify the factors associated with the practice of periodontal surgery by GDs. Differences between the 2 groups were studied according to whether GDs reported practice periodontal surgery for each candidate factor (sociodemographic and periodontal practice characteristics). First, P values were determined using the appropriate tests (Chi-square of likelihood ratio for categorical variables and Wald statistic for continuous variables). The examination of odds ratios in univariate models and the correlations study of variables of the same interest completed this first analysis in order to exclude impertinent and/or correlated variables. Correlations were studied using Spearman’s correlation coefficients for ordinal variables and Cramer’s V for nominal variables. Variables with a P value <.25 and/or that were clinically relevant were then proposed for multivariate analysis. An automatic stepwise selection followed by the study of the importance of each variable allowed defining the multivariate model identifying the factors predicting the development of periodontal surgery activity by GDs. Reintroduction of each variable not initially retained was tested with the analysis of model statistics and the likelihood test to ensure that all interest factors had been identified. The fit of the model was determined using a receiver operating characteristic (ROC) curve and the area under the curve statistic as well as the standardised residuals of the deviance graph. All statistical analyses were performed using R software, version 3.6.1.

The RPPS data from the present survey are available in open access, and their use complies with the rules set out in the decree of 18 April 2017 on the processing of personal data from the RPPS. Because of the anonymous nature of the survey formal ethics, institutional review board approval was not required. However, the study was conducted with the approval of the French Dental Office (ONCD) and in accordance with the Declaration of Helsinki.

Results

Responses

Of the 422 responses (410 by post and 12 by email), a total of 23 were excluded (3 because the recipients refused to complete them and 20 because of incorrect postal addresses). Thirteen practitioners reported that they were no longer practicing as GDs and were not eligible. In addition, one was excluded because the GD only answered one question. Thus, with a validity rate of 98.7% and an eligibility rate of 96.8%, 385 questionnaires were assessed. One hundred one did not include answers to all questions, and 284 included answers to all questions. Each question was answered by at least 95% of the respondents.

Population

The demographic and clinical characteristics of the sample are presented in Table 1. The respondents mean age was 45.2 ± 12.78 years, close to that presented by the ONCD for GDs (47.3 years). No differences of age distribution were observed with French GDs ($P = .40$ and $P = .17$ for males and females, respectively). The sex distribution did not significantly differ between the sample of participants and the population of GDs ($P = .15$). Exclusively private practitioners were overwhelmingly represented in the population of GDs (81.7%) and in the sample as well ($n = 322$; 83.6%). A The distribution of the type of practice did not significantly differ between the population and the sample ($P = .39$). The majority of dentists claimed that they worked in a group practice ($n = 254$; 66.0%). The urban ($n = 206$) or semi-urban ($n = 97$) location of practices represented the majority of the sample (78.7%), which was

in accordance with the national population of dentists.¹⁴ Health care accessibility based on the departmental density of GDs does not differ significantly between the sample and the population of GDs ($P = .79$) (Table 1).

Periodontal practice by general dental practitioners

Periodontal diagnosis and treatment concerned $32.0\% \pm 21.5\%$ of the respondents' patients. Only 54 GDs (14.03%) were predominantly involved in periodontal diagnosis and treatment. A great majority of the GDs ($n = 363$; 93.3%) reported taking a complete history for all their patients, but only 181 (47.0%) performed systematic full oral examinations. Most of the responding GDs ($n = 374$; 97.1%) reported that they took radiographs for the diagnosis of periodontitis (Table 2), with 327 (84.9%) and 244 (63.4%) using periapical radiographs and orthopantomograms, respectively. Bitewings were used by 46 (12%) of the GDs. The diagnosis of periodontitis was made from radiographs alone by 243 (63.1%) of the GDs. Periodontal diagnosis with full mouth probing was reported by 124 (32.21%) GDs, but only 97 (25.2%) performed it systematically. Systemic antibiotics were prescribed for the treatment of periodontitis on average in $37.4\% \pm 26.4\%$ of cases. They were used by 362 (94.0%) GDs, with 76 (19.7%) prescribing them for the majority of their patients with periodontitis and 20 (5.2%) prescribing them routinely for all such patients. Root surface debridement and periodontal surgery were performed respectively by 341 (88.57%) and 132 (35.8%) GDs.

One hundred ninety-six (50.9%) of respondents reported identifying at least 6 patients per week who required management of periodontitis. Only a small proportion of the respondents reported that they did not perform any periodontal treatment, and 326 (84.7%) reported performing at least one

Table 1 – Sociodemographic characteristics of the participants compared to the population of GDs in France.

Characteristics	Participants of the study	GDs in Metropolitan France ¹	P value
<u>Age (Years)</u>			
Mean \pm SD	45.2 \pm 12.78	47.5 \pm [No data available]	Not applicable
<u>Sex</u>			.15
Female	188 (48.8)	18,742 (45.1)	
Male	197 (51.2)	22,816 (54.9)	
<u>Private practice</u>			.39
Yes	322 (83.6)	33,831 (81.8)	
No	63 (16.4)	7545 (18.2)	
<u>- Having a periodontist in your practice</u>			Not applicable
Individual practice	131 (34.0)	No data available	
Group without periodontist	192 (49.9)		
Group with periodontist	62 (16.1)		
<u>- Location of practice</u>			Not applicable
Urban	206 (53.5)	No data available	
Semi-urban	97 (25.2)		
Rural	74 (19.2)		
Mixed	8 (2.1)		
<u>- Departmental density of DS²</u>			.79
≥ 75	142 (36.9)	14,964 (38.4)	
≥ 60	106 (27.5)	10,337 (25.5)	
< 60	137 (35.6)	13,645 (35.1)	

¹ Data source: Age and Sex, ONCD; Private practice and Departmental density of DS, DRESS.

² Density per 100,000 inhabitants. ³ Chi-square of likelihood ratio for categorical variables and Wald statistic for continuous variables. DS, dental surgesons; GD, general dentist.

Table 2 – Periodontal procedures by GDs and association with periodontal surgery practice.

Procedures	Yes, n (%)	No, n (%)	P value
Periodontal diagnostic and treatment activity >50%	54 (14.03)	331 (85.97)	.0028
Systematic complete patient history	363 (94.29)	22 (5.71)	.833
Systematic oral examination	363 (94.29)	22 (5.71)	.001
Radiographs for PD diagnostic	374 (97.14)	11 (2.86)	.227
Periapical	327 (84.94)	58 (15.06)	.360
Orthopantomogram	244 (63.38)	141(36.62)	.485
Bitewings	47 (12.21)	339 (87.79)	.459
Full mouth probing	124 (32.21)	261 (67.79)	<.001
Antibiotics systemic prescription for PD treatment	362 (94.03)	23(5.97)	.002
- >50%	76 (19.74)	309 (80.26)	.113
Systematic use	20 (5.19)	365 (94.81)	.945
Implantology practice	144 (37.40)	241 (62.60)	<.001
Root surface debridement	341 (88.57)	44 (11.43)	<.001
Periodontal surgery	132 (34.29)	253 (65.71)	-

PD, periodontal disease.

treatment per week. Two hundred one (52%) respondents reported that they did not refer any patients per week to periodontally oriented practitioners. Of the GDs who do not refer any patients on a weekly basis, 54 (14.29%) reported that they did not perform periodontal surgery.

Reimbursement from the insurance systems for periodontal treatment seemed to be insufficient and was reported as limiting their implementation by 295 (76.4%) of the respondents (Table 3). This limitation of periodontal activity for financial reasons was reported as a major reason for not performing periodontal surgery ($P < .001$). Whilst oral hygiene instructions were given to $82.1\% \pm 19.8\%$ of patients, 188 (48.8%) respondents were reluctant to provide periodontal therapy for patients with poor oral hygiene. Although the majority of the GDs considered their knowledge and their skills to be sufficient for the implementation of periodontal treatment, 129 (almost a third of all respondents) responded that these may limit them from providing such care.

Periodontal surgery and associated factors in general dental practice

Seventeen relevant variables were proposed for the construction of the multivariate model: age, sex, private practice, having a periodontist in your practice, departmental density of dentists, diagnosis and treatment frequency of PDs, full oral examination, selective periodontal probing frequency, full mouth periodontal probing, radiographs for PDs diagnosis, root debridement practice, implantology practice, periodontal care needs, periodontal treatment performed, referral to perio-oriented practitioner, insufficient refunds, and patients with poor oral hygiene. Eight factors associated with a periodontal surgery practice amongst GDs were identified in the multiple regression model. The outcomes of this model are presented in Table 4.

The systematic performance of complete periodontal probing as well as the frequent performance of root debridement showed a significant association with the performance of periodontal surgical procedures. In particular, sex and limitations in the management of periodontitis seemed to restrict the practice of periodontal surgery. This activity was less commonly performed by women and practitioners who declared a disinclination to practice of periodontology because of insufficient insurance fees and uncertainty as to how to treat periodontal diseases. Conversely, the factors related to the diagnosis and initial treatment of periodontal disease were significantly associated with the implementation of periodontal surgical procedures.

The examination of the ROC curve together with the graphs of deviance residues and the area under the curve value (AUC = 0.89) showed a good predictive capacity of this model (Figure).

Discussion

The rather high proportion of patients requiring management of periodontitis by the majority of the respondents confirms that PDs are a major public health concern.¹⁵ A third of the

Table 3 – Care needs, periodontal management of patients with periodontal diseases, and factors preventing or limiting the availability of periodontal treatment.

	Number of patients per week			P value
	Low or nil n (%)	Moderate, n (%)	High, n (%)	
Care needs ¹	189 (49.1)	133 (34.5)	63 (16.4)	.001
Treatment performed ²	59 (15.3)	274 (71.2)	52 (13.5)	<.001
Referrals to periodontist ²	201 (52.2)	172 (44.7)	12 (3.1)	<.001

	Limitation of periodontal treatments			P value
	Yes, n (%)	No, n (%)	Don't know, n (%)	
Insufficient refund	294 (76.36)	81 (21.04)	10 (2.60)	<.001
Patients with poor oral hygiene	188 (48.83)	187 (48.57)	10 (2.60)	.809
Unsure about treatments	129 (33.51)	244 (63.38)	12 (3.11)	<.001

¹ Low or null: 0–5; moderate: 6–9; important: ≥ 10 .

² Null: 0; moderate: 1–5; important: ≥ 6 .

Table 4 – Predictors of periodontal surgery practice amongst GDs.

Variable	OR	95% CI	P value
Sex			
Male	1		
Female	0.35	0.19–0.64	<.0001
Full mouth periodontal probing			
No	1		
Yes	2.08	1.08–4.04	.03
Occasionally	2.58	0.89–7.39	.07
Root debridement practice*			
Low	1		
High	2.42	1.33–4.51	.004
Implantology practice			
No	1		
Yes	4.99	2.74–9.28	<.0001
Periodontal treatments performed per week			
0	1	0.86–10.05	.112
1–5	2.64	1.93–33.57	.005
6+	7.37		
Referrals to periodontist per week			
0	1		
1–5	0.21	0.11–0.40	<.0001
6+	0.36	0.05–2.19	.276
Insufficient refund			
No	1		
Yes	0.48	0.24–0.95	.04
Don't know	0.16	0.01–2.09	.212
Unsure about treatment procedures			
No	1		
Yes	0.36	0.17–0.75	.007
Don't know	2.30	0.41–10.93	.307

* Low: ≤25% of patients; high: >25% of patients.CI, confidence interval; OR, odds ratio.

respondents claimed to perform periodontal surgery, whilst a majority (88.6%) performed root surface debridement and was involved in the management of PDs. It is difficult to assess whether the periodontal surgery provided by this minority is sufficient to meet the real needs of the French population. This finding is consistent with those in an Australian study,¹⁶ in which the majority of GDs reported that they provided most nonsurgical periodontal treatments for their patients, whilst most surgical treatment was referred to periodontists. Although the speciality of periodontics is not recognised in France,¹⁷ the high proportion of periodontal activity found in a low proportion of respondents underlined a significant orientation towards a periodontal practice by

some GDs. The main factors associated with periodontal surgical treatment in general practice were those related to the diagnosis and treatment activity of PDs, sex, and barriers to perform periodontal treatments, such as financial aspects or the level of confidence regarding the provision of periodontal treatment. It was found that complete periodontal probing and root surface debridement, together with weekly periodontal activity, were performed by a minority of GDs and that male GDs were more likely to provide periodontal surgery than female GDs. Although there has been no previous assessment of this aspect in France to support this finding, some surveys in other countries have also found that female GDs were more orientated towards general dentistry and children’s dentistry than were male GDs. The feminisation of the dental profession will probably modify the impact of this factor in the future.^{18,19}

As screening, full mouth probing and radiographic assessment are key elements in the diagnosis of periodontitis.²⁰ Full mouth probing was not often performed by the respondents in the current study, echoing the findings of a study in 2011 in Nova Scotia.²¹ Conversely, radiographic examinations were commonly performed and the preferential use of periapical radiographs and orthopantomograms is consistent with their indication for the diagnosis of periodontitis.²⁰ This lower level of screening and diagnosis activity is certainly a concern in the early management of periodontal diseases.

Systemic antibiotics were commonly prescribed for the treatment of periodontitis by the respondents, and a minority of them prescribed antibiotics systematically (ie, for all of their patients with periodontitis). This is worrying and conflicts with recently published European Federation of Periodontology evidence-based guidelines.²² This frequent use of antibiotics by GDs was also observed in a recent study,²³ with 76% of practitioners using them for the management of periodontitis and 12% always prescribing them.

A minority of the respondents stated that their uncertainty about the appropriate way to treat periodontal problems could limit their management of periodontal diseases. This difficulty to treat periodontal patients was also found 24 years ago in a study in Scotland.²⁴ Thus, in view of the growing need for periodontal care, it could be appropriate to promote periodontal training for GDs, as highlighted by the European DELPHI survey²⁵ in 2015. Patients’ poor oral hygiene was also found to be a barrier to periodontal treatment by some respondents (49%), as found in a study in Australia.¹⁶ This reluctance from GDs is understandable, as good patient

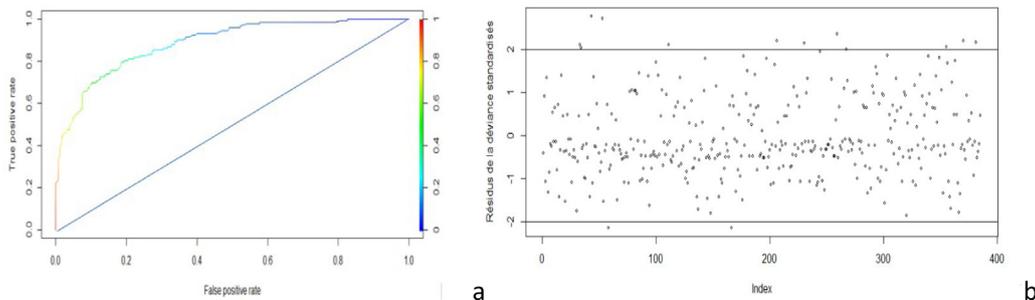


Figure – ROC curve (3a) and graphs of deviance residues (3b) of the multivariate logistic model.

plaque control is a necessary condition for the restoration of periodontal health.²²

The response rate of the present survey (23.4%) is in agreement with the ones found in similar studies conducted in Switzerland (31.8%) and Belgium (25.1%).^{26,27} A recent French study⁶ reported a similar response rate. The practitioners' responses, based on a voluntary approach, may therefore be associated with a selection bias due to a possible higher participation of dentists involved in periodontal practice. Nevertheless, as far as certain sociodemographic characteristics—such as sex, age distribution, type of practice, and the GDs' accessibility—were concerned, the profile of respondents in this study matched the national profile.

As the anonymity of the respondents is necessary to limit bias and to comply with French regulations, it was not possible to assess the reasons for not participating in the survey.

Missing data can weaken statistical analyses. Data imputation by factorial analysis of mixed data was used as a suitable tool for the analysis. Due to the small percentage of missing data analysed in the current study (the rate of missing data was <5%), this factor should have had little effect on the results.

Conclusions

This first cross-sectional study carried out on a national scale has produced an insight into the delivery of periodontal care and treatment by general dentists in France. It confirms that periodontal surgery is performed by a minority of practitioners. In the absence of a recognised specialty in periodontology, this periodontal surgery appears to be performed by GDs with a special interest in periodontology and all aspects of the management of periodontal diseases. Uncertainty about how to treat periodontal problems and reimbursement levels appear to be obstacles to the provision of comprehensive periodontal care in general practice in France. Male practitioners appeared to be more involved in periodontal surgery than female practitioners. Assessment of GDs' education levels regarding guidelines for the management of periodontal disease would shed light on this trend towards periodontal specialisation.

This study also highlighted the insufficient performance of screening and diagnostic procedures for periodontal diseases by GDs. It opens the discussion on the need to develop periodontal education in order to update GDs on the modalities of prevention, screening, and treatment of patients with periodontitis and thus to guarantee an adequate management of this disease in France. Thus, these results support the view that there is a need to develop an extensive continuing education programme for GDs and to promote the dissemination of good practice recommendations.

Acknowledgements

The authors are grateful to the French Association of Dental Public Health Teachers, in particular professors Anne-Marie Musset and Olivier Hamel, who helped in the completion of this study.

Conflict of interest

None disclosed.

REFERENCES

- Petersen PE. The World Oral Health Report 2003: continuous improvement of oral health in the 21st century—the approach of the WHO Global Oral Health Programme. *Community Dent Oral Epidemiol* 2003;31(Suppl 1):3–23.
- Jepsen S, Blanco J, Buchalla W, et al. Prevention and control of dental caries and periodontal diseases at individual and population level: consensus report of group 3 of joint EFP/ORCA workshop on the boundaries between caries and periodontal diseases. *J Clin Periodontol* 2017;44(Suppl 18):S85–93.
- Kravitz A, Bullock A, Cowpe J, et al. *Manual of dental practice 2015: Edition 5.1*. Counc Eur Dent 2015:137–48.
- Aleksejunienė J, Purienė A, Rimkervicius A, et al. Knowledge, dentist confidence and management of periodontal patients among general dentists from Belarus, Lithuania, Macedonia, Moldova and Romania. *BMC Oral Health* 2020;20(1):47. doi: 10.1186/s12903-020-1033-9.
- Gilbert GH, Gordan VV, Korelitz JJ, et al. Provision of specific dental procedures by general dentists in the National Dental Practice-Based Research Network: questionnaire findings. *BMC Oral Health* 2015;15:11. doi: 10.1186/1472-6831-15-11.
- Doméjean S, Léger S, Simon A, et al. Knowledge, opinions and practices of French general practitioners in the assessment of caries risk: results of a national survey. *Clin Oral Investig* 2017;21(2):653–63.
- Doméjean S, Léger S, Maltrait M, et al. Changes in occlusal caries lesion management in France from 2002 to 2012: a persistent gap between evidence and clinical practice. *Caries Res* 2015;49(4):408–16.
- Basmaadjian-Charles C, Bourgeois D, Coudeville L, et al. National survey of endodontics in general dental practice in France. *Eur J Prosthodont Restor Dent* 2004;12(4):144–53.
- Ordre National des Chirurgiens-dentistes. Cartographies et données nationales. Available from: <http://www.ordre-chirurgiens-dentistes.fr/cartographie/>. Accessed September 2021.
- Australian Bureau of Statistics. Sample size calculator. Available from: <https://www.abs.gov.au/websitedbs/D3310114.nsf/home/Sample+Size+Calculator>. Accessed September 2021.
- Edwards P, Roberts I, Clarke M, et al. Methods to increase response rates to postal questionnaires. *Cochrane Database Syst Rev* 2007(2):MR000008.
- Audigier V, Husson F, Josse J. A principal component method to impute missing values for mixed data. *Adv Data Anal Classif* 2013;10(1).
- Hosmer DW, Lemeshow S. *Applied logistic regression*. 2nd ed. New York: Wiley-Interscience; 1989.
- DREES. Portrait des professionnels de santé. Paris: INSEE. 2016. Available from: https://drees.solidarites-sante.gouv.fr/sites/default/files/2020-10/pano_gfs-2016_mel_301117.pdf. Accessed September 2021.
- Petersen PE, Ogawa H. The global burden of periodontal disease: towards integration with chronic disease prevention and control. *Periodontol* 2012;60(1):15–39.
- Darby IB, Angkasa F, Duong C, et al. Factors influencing the diagnosis and treatment of periodontal disease by dental practitioners in Victoria. *Aust Dent J* 2005;50(1):37–41.
- Ordre National des Chirurgiens-dentistes, Exercer la profession dentaire en France: Guide pratique à destination des praticiens à diplôme européen. 2018. Available from: <http://www.dollusconsulting.fr/Dollusconsulting.fr/Docs%20%C3>

- [%A0%20telecharger/publication.pdf](#). Accessed September 2021.
18. McKay JC, Quiñonez CR. The feminization of dentistry: implications for the profession. *J Can Dent Assoc* 2012;78:c1. PMID: 22322017.
 19. Dhima M, Petropoulos VC, Han RK, et al. Dental students' perceptions of dental specialties and factors influencing specialty and career choices. *J Dent Educ* 2012;76(5):562–73.
 20. Preshaw PM. Detection and diagnosis of periodontal conditions amenable to prevention. *BMC Oral Health* 2015;15(Suppl 1):S5. doi: 10.1186/1472-6831-15-S1-S5.
 21. Ghiabi E, Weerasinghe S. The periodontal examination profile of general dentists in Nova Scotia, Canada. *J Periodontol* 2011;82(1):33–40.
 22. European Federation of periodontology. Dossier on periodontal diseases. 2020. Available from: https://www.efp.org/fileadmin/uploads/efp/Documents/Campaigns/Gum_health_day/Publications/EFP_Dossier_on_Periodontal_Disease_2020.pdf. Accessed 4 March 2022.
 23. Kraatz J, Hoang H, Ivanovski S, et al. Periodontal diagnosis, treatment, and referral patterns of general dental practitioners. *J Investig Clin Dent* 2019;10(3):e12411. doi: 10.1111/jicd.12411.
 24. Chestnutt IG, Kinane DF. Factors influencing the diagnosis and management of periodontal disease by general dental practitioners. *Br Dent J* 1997;183(9):319–24.
 25. Madianos P, Papaioannou W, Herrera D, et al. EFP Delphi study on the trends in periodontology and periodontics in Europe for the year 2025. *J Clin Periodontol* 2016;43(6):472–81.
 26. Zaher CA, Hachem J, Puhan MA, et al. Interest in periodontology and preferences for treatment of localized gingival recessions. *J Clin Periodontol* 2005;32(4):375–82.
 27. Slaus G, Bottenberg P. A survey of endodontic practice amongst Flemish dentists. *Int Endod J* 2002;35(9):759–67.