**Periodontal screening and referral behaviour of general dental practitioners in Flanders**

For figures, tables and references we refer the reader to the original paper.

Introduction

Periodontitis is a prevalent problem: 10.8% of the people worldwide suffer from severe periodontitis, while mild to moderate periodontitis affects the majority of adults [[1](https://link.springer.com/article/10.1007%2Fs00784-017-2212-1#CR1), [2](https://link.springer.com/article/10.1007%2Fs00784-017-2212-1#CR2)]. If this condition is not treated, it can lead to loss of connective tissue, alveolar bone and ultimately tooth loss. To halt its progress, early diagnosis is of utmost importance [[3](https://link.springer.com/article/10.1007%2Fs00784-017-2212-1#CR3), [4](https://link.springer.com/article/10.1007%2Fs00784-017-2212-1#CR4)]. However, to date, still no reliable prognostic indicators exist, which makes regular clinical examination of all individuals crucial for the early detection of periodontitis [[5](https://link.springer.com/article/10.1007%2Fs00784-017-2212-1#CR5), [6](https://link.springer.com/article/10.1007%2Fs00784-017-2212-1#CR6)].

General dental practitioners (GDPs), the first-line dental caregivers, should be well prepared to diagnose periodontitis in a timely manner when treatment still has a good prognosis. In fact, all patients entering their offices should be periodontally screened on a regular basis [[7](https://link.springer.com/article/10.1007%2Fs00784-017-2212-1#CR7)]. Since recording full-mouth probing depth measurements is time-consuming and just one of their many tasks, it is often not feasible to carry this out for GDPs [[8](https://link.springer.com/article/10.1007%2Fs00784-017-2212-1#CR8)]. Therefore, there is a need for a screening tool that is sensitive, simple, rapid and cost-effective [[5](https://link.springer.com/article/10.1007%2Fs00784-017-2212-1#CR5), [9](https://link.springer.com/article/10.1007%2Fs00784-017-2212-1#CR9)]. Moreover, this tool should help them to refer these patients to periodontists, the second-line caregivers [[10](https://link.springer.com/article/10.1007%2Fs00784-017-2212-1#CR10)]. They rely on GDPs to identify the periodontal needs of their patients and refer them accordingly [[11](https://link.springer.com/article/10.1007%2Fs00784-017-2212-1#CR11)].

Driven by the World Health Organization (WHO), Ainamo and co-workers (1982) proposed the Community Periodontal Index of Treatment Needs (CPITN) as a tool for periodontal diagnosis and treatment [[12](https://link.springer.com/article/10.1007%2Fs00784-017-2212-1#CR12)]. A drawback of this screening instrument is that no attempt was made to score the degree of attachment loss. Afterwards, several tools based on this one including attachment loss were suggested. The two most famous are undoubtedly the Basic Periodontal Examination (BPE) introduced by the British Society of Periodontology in the late eighties and the Periodontal Screening and Recording (PSR) Index proposed jointly by the American Dental Association and American Academy of Periodontology in 1995 [[13](https://link.springer.com/article/10.1007%2Fs00784-017-2212-1#CR13), [14](https://link.springer.com/article/10.1007%2Fs00784-017-2212-1#CR14)].

In 1998, a modification of the CPITN was proposed by the Dutch Society of Periodontology: the Dutch Periodontal Screening Index (DPSI) [[5](https://link.springer.com/article/10.1007%2Fs00784-017-2212-1#CR5)]. This screening instrument was later introduced in Belgium, and since 2006, it is almost fully reimbursed once a year by the Belgian health care system. The goal of the DPSI was, accordingly to the BPE and PSR, to add information of the attachment level to the CPITN [[5](https://link.springer.com/article/10.1007%2Fs00784-017-2212-1#CR5)]. The main difference of CPITN and DPSI is that score CPITN 3 was differentiated to ‘3 minus’ for pathological pockets of 4–5 mm without recession and ‘3 plus’ when gingival recessions can be measured. The specific scores of the DPSI and their associated treatment needs are depicted in Table [1](https://link.springer.com/article/10.1007%2Fs00784-017-2212-1#Tab1).

**Table 1**

The Dutch Periodontal Screening Index and the associated treatment needs

In the Netherlands, in 1999, about 75% of the GDPs were applying the DPSI [[5](https://link.springer.com/article/10.1007%2Fs00784-017-2212-1#CR5)]. In Belgium, it is also the advised screening method. However, at this moment, it is not clear if the DPSI is the preferred screening method for GDPs in Belgium and whether they adjust their referral behaviour accordingly. The aim of this study was to investigate the screening and referral behaviour of GDPs in Flanders, the Dutch-speaking part of Belgium, concerning periodontitis. Additionally, it was researched if this was influenced by year of graduation, sex, education and location of their dental practice.

Materials and methods

This study was conducted by an online Google drive questionnaire in Dutch (see online appendix [1](https://link.springer.com/article/10.1007%2Fs00784-017-2212-1#MOESM1)), which comprised ten questions, with a combination of multiple-choice and open questions. In order to reach a substantial part of the Flemish dentist population, the main investigator (EM) reached out to the most important Flemish dental professional societies. The ‘Leuvense Universitaire Tandheelkunde Vereniging’ (LUTV) and ‘Koninklijke Limburgse Tandartsen Vereniging’ (KLTV) made it possible for the authors to send a personal invitation for the questionnaire to all their members. Additionally, the ‘Verbond der Vlaamse Tandartsen’ (VVT) and ‘Vlaamse Beroepsvereniging Tandartsen’ (VBT) put the questionnaire in their online newsletter; VVT also put the link on their Facebook page. Finally, personal invitations were sent by email to 1609 Flemish dentists of whom their addresses could be found on [www.mijntandarts.be](http://www.mijntandarts.be/), an online database of all dentist members of the VVT.

Before the Google drive questionnaire was sent to all the dentists, the questionnaire was tested with Qualtrics. Since all the questions were clear to these 20 respondents, the questionnaire was kept as it was. However, due to the limited capacity of Qualtrics, it was decided to work with Google drive. The questionnaire could be filled in online and was conducted anonymously. Participation was voluntary and the ethical commission approved the study with the number mp0864. The data were collected between January and May 2016.

The questionnaire (see online appendix [1](https://link.springer.com/article/10.1007%2Fs00784-017-2212-1#MOESM1)) consisted of two parts: the first part aimed at describing the profile of the dentist. Gender, age, year of graduation, education centre, specialisation and location of dental practice were surveyed. The second part of the questionnaire was designed to determine the periodontal screening method and referral behaviour of the Flemish dentists. Firstly, it comprised two questions about the used screening method: the first one inquiring the preferred screening method and the second one about when this method was applied. Furthermore, it was surveyed if general dental practitioners check certain periodontal risk factors. Finally, the referral behaviour was investigated based on an open-ended question.

When the respondents answered a certain age from which they screen (as an answer to question 8, online appendix [1](https://link.springer.com/article/10.1007%2Fs00784-017-2212-1#MOESM1)), this was analysed keeping the Van der Velden classification in mind [[15](https://link.springer.com/article/10.1007%2Fs00784-017-2212-1#CR15)], a classification system based on clinical symptoms and the age of the patient. According to this system, one speaks about pre-puberty when the patient is ≤ 12 years old, juvenile when the patient is 13–20 years old, post-adolescent between 21 and 35 years and adult when the patient is ≥ 36 years old.

Chi-square tests were performed with IBM’s SPSS Statistics 21 (release 21.0.0.0, 2012 64-bit edition). p values and Cramer’s V were reported as measures of statistical significance and effect size, respectively. A p value < 0.05 was seen as statistically significant.

Results

One thousand fifty dentists answered the questionnaire; 159 of these were excluded for further analysis since these respondents did not match with the target audience. Sixty-four 64 of these reported to be periodontists, 61 were orthodontists and 4 were maxillofacial surgeons. These are second-line caregivers and it was our aim to investigate how general dentists screen for periodontitis and refer to specialists. Additionally, the questionnaires from one Luxembourger, one respondent not mentioning the location of his practice, 13 French-speaking dentists and 15 Dutch dentists were not taken into account, since Flemish dentists were the population of interest. The results of 891 respondents were further analysed.

The number of women answering the questionnaire (477, 54%) and men (414, 46%) is comparable. The majority of GDPs is older than 50 (461, 52%) and they graduated from 1 to 58 years ago (mean: 20.80, SD: ± 12.45), a majority of them from the KU Leuven (582, 65%). More details about this sample of Flemish dentists can be found in Table [2](https://link.springer.com/article/10.1007%2Fs00784-017-2212-1#Tab2).

Table 2

General information about the GDP’s who answered the questionnaire

Five hundred seventy-three (64%) respondents answered using DPSI as periodontal screening method. Two hundred forty-nine (28%) used pocket-probing depths as primary screening method, 34 (4%) GDPs used only radiographs for screening and 35 (4%) mentioned to have no method for periodontal screening. DPSI usage was not influenced by sex, education centre and location of the dental practice (p values respectively: 0.552, 0.766, and 0.398). However, DPSI usage was influenced by year of graduation: the longer the GDPs were graduated, the less they used DPSI (p < 0.001). The proportion of dentists using DPSI according to year of graduation can be seen in detail in Fig. [1](https://link.springer.com/article/10.1007%2Fs00784-017-2212-1#Fig1). Moreover, this difference was the most distinct for the dentists that graduated in 2006, the year from which DPSI was reimbursed by the RIZIV, compared to these that graduated before 2006. A less significant impact can also be seen concerning specialisation. GDPs who mentioned to have a specific field of interest (such as paediatric dentistry, aesthetic dentistry, …) use DPSI more frequently (69%) than GDPs who said that they did not have a specialisation (62%) (p = 0.045).

Fig. 1

The number of GDPs who answered the questionnaire and the proportion of them who use DPSI as a screening instrument

Four hundred forty GDPs selected only one answer answering when they used their periodontal screening methods, 427 GDPs chose more than one answer and 24 did not answer this question. From the 440 GDPs who selected one answer, 284 (65%) screen every patient, 65 (15%) only screen based on oral hygiene, 65 (15%) when they notice bone loss on radiographs and 26 (6%) from a certain age. None of these dentists screened solely based on family history. From the 867 GDPs who answered the question, 353 (41%) GDPs indicated to screen every patient. Dentists using DPSI are more likely (31%) to screen standard every patient than dentists who use a different screening method (10%) (p < 0.001). Two hundred fifty-eight of the dentists mentioned a certain age from which they screen; the average (± SD) age from which they screen is 22.88 ± 12.34 years. The distribution of age from which dentist screened their patients based on the Van der Velden classification is shown in Fig. [2](https://link.springer.com/article/10.1007%2Fs00784-017-2212-1#Fig2) [[15](https://link.springer.com/article/10.1007%2Fs00784-017-2212-1#CR15)].

Fig. 2

Age from which dentists screen their patients according to the Van der Velden classification (258 respondents)

Concerning the risk factors associated with periodontitis, 827 (93%) GDPs said to check smoking behaviour, 647 (73%) payed attention to diabetes and 571 (64%) to family history.

Eight hundred sixty-six answers according to the referral behaviour could be grouped; this is displayed in Fig. [3](https://link.springer.com/article/10.1007%2Fs00784-017-2212-1#Fig3). A minority (28, 3%) of the dentists reported to do the entire periodontal treatment themselves, 130 (15%) did the initial treatment themselves and refer afterwards to a periodontist when deep pockets persist. One hundred sixty (18%) always referred to a periodontist and 29 (3%) wrote to base their referral behaviour solely on the motivation of the patient. The majority of dentists, 519 (60%), based their referral on the degree of periodontal disease. One hundred seventy (20% of all questioned dentists) of them used DPSI for this, 175 (20% of all questioned dentists) based themselves on probing pocket depths and 174 (20% of all questioned dentists) did not mention specific criteria, only generic terms related to the degree of periodontal disease.

Fig. 3

When do you refer to a periodontist (n = 866)?

Figure [4](https://link.springer.com/article/10.1007%2Fs00784-017-2212-1#Fig4) depicts when GDPs refer to a periodontist based on specific measurements. When using DPSI as a tool for referral, 28 GDPs said to refer from DPSI 3 (which is in fact not a score, so this could not be included in the figure), 29 from DPSI 3−, 82 from DPSI 3+ and 24 from DPSI 4; one mentioned B+ or C and six did not fill in a specific value. When using pocket-probing depth, one dentist referred when pockets are deeper than 2 mm, 9 when PPD > 3 mm, 31 when PPD > 4 mm, 86 when PPD > 5, 29 when PPD > 6 mm and 5 when PPD >7 mm; 14 did not mention a specific value.

Fig. 4

Referral with DPSI (n = 135) and pocket depth (n = 161) as base

Of course some information got lost when grouping these answers into strict groups; however, it was striking that next to criteria related to periodontal disease, a lot of GDPs mentioned also personal factors. Next to the 29 GDPs that mentioned solely motivation of the patient as a criterion when asking when they refer, 71 mentioned this as an additional consideration when thinking about referral. So 100 (12%) GDPs took into account how they experience the motivation of the patient; additionally, 18 (2%) mentioned the financial aspect as a reason not to refer the patient to a specialist.

Discussion

Sixty-four percent of Flemish GDPs use DPSI to screen for periodontal diseases. Twenty-eight percent measure pocket-probing depth for this, 4% solely take radiographs and 4% have no screening method at all. The usage of DPSI is influenced by the year of graduation; the longer the dentists were graduated, the less they used DPSI. Contrastingly, sex, education and province of the dental practice did not seem to influence the use of this screening index. For referral, only 19% of the questioned GDPs rely on DPSI.

According to recent data from the Federal Public Service Health, Food, Chain Safety and Environment, there are about 3800 Dutch-speaking dentists active in Belgium [[16](https://link.springer.com/article/10.1007%2Fs00784-017-2212-1#CR16)]. In order to obtain a representative sample of these GDPs, we intended to do a random sampling and send our questionnaire by post to the selected GDPs. However, since we could not retrieve a list with all the addresses of the GDPs, we decided to distribute our questionnaire through different channels online. With 891 surveys completed by GDPs, we can assume that about 26% of our target audience responded. The exact response rate however cannot be calculated, since the questionnaire was distributed through different channels at the same time, such as mailing lists and electronic newsletters of different professional organisations. Therefore, no match could be made between the dentists that were invited and those who answered the questionnaire. The GDPs who answered the questionnaire reflect the population of Flemish dentists concerning age and gender [[16](https://link.springer.com/article/10.1007%2Fs00784-017-2212-1#CR16)]. However, to conclude that this group is representative of the population, more epidemiological data should be compared between the respondents and the target population.

Eight hundred twenty-two (92%) of the questioned dentists use a periodontal probe as screening instrument; this is in line or even slightly better than previous research. In 1999, Linden and co-workers found that 73% of the practitioners in North West England and 67% of the practitioners in Northern Ireland carried out an examination with a periodontal probe [[17](https://link.springer.com/article/10.1007%2Fs00784-017-2212-1#CR17)]. In 2004, this seemed to be improved with 93% of the questioned GDPs in England and Wales reporting to measure pockets in new adult patients and 85% in recall patients [[18](https://link.springer.com/article/10.1007%2Fs00784-017-2212-1#CR18)]. In Australia, it was shown that 80% of the dentists of Victoria screened all new patients for periodontal disease [[19](https://link.springer.com/article/10.1007%2Fs00784-017-2212-1#CR19)]. More recently, it was reported that 45% of the Turkish GDPs use a probe for periodontal screening.

However, with 64% of all Flemish dentists using DPSI, almost 20 years after its introduction and 10 years after its reimbursement, Belgian GDPs are still doing worse than the Dutch dentists in 1999 when 75% of them claimed to use DPSI at that moment [[5](https://link.springer.com/article/10.1007%2Fs00784-017-2212-1#CR5)]. However, our results are in line with other study results concerning the use of a specific screening instrument. In North West England and Northern Ireland, respectively 68 and 47% of the GDPs recorded the periodontal status according to CPITN [[17](https://link.springer.com/article/10.1007%2Fs00784-017-2212-1#CR17)]. In England and Wales, 91% measures BPE in new patients and 84% in recall patients [[18](https://link.springer.com/article/10.1007%2Fs00784-017-2212-1#CR18)]. Contrastingly, in Canada, only 32.5% of the GDPs use the PSR index [[20](https://link.springer.com/article/10.1007%2Fs00784-017-2212-1#CR20)].

Four percent of the respondents reported to use solely radiographs as a screening method for periodontal diseases. Moreover, 65 dentists (7%) based their decision to use a probe for periodontal screening only on bone loss noticed radiographically. Radiographs have their place in periodontal diagnosis; when periodontal problems are diagnosed by probe, radiographic examination and detailed findings are essential for further diagnostics [[3](https://link.springer.com/article/10.1007%2Fs00784-017-2212-1#CR3), [9](https://link.springer.com/article/10.1007%2Fs00784-017-2212-1#CR9), [18](https://link.springer.com/article/10.1007%2Fs00784-017-2212-1#CR18)]. However, they are not the primary screening method of choice, since panoramic, as well as bitewing and peri-apical radiography underestimate the bone loss [[21](https://link.springer.com/article/10.1007%2Fs00784-017-2212-1#CR21), [22](https://link.springer.com/article/10.1007%2Fs00784-017-2212-1#CR22)]. Radiographs taken in daily dental practice are thus not highly reflective of the real periodontal situation [[3](https://link.springer.com/article/10.1007%2Fs00784-017-2212-1#CR3)].

More disturbing is that 4% of the GDPs mention to have no standardised method at all to screen for periodontal diseases.

The most important determinant of DPSI usage seems the year of graduation. The longer the GDPs were graduated, the less DPSI was used. The same trend ‘the more experienced the dentist, the less a periodontal probe was used’ was seen in previous studies [[18](https://link.springer.com/article/10.1007%2Fs00784-017-2212-1#CR18), [23](https://link.springer.com/article/10.1007%2Fs00784-017-2212-1#CR23)]. A possible explanation for this trend seen in Flemish dentists can be that DPSI is only proposed in 1998 and actively promoted and reimbursed in Belgium since 2006. Older dentists, who do not know this method from their dental training, are maybe less keen to adopt this screening tool.

Forty-one percent of the Flemish GDPs indicated to screen every patient. This is in line with the use of the BPE in England and Wales: 56% of the dentist use BPE as a screening tool in all new patients and 22% in all recall patients [[18](https://link.springer.com/article/10.1007%2Fs00784-017-2212-1#CR18)]. Since recall patients seem less likely to be screened with a specific tool, more information would have been obtained by our questionnaire if we made this distinction between new and recall patients.

There was opted for an open-ended question concerning referral behaviour to collect as much information as possible. The answers showed that there are many different ways to decide if and when to refer to a periodontist. It was clear that GDPs mainly take their own abilities and the severity of the periodontal disease into account when referring to a periodontal specialist. There are thus many different ways to decide if and when to refer to a periodontist. This can partly be explained by the fact that in Belgium, no clear referral protocol is available and moreover, every dentist has its own abilities and interests. However, since this was an open-ended question, next to most important factors influencing referral, also some additional points were repeated by different GDPs. The way GDPs assess patient preferences seems important in the referral process: when patients are not motivated or the GDP thinks the patient has financial constraint, GDPs wrote not to refer these patients. This can be inherent of the Belgian system, since periodontal treatment is (almost) not reimbursed by the Belgian health care system. Since, there is a shortage of dentists in Belgium; also, time is a determining factor. Some dentist wrote that they already have so much work that they do not have the time to do the periodontal treatments in their own patients. The number of group practices, with dentists with different specialisations, is increasing in Belgium; several dentists working in such a practice wrote that they always refer to a periodontist in the same group practice.

This question also showed that some GDPs indicated to use DPSI, but that they are not really accustomed with it: 28 of the 164 GDPs answering this question (17%) with a specific DPSI code said they refer from DPSI 3. However, score DPSI 3 does not really exist, only 3− or 3+. Additionally, one mentioned B+ or C, which are not DPSI scores, but depict the associated treatment needs.

For future research, attention should be paid to some drawbacks inherent to the currently chosen study set-up. Since the population is not randomly sampled, but as many Flemish GDPs as possible were targeted, possibly only the ones who are most interested in periodontology answered the questionnaire. The survey was also solely distributed online, so the dentists who are less familiar with computers were not reached. In order to obtain as many respondents as possible, there was chosen for a short survey with easy formulated questions; the wording was first checked by experts in the field and this version was pilot tested in 20 Flemish GDPs. So, the face validity of the research was checked; however, for future research, one should keep in mind that there are more aspects to the validity of a questionnaire.

Conclusion

It is clear that there is room for improvement with regards to the use of periodontal screening methods in Flanders. Referral is subjective and GDPs must make this personal decision based on an honest assessment of their own abilities and the needs of the patients.

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