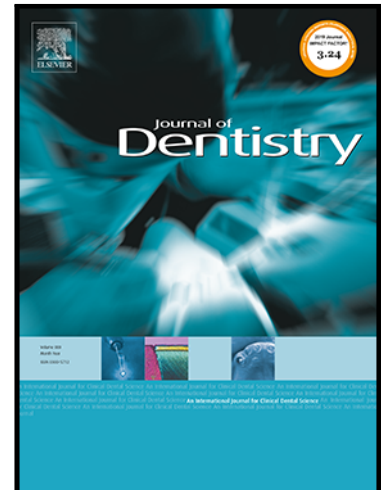


Assessment of knowledge and professional practices related to dentin hypersensitivity: Results from a practice-based research network (ReCOL) survey

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**Title:** Assessment of knowledge and professional practices related to dentin hypersensitivity: Results from a practice-based research network (ReCOL) survey

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**Abstract:**

**Objectives:** Dentin hypersensitivity (DH) remains a common clinical challenge, and its pathogenesis is still poorly understood by many dental practitioners (DPs). While several international surveys have explored DPs' knowledge and practices regarding DH, European data remain scarce. This study aimed to assess the knowledge, opinions, diagnostic approaches, and management practices related to DH among French-speaking DPs in France and Belgium.

**Methods:** A specifically designed French-language questionnaire was distributed online to members of the ReCOL practice-based research network in France and the Belgian Dental Medicine Society. Responses from 489 DPs were considered for analysis (descriptive and statistical - U Mann-Whitney and Chi-squared test).

**Results:** The findings revealed substantial variability in knowledge and clinical practices, both within and between the two countries. Significant relationships were also found between demographic characteristics (particularly age) and their knowledge and practices. Although more than 80% identified fluid movement within dentinal tubules as a key pain mechanism, fewer than half reported confidence in diagnosing DH (France: 36.5%; Belgium: 48.3%), highlighting persistent uncertainties in clinical practice.

**Conclusions:** Greater awareness, more systematic screening strategies, strengthened initial and continuing education, and clearer evidence-based recommendations are needed to improve DH diagnosis and management.

**Clinical significance:** In France and Belgium, there is substantial variability in DPs' understanding, diagnostic approaches and management strategies toward DH. More importantly, DH remains insufficiently prioritized in daily clinical practice despite its high prevalence and its well-documented negative impact on patients' QoL. Many participants expressed a desire for additional education and continuing professional development regarding DH.

**Keywords:** Dentin sensitivity; surveys and questionnaires; Dentists; Practice patterns, dentists'; Clinical decision-making

## Introduction

Dentine Hypersensitivity (DH) has been defined as a “short sharp pain arising from exposed dentine in response to stimuli typically thermal, evaporative, tactile, osmotic or chemical and which cannot be ascribed to any other form of dental defect or pathology” [1]. Following a meta-analysis based on 77 studies (worldwide), the best estimate of its prevalence is 11.5 % [2] with a wide heterogeneity from 1.3 % (Nigeria) to 92.1 % (UK) depending on a myriad of factors such as patient age range, recruitment strategy, diagnosis tests or number of study sites. Notwithstanding this heterogeneity, it may be argued that DH is a major problem of public health especially since DH has been shown to negatively affect patients’ quality of life (QoL) [3-8].

About 20 questionnaire-based surveys have been conducted worldwide to describe knowledge, opinions and practices toward DH pathogenesis, diagnosis and management, namely in Australia [9], Brazil [10, 11], Canada [12], Greece [13], India [14, 15], Nigeria [16], Pakistan [17], Senegal [18], The Netherlands [19], UK [20] and USA [21-25]. They showed that there is a great variability in DH perception and management within and between countries and that DH constitutes a significant clinical challenge for dental practitioners (DPs). This issue may be linked to multiple factors: an unclear pathogenesis [26], the difficulty to reproduce in clinical dental setting the stimuli for inducing DH pain [5], the variety of therapeutic agents [27] and their lack of long-term results [27]. Nevertheless, assessing the knowledge and practices may appear crucial as it may directly impact health outcomes by promoting early diagnosis and interventions and reducing the negative impact of DH on QoL. Yet there is a lack of data in France and Belgium regarding the professional practices related to DH; this situation is particularly problematic as there are neither European guidelines nor consensus toward DH diagnosis and management. As a first step to help addressing this gap in the French-speaking part of Europe, it was decided to conduct a questionnaire survey in France and in the French-speaking part of Belgium to assess knowledge, opinions and practices of DPs regarding DH pathogenesis, diagnosis and management.

Consequently, the objective of the present study was to assess DPs’ knowledge and professional practices regarding the diagnosis and management of DH in the French-speaking Europe, including France and the French-speaking part of Belgium.

## Materials and methods

### Study design

A practice-based, cross-sectional, questionnaire-based study was designed according to CHERRIES (checklist for reporting results of internet E-surveys) [28] and initiated by ReCOL, a French-speaking dental practice-based research network (Fr-DPBRN) created in 2019 and supported by the French Dental Association (Association Dentaire Française or ADF), a member of the World Dental Federation (Fédération Dentaire Internationale or FDI). Registration to ReCOL is free and restricted to dentists practicing in France; inspired by other DPBRNs, ReCOL shares similar objectives, mainly oral health improvement, by conducting dental practice-based research and by helping dental professional and their patients [29-31]. Eligible DP respondents were, respectively in France and Belgium, members of the ReCOL network and of the Belgian Dental Medicine Society.

### Questionnaire

A questionnaire aiming to assess DPs' knowledge, opinions and practices about DH diagnosis and management was specifically developed in French for the present project. It was based on other questionnaire surveys in Australia [9], Brazil [10], Senegal [18], The Netherlands [19], UK [20] and USA [21, 23-25]. Prior administration, some minor adjustments were then made following a pilot phase ran among ReCOL investigators in France (S. Doméjean, B. Grosgeat, V. Szönyi) and Francophone partners in Belgium (A. Mainjot), Canada (C. Bedos) and Morocco (S. Ghoul).

The questionnaire comprised a total of 22 items (one to six items per screen page; five screen pages). The questions were binary (yes/no), or closed-ended (multiple or forced choice), and developed around three sections:

- Section 1 – Respondent data: participant socio-demographic characteristics (gender, birth year, type of activity), (three items);
- Section 2 - Respondent DH knowledge: questions related DH description, mechanisms of pain transmission, triggering factors, predisposing factors, diagnosis, management and impact on patients' QoL (15 items);
- Section 3 - Respondent education in the field of DH: DPs' opinion concerning education in the field of DH, particularly adequacy of undergraduate dental education (initial education), interest for further continuing education on the topic and reading of scientific articles about DH and academic lectures and tutorials (four items).

Items within the questionnaire were not randomized nor alternated, and the questioning was simple enough to avoid adaptive questioning (i.e. items conditionally displayed based on responses to other items).

The questionnaire is available upon request.

#### Recruitment process and questionnaire administration

Survey recruitment of a convenient sample used a snowball and purposive sampling route: initial contact with the potential respondents was principally made by sending an e-mail to all members of ReCOL in France (n=1,063) and of the Belgian Dental Medicine Society in Belgium (n=3,869). Additionally, advertisements were also posted in France through Facebook, particularly in private professional groups. The survey was voluntary, and there were no incentives (either monetary or non-monetary) for participation. A single URL, unique to the survey, was set up and pointed to a SurveyMonkey® online questionnaire. Responses were thus collected automatically by the SurveyMonkey® system. Original data were stored in a password-protected electronic format (external hard driver) and were only accessible by ReCOL administrators. The data were not disclosed to any outside organization, and they were only processed by the persons in charge of the analysis (SC and SD). To ensure completion, all questions systematically required an answer. The back button and review functionality were enabled so respondents could change answers before final validation. The survey was available from 01/04/2025 to 20/06/2025. The IP address of the computer was used to avoid respondents with the same IP address to access the survey twice.

#### Statistical analysis

Statistical analysis was conducted in R using Jamovi 2.7.4 and Table One from ClinicoPath package. Likert plot was generated using ggplot2 [32-36]. Other graphs were generated using JASP 0.95.4. Regarding the age of the respondents (in 2025 – time of the study), the following subgroups were considered “<45 years old” *versus* “45 years old or more”. All continuous variables shown a p-value below 0.05 at Shapiro-Wilk test so the groups were compared using a non-parametric U Mann-Whitney test. For categorical variables, Chi-squared test was used to compare the groups. The Holm correction was applied to account for multiple testing.

#### Ethics

The study was ethically approved and registered in France by the Comité National Informatique et Liberté (CNIL) (registration number 2232858v0). According to the French legislation, participation was anonymous and original data were only accessible by investigators. No written consent was required for the present study as an individual participant's voluntary

completion of the questionnaire was tantamount to consent. In Belgium, no specific procedures were required according to the national regulation for anonymous surveys.

## Results

### Respondent data

A sample of 505 respondents filled in the online survey, with an average filling time of 6m 12s. A total of 343 DPs practicing in France (Fr-respondents) and 162 in Belgium (Be-respondents) answered the questionnaire (leading to response rates at 32.3 % in France and 4.2 % in Belgium). After excluding DPs with a specialized practice in pediatric dentistry ( $n = 9$ ) and orthodontics ( $n = 7$ ), as they do not manage DH in their specific practices, 331 and 158 DPs practicing in France and Belgium, respectively, were included in the analysis. Table 1 presents the demographic characteristics of Fr- and Be-respondents and of DPs practicing in France and in Belgium at the time of the study; Fr-respondents were significantly younger than Be-respondents (median age of 43 years in France and 49 in Belgium,  $p = 5.252 \times 10^{-5}$ , U Mann-Whitney) (Fig. 1).

### DH description and pathogenesis

About 90 % of the respondents in both countries described DH as a “short, sharp pain arising from an exposed dentin, to evaporative, thermal, tactile, osmotic or chemical stimuli and that cannot be ascribed to any other dental defect or disease” (without any significant differences between countries).

Be-respondents who read scientific articles about DH were more likely to opt for the option “intermittent, sharp, stabbing, shooting pain in the cheek, lips, gums, or chin on one side being able to build in strength, decrease and begin again, and then abruptly end” ( $p = 0.004$ ; U Mann-Whitney).

When asked about mechanisms of pain transmission, triggering factors and predisposing factors, responses varied within country (for all questions) as well as between countries ( $p \leq 0.05$  for mechanisms of pain transmission and predisposing factors;  $\chi^2$  and U Mann-Whitney) (Table 2).

If more than 80 % of the respondents mentioned the fluid flow within dentine tubules causing nerve stimulation as responsible for pain transmission, far less respondents were aware of the non-exhaustive nature of the mechanisms (more likely, one option chosen in Belgium and two

in France) (Table 2). The five top-cited DH predisposing factors in both countries were an “iatrogenic toothbrushing”, the “presence of gingival recession”, the “presence of erosion”, the “use of abrasive toothpaste” and an “acidic diet” (Table 2).

Age was significantly related to responses about DH predisposing factors. Respondents aged under 45 from both countries were more likely to cite the presence of abfraction (respectively  $p < 0.001$  and  $p = 0.006$ ,  $\chi^2$ ); furthermore, those practicing in France were also more likely to cite the presence of periodontal disease (respectively  $p = 0.042$ ,  $\chi^2$  Holm-corrected).

Contrary to age and reading of scientific articles about DH, gender was not significantly associated to any DH description and pathogenesis items, either in France or in Belgium.

### DH diagnosis

Table 3 summarizes the responses to questions related to DH diagnosis in clinical practice. Significant variability was observed within countries (for all questions) as well as between countries for detection-diagnosis techniques and confidence level toward DH diagnosis (Table 3).

Approximately 17 % of respondents (whatever the country) declared not to screen DH systematically during their routine examination. Detection/diagnosis of DH was based on a spontaneous patient report confirmed by dental exam by most respondents in both countries (more than 90%) and that, in average, respondents used a combination of three options. After a spontaneous patient report confirmed by dental exam, the most chosen options were the air blast test, the scratching with a dental explorer, a cold test and a medical interview with questions specific to DH. Only 36.5 % of Fr-respondents and 48.3 % of Be-respondents felt very confident or confident toward their DH diagnosis; it appeared that Be-respondents were more likely to be very confident than Fr-respondents ( $p = 0.022$ ,  $\chi^2$ ).

The level of confidence toward diagnosis was not related to any respondent characteristics either in France or in Belgium.

### DH management

Approximately 57 % of the Fr- and 65 % of the Be-respondents felt confident in managing DH (Table 4). Variability was highlighted within and between countries regarding the type of recommendations delivered, the knowledge toward mechanism of action of desensitizing agents and the confidence level toward DH management (Schiff score 0-3) (Table 4).

The use of a specific toothpaste and advice targeting the toothbrushing frequency were the two most frequently cited recommendations against DH (more than 90 % in both countries) (Table 4). Fr-respondents aged 45 old or more were more likely to deliver recommendations targeting acidic diet ( $p < 0.001$ ,  $\chi^2$ ) when age was not related to any specific recommendation in Belgium. Neither gender nor reading of scientific articles about DH was significantly associated with the delivery of recommendation in both countries.

About the nature of mechanism of action of desensitizing agents (multiple-choice question), more than 90% of respondents answered that those agents block open tubules and approximately half of them thought they allow a remineralization of exposed dentine (Table 4). Reading of scientific articles about DH was related to respondent answers but in different manners in France and Belgium: Be-respondents who read scientific articles about DH were more likely to opt for a remineralizing effect ( $p = 0.042$ ,  $\chi^2$  Holm-corrected).

From Schiff score 0-3, the management patterns look globally similar in Belgium and France. Schiff 0 management differs from Schiff 1-3 with a predominance of RF elimination and active surveillance/follow-up; from Schiff 1 to 3, curves are progressively placed outside illustrating that respondents reinforce their management strategies when Schiff score increases (Table 4, Fig. 2).

As summarized in Table 5, gender, age and reading of scientific articles about DH were significantly associated with DH management for each Schiff score, suggesting that respondents' characteristics influence clinical decision-making.

#### DH impact on QoL

Most respondents of both countries acknowledge DH impact on patient QoL (France: 96.8 %; Belgium: 91 %;) when few denied it or have no opinion (respectively 1.6 % and 1.6 % in France and 4.1 % and 4.8 % in Belgium).

Fr-respondents were more inclined to recognize the problem than Be-respondents ( $p = 0.032$ ;  $\chi^2$ ). Age, gender and reading of scientific articles about DH are not significantly associated with response to QoL question in either France or Belgium.

#### Initial and continuing education

The majority of respondents in both countries reported that their initial education in the field of DH was insufficient (France: 58.7 %; Belgium: 54.5 %;) when only 25 % and 31.7 % among the Fr- and Be-respondents thought the opposite (the remaining respondents having no opinion). Those results must be placed side by side with others showing that 68.9 % and 80.7 % of the Fr- and Be-respondents declared to be interested in further education in this field (when 12.2% and 14.5 % do not have any opinion and the remaining respondents are not interested). Be-respondents were more likely to endorse the idea of further continuing education ( $p < 0.001$ ) than Fr-respondents.

Respondent age was not significantly associated with responses related to dental in the field of DH education (initial and continuing education) either in France or in Belgium.

## Discussion

The present survey investigated the knowledge, opinions, and clinical practices of DPs in France and Belgium regarding DH. Overall, the findings revealed substantial variability in DPs' understanding, diagnostic approaches and management strategies toward DH. More importantly, the results suggest that DH remains insufficiently prioritized in daily clinical practice despite its high prevalence and its well-documented negative impact on patients' QoL.

Questionnaire-based surveys remain useful tools to explore professional practices and perceptions regarding DH, even though they cannot fully reflect actual clinical behavior [22]. Similar methodologies have previously been used worldwide to investigate DPs' approaches toward DH [9-25]. To our knowledge, the present study is the first conducted in France and Belgium, and more broadly in the French-speaking Europe, thus providing valuable insights into current clinical perceptions and management strategies.

In France, the study relied on ReCOL, the French dental practice-based research network, which helps bridge the gap between private practice and academic research [29, 37]. The collaboration with the Belgian Dental Medicine Society also enabled extension of the survey to the French-speaking part of Belgium. Although the Belgian response rate remained limited and should therefore be interpreted with caution, the demographic characteristics of Be-respondents globally reflected the general population of DPs in both countries, providing valuable insights into the topic.

The importance of studying DH in clinical practice is supported by its high prevalence in Europe. Recent European data reported that approximately 29 % of individuals experience clinically significant DH [38, 39], while French data showed that nearly 40 % of subjects experienced DH in response to cold air stimulation [40]. Beyond prevalence alone, numerous studies have highlighted the negative impact of DH on daily activities and QoL [3-8]. Nevertheless, the present findings suggest that DH is still frequently perceived as a secondary or relatively minor condition in clinical practice. Indeed, less than half of respondents (France: 47.4 %, Belgium: 39.3 %) reported systematically screening for DH during routine examinations; this is consistent with the 42.5 % obtained 20 years ago in a Dutch study (1995) [19], when Greek results were about 60 % in 2019 [13]. Overall, the present findings are in accordance with Asimakopoulou *et al.* recent conclusion: “DPs often do not consider DH as a serious condition requiring active investigation” [41]. Several barriers have been identified, including difficulties in diagnosis, limited formal training, and the perception that discussions about DH should primarily involve patients who are likely to adhere to recommendations. Interestingly, patients themselves often appear reluctant to discuss DH symptoms, perceiving them as insufficiently important to warrant dedicated attention during dental consultations [42]. Altogether, these findings suggest the existence of a mutual trivialization of DH by both DPs and patients, potentially contributing to underdiagnosis and delayed management despite the significant burden associated with the condition.

The present study also highlighted important gaps in DPs’ knowledge regarding DH pathophysiology. Although most respondents correctly identified the commonly accepted definition of DH, fewer DPs were aware of the diversity of mechanisms potentially involved in pain transmission beyond Brännström’s hydrodynamic theory [26]. Only two other questionnaire surveys investigated pathophysiology knowledge [9, 18]. In Australia, 80.5% of respondents were aware of Brännström’s hydrodynamic theory, whereas only 18.1% recognized the potential involvement of odontoblasts. Similarly, in Senegal, approximately 90.9% of respondents were familiar with the hydrodynamic theory, while only 3.6% identified odontoblast involvement. While hydrodynamic theory remains the dominant explanatory model [43], alternative or complementary mechanisms involving nociceptor sensitization, odontoblast signaling and neural responses have also been proposed [26]. A better understanding of these mechanisms may help DPs better understand the rationale underlying current therapeutic approaches and support more evidence-based clinical decision-making. In this context, strengthening both initial and continuing education on DH appears essential. This interpretation

is supported by recent work comparing dental students and DPs, which demonstrated persistent gaps in knowledge regarding DH prevention, diagnosis and management [11].

Recent interventional studies have evaluated a broad range of therapeutic strategies targeting different mechanisms involved in DH, including tubular occlusion, neural desensitization and biomodulation. Therapeutic approaches therefore range from home-use agents such as desensitizing toothpastes and mouthrinses [44, 45], to professionally applied non-invasive therapies including varnishes and photobiomodulation [11, 46], and more invasive approaches such as laser therapies and periodontal root coverage procedures [47]. This broad therapeutic spectrum reflects both the multifactorial nature of DH and the absence of a universally standardized treatment pathway.

Regarding management strategies, the present findings suggest a relatively consistent stepwise therapeutic approach according to DH severity. For mild DH, DPs mainly recommended preventive measures and desensitizing toothpastes, whereas more severe cases led to consideration of professionally applied or more invasive treatments. This gradual escalation is generally consistent with the current interventional literature, in which home-use products are considered first-line treatments, followed by professionally applied agents and, restorative or surgical interventions [11, 44-47].

However, despite this apparent consistency, substantial variability in therapeutic choices persists among DPs. Such heterogeneity likely reflects the absence of clear consensus and standardized clinical protocols regarding DH management. Similarly, although current recommendations emphasize the importance of structured diagnostic approaches continuing education combining exclusion of other causes of pain, standardized clinical testing, and patient-reported outcomes, these principles do not appear to be consistently implemented in daily practice [48].

Interestingly, while most interventional studies have primarily evaluated treatment efficacy using short-term clinical outcomes, fewer have investigated the relationship between clinical improvement and patient-perceived benefits. The present findings therefore further support the importance of integrating patient-reported outcomes into both clinical research and routine practice, as treatment success in DH cannot be fully captured through clinical measures alone.

Several limitations related to this type of questionnaire-based survey should nevertheless be acknowledged [49]. As with all questionnaire-based studies, the findings rely on self-reported practices that may differ from actual clinical behavior. In addition, the response rate, particularly in Belgium, remains limited and may introduce selection bias. However, the demographic distribution of respondents was broadly consistent with that of the national DP populations, supporting the relevance of the present findings. Finally, as participation was voluntary, DPs with a greater interest in DH may have been more likely to participate than non-respondents, potentially leading to an overestimation of knowledge and adherence to recommended clinical practices. In addition, the use of a closed-ended questionnaire may have limited the nuance of participants' responses and increased the likelihood of socially desirable answers.

Altogether, the present study suggests that there is substantial variability in DPs' understanding, diagnostic approaches and management strategies toward DH in France and in Belgium. Greater awareness, strengthened initial and continuing education, and clearer evidence-based recommendations are needed to improve the confidence level toward DH diagnosis.

### **List of abbreviations**

ADF: association dentaire française

Be-respondents: respondents practicing in Belgium

CHERRIES: checklist for reporting results of internet e-surveys

CNIL: commission nationale de l'informatique et des libertés

DH: dentin hypersensitivity

DPs: dental practitioners

FDI: Fédération dentaire internationale (world dental federation)

Fr-DPBRN: French-speaking dental practice-based research network

Fr-respondents: respondents practicing in France

QoL: quality of life

ReCOL: réseau de recherche clinique en odontologie libérale

UK: United Kingdom

USA: United States of America

**Author contributions**

VQ developed the questionnaire and contributed to the interpretation of the results, and drafted the manuscript.

BG contributed to the survey dissemination in France, data interpretation, and critical revision of the manuscript.

CS contributed to the statistical analysis, data interpretation, and critical revision of the manuscript.

AM contributed to the survey dissemination in Belgium, data interpretation, and critical revision of the manuscript.

SD conceived and designed the study, developed the questionnaire, supervised the project and the statistical analysis, contributed to data interpretation, and critically revised the manuscript.

All authors read, revised, and approved the final manuscript.

**Ethics declarations**

The authors declare no conflict of interest.

**Data availability**

The data supporting this article can be made available by the corresponding author upon request.

**Funding information**

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Table 1. Demographic characteristics of the respondents

|                                        | FRANCE                 |                                      | BELGIUM                |                                       |
|----------------------------------------|------------------------|--------------------------------------|------------------------|---------------------------------------|
|                                        | Respondents<br>n = 331 | General<br>population<br>N = 48,978* | Respondents<br>n = 158 | General<br>population<br>N = 10,966** |
| <b>Gender</b>                          | n = 330***             |                                      | n = 158                |                                       |
| Male                                   | 48.2 %                 | 49.5 %                               | 41.1 %                 | 47.9 %                                |
| Female                                 | 51.8 %                 | 50.5 %                               | 58.9 %                 | 52.1 %                                |
| <b>Age</b>                             | n = 330***             |                                      | n = 158                |                                       |
| Median (IQR)                           | 43 (18)                | 44.2                                 | 49 (23)                | -                                     |
| Minimum                                | 24                     | -                                    | 24                     | -                                     |
| Maximum                                | 72                     | -                                    | 79                     | -                                     |
| <b>Type of practice</b>                | n = 325***             |                                      | n = 154***             |                                       |
| Private practice                       | 79.7 %                 | 82.2 %                               | 88.3 %                 | -                                     |
| Salaried practice                      | 6.2 %                  | 17.8 %                               | 1.3 %                  |                                       |
| University hospital                    | 6.5 %                  | -                                    | 6.5 %                  |                                       |
| Private + salaried practice            | 1.2 %                  | -                                    | 0 %                    |                                       |
| Private practice + university hospital | 6.4 %                  | -                                    | 3.9 %                  |                                       |
| <b>Continuing education toward DH</b>  | n = 323                |                                      | n = 158                |                                       |
| Yes                                    | 27.8 %                 |                                      | 36.1 %                 | -                                     |
| No                                     | 72.2 %                 |                                      | 63.9 %                 | -                                     |

DH: dentine hypersensitivity; IQR: interquartile range

\*: in July 2025 – Data from the Conseil National des Chirurgiens-Dentistes

<https://www.ordre-chirurgiens-dentistes.fr/cartographie/>

\*\* : in 2024 – Data from Service Public Fédéral, HWF Statan 2024

<https://5199.f2w.fedict.be/fr/documents/hwf-statan-2024-statistiques-detaillees>

Last access 31/07/2025

Last access 31/07/2025

\*\*\*: not all respondents answered all the questions.

-: no available data

Table 2. Knowledge toward dentine hypersensitivity description and pathogenesis (mechanisms of pain transmission, triggering factors and predisposing factors)

|                                                                                                                                                                                                                                                            | Citation frequency<br>n (%) |                   | Comparison France - Belgium<br>(p-value)*** |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|-------------------|---------------------------------------------|
|                                                                                                                                                                                                                                                            | FRANCE*<br>n (%)            | BELGIUM*<br>n (%) |                                             |
| <b>DH description</b><br>(single-choice question)                                                                                                                                                                                                          |                             |                   |                                             |
| • Short, sharp pain arising from an exposed dentine, to evaporative, thermal, tactile, osmotic or chemical stimuli and that cannot be ascribed to any other dental defect or disease.                                                                      | 304 (91.8)                  | 141 (89.2)        | 0.435                                       |
| • Sharp, severe, radiating pain of long duration and varying intensity occurring spontaneously or following a hot or cold stimulus. In the latter case, the pain may linger even after the stimulus is removed.                                            | 20 (6.1)                    | 11 (7)            | 0.848                                       |
| • Intermittent, sharp, stabbing, shooting pain in the cheek, lips, gums, or chin on one side being able to build in strength, decrease and begin again, and then abruptly end. It can be triggered by stimuli as light as a breeze or a touch on the face. | 7 (2.1)                     | 6 (3.8)           | 0.440                                       |
| <b>DH mechanisms of pain transmission**</b><br>(multiple-choice question)                                                                                                                                                                                  |                             |                   |                                             |
| • Fluid flow within dentine tubules causing nerve stimulation                                                                                                                                                                                              | 293 (88.5)                  | 133 (84.2)        | 0.180                                       |
| • Stimulation of pulpal nerves                                                                                                                                                                                                                             | 106 (32)                    | 33 (20.9)         | <b>0.011</b>                                |
| • Stimulation of odontoblasts <i>via</i> exposed dentine                                                                                                                                                                                                   | 118 (35.6)                  | 30 (19)           | <b>&lt;0.001</b>                            |
| • Stimulation of cold receptors in the dental pulp                                                                                                                                                                                                         | 80 (24.2)                   | 27 (17.1)         | 0.077                                       |
| • I do not know                                                                                                                                                                                                                                            | 9 (2.7)                     | 8 (5.1)           | 0.186                                       |
| <b>Combinations of options</b>                                                                                                                                                                                                                             |                             |                   | <b>&lt;0.001<sup>1</sup></b>                |
| • Median (IQR)                                                                                                                                                                                                                                             | 2 (1)                       | 1 (1)             |                                             |
| • Range                                                                                                                                                                                                                                                    | 0-4                         | 0-4               |                                             |
| <b>DH triggering factors**</b><br>(multiple-choice question)                                                                                                                                                                                               |                             |                   |                                             |
| • Cold                                                                                                                                                                                                                                                     | 331 (100)                   | 158 (100)         | NA                                          |
| • Sugar                                                                                                                                                                                                                                                    | 265 (80.1)                  | 128 (81)          | 0.804                                       |
| • Mechanical stimulus                                                                                                                                                                                                                                      | 257 (77.6)                  | 117 (74.1)        | 0.381                                       |
| • Acid                                                                                                                                                                                                                                                     | 249 (75.2)                  | 114 (72.2)        | 0.467                                       |
| • Hot                                                                                                                                                                                                                                                      | 216 (65.3)                  | 110 (69.6)        | 0.338                                       |
| <b>Combinations of options</b>                                                                                                                                                                                                                             |                             |                   | 0.893 <sup>1</sup>                          |
| • Median (IQR)                                                                                                                                                                                                                                             | 4 (2)                       | 4 (2)             |                                             |
| • Range                                                                                                                                                                                                                                                    | 1-5                         | 1-5               |                                             |
| <b>DH predisposing factors **</b><br>(multiple-choice question)                                                                                                                                                                                            |                             |                   |                                             |
| • Iatrogenic toothbrushing                                                                                                                                                                                                                                 | 317 (95.8)                  | 149 (94.3)        | 0.474                                       |
| • Gingival recession                                                                                                                                                                                                                                       | 310 (93.7)                  | 143 (90.5)        | 0.212                                       |
| • Erosion                                                                                                                                                                                                                                                  | 257 (77.6)                  | 121 (76.6)        | 0.793                                       |
| • Abrasive toothpaste                                                                                                                                                                                                                                      | 256 (77.7)                  | 116 (73.4)        | 0.342                                       |
| • Acidic diet                                                                                                                                                                                                                                              | 263 (79.5)                  | 114 (72.2)        | 0.072                                       |
| • Excessive tooth whitening                                                                                                                                                                                                                                | 225 (68)                    | 92 (58.2)         | <b>0.035</b>                                |
| • Recent scaling and root planning                                                                                                                                                                                                                         | 213 (64.4)                  | 91 (57.6)         | 0.150                                       |
| • Periodontal disease                                                                                                                                                                                                                                      | 207 (62.5)                  | 73 (46.2)         | <b>&lt;0.001</b>                            |

|                                       |            |           |                          |
|---------------------------------------|------------|-----------|--------------------------|
| • Abfraction                          | 192 (58)   | 73 (46.2) | <b>0.014</b>             |
| • Bruxism                             | 119 (36)   | 63 (39.9) | 0.401                    |
| • Recent periodontal surgery          | 137 (41.4) | 56 (35.4) | 0.208                    |
| • Dental caries                       | 79 (23.9)  | 45 (28.5) | 0.273                    |
| • Occlusal trauma/habits              | 104 (31.4) | 41 (25.9) | 0.215                    |
| <b><u>Combinations of options</u></b> |            |           | <b>0.017<sup>1</sup></b> |
| • Median (IQR)                        | 8 (4)      | 7 (5)     |                          |
| • Range                               | 1-13       | 1-13      |                          |

DH: dentine hypersensitivity; IQR: interquartile range; NA: not applicable

\*: not all respondents answered all the questions

\*\*: respondents may choose several options for the question

\*\*\*: Chi-squared test except U Mann-Whitney for p-values marked with <sup>1</sup>

In bold:  $p \leq 0.05$

Table 3. Diagnosis of dentine hypersensitivity

|                                                                                       | Citation frequency<br>n (%) |                   | Comparison France -<br>Belgium<br>(p-value)*** |
|---------------------------------------------------------------------------------------|-----------------------------|-------------------|------------------------------------------------|
|                                                                                       | FRANCE*<br>n (%)            | BELGIUM*<br>n (%) |                                                |
| <b>DH systematic screening during routine examination</b><br>(single-choice question) |                             |                   |                                                |
| • Yes                                                                                 | 157 (47.4)                  | 62 (39.3)         | 0.108                                          |
| • No                                                                                  | 55 (16.6)                   | 28 (17.7)         | 0.861                                          |
| • Not particularly                                                                    | 119 (36)                    | 68 (43)           | 0.159                                          |
| <b>Technique(s) to detect and diagnose DH **</b><br>(multiple-choice question)        |                             |                   |                                                |
| • Spontaneous patient report confirmed by dental exam                                 | 299 (90.3)                  | 146 (92.4)        | 0.454                                          |
| • Air blast test                                                                      | 275 (83.1)                  | 131 (82.9)        | 0.963                                          |
| • Scratching dentine with dental explorer                                             | 160 (48.3)                  | 81 (51.3)         | 0.545                                          |
| • Cold test                                                                           | 73 (22.1)                   | 53 (33.5)         | <b>0.007</b>                                   |
| • Medical interview with specific questions                                           | 132 (39.9)                  | 43 (27.2)         | <b>0.006</b>                                   |
| • Percussion test                                                                     | 10 (3)                      | 12 (7.6)          | <b>0.022</b>                                   |
| • Numeric rating of pain (VAS)                                                        | 48 (14.5)                   | 8 (5.1)           | <b>0.002</b>                                   |
| • Hot test                                                                            | 8 (2.4)                     | 6 (3.8)           | 0.392                                          |
| • No specific test                                                                    | 5 (1.5)                     | 0 (0)             | 0.120                                          |
| <b>Combinations of options</b>                                                        |                             |                   | 0.989 <sup>1</sup>                             |
| • Median (IQR)                                                                        | 3 (2)                       | 3 (2)             |                                                |
| • Range                                                                               | 0-8                         | 1-6               |                                                |
| <b>Confidence level toward DH diagnosis</b>                                           |                             |                   |                                                |
| • Very confident                                                                      | 21 (6.7)                    | 20 (13.8)         | <b>0.022</b>                                   |
| • Confident                                                                           | 93 (29.8)                   | 50 (34.5)         | 0.371                                          |
| • Fairly confident                                                                    | 135 (43.3)                  | 51 (35.2)         | 0.124                                          |
| • Not very confident                                                                  | 52 (16.7)                   | 18 (12.4)         | 0.301                                          |
| • Not confident at all                                                                | 6 (1.9)                     | 3 (2.1)           | 1.000                                          |
| • I do not know                                                                       | 5 (1.6)                     | 3 (2.1)           | 1.000                                          |

DH: dentine hypersensitivity; IQR: interquartile range; VAS: visual analog scale

\*: not all the respondents answered all the questions

\*\*: respondents may choose several options for the question

\*\*\*: Chi-squared test except U Mann-Whitney for p-values marked with <sup>1</sup>

In bold:  $p \leq 0.05$

Table 4. Management of dentine hypersensitivity

|                                                                                                            | Citation frequency<br>n (%) |                   | Comparison<br>France –<br>Belgium<br>(p-value)*** |
|------------------------------------------------------------------------------------------------------------|-----------------------------|-------------------|---------------------------------------------------|
|                                                                                                            | FRANCE*<br>n (%)            | BELGIUM*<br>n (%) |                                                   |
| <b>Recommendations delivery against DH</b><br>(multiple-choice question)                                   |                             |                   |                                                   |
| • Recommendations of a specific toothpaste                                                                 | 293 (93.6)                  | 135 (93.1)        | 0.838                                             |
| • Recommendations targeting toothbrushing frequency                                                        | 290 (92.7)                  | 131 (90.3)        | 0.399                                             |
| • Recommendations targeting acidic diet                                                                    | 200 (63.9)                  | 85 (58.6)         | 0.279                                             |
| • Recommendations to avoid brushing immediately after eating                                               | 143 (45.7)                  | 67 (46.2)         | 0.917                                             |
| • Other                                                                                                    | 19(6.1)                     | 16 (11)           | 0.063                                             |
| • Any specific recommendation                                                                              | 3 (1)                       | 1 (0.7)           | 0.774                                             |
| <b>Combinations of options</b>                                                                             |                             |                   | 0.840 <sup>1</sup>                                |
| • Median (IQR)                                                                                             | 3 (0.9)                     | 3 (1)             |                                                   |
| • Range                                                                                                    | 0-5                         | 0-5               |                                                   |
| <b>Mechanism of action of desensitizing agents</b><br>(multiple-choice question)                           |                             |                   |                                                   |
| • Block opened tubules                                                                                     | 295 (94.6)                  | 142 (97.9)        | 0.100                                             |
| • Remineralise exposed dentine                                                                             | 163 (52.2)                  | 71 (49)           | 0.514                                             |
| • Disrupt pain transmission                                                                                | 54 (17.3)                   | 16 (11)           | <b>0.083</b>                                      |
| • Remove dental plaque                                                                                     | 12 (3.8)                    | 5 (3.4)           | 0.834                                             |
| • Other                                                                                                    | 1 (0.3)                     | 1 (0.7)           | 0.578                                             |
| • I do not know                                                                                            | 4 (1.3)                     | 0 (0)             | 0.171                                             |
| <b>Combinations of options</b>                                                                             |                             |                   | 0.364 <sup>1</sup>                                |
| • Median (IQR)                                                                                             | 1.7 (0.7)                   | 1.6 (0.6)         |                                                   |
| • Range                                                                                                    | 0-4                         | 1-4               |                                                   |
| <b>Specific management for patients presenting a Schiff 0 to air test **</b><br>(multiple-choice question) |                             |                   |                                                   |
| • Active surveillance and follow-up                                                                        | 204 (65.2)                  | 90 (62.5)         | 0.579                                             |
| • Risk factor elimination                                                                                  | 171 (55)                    | 76 (52.8)         | 0.665                                             |
| • Desensitizing toothpaste                                                                                 | 89 (28.4)                   | 39 (27.1)         | 0.765                                             |
| • Varnish/adhesive                                                                                         | 24 (7.7)                    | 16 (11.1)         | 0.226                                             |
| • Composite restoration                                                                                    | 21 (6.7)                    | 8 (5.6)           | 0.638                                             |
| • Mouth wash                                                                                               | 10 (3.2)                    | 5 (3.5)           | 0.877                                             |
| • GIC restoration                                                                                          | 9 (2.9)                     | 5 (3.5)           | 0.731                                             |
| • Mucogingival surgery                                                                                     | 13 (4.2)                    | 2 (1.4)           | 0.123                                             |
| • Endodontic treatment                                                                                     | 4 (1.3)                     | 2 (1.4)           | 0.923                                             |
| • Laser                                                                                                    | 3 (1)                       | 1 (0.7)           | 0.778                                             |
| • Other                                                                                                    | 0 (0)                       | 0 (0)             | <b>NA</b>                                         |
| <b>Combinations of options</b>                                                                             |                             |                   | 0.537 <sup>1</sup>                                |
| • Median (IQR)                                                                                             | 1.8 (0.9)                   | 1.7 (1)           |                                                   |
| • Range                                                                                                    | 1-7                         | 1-7               |                                                   |
| <b>Specific management for patients presenting a Schiff 1 to air test **</b><br>(multiple-choice question) |                             |                   |                                                   |
| • Desensitizing toothpaste                                                                                 | 242 (77.3)                  | 107 (74.3)        | 0.482                                             |
| • Risk factor elimination                                                                                  | 233 (74.4)                  | 105 (72.9)        | 0.730                                             |
| • Active surveillance and follow-up                                                                        | 73 (23.3.)                  | 39 (27.1)         | 0.385                                             |
| • Varnish/adhesive                                                                                         | 95 (30.4)                   | 33 (22.9)         | 0.100                                             |

|                                                                                                            |            |            |                          |
|------------------------------------------------------------------------------------------------------------|------------|------------|--------------------------|
| • Mouth wash                                                                                               | 36 (11.5)  | 17 (11.8)  | 0.925                    |
| • Composite restoration                                                                                    | 34 (10.9)  | 10 (6.9)   | 0.187                    |
| • GIC restoration                                                                                          | 18 (5.8)   | 8 (5.6)    | 0.933                    |
| • Mucogingival surgery                                                                                     | 15 (4.8)   | 4 (2.8)    | 0.316                    |
| • Laser                                                                                                    | 3 (1)      | 2 (1.4)    | 0.681                    |
| • Endodontic treatment                                                                                     | 0 (0)      | 0 (0)      | NA                       |
| • Other                                                                                                    | 1 (0.3)    | 0 (0)      | 0.497                    |
| <b>Combinations of options</b>                                                                             |            |            | 0.221 <sup>1</sup>       |
| • Median (IQR)                                                                                             | 2.4 (1.1)  | 2.3 (1.1)  |                          |
| • Range                                                                                                    | 1-7        | 1-5        |                          |
| <b>Specific management for patients presenting a Schiff 2 to air test **</b><br>(multiple-choice question) |            |            |                          |
| • Desensitizing toothpaste                                                                                 | 289 (92.3) | 133 (92.4) | 0.991                    |
| • Risk factor elimination                                                                                  | 250 (79.9) | 114 (79.2) | 0.862                    |
| • Varnish/adhesive                                                                                         | 204 (65.2) | 91 (63.2)  | 0.681                    |
| • Composite restoration                                                                                    | 116 (37.1) | 40 (27.8)  | 0.052                    |
| • Mouth wash                                                                                               | 76 (24.3)  | 28 (19.4)  | 0.252                    |
| • GIC restoration                                                                                          | 46 (14.7)  | 19 (13.2)  | 0.669                    |
| • Active surveillance and follow-up                                                                        | 11 (3.5)   | 11 (7.6)   | 0.056                    |
| • Mucogingival surgery                                                                                     | 43 (13.7)  | 8 (5.6)    | <b>0.010</b>             |
| • Endodontic treatment                                                                                     | 0 (0)      | 4 (2.8)    | <b>0.003</b>             |
| • Laser                                                                                                    | 19 (6.1)   | 3 (2.1)    | 0.064                    |
| • Other                                                                                                    | 2 (0.6)    | 1 (0.7)    | 0.946                    |
| <b>Combinations of options</b>                                                                             |            |            | 0.062 <sup>1</sup>       |
| • Median (IQR)                                                                                             | 3.4 (1.3)  | 3.1 (1.2)  |                          |
| • Range                                                                                                    | 1-8        | 1-6        |                          |
| <b>Specific management for patients presenting a Schiff 3 to air test **</b><br>(multiple-choice question) |            |            |                          |
| • Desensitizing toothpaste                                                                                 | 278 (88.8) | 122 (84.7) | 0.218                    |
| • Risk factor elimination                                                                                  | 248 (79.2) | 113 (78.5) | 0.853                    |
| • Varnish/adhesive                                                                                         | 194 (62)   | 88 (61.1)  | 0.859                    |
| • Composite restoration                                                                                    | 202 (64.5) | 81 (56.2)  | 0.090                    |
| • GIC restoration                                                                                          | 85 (27.2)  | 33 (22.9)  | 0.336                    |
| • Mouth wash                                                                                               | 83 (26.5)  | 28 (19.4)  | 0.101                    |
| • Mucogingival surgery                                                                                     | 90 (28.8)  | 16 (11.1)  | <b>&lt;0.001</b>         |
| • Endodontic treatment                                                                                     | 17 (5.4)   | 15 (10.4)  | 0.052                    |
| • Laser                                                                                                    | 30 (9.6)   | 5 (3.5)    | <b>0.022</b>             |
| • Active surveillance and follow-up                                                                        | 4 (1.3)    | 3 (2.1)    | 0.515                    |
| • Other                                                                                                    | 2 (0.6)    | 2 (1.4)    | 0.424                    |
| <b>Combinations of options</b>                                                                             |            |            | <b>0.004<sup>1</sup></b> |
| • Median (IQR)                                                                                             | 3.9 (1.4)  | 3.5 (1.5)  |                          |
| • Range                                                                                                    | 1-10       | 1-7        |                          |
| <b>Confidence level toward DH management</b>                                                               |            |            |                          |
| • I am confident                                                                                           | 177 (56.7) | 94 (64.8)  |                          |
| • I am not confident                                                                                       | 69 (22.1)  | 27 (18.6)  |                          |
| • No opinion                                                                                               | 66 (21.2)  | 24 (16.6)  |                          |

DH: dentine hypersensitivity; GIC: glass ionomer cement; IQR: interquartile range; VAS: visual analog scale

\*: not all the respondents answered all the questions

\*\*: respondents may choose several options for the question

\*\*\*: Chi-squared test except U Mann-Whitney for p-values marked with <sup>1</sup>

In bold:  $p \leq 0.05$

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Table 5. Significant relationship between respondent characteristics and responses to questions related to knowledge, detection/diagnosis and management\*\*\* (Holm-adjusted p-value)

|                                     | <b>GENDER</b><br>♂ vs ♀   |                                                | <b>AGE</b><br><45yo vs ≥45 (yo)                                                     |                                                  | <b>READING OF<br/>SCIENTIFIC ARTICLES<br/>ABOUT DH</b><br>yes vs no                   |                                                    |
|-------------------------------------|---------------------------|------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------|---------------------------------------------------------------------------------------|----------------------------------------------------|
|                                     | <b>FRANCE</b>             | <b>BELGIUM</b>                                 | <b>FRANCE</b>                                                                       | <b>BELGIUM</b>                                   | <b>FRANCE</b>                                                                         | <b>BELGIUM</b>                                     |
| <b>Schiff 0 management</b>          | NS                        | NS                                             | - DTP: ≥ 45<br>(0.015)<br>- Varnish: ≥45<br>(0.021)<br>- Surveillance: < 45 (0.021) | - DTP: ≥ 45<br>(0.03)                            | - MG surg:<br>yes (0.024)                                                             | NS                                                 |
| <b>Schiff 1 management</b>          | NS                        | - Varnish:<br>♀ (0.042)                        | - GIC: ≥ 45<br>(0.012)<br>- Surveillance: < 45 (0.027)                              | - DTP: ≥ 45<br>(0.018)<br>- GIC: ≥ 45<br>(0.034) | - More options: yes<br>(0.024)<br>- MG surg:<br>yes (0.018)                           | - Varnish:<br>yes (0.006)<br>- GIC: yes<br>(0.048) |
| <b>Schiff 2 management</b>          | - MG surg:<br>♂ (0.036)   | - Pred F: ♀<br>(0.021)<br>- Endo: ♂<br>(0.048) | NS                                                                                  | NS                                               | - More options: yes<br>(<0.001)<br>- MG surg:<br>yes (0.048)<br>-                     | - GIC: yes<br>(0.021)                              |
| <b>Schiff 3 management</b>          | - Composite:<br>♀ (0.024) | - Pred F: ♀<br>(0.012)                         | NS                                                                                  | - MG surg:<br>< 45 (0.009)                       | - More options: yes<br>(<0.001)<br>- MG surg:<br>yes (0.036)<br>- GIC: yes<br>(0.009) | NS                                                 |
| <b>Confidence toward management</b> | NS                        | NS                                             | - Less definite opinion and more “no opinion”:<br><45 (0.0072)                      | NS                                               | - Less definite opinion, less “yes” and more “no opinion”:<br>no (0.026) <sup>1</sup> | NS                                                 |

DH: dentine hypersensitivity; DTP: desensitizing toothpaste; GIC: glass ionomer cement; MG surg: mucogingival surgery; MW: mouthwash; NS: non-significant; Pred F: predisposing factors; vs: *versus*; y: year-old; ♂: men; ♀: women

\*\*\*: Chi-squared test except U Mann-Whitney for p-values marked with <sup>1</sup>

In bold:  $p \leq 0.05$

When the relationship is significant ( $p \leq 0.05$ ), the Table mentions the p-value and the option accompanied by the characteristic with the highest occurrence. For example: Composite: ♀ (0.024) means that, in France, ♀ were more likely to choose composite restorations than ♂ for the management of a Schiff 3 DH to air blast test with a p-value at 0.024 (Chi-squared test, Holm-adjusted p-value).

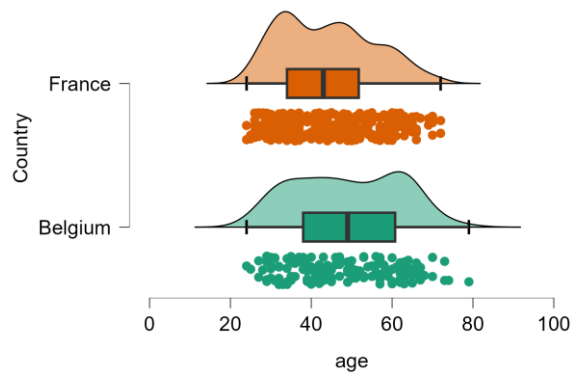


Figure 1. Graphic representation of respondent distribution in terms of age (years) in France and in Belgium

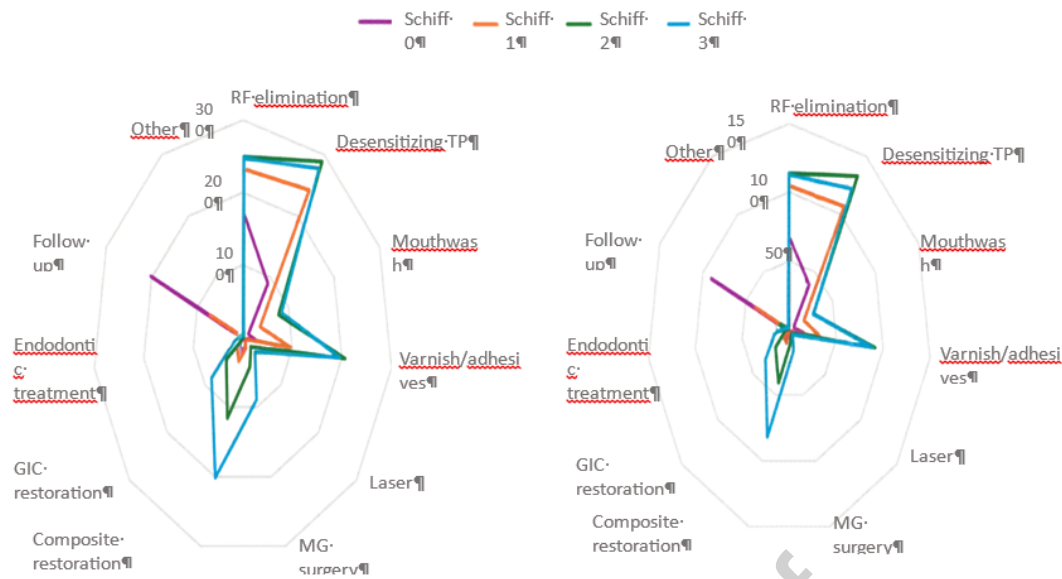


Figure 2. Graphic representation of dentine hypersensitivity management (from Schiff scores 0 to 3 to air blast test) in France and in Belgium

GIC: glass ionomer cement; MG: mucogingival; RF: risk factor; TP: desensitizing toothpaste

## Ethics declaration

### Informed consent and patient details

The authors have NOT obtained informed consent from participants or their legal representatives. The study was ethically approved and registered in France by the Comité National Informatique et Liberté (CNIL) (registration number 2232858v0). According to the French legislation, participation was anonymous and original data were only accessible by investigators. No written consent was required for the present study as an individual participant's voluntary completion of the questionnaire was tantamount to consent. In Belgium, no specific procedures were required according to the national regulation for anonymous surveys.

### Studies in Human

This study was performed in compliance with relevant laws, regulatory frameworks and guidelines where the research took place.

This study was conducted in accordance with The study (questionnaire survey) was ethically approved and registered in France by the Comité National Informatique et Liberté (CNIL) (registration number 2232858v0). According to the French legislation, participation was anonymous and original data were only accessible by investigators. No written consent was required for the present study as an individual participant's voluntary completion of the questionnaire was tantamount to consent. In Belgium, no specific procedures were required according to the national regulation for anonymous surveys..

Ethics committee approval was not required under relevant laws and institutional guidelines. The study (questionnaire survey) was ethically approved and registered in France by the Comité National Informatique et Liberté (CNIL) (registration number 2232858v0). According to the French legislation, participation was anonymous and original data were only accessible by investigators. No written consent was required for the present study as an individual participant's voluntary completion of the questionnaire was tantamount to consent. In Belgium, no specific procedures were required according to the national regulation for anonymous surveys.

**Declaration of interests**

☐ The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

☒ The authors declare the following financial interests/personal relationships which may be considered as potential competing interests:

Sophie DOMEJEAN reports administrative support was provided by ReCOL (réseau de recherche clinique en odontologie libérale). If there are other authors, they declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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