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ORIGINAL ARTICLE

Back pain prevalence, intensity and associated factors in French dentists: a national study among 1004 professionals

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Abstract

Objectives Back pains are the most frequent musculoskeletal disorders among dentists, exposed to many work-related risk factors. We aimed to assess the prevalence and intensity of back pains as well as the impact of some work behaviors among a large sample of dentists.

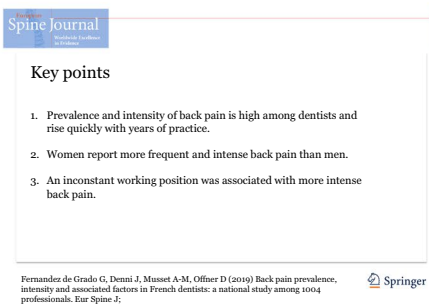
Materials and methods Data from 1004 French dentists were collected via an Internet questionnaire. Neck, upper back and lower back pains prevalence, intensity (0–10 scale) and consequences on work were studied, as well as sex, age, years of practice, working position, type of seat, stretching on work days.

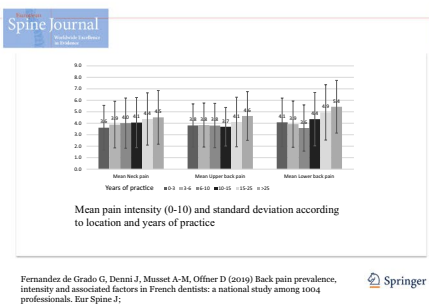
Results Dentists were 77.9% to report chronic back pains, with intensity from 3.9 to 4.3 according to location. Women reported more frequent and intense pains than men in neck and upper back (OR 1.5). Age and years of practice were associated with more intense pains (OR up to 3.9), dentists alternating standing and sitting positions reported more frequent and more intense pains in upper and lower back (OR up to 1.5) than those with a fixed position, be it sitting or standing.

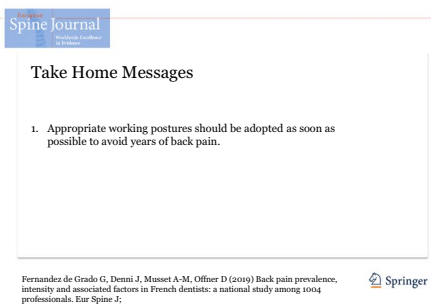
Conclusions Prevalence and intensity of back pain are important among dentists and increase greatly over working life. Preventive methods such as ergonomics exist and awareness should be raised among dentists and dental student.

Graphic abstract

These slides can be retrieved under Electronic Supplementary Material.







Keywords Musculoskeletal disorders · Dentistry · Occupational health · Ergonomics

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Introduction

Musculoskeletal disorders, especially lower back (lumbar region), upper back (thoracic region) and neck (cervical region) pains, are frequent diseases, strongly associated with working habits among workers adopting specific postures with a flexed, rotated and awkward positioning of the spine, such as healthcare workers like dentists [1, 2]. In France, they represent 80% of the work-associated diseases, with more than 36,000 victims and a cost of 787 million of euros in 2006 [3]. In the USA, the cost of back pain only was 284.4 billion dollars in 2011 [4].

Chronic pain is defined by the World Health Organization (WHO) as a pain lasting or recurring for at least 3 months [5]. Studies report a high prevalence of dentists suffering from chronic back pains (lower, upper or neck pain), from 60% to more than 90%, making it the most frequent musculoskeletal disorder according to reviews of the literature [2, 6, 7], and thus a significant burden for the profession. Reports about this situation are worldwide [8–10]. This proportion is greater than among less straining professions like physicians or lawyers, linked to many identified risk factors: repetitive motions, static and straining working positions with unsupported forearms, use of vibrating tools, as well as an important psychological stress [7, 11–13]. Indeed, prevalence of chronic back pain among workers in France was estimated at only 35%, much lower than among dentists [14]. The awkward postures more frequently identified among dental professionals are: neck flexion; trunk inclination and rotation; shoulders lifting; curving of the vertebral column; incorrect positioning of the lower limbs [15]. Those working postures have been identified at particularly high risk of musculoskeletal disease, specifically neck and lower back pain [16].

Years of practice have been associated with back pain: Dentists in the middle of their career report pains more frequently than those with more years of practice, or those practicing for the shortest amount of time [7]. Women report more frequent and more intense pains than men, which should be a source of concern since the profession is becoming predominantly feminine [7].

Recent reviews studied the effect of preventive actions, such as physical activity, stretching, keeping a balanced posture or alternating between different positions [6, 15]. Those preventive actions emerged as very important in the prevention of musculoskeletal disorders; however, the methodological and statistical qualities of the studies are poor according to a recent umbrella review which also highlights a need for randomized clinical trials to improve the evidence level of these results [15].

The aim of this study was to assess the actual prevalence of back or neck pain and its intensity among French dentists, as well as to determine the effect of some potentially associated factors such as the years since starting to work, the working position, the type of working seat or the use of stretching movements during working days.

The last studies on the prevalence of back pains among French dentists were carried out in 2014 with only 118 dentists [17] and before that in 2000 among all the French dentists but without information about how many of them answered effectively [18]. They described the practice of dentists as well as the association between some working habits and pains. Both of them found a prevalence of chronic back pains around 60%, but their methodology is unclear, and thus do not participate to enrich the international and national database with precise information. Consequently, we decided to lead a large study to assess the current situation with a significant statistical power.

Materials and methods

Study design and recruitment

We used a Google® form questionnaire (Google, Mountain View, CA) that was online from October 15, 2017, to February 22, 2018. The link to this questionnaire was put on the social media *Facebook* (https://www.facebook.com). To avoid answers from non-dentists, this link was made visible only on private groups (with restricted admission) dedicated to French dentists.

Data collection was anonymous, and neither name nor any personal information such as email address was collected. Participants were informed of the study's goal. We complied with the French Data Protection Agency CNIL's Reference Methodology (MR-003) for the data collection, preservation and protection.

Questionnaire

Information collected was: age, sex, years since starting to work (years of practice); suffering from chronic back or neck pain–chronic pain is defined as a pain lasting for more than 3 months according to the WHO (yes/no) and if so the average intensity of the pain (on a 0–10 scale) in the lower back, upper back and neck; back pain having already prevented work; working position (overwhelmingly sitting, overwhelmingly standing, both at substantially equal duration); working seat (standing, kneeling stool, saddle, chair with a full back support, stool with procedure arm, simple stool without back support) (Fig. 1); stretching at least once after working for a day or two.

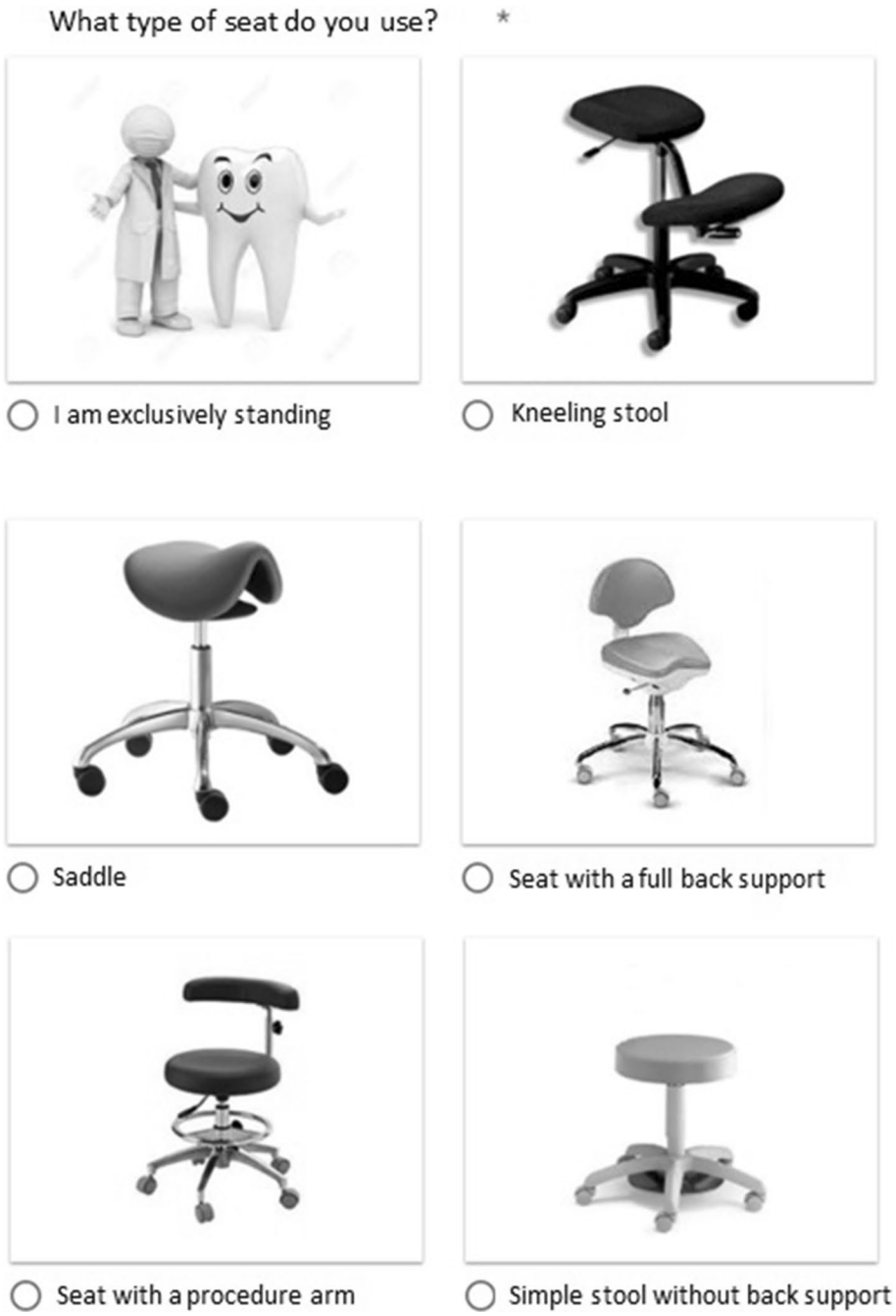

Fig. 1 Translated sample from the questionnaire illustrating the types of seat: standing, kneeling stool, saddle, chair with a full back support, stool with procedure arm, simple stool without back support

Statistical analyses

Statistical analyses were made using R Core Team [19] with the RStudio interface [20].

Chi-square tests were used to compare the proportions between two groups or more, Student's tests to compare means between two groups, and regression model to compare means between more than two groups. Multivariate analysis was done using upper and lower stepwise logistic regressions at a $p < 0.05$ threshold, with "suffering from chronic pain" as the dependent variable. Unless specified otherwise, intensity of pain for each location was studied only among dentists who reported chronic pain and who did not answer "0" to the pain intensity for the associated location.

Results

We collected 1004 full questionnaires during the study: 622 from women (62%) and 382 from men (38%). Most of the answers (62.1%) were from dentists less than 35 years old and working since less than 6 years (49.2%) (Fig. 2).

Prevalence of chronic pain was 77.9%, with a significant gender disparity: 81.83% of women and 71.47% of men ($p < 0.05$).

On the 0–10 scale, mean intensity of lower back pain was 2.9, upper back pain was 2.7 and neck pain was 2.6 among the whole population. Among dentists reporting chronic pain, mean intensity of lower back pain was 4.3, upper back 3.9, neck 4.0 (Table 2).

While the prevalence of chronic pain was not significantly ($p = 0.10$) associated with age, it seemed increased between 25 and 55 years old (78.1–83.9%) compared to 18–25-year-old (72.7%) and more than 55-year-old (71.8%) dentists.

Prevalence of chronic pain was significantly associated ($p < 0.01$) with years of practice, with the same pattern as age: lower prevalence among dentists working since less than 3 years or more than 25 years than dentists working since 3–25 years (Table 1).

Chronic pain prevented 19.5% of the respondent from working at least once. Working positions reported were: mostly sitting at 93.2%, mostly standing at 1.8% and both at 4.9%. Dentists sitting or standing most of the time showed less frequent pains (77.7% in both groups) than those switching positions (82%); however, this result was not significant.

The most frequent working seats were saddles (58.5%), chairs with a full back rest (28.2%) or stools with an arm (9.3%). Seat type was not linked to the prevalence of chronic pain.

Only 21% of respondents stretched at the end of a working day or after 2 days of work, without association with the prevalence of chronic pain.

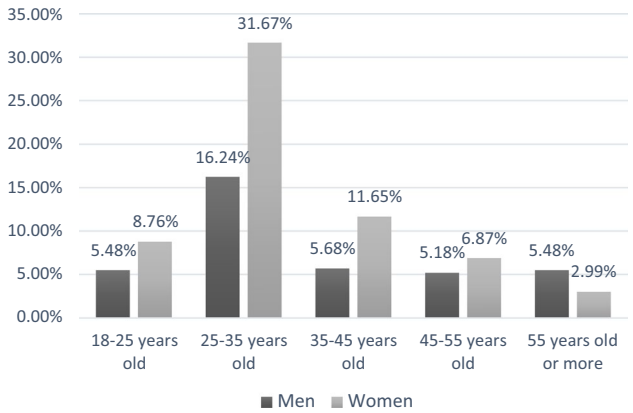

Fig. 2 Population of respondents studied by age and sex, $n = 1004$

Factors associated with the location and intensity of pain among dentists suffering from chronic pain

Mean pain intensity, standard deviation (SD) and significance (p) according to descriptive factors are shown in Table 2.

Compared to men, women reported more intense neck pain and upper back pain ($p < 0.05$), while there was no significant difference concerning lower back pain ($p = 0.74$).

Growing older and working since a longer time (with base levels at 18–25 years old and 0–3 years of work) were significantly associated with a regular increase in pain intensity in the neck, upper back and lower back (Table 2 and Fig. 3).

Dentists who were prevented from working at least once due to chronic pain reported more intense pain ($p < 0.001$) in every location, especially lower back.

Dentists working by alternating standing and sitting positions reported more intense upper and lower back pain than those standing or sitting.

Seat type was not significantly associated with pain intensity, with only slight differences in mean values.

Stretching was slightly associated ($p < 0.05$) with more intense levels of pain in the upper back.

Multivariate analysis results

After logistic regression to control for confounding factors, no such factor was highlighted. The three main significant

Table 1 Prevalence of chronic pain according to years of practice and age

Years of practice	Population (% of the full population)	Prevalence of chronic pain in each group (n)	Age	Population (% of the full population)	Prevalence of chronic pain in each group (n)
0–3	331 (33%)	72% (239)	18–25	143 (14%)	72% (104)
3–6	163 (16%)	84% (137)	25–35	481 (48%)	78% (376)
6–10	144 (14%)	81% (117)	35–45	174 (17%)	84% (146)
10–15	103 (10%)	84% (87)	45–55	121 (12%)	79% (95)
15–25	136 (14%)	79% (108)	55 or more	85 (9%)	72% (61)
> 25	127 (13%)	74% (94)			
Full population	1004 (100%)	78% (782)		1004 (100%)	78% (782)

The prevalence of chronic pain according to years of practice showed significantly different values between the six groups ($p < 0.01$). This was not the case with age, despite a similar pattern ($p = 0.10$)

Table 2 Pain intensity according to location and significant descriptive factors

	Mean neck pain intensity ± SD	OR	*p*	Mean upper back pain intensity ± SD	OR	*p*	Mean lower back pain intensity ± SD	OR	*p*
Full population	2.6 ± 2.5			2.7 ± 2.4			2.9 ± 2.7		
Population suffering from chronic pain	4.0 ± 2.1			3.9 ± 2.0			4.3 ± 2.3		
Descriptive variables									
Sex									
Men	3.7 ± 2.1			3.7 ± 1.9			4.4 ± 2.2		
Women	4.1 ± 2.2	1.5	*	4.1 ± 2.0	1.5	*	4.3 ± 2.3	1.0	NS
Years of practice									
0–3	3.6 ± 1.9			3.8 ± 1.9			4.1 ± 2.1		
3–6	3.9 ± 2.0	1.3	NS	3.8 ± 1.9	1.0	NS	3.9 ± 2.0	0.9	NS
6–10	4.0 ± 2.2	1.5	NS	3.8 ± 1.9	1.0	NS	3.6 ± 2.0	0.6	NS
10–15	4.1 ± 2.2	1.6	NS	3.7 ± 1.7	0.9	NS	4.4 ± 2.3	1.3	NS
15–25	4.4 ± 2.3	2.1	**	4.1 ± 2.2	1.3	NS	4.9 ± 2.4	2.4	**
> 25	4.5 ± 2.3	2.5	**	4.6 ± 2.1	2.3	**	5.4 ± 2.3	3.9	***
Age									
18–25	3.6 ± 1.9			3.8 ± 1.8			4.4 ± 2.2		
25–35	3.8 ± 2.0	1.2	NS	3.9 ± 2.0	1.0	NS	3.8 ± 2.1	0.6	*
35–45	4.1 ± 2.2	1.7	NS	3.8 ± 1.8	0.9	NS	4.1 ± 2.2	0.7	NS
45–55	4.5 ± 2.3	2.5	**	4.3 ± 2.1	1.6	NS	5.4 ± 2.4	2.8	**
> 55	4.6 ± 2.5	2.8	**	4.5 ± 2.1	2.0	*	5.5 ± 2.2	3.1	**
Pain prevented work									
No	3.8 ± 2.0			3.7 ± 1.8			4.0 ± 2.1		
Yes	4.5 ± 2.3	2.0	***	4.6 ± 2.2	2.4	***	5.3 ± 2.3	3.7	***
Work position									
Sitting	4.0 ± 2.1			3.9 ± 1.9			4.3 ± 2.2		
Standing	2.9 ± 1.4	0.3	NS	3.8 ± 1.9	0.9	NS	4.0 ± 2.6	0.8	NS
Both	3.9 ± 2.3	0.9	NS	4.8 ± 2.3	2.4	*	5.1 ± 2.3	2.4	*
Stretching									
No	4.0 ± 2.1			3.8 ± 1.9			4.2 ± 2.2		
Yes	3.8 ± 2.2	0.9	NS	4.3 ± 2.0	1.5	*	4.5 ± 2.3	1.3	NS

p: NS > 0.05 * ≤ 0.05; ** ≤ 0.01; *** ≤ 0.001

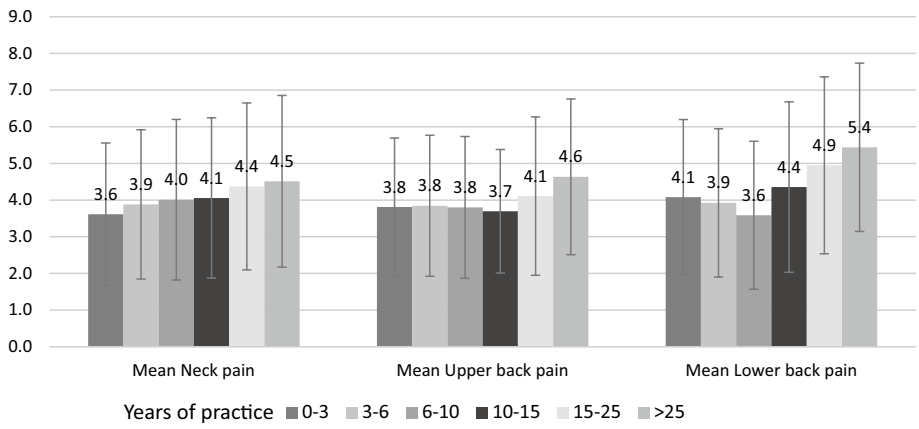

Fig. 3 Mean pain intensity (0–10) and standard deviation according to location and years of practice

variables identified during bivariate analyses stayed in the final model: "sex" (OR 1.7, $p < 0.0001$), "pain prevented work" (OR 7.5, $p < 0.0001$) and "years of practice." Compared to a base level of 0–3 years of work, working for 3–6 years was associated with a higher frequency of chronic pain (OR 1.9, $p < 0.05$). Other levels were not significantly different (OR 1.7, $p = 0.08$ for 10–15 years of work for example).

Discussion

We managed to gather a large number of responses in our study with more than a thousand answers, allowing us to reach high statistical significance levels compared to previous studies in France and worldwide [7, 8, 17, 18]. Our studied population was young and mostly feminine. This is likely due to the diffusion mode of the study via Internet and specifically a notorious social media. While our population may show some discrepancy with the actual dentist population in France, which is reported to be older (mean age of 47.4 years old) and more balanced according to sex (45.5% of women) [21], the risk of bias is rather unlikely since we made most of our analyses according to age and sex. Still, it may have led to a lack of power when studying the older groups, but this was offset by our important sample.

Our questionnaire was deliberately short to avoid repelling respondents and to focus on points of interest.

Our findings of a prevalence of 77.9% of chronic back pain with an increase among women are totally coherent with other studies' results [2, 8, 9].

Age and years of practice are very much correlated together and gave results coherent with the literature as well: a lower prevalence of back pain among dentists who just started to work or who worked for a long time [9, 12]. It is to be noted that the back pains appear quickly after starting to work: Their prevalence jumps from 72% before 3 years of work to 84% between 3 and 6 years of work. The diminution of the prevalence of back pains with time needs explanations: It is likely that after many years of work, some practitioners either manage to use good working postures, or try to lighten their charge by working part-time. However, those who do not manage to suppress these pains suffer from an increased pain intensity.

The respondents who shifted frequently between sitting and standing seemed to show more frequent back pains, but their few numbers (less than 5% of the respondents) prevented us from getting a significant association. However, those respondents reported significant more intense back pains. We checked for confusion with age and years of practice, but the impact of working position stays unchanged over years. Thus, it is possible that they change the position frequently because they do not have knowledge of a good posture, leading to back pains, or inversely that they change posture frequently to avoid back pains.

Seats without back support seemed to be associated with an increased intensity of back pains, but further studies are needed to reach an appropriate statistical significance since some categories concerned less than 5 respondents in our study.

Previous studies focused only on the impact of the seat type on position and not on pain prevalence or intensity. The way the seats are used and adjusted, as well as positioning may lead to back pains independently of the type of seat [22].

Stretching showed no association with neither the prevalence nor the intensity of back pains, except for a slight association with increased upper back pain. The association of stretching with pain is complex. Stretching is mostly done to alleviate or avoid the pain and may be associated with less pain. On the contrary, stretching is more likely to be done by people who are already suffering from musculoskeletal disorders and thus could also be associated with more pain. Longitudinal studies may be more adapted to assess the efficiency of stretching in preventing and alleviating back pains [15].

The prevalence of back pains increases quickly after only 3 years of practice, and their intensity keeps increasing over the years. Preventive actions should be taken as soon as possible. Ergonomics is already included in dental students' teachings [23], but may be overlooked by the students who do not feel neck or back pains yet. Precocious awareness about potential future back pains is the cornerstone for future good habits and should be raised.

Conclusion

The prevalence of back pains is important among dentists and rises quickly when they start working. Appropriate postures should be adopted as soon as possible to avoid years of back pain, which disrupt personal and professional life as well as they are expensive for the individual and the society.

We need to implement efficient methods to raise awareness about the existing ways to prevent back pains among students and young dentists. Prospective studies to investigate the possible links of causality between working habits and appearance of back pains over a long time period could help identify specific alterable elements in dental practice to improve dentist's health.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval This article does not contain any studies with human participants or animals performed by any of the authors.

Informed consent Informed consent was obtained from all individual participants included in the study.

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