

A Study of Dentists about Their Knowledge and Practice of Dentine Hypersensitivity

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Abstract

Objective The aim of this study was to evaluate the knowledge and practice about dentine hypersensitivity (DH) among dental practitioners.

Materials and Methods A pilot-tested questionnaire was sent to practicing dentists ($n = 588$) working in private and public sectors in Lahore, Pakistan. The questions assessed dentists' knowledge about type of pain and predisposing factors of DH. The dentists were asked about their preferred methods of diagnosing and managing the condition.

Statistical Analysis Basic statistics, chi-squared test, and multivariate logistic regression were performed.

Results Most dentists (64.3%) reported examining one to five patients with DH per week in their dental clinics. A large majority (85.4%) indicated DH as a stimulated short pain from a tooth. Recession of gums (96.6%), aggressive brushing (88.2%), and frequent use of teeth whitening procedures (83.1%) were most frequently reported predisposing factors of DH. Among most commonly used methods of diagnosis, spontaneous pain after the application of air blast was reported by 74.8% of the participants and followed by spontaneous patient report confirmed by dental examination (57.7%). Most widely used management approaches of DH included the use of fluoride products (96.2%), use of desensitizing potassium nitrate toothpastes (75%), and application of bonding agents (56.2%). Female versus male dentists (odds ratio [OR]: 7.79, $p < 0.001$) and private practitioners versus public dentists (OR: 7.34, $p < 0.001$) were more likely to examine greater number of patients with DH.

Conclusion Dentists used various methods for diagnosing and managing patients with DH. Application of air blast to evaluate spontaneous pain and use of fluoride products were most widely used diagnostic and management preferences, respectively.

Keywords

- ▶ dentine hypersensitivity
- ▶ dentists
- ▶ knowledge
- ▶ diagnosis
- ▶ management

Introduction

Dentine hypersensitivity (DH) is a common oral condition that is characterized by sharp and transient pain frequently arising from thermal, chemical, tactile stimuli in exposed dentine.¹ Stimulation resulting from cold food or drink is the most common cause of pain; however, the use of citrus fruits, sweets, and salty food can also lead to DH.²

Discomfort associated with DH negatively affects the quality of life of patients.^{3,4} Patients with DH avoid eating, drinking and brushing, and consult dentist or use self-medication to relieve the pain.⁵ Gingival recession, excessive tooth brushing, scaling and root planning, and attrition are some of the common predisposing factors of DH.⁶ Previous studies reported the prevalence of DH in different parts of the world that ranged from 20.6 to 41.9%.⁵⁻¹⁰ However, a study of patients

attending a teaching dental hospital documented a prevalence of 1.34%.¹¹

It was reported that the majority of dentists were aware of the etiological factors of DH in United Kingdom.¹² Most of Australian dentists reported understanding of DH and prescribed desensitizing agents to treat the condition.¹³ According to dental practitioners in the United States, the use of desensitizing potassium nitrate toothpaste was the most common treatment modality for the management of DH.¹⁴ Similarly, dentists in the United States identified gingival recession, abrasion, erosion, and attrition as the most common predisposing factors of DH and employed a variety of diagnostic methods.² The most common theories of DH include direct innervation theory, odontoblast receptor theory, and fluid movement/hydrodynamic theory.¹⁵ About half the Nigerian dentists correctly identified "hydrodynamic theory" as the most common theory of DH¹⁵ and had inadequate knowledge and skills to diagnose and manage the condition.¹⁶

DH is highly prevalent and underdiagnosed condition that can be treated with a wide variety of inexpensive medications.¹ Hence, adequate understanding of DH among dentists is critical for the successful treatment of the condition to improve the standard of care and quality of life of patients. There is a lack of reliable data about DH among dentists in Pakistan. The objective of the study was to assess dentists' knowledge and practice of DH in Lahore, Pakistan.

Materials and Methods

This is a cross-sectional observation study. The target population was practicing dentist from private and public sectors in Lahore, Pakistan. The dentists with more than one year of clinical experience, practicing in Lahore, and those who showed voluntary participation met eligibility criteria for the selection in the present study. The study was conducted from October 2017 to December 2017 with a calculated sample of 588 eligible dentists. A 95% confidence interval, anticipated percentage frequency, and estimated population size were used for sample size calculation.¹⁷ The power of study was 80% assuming β equal to 0.20 (power = $1 - \beta$).

A questionnaire was developed based on previous similar studies.^{2,12-16} The self-administered structured questionnaire had closed ended questions about sociodemographic data/knowledge and diagnosis/management of DH. The instrument was piloted over 30 participants to evaluate its applicability and practicality in the field. Modifications were made based on the results of the pilot study. For example, there were seven options against the question about the number of patients complaining of DH. These options were reduced to four after dentists' feedback. Finally, approved questionnaire was administered among dentists in their clinics. For the purpose of obtaining satisfactory response rate, research assistants made maximum of three visits to dental clinics to accommodate the busy schedule of the dentists.

Ethical approval was obtained from the Institutional Review Board at the Fatima Jinnah Medical and Dental College, Lahore. The study participants provided their consents by filling out the questionnaire. The researchers briefed

participants through one-on-one discussion about the details of study including the objective and purpose of study. Identification of study participants remained concealed because of anonymous questionnaire. The study was conducted in full accordance with the World Medical Association Declaration of Helsinki.

Descriptive statistics were expressed using frequency distribution, mean, and standard deviation. Pearson's chi-squared tests were performed to evaluate the relationship of independent variables with knowledge, diagnosis, and management of DH. In addition, examination of number of patients with DH per week was used as the dependent variable and was dichotomized in to those who examined 0 to 10 patients (lesser number of patients) and 11 to ≥ 20 patients (greater number of patients) per week. Gender, type of job, monthly income, year since graduation, and basic dental qualifications were used as covariates to evaluate their influence on examining greater number of patients with DH per week and crude and adjusted odds ratio [OR]: were calculated with 95% confidence interval. For statistical tests, p -value was set at <0.05 . Statistical analyses were performed using SPSS software (IBM SPSS Statistics for Windows, Version 22.0. Armonk, New York, United States).

Results

The study had a good response rate (89.6%, 527/588 dentists). The study sample comprised of 41.6% of male and 58.4% of female dentists. The mean age of the participants was 29.46 ± 3.04 years. Almost half the participants (46.1%) were from private dental practice and 47.1% obtained their basic dental qualification from a private dental institution. Similarly, about half the participants (56%) had ≤ 5 years since graduation. The majority (64.3%) reported examining one to five patients with DH per week in their dental clinics (► **Table 1**).

Regarding the type of pain in DH, stimulated short pain from a tooth was the most common (85.4%) and it significantly differed between male (49.8%) and female dentists (50.2%) ($p < 0.001$). Recession of gums (96.6%), aggressive brushing (88.2%), and frequent use of tooth whitening procedures (83.1%) were the most common predisposing factors of DH. Significantly greater percentage of male (55.6%) than female (44.4%) dentists considered recession of gums as a predisposing factor of DH ($p < 0.001$). Similarly, more male (55.7%) than female participants (44.3%) believed that DH is caused by aggressive brushing ($p < 0.012$). In contrast, more female (55.7%) than male dentists (44.3%) identified frequent use of teeth whitening procedures as a predisposing factor of DH ($p < 0.001$) (► **Table 2**).

Among diagnostic methods, the participants most frequently reported evaluating spontaneous pain after the application of air blast (74.8%), followed by spontaneous patient report confirmed by dental examination (57.7%) and spontaneous pain after the application of cold water (43.3%). The electric pulp tester was used by only two dental practitioners in the study. Significantly, higher percent of female versus male dentists preferred diagnosing DH by spontaneous pain after the application of air blast and cold water

Table 1 Distribution of responses of dentists

Variables	n (%)
Gender	
Male	219 (41.6)
Female	308 (58.4)
Type of job	
Private	243 (46.1)
Public	284 (53.9)
Basic dental qualification obtained from	
Private institution	248 (47.1)
Public institution	279 (52.9)
Year since graduation	
≤Five years	295 (56)
>Five years	232 (44)
Monthly income	
<500 \$US	219 (41.6)
≥500 \$US	308 (58.4)
Number of patients with DH per week	
1–5 patients per week	339 (64.3)
6–10 patients per week	81 (15.4)
11–15 patients per week	89 (16.9)
16–≥20 patients per week	18 (3.4)
Age	Mean ± SD 29.46 ± 3.04

Abbreviation: DH, dentine hypersensitivity.

($p < 0.001$) (► **Table 3**). The use of fluoride products was the most frequently (96.2%) reported management approach of DH followed by potassium nitrate toothpastes (75%) and dentine bonding agents (56.2%). Significantly higher percentage of male dentists preferred using these products compared with female dentists ($p < 0.001$). Glutaraldehyde/HEMA products (8.2%) and oxalates (8.7%) were the least commonly employed methods for the management of DH (► **Table 3**).

► **Table 4** summarizes data about the comparison between private and public dentists, and dentists with ≤ 5 year since graduation and those with > 5 years since graduation with regard to their preferences for diagnosis and management of DH. The use of air blast and cold water was more frequently employed by public dentists and dentists with more experience (>5 years) than private dentists and dentists with less experience (≤ 5 year) since graduation ($p < 0.001$). Significantly higher proportion of public dentists (56%) used fluoride products than private practitioners (44%) ($p < 0.001$). However, no significant differences were observed regarding the use of potassium nitrate toothpaste between private and public dentists ($p = 0.667$). The dentist with ≤ 5 years of experience (58.2%) used fluoride products, dentine bonding agents, and diet counseling more commonly than those with > 5 years of experience (41.8%) ($p < 0.001$) (► **Table 4**). Multivariate logistic regression analysis demonstrated that female dentists (OR: 7.79, $p < 0.001$), private practitioners (OR: 7.34, $p < 0.001$), and dentists with monthly income of ≥ 500 \$US per month (OR: 9.41, $p < 0.001$) were more likely to examine greater number of patients with DH. Similarly, the odds of examining greater number of patients with DH per week

Table 2 Knowledge of male and female dentists about dentine hypersensitivity

Response	Sample n/%	Male n/%	Female n/%	p-Value
Types of pain in DH				
Spontaneous throbbing pain from a tooth	2 (0.4)	0 (0)	2 (100)	0.127
Intermittent short sharp pain from a tooth	149 (28.3)	137 (91.9)	12 (8.1)	< 0.001
Stimulated short sharp pain from a tooth	450 (85.4)	224 (49.8)	226 (50.2)	< 0.001
Chronic dull pain from a tooth	56 (10.6)	0 (0)	56 (100)	< 0.001
Predisposing factors of DH				
Aggressive brushing /over brushing	465 (88.2)	259 (55.7)	206 (44.3)	0.012
Frequent use of teeth whitening procedures	438 (83.1)	194 (44.3)	244 (55.7)	< 0.001
Excessive dental flossing	35 (6.6)	35 (100)	0 (0)	< 0.001
Recession of gingiva	509 (96.6)	283 (55.6)	226 (44.4)	< 0.001
Periodontal surgery	96 (18.2)	44 (45.8)	52 (54.2)	0.087
Scaling and root planning	398 (75.5)	257 (64.6)	141 (35.4)	< 0.001
Periodontal pocket	192 (36.4)	89 (46.4)	103 (53.6)	0.010
Bruxism	218 (41.4)	160 (73.4)	58 (26.6)	< 0.001
Smoking	2 (0.4)	2	0	0.188
Abrasion, erosion, abfraction and/or attrition	403 (76.5)	224 (55.6)	179 (44.4)	0.118
Excessive use of citrus juices, and/or carbonated drinks	337 (63.9)	196 (58.2)	141 (41.8)	0.006
Gastric reflux and/or excessive vomiting	287 (54.5)	196 (68.3)	91 (31.7)	< 0.001
Trauma during tooth preparation	383 (72.7)	256 (66.8)	127 (33.2)	< 0.001
Loss of cementum	394 (74.8)	246 (62.4)	148 (37.6)	< 0.001

Abbreviation: DH, dentine hypersensitivity.

Table 3 Practice of male and female dentists about the diagnosis of dentine hypersensitivity

Diagnostic methods of DH	Sample n/%	Male n/%	Female n/%	p-Value
Spontaneous patient report confirmed by dental exam	304 (57.7)	105 (53.8)	90 (46.2)	0.959
Patient report after dentist's query	195 (37)	206 (52.3)	188 (47.7)	0.262
Spontaneous pain after the application of air blast	394 (74.8)	99 (43.4)	129 (56.6)	< 0.001
Spontaneous pain after the application of cold water	228 (43.3)	99 (43.4)	129 (56.6)	< 0.001
Spontaneous pain after scratching dentine with dental explorer	181 (34.3)	106 (58.6)	75 (41.4)	0.105
Use of electric pulp tester	2 (0.4)	2	0	0.188
Asking patient to numerically rate pain	97 (18.4)	41 (42.3)	56 (57.7)	0.012
Asking patient to rate pain using visual analogue scale	79 (15)	0	75	< 0.001
Management preferences of DH				
Use of fluoride products (e.g., gels, varnishes, pastes, rinses)	507 (96.2)	283 (55.8)	224 (44.2)	< 0.001
Use of desensitizing potassium nitrate toothpastes	395 (75)	247 (62.5)	148 (37.5)	< 0.001
Application of glutaraldehyde/HEMA products	43 (8.2)	43 (100)	0 (0)	< 0.001
Application of dentine bonding agents	296 (56.2)	180 (60.8)	116 (39.2)	< 0.001
Application of sealants	120 (22.8)	4 (3.3)	116 (96.7)	< 0.001
Provision of restorative treatments	180 (34.2)	128 (71.1)	52 (28.9)	< 0.001
Use of lasers	56 (10.6)	2 (3.6)	54 (96.4)	< 0.001
Use of oxalates	46 (8.7)	28 (60.9)	18 (39.1)	0.307
Diet counseling	290 (55)	165 (56.9)	125 (43.1)	0.104

Abbreviation: DH, dentine hypersensitivity.

were significantly higher for dentists with ≥ 5 years since graduation (OR: 2.75, $p = 0.002$) and those who obtained basic dental qualification from private dental institution (OR: 2.04, $p = 0.026$) (► **Table 5**).

Discussion

This study evaluated dentists' preferences about the diagnosis and management of DH in addition to their understanding about the type of pain and its predisposing factors. In line with the results of a previous study (92.8%) in Nigeria,¹⁶ a vast majority of participants (85.4%) in this study described DH as a stimulated short sharp pain. It is known that DH is a multifactorial condition.^{10,18} The present study showed that dental practitioners identified different etiological factors leading to DH; however, gingival recession was the most frequently reported factor. This finding is in accordance with similar questionnaire-based studies of dental practitioners in the United States and Australia.^{2,13} On the other hand, Indian dentists indicated dental caries as the main etiological agent of DH.¹⁹ The finding of gingival recession as the most common etiological factor is supported by one of the most widely accepted theories of DH, hydrodynamic theory.⁵ Clinical studies from China, India, and Brazil had also reported an association between gingival recession and DH.^{7,8,10}

Dental practitioners in our study used diverse diagnostic methods; however, they most frequently used air blast to evaluate the spontaneous pain of DH, followed by spontaneous patient report confirmed by dental exam. Similarly, dentists in the United States most frequently diagnosed DH by confirming patient report coupled with clinical

examination, while air blast was the second most commonly used method of diagnosis.² Another study in the United States also reported that most dental practitioners relied on patients' report for the diagnosis of DH.²⁰ In Senegal, 68% of dentists used mechanical stimuli to diagnose the DH pain.²¹ Scratching of tooth was the most commonly used diagnostic method reported by dentists in Nigeria.¹⁶

The current study found that many different diagnostic techniques of DH differed significantly between male and female dentists, private and public dentists, and dentists with lesser and greater clinical experience. However, consistent patterns regarding the use of diagnostic methods among these dentists were not identified in the study. The present study demonstrated that the use of fluoride formulations and potassium nitrate toothpaste was the most common preferences for the management of DH. These findings are in agreement with the results of previous studies in Canada, United Kingdom, Australia, and the United States.^{2,12,13,20} A recent study of private practitioners in India reported the prescription of desensitizing agents for home use as the most common management option.¹⁹ Recently, dentists used sensitivity toothpastes and desensitizers as the most frequently recommended first line of treatment of DH in United Kingdom.²² It was also found that the application of fluoride toothpaste resulted in improved satisfaction of patients with the treatment of DH.²³ In addition, striking similarities were observed between dentists' preferences for the treatment of DH and actual recommendations for patients with DH.^{2,14}

The use of dentine bonding agent (56.2%) and diet counseling (55%) were the third most common treatment modalities in this study. These findings are consistent with the

Table 4 Practice of private and public dentists and dentists with ≤ 5 and > 5 years of experience about the management of dentine hypersensitivity

Diagnostic methods of DH	Private practitioners	Public dentist	p-Value	Dentist with ≤ 5 years since graduation	Dentist with > 5 years since graduation	p-Value
Spontaneous patient report confirmed by dental exam	141 (46.4)	163 (53.6)	0.884	179 (58.9)	125 (41.1)	0.117
Patient report after dentist's query	80 (41)	115 (59)	0.073	157 (80.5)	38 (19.5)	< 0.001
Spontaneous pain after the application of air blast	147 (37.3)	247 (62.7)	< 0.001	182 (46.2)	212 (53.8)	< 0.001
Spontaneous pain after the application of cold water	58 (25.4)	170 (74.6)	< 0.001	74 (32.5)	154 (67.5)	< 0.001
Spontaneous pain after scratching dentine with dental explorer	82 (45.3)	99 (54.7)	0.788	76 (42)	105 (58)	< 0.001
Use of electric pulp tester	2 (100)	0 (0.0)	0.212 ^a	2 (100)	0 (0.0)	0.506 ^a
Asking patient to numerically rate pain	95 (97.9)	2 (2.1)	< 0.001	36 (37.1)	61 (62.9)	< 0.001
Asking patient to rate pain using visual analogue scale	41 (51.9)	38 (48.1)	0.263	61 (77.2)	18 (22.8)	< 0.001
Management preferences of DH						
Use of fluoride products (e.g., gels, varnishes, pastes, rinses)	223 (44)	284 (56)	< 0.001	295 (58.2)	212 (41.8)	< 0.001
Use of desensitizing potassium nitrate toothpastes	180 (45.6)	215 (54.4)	0.667	232 (58.7)	163 (41.3)	0.027
Application of glutaraldehyde/HEMA products	43 (100)	0 (0)	< 0.001	2 (4.7)	41 (95.3)	< 0.001
Application of dentine bonding agents	166 (56.1)	130 (43.9)	< 0.001	140 (47.3)	156 (52.7)	< 0.001
Application of sealants	85 (70.8)	35 (29.2)	< 0.001	65 (54.2)	55 (45.8)	0.649
Provision of restorative treatments	5 (2.8)	175 (97.2)	< 0.001	77 (42.8)	103 (57.2)	< 0.001
Use of lasers	56 (100)	0 (0)	< 0.001	38 (67.9)	18 (32.1)	0.058
Use of oxalates	20 (43.5)	26 (56.5)	0.708	2 (4.3)	44 (95.7)	< 0.001
Diet counseling	97 (33.4)	193 (66.6)	< 0.001	151 (52.1)	139 (47.9)	0.046

Abbreviation: DH, dentine hypersensitivity.

^aFisher's exact test.

results of a previous study.²⁰ It is known that dietary acids can cause erosion of enamel, leading to the exposure of dentine and dentinal tubules that results in increased flow of fluids upon stimulation.⁶ The use of bonding agent can significantly reduce symptoms of DH.²⁴ This might explain why almost half the dentists in our study reported using bonding agent and providing dietary counseling for the treatment of DH.

The application of glutaraldehyde/HEMA products (8.2%) and use of oxalates (8.7%) were the least frequently reported treatment modalities in the present study. This is in contrast to the findings of a previous study which found that 58% and 46% of participating dentists used glutaraldehyde/HEMA products and oxalates, respectively.²⁰ The effectiveness of laser for the treatment of DH has been demonstrated in many clinical studies.²⁵⁻²⁷ Despite, only 10.6% of dentists preferred

lasers for the management of DH in the current study, possibly because most dentists might not afford laser apparatus in their clinics.

The results of this study showed inconsistent trends regarding treatment modalities among dentists. It was found that significantly higher percent of male than female dentists used fluorides products, desensitizing potassium nitrates toothpastes, and application of bonding agents to manage DH. On the contrary, male and female dentists showed no significant differences about providing diet counseling. Similarly, more public dentists used fluoride products and provided diet counseling than private practitioners. However, no significant differences were observed regarding the use of potassium nitrate toothpaste between private and public dentists.

Table 5 Bivariate and multivariate logistic regression: Factors associated with the examining of greater number of patients with dentin hypersensitivity

Variables	Examining greater number of patients with DH			
	Crude OR (95% CI)	p-Value	Adjusted OR (95% CI)	p-Value
Gender Female ^a Male	4.91 (3.03, 7.96)	< 0.001	7.79 (3.87, 15.66)	< 0.001
Type of job Private ^a Public	4.96 (3.06, 8.05)	< 0.001	7.34 (3.78, 14.25)	< 0.001
Monthly income <500 \$US ^a ≥500 \$US	4.54 (2.64, 7.8)	< 0.001	9.41 (4.67, 18.93)	< 0.001
Year since graduation > Five years ^a ≤ Five years	0.86 (0.56, 1.32)	0.498	2.75 (1.46, 5.19)	0.002
Basic dental qualification (BDS or equivalent) obtained from Private dental college ^a Public dental college	4.72 (2.91, 7.65)	< 0.001	2.04 (1.09, 3.82)	0.026

Abbreviations: CI, confidence interval; DH, dentine hypersensitivity; OR, odds ratio.

^aReference categories.

This is the first study that provided valuable data about the current trends of diagnosis and management of DH in dental practice in Pakistan. The analysis of a large data in the study provided robust and valid findings that can be used by the organizers of continuing education activities and dental institutions to enhance knowledge and skills of dental professionals related to DH. Although data collection included a large sample of dentists from a cosmopolitan city of 11.1 million people, the generalizability of the results to other geographical locations or regions should be done with caution. In addition, the dentists conveniently participated in the study. Hence, the study may not comprehensively represent the dentists' population in the city. Moreover, there can be over- and under-reporting of some responses by male and female dentists, private and public dentists, and dentists with less or more clinical experience, etc. In future, a nationwide study should be conducted to evaluate practices of dentists about DH.

Conclusion

In conclusion, DH is a highly prevalent condition in dental practice. The majority of dentists identified recession of gums, aggressive brushing, and frequent use of tooth whitening procedures as the predisposing factors. Diagnostic techniques and management preferences varied among participating dentists. The application of air blast and spontaneous patient report confirmed by dental examination were the most frequently used diagnostic methods. Preferred management approaches included the use of fluoride products, desensitizing toothpastes, and bonding agents. Dental practitioners should continuously update their knowledge and skills to effectively manage DH and improve quality of life of patients.

Conflict of Interest

None declared.

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