Evaluation of dentine hypersensitivity in adult population with chronic periodontitis visiting dental hospital in Chandigarh

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ABSTRACT

**Background:** Periodontal attachment loss could be an earlier indicator or a possible risk factor of dentine hypersensitivity (DH). Thus, there is a need for diagnosing this condition both by questionnaire and by clinical examination before rendering both home care and in-office treatment modalities.

**Aims:** To investigate the relationship between various demographic factors and DH and to detect the percentage of patients using desensitizing agents.

**Materials and Methods:** In this cross-sectional study, 2051 patients were evaluated till the required sample size of 1000 patients was achieved who were evaluated both by questionnaire and clinical test. Association between DH clinical attachment level and apparent recession was established.

**Results:** This study found that the prevalence of dentine hypersensitivity in chronic periodontitis patients was 37.2% according to questionnaire and 47.8% according to the results of clinical test. Various demographic factors were found to affect dentine hypersensitivity such as age, gender, education, diet, and locality.

**Conclusion:** The prevalence of dentine hypersensitivity in chronic periodontitis patients was 37.2% according to questionnaire and 47.8% according to the results of clinical test. Periodontal attachment loss could be an earlier indicator or a possible risk factor of DH. Only 14.36% of the patients with sensitive teeth used desensitizing paste. This could be due to the fact that either the patients did not consider the condition bad enough to warrant treatment or it was not being diagnosed.

**Key words:** Dentine hypersensitivity, epidemiology, gingival recession, periodontal diseases

Dentine hypersensitivity (DH) is a common painful condition which has been defined as a “short, sharp pain arising from exposed dentine response to stimuli typically thermal, evaporative, tactile, osmotic, or chemical, and which cannot be ascribed to any other form of dental defect or disease.”[1] DH affects a significantly large proportion of the adult population. Several studies have reported that DH was found in adult populations with prevalence ranging from 2.8% to 74%.[2-4] This wide variation in prevalence has been presumed due to a number of factors, including different methods used to diagnose the condition, variation in the type of sample population, variation in the consumption of foods and drinks, variation in the type of sample population, and the type of setting where the study was carried out.[5] However, the amount of epidemiological data on dentine hypersensitivity in patients with chronic periodontitis is scarce. Most of the studies have been carried out using a patient questionnaire with no subsequent clinical examination, so it is likely to be an overestimation due to the inclusion of other causes of sensitivity.[6] Furthermore, none of the studies provide the data on the prevalence of DH in patients of chronic periodontitis exclusively and the proportion of patients who have undergone treatment for sensitivity.

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Therefore, the primary aim of this study was to carry out a cross-sectional study in chronic periodontitis patients visiting dental hospital to estimate the prevalence of self-reported DH based on the questionnaire and actual DH based on clinical examination. Secondly, the aim was to investigate the relationship between various demographic factors and DH.

MATERIALS AND METHODS

This study was carried out from May 2011 to December 2012 in a dental hospital at Chandigarh in India. The study was cleared by the Ethical Committee of Panjab University on May 2011. This project received grant from the Department of Science and Technology, Chandigarh. The investigation was carried out in the form of a DH questionnaire DH(Q) followed by a DH clinical examination DH(C). All patients were clinically examined for DH regardless of their response to questionnaire. Informed consent was obtained from all recruits.

Inclusion and exclusion criteria

About 2051 subjects were evaluated till the sample size of 1000 was achieved based on the inclusion criteria. Equal number of male and female patients was evaluated, i.e., M:F is 1:1. The inclusion criteria were as follows:

- Subjects of age 20–69 years and in good general health
- Subjects with a history of phase 1 therapy in the past 3 months
- Patients with acute dental problems
- Patients undergoing orthodontic therapy
- Subjects with a history of phase 1 therapy in the past 3 months
- Patients with caries, attrition, erosion, abrasion, and abfraction.
- Abutment teeth for dentures and bridge work
- Teeth with marginal restorations interfering with dentine hypersensitivity evaluation
- Teeth with caries, attrition, erosion, abrasion, and abfraction.

Exclusion criteria were based on Gillam et al.[7] with slight modification. Subjects with any of the following conditions were not included in the study:

- Subjects with a history of allergies, diabetes mellitus, hypertension, any disease requiring analgesic drugs, tranquilizers, or mood-altering medication
- Subjects with a history of phase 1 therapy in the past 3 months
- Patients with acute dental problems
- Patients undergoing orthodontic therapy
- Patients using both home care and in-office desensitizing agents were excluded.

Teeth with any of the following conditions were not included in the study:

- Root-filled teeth
- Crowned teeth
- Abutment teeth for dentures and bridge work
- Teeth with marginal restorations interfering with dentine hypersensitivity evaluation
- Teeth with caries, attrition, erosion, abrasion, and abfraction.

Questionnaire and clinical test

Questions about DH were read to the subjects and answers were recorded by the same examiner. The first part of the questionnaire gathered sociodemographic data (age, gender, location, education, diet, personal habits, pain-inciting stimuli, and its duration and frequency were asked and written down). Subjects who reported having hypersensitivity symptoms in the questionnaire were further diagnosed by a blast of air from a triple syringe connected to an air compressor at a pressure of 60 psi under room temperature of about 20–25°C. This air jet, lasting for 3 s at a distance of 1 cm from the tooth surface (1 s for each surface including the buccal, occlusal, and lingual surface), was directed at the patients’ tooth, and their personal perception of the severity of pain was associated with sensitivity by making a mark on a visual analog scale (VAS). A 10 cm horizontal VAS was used with the anchors designated as “no pain” and “severe pain.” Each subject dichotomized the response for each tooth as “no discomfort” or “discomfort.” No attempt was made to grade the severity of the discomfort associated with a particular tooth. About 13,384 teeth were examined clinically by the same examiner.

Both the attachment loss and gingival recession were measured on sensitive teeth, and all data were recorded on a clinical form according to different tooth types. All the measurements were made using a 1 mm Williams graduated periodontal probe (first generation periodontal probe) on all six sites of a tooth. The tip of the instrument was placed with a light pressure of about 20 g into the gingival sulcus parallel to the long axis of the tooth. The deepest pocket depth around the tooth was recorded as PD. Then, using the same probe, the distance of gingival margin to cemento-enamel junction was recorded as gingival margin level (GML). Thereafter, clinical attachment level (CAL) was calculated as CAL = PD – GML.

Data processing and statistical analysis

All statistics were calculated using SPSS (Software package for Statistical Analysis) version 17. Categorical variables were presented as number and percentages. Chi-square test or Fisher’s exact test was applied for comparison of different sexes and age groups with or without DH. A 95% level of significance, i.e., $P \leq 0.05$ was reached where a significant difference is reported in the text.

RESULTS

Questionnaire

A total of 2051 patients were evaluated till the required sample size of 1000 patients was achieved based on the inclusion criteria. Three hundred and seventy-two subjects reported hypersensitivity symptoms in the questionnaire, yielding an overall prevalence of 37.2%. Gender distribution of 372; 211 females and 161 males had dentine hypersensitivity ($P \leq 0.001$) [Figure 1] shows that the prevalence of hypersensitivity is significantly higher in females.
Age distribution
The greatest number of subjects reporting dentine hypersensitivity symptoms was found to be in 40–49 years age group \( (P \leq 0.001) \) followed by 20–29 years age group. The least number of subjects reporting dentine hypersensitivity was in the 60–69 years age group [Figure 2].

Educational distribution
The study shows that the prevalence of dentine hypersensitivity is maximum among illiterate females, i.e., F:M of 1.09:1 \( (P \leq 0.001) \) [Table 1].

Diet distribution
Table 1 shows that the prevalence of dentine hypersensitivity is more in vegetarians as compared to the nonvegetarians \( (P \leq 0.05) \). On the other hand, there is no statistically significant difference in dentine hypersensitivity among the alcoholics and nonalcoholics. However, alcoholics showed more signs of DH.

Locality distribution
According to Table 1, the subjects residing in the city present with more dentine hypersensitivity as compared to those residing in suburbs \( (P \leq 0.05) \).

Dentine hypersensitivity
In this study, the most common type of stimuli for hypersensitivity was sweet \( (31.5\%) \) followed by heat \( (26.1\%) \) [Figure 3].

More females showed the longevity of DH that lasted as long as the stimuli were present, the difference was not statistically significant as compared to males \( (P < 0.075) \). Higher percentage of DH was found in females for a duration of <6 months \( (64\%) \) [Table 1].

Dentine hypersensitivity clinical test
All 1000 patients were examined clinically using blast of air from a triple syringe. Of all 1000 patients, 478 patients tested positive for DH, thus yielding an overall prevalence of 47.8%. Of 478, 264 were females and 214 were males, yielding a female to male ratio of 1.09 \( (P \leq 0.01) \).

Figure 1 shows that females observed statistically significant DH \( (C) \) as compared to males, i.e., 51.8% and 43.7%, respectively \( (P < 0.01) \).

Distributions categorized by age showed that the greatest number of subjects with DH \( (C) \) as diagnosed by cold air blast stimulus occurred in 40–49 years age group \( (P < 0.001) \); with the least number occurring in the 60–69 years age group [Figure 2].

The age and gender distribution of both DH \( (C) \) and DH \( (Q) \) were observed to be similar. A total of 13,384 teeth were
examined, of which 6398 teeth (47.8%) responded to cold air blast stimulus. The presence of DH by tooth type showed that the premolar was the most commonly affected, followed by the first molar, while the second molar was the least affected.

Figures 4 and 5 show that all 6398 (47.8%) sensitive teeth were associated with attachment loss without apparent recession whereas 2393/6398 (37.4%) had both attachment loss and apparent recession.

**DISCUSSION**

In this cross-sectional study, 2051 patients were evaluated till the required sample size of 1000 patients was achieved who were evaluated both by questionnaire and clinical test. This study observed that the total prevalence of DH in patients of chronic periodontitis was 37.2% according to the results of the questionnaire and 47.8% according to the results of clinical test. These findings are in accordance to the studies showing clinical examination in university clinics which reported higher prevalence values of >30% and had similar sample size\(^ {[8-11]}\).

Since all the patients had to undergo clinical test, this study showed a slightly higher prevalence. Moreover, in the present study, an air blast from a dental air syringe was used as a stimulus test, which was in accordance to several previous studies\(^ {[2,3,11]}\).

It has been suggested that for a prevalence study with a larger sample size, an air blast stimulus is an effective method. It could also be suggested that an air blast with both thermal and evaporative components is more comparable to the clinical test.
Dentine hypersensitivity in chronic periodontitis patients

Sood, et al.

Indian Journal of Dental Research, 27(3), 2016

Figure 5: Total amount of attachment loss and gingival recession by tooth type in a clinical test

Fischer et al.\(^\text{(12)}\) and Liu et al.\(^\text{(10)}\) reported that 95% and 92% of sensitive subjects were sensitive to an air blast stimulus. Chabanski et al.\(^\text{(9)}\) also reported that there was no statistically significant difference in the subjective response to tactile and evaporative stimuli. Absi et al.\(^\text{(13)}\) had previously reported that usually only a limited area of the exposed dentine was actually sensitive, and evaporative stimuli was more aggressive than tactile stimuli as the probes did not touch the sensitive area of sensitive teeth, thus the air blast technique is more widely recommended.

It is well established that DH occurs more commonly in females.\(^\text{[4,12,14]}\) The female: male ratios found by the questionnaire and clinical test were both statistically significant (\(P < 0.01\)). The reason for this difference might be due to the fact that women have better overall healthcare and oral hygiene awareness, which would make them more sensitive to DH.\(^\text{[15]}\) Females also appeared to be more sensitive to pain and this physiological phenomenon may be another possible reason leading to the difference.\(^\text{[16,17]}\)

Our present study showed that the highest prevalence of DH occurred in 40–49–year-old age group (\(P < 0.001\)), which is similar to the findings reported by Rees and Addy.\(^\text{[18]}\) The age group of 60–69 years showed minimum hypersensitivity. Declining DH symptoms after the age of sixty may be due to the development of secondary or sclerotic dentine.\(^\text{[12]}\)

In our study, the prevalence of DH was found to be maximum among the illiterate females (\(P < 0.001\)), which is in accordance to the study conducted by Que et al., especially in female workers or laborers of lower socioeconomic status.\(^\text{[5]}\)

In our study, majority of vegetarians had DH as compared to nonvegetarians (\(P < 0.05\)). It could be due to high intake of coarse and fibrous foods by the Indian population as compared to the Westernized populations.\(^\text{[13]}\)

On the other hand, neither alcoholics nor nonalcoholics had any effect on DH. This finding is not in accordance to the well-established fact that erosive foods and drinks can remove the dentinal smear layer and increase the patency of the dentinal tubules, thereby exacerbating DH.\(^\text{[19]}\)

This study showed that the subjects residing in the cities are more prone to have DH as compared to suburbs. This could be due to the fact that more number of persons residing in the city turned to dental hospital for routine check-ups as compared to those who lived in suburbs. These findings are in accordance to the study conducted by Rees JS where both the inner city population and the patients from the rural areas were considered.\(^\text{[2]}\)

Response to sweat was cited as the most common stimulus for sensitivity (31.5%). This finding was in contrast to the findings of Orchardson et al.\(^\text{[8]}\) and Chabanski et al.\(^\text{[20]}\) who reported cold as the most common stimuli. Other studies have also reported cold as the common stimuli.\(^\text{[12,21,22]}\) The
Dentine hypersensitivity in chronic periodontitis patients

second most prevalent stimulus reported in this study was heat. This is in contrast to the study conducted by Flynn et al. [21] and Fischer et al. [12] Brännström et al. believed that pain from heat takes longer to develop than pain from cold because heat causes inward movement of tubular fluid whereas the outward movement caused by cold develops more rapidly. [23] In this study, subjects who reported pain by sweet stimuli were mainly elicited by consuming sweets made up of refined sugars. In a country such as India, the dietary pattern is such that all over the subcontinent people like to supplement their foods with sweets, especially in Northern India.

It was found that all the patients, especially females who suffered currently from dentine sensitivity claimed to have endured the condition for <6 months (63.7%) whereas 18.8% showed discomfort for less than a year and only 15.1% showed the duration of discomfort between 1 and 5 years. These findings are in accordance to the study conducted by Gillam et al. [22] who claimed that 17.7% of patients from the UK and 23.6% patients from Korea claimed that their discomfort did not persist beyond 1 year. The longevity of DH in this study was found to last as long as the stimuli were present, while 27.7% patients expressed their discomfort for <2 min whereas in only 22.8% patients, the discomfort lasted for more than 2 min. This finding is in contrast to the finding of Flynn et al. [21] who showed that only 1.08% patients reported discomfort as long as stimuli was applied or <2 min. Majority of the patients showed longevity of DH for more than 2 min of removal of stimuli.

The teeth most often affected by DH were the premolars and the first molars. Most of the earlier studies had also reported premolars and/or the first molars as the most common sensitive teeth. [2,3,8,12] The questionnaire revealed that 14.36% of the subjects who thought they had sensitive teeth used desensitizing paste. This finding is in accordance to the study conducted by Flynn et al. [21] who found that only one-quarter of the subjects with DH received professional treatment. This could be due to the fact that either the patients did not consider the condition bad enough to warrant treatment or it was not being diagnosed.

Some previous studies have reported prevalence of DH associated with gingival recession ranging from 29.7% to 93%. [3,9,11,18] In this study, it was found that of all sensitive teeth associated with periodontal attachment loss, only one-third had gingival recession. Root surfaces may be exposed after periodontal attachment loss occurred and before gingival recession, thus exposed root surfaces become susceptible to acidic food and drinks, which may soften the dentine. Subsequent tooth brushing with toothpaste may contribute to further loss of tooth structure. [24] This suggests that periodontal attachment could be an earlier risk indicator for DH than gingival recession. There are some limitations to the present study, as it is recognized that using only an air blast stimulus might not be capable of replicating all types of DH, especially for the clinical trials, which need to be accurately compared before and after treatment. The study primarily focuses on DH due to attachment loss and/or recession, thus the other etiological dental anomalies associated with DH were not considered.

CONCLUSION

This cross-sectional study found that the prevalence of dentine hypersensitivity in chronic periodontitis patients attending O.P.D in Govt. Dental College and hospital at Chandigarh in North India was 37.2% according to questionnaire and 47.8% according to the results of clinical test. Various demographic factors were found to affect dentine hypersensitivity such as age, gender, education, diet, and locality. Overall, the prevalence of DH decreased with age with minimum prevalence at the age of 60–69 years. The first premolar was the most commonly affected tooth whereas the second molar was the least affected tooth. Periodontal attachment loss could be an earlier indicator or a possible risk factor of DH. Only 14.36% of the patients with sensitive teeth used desensitizing paste; this is indicative of the fact that people in this region are not aware of their dental condition, so because of lack of knowledge, they do not seek any treatment. Moreover, through this study, many cases with DH were detected clinically who did not report any DH when asked using a questionnaire.

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Conflicts of interest

There are no conflicts of interest.

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254

Indian Journal of Dental Research, 27(3), 2016
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Dentine hypersensitivity in chronic periodontitis patients

Sood, et al.

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